CHAPTER 2

Configuring Interfaces

The main function of a switch is to relay frames from one data link to another. To relay the frames, the characteristics of the interfaces through which the frames are received and sent must be defined. The configured interfaces can be Fibre Channel interfaces, Gigabit Ethernet interfaces, the management interface (mgmt0), or VSAN interfaces.

This chapter describes the basic interface configuration to get your switch up and running. It includes the following sections:

For more information on configuring mgmt0 interfaces, refer to the *Cisco MDS 9000 Family NX-OS Fundamentals Configuration Guide* and *Cisco MDS 9000 Family NX-OS IP Services Configuration Guide*.

See the *Cisco MDS 9000 Family NX-OS IP Services Configuration Guide* for more information on configuring Gigabit Ethernet interfaces.

Tip Before you begin configuring the switch, ensure that the modules in the chassis are functioning as designed. See the *Cisco MDS 9000 Family NX-OS Fundamentals Configuration Guide*.

Tip Before you begin configuring the switch, ensure that the modules in the chassis are functioning as designed. To verify the status of a module at any time, enter the **show module** command in EXEC mode. For information about verifying the module status, refer to the *Cisco NX-OS Fundamentals Configuration Guide*.

Fibre Channel Interfaces

This section describes Fibre Channel interface characteristics, including (but not limited to) modes, frame encapsulation, states, SFPs, and speeds.

This section includes the following topics:

Generation 1 Interfaces Configuration Guidelines

The Generation 1 interfaces configuration guidelines apply to the following hardware:

- The 32-port, 2-Gbps or 1-Gbps switching module interfaces.
- The Cisco MDS 9140 and 9120 switch interfaces.

Note Due to the hardware design of the MDS 9134 switch, we do not support interface out-of-service action on either of its two 10-Gigabit ports. This is because no internal port hardware resource is released when an out-of-service action is performed on these 10-Gigabit ports.

When configuring these host-optimized ports, the following port mode guidelines apply:

- You can configure only the first port in each 4-port group (for example, the first port in ports 1-4, the fifth port in ports 5-8, and so on) as an E port. If the first port in the group is configured as an E port, the other three ports in each group (ports 2-4, 6-8, and so on) are not usable and remain shutdown.

- If you execute the **write erase** command on a 32-port switching module, and then copy a saved configuration to the switch from a text file that contains the **no system default switchport shutdown** command, you need to copy the text file to the switch again for the E ports to come up without manual configuration.
- If any of the other three ports are enabled, you cannot configure the first port as an E port. The other three ports continue to remain enabled.
- The auto mode is not allowed in a 32-port switching module or the host-optimized ports in the Cisco 9100 Series (16 host-optimized ports in the Cisco MDS 9120 switch and 32 host-optimized ports in the Cisco MDS 9140 switch).
- The default port mode is Fx (Fx negotiates to F or FL) for 32-port switching modules.
- The 32-port switching module does not support FICON.

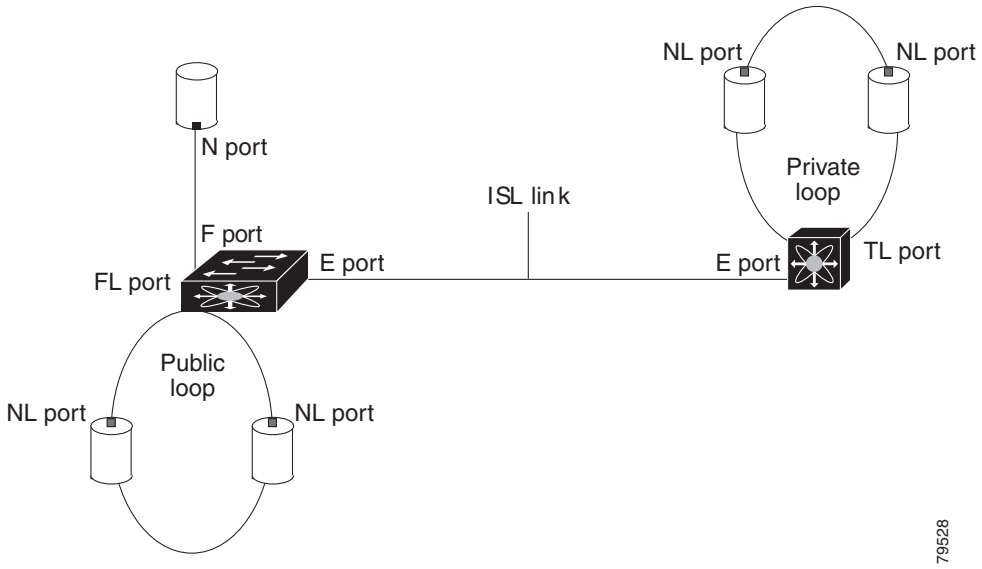
Note We recommend that you configure your E ports on a 16-port switching module. If you must configure an E port on a 32-port host-optimized switching module, the other three ports in that 4-port group cannot be used.

Note In the Cisco MDS 9100 Series, the groups of ports that are located on the left and outlined in white are full line rate. The other ports are host-optimized. Each group of 4 host-optimized ports have the same features as for the 32-port switching module.

About Interface Modes

Each physical Fibre Channel interface in a switch may operate in one of several port modes: E port, F port, FL port, TL port, TE port, SD port, ST port, and B port (see Figure 2-1). Besides these modes, each interface may be configured in auto or Fx port modes. These two modes determine the port type during interface initialization.

Figure 2-1 Cisco MDS 9000 Family Switch Port Modes



Note Interfaces are created in VSAN 1 by default. See the *Cisco MDS 9000 Family NX-OS Fabric Configuration Guide*.

Each interface has an associated administrative configuration and an operational status:

- The administrative configuration does not change unless you modify it. This configuration has various attributes that you can configure in administrative mode.
- The operational status represents the current status of a specified attribute like the interface speed. This status cannot be changed and is read-only. Some values may not be valid when the interface is down (for example, the operational speed).

Note When a module is removed and replaced with the same type of module, the configuration is retained. If a different type of module is inserted, then the original configuration is no longer retained.

Each interface is briefly described in the sections that follow.

E Port

In expansion port (E port) mode, an interface functions as a fabric expansion port. This port may be connected to another E port to create an Inter-Switch Link (ISL) between two switches. E ports carry frames between switches for configuration and fabric management. They serve as a conduit between switches for frames destined to remote N ports and NL ports. E ports support class 2, class 3, and class F service.

An E port connected to another switch may also be configured to form a PortChannel (see Chapter 6, “Configuring PortChannels”).

Note We recommend that you configure E ports on 16-port modules. If you must configure an E port on a 32-port oversubscribed module, then you can only use the first port in a group of four ports (for example, ports 1 through 4, 5 through 8, and so forth). The other three ports cannot be used.

F Port

In fabric port (F port) mode, an interface functions as a fabric port. This port may be connected to a peripheral device (host or disk) operating as an N port. An F port can be attached to only one N port. F ports support class 2 and class 3 service.

FL Port

In fabric loop port (FL port) mode, an interface functions as a fabric loop port. This port may be connected to one or more NL ports (including FL ports in other switches) to form a public arbitrated loop. If more than one FL port is detected on the arbitrated loop during initialization, only one FL port becomes operational and the other FL ports enter nonparticipating mode. FL ports support class 2 and class 3 service.

Note FL port mode is not supported on 4-port 10-Gbps switching module interfaces.

NP Ports

An NP port is a port on a device that is in NPV mode and connected to the core switch via an F port. NP ports function like N ports except that in addition to providing N port operations, they also function as proxies for multiple, physical N ports.

For more details about NP ports and NPV, see Chapter 7, “Configuring N Port Virtualization.”.

TL Port

In translative loop port (TL port) mode, an interface functions as a translative loop port. It may be connected to one or more private loop devices (NL ports). TL ports are specific to Cisco MDS 9000 Family switches and have similar properties as FL ports. TL ports enable communication between a private loop device and one of the following devices:

- A device attached to any switch on the fabric
- A device on a public loop anywhere in the fabric
- A device on a different private loop anywhere in the fabric
- A device on the same private loop

TL ports support class 2 and class 3 services.

Private loop devices refer to legacy devices that reside on arbitrated loops. These devices are not aware of a switch fabric because they only communicate with devices on the same physical loop (see the “About TL Port ALPA Caches” section on page 2-30).

Tip We recommend configuring devices attached to TL ports in zones that have up to 64 zone members.

Note TL port mode is not supported on Generation 2 switching module interfaces.

TE Port

In trunking E port (TE port) mode, an interface functions as a trunking expansion port. It may be connected to another TE port to create an extended ISL (EISL) between two switches. TE ports are specific to Cisco MDS 9000 Family switches. They expand the functionality of E ports to support the following:

- VSAN trunking
- Transport quality of service (QoS) parameters
- Fibre Channel trace (fctrace) feature

In TE port mode, all frames are transmitted in EISL frame format, which contains VSAN information. Interconnected switches use the VSAN ID to multiplex traffic from one or more VSANs across the same physical link. This feature is referred to as trunking in the Cisco MDS 9000 Family switches (see Chapter 5, "Configuring Trunking"). TE ports support class 2, class 3, and class F service.

TF Port

In trunking F port (TF port) mode, an interface functions as a trunking expansion port. It may be connected to another trunked N port (TN port) or trunked NP port (TNP port) to create a link between a core switch and an NPV switch or an HBA to carry tagged frames. TF ports are specific to Cisco MDS 9000 Family switches. They expand the functionality of F ports to support VSAN trunking.

In TF port mode, all frames are transmitted in EISL frame format, which contains VSAN information. Interconnected switches use the VSAN ID to multiplex traffic from one or more VSANs across the same physical link. This feature is referred to as trunking in the Cisco MDS 9000 Family (see Chapter 5, "Configuring Trunking"). TF ports support class 2, class 3, and class F service.

TNP Port

In trunking NP port (TNP port) mode, an interface functions as a trunking expansion port. It may be connected to a trunked F port (TF port) to create a link to a core NPIV switch from an NPV switch to carry tagged frames.

SD Port

In SPAN destination port (SD port) mode, an interface functions as a switched port analyzer (SPAN). The SPAN feature is specific to switches in the Cisco MDS 9000 Family. It monitors network traffic that passes though a Fibre Channel interface. This monitoring is done using a standard Fibre Channel analyzer (or a similar switch probe) that is attached to an SD port. SD ports do not receive frames, they only transmit a copy of the source traffic. The SPAN feature is nonintrusive and does not affect switching of network traffic for any SPAN source ports (see the *Cisco MDS 9000 Family NX-OS System Management Configuration Guide*).

ST Port

In the SPAN tunnel port (ST port) mode, an interface functions as an entry point port in the source switch for the RSPAN Fibre Channel tunnel. The ST port mode and the remote SPAN (RSPAN) feature are specific to switches in the Cisco MDS 9000 Family. When configured in ST port mode, the interface cannot be attached to any device, and thus cannot be used for normal Fibre Channel traffic (see the *Cisco MDS 9000 Family NX-OS System Management Configuration Guide*).

Note ST port mode is not supported on the Cisco MDS 9124 Fabric Switch, the Cisco Fabric Switch for HP c-Class BladeSystem, and the Cisco Fabric Switch for IBM BladeCenter.

Fx Port

Interfaces configured as Fx ports can operate in either F port or FL port mode. The Fx port mode is determined during interface initialization depending on the attached N port or NL port. This administrative configuration disallows interfaces to operate in any other mode—for example, preventing an interface to connect to another switch.

B Port

While E ports typically interconnect Fibre Channel switches, some SAN extender devices, such as the Cisco PA-FC-1G Fibre Channel port adapter, implement a bridge port (B port) model to connect geographically dispersed fabrics. This model uses B ports as described in the T11 Standard FC-BB-2.

If an FCIP peer is a SAN extender device that only supports Fibre Channel B ports, you need to enable the B port mode for the FCIP link. When a B port is enabled, the E port functionality is also enabled and they coexist. If the B port is disabled, the E port functionality remains enabled (see the *Cisco MDS 9000 Family NX-OS IP Services Configuration Guide*).

Auto Mode

Interfaces configured in auto mode can operate in one of the following modes: F port, FL port, E port, TE port, or TF port. The port mode is determined during interface initialization. For example, if the interface is connected to a node (host or disk), it operates in F port or FL port mode depending on the N port or NL port mode. If the interface is attached to a third-party switch, it operates in E port mode. If the interface is attached to another switch in the Cisco MDS 9000 Family, it may become operational in TE port mode (see Chapter 5, “Configuring Trunking”).

TL ports and SD ports are not determined during initialization and are administratively configured.

Note Fibre Channel interfaces on Storage Services Modules (SSMs) cannot be configured in auto mode.

About Interface States

The interface state depends on the administrative configuration of the interface and the dynamic state of the physical link.

Administrative States

The administrative state refers to the administrative configuration of the interface as described in Table 2-1.

Table 2-1 Administrative States

Administrative State	Description
Up	Interface is enabled.
Down	Interface is disabled. If you administratively disable an interface by shutting down that interface, the physical link layer state change is ignored.

Operational States

The operational state indicates the current operational state of the interface as described in Table 2-2.

Table 2-2 Operational States

Operational State	Description
Up	Interface is transmitting or receiving traffic as desired. To be in this state, an interface must be administratively up, the interface link layer state must be up, and the interface initialization must be completed.
Down	Interface cannot transmit or receive (data) traffic.
Trunking	Interface is operational in TE or TF mode.

Reason Codes

Reason codes are dependent on the operational state of the interface as described in Table 2-3.

Table 2-3 Reason Codes for Interface States

Administrative Configuration	Operational Status	Reason Code
Up	Up	None.
Down	Down	Administratively down—If you administratively configure an interface as down, you disable the interface. No traffic is received or transmitted.
Up	Down	See Table 2-4.

Note Only some of the reason codes are listed in Table 2-4.

If the administrative state is up and the operational state is down, the reason code differs based on the nonoperational reason code as described in Table 2-4.

Table 2-4 Reason Codes for Nonoperational States

Reason Code (long version)	Description	Applicable Modes
Link failure or not connected	The physical layer link is not operational.	All
SFP not present	The small form-factor pluggable (SFP) hardware is not plugged in.	
Initializing	The physical layer link is operational and the protocol initialization is in progress.	
Reconfigure fabric in progress	The fabric is currently being reconfigured.	
Offline	The Cisco NX-OS software waits for the specified R_A_TOV time before retrying initialization.	
Inactive	The interface VSAN is deleted or is in a suspended state. To make the interface operational, assign that port to a configured and active VSAN.	
Hardware failure	A hardware failure is detected.	
Error disabled	Error conditions require administrative attention. Interfaces may be error-disabled for various reasons. For example: • Configuration failure. • Incompatible buffer-to-buffer credit configuration. To make the interface operational, you must first fix the error conditions causing this state; and next, administratively shut down or enable the interface.	
FC redirect failure	A port is isolated because a Fibre Channel redirect is unable to program routes.	
No port activation license available	A port is not active because it does not have a port license.	
SDM failure	A port is isolated because SDM is unable to program routes.	

Table 2-4 Reason Codes for Nonoperational States (continued)

Reason Code (long version)	Description	Applicable Modes
Isolation due to ELP failure	The port negotiation failed.	Only E ports and TE ports
Isolation due to ESC failure	The port negotiation failed.	
Isolation due to domain overlap	The Fibre Channel domains (fcdomain) overlap.	
Isolation due to domain ID assignment failure	The assigned domain ID is not valid.	
Isolation due to the other side of the link E port isolated	The E port at the other end of the link is isolated.	
Isolation due to invalid fabric reconfiguration	The port is isolated due to fabric reconfiguration.	
Isolation due to domain manager disabled	The fcdomain feature is disabled.	
Isolation due to zone merge failure	The zone merge operation failed.	
Isolation due to VSAN mismatch	The VSANs at both ends of an ISL are different.	
Nonparticipating	FL ports cannot participate in loop operations. It may happen if more than one FL port exists in the same loop, in which case all but one FL port in that loop automatically enters nonparticipating mode.	Only FL ports and TL ports
PortChannel administratively down	The interfaces belonging to the PortChannel are down.	Only PortChannel interfaces
Suspended due to incompatible speed	The interfaces belonging to the PortChannel have incompatible speeds.	
Suspended due to incompatible mode	The interfaces belonging to the PortChannel have incompatible modes.	
Suspended due to incompatible remote switch WWN	An improper connection is detected. All interfaces in a PortChannel must be connected to the same pair of switches.	

Configuring Fibre Channel Interfaces

To configure a Fibre Channel interface, follow these steps:

	Command	Purpose
Step 1	`switch# config t`	Enters configuration mode.
Step 2	`switch(config)# interface fc1/1` `switch(config-if)#`	Selects a Fibre Channel interface and enters interface configuration submode. **Note** When a Fibre Channel interface is configured, it is automatically assigned a unique world wide name (WWN). If the interface's operational state is up, it is also assigned a Fibre Channel ID (FC ID).

To configure a range of interfaces, follow these steps:

	Command	Purpose
Step 1	`switch# config t`	Enters configuration mode.
Step 2	`switch(config)# interface fc1/1 - 4 , fc2/1 - 3` `switch(config-if)#`	Selects the range of Fibre Channel interfaces and enters interface configuration submode3. **Note** In this command, provide a space before and after the comma.

For the Cisco Fabric Switch for HP c-Class BladeSystem and the Cisco Fabric Switch for IBM BladeCenter, you can configure a range of interfaces among internal ports or external ports, but you cannot mix both interface types within the same range. For example, "bay 1-10, bay 12" or "ext 0, ext 15-18" are valid ranges, but "bay 1-5, ext 15-17" is not.

Graceful Shutdown

Interfaces on a port are shut down by default (unless you modified the initial configuration).

The Cisco NX-OS software implicitly performs a graceful shutdown in response to either of the following actions for interfaces operating in the E port mode:

- If you shut down an interface.
- If a Cisco NX-OS software application executes a port shutdown as part of its function.

A graceful shutdown ensures that no frames are lost when the interface is shutting down. When a shutdown is triggered either by you or the Cisco NX-OS software, the switches connected to the shutdown link coordinate with each other to ensure that all frames in the ports are safely sent through the link before shutting down. This enhancement reduces the chance of frame loss.

A graceful shutdown is not possible in the following situations:

- If you physically remove the port from the switch.
- If in-order delivery (IOD) is enabled (for information about IOD, refer to the *Cisco MDS 9000 Family NX-OS Fabric Configuration Guide*).
- If the Min_LS_interval interval is higher than 10 seconds. For information about FSPF global configuration, refer to the *Cisco MDS 9000 Family NX-OS Fabric Configuration Guide*.

Note This feature is only triggered if both switches at either end of this E port interface are MDS switches and are running Cisco SAN-OS Release 2.0(1b) or later, or MDS NX-OS Release 4.1(1a) or later.

Setting the Interface Administrative State

To gracefully shut down an interface, follow these steps:

	Command	Purpose
Step 1	`switch# config t`	Enters configuration mode.
Step 2	`switch(config)# interface fc1/1`	Selects a Fibre Channel interface and enters interface configuration submode.
Step 3	`switch(config-if)# shutdown`	Gracefully shuts down the interface and administratively disables traffic flow (default).

To enable traffic flow, follow these steps:

	Command	Purpose
Step 1	`switch# config t`	Enters configuration mode.
Step 2	`switch(config)# interface fc1/1`	Selects a Fibre Channel interface and enters interface configuration submode.
Step 3	`switch(config-if)# no shutdown`	Enables traffic flow to administratively allow traffic when the **no** prefix is used (provided the operational state is up).

Configuring Interface Modes

To configure the interface mode, follow these steps:

	Command	Purpose
Step 1	`switch# config t`	Enters configuration mode.
Step 2	`switch(config)# interface fc1/1` `switch(config-if)#`	Selects a Fibre Channel interface and enters interface configuration submode.
Step 3	`switch(config-if)# switchport mode F` `switch(config-if)#`	Configures the administrative mode of the port. You can set the operational state to auto, E, F, FL, Fx, TL, NP, or SD port mode. **Note** Fx ports refers to an F port or an FL port (host connection only), but not E ports.
	`switch(config-if)# switchport mode auto` `switch(config-if)#`	Configures the interface mode to auto-negotiate an E, F, FL, or TE port mode (not TL or SD port modes) of operation. **Note** TL ports and SD ports cannot be configured automatically. They must be administratively configured. **Note** You cannot configure Fibre Channel interfaces on SSMs in auto mode.

Configuring System Default Port Mode F

The **system default switchport mode F** command sets the administrative mode of all Fibre Channel ports to mode F, while avoiding traffic disruption caused by the formation of unwanted Inter-Switch Links (ISLs). This command is part of the setup utility that runs during bootup after a **write erase** or **reload**. It can also be executed from the command line in configuration mode. This command changes the configuration of the following ports to administrative mode F:

- All ports that are down and that are not out-of-service.
- All F ports that are up, whose operational mode is F, and whose administrative mode is not F.

This command does not affect the configuration of the following ports:

- All user-configured ports, even if they are down.
- All non-F ports that are up; however, if non-F ports are down, this command changes the administrative mode of those ports.

Example 2-1 shows the command in the setup utility, and Example 2-2 shows the command from the command line.

Example 2-1 Setup Utility

```
Configure default switchport mode F (yes/no) [n]: y
```

Example 2-2 Command Line

```
switch(config)# system default switchport mode F
```

Note To ensure that ports that are part of ISLs do not get changed to port mode F, configure the ports in port mode E, rather than in Auto mode.

Note When the command is executed from the command line, switch operation remains graceful. No ports are flapped.

To set the administrative mode of Fibre Channel ports to mode F in the CLI, follow these steps:

	Command	Purpose
Step 1	`switch# config t`	Enters configuration mode.
Step 2	`switch(config)# system default switchport mode F`	Sets the administrative mode of Fibre Channel ports to mode F (if applicable).
	`switch(config)# no system default switchport mode F`	Sets the administrative mode of Fibre Channel ports to the default (unless user configured).

Note For detailed information about the switch setup utility see the *Cisco MDS 9000 Family NX-OS Fundamentals Configuration Guide*.

Configuring Port Administrative Speeds

By default, the port administrative speed for an interface is automatically calculated by the switch.

Caution Changing the port administrative speed is a disruptive operation.

To configure the port speed of the interface, follow these steps:

	Command	Purpose
Step 1	`switch# config t`	Enters configuration mode.
Step 2	`switch(config)# interface fc 1/1`	Selects the mgmt0 interface and enters interface configuration mode.
Step 3	`switch(config-if)# switchport speed 1000`	Configures the port speed of the interface to 1000 Mbps. The number indicates the speed in megabits per second (Mbps). You can set the speed to **1000** (for 1-Gbps interfaces), **2000** (for 2-Gbps interfaces), **4000** (for 4-Gbps interfaces), **8000** (for 8-Gbps interfaces), or **auto** (default).
	`switch(config-if)# no switchport speed`	Reverts the factory default (**auto**) administrative speed of the interface.

For internal ports on the Cisco Fabric Switch for HP c_Class BladeSystem and Cisco Fabric Switch for IBM BladeCenter, a port speed of 1 Gbps is not supported. Auto-negotiation is supported between 2 Gbps and 4 Gbps only. Also, if the BladeCenter is a T chassis, then port speeds are fixed at 2 Gbps and auto-negotiation is not enabled.

Autosensing

Autosensing speed is enabled on all 4-Gbps and 8-Gbps switching module interfaces by default. This configuration enables the interfaces to operate at speeds of 1 Gbps, 2 Gbps, or 4 Gbps on the 4-Gbps switching modules, and 8 Gbps on the 8-Gbps switching modules. When autosensing is enabled for an interface operating in dedicated rate mode, 4 Gbps of bandwidth is reserved, even if the port negotiates at an operating speed of 1 Gbps or 2 Gbps.

To avoid wasting unused bandwidth on 48-port and 24-port 4-Gbps and 8-Gbps Fibre Channel switching modules, you can specify that only 2 Gbps of required bandwidth be reserved, not the default of 4 Gbps or 8 Gbps. This feature shares the unused bandwidth within the port group provided that it does not exceed the rate limit configuration for the port. You can also use this feature for shared rate ports that are configured for autosensing.

Tip When migrating a host that supports up to 2-Gbps traffic (that is, not 4 Gbps with autosensing capabilities) to the 4-Gbps switching modules, use autosensing with a maximum bandwidth of 2 Gbps. When migrating a host that supports up to 4-Gbps traffic (that is, not 8 Gbps with autosensing capabilities) to the 8-Gbps switching modules, use autosensing with a maximum bandwidth of 4 Gbps.

Configuring the Interface Description

Interface descriptions enable you to identify the traffic or the use for that interface. The interface description can be any alphanumeric string.

To configure a description for an interface, follow these steps:

	Command	Purpose
Step 1	`switch# config t`	Enters configuration mode.
Step 2	`switch(config)# interface fc1/1` `switch(config-if)#`	Selects a Fibre Channel interface and enters interface configuration submode.
Step 3	`switch(config-if)# switchport description cisco-HBA2`	Configures the description of the interface. The string can be up to 80 characters long.
	`switch(config-if)# no switchport description`	Clears the description of the interface.

Specifying a Port Owner

Using the port owner feature, you can specify the owner of a port and the purpose for which a port is used so that the other administrators are informed.

To specify or remove the port owner, follow these steps:

	Command	Purpose
Step 1	`switch# config t`	Enters configuration mode.
Step 2	`switch(config)# interface fc1/1`	Selects the port interface.
Step 3	`switch(config)# switchport owner description`	Specifies the owner of the switch port. The description can include name of the owner and the purpose for which the port is used. The description can be up to 80 characters long.
	`switch(config)# no switchport owner`	Removes (default) the port owner description.

Note The port guard and port owner features are available for all ports regardless of the operational mode.

To display the owner description specified for a port, use the following commands:

```
switch# show running interface fc module-number/interface-number
switch# show port internal info interface fc module-number/interface-number
```

Frame Encapsulation

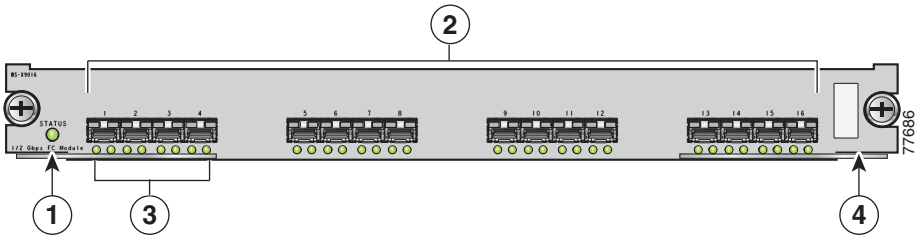
The **switchport encap eisl** command only applies to SD port interfaces. This command determines the frame format for all frames transmitted by the interface in SD port mode. If the encapsulation is set to EISL, all outgoing frames are transmitted in the EISL frame format, regardless of the SPAN sources.

The **switchport encap eisl** command is disabled by default. If you enable encapsulation, all outgoing frames are encapsulated, and you will see a new line (Encapsulation is eisl) in the **show interface** *SD_port_interface* command output. See the *Cisco MDS 9000 Family NX-OS System Management Configuration Guide*.

Identifying the Beacon LEDs

Figure 2-2 displays the status, link, and speed LEDs in a 16-port switching module.

Figure 2-2 Cisco MDS 9000 Family Switch Interface Modes



1	Status LED[1]	**3**	Link LEDs[1] and speed LEDs[2]
2	1/2-Gbps Fibre Channel port group[3]	**4**	Asset tag[4]

1. See the *Cisco MDS 9000 Family NX-OS Fundamentals Configuration Guide*.
2. See the "About Speed LEDs" section on page 2-17.
3. See the "Generation 1 Interfaces Configuration Guidelines" section on page 2-2.
4. Refer to the Cisco MDS 9000 Family hardware installation guide for your platform.

About Speed LEDs

Each port has one link LED on the left and one speed LED on the right.

The speed LED displays the speed of the port interface:

- Off—The interface attached to that port is functioning at 1000 Mbps.
- On (solid green)—The interface attached to that port is functioning at 2000 Mbps (for 2 Gbps interfaces).

The speed LED also displays if the beacon mode is enabled or disabled:

- Off or solid green—Beacon mode is disabled.
- Flashing green—The beacon mode is enabled. The LED flashes at one-second intervals.

Note Generation 2 and Generation 3 modules and fabric switches do not have speed LEDs.

Configuring Beacon Mode

By default, the beacon mode is disabled on all switches. The beacon mode is indicated by a flashing green light that helps you identify the physical location of the specified interface. Configuring the beacon mode has no effect on the operation of the interface.

To enable beacon mode for a specified interface or range of interfaces, follow these steps:

	Command	Purpose
Step 1	`switch# config t` `switch(config)#`	Enters configuration mode.
Step 2	`switch(config)# interface fc1/1` `switch(config-if)#`	Selects a Fibre Channel interface and enters interface configuration submode.
Step 3	`switch(config-if)# switchport beacon`	Enables the beacon mode for the interface.
	`switch(config-if)# no switchport beacon`	Disables the beacon mode for the interface.

Note The flashing green light turns on automatically when an external loopback is detected that causes the interfaces to be isolated. The flashing green light overrides the beacon mode configuration. The state of the LED is restored to reflect the beacon mode configuration after the external loopback is removed.

About Bit Error Thresholds

The bit error rate threshold is used by the switch to detect an increased error rate before performance degradation seriously affects traffic.

The bit errors can occur for the following reasons:

- Faulty or bad cable.
- Faulty or bad GBIC or SFP.
- GBIC or SFP is specified to operate at 1 Gbps but is used at 2 Gbps.
- GBIC or SFP is specified to operate at 2 Gbps but is used at 4 Gbps.
- Short haul cable is used for long haul or long haul cable is used for short haul.
- Momentary sync loss.
- Loose cable connection at one or both ends.
- Improper GBIC or SFP connection at one or both ends.

A bit error rate threshold is detected when 15 error bursts occur in a 5-minute period. By default, the switch disables the interface when the threshold is reached. You can enter a **shutdown** and **no shutdown** command sequence to reenable the interface.

You can configure the switch to not disable an interface when the threshold is crossed. By default, the threshold disables the interface.

To disable the bit error threshold for an interface, follow these steps:

	Command	Purpose
Step 1	`switch# config t`	Enters configuration mode.
Step 2	`switch(config)# interface fc1/1` `switch(config-if)#`	Selects a Fibre Channel interface and enters interface configuration submode.
Step 3	`switch(config-if)# switchport ignore bit-errors`	Prevents the detection of bit error threshold events from disabling the interface.
	`switch(config-if)# no switchport ignore bit-errors`	Prevents the detection of bit error threshold events from enabling the interface.

Note Regardless of the setting of the **switchport ignore bit-errors** command, the switch generates a syslog message when bit-error threshold events are detected.

Switch Port Attribute Default Values

You can configure attribute default values for various switch port attributes. These attributes will be applied globally to all future switch port configurations, even if you do not individually specify them at that time.

To configure switch port attributes, follow these steps:

	Command	Purpose
Step 1	`switch# config t`	Enters configuration mode.

	Command	Purpose
Step 2	`switch(config)# no system default switchport shutdown` `switch(config)#`	Configures the default setting for administrative state of an interface as Up. (The factory default setting is Down). **Tip** This command is applicable only to interfaces for which no user configuration exists for the administrative state.
	`switch(config)# system default switchport shutdown` `switch(config)#`	Configures the default setting for administrative state of an interface as Down. This is the factory default setting. **Tip** This command is applicable only to interfaces for which no user configuration exists for the administrative state.
	`switch(config)# system default switchport trunk mode auto` `switch(config)#`	Configures the default setting for administrative trunk mode state of an interface as Auto. **Note** The default setting is trunk mode on.

About SFP Transmitter Types

The small form-factor pluggable (SFP) hardware transmitters are identified by their acronyms when displayed. Table 2-5 defines the acronyms used for SFPs.

The small form-factor pluggable (SFP) hardware transmitters are identified by their acronyms when displayed in the **show interface brief** command. If the related SFP has a Cisco-assigned extended ID, then the **show interface** and **show interface brief** commands display the ID instead of the transmitter type. The **show interface transceiver** command and the **show interface fc***s lot/port* **transceiver** command display both values for Cisco-supported SFPs. Table 2-5 defines the acronyms used in the command output (see the "Displaying Interface Information" section on page 2-20).

Table 2-5 SFP Transmitter Acronym Definitions

Definition	Acronym
Standard transmitters defined in the GBIC specifications	
short wave laser	swl
long wave laser	lwl
long wave laser cost reduced	lwcr
electrical	elec
Extended transmitters assigned to Cisco-supported SFPs	
CWDM-1470	c1470
CWDM-1490	c1490
CWDM-1510	c1510
CWDM-1530	c1530
CWDM-1550	c1550
CWDM-1570	c1570
CWDM-1590	c1590
CWDM-1610	c1610

Displaying Interface Information

The **show interface** command is invoked from the EXEC mode and displays the interface configurations. Without any arguments, this command displays the information for all the configured interfaces in the switch. See Examples 2-3 to 2-10.

Example 2-3 Displays All Interfaces

```
switch# show interface
fc1/1 is up
    Hardware is Fibre Channel, SFP is short wave laser
    Port WWN is 20:0b:00:05:30:00:8d:de
    Admin port mode is F
    Port mode is F, FCID is 0x610000
    Port vsan is 2
    Speed is 2 Gbps
    Transmit B2B Credit is 3
    Receive B2B Credit is 16
    Receive data field Size is 2112
    Beacon is turned off
    5 minutes input rate 0 bits/sec, 0 bytes/sec, 0 frames/sec
    5 minutes output rate 0 bits/sec, 0 bytes/sec, 0 frames/sec
      134 frames input, 8468 bytes
        0 discards, 0 errors
        0 CRC,  0 unknown class
        0 too long, 0 too short
      154 frames output, 46072 bytes
        0 discards, 0 errors
      1 input OLS, 1 LRR, 0 NOS, 0 loop inits
      1 output OLS, 0 LRR, 1 NOS, 0 loop inits
      16 receive B2B credit remaining
      3 transmit B2B credit remaining.
. . .
fc1/9 is trunking
    Hardware is Fibre Channel, SFP is long wave laser cost reduced
    Port WWN is 20:09:00:05:30:00:97:9e
    Peer port WWN is 20:0b:00:0b:5f:a3:cc:00
    Admin port mode is E, trunk mode is on
    Port mode is TE
    Port vsan is 100
    Speed is 2 Gbps
    Transmit B2B Credit is 255
    Receive B2B Credit is 255
    Receive data field Size is 2112
    Beacon is turned off
    Trunk vsans (admin allowed and active) (1,100,3000)
    Trunk vsans (up)                       (1,100,3000)
    Trunk vsans (isolated)                 ()
    Trunk vsans (initializing)             ()
    5 minutes input rate 280 bits/sec, 35 bytes/sec, 0 frames/sec
    5 minutes output rate 176 bits/sec, 22 bytes/sec, 0 frames/sec
      4609939 frames input, 8149405708 bytes
        0 discards, 0 errors
        0 CRC,  0 unknown class
        0 too long, 0 too short
      4638491 frames output, 7264731728 bytes
        0 discards, 0 errors
      3 input OLS, 9 LRR, 1 NOS, 0 loop inits
      9 output OLS, 7 LRR, 1 NOS, 0 loop inits
      16 receive B2B credit remaining
      3 transmit B2B credit remaining.
. . .
```

```
fc1/13 is up
    Hardware is Fibre Channel, SFP is short wave laser
    Port WWN is 20:0d:00:05:30:00:97:9e
    Admin port mode is auto, trunk mode is on
    Port mode is F, FCID is 0x650100
    Port vsan is 100
    Speed is 2 Gbps
    Transmit B2B Credit is 3
    Receive B2B Credit is 16
    Receive data field Size is 2112
    Beacon is turned off
    5 minutes input rate 0 bits/sec, 0 bytes/sec, 0 frames/sec
    5 minutes output rate 0 bits/sec, 0 bytes/sec, 0 frames/sec
      8696 frames input, 3227212 bytes
        0 discards, 0 errors
        0 CRC,  0 unknown class
        0 too long, 0 too short
      16799 frames output, 6782444 bytes
        0 discards, 0 errors
      0 input OLS, 0 LRR, 0 NOS, 0 loop inits
      1 output OLS, 1 LRR, 0 NOS, 1 loop inits
      16 receive B2B credit remaining
      3 transmit B2B credit remaining.
. . .
sup-fc0 is up
    Hardware is Fibre Channel
    Speed is 1 Gbps
    139597 packets input, 13852970 bytes
      0 multicast frames, 0 compressed
      0 input errors, 0 frame, 0 overrun 0 fifo
    139516 packets output, 16759004 bytes, 0 underruns
      0 output errors, 0 collisions, 0 fifo
      0 carrier errors
```

You can also specify arguments (a range of interfaces or multiple, specified interfaces) to display interface information. You can specify a range of interfaces by issuing a command with the following example format:

```
interface fc1/1 - 5 , fc2/5 - 7
```

Note The spaces are required before and after the dash (**-**) and before and after the comma (**,**).

Example 2-4 Displays Multiple, Specified Interfaces

```
switch# show interface fc3/13 , fc3/16
fc3/13 is up
    Hardware is Fibre Channel, SFP is short wave laser
    Port WWN is 20:8d:00:05:30:00:97:9e
    Admin port mode is FX
    Port mode is F, FCID is 0x7b0300
    Port vsan is 1
    Speed is 2 Gbps
    Transmit B2B Credit is 3
    Receive B2B Credit is 12
    Receive data field Size is 2112
    Beacon is turned off
    5 minutes input rate 0 bits/sec, 0 bytes/sec, 0 frames/sec
    5 minutes output rate 0 bits/sec, 0 bytes/sec, 0 frames/sec
      1856 frames input, 116632 bytes
        0 discards, 0 errors
        0 CRC,  0 unknown class
        0 too long, 0 too short
```

```
      1886 frames output, 887712 bytes
        0 discards, 0 errors
      0 input OLS, 0 LRR, 0 NOS, 1 loop inits
      1 output OLS, 1 LRR, 0 NOS, 1 loop inits
      16 receive B2B credit remaining
      3 transmit B2B credit remaining.

fc3/16 is up
    Hardware is Fibre Channel, SFP is short wave laser
    Port WWN is 20:90:00:05:30:00:97:9e
    Admin port mode is FX
    Port mode is F, FCID is 0x7d0100
    Port vsan is 3000
    Speed is 2 Gbps
    Transmit B2B Credit is 3
    Receive B2B Credit is 12
    Receive data field Size is 2112
    Beacon is turned off
    5 minutes input rate 504 bits/sec, 63 bytes/sec, 0 frames/sec
    5 minutes output rate 520 bits/sec, 65 bytes/sec, 0 frames/sec
      47050 frames input, 10311824 bytes
        0 discards, 0 errors
        0 CRC,  0 unknown class
        0 too long, 0 too short
      62659 frames output, 10676988 bytes
        0 discards, 0 errors
      0 input OLS, 0 LRR, 0 NOS, 0 loop inits
      1 output OLS, 1 LRR, 0 NOS, 1 loop inits
      16 receive B2B credit remaining
      3 transmit B2B credit remaining.
```

Example 2-5 Displays a Specific Interface

```
switch# show interface fc2/2
fc2/2 is trunking
    Port description is Trunk to Core-4
    Hardware is Fibre Channel, SFP is short wave laser
    Port WWN is 20:42:00:05:30:00:97:9e
    Peer port WWN is 20:cc:00:05:30:00:50:9e
    Admin port mode is E, trunk mode is on
    Port mode is TE
    Port vsan is 1
    Speed is 2 Gbps
    Transmit B2B Credit is 255
    Receive B2B Credit is 255
    Receive data field Size is 2112
    Beacon is turned off
    Belongs to port-channel 2
    Trunk vsans (admin allowed and active) (1,100,3000)
    Trunk vsans (up)                       (1)
    Trunk vsans (isolated)                 (100,3000)
    Trunk vsans (initializing)             ()
    5 minutes input rate 0 bits/sec, 0 bytes/sec, 0 frames/sec
    5 minutes output rate 32 bits/sec, 4 bytes/sec, 0 frames/sec
      2214834 frames input, 98673588 bytes
        0 discards, 0 errors
        0 CRC,  0 unknown class
        0 too long, 0 too short
      2262415 frames output, 343158368 bytes
        0 discards, 0 errors
      1 input OLS, 1 LRR, 1 NOS, 0 loop inits
      2 output OLS, 1 LRR, 0 NOS, 0 loop inits
      16 receive B2B credit remaining
```

```
        3 transmit B2B credit remaining.
```

Example 2-6 Displays Port Description

```
switch# show interface description
--------------------------------------------------------------------------------
Interface          Description
--------------------------------------------------------------------------------
fc3/1              test intest
fc3/2              --
fc3/3              --
fc3/4              TE port
fc3/5              --
fc3/6              --
fc3/10             Next hop switch 5
fc3/11             --
fc3/12             --
fc3/16             --
--------------------------------------------------------------------------------
Interface          Description
--------------------------------------------------------------------------------
port-channel 1     --
port-channel 5     --
port-channel 6     --
```

Example 2-7 Displays Interface Information in a Brief Format

```
switch# show interface brief

--------------------------------------------------------------------------------
Interface  Vsan   Admin  Admin   Status          SFP   Oper  Oper   Port
                 Mode   Trunk                         Mode  Speed  Channel
                        Mode                                (Gbps)
--------------------------------------------------------------------------------
fc1/1      1      E      on      trunking         swl    TE      2    1
fc1/2      1      E      on      trunking         swl    TE      2    1
fc1/3      1      auto   on      SFPAbsent       --     --            --
fc1/4      1      auto   on      SFPAbsent       --     --            --
fc1/5      3000   auto   on      up               swl    F       2    --
...
fc2/2      1      E      on      trunking         swl    TE      2    2
fc2/3      1      auto   on      down             c1610  --            --
fc2/4      1      auto   on      down             c1590  --            --
fc2/5      3000   auto   on      notConnected     lwcr   --            --
fc2/6      1      auto   on      SFPAbsent       --     --            --
...
fc3/16     3000   FX     --      up               swl    F       2    --
fc3/17     1      FX     --      SFPAbsent       --     --            --
...
--------------------------------------------------------------------------------
Interface               Status     IP Address        Speed        MTU
--------------------------------------------------------------------------------
GigabitEthernet4/1      SFPAbsent --                auto         1500
...
GigabitEthernet4/6      down       10.1.1.2/8       auto         3000
GigabitEthernet4/7      down       10.1.1.27/24     auto         1500
GigabitEthernet4/8      down       --               auto         1500

--------------------------------------------------------------------------------
Interface           Status              Oper Mode           Oper Speed
                                                            (Gbps)
--------------------------------------------------------------------------------
```

```
iscsi4/1            down                --
...
------------------------------------------------------------------------------
Interface          Status                            Speed
                                                     (Gbps)
------------------------------------------------------------------------------
sup-fc0            up                                1

------------------------------------------------------------------------------
Interface               Status     IP Address        Speed        MTU
------------------------------------------------------------------------------
mgmt0                   up         172.19.48.96/25   100 Mbps     1500

------------------------------------------------------------------------------
Interface               Vsan     Admin    Status            Oper   Oper
                                 Trunk                      Mode   Speed
                                 Mode                              (Gbps)
------------------------------------------------------------------------------
port-channel 1          1        on       trunking          TE     4
port-channel 2          1        on       trunking          TE     4

------------------------------------------------------------------------------
Interface  Vsan   Admin  Admin   Status       Oper  Profile  Port-channel
                  Mode   Trunk               Mode
                         Mode
------------------------------------------------------------------------------
fcip10     1      auto   on      notConnected --     10       --
```

Example 2-8 Displays Interface Counters

```
switch# show interface counters
fc3/1
    5 minutes input rate 24 bits/sec, 3 bytes/sec, 0 frames/sec
    5 minutes output rate 16 bits/sec, 2 bytes/sec, 0 frames/sec
    3502 frames input, 268400 bytes
      0 discards, 0 CRC, 0 unknown class
      0 too long, 0 too short
    3505 frames output, 198888 bytes
      0 discards
    1 input OLS, 1 LRR, 1 NOS, 0 loop inits
    2 output OLS, 1 LRR, 1 NOS, 0 loop inits
    1 link failures, 1 sync losses, 1 signal losses
.
.
.
fc9/8
    5 minutes input rate 0 bits/sec, 0 bytes/sec, 0 frames/sec
    5 minutes output rate 0 bits/sec, 0 bytes/sec, 0 frames/sec
    0 frames input, 0 bytes
      0 class-2 frames, 0 bytes
      0 class-3 frames, 0 bytes
      0 class-f frames, 0 bytes
      0 discards, 0 CRC, 0 unknown class
      0 too long, 0 too short
    0 frames output, 0 bytes
      0 class-2 frames, 0 bytes
      0 class-3 frames, 0 bytes
      0 class-f frames, 0 bytes
      0 discards
    0 input OLS, 0 LRR, 0 NOS, 0 loop inits
    0 output OLS, 0 LRR, 0 NOS, 0 loop inits
    0 link failures, 0 sync losses, 0 signal losses
      16 receive B2B credit remaining
```

```
      3 transmit B2B credit remaining.
. . .
sup-fc0
    114000 packets input, 11585632 bytes
      0 multicast frames, 0 compressed
      0 input errors, 0 frame, 0 overrun 0 fifo
    113997 packets output, 10969672 bytes, 0 underruns
      0 output errors, 0 collisions, 0 fifo
      0 carrier errors

mgmt0
    31557 packets input, 2230860 bytes
      0 multicast frames, 0 compressed
      0 input errors, 0 frame, 0 overrun 0 fifo
    26618 packets output, 16824342 bytes, 0 underruns
      0 output errors, 0 collisions, 7 fifo
      0 carrier errors

vsan1
    0 packets input, 0 bytes, 0 errors, 0 multicast
    0 packets output, 0 bytes, 0 errors, 0 dropped
.
.
.
port-channel 1
    5 minutes input rate 0 bits/sec, 0 bytes/sec, 0 frames/sec
    5 minutes output rate 0 bits/sec, 0 bytes/sec, 0 frames/sec
    0 frames input, 0 bytes
      0 class-2 frames, 0 bytes
      0 class-3 frames, 0 bytes
      0 class-f frames, 0 bytes
      0 discards, 0 CRC, 0 unknown class
      0 too long, 0 too short
    0 frames output, 0 bytes
      0 class-2 frames, 0 bytes
      0 class-3 frames, 0 bytes
      0 class-f frames, 0 bytes
      0 discards
    0 input OLS, 0 LRR, 0 NOS, 0 loop inits
    0 output OLS, 0 LRR, 0 NOS, 0 loop inits
    0 link failures, 0 sync losses, 0 signal losses
```

Note Interfaces 9/8 and 9/9 are not trunking ports and display class 2, 3, and F information as well.

Example 2-9 Displays Interface Counters in Brief Format

```
switch# show interface counters brief

-------------------------------------------------------------------------------
Interface          Input (rate is 5 min avg)      Output (rate is 5 min avg)
                   ------------------------------ ------------------------------
                   Rate     Total                 Rate     Total
                   Mbits/s  Frames                Mbits/s  Frames
-------------------------------------------------------------------------------
fc3/1              0        3871                  0        3874
fc3/2              0        3902                  0        4232
fc3/3              0        3901                  0        4138
fc3/4              0        3895                  0        3894
fc3/5              0        3890                  0        3897
fc9/8              0        0                     0        0
fc9/9              0        5                     0        4
```

```
fc9/10            0        4186                  0        4182
fc9/11            0        4331                  0        4315

-------------------------------------------------------------------------------
Interface         Input (rate is 5 min avg)      Output (rate is 5 min avg)
                  ------------------------------ ------------------------------
                  Rate     Total                 Rate     Total
                  Mbits/s  Frames                Mbits/s  Frames
-------------------------------------------------------------------------------
port-channel 1    0        0                     0        0
port-channel 2    0        3946                  0        3946
```

Note The **show interface transceiver** command can only be issued on a switch in the Cisco MDS 9100 Series if the SFP is present (see Example 2-10).

Example 2-10 Displays Transceiver Information

```
switch# show interface transceiver
fc1/1 SFP is present
    name is CISCO-AGILENT
    part number is QFBR-5796L
    revision is
    serial number is A00162193
    fc-transmitter type is short wave laser
    cisco extended id is unknown (0x0)
...
fc1/9 SFP is present
    name is FINISAR CORP.
    part number is FTRJ-1319-7D-CSC
    revision is
    serial number is H11A6ER
    fc-transmitter type is long wave laser cost reduced
    cisco extended id is unknown (0x0)
...
```

Example 2-11 displays the entire running configuration with information for all interfaces. The interfaces have multiple entries in the configuration files to ensure that the interface configuration commands execute in the correct order when the switch reloads.

Example 2-11 Displays the Running Configuration for All Interfaces

```
switch# show running-config
...
interface fc9/1
  switchport speed 2000
...
interface fc9/1
  switchport mode E
...
interface fc9/1
  channel-group 11 force
  no shutdown
```

Example 2-12 displays the running configuration information for a specified interface. The interface configuration commands are grouped together.

Example 2-12 Displays the Running Configuration for a Specified Interface

```
switch# show running-config interface fc1/1
interface fc9/1
  switchport speed 2000
  switchport mode E
  channel-group 11 force
  no shutdown
```

Example 2-13 displays the running configuration after the **system default switchport mode F** command is executed. Example 2-14 displays the running configuration after two interfaces are individually configured for mode FL.

Example 2-13 Displays the Running Configuration After the System Default Switchport Mode F Command is Executed

```
switch# show running-config
version 3.1(3)
system default switchport mode F
interface fc4/1
interface fc4/2
interface fc4/3
interface fc4/4
interface fc4/5
interface fc4/6
interface fc4/7
interface fc4/8
interface fc4/9
interface fc4/10
```

Example 2-14 Displays the Running Configuration After Two Interfaces Are Individually Configured for Mode FL

```
switch# show running-config
version 3.1(3)
system default switchport mode F
interface fc4/1
  switchport mode FL
interface fc4/2
interface fc4/3
  switchport mode FL
interface fc4/4
interface fc4/5
interface fc4/6
interface fc4/7
interface fc4/8
interface fc4/9
interface fc4/1
```

Example 2-15 displays interface information in a brief format after the **system default switchport mode F** command is executed. Example 2-16 displays interface information in a brief format after two interfaces are individually configured for mode FL.

Example 2-15 Displays Interface Information in a Brief Format After the System Default Switchport Mode F Command is Executed

```
switch# show interface brief
--------------------------------------------------------------------------------
Interface  Vsan   Admin  Admin   Status          SFP    Oper  Oper   Port
                 Mode   Trunk                          Mode  Speed  Channel
```

```
                          Mode                                    (Gbps)
--------------------------------------------------------------------------------
fc4/1       1       F       --      notConnected     swl     --          --
fc4/2       1       F       --      notConnected     swl     --          --
fc4/3       1       F       --      notConnected     swl     --          --
fc4/4       1       F       --      notConnected     swl     --          --
fc4/5       1       F       --      sfpAbsent        --      --          --
fc4/6       1       F       --      sfpAbsent        --      --          --
fc4/7       1       F       --      sfpAbsent        --      --          --
fc4/8       1       F       --      sfpAbsent        --      --          --
fc4/9       1       F       --      sfpAbsent        --      --          --
```

Example 2-16 Displays Interface Information in a Brief Format After Two Interfaces Are Individually Configured for Mode FL

```
switch# show interface brief

--------------------------------------------------------------------------------
Interface  Vsan   Admin  Admin   Status          SFP    Oper  Oper   Port
                  Mode   Trunk                          Mode  Speed  Channel
                         Mode                           (Gbps)
--------------------------------------------------------------------------------
fc4/1      1      FL     --      notConnected     swl    --          --
fc4/2      1      F      --      notConnected     swl    --          --
fc4/3      1      FL     --      notConnected     swl    --          --
fc4/4      1      F      --      notConnected     swl    --          --
fc4/5      1      F      --      sfpAbsent        --     --          --
fc4/6      1      F      --      sfpAbsent        --     --          --
fc4/7      1      F      --      sfpAbsent        --     --          --
fc4/8      1      F      --      sfpAbsent        --     --          --
fc4/9      1      F      --      sfpAbsent        --     --          --
fc4/10     1      F      --      sfpAbsent        --     --          --
```

TL Ports for Private Loops

Private loops require setting the interface mode to TL. This section describes TL ports and includes the following sections:

About TL Ports

Private loop devices refer to legacy devices that reside on arbitrated loops. These devices are not aware of a switch fabric because they only communicate with devices on the same physical loop. The legacy devices are used in Fibre Channel networks, and devices outside the loop may need to communicate with them. The communication functionality is provided through TL ports. See the "About Interface Modes" section on page 2-3.

TL port mode is not supported on the following hardware:

- Generation 2 switching module interfaces
- Cisco MDS 9124 Fabric Switch
- Cisco Fabric Switch for HP c-Class BladeSystem
- Cisco Fabric Switch for IBM BladeCenter

Follow these guidelines when configuring private loops:

- A maximum of 64 fabric devices can be proxied to a private loop.
- Fabric devices must be in the same zone as private loop devices to be proxied to the private loop.
- Each private device on a TL port may be included in a different zone.
- All devices on the loop are treated as private loops. You cannot mix private and public devices on the loop if the configured port mode is TL.
- The only FC4-type supported by TL ports is SCSI (FCP).
- Communication between a private initiator to a private target on the same private loop does not invoke TL port services.

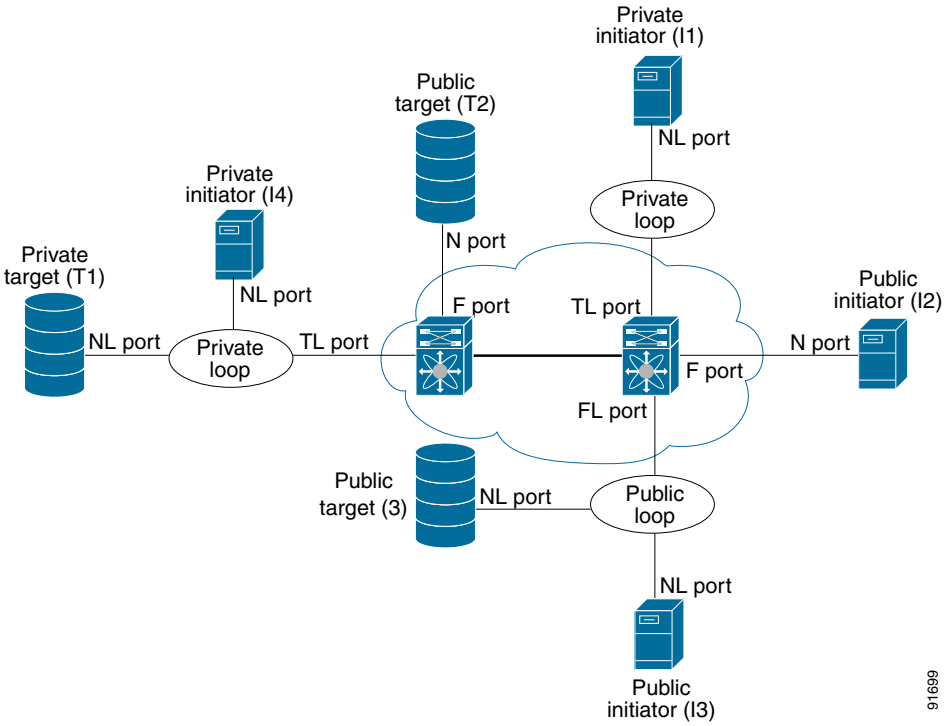
Table 2-6 lists the TL port translations supported in Cisco MDS 9000 Family switches.

Table 2-6 Supported TL Port Translations

Translation from	Translation to	Example
Private initiator	Private target	From I1 to T1 or vice versa
Private initiator	Public target — N port	From I1 to T2 or vice versa
Private initiator	Public target — NL port	From I4 to T3 or vice versa
Public initiator — N port	Private target	From I2 to T1 or vice versa
Public initiator — NL port	Private target	From I3 to T1 or vice versa

Figure 2-3 shows examples of TL port translation support.

Figure 2-3 TL Port Translation Support Examples



Configuring TL Ports

Use the **switchport mode** command to configure a TL port. See the "Configuring Interface Modes" section on page 2-13.

About TL Port ALPA Caches

Although TL ports cannot be automatically configured, you can manually configure entries in arbitrated loop physical address (ALPA) caches. Generally, ALPA cache entries are automatically populated when an ALPA is assigned to a device. Each device is identified by its port world wide name (pWWN). When a device is allocated an ALPA, an entry for that device is automatically created in the ALPA cache.

A cache contains entries for recently allocated ALPA values. These caches are maintained on various TL ports. If a device already has an ALPA, the Cisco NX-OS software attempts to allocate the same ALPA to the device each time. The ALPA cache is maintained in persistent storage and saves information across switch reboots. The maximum cache size is 1000 entries. If the cache is full, and a new ALPA is allocated, the Cisco NX-OS software discards an inactive cache entry (if available) to make space for the new entry. See the "TL Port" section on page 2-5 for more information on TL ports.

Displaying TL Port Information

The **show tlport** command displays the TL port interface configurations. This command provides a list of all TL ports configured in a switch and shows the associated VSAN, the FC ID for the port (only domain and area are valid), and the current operational state of the TL port (up or initializing). See Example 2-17 through Example 2-20.

Example 2-17 Displays the TL Ports in All VSANs

```
switch# show tlport list
------------------------------
Interface Vsan FC-ID    State
------------------------ ------
fc1/16    1    0x420000 Init
fc2/26    1    0x150000 Up
```

TL ports allow a private device (devices that physically reside on the loop) to see a fabric device and vice-versa by proxying fabric devices on the loop. Fabric devices are proxied by allocating each fabric device an ALPA on this loop.

In addition to these proxied devices, other virtual devices (local or remote domain controller addresses) are also allocated ALPAs on the loop. A switch reserves the ALPA for its own communication with private devices, and the switch acts as a SCSI initiator.

The first column in the output of the **show tlport interface** command is the ALPA identity of the device on the loop. The columns that follow include the port WWNs, the node WWNs for each device, the device as a SCSI initiator or target, and the real FC ID of the device.

Example 2-18 Displays the Detailed Information for a Specific TL Port

```
switch# show tlport interface fc1/16 all
fc1/16 is up, vsan 1, FCID 0x420000
--------------------------------------------------------------------------------
alpa pWWN                   nWWN                   SCSI Type Device  FC-ID
--------------------------------------------------------------------------------
0x01 20:10:00:05:30:00:4a:de 20:00:00:05:30:00:4a:de Initiator Proxied 0xfffc42
0x73 22:00:00:20:37:39:ae:54 20:00:00:20:37:39:ae:54 Target    Private 0x420073
0xef 20:10:00:05:30:00:4a:de 20:00:00:05:30:00:4a:de Initiator Switch  0x0000ef
```

Example 2-19 Displays TL Port Information for Private Devices

```
switch# show tlport interface fc 1/16 private
fc1/16 is up, vsan 1, FCID 0x420000
------------------------------------------------------------------------
alpa pWWN                   nWWN                   SCSI Type FC-ID
------------------------------------------------------------------------
0x73 22:00:00:20:37:39:ae:54 20:00:00:20:37:39:ae:54 Target    0x420073
0x74 22:00:00:20:37:38:d3:de 20:00:00:20:37:38:d3:de Target    0x420074
```

Example 2-20 Displays TL Port Information for Proxied Devices

```
switch# show tlport interface fc 1/16 proxied
fc1/16 is up, vsan 1, FCID 0x420000
------------------------------------------------------------------------
alpa pWWN                   nWWN                   SCSI Type FC-ID
------------------------------------------------------------------------
0x01 20:10:00:05:30:00:4a:de 20:00:00:05:30:00:4a:de Initiator 0xfffc42
0x02 21:00:00:e0:8b:01:95:e7 20:00:00:e0:8b:01:95:e7 Initiator 0x420100
```

Manually Inserting Entries into ALPA Cache

To manually insert entries into the ALPA cache, follow these steps:

	Command	Purpose
Step 1	`switch# config t`	Enters configuration mode.
Step 2	`switch(config)# tlport alpa-cache interface fc1/2 pwwn 22:00:00:20:37:46:09:bd alpa 0x02`	Configures manual entries into the ALPA cache.
Step 3	`switch(config)# tlport alpa-cache interface fc1/3 pwwn 22:00:00:20:37:46:09:bd`	Removes this entry from the ALPA cache.

Displaying the ALPA Cache Contents

The **show tlport alpa-cache** command displays the contents of the ALPA cache.

```
switch# show tlport alpa-cache
-------------------------------------------------------
alpa              pWWN               Interface
-------------------------------------------------------
0x02  22:00:00:20:37:46:09:bd     fc1/2
0x04  23:00:00:20:37:46:09:bd     fc1/2
```

The first entry indicates that if a device with a pWWN of 22:00:00:20:37:46:09:bd is exported on TL port fc1/2, then the pWWN is allocated an alpa 0x02 (if available).

Clearing the ALPA Cache

The **clear tlport alpa-cache** command clears the entire content of the ALPA cache.

Configuring Port Guard

The port guard feature is intended for use in environments where the system and application environment does not adapt quickly and efficiently to a port going down and back up, or to a port rapidly cycling up and down, which can happen in some failure modes. For example, if a system takes five seconds to stabilize after a port goes down, but the port is going up and down once a second, this might ultimately cause a more severe failure in the fabric.

The port guard feature gives the SAN administrator the ability to prevent this issue from occurring in environments that are vulnerable to these problems. The port can be configured to stay down after the first failure, or after specified number of failures in a specified time period. This allows the SAN administrator to intervene and control the recovery, avoiding any problems caused by the cycling.

Using the port guard feature, you can restrict the number of error reports and bring a malfunctioning port to down state dynamically. A port can be configured to go into error-disabled state for specific types of failures.

A general link failure caused by link-down is the superset of all other causes. The sum of the number of all other causes equals to the number of link-down link failures. This means a port is brought to down state when it reaches the maximum number of allowed link failures or the number of specific causes.

The causes of link failure can be any of the following:

- ESP trustsec-violation

- Bit-errors
- Signal loss
- Sync loss
- Link reset
- Credit loss
- Additional causes might be the following:
  - Not operational (NOS).
  - Too many interrupts.
  - Cable is disconnected.
  - Hardware recoverable errors.
  - The connected device rebooted (F ports only).
  - The connected linecard rebooted (ISL only).

To enable or disable the port guard for a port, follow these steps:

	Command	Purpose
Step 1	`switch# config t`	Enters configuration mode.
Step 2	`switch(config)# interface fc1/1`	Selects the port interface.
Step 3	`switch(config)# errdisable detect cause link-down`	Brings the port to down state if the link flaps once.
	`switch(config)# errdisable detect cause link-down [num-times number duration seconds]`	Brings the port to down state if the link flaps for the *number* of instances within the specified *seconds*.
	`switch(config)# no errdisable detect cause link-down`	Removes (default) the port guard configuration for the interface. The link resumes flapping and sending error reports normally.
Step 4	`switch(config)# errdisable detect cause {trustsec-violation | bit-errors | credit-loss | link-reset | signal-loss | sync-loss}`	Brings the port to down state if the specified error occurs even once.
	`switch(config)# errdisable detect cause {trustsec-violation | bit-errors | credit-loss | link-reset | signal-loss | sync-loss} [num-times number duration seconds]`	Brings the port to down state if the specified error occurs for the *number* of instances within the specified *seconds*.
	`switch(config)# no errdisable detect cause {trustsec-violation | bit-errors | credit-loss | link-reset | signal-loss | sync-loss}`	Removes (default) the port guard configuration for the interface. The link resumes flapping and sending error reports normally.

Link down is the superset of all other causes. A port is brought to down state if the total number of other causes equals to the number of allowed link-down failures.

This example shows how to configure port guard to bring a port to down state if the link flaps 5 times within 120 seconds based on multiple causes:

```
Switch# config t
Switch (config)# interface fc1/1
Switch (config-if)# errdisable detect cause link-down num-times 5 duration 120
Switch (config-if)# errdisable detect cause bit-errors num-times 5 duration 120
```

```
Switch (config-if)# errdisable detect cause credit-loss num-times 5 duration 120
```

With this configuration:

- The port will be error-disabled due to bit errors if the port suffers link failure due to bit errors 5 times in 120 seconds.
- The port will be error-disabled due to credit loss if the port suffers link failure due to credit loss 5 times in 120 seconds.
- The port will be error-disabled due to link down if the port suffers link failure due to bit errors 2 times and link-failure due to credit loss 3 times in 120 seconds.

Note Even if the link does not flap due to failure of the link, and port guard is not enabled, the port goes into a down state if too many invalid FLOGI requests are received from the same host. Use the **shut** and the **no shut** commands consecutively to bring up the link.

This example shows the internal information about a port in down state because of trustsec violation:

```
Switch# show port internal info interface fc8/3
fc8/3 is down (Error disabled - port down due to trustsec violation)
    Hardware is Fibre Channel, SFP is short wave laser w/o OFC (SN)
    Port WWN is 21:c3:00:0d:ec:10:57:80
    Admin port mode is E, trunk mode is on
    snmp link state traps are enabled
    Port vsan is 1
    Receive data field Size is 2112
    Beacon is turned off
    5 minutes input rate 0 bits/sec, 0 bytes/sec, 0 frames/sec
    5 minutes output rate 0 bits/sec, 0 bytes/sec, 0 frames/sec
      11274 frames input, 1050732 bytes
        0 discards, 0 errors
        0 CRC, 0 unknown class
        0 too long, 0 too short
      11242 frames output, 971900 bytes
        0 discards, 0 errors
      11 input OLS, 34 LRR, 10 NOS, 0 loop inits
      72 output OLS, 37 LRR, 2 NOS, 0 loop inits
    Interface last changed at Sun Nov 27 07:34:05 1988

   admin port-down trustsec-violation(3) num_times 0, duration = 0
    state reason (Error disabled - port down due to trustsec violation)
    Port guard trustsec violation is Enabled
    errdisabled on trustsec violation TRUE, oper cnt = 1
    port guard first trustsec violation Sun Nov 27 07:34:05 1988
```

Configuring Port Monitor

Port monitor helps to monitor the performance and the status of ports and generate alerts when problems occur. You can configure the thresholds for various counters and trigger an event when the values cross the threshold settings.

This section includes the following topics:

Enabling Port Monitor

To enable port monitor, follow these steps:

	Command	Purpose
Step 1	`switch# config t`	Enters configuration mode.
Step 2	`switch(config)# port-monitor enable`	Enables (default) port monitoring.
	`switch(config)# no port-monitor enable`	Disables port monitoring.

Configuring Port Monitor Policy

To configure a port monitor policy, follow these steps:

	Command	Purpose
Step 1	`switch# config t`	Enters configuration mode.
Step 2	`switch(config)# port-monitor name` *policyname*	Specifies the policy name and enters the port monitoring policy configuration mode.
	`switch(config)# no port-monitor name` *policyname*	Removes the policy.
Step 3	`switch(config-port-monitor)# port-type access-port`	Applies the policy to the access ports.
	`switch(config-port-monitor)# port-type trunks`	Applies the policy to the trunk ports.
	`switch(config-port-monitor)# port-type all`	Applies the policy to all ports.

	Command	Purpose
Step 4	`switch(config-port-monitor)# counter invalid-crc poll-interval seconds delta rising-threshold percentage1 event event-id falling-threshold percentage2 event event-id`	Specifies the delta invalid CRC poll interval in seconds, the thresholds in percentage, and the event IDs of events to be triggered.
	`switch(config-port-monitor)# counter invalid-words poll-interval seconds delta rising-threshold percentage1 event event-id falling-threshold percentage2 event event-id`	Specifies the delta invalid words poll interval in seconds, the thresholds in percentage, and the event IDs of events to be triggered.
	`switch(config-port-monitor)# counter link-loss poll-interval seconds delta rising-threshold percentage1 event event-id falling-threshold percentage2 event event-id`	Specifies the delta link loss poll interval in seconds, the thresholds in percentage, and the event IDs of events to be triggered.
	`switch(config-port-monitor)# counter protocol-error poll-interval seconds delta rising-threshold percentage1 event event-id falling-threshold percentage2 event event-id`	Specifies the delta protocol error poll interval in seconds, the thresholds in percentage, and the event IDs of events to be triggered.
	`switch(config-port-monitor)# counter rx-performance poll-interval seconds delta rising-threshold percentage1 event event-id falling-threshold percentage2 event event-id`	Specifies the delta Rx counter poll interval in seconds and thresholds in percentage.
	`switch(config-port-monitor)# counter signal-loss poll-interval seconds delta rising-threshold percentage1 event event-id falling-threshold percentage2 event event-id`	Specifies the delta signal loss poll interval in seconds, the thresholds in percentage, and the event IDs of events to be triggered.
	`switch(config-port-monitor)# counter state-change poll-interval seconds delta rising-threshold percentage1 event event-id falling-threshold percentage2 event event-id`	Specifies the delta state change poll interval in seconds, the thresholds in percentage, and the event IDs of events to be triggered.
	`switch(config-port-monitor)# counter sync-loss poll-interval seconds delta rising-threshold percentage1 event event-id falling-threshold percentage2 event event-id`	Specifies the delta sync loss poll interval in seconds, the thresholds in percentage, and the event IDs of events to be triggered.
	`switch(config-port-monitor)# counter tx-performance poll-interval seconds delta rising-threshold percentage1 event event-id falling-threshold percentage2 event event-id`	Specifies the delta Tx counter poll interval in seconds and thresholds in percentage.
	`switch(config-port-monitor)# no counter sync-loss`	Reverts to the default policy for sync loss performance counter values.
	`switch(config-port-monitor)# no counter tx-performance`	Reverts to the default policy for Tx performance counter values.
Step 5	`switch(config-port-monitor)# monitor counter rx-performance`	Turns on Rx performance monitoring.
	`switch(config-port-monitor)# monitor counter tx-performance`	Turns on Tx performance monitoring.
	`switch(config-port-monitor)# no monitor counter tx-performance`	Turns off Tx performance monitoring.
	`switch(config-port-monitor)# no monitor counter sync-loss`	Turns off monitoring sync loss.
	`switch(config-port-monitor)# no monitor counter state-change`	Turns off monitoring state change.

Default Policy

The default policy has the following threshold values:

Counter	Threshold Type	Interval (Seconds)	% Rising Threshold	Event	% Falling Threshold	Event
Link Loss	Delta	60	5	4	1	4
Sync Loss	Delta	60	5	4	1	4
Protocol Error	Delta	60	1	4	0	4
Signal Loss	Delta	60	5	4	1	4
Invalid Words	Delta	60	1	4	0	4
Invalid CRCs	Delta	60	5	4	1	4
RX Performance	Delta	60	2147483648	4	524288000	4
TX Performance	Delta	60	2147483648	4	524288000	4

Activating a Port Monitor Policy

To activate a port monitor policy, follow these steps:

	Command	Purpose
Step 1	`switch# config t`	Enters configuration mode.
Step 2	`switch(config)# port-monitor activate` *policyname*	Activates the specified port monitor policy.
	`switch(config)# port-monitor activate`	Activates the default port monitor policy.
	`switch(config)# no port-monitor activate` *policyname*	Deactivates the specified port monitoring policy.

Displaying Port Monitor Status and Policies

The following commands display information regarding port monitor:

```
switch# show port-monitor status
Port Monitor    : Enabled
Active Policies : sample
Last 10 logs :

switch# show port-monitor
--------------------------------------------------------------------------------
Port Monitor : enabled
--------------------------------------------------------------------------------
Policy Name  : sample
Admin status : Not Active
Oper status  : Not Active
Port type    : All Access Ports
--------------------------------------------------------------------------------
Counter          Threshold  Interval Rising Threshold event Falling Threshold  event In
Use
-------          ---------  -------- ---------------- ----- ------------------ ----- -----
Link Loss        Delta      60       5                4     1                  4     Yes
Sync Loss        Delta      60       5                4     1                  4     Yes
```

```
Protocol Error   Delta      60       1               4     0                 4     Yes
Signal Loss      Delta      60       5               4     1                 4     Yes
Invalid Words    Delta      60       1               4     0                 4     Yes
Invalid CRC's    Delta      60       5               4     1                 4     Yes
RX Performance   Delta      60       2147483648      4     524288000         4     Yes
TX Performance   Delta      60       2147483648      4     524288000         4     Yes
-------------------------------------------------------------------------------------

Policy Name  : default
Admin status : Not Active
Oper status  : Not Active
Port type    : All Ports
-------------------------------------------------------------------------------------
Counter          Threshold  Interval Rising Threshold event Falling Threshold  event In
Use
-------          ---------  -------- ---------------- ----- ------------------ ----- -----
Link Loss        Delta      60       5               4     1                 4     Yes
Sync Loss        Delta      60       5               4     1                 4     Yes
Protocol Error   Delta      60       1               4     0                 4     Yes
Signal Loss      Delta      60       5               4     1                 4     Yes
Invalid Words    Delta      60       1               4     0                 4     Yes
Invalid CRC's    Delta      60       5               4     1                 4     Yes
RX Performance   Delta      60       2147483648      4     524288000         4     Yes
TX Performance   Delta      60       2147483648      4     524288000         4     Yes
-------------------------------------------------------------------------------------

switch# show port-monitor active
Policy Name  : sample
Admin status : Active
Oper status  : Active
Port type    : All Access Ports
-------------------------------------------------------------------------------------
Counter          Threshold  Interval Rising Threshold event Falling Threshold  event In
Use
-------          ---------  -------- ---------------- ----- ------------------ ----- -----
Link Loss        Delta      60       5               4     1                 4     Yes
Sync Loss        Delta      60       5               4     1                 4     Yes
Protocol Error   Delta      60       1               4     0                 4     Yes
Signal Loss      Delta      60       5               4     1                 4     Yes
Invalid Words    Delta      60       1               4     0                 4     Yes
Invalid CRC's    Delta      60       5               4     1                 4     Yes
RX Performance   Delta      60       2147483648      4     524288000         4     Yes
TX Performance   Delta      60       2147483648      4     524288000         4     Yes
-------------------------------------------------------------------------------------

switch# show port-monitor sample
Policy Name  : sample
Admin status : Active
Oper status  : Active
Port type    : All Access Ports
-------------------------------------------------------------------------------------
Counter          Threshold  Interval Rising Threshold event Falling Threshold  event In
Use
-------          ---------  -------- ---------------- ----- ------------------ ----- -----
Link Loss        Delta      60       5               4     1                 4     Yes
Sync Loss        Delta      60       5               4     1                 4     Yes
Protocol Error   Delta      60       1               4     0                 4     Yes
Signal Loss      Delta      60       5               4     1                 4     Yes
Invalid Words    Delta      60       1               4     0                 4     Yes
Invalid CRC's    Delta      60       5               4     1                 4     Yes
RX Performance   Delta      60       2147483648      4     524288000         4     Yes
TX Performance   Delta      60       2147483648      4     524288000         4     Yes
-------------------------------------------------------------------------------------
```

Configuring Port Group Monitor

Each line card or module has a predefined set of ports which share the same backplane bandwidth called port groups. While oversubscription is a feature, the port group monitor feature helps to monitor the spine bandwidth utilization. An alarm syslog is generated so that you can provision the ports across port groups evenly to manage the oversubscription better.

When the port group monitor feature is enabled and a policy consisting of polling interval in seconds, and the raising and falling thresholds in percentage are specified, port group monitor generates a syslog if a port group traffic goes above the specified percentage of the maximum supported bandwidth for that port group (for rx and for tx) and another syslog if the value falls below the specified threshold.

This section includes the following topics:

Enabling Port Group Monitor

To enable port group monitor, follow these steps:

	Command	Purpose
Step 1	`switch# config t`	Enters configuration mode.
Step 2	`switch(config)# port-group-monitor enable`	Enables (default) port group monitoring.
	`switch(config)# no port-group-monitor enable`	Disables port group monitoring.

Configuring Port Group Monitor Policy

To configure port group monitor policy, follow these steps:

	Command	Purpose
Step 1	`switch# config t`	Enters configuration mode.
Step 2	`switch(config)# port-group-monitor name` *policyname*	Specifies the policy name and enters the port group monitoring policy configuration mode.
	`switch(config)# no port-group-monitor name` *policyname*	Removes the policy.
Step 3	`switch(config-port-group-monitor)# counter rx-performance poll-interval` *seconds* `delta rising-threshold` *percentage1* `falling-threshold` *percentage2*	Specifies the delta Rx counter poll interval in seconds and thresholds in percentage.
	`switch(config-port-group-monitor)# counter tx-performance poll-interval` *seconds* `delta rising-threshold` *percentage1* `falling-threshold` *percentage2*	Specifies the delta Tx counter poll interval in seconds and thresholds in percentage.
	`switch(config-port-group-monitor)# no counter tx-performance`	[1]Reverts to the [2]default policy.

	Command	Purpose
Step 4	`switch(config-port-group-monitor)# monitor counter rx-performance`	Turns on Rx performance monitoring.
	`switch(config-port-group-monitor)# monitor counter tx-performance`	Turns on Tx performance monitoring.
	`switch(config-port-group-monitor)# no monitor counter tx-performance`	[3]Turns off Tx performance monitoring.

1. See Reverting to the Default Policy for a Specific Counter, page 2-40.
2. See Default Policy, page 2-40
3. See Turning Off the Monitoring of Specific Counter, page 2-41.

Default Policy

The default policy has the following threshold values:

Counter	Threshold Type	Interval (Seconds)	% Rising Threshold	% Falling Threshold
RX Performance	Delta	60	80	20
TX Performance	Delta	60	80	20

Reverting to the Default Policy for a Specific Counter

When the **no counter** command is used in the **config-port-group-monitor** mode, the specified counter polling values will revert to the default values as seen in the following example:

```
switch(config)# port-group-monitor name PGMON_policy
switch(config-port-group-monitor)# counter tx-performance poll-interval 100 delta
rising-threshold 65  falling-threshold 25
switch(config)# show port-group-monitor PGMON_policy

Policy Name  : PGMON_policy
Admin status : Not Active
Oper status  : Not Active
Port type    : All Port Groups
--------------------------------------------------------------------------------
Counter          Threshold  Interval %ge Rising Threshold %ge Falling Threshold  In Use
-------          ---------  -------- -------------------- ---------------------- ------
RX Performance   Delta      60       80                   10                     Yes
TX Performance   Delta      100      65                   25                     Yes

switch(config)# port-group-monitor name PGMON_policy
switch(config-port-group-monitor)# no counter tx-performance
switch(config)# show port-group-monitor PGMON_policy


Policy Name  : PGMON_policy
Admin status : Not Active
Oper status  : Not Active
Port type    : All Port Groups
--------------------------------------------------------------------------------
Counter          Threshold  Interval %ge Rising Threshold %ge Falling Threshold  In Use
-------          ---------  -------- -------------------- ---------------------- ------
RX Performance   Delta      60       80                   10                     Yes
TX Performance   Delta      60       80                   10                     Yes
--------------------------------------------------------------------------------
```

Turning Off the Monitoring of Specific Counter

When the **no monitor counter** command is used in the **config-port-group-monitor** mode, it turns off the monitoring of the specified counter in the given policy as seen in the following example:

```
switch(config)# show port-group-monitor PGMON_policy

Policy Name  : PGMON_policy
Admin status : Not Active
Oper status  : Not Active
Port type    : All Port Groups
--------------------------------------------------------------------------------
Counter          Threshold  Interval %ge Rising Threshold %ge Falling Threshold  In Use
-------          ---------  -------- -------------------- ---------------------- ------
RX Performance   Delta      26       450                  250                    Yes
TX Performance   Delta      60       100                  80                     Yes
--------------------------------------------------------------------------------

switch(config)# port-group-monitor name PGMON_policy
switch(config-port-group-monitor)# no monitor counter rx-performance

switch(config)# show port-group-monitor PGMON_policy

Policy Name  : PGMON_policy
Admin status : Not Active
Oper status  : Not Active
Port type    : All Port Groups
--------------------------------------------------------------------------------
Counter          Threshold  Interval %ge Rising Threshold %ge Falling Threshold  In Use
-------          ---------  -------- -------------------- ---------------------- ------
RX Performance   Delta      26       450                  250                    No
TX Performance   Delta      60       100                  80                     Yes
--------------------------------------------------------------------------------
```

Activating a Port Group Monitor Policy

To activate a port group monitor policy, follow these steps:

	Command	Purpose
Step 1	`switch# config t`	Enters configuration mode.
Step 2	`switch(config)# port-group-monitor activate` *policyname*	Activates the specified port group monitor policy.
	`switch(config)# port-group-monitor activate`	Activates the default port group monitor policy.
	`switch(config)# no port-group-monitor activate` *policyname*	Deactivates the specified port group monitor policy.

Displaying Port Group Monitor Status and Policies

The following commands display information about port group monitor:

```
switch# show port-group-monitor status
Port Group Monitor : Enabled
Active Policies : pgm2
Last 10 logs :
switch#
```

```
switch# show port-group-monitor
--------------------------------------------------------------------------------
Port Group Monitor : enabled
--------------------------------------------------------------------------------
Policy Name  : pgm1
Admin status : Not Active
Oper status  : Not Active
Port type    : All Port Groups
--------------------------------------------------------------------------------
Counter          Threshold  Interval %ge Rising Threshold %ge Falling Threshold  In Use
-------          ---------  -------- -------------------- ---------------------- ------
RX Performance   Delta      60       50                   10                     Yes
TX Performance   Delta      60       50                   10                     Yes
--------------------------------------------------------------------------------
Policy Name  : pgm2
Admin status : Active
Oper status  : Active
Port type    : All Port Groups
--------------------------------------------------------------------------------
Counter          Threshold  Interval %ge Rising Threshold %ge Falling Threshold  In Use
-------          ---------  -------- -------------------- ---------------------- ------
RX Performance   Delta      60       80                   10                     Yes
TX Performance   Delta      60       80                   10                     Yes
--------------------------------------------------------------------------------
Policy Name  : default
Admin status : Not Active
Oper status  : Not Active
Port type    : All Port Groups
--------------------------------------------------------------------------------
Counter          Threshold  Interval %ge Rising Threshold %ge Falling Threshold  In Use
-------          ---------  -------- -------------------- ---------------------- ------
RX Performance   Delta      60       80                   20                     Yes
TX Performance   Delta      60       80                   20                     Yes
--------------------------------------------------------------------------------

switch# show port-group-monitor active
Policy Name  : pgm2
Admin status : Active
Oper status  : Active
Port type    : All Port Groups
--------------------------------------------------------------------------------
Counter          Threshold  Interval %ge Rising Threshold %ge Falling Threshold  In Use
-------          ---------  -------- -------------------- ---------------------- ------
RX Performance   Delta      60       80                   10                     Yes
TX Performance   Delta      60       80                   10                     Yes
--------------------------------------------------------------------------------

switch# show port-group-monitor PGMON_policy
PPolicy Name  : PGMON_policy
Admin status : Not Active
Oper status  : Not Active
Port type    : All Port Groups
--------------------------------------------------------------------------------
Counter          Threshold  Interval %ge Rising Threshold %ge Falling Threshold  In Use
-------          ---------  -------- -------------------- ---------------------- ------
RX Performance   Delta      26       450                  250                    No
TX Performance   Delta      60       100                  80                     Yes
--------------------------------------------------------------------------------
```

Configuring Slow Drain Device Detection and Congestion Avoidance

This section includes the following topics:

About Slow Drain Device Detection and Congestion Avoidance

All data traffic between end devices in a SAN fabric is carried by Fibre Channel Class 3, and in some cases, Class 2 services that use link-level, per-hop-based, and buffer-to-buffer flow control. These classes of service do not support end-to-end flow control. When there are slow devices attached to the fabric, the end devices do not accept the frames at the configured or negotiated rate. The slow devices lead to ISL credit shortage in the traffic destined for these devices and they congest the links. The credit shortage affects the unrelated flows in the fabric that use the same ISL link even though destination devices do not experience slow drain.

This feature provides various enhancements to detect slow drain devices that are causing congestion in the network and also provides a congestion avoidance function.

This feature is focused mainly on the edge ports that are connected to slow drain devices. The goal is to avoid or minimize the frames stuck condition in the edge ports due to slow drain devices that are causing ISL blockage. To avoid or minimize the stuck condition, configure lesser frame timeout for the ports. No-credit timeout drops all packets once the slow drain is detected using the configured thresholds. The lesser frame timeout value helps to alleviate the slow drain condition that affects the fabric by dropping the packets on the edge ports sooner than the time they actually get timed out (500 ms). This function frees the buffer space in ISL, which can be used by other unrelated flows that do not experience slow drain condition.

Note This feature is used mainly for edge ports that are connected to slow edge devices. Even though this feature can be applied to ISLs as well, we recommend that you apply this feature only for edge F ports and retain the default configuration for ISLs as E and TE ports. This feature is not supported on Generation 1 modules.

Configuring Stuck Frame Timeout Value

The default stuck frame timeout value is 500 ms. We recommend that you retain the default configuration for ISLs and configure a value not exceeding 500 ms (100 to 200 ms) for fabric F ports.

To configure the stuck frame timeout value, follow these steps:

	Command	Purpose
Step 1	`switch# config t`	Enters configuration mode.
Step 2	`switch(config)# system timeout congestion-drop` *seconds* `mode E|F`	Specifies the stuck frame timeout value in ms and the port mode for the switch.
	`switch(config)# system timeout congestion-drop default mode E|F`	Specifies the default stuck frame timeout port mode for the switch.

Configuring No-Credit Timeout Value

When the port does not have the credits for the configured period, no-credit timeout can be enabled on that port. This will result in all frames coming to that port getting dropped in the egress. This will free the buffer space in the ISL link, which carries traffic for this port. This will help reduce fabric slow down and congestion on other unrelated flows using the same link.

The frames that will be dropped would have just entered the switch or would have stayed in the switch for the configured timeout value. These are preemptive drops and will clear the congestion completely compared to the stuck frame timeout value.

No-credit timeout feature is disabled by default. We recommend that you retain the default configuration for ISLs and configure a value not exceeding 500 ms (200 to 300 ms) for fabric F ports.

Note The no-credit timeout value and stuck frame timeout value are interlinked. The no-credit timeout value must always be greater than the stuck frame timeout value.

To configure the no-credit timeout value, follow these steps:

	Command	Purpose
Step 1	`switch# config t`	Enters configuration mode.
Step 2	`switch(config)# system timeout no-credit-drop` *seconds* `mode E|F`	Specifies the no-credit timeout value and port mode for the switch.
	`switch(config)# system timeout no-credit-drop default mode E|F`	Specifies the default no-credit timeout value port mode for the switch.

Configuring Credit Loss Recovery Threshold and Action

When the port detects the credit loss condition and recovers, then the port can be error-disabled, a trap can be sent with interface details, and a syslog can be generated with interface details. When the configured threshold is exceeded, one or more of these actions can be combined together. These actions can be turned on or off depending on situation. The port monitor feature provides the command line interface to configure the thresholds and action.

The thresholds are that the credit loss recovery can be between 1 and 10 and the interval can be 1 second to 1 hour. The default value is 3 in 10 minutes and generates a syslog.

When the port sees the credit loss condition and fails to recover, the port flaps. This function is already part of port guard and so you can configure the supported actions using the Port Guard feature.

To configure credit loss recovery threshold and action, refer to the "Configuring Port Monitor" section on page 2-34.

The following example shows the credit loss recovery threshold and action configuration:

```
switch# show port-monitor
Policy Name  : Cisco
Admin status : Active
Oper status  : Active
Port type    : All Ports
--------------------------------------------------------------------------------
----------
Counter                 Threshold  Interval Rising Threshold event Falling Threshold
event Portguard     In Use
-------                 ---------  -------- ---------------- ----- ------------------
----- ---------     ------
Link Loss               Delta      60       5               4     1                 4
Not enabled   Yes
Sync Loss               Delta      60       5               4     1                 4
Not enabled   Yes
Protocol Error          Delta      60       1               4     0                 4
Not enabled   Yes
Signal Loss             Delta      60       5               4     1                 4
Not enabled   Yes
Invalid Words           Delta      60       1               4     0                 4
Not enabled   Yes
Invalid CRC's           Delta      60       5               4     1                 4
Not enabled   Yes
RX Performance          Delta      60       2147483648      4     524288000         4
Not enabled   Yes
TX Performance          Delta      60       2147483648      4     524288000         4
Not enabled   Yes
TX Discards             Delta      60       200             4     10                4
Not enabled   Yes
LR RX                   Delta      60       5               4     1                 4
Not enabled   Yes
LR TX                   Delta      60       5               4     1                 4
Not enabled   Yes
Timeout Discards        Delta      60       200             4     10                4
Not enabled   Yes
Credit Loss Reco        Delta      60       1               4     0                 4
Not enabled   Yes
TX Credit Not Available  Delta     60       10              4     0                 4
Not enabled   Yes
--------------------------------------------------------------------------------
---------
```

The following default port monitor policy will be active when the switch comes up:

```
Policy Name  : slowdrain
Admin status : Not Active
Oper status  : Not Active
Port type    : All Ports
--------------------------------------------------------------------------------
----------
Counter                 Threshold  Interval Rising Threshold event Falling Threshold
event Portguard     In Use
-------                 ---------  -------- ---------------- ----- ------------------
----- ---------     ------
Credit Loss Reco        Delta      5        4               4     1                 4
Not enabled   Yes
TX Credit Not Available  Delta     1        20              4     10                4
Not enabled   Yes
```

Configuring Average Credit Non-Available Duration Threshold and Action

When the average credit non-available duration exceeds the set threshold, the port can be error-disabled, a trap can be sent with interface details, and a syslog can be generated with interface details. One or more of these actions can also be combined together. These actions can be turned on or off depending on the situation. The port monitor feature provides the command line interface to configure the thresholds and action. The threshold configuration can be a percentage of credit non-available duration in an interval.

The thresholds are that the credit non-available duration can be 0 percent to 100 percent in multiples of 10, and the interval can be 1 second to 1 hour. The default is 10 percent in 1 second and generates a syslog.

To configure average credit non-available duration threashold and action, refer to the "Configuring Port Monitor" section on page 2-34.

Note This feature is not supported on 1 RU fabric switches.

Management Interfaces

You can remotely configure the switch through the management interface (mgmt0). To configure a connection on the mgmt0 interface, you must configure either the IP version 4 (IPv4) parameters (IP address, subnet mask, and default gateway) or the IP version 6 (IPv6) parameters so that the switch is reachable.

This section describes the management interfaces and includes the following topics:

About Management Interfaces

Before you begin to configure the management interface manually, obtain the switch's IPv4 address and subnet mask, or the IPv6 address.

The management port (mgmt0) is autosensing and operates in full-duplex mode at a speed of 10/100/1000 Mbps. Autosensing supports both the speed and the duplex mode. On a Supervisor-1 module, the default speed is 100 Mbps and the default duplex mode is auto. On a Supervisor-2 module, the default speed is auto and the default duplex mode is auto.

Note You need to explicitly configure a default gateway to connect to the switch and send IP packets or add a route for each subnet.

Configuring Management Interfaces

To configure the mgmt0 Ethernet interface to connect over IPv4, follow these steps:

	Command	Purpose
Step 1	`switch# config terminal` `switch(config)#`	Enters configuration mode.
Step 2	`switch(config)# interface mgmt0` `switch(config-if)#`	Selects the management Ethernet interface on the switch and enters interface configuration submode.
Step 3	`switch(config-if)# ip address 10.16.1.2 255.255.255.0`	Configures the IPv4 address and IPv4 subnet mask.
Step 4	`switch(config-if)# no shutdown`	Enables the interface.
Step 5	`switch(config-if)# exit` `switch(config)#`	Returns to configuration mode.
Step 6	`switch(config)# ip default-gateway 1.1.1.4`	Configures the default gateway IPv4 address.
Step 7	`switch(config)# exit` `switch#`	Returns to EXEC mode.
Step 8	`switch# copy running-config startup-config`	(Optional) Saves your configuration changes to the file system. **Note** If you want to save your configuration, you can enter this command at any time.

To configure the mgmt0 Ethernet interface to connect over IPv6, follow these steps:

	Command	Purpose
Step 1	`switch# config terminal` `switch(config)#`	Enters configuration mode.
Step 2	`switch(config)# interface mgmt0` `switch(config-if)#`	Selects the management Ethernet interface on the switch and enters interface configuration submode.
Step 3	`switch(config-if)# ipv6 enable`	Enables IPv6 and assigns a link-local address on the interface.
Step 4	`switch(config-if)# ipv6 address ipv6 address 2001:0db8:800:200c::417a/64`	Specifies an IPv6 unicast address and prefix length on the interface.
Step 5	`switch(config-if)# no shutdown`	Enables the interface.
Step 6	`switch(config-if)# end` `switch#`	Returns to EXEC mode.
Step 7	`switch# copy running-config startup-config`	(Optional) Saves your configuration changes to the file system. **Note** If you want to save your configuration, you can enter this command at any time.

Displaying Management Interface Configuration

To display the management interface configuration, use the **show interface mgmt 0** command.

```
switch# show interface mgmt 0
mgmt0 is up
    Hardware is FastEthernet
```

```
Address is 000c.30d9.fdbc
Internet address is 10.16.1.2/24
MTU 1500 bytes, BW 100 Mbps full Duplex
26388 packets input, 6101647 bytes
  0 multicast frames, 0 compressed
  0 input errors, 0 frame, 0 overrun 0 fifo
10247 packets output, 2389196 bytes, 0 underruns
  0 output errors, 0 collisions, 0 fifo
  0 carrier errors
```

VSAN Interfaces

VSANs apply to Fibre Channel fabrics and enable you to configure multiple isolated SAN topologies within the same physical infrastructure. You can create an IP interface on top of a VSAN and then use this interface to send frames to this VSAN. To use this feature, you must configure the IP address for this VSAN. VSAN interfaces cannot be created for nonexisting VSANs.

This section describes VSAN interfaces and includes the following topics:

About VSAN Interfaces

Follow these guidelines when creating or deleting VSAN interfaces:

- Create a VSAN before creating the interface for that VSAN. If a VSAN does not exist, the interface cannot be created.
- Create the interface VSAN—it is not created automatically.
- If you delete the VSAN, the attached interface is automatically deleted.
- Configure each interface only in one VSAN.

Tip After configuring the VSAN interface, you can configure an IP address or Virtual Router Redundancy Protocol (VRRP) feature. See the *Cisco MDS 9000 Family NX-OS IP Services Configuration Guide*.

Creating VSAN Interfaces

To create a VSAN interface, follow these steps:

	Command	Purpose
Step 1	`switch# config t`	Enters configuration mode.
Step 2	`switch(config)# interface vsan 2` `switch(config-if)#`	Configures a VSAN with the ID 2.
Step 3	`switch(config-if)# no shutdown`	Enables the VSAN interface.

Displaying VSAN Interface Information

To display VSAN interface information, use the **show interface vsan** command.

```
switch# show interface vsan 2
vsan2 is up, line protocol is up
    WWPN is 10:00:00:05:30:00:59:1f, FCID is 0xb90100
    Internet address is 10.1.1.1/24
    MTU 1500 bytes, BW 1000000 Kbit
    0 packets input, 0 bytes, 0 errors, 0 multicast
    0 packets output, 0 bytes, 0 errors, 0 dropped
```

Default Settings

Table 2-7 lists the default settings for interface parameters.

Table 2-7 Default Interface Parameters

Parameters	Default
Interface mode	Auto
Interface speed	Auto
Administrative state	Shutdown (unless changed during initial setup)
Trunk mode	On (unless changed during initial setup) on non-NPV and NPIV core switches. Off on NPV switches.
Trunk-allowed VSANs or VF-IDs	1 to 4093
Interface VSAN	Default VSAN (1)
Beacon mode	Off (disabled)
EISL encapsulation	Disabled
Data field size	2112 bytes