Configuring Interfaces

This chapter provides information about interfaces and how to configure interfaces.

Finding Feature Information

Your software release might not support all the features documented in this module. For the latest caveats and feature information, see the Bug Search Tool at https://tools.cisco.com/bugsearch/ and the release notes for your software release. To find information about the features documented in this module, and to see a list of the releases in which each feature is supported, see the New and Changed chapter or the Feature History table below.

Feature History for Interfaces

Table 1: New and Changed Features, on page 3 lists the New and Changed features.

Table 1: New and Changed Features

Feature Name	Release	Feature Information
Interfaces and Port Channels		
Port Beaconing	8.4(1)	This feature is supported on Cisco MDS switches that are operating in Cisco NPV mode.
Port Monitor	8.4(1)	Added support to configure a logging severity level for port monitor syslog messages.
Interfaces	8.4(1)	Fixed the output formatting of the **show logging onboard txwait** command.
Port Beaconing	8.3(1)	This feature can be used to identify individual switch and directly attached peer ports in a data center environment. The following command was introduced: **beacon interface fc** *slot/port* {**both** | **local** | **peer**} [**status** {**normal** | **warning** | **critical**}] [**duration** *seconds*] [**frequency** *number*]
Interface Modes	8.1(1)	The link connecting from a core switch to a Cisco N-Port Virtualizer (NPV) switch must be treated as an ISL (core port) in interfaces and port channels. Port monitor may take portguard action on the link if it is treated as an edge port, which will result in the loss of connectivity to the devices that are connected to the Cisco NPV switch. The following command was introduced: **switchport logical-type** {**auto** | **core** | **edge**}
Port Monitor		

Feature Name	Release	Feature Information
Port Monitor Policy	8.5(1)	A new port monitor portguard action (cong-isolate-recover) was introduced for the credit-loss-reco, tx-credit-not-available, tx-slowport-oper-delay, and txwait counters. The *cong-isolate-recover* portguard action was added to the following commands: • **counter credit-loss-reco** • **counter tx-credit-not-available** • **counter tx-slowport-oper-delay** • **counter tx-wait**
Port Monitor	8.1(1)	The **port-type** {**access-port** | **trunks** | **all**} command was replaced with the **logical-type** {**core** | **edge** | **all**} command, where **port-type** was replaced with **logical-type**, **access-port** was replaced with **edge**, and **trunks** was replaced with **core**. The following command was modified: **logical-type** {**core** | **edge** | **all**}
Port Monitor Policy	8.1(1)	A new port monitor portguard action (cong-isolate) was introduced for the credit-loss-reco, tx-credit-not-available, tx-slowport-oper-delay, and txwait counters. The *cong-isolate* portguard action was added to the following commands: • **counter credit-loss-reco** • **counter tx-credit-not-available** • **counter tx-slowport-oper-delay** • **counter tx-wait**

Information About 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.

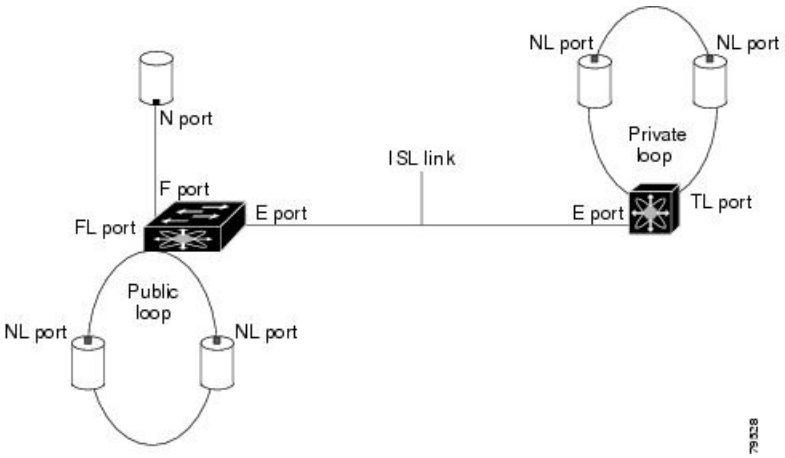
Interface Description

For Fibre Channel interfaces, you can configure the description parameter to provide a recognizable name for an interface. Using a unique name for each interface allows you to quickly identify an interface when you are looking at a listing of multiple interfaces. You can also use the description to identify the traffic or the use for a specific interface.

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, and ST port (see Figure 1: Cisco MDS 9000 Series Switch Port Modes, on page 5). 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 1: Cisco MDS 9000 Series Switch Port Modes



Note Interfaces are created in VSAN 1 by default. For more information about VSAN, see the Cisco MDS 9000 Series 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, such as the interface speed. This status cannot be changed and is read-only. Some values, for example, operational speed, may not be valid when the interface is down.

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

E Port

In expansion port (E port) mode, an interface functions as a fabric expansion port. This port can 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 for remote N ports and NL ports. E ports support Class 2, Class 3, and Class F services.

An E port connected to another switch can also be configured to form a port channel. For more details about configuring a port channel, see Configuring Port Channels.

F Port

In fabric port (F port) mode, an interface functions as a fabric port. This port can 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 services.

FL Port

In fabric loop port (FL port) mode, an interface functions as a fabric loop port. This port can 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 services.

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 Configuring N Port Virtualization .

TE Port

In trunking E port (TE port) mode, an interface functions as a trunking expansion port. It can be connected to another TE port to create an extended ISL (EISL) between two switches. TE ports are specific to Cisco MDS 9000 Series Multilayer Switches. These switches 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 the 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 Series Multilayer Switches. For more details about trunking, see Configuring Trunking. TE ports support Class 2, Class 3, and Class F services.

TF Port

In trunking F port (TF port) mode, an interface functions as a trunking expansion port. It can 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 host bus adapter (HBA) in order to carry tagged frames. TF ports are specific to Cisco MDS 9000 Series Multilayer Switches. They expand the functionality of F ports to support VSAN trunking.

In TF port mode, all the 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 Series Multilayer Switches. For more details about trunking, see Configuring Trunking. TF ports support Class 2, Class 3, and Class F services.

TNP Port

In trunking NP port (TNP port) mode, an interface functions as a trunking expansion port. It can be connected to a trunked F port (TF port) to create a link to a core NPIV switch from an NPV switch in order 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 Series. It monitors network traffic that passes though a Fibre Channel interface. This 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 non-intrusive and does not affect switching of network traffic in SPAN source ports. For more details about SPAN, see the Cisco MDS 9000 Series 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 Series Multilayer Switches. When configured in ST port mode, the interface cannot be attached to any device, and thus cannot be used for normal Fibre Channel traffic. For more details about SPAN, see the Cisco MDS 9000 Series NX-OS System Management Configuration Guide.

Fx Port

Interfaces configured as Fx ports can operate in either F port mode 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.

Auto Mode

Interfaces configured in auto mode can operate in F port, FL port, E port, TE port, or TF port mode. 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 mode or FL port mode depending on the N port mode 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 Series Multilayer Switches, it may become operational in TE port mode. For more details about trunking, see Configuring Trunking.

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

Interface States

An 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: Administrative States , on page 8.

Table 2: 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

Operational state indicates the current operational state of an interface, as described in Table 3: Operational States , on page 8.

Table 3: Operational States

Operational State	Description
Up	Interface is transmitting or receiving traffic, as required. 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 mode or TF mode.

Reason Codes

Reason codes are dependent on the operational state of an interface, as described in Table 4: Reason Codes for Interface States , on page 8.

Table 4: Reason Codes for Interface States

Administrative Configuration	Operational Status	Reason Code
Up	Up	None.

Administrative Configuration	Operational Status	Reason Code
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 5: Reason Codes for Nonoperational States , on page 10. Note that only some of the reason codes are listed in Table 5: Reason Codes for Nonoperational States , on page 10.

Note Only some of the reason are listed in the table.

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 5: Reason Codes for Nonoperational States , on page 10.

Table 5: 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: • Configuration failure • Incompatible buffer-to-buffer credit configuration To make the interface operational, you must first fix the error conditions causing this state, and administratively shut down or enable the interface.	
Fibre Channel 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.	

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. This might occur 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
Port Channel administratively down	The interfaces belonging to a port channel are down.	Only port channel interfaces
Suspended due to incompatible speed	The interfaces belonging to a port channel have incompatible speeds.	
Suspended due to incompatible mode	The interfaces belonging to a port channel have incompatible modes.	
Suspended due to incompatible remote switch WWN	An improper connection is detected. All interfaces in a port channel must be connected to the same pair of switches.	

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 the 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 more details about IOD, see Cisco MDS 9000 Series NX-OS Fabric Configuration Guide.
- If the Min_LS_interval interval is higher than 10 seconds. For information about Fabric Shortest Path First (FSPF) global configuration, see Cisco MDS 9000 Series NX-OS Fabric Configuration Guide

  .

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

Port Administrative Speeds

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

Autosensing

Auto sensing 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 4-Gbps switching modules, and 8 Gbps on 8-Gbps switching modules. When auto sensing 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 the bandwidth does not exceed the rate limit configuration for the port. You can also use this feature for shared rate ports that are configured for auto sensing.

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

Frame Encapsulation

The **switchport encap eisl** command applies only to SD port interfaces. This command determines the frame format for all the 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. For information about encapsulation, see the Cisco MDS 9000 Series NX-OS System Management Configuration Guide.

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. For information about encapsulation, see the Cisco MDS 9000 Series NX-OS System Management Configuration Guide.

Debounce Timer

Debounce timers delay the notification of link changes that can decrease traffic loss due to a network reconfiguration.

There are two types of debounce timers:

- Sync Loss: This timer applies when a link is active. A link is active after the link initialization (LR-LRR-IDLE-IDLE) is successful. If there is synchronization loss for less than 100 ms when the Fibre Channel link is active, the interface does not bounce, but remains active. The value for debounce timer link down due to synchronization loss is 100 ms for Fibre Channel interfaces. This value cannot be configured. If there is synchronization loss for 100 ms or more when the Fibre Channel link is active, the interface goes down with the following message:

```
%PORT-5-IF_DOWN_LINK_FAILURE: %$VSAN vsan%$ Interface intf is down (Link failure loss
of sync)
```

- NOS/OLS: This timer applies when a Fibre Channel port is initializing prior to when it is active. A Fibre Channel port is initializing prior to FLOGI or ACC (FLOGI) for F ports and ELP or ACC (ELP) for E ports. During the port initialization if a Fibre Channel interface encounters multiple NOS/OLS sequences continuously for a threshold of 10 times in 2 seconds, the interface is going to be moved to the *errDisabled* state with the following message:

```
%PORT-5-IF_DOWN_LINK_FAILURE: %$VSAN vsan%$ Interface intf is down (Link failure due
to NOS/OLS debounce timeout)
```

  The value for NOS/OLS debounce timer is 2 seconds and not configurable.

Port Beaconing

The Port Beaconing feature can be used to identify individual switch and directly attached peer ports in a data center environment. This feature may be used by a switch administrator to help a data center operations personnel to identify ports that need to be serviced by replacing cables or small form-factor pluggable transceivers (SFPs).

The switch administrator can specify a status, duration, and blink rate for switch port beacon LEDs. Port Beacon LEDs of any directly attached peer port may also be controlled if the peer supports the Link Cable Beaconing (LCB) Fibre Channel protocol. Port beacon LEDs on either end or both ends of a link may be controlled using a single command.

Bit Error Rate Thresholds

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

Bit errors occur because of the following reasons:

- Faulty or bad cable
- Faulty or bad Gigabit Interface Converter (GBIC) or Small Form-Factor Pluggable (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 synchronization loss
- Loose cable connection at one end or both ends
- Improper GBIC or SFP connection at one end or both ends

A BER threshold is detected when 15 error bursts occur in an interval of minimum 45 seconds and a maximum of 5-minute period with a sampling interval of 3 seconds. By default, the switch disables the interface when the threshold is reached. Use the **shutdown** and **no shutdown** command sequence to re-enable the interface.

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

Disabling the Bit Error Rate Threshold

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

To disable the BER threshold for an interface, perform these steps:

Step 1 Enter configuration mode:

switch# **configure terminal**

Step 2 Select a Fibre Channel interface and enter interface configuration submode:

switch(config)# **interface fc1/1**

Step 3 Prevent the detection of BER events from disabling the interface:

switch(config-if)# **switchport ignore bit-errors**

(Optional) Prevent the detection of BER events from enabling the interface:

switch(config-if)# **no switchport ignore bit-errors**

Tip Regardless of the setting of the **switchport ignore bit-errors** command, a switch generates a syslog message when the BER threshold is exceeded.

SFP Transmitter Types

The SFP hardware transmitters are identified by their acronyms when displayed using the **show interface brief** command. If the related SFP has a Cisco-assigned extended ID, the **show interface** and **show interface brief** commands display the ID instead of the transmitter type. The **show interface transceiver** and **show interface fc** *slot/port* **transceiver** commands display both values (ID and transmitter type) for Cisco-supported SFPs. Table 6: SFP Transmitter Acronym Definitions , on page 15 defines the acronyms used in the command output. For information about how to display interface information, see the Displaying Interface Information, on page 62.

Table 6: SFP Transmitter Acronym Definitions

Definition	Acronym
Standard transmitters defined in the GBIC specifications	
Short wave laser	swl
Medium wave laser	mwl
Extended reach wave laser	erwl
Long wave laser	lwl
Long wave laser cost reduced	lwcr
Electrical	elec

Port Monitor

The Port Monitor feature can be used to monitor the performance and status of ports and generate alerts and syslog messages when problems occur. You can configure thresholds for various counters and enable event triggers when the values cross the threshold.

For rising and falling thresholds, a syslog is generated only when the counter value crosses these threshold values.

Table 7: Default Port Monitor Policy with Threshold Values for Releases Prior to Cisco MDS NX-OS Release 8.5(1), on page 16 displays the default port monitor policy with threshold values. The unit for threshold values (rising and falling) differs across different counters.

Note The link connecting a core switch to a Cisco NPV switch should be treated as an Inter-Switch Link (ISL) (core port) in the port monitor. Previously, core ports were included as access ports and were subject to any portguard actions configured. This allows portguard actions on true access (edge) ports, while ports connecting to Cisco NPV switches remain unaffected. Use the interface level **switchport logical-type** command to change the logical type for the links between an NPIV switch and a Cisco NPV switch.

Note From Cisco MDS NX-OS Release 8.3(1), NP ports are also monitored in port monitor.

Table 7: Default Port Monitor Policy with Threshold Values for Releases Prior to Cisco MDS NX-OS Release 8.5(1)

Counter	Threshold Type	Interval (Seconds)	Rising Threshold	Event	Falling Threshold	Event	Warning Threshold	Port Monitor Portguard
link-loss	Delta	60	5	4	1	4	Not enabled	Not enabled
sync-loss	Delta	60	5	4	1	4	Not enabled	Not enabled
signal-loss	Delta	60	5	4	1	4	Not enabled	Not enabled
state-change	Delta	60	5	4	0	4	Not enabled	Not enabled
invalid-words	Delta	60	5	4	0	4	Not enabled	Not enabled
invalid-crc	Delta	60	5	4	1	4	Not enabled	Not enabled
tx-discards	Delta	60	200	4	10	4	Not enabled	Not enabled
lr-rx	Delta	60	5	4	1	4	Not enabled	Not enabled
lr-tx	Delta	60	5	4	1	4	Not enabled	Not enabled
timeout-discards	Delta	60	200	4	10	4	Not enabled	Not enabled
credit-loss-reco	Delta	60	1	4	0	4	Not enabled	Not enabled
tx-credit-not-available	Delta	1	10% [1]	4	0%	4	Not enabled	Not enabled
rx-datarate	Delta	60	80%	4	20%	4	Not enabled	Not enabled
tx-datarate	Delta	60	80%	4	20%	4	Not enabled	Not enabled
tele-port-perf-bad [2]	Absolute	60	50 ms	4	0 ms	4	Not enabled	Not enabled
txwait [3]	Delta	60	40%	4	0%	4	Not enabled	Not enabled

1 tx-credit-not-available and TXWait are configured as a percentage of the polling interval. So, if 10% is configured with a 1 second polling interval, the tx-credit-not-available will alert when the port does not have tx credits available for 100 ms.

If the tx-credit-not-available timer and the port monitor timer do not start at the same time or if the difference between the tx-credit-not-available timer and the port monitor timer is not zero, there will be a spike of rising and falling alarms from port monitor.

2
- For all platforms, if the default value for tx-slowport-oper-delay is modified, ISSD to a version lower than Cisco MDS NX-OS Release 6.2(13) will be restricted. To proceed with ISSD, use the **no** form of the **counter tx-slowport-oper-delay** command to roll back to the default value.
- This counter was introduced in Cisco NX-OS Release 6.2(13).

3
- For all platforms, if the default value for txwait is modified, ISSD to a version lower than Cisco MDS NX-OS Release 6.2(13) will be restricted. To proceed with ISSD, use the **no** form of the **counter txwait** command to roll back to the default value.
- This counter was introduced in Cisco NX-OS Release 6.2(13).

Table 8: Default Port Monitor Policy with Threshold Values for Cisco MDS NX-OS Release 8.5(1) and Later Releases

Counter	Threshold Type	Interval (Secs)	Warning		Thresholds		Rising/Falling actions			Congestion-signal	
			Threshold	Alerts	Rising	Falling	Event	Alerts	PortGuard	Warning	Alarm
link-loss	Delta	60	none	n/a	5	1	4	syslog, rmon	none	n/a	n/a
sync-loss	Delta	60	none	n/a	5	1	4	syslog, rmon	none	n/a	n/a
signal-loss	Delta	60	none	n/a	5	1	4	syslog, rmon	none	n/a	n/a
invalid-words	Delta	60	none	n/a	1	0	4	syslog, rmon	none	n/a	n/a
invalid-crcs	Delta	60	none	n/a	5	1	4	syslog, rmon	none	n/a	n/a
state-change	Delta	60	none	n/a	5	0	4	syslog, rmon	none	n/a	n/a
tx-discards	Delta	60	none	n/a	200	10	4	syslog, rmon	none	n/a	n/a
lr-rx	Delta	60	none	n/a	5	1	4	syslog, rmon	none	n/a	n/a
lr-tx	Delta	60	none	n/a	5	1	4	syslog, rmon	none	n/a	n/a
timeout-discards	Delta	60	none	n/a	200	10	4	syslog, rmon	none	n/a	n/a

Counter	Threshold Type	Interval (Secs)	Warning		Thresholds		Rising/Falling actions			Congestion-signal	
			Threshold	Alerts	Rising	Falling	Event	Alerts	PortGuard	Warning	Alarm
[illegible]	Delta	60	none	n/a	1	0	4	syslog, rmon	none	n/a	n/a
[illegible]	Delta	60	none	n/a	10% [4]	0%	4	syslog, rmon	none	n/a	n/a
rx-datarate	Delta	10	none	n/a	80%	70%	4	syslog, rmon	none	n/a	n/a
tx-datarate	Delta	10	none	n/a	80%	70%	4	syslog, rmon	none	n/a	n/a
[illegible] [5]	Absolute	60	none	n/a	50ms	0ms	4	syslog, rmon	none	n/a	n/a
txwait [6]	Delta	60	none	n/a	30%	10%	4	syslog, rmon	none	n/a	n/a
[illegible]	Delta	10	none	n/a	5@90%	1@90%	4	syslog, rmon, obfl	none	n/a	n/a
[illegible]	Delta	10	none	n/a	5@90%	1@90%	4	syslog, rmon, obfl	none	n/a	n/a
input-errors	Delta	60	none	n/a	5	1	4	syslog, rmon	none	n/a	n/a

[4] tx-credit-not-available and TXWait are configured as a percentage of the polling interval. So, if 10% is configured with a 1 second polling interval, the tx-credit-not-available will alert when the port does not have tx credits available for 100 ms.

If the tx-credit-not-available timer and the port monitor timer do not start at the same time or if the difference between the tx-credit-not-available timer and the port monitor timer is not zero, there will be a spike of rising and falling alarms from port monitor.

[5]
- For all platforms, if the default value for tx-slowport-oper-delay is modified, ISSD to a version lower than Cisco MDS NX-OS Release 6.2(13) will be restricted. To proceed with ISSD, use the **no** form of the **counter tx-slowport-oper-delay** command to roll back to the default value.
- This counter was introduced in Cisco NX-OS Release 6.2(13).

[6]
- For all platforms, if the default value for txwait is modified, ISSD to a version lower than Cisco MDS NX-OS Release 6.2(13) will be restricted. To proceed with ISSD, use the **no** form of the **counter txwait** command to roll back to the default value.
- This counter was introduced in Cisco NX-OS Release 6.2(13).

Table 9: Recommended Units for Port Monitor Policy For Releases Prior to Cisco MDS NX-OS Release 8.5(1)

Counter	Threshold Type	Interval (Seconds)	Rising Threshold	Event	Falling Threshold	Event	Warning Threshold
link-loss	Delta	Seconds	Number	Event ID	Number	Event ID	Number
sync-loss	Delta	Seconds	Number	Event ID	Number	Event ID	Number
signal-loss	Delta	Seconds	Number	Event ID	Number	Event ID	Number
state-change	Delta	Seconds	Number	Event ID	Number	Event ID	Number
invalid-words	Delta	Seconds	Number	Event ID	Number	Event ID	Number
invalid-crc's	Delta	Seconds	Number	Event ID	Number	Event ID	Number
tx-discards	Delta	Seconds	Number	Event ID	Number	Event ID	Number
lr-rx	Delta	Seconds	Number	Event ID	Number	Event ID	Number
lr-tx	Delta	Seconds	Number	Event ID	Number	Event ID	Number
timeout-discards	Delta	Seconds	Number	Event ID	Number	Event ID	Number
credit-loss-reco	Delta	Seconds	Number	Event ID	Number	Event ID	Number
tx-credit-not-available	Delta	Seconds	Percentage	Event ID	Percentage	Event ID	Percentage
rx-datarate	Delta	Seconds	Percentage	Event ID	Percentage	Event ID	Percentage
tx-datarate	Delta	Seconds	Percentage	Event ID	Percentage	Event ID	Percentage
tx-slowport-oper-delay	Absolute	Seconds	Milliseconds	Event ID	Milliseconds	Event ID	Milliseconds
txwait	Delta	Seconds	Percentage	Event ID	Percentage	Event ID	Percentage
err-pkt-to-xbar	Delta	Seconds	Number	Event ID	Number	Event ID	Number
err-pkt-from-xbar	Delta	Seconds	Number	Event ID	Number	Event ID	Number

Table 10: Recommended Units for Port Monitor Policy For Cisco MDS NX-OS Release 8.5(1) and Later Releases

Counter	Threshold Type	Interval (Secs)	Warning		Thresholds		Rising/Falling actions			Congestion-signal	
			Threshold	Alerts	Rising	Falling	Event	Alerts	PortGuard	Warning	Alarm
link-loss	Delta	Seconds	Number	syslog, rmon	Number	Number	Event ID	syslog, rmon	none	n/a	n/a
sync-loss	Delta	Seconds	Number	syslog, rmon	Number	Number	Event ID	syslog, rmon	none	n/a	n/a
signal-loss	Delta	Seconds	Number	syslog, rmon	Number	Number	Event ID	syslog, rmon	none	n/a	n/a

Counter	Threshold Type	Interval (Secs)	Warning		Thresholds		Rising/Falling actions			Congestion-signal	
			Threshold	Alerts	Rising	Falling	Event	Alerts	PortGuard	Warning	Alarm
invalidwords	Delta	Seconds	Number	syslog, rmon	Number	Number	Event ID	syslog, rmon	none	n/a	n/a
invalidcrcs	Delta	Seconds	Number	syslog, rmon	Number	Number	Event ID	syslog, rmon	none	n/a	n/a
statechange	Delta	Seconds	Number	syslog, rmon	Number	Number	Event ID	syslog, rmon	none	n/a	n/a
tx-discards	Delta	Seconds	Number	syslog, rmon	Number	Number	Event ID	syslog, rmon	none	n/a	n/a
lr-rx	Delta	Seconds	Number	syslog, rmon	Number	Number	Event ID	syslog, rmon	none	n/a	n/a
lr-tx	Delta	Seconds	Number	syslog, rmon	Number	Number	Event ID	syslog, rmon	none	n/a	n/a
invalidcrcs	Delta	Seconds	Number	syslog, rmon	Number	Number	Event ID	syslog, rmon	none	n/a	n/a
codelossco	Delta	Seconds	Number	syslog, rmon	Number	Number	Event ID	syslog, rmon	none	n/a	n/a
txcredita	Delta	Seconds	Percentage	syslog, rmon	Percentage	Percentage	Event ID	syslog, rmon	none	n/a	n/a
rx-datarate	Delta	Seconds	Percentage	syslog, rmon	Percentage	Percentage	Event ID	syslog, rmon	none	n/a	n/a
tx-datarate	Delta	Seconds	Percentage	syslog, rmon	Percentage	Percentage	Event ID	syslog, rmon	none	n/a	n/a
txwaitpo	Absolute	Seconds	Milliseconds	syslog, rmon	Milliseconds	Milliseconds	Event ID	syslog, rmon	none	n/a	n/a
txwait	Delta	Seconds	Percentage	syslog, rmon	Percentage	Percentage	Event ID	syslog, rmon	none	Percentage	Percentage
fpeerdown	Delta	Seconds	Number	syslog, rmon	Number	Number	Event ID	syslog, rmon	none	n/a	n/a
fpeerdown	Delta	Seconds	Number	syslog, rmon	Number	Number	Event ID	syslog, rmon	none	n/a	n/a
rxdatabust	Delta	Seconds	Number	syslog, rmon, obfl	Number	Number	Event ID	syslog, rmon, obfl	none	n/a	n/a

Counter	Threshold Type	Interval (Secs)	Warning		Thresholds		Rising/Falling actions			Congestion-signal	
			Threshold	Alerts	Rising	Falling	Event	Alerts	PortGuard	Warning	Alarm
tx-datarate-bps	Delta	Seconds	Number	syslog, rmon, obfl	Number	Number	Event ID	syslog, rmon, obfl	none	n/a	n/a
input-errors	Delta	Seconds	Number	syslog, rmon	Number	Number	Event ID	syslog, rmon	none	n/a	n/a

Note

- From Cisco MDS NX-OS Release 8.1(1), the err-pkt-from-port—ASIC Error Pkt from Port counter is deprecated.
- The err-pkt-from-port—ASIC Error Pkt from Port, err-pkt-to-xbar—ASIC Error Pkt to xbar, and err-pkt-from-xbar—ASIC Error Pkt from xbar counters were introduced in Cisco NX-OS Release 5.2(2a) and are not supported on one rack unit and two rack unit switches.
- We recommend that you use the delta threshold type for all the counters except the tx-slowport-oper-delay counter which uses absolute threshold type.
- The rx-datarate and tx-datarate are calculated using the inoctets and outoctets on an interface.
- The unit for threshold values (rising and falling) differs across different counters.
- The tx-slowport-oper-delay wait counter is applicable only for advanced 16-Gbps and 32-Gbps modules and switches.
- You must configure slow-port monitoring using the **system timeout slowport-monitor** command in order to get alerts for tx-slowport-count and tx-slowport-oper-delay for a particular port type. (See the **system timeout slowport-monitor** command in the Cisco MDS 9000 Series Command Reference.)
- Absolute counters do not support port-guard action. However, tx-slowport-oper-delay counter supports Congestion Isolation port-guard action.
- The txwait counter is applicable only for advanced 16-Gbps and 32-Gbps modules and switches. In the default configuration, the port monitor sends an alert if the transmit credit is not available for 400 ms (40%) in 1 second.

  txwait sends alerts when there are multiple slow-port events that have not hit the slow-port monitor threshold, but have together hit the txwait threshold configured. For example, if there are 40 discrete 10-ms intervals of 0 TX credits in 1 second, tx-slowport-oper-delay does not find these credits; txwait finds the credits and sends an alert.
- The state-change counter records the port down-to-port up action as one state change that is similar to *flap*. This is the reason the state-change counter does not have the portguard action set as *flap*.
- When the portguard action is set as *flap*, you will get alerts only through syslog.
- Only the credit-loss-reco, tx-credit-not-available, tx-slowport-oper-delay, and txwait counters use the **cong-isolate** and **cong-isolate-recover** keywords to detect slow flow on a device. For more information, see Configuring a Port Monitor Policy, on page 49.
- You can configure RMON alerts for rx-datarate-burst, tx-datarate-burst, sfp-rx-power-low-warn and sfp-tx-power-low-warn counters. However, RMON alerts will not be generated.

For more information on internal CRC errors and the various stages, see the "Internal CRC Detection and Isolation" section in the Cisco MDS 9000 Series High Availability Configuration Guide, Release 8.x.

Table 11: Slowdrain Port-Monitor Policy Threshold Value For Releases Prior to Cisco MDS NX-OS Release 8.5(1), on page 23 displays the threshold value of the slow-drain port-monitor policy:

Table 11: Slowdrain Port-Monitor Policy Threshold Value For Releases Prior to Cisco MDS NX-OS Release 8.5(1)

Counter	Threshold Type	Interval (Seconds)	Rising Threshold	Event	Falling Threshold	Event	Port Monitor Portguard
Credit Loss Reco	Delta	1	1	4	0	4	Not enabled
TX Credit Not Available	Delta	1	10	4	0	4	Not enabled

Table 12: Slowdrain Port-Monitor Policy Threshold Value For Cisco MDS NX-OS Release 8.5(1) and Later Releases

Counter	Threshold Type	Interval (Secs)	Warning		Thresholds		Rising/Falling actions			Congestion-signal	
			Threshold	Alerts	Rising	Falling	Event	Alerts	PortGuard	Warning	Alarm
Credit Loss Reco	Delta	1	none	n/a	1	0	4	syslog, rmon	none	n/a	n/a
TX Credit Not Available	Delta	1	none	n/a	10	0	4	syslog, rmon	none	n/a	n/a
tx-datarate	Delta	10	none	n/a	80	70	4	syslog, obfl	none	n/a	n/a

Note If no other port monitor policy is explicitly activated, the slowdrain policy is activated. The default policy shows only the default counter monitor values.

Crossbar (Xbar) Counters

The Xbar counters monitor internal CRC errors. These are CRC errors that have been caused internally by one of the forwarding *stages* in the switch. These only apply to director class FC modules.

The following are the crossbar counters:

- err-pkt-from-port
- err-pkt-to-xbar
- err-pkt-from-xbar

The above crossbar (Xbar) counters are not included in the default policy.

Note

- Crossbar (Xbar) counters are supported only on the Cisco MDS 9700 48-Port 16-Gbps Fibre Channel Switching Module (DS-X9448-768K9), Cisco MDS 9700 48-Port 32-Gbps Fibre Channel Switching Module (DS-X9648-1536K9), and Cisco MDS 9000 24/10-Port SAN Extension Module (DS-X9334-K9).
- Check interval does not function or apply to the crossbar counters.

- err-pkt-from-port—ASIC Error Pkt from port

Note The err-pkt-from-port counter is deprecated from Cisco MDS NX-OS Release 8.1(1).

- err-pkt-to-xbar—ASIC Error Pkt to xbar: This counter provides information about the number of internal CRC errors detected at an FC ASIC on a module and sent to the crossbar ASIC in the same module (ingress direction). These are referred to as *stage 1* internal CRC errors.
- err-pkt-from-xbar—ASIC Error Pkt from xbar: This counter provides information about the number of internal CRC errors detected at an FC ASIC on a module that were received from the crossbar ASIC in the same module (egress direction). These are referred to as *stage 5* internal CRC errors.

These two err-pkt counters are handled differently than the normal port monitor counters. Every 10 seconds (nonconfigurable), the counters' values are obtained for each FC ASIC on each module (linecard). If the counter has increased by any value, then port monitor increments its internal err-pkt-to/from-xbar counter by 1 for that FC ASIC. 10 seconds later they are checked and incremented again in a similar manner. The port monitor internal err-pkt-to/from-xbar counter would have to increase for a specific FC ASIC to a value that equals or exceeds the configured rising threshold in the configured poll-interval time for it to trigger a rising threshold alert. For example, if the poll interval is 60 and the rising threshold for this counter is 3, then it indicates that the counter for a specific FC ASIC for a port range would have to increment in a minimum of 3 separate 10 second intervals within the poll interval of 60 seconds to generate a rising-threshold alert.

Note

- On the 2/4/8/10/16 Gbps Advanced FC module, DS-X9448-768K9, there are 6 FC ASICs each handling 8 ports.
- On the 1/10/40G IPS,2/4/8/10/16G FC module, DS-X9334-K9, there are 3 FC ASICs each handling 8 ports.
- On the 4/8/16/32 Gbps Advanced FC module, DS-X9648-1536K9, there are 3 FC ASICs each handling 16 ports.

SFP Counters

From Cisco MDS NX-OS Release 8.5(1), the SFP counters allow you to configure the low warning thresholds for *Tx Power* and *Rx Power* for SFPs so that you receive a syslog when these values drop below the configured values. SFPs are monitored once every 10 minutes (600 seconds). The rising threshold is the count of the times the Rx or Tx Power was less than or equal to the SFP's Rx or Tx Power low warning threshold multiplied by the percentage. Consequently, the rising threshold can at most increment by one, every 10 minutes. Configuring a rising threshold value that is more than the 600 multiple of the poll interval will display an error. For example, for a polling interval of 1200, the rising threshold will be 2 (1200/600) and cannot be more than 2. The SFP counters are not included in the default policy and the only alert action that is available is syslog. You can configure the polling interval using the port monitor **counter** command.

You can configure the SFP counters as below:

- Configuring a low warning threshold percentage of 100% allows this counter to trigger when the Rx Power is less than or equal to the SFP's Rx Power low warning threshold.

- Configuring a low warning threshold percentage less than 100% allows this counter to trigger when the Rx Power is above the SFP's Rx Power low warning threshold.
- Configuring a low warning threshold percentage of greater than 100% allows this counter to trigger when the Rx Power is less than the SFP's Rx Power low warning threshold (between low warning and low alarm).

Note

- The SFP counters are not part of the default port monitor policy. You must explicitly enable them using the **monitor counter** command.
- The minimum polling interval for SFP counters is 600 seconds. The polling interval must be in multiple of 600. You can configure the polling interval using the port monitor **counter** command.

For configuring the SFP counters, see Configuring a Port Monitor Policy, on page 49.

The following are the SFP counters:

- sfp-rx-power-low-warn: Specifies the number of times a port's SFP has reached a percentage of the SFP's Rx Power's low warning threshold. This threshold varies depending on the SFP type, speed, and manufacturer and can be displayed via the **show interface transceiver details** command. Hence, this threshold is not an absolute value but a percentage of each individual SFP's Rx Power low warning threshold. This percentage can be configured in the range of 50% to 150% to allow for alerting at values less than the Rx Power low warning threshold or greater than the Rx Power low warning threshold.. Hence, this is an absolute value and varies between 50% to 150%. The low warning threshold value is calculated as the actual low warning threshold value of the SFP times the specified percentage. If the Rx power is lesser than or equal to the low warning threshold value, then this counter is incremented.
- sfp-tx-power-low-warn: Specifies the number of times a port's SFP has reached a percentage of the SFP's Tx Power's low warning threshold. This threshold varies depending on the SFP type, speed, and manufacturer and can be displayed via the **show interface transceiver details** command. Hence, this threshold is not an absolute value but a percentage of each individual SFP's Tx Power low warning threshold. This percentage can be configured in the range of 50% to 150% to allow for alerting at values less than the Tx Power low warning threshold or greater than the Tx Power low warning threshold.. Hence, this is an absolute value and varies between 50% to 100%. The low warning threshold value is calculated as the actual low warning threshold value of the SFP times the specified percentage. If the Tx power is lesser than or equal to the low warning threshold value, then this counter is incremented.

Datarate Burst Counters

From Cisco MDS NX-OS Release 8.5(1), the datarate burst counters monitor the number of times the datarate crosses the configured threshold datarate in 1 second intervals. If the number crosses the configured number for rising threshold, the configured alert actions are taken as the condition is met. Datarate burst counters are polled every second. The datarate burst counters are not included in the default policy. For configuring the datarate burst counters, see Configuring a Port Monitor Policy, on page 49.

The following are the datarate burst counters:

- rx-datarate-burst
- tx-datarate-burst

Warning Threshold

Port Monitor warning thresholds can be used to generate syslog messages before rising and falling thresholds are reached. A single threshold is configurable per Port Monitor counter. A syslog is generated whenever the counter crosses the configured warning threshold in either the rising or falling direction. This allows the user to track counters that are not severe enough to hit the rising threshold, but where nonzero events are of interest.

The warning threshold must be equal or less than the rising threshold and equal or greater than the falling threshold.

The warning threshold is optional; warning syslogs are only generated when it is specified in a counter configuration.

Use Case—Warning Threshold

Let us consider two scenarios with the following configurations:

- Rising threshold is 30
- Warning threshold is 10
- Falling threshold is 0

This example displays the syslog generated when the error count is less than the rising threshold value, but has reached the warning threshold value:

Syslog Generated When the Error Count is Less Than the Rising Threshold Value

```
%PMON-SLOT2-4-WARNING_THRESHOLD_REACHED_UPWARD: Invalid Words has reached warning threshold
 in the upward direction (port fc2/18 [0x1091000], value = 10).

%PMON-SLOT2-5-WARNING_THRESHOLD_REACHED_DOWNWARD: Invalid Words has reached warning threshold
 in the downward direction (port fc2/18 [0x1091000], value = 5).
```

In the first polling interval, the errors triggered for the counter (Invalid Words) are 10, and have reached the warning threshold value. A syslog is generated, indicating that the error count is increasing (moving in the upward direction).

In the next polling interval, the error count decreases (moves in the downward direction), and a syslog is generated, indicating that the error count has decreased (moving in the downward direction).

This example displays the syslog that is generated when the error count crosses the rising threshold value:

Syslog Generated When the Error Count Crosses the Rising Threshold Value

```
%PMON-SLOT2-4-WARNING_THRESHOLD_REACHED_UPWARD: Invalid Words has reached warning threshold
 in the upward direction (port fc2/18 [0x1091000], value = 30).

%PMON-SLOT2-3-RISING_THRESHOLD_REACHED: Invalid Words has reached the rising threshold
(port=fc2/18 [0x1091000], value=30).

%SNMPD-3-ERROR: PMON: Rising Alarm Req for Invalid Words counter for port fc2/18(1091000),
 value is 30 [event id 1 threshold 30 sample 2 object 4 fcIfInvalidTxWords]

%PMON-SLOT2-5-WARNING_THRESHOLD_REACHED_DOWNWARD: Invalid Words has reached warning threshold
```

```
 in the downward direction (port fc2/18 [0x1091000], value = 3).

%PMON-SLOT2-5-FALLING_THRESHOLD_REACHED: Invalid Words has reached the falling threshold
(port=fc2/18 [0x1091000], value=0).

%SNMPD-3-ERROR: PMON: Falling Alarm Req for Invalid Words counter for port fc2/18(1091000),
 value is 0 [event id 2 threshold 0 sample 2 object 4 fcIfInvalidTxWords]
```

This example displays the syslog generated when the error count is more than the warning threshold value and less than the rising threshold value:

Syslog Generated When the Error Count is More than the Warning Threshold Value and Less than the Rising Threshold Value

```
%PMON-SLOT2-4-WARNING_THRESHOLD_REACHED_UPWARD: Invalid Words has reached warning threshold
 in the upward direction (port fc2/18 [0x1091000], value = 15).

%PMON-SLOT2-5-WARNING_THRESHOLD_REACHED_DOWNWARD: Invalid Words has reached warning threshold
 in the downward direction (port fc2/18 [0x1091000], value = 3).
```

The errors generated for the counter (Invalid Words) are 30 when the counter has crossed both the warning and rising threshold values. A syslog is generated when no further errors are triggered.

As there are no further errors in this poll interval, the consecutive polling interval will have no errors, and the error count decreases (moves in downward direction) and reaches the falling threshold value, which is zero. A syslog is generated for the falling threshold.

Port Monitor Check Interval

Check interval polls for values more frequently within a poll interval so that the errors are detected much earlier and appropriate action can be taken.

With the existing poll interval, it is not possible to detect errors at an early stage. Users have to wait till the completion of the poll interval to detect the errors.

By default, the check interval functionality is not enabled.

Note

- From Cisco MDS NX-OS Release 8.5(1), port monitor does *early detection* and does not require the port monitor check interval feature to be configured, as it is redundant.
- The port monitor check interval feature is supported only on the Cisco MDS 9710 Multilayer Director, Cisco MDS 9718 Multilayer Directors, Cisco MDS 9706 Multilayer Directors, Cisco MDS 9250i, Cisco MDS 9148T, Cisco MDS 9396T, and Cisco MDS 9132T.
- Check interval is supported on both counters, absolute and delta.
- We recommend that you configure the poll interval as a multiple of the check interval.
- When a port comes up, the check interval will not provide an alert regarding invalid words for the port until the poll interval expires. We recommend that you bring up a set of ports at a given time in the module instead of all the ports.

Port Monitor Early Detection

Prior to Cisco MDS NX-OS Release 8.5(1) and without check interval configured, port-monitor checked to determine if the warning or rising thresholds were reached only after the polling interval expired. Starting with Cisco MDS NX-OS Release 8.5(1), most port monitor counters are monitored every second so that port monitor can detect warning and rising thresholds and take alert actions as soon as the threshold is detected. There is no change in the falling threshold behavior.

Port Monitor Alerts

From Cisco MDS NX-OS Release 8.5(1), port monitor allows you to configure alerts for each counter so that you can tailor the alerts that port monitor generates with each counter. By default, all counters are configured for syslog and RMON alerts. Only the rx-datarate, tx-datarate, rx-datarate-burst, and tx-datarate-burst counters allow the configuration of the OBFL alert type. OBFL indicates that these counters record their events into Onboard Failure Logging. These are disposable via the **show logging onboard datarate** command.

The following alerts are supported:

- syslog: Generates a syslog when a configured threshold is reached. You can also configure an event ID (severity-level) for the syslogs that are generated when a rising or falling threshold is detected so that you can filter the logs using the severity level.

  The following severity levels are supported:

  - ALERT (1)
  - CRITICAL (2)
  - ERROR (3)
  - WARNING (4)
  - NOTICE (5)

- rmon: Generates an SNMP alert when a configured threshold is reached.
- obfl: Enables OBFL logging.

  Note The OBFL alert is supported only for rx-datarate, tx-datarate, rx-datarate-burst, and tx-datarate-burst counters.

- none: Disables all alerts.

Port Group Monitor

Note Port Group Monitor functionality only applies to modules that support oversubscription.

The ports on a line card are divided into fixed groups called port groups that share a link of fixed bandwidth to the backplane. Since the total port bandwidth can exceed the backplane link bandwidth, frames will be queued, introducing traffic delays. The Port Group Monitor functionality can be used to monitor this

oversubscription in both the transmit and receive directions to allow ports to be rebalanced between port groups before the delays become unacceptable.

When the Port Group Monitor feature is enabled and when a policy consisting of polling interval in seconds and the rising and falling thresholds in percentage are specified, the port group monitor generates a syslog if port group traffic goes above the specified percentage of the maximum supported bandwidth for that port group (for receive and for transmit). Another syslog is generated if the value falls below the specified threshold.

Table shows the threshold values for the default Port Group Monitor policy:

Table 13: Default Port Group Monitor Policy Threshold Values

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

Note When a port group monitor is enabled in a 1-rack box, and if any of the thresholds is met for the receive performance and transmit performance counters, the port group monitor is not supported.

Portguard

The Portguard feature is intended for use in environments where systems do not adapt quickly to a port going down and up (single or multiple times). For example, if a large fabric takes 5 seconds to stabilize after a port goes down, but the port actually goes up and down once per second, a severe failure might occur in the fabric, including devices becoming permanently unsynchronized.

The Portguard feature provides the SAN administrator with the ability to prevent this issue from occurring. A port can be configured to stay down after a specified number of failures in a specified time period. This allows the SAN administrator to automate fabric stabilization, thereby avoiding problems caused by the up-down cycle.

Using the Portguard feature, the SAN administrator can restrict the number of error events and bring a malfunctioning port to down state dynamically once the error events exceed the event threshold. A port can be configured such that it shuts down when specific failures occur.

There are two types of portguard, *Port Level* type and *Port Monitor* type. While the former is a basic type where event thresholds are configurable on a per port basis, the latter allows the configuration of policies that are applied to all the ports of the same type, for example, all E ports or all F ports.

Note We recommend against the simultaneous use of both types of portguard for a given port.

Port Level Portguard

The following is the list of events that can be used to trigger port-level portguard actions:

- TrustSec violation—Link fails because of excessive TrsustSec violation events.
- Bit errors—Link fails because of excessive bit error events.
- Signal loss—Link fails because of excessive signal loss events.
- Signal synchronization loss—Link fails because of excessive signal synchronization events.
- Link reset—Link fails because of excessive link reset events.
- Link down—Link fails because of excessive link down events.
- Credit loss (Loop F ports only)—Link fails because of excessive credit loss events.

A link failure occurs when it receives two bad frames in an interval of 10 seconds and the respective interface will be error disabled. 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 the number of link down failures. This means that a port is brought to down state when it reaches the maximum number of allowed link failures or the maximum number of specified causes.

Port level portguard can be used to shut down misbehaving ports based on certain link event types. Event thresholds are configurable for each event type per port which makes them customizable between host, array, and tape F ports, or between intra- and inter-data center E ports, for example.

The events listed above might get triggered by certain events on a port, such as:

- Receipt of Not Operational Signal (NOS)
- Too many hardware interrupts
- The cable is disconnected
- The detection of hardware faults
- The connected device is rebooted (F ports only)
- The connected modules are rebooted (E ports only)

Port Monitor Portguard

The Port Monitor Portguard feature allows a port to be automatically error disabled, flapped, congestion-isolated, and so on when a given event threshold is reached.

Note Absolute counters do not support portguard action. However, TX Slowport Oper Delay counter supports Congestion Isolation portguard action.

Note From Cisco MDS NX-OS Release 8.5(1), the input errors, sfp-rx-power-low-warn, sfp-tx-power-low-warn, rx-datarate-burst, and tx-datarate-burst counters were added.

The following is the list of events that can be used to trigger the Port Monitor portguard actions:

- credit-loss-reco

- link-loss
- signal-loss
- sync-loss
- rx-datarate
- invalid-crcs
- invalid-words
- timeout-discards
- tx-credit-not-available
- tx-datarate
- tx-discards
- tx-slowport-oper-delay
- txwait
- input-errors
- sfp-rx-power-low-warn
- sfp-tx-power-low-warn
- state-change
- rx-datarate-burst
- tx-datarate-burst

Interface Types

Management Interfaces

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

Before you configure the management interface manually, obtain the switch's IPv4 address, subnet mask, and default gateway, or the IPv6 address, depending on which IP version you are configuring.

The management port (mgmt0) auto senses and operates in full-duplex mode at a speed of 10, 100, or 1000 Mbps. Auto sensing supports both the speed mode 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 and the default duplex mode are set to auto.

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

VSAN Interfaces

VSANs are applicable 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 the corresponding VSAN. To use this feature, configure the IP address for this VSAN.

Note VSAN interfaces cannot be created for non existing VSANs.

Prerequisites for Interfaces

Before you begin configuring the interfaces, 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 MDS 9000 Series NX-OS Fundamentals Configuration Guide.

Guidelines and Limitations

From Cisco MDS NX-OS Release 7.3(x) or earlier, ports were classified as port type access ports, trunks, or all in the port monitor. Access ports were mode (T)F ports and trunks were mode (T)E ports (ISLs). Since ports connecting to Cisco NPV switches are mode (T)F, they were included under the port type access ports. These Cisco NPV ports behave like ISLs, but they are a multi-user connection to a switch and not an end device. Because of this, it is not preferred to take portguard actions on the access ports for port-monitor counters pertaining to slow-drain conditions.

From Cisco MDS NX-OS Release 8.1(1), the port monitor has implemented a different classification mechanism. Instead of port type access ports, trunks, or all, a logical type core, edge, or all value can be configured. Core ports are mode T(E) ports and ports connecting core switches to Cisco NPV switches. Edge ports are mode F ports connecting to end devices. With this new classification, portguard actions can safely be configured especially pertaining to slow drain type conditions such that when the problem is detected and the action is taken, it is only on the ports connected to end devices. It is still valid to configure portguard actions for logical type core ports, but this should only be done for counters pertaining to physical errors on the port (such as link loss, invalid words, invalid CRC, and so on).

The MDS NX-OS will automatically classify all F port-channels and trunking F ports as logical-type core. It will classify all non-trunking F ports, including those to both Cisco and non-Cisco NPV switches, as logical-type edge.

If a Cisco NPV switch or non-Cisco NPV switch cannot take portguard types of actions then classifying the ports connected to it as logical-type edge is appropriate.

The logical type of a port is displayed using the **show interface** and **show interface brief** commands.

Note When you use the **logical-type** command to define a port type, the command overrides the default port type.

In the port monitor, you can configure the policies per port type (core and edge) so that portguard action can be taken on the ports when certain criteria are met. Generally, edge policies are configured to take portguard action on ports and the core policies will not be configured with portguard action. If the link between a core switch and a Cisco NPV switch is treated as an edge port, portguard action is taken on such ports which will result in the loss of connectivity to all the devices connected to the Cisco NPV switch.

For any Cisco NPV switch that supports its own Port Monitor policies, it is best to implement these portguard actions on the Cisco NPV switch itself. Hence, we recommend that all non-trunking F ports connected to Cisco NPV switches be manually configured to a logical type of core, using the **switchport logical-type core** command. This will ensure that port monitor core policy is applied to the port connected to a Cisco NPV switch. We also recommend that Port Monitor be implemented on the Cisco NPV switch, if supported.

For more information, see Interface Modes, on page 5.

Guidelines for Configuring Port Monitor Check Interval

- Check interval should be configured before activating any port monitor policies.

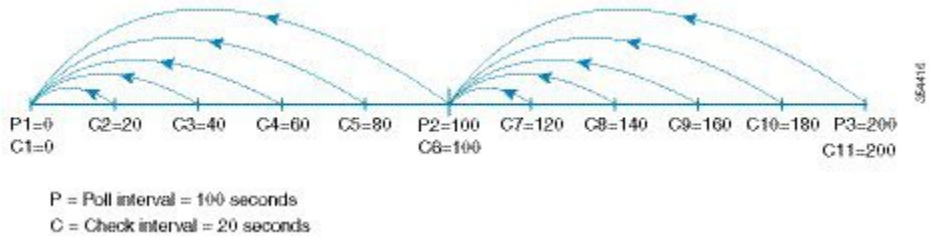
Note The value of the check interval is common across counters and policies.

- We recommend that you configure the check interval to be less than the poll interval. Also, configure the poll interval as a multiple of the check interval.
- Check interval is applicable to all the active port monitor policies configured.
- Users should deactivate all the active port monitor policies before enabling, modifying, or disabling the check interval functionality.
- Check interval cannot be enabled when an active policy is configured.
- Software downgrade to a version that does not support the check interval functionality is restricted when the check interval functionality is enabled.
- We recommend that you do not have a portguard action set to the state-change counter when an interface state is changed from down state to up state.
- We recommend that you do not use the default policy when the check interval is configured.

Check Interval

Let us consider a scenario where the poll interval, rising threshold and check interval are configured with the following values:

- Poll interval is 100 seconds
- Rising threshold is 30
- Check interval is 20 seconds



The check interval starts its interval, C1, along with the poll interval at P1. If an error occurs between the check intervals C2 and C3, the check intervals C2 and C3 are higher than the configured rising threshold value of 30, an alert (syslog or trap or both) is generated at C3, alerting the user that an error has occurred at that particular port.

Note You can configure longer poll intervals to capture events across poll intervals. For example, configure a poll interval of 24 hours with a check interval of 30 seconds, with the rising threshold value being checked cumulatively every 30 seconds.

Guidelines for VSAN Interface Configuration

- 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 Series NX-OS IP Services Configuration Guide.

Guidelines and Limitations for Port Beaconing

- The port beacon LED on directly attached peers can only be controlled when the link to the peer is up and operational.
- If you enable port beacon mode on a port using the **beacon interface** command and then enable beacon mode using the **switchport beacon** command, the beacon mode takes precedence and the port beacon mode will be disabled. If you disable the beacon mode, the port beacon mode will continue to be disabled until you enable the port beacon mode again.
- If you send a port beaconing request from Switch A to Switch B using the **beacon interface** command and then if you enable **switchport beacon** locally on Switch B, the **switchport beacon** command takes precedence over the port beaconing request and stops the LED activity on Switch B. However, if you run the **show interface** command on Switch A, the output will continue to show the port beaconing status for the port on Switch B until the specified duration is reached.
- If you enable port beacon mode on a port using the **beacon interface** command and then perform a system switchover using the **system switchover** command, the **show interface** command on the switch does not show the port beaconing status as on. However, the port LED to which the port beaconing request was sent continues to beacon with the specified parameters until the specified duration is reached or when you run the **switchport beacon** command to override the port beaconing request for the port.
- If you send a port beaconing request with the duration set to 0 from Switch A that is running Cisco MDS NX-OS Release 8.3(1) or later releases to Switch B and then downgrade Switch A to Cisco MDS NX-OS Release 8.2(2) or earlier releases, the port LED on Switch B to which the port beaconing request was sent continues to beacon with the specified parameters until you run the **switchport beacon** command to override the port beaconing request for the port on Switch B.
- From Cisco MDS NX-OS Release 8.4(1), this feature is supported on Cisco MDS switches that are operating in Cisco NPV mode.
- This feature is not supported on port-channel interfaces. It is supported only on individual Fibre Channel interfaces or port-channel members.

Default Settings

Table 14: Default Interface Parameters , on page 37 lists the default settings for interface parameters.

Table 14: 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

Configuring Interfaces

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

For more information on configuring Gigabit Ethernet interfaces, see the Cisco MDS 9000 Series NX-OS IP Services Configuration Guide.

Configuring a Fibre Channel Interface

To configure a Fibre Channel interface, perform these steps:

Step 1 Enter configuration mode:

switch# **configure terminal**

Step 2 Select a Fibre Channel interface and enter interface configuration submode:

switch(config)# **interface fc 1/1**

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).

Configuring a Range of Fibre Channel Interfaces

To configure a range of interfaces, perform these steps:

Step 1 Enter configuration mode:

switch# **configure terminal**

Step 2 Select the range of Fibre Channel interfaces and enter interface configuration submode3:

switch(config)# **interface fc1/1 - 4 , fc2/1 - 3**

Note When using this command, provide a space before and after the comma.

Setting the Interface Administrative State

To set the interface administrative state, you must first gracefully shut down the interface and enable traffic flow.

Shutting Down an Interface

To gracefully shut down an interface, perform these steps:

Step 1 Enter configuration mode:

switch# **configure terminal**

Step 2 Select a Fibre Channel interface and enter interface configuration submode:

switch(config)# **interface fc1/1**

Step 3 Gracefully shut down the interface and administratively disable the traffic flow; this is the default state

switch(config-if)# **shutdown**

Enabling Traffic Flow

To enable traffic flow, perform these steps:

Step 1 Enter configuration mode:

switch# **configure terminal**

Step 2 Select a Fibre Channel interface and enter interface configuration submode:

switch(config)# **interface fc1/1**

Step 3 Enable traffic flow to administratively allow traffic when the no prefix is used (provided the operational state is up):

switch(config-if)# **no shutdown**

Configuring an Interface Mode

To configure the interface mode, perform these steps:

Step 1 Enter configuration mode:

switch# **configure terminal**

Step 2 Select a Fibre Channel interface and enter interface configuration submode:

switch(config)# **interface fc1/1**

Step 3 Configure the administrative mode of the port. You can set the operational state to auto, E, F, FL, Fx, TL, NP, or SD port mode:

switch(config-if)# **switchport mode F**

Note Fx ports refer to an F port or an FL port (host connection only), but not E ports.

Step 4 Configure interface mode to auto negotiate an E, F, FL, or TE port mode (not TL or SD port modes) of operation:

switch(config-if)# **switchport mode auto**

Note
- TL ports and SD ports cannot be configured automatically. They must be administratively configured.
- You cannot configure Fibre Channel interfaces on Storage Services Modules (SSM) in auto mode.

Configuring the MAX NPIV Limit

Note Both the **max-npiv-limit** and **trunk-max-npiv-limit** can be configured on a port or port channel. If the port or port channel becomes a trunking port, **trunk-max-npiv-limit** is used for limit checks.

To configure the maximum NPIV limit, perform these steps:

Step 1 Enter configuration mode:

switch# **configure terminal**

Step 2 Select a Fibre Channel interface and enter interface configuration submode:

switch(config)# **interface fc 3/29**

Step 3 Configure switch port mode F on the Fibre Channel interface:

switch(config-if)# **switchport mode F**

Step 4 Specify the maximum login value for this port:

switch(config-if)# **switchport max-npiv-limit 100**

The valid range is from 1 to 256.

Configuring the System Default F Port Mode

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 ISLs. This command is part of the setup utility that runs during bootup after a **write erase** or **reload** command is issued. 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.

The **system default switchport mode F** 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.

Note

- To ensure that ports that are a part of ISLs do not get changed to port mode F, configure the ports in port mode E, rather than in auto mode.
- When the command is executed from the command line, the switch operation remains graceful. No ports are flapped.

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

Step 1 Enter configuration mode:

switch# **configure terminal**

Step 2 Sets administrative mode of Fibre Channel ports to mode F (if applicable):

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

(Optional) Set the administrative mode of Fibre Channel ports to the default (unless user configured), use the following command:

switch(config)# **no system default switchport mode F**

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

Setup Utility

Setup Utility , on page 41 shows the command in the setup utility and the command from the command line.

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

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

Configuring ISL Between Two Switches

Note Ensure that the Fibre Channel cable is connected between the ports and perform a no-shut operation on each port.

E-port mode is used when a port functions as one end of an ISL setting. When you set the port mode to E, you restrict the port coming up as an E port (trunking or nontrunking, depending on the trunking port mode).

To configure the port mode to E:

Step 1 Enter configuration mode:

switch#**configure terminal**

Step 2 Select a Fibre Channel interface and enter interface configuration submode:

switch(config)# **interface fc 3/29**

Step 3 Configure switch port mode E on the Fibre Channel interface:

switch(config)# **switchport mode E**

Note Ensure that you perform the task of setting the port mode to E on both the switches between which you are attempting to bring up the ISL link.

Configuring the Port Administrative Speeds

Note Changing the port administrative speed is a disruptive operation.

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

Step 1 Enter configuration mode:

switch# **configure terminal**

Step 2 Select the Fibre Channel interface and enter interface configuration mode:

switch(config)# **interface fc 1/1**

Step 3 Configure the port speed of the interface to 1000 Mbps:

switch(config-if)# **switchport speed 1000**

All the 10-Gbps capable interfaces, except the interface that is being configured, must be in the out-of-service state. At least one other 10-Gbps capable interface must be in the in-service state.

(Optional) Revert to the factory default (auto) administrative speed of the interface:

switch(config-if)# **no switchport speed**

Configuring Port Speed Group

To configure the port speed group of the interface, perform these steps:

Step 1 Enter configuration mode:

switch# **configure terminal**

Step 2 Select the Fibre Channel interface and enter interface configuration mode:

switch(config)# **interface fc 1/1**

Step 3 Configure the port speed group to 10 Gbps:

switch(config-if)# **speed group 10g**

The preferred way of changing the speed group is the **10g-speed-mode** command.

(Optional) Unset the port speed group and revert to the factory default (auto) administrative speed group of the interface:

switch(config-if)# **no speed group 10g**

Configuring the Interface Description

The interface description can be any alphanumeric string that is up to 80 characters long.

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

Step 1 Enter configuration mode:

switch# **configure terminal**

Step 2 Select a Fibre Channel interface and enter interface configuration submode:

switch(config)# **interface fc1/1**

Step 3 Configure the description of the interface:

switch(config-if)# **switchport description cisco-HBA2**

The string can be up to 80 characters long.

(Optional) Clear the description of the interface:

switch(config-if)# **no switchport description**

Configuring a Port Logical Type

The logical port type can be used to override the default type assigned by the Cisco NX-OS to a port. Previously, point to point F and TF ports were used by a single edge device with a single login to the switch. With the adoption of the Cisco NPV technology, these types of switch ports can now have multiple logins from multiple edge devices on a single port. In such cases, the ports are no longer dedicated to a single edge device, but are shared by multiple devices similar to Inter-Switch Links (ISLs). The **switchport logical-type** command allows the you to change the port type so that port monitor and congestion timeout features apply core type policies and not the more aggressive edge type policies to such links.

Step 1 Enter configuration mode:

switch# **configure terminal**

Step 2 Select a Fibre Channel interface and enter interface configuration submode:

switch(config)# **interface fc1/1**

Step 3 Configure a logical type for an interface:

switch(config-if)# **switchport logical-type** {**auto** | **core** | **edge**}

(Optional) Remove the logical type from an interface:

switch(config-if)# **no switchport logical-type** {**auto** | **core** | **edge**}

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.

Note The Portguard and Port Owner features are available for all ports regardless of the operational mode.

To specify or remove a port owner, perform these steps:

Step 1 Enter configuration mode:

switch# **configure terminal**

Step 2 Select the port interface:

switch(config)# **interface fc1/1**

Step 3 Specify the owner of the switch port:

switch(config)# **switchport owner** *description*

The description can include the name of the owner and the purpose for which the port is used, and can be up to 80 characters long.

(Optional) Remove the port owner description:

switch(config)# **no switchport owner**

(Optional) Display the owner description specified for a port, use one of the following commands:

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

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. Note that configuring the beacon mode has no effect on the operation of the interface.

To configure a beacon mode for a specified interface or range of interfaces, perform these steps:

Step 1 Enter configuration mode:

switch# **configure terminal**

Step 2 Select a Fibre Channel interface and enter interface configuration submode:

switch(config)# **interface fc1/1**

Step 3 Enable the beacon mode for the interface:

switch(config-if)# **switchport beacon**

(Optional) Disable the beacon mode for the interface:

switch(config-if)# **no switchport beacon**

Tip The flashing green light turns on automatically when an external loopback that causes the interfaces to be isolated is detected. 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.

Configuring the Port Beacon LED

To configure the port beacon LEDs on one or both ends of a link, perform this step:

switch# **beacon interface fc** *slot/port* {**both** | **local** | **peer**} [**status** {**normal** | **warning** | **critical**}] [**duration** *seconds*] [**frequency** *number*]

Configuring a Switch Port Attribute Default Value

You can configure 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 a default value for a switch port attribute, perform these steps:

Step 1 Enter configuration mode:

switch# **configure terminal**

Step 2 Configure the default setting for the administrative state of an interface as up (the factory default setting is down):

switch(config)# **no system default switchport shutdown**

Note This command is applicable only to interfaces for which no user configuration exists for the administrative state.

(Optional) Configure the default setting for the administrative state of an interface as down:

switch(config)# **system default switchport shutdown**

Note This command is applicable only to interfaces for which no user configuration exists for the administrative state.

(Optional) Configure the default setting for the administrative trunk mode state of an interface as Auto:

switch(config)# **system default switchport trunk mode auto**

Note The default setting is On.

Configuring the Port-Level Portguard

All portguard causes are monitored over a common time interval with the same start and stop times. The *link down* counter is not a specific event, but the aggregation of all other cause counters in the same time interval.

To configure a port-level portguard for a interface, perform these steps:

Step 1 Enter configuration mode:

switch# **configure terminal**

Step 2 Select the interface:

switch(config)# **interface fc1/1**

Step 3 Enable portguard error disabling of the interface if the link goes down once:

switch(config-if)# **errdisable detect cause link-down**

(Optional) Enable portguard error disabling of the interface if the link flaps a certain number of times within the specified time, in *seconds*:

switch(config-if)# **errdisable detect cause link-down** [**num-times** *number* **duration** *seconds*]

Note The duration range is from 45 to 2000000 seconds. The duration must be equal to or greater than **num-times** multipled by 45.

(Optional) Remove the portguard configuration for the interface:

switch(config-if)# **no errdisable detect cause link-down**

The link resumes flapping and sending error reports normally.

Step 4 Enable portguard error disabling of the interface if the specified error occurs once:

switch(config-if)# **errdisable detect cause** {**trustsec-violation** | **bit-errors** | **credit-loss** | **link-reset** | **signal-loss** | **sync-loss**}

(Optional) Enable portguard error disabling of the interface if the specified error occurs a certain number times within the specified time, in *seconds*:

switch(config-if)# **errdisable detect cause** {**trustsec-violation** | **bit-errors** | **credit-loss** | **link-reset** | **signal-loss** | **sync-loss**} [**num-times** *number* **duration** *seconds*]

(Optional) Remove the portguard configuration for the interface:

switch(config-if)# **no errdisable detect cause** {**trustsec-violation** | **bit-errors** | **credit-loss** | **link-reset** | **signal-loss** | **sync-loss**}

The link resumes flapping and sending error reports normally.

Note The portguard credit loss event is triggered only on loop interfaces; it is not triggered on point-to-point interfaces.

This example shows how to configure portguard to set an interface to error disabled state if the link flaps 5 times within 225 seconds due to multiple causes. The portguard controls the interface in the following manner:

Example

This example shows how to configure portguard to bring a port to down state if the link flaps 5 times within 225 seconds based on multiple causes:

```
switch# configure terminal
switch(config)# interface fc1/1
switch(config-if)# errdisable detect cause link-down num-times 5 duration 225
switch(config-if)# errdisable detect cause bit-errors num-times 5 duration 225
switch(config-if)# errdisable detect cause credit-loss num-times 5 duration 225
```

The above example sets the configuration to the following status:

- The port will be error disabled due to link down if the port suffers link failure due to link down 5 times in 225 seconds.
- The port will be error-disabled due to bit errors if the port suffers link failure due to bit errors 5 times in 225 seconds.
- The port will be error-disabled due to credit loss if the port suffers link failure due to credit loss 5 times in 225 seconds.

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

```
switch# show interface fc1/9
fc1/9 is trunking
    Hardware is Fibre Channel, SFP is short wave laser w/o OFC (SN)
    Port WWN is 20:09:54:7f:ee:eb:dc:00
    Peer port WWN is 20:49:8c:60:4f:53:bb:80
    Admin port mode is auto, trunk mode is on
    snmp link state traps are enabled
    Port mode is TE
    Port vsan is 1
    Admin Speed is auto max 16 Gbps
    Operating Speed is 4 Gbps
    Rate mode is dedicated
    Port flow-control is R_RDY

    Transmit B2B Credit is 500
    Receive B2B Credit is 500
    B2B State Change Number is 14
    Receive data field Size is 2112
    Beacon is turned off
    Logical type is core
    Belongs to port-channel2
    Trunk vsans (admin allowed and active) (1-2,5)
    Trunk vsans (up)                       (1-2)
    Trunk vsans (isolated)                 (5)
    Trunk vsans (initializing)             ()
    5 minutes input rate 448 bits/sec,56 bytes/sec, 0 frames/sec
    5 minutes output rate 384 bits/sec,48 bytes/sec, 0 frames/sec
```

```
  783328 frames input,58490580 bytes
    0 discards,0 errors
    0 invalid CRC/FCS,0 unknown class
    0 too long,0 too short
  783799 frames output,51234876 bytes
    0 discards,0 errors
  56 input OLS,63  LRR,8 NOS,277 loop inits
  49 output OLS,27 LRR, 49 NOS, 43 loop inits
  500 receive B2B credit remaining
  500 transmit B2B credit remaining
  500 low priority transmit B2B credit remaining
Last clearing of "show interface" counters :  never
```

Tip

- 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.
- Even if the link does not flap due to failure of the link, and portguard 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.

Configuring a Port Monitor

Configuring a portguard action is optional for each counter in a port monitor policy, and is disabled by default.

Enabling a Port Monitor

To enable or disable a port monitor, perform these steps:

Step 1 Enter configuration mode:

switch# **configure terminal**

Step 2 Enable port monitoring:

switch(config)# **port-monitor enable**

(Optional) Disable port monitoring:

switch(config)# **no port-monitor enable**

Configuring the Check Interval

To configure the check interval, perform these steps:

Step 1 Enter the configuration mode:

switch# **configure terminal**

Step 2 Configure the check interval time to 30 seconds

switch# **port-monitor check-interval** *30*

To disable check interval use the following command:

switch# **no port-monitor check-interval**

Configuring a Port Monitor Policy

To configure a port monitor policy, perform these steps:

Step 1 Enter configuration mode:

switch# **configure terminal**

Step 2 Specify the policy name and enter port monitoring policy configuration mode:

switch(config)# **port-monitor name** *policyname*

(Optional) Remove the policy name:

switch(config)# **no port-monitor name** *policyname*

Step 3 Apply policy type:

switch(config-port-monitor)# **logical-type** {**core** | **edge** | **all**}

Step 4 Specify the counter parameters:

Releases prior to Cisco MDS NX-OS Release 8.5(1)

switch(config-port-monitor)# **counter** {**credit-loss-reco** | **err-pkt-from-port** | **err-pkt-from-xbar** | **err-pkt-to-xbar** | **invalid-crc** | **invalid-words** | **link-loss** | **lr-rx** | **lr-tx** | **rx-datarate** | **signal-loss** | **state-change** | **sync-loss** | **timeout-discards** | **tx-credit-not-available** | **tx-datarate** | **tx-discards** | **tx-slowport-oper-delay** | **txwait**} **poll-interval** *seconds* {**absolute** | **delta**} **rising-threshold** *count1* **event** *RMON-ID* **warning-threshold** *count2* **falling-threshold** *count3* **event** *RMON-ID* **portguard** { **cong-isolate** | **errordisable** | **flap**}

Cisco MDS NX-OS Release 8.5(1) and later releases

switch(config-port-monitor)# **counter** {**credit-loss-reco** | **err-pkt-from-port** | **err-pkt-from-xbar** | **err-pkt-to-xbar** | **input-errors** | **invalid-crc** | **invalid-words** | **link-loss** | **lr-rx** | **lr-tx** | **rx-datarate** | **rx-datarate-burst** | **sfp-rx-power-low-warn** | **sfp-tx-power-low-warn** | **signal-loss** | **state-change** | **sync-loss** | **timeout-discards** | **tx-credit-not-available** | **tx-datarate** | **tx-datarate-burst** | **tx-discards** | **tx-slowport-oper-delay** | **txwait** [**warning-signal-threshold** *count1* **alarm-signal-threshold** *count2* **portguard congestion-signals**]} **poll-interval** *seconds* {**absolute** | **delta**} **rising-threshold** *count3* **event** *RMON-ID* [**warning-threshold** *count4*] [**alerts** [**obfl rmon syslog** | **none**]] [**datarate** *count5*] [**falling-threshold** *count6*] [**portguard** {**DIRL** | **FPIN** | **cong-isolate** | **cong-isolate-recover** | **errordisable** | **flap**]}

Note

- A port monitor policy cannot be configured as a combination of cong-isolate, cong-isolate-recover, DIRL, and FPIN port guard actions. For example, if in a policy you configure the tx-datarate, tx-datarate-burst, and txwait with DIRL portguard action and then configure the credit-loss-reco counter with the cong-isolate portguard action, you will not be able to activate the policy.
- Port monitor polling interval must not be more than the configured recovery interval when the cong-isolate, cong-isolate-recover, DIRL, and FPIN port guard actions are configured.
- We recommend that you use the delta threshold type for all the counters except the tx-slowport-oper-delay counter which uses absolute threshold type.
- The rx-datarate and tx-datarate are calculated using the inoctets and outoctets on an interface.
- You must activate the **err-pkt-from-port**, **err-pkt-from-xbar**, and **err-pkt-to-xbar** counters using the **monitor counter** *name* command, before specifying the counter parameters.
- Counters **err-pkt-from-xbar**, **err-pkt-from-port**, and **err-pkt-to-xbar** support delta threshold type only.
- Counter **tx-slowport-oper-delay** supports **absolute** threshold type only.
- Counter **tx-slowport-oper-delay** does not support portguard action.
- You must first enable ER_RDY flow-control mode using the **system fc flow-control er_rdy** command and then enable congestion isolation using the **feature congestion-isolation** command before setting the portguard action as congestion isolate (cong-isolate) and congestion isolation recovery (cong-isolate-recover).
- From Cisco MDS NX-OS Release 8.5(1), a new default *fabricmon_edge_policy* is introduced where FPIN is already configured for the supported counters.
- From Cisco MDS NX-OS Release 8.5(1), switches operating in the Cisco NPV mode do not support cong-isolate, cong-isolate-recover, DIRL, and FPIN portguard actions and the default *fabricmon_edge_policy*.
- When you configure a policy with the cong-isolate, cong-isolate-recover, DIRL, or FPIN portguard actions, you can expect multiple rising thresholds without waiting for a falling threshold.
- You must configure Exchange Diagnostic Capabilities (EDC) interval for congestion signal before configuring the TxWait **warning-signal-threshold** and **alarm-signal-threshold** values. For more information, see Configuring EDC Congestion Signal.
- The **cong-isolate**, **cong-isolate-recover**, **DIRL**, and **FPIN** portguard actions are applicable only for logical-type edge policies.
- The **cong-isolate** and **cong-isolate-recover** port monitor portguard actions are supported only for the credit-loss-reco, tx-credit-not-available, tx-slowport-oper-delay, and txwait counters.
- The **DIRL** port monitor portguard action is supported only for the tx-datarate, tx-datarate-burst, and txwait counters.
- The **FPIN** port monitor portguard action is supported only for the link-loss, sync-loss, signal-loss, invalid-words, invalid-crc, and txwait counters.
- For SFP counters, **sfp-rx-power-low-warn** and **sfp-tx-power-low-warn**, the polling interval must be configured in multiples of 600 (10 minutes) and the rising threshold value should not exceed the multiple value of the polling interval. For example, if the polling interval is configure as 1800, which is 3 times 600, then the rising threshold value should not be more than 3.

- The rx-datarate-burst and tx-datarate-burst counters are configured as the number of 1-second bursts above 90% (default) detected in a polling interval. You can change the default datarate burst threshold using the **counter tx-datarate-burst poll-interval** *seconds* **delta rising-threshold** *count* **event** *RMON-ID* **datarate** *percentage* command.

(Optional) Revert to the default values for a counter:

Releases prior to Cisco MDS NX-OS Release 8.5(1)

switch(config-port-monitor)# **no counter** {**credit-loss-reco** | **err-pkt-from-port** | **err-pkt-from-xbar** | **err-pkt-to-xbar** | **invalid-crc** | **invalid-words** | **link-loss** | **lr-rx** | **lr-tx** | **rx-datarate** | **signal-loss** | **state-change** | **sync-loss** | **timeout-discards** | **tx-credit-not-available** | **tx-datarate** | **tx-discards** | **tx-slowport-oper-delay** | **txwait**} **poll-interval** *seconds* {**absolute** | **delta**} **rising-threshold** *count1* **event** *RMON-ID* **warning-threshold** *count2* **falling-threshold** *count3* **event** *RMON-ID* **portguard** { **cong-isolate** | **errordisable** | **flap**}

Cisco MDS NX-OS Release 8.5(1) and later releases

switch(config-port-monitor)# **no counter** {**credit-loss-reco** | **err-pkt-from-port** | **err-pkt-from-xbar** | **err-pkt-to-xbar** | **input-errors** | **invalid-crc** | **invalid-words** | **link-loss** | **lr-rx** | **lr-tx** | **rx-datarate** | **rx-datarate-burst** | **sfp-rx-power-low-warn** | **sfp-tx-power-low-warn** | **signal-loss** | **state-change** | **sync-loss** | **timeout-discards** | **tx-credit-not-available** | **tx-datarate** | **tx-datarate-burst** | **tx-discards** | **tx-slowport-oper-delay** | **txwait** [**warning-signal-threshold** *count1* **alarm-signal-threshold** *count2* **portguard congestion-signals**]} **poll-interval** *seconds* {**absolute** | **delta**} **rising-threshold** *count3* **event** *RMON-ID* [**warning-threshold** *count4*] [**alerts** [**obfl rmon syslog** | **none**]] [**datarate** *count5*] [**falling-threshold** *count6*] [**portguard** {**DIRL** | **FPIN** | **cong-isolate** | **cong-isolate-recover** | **errordisable** | **flap**]}

(Optional) Monitor a counter:

Releases prior to Cisco MDS NX-OS Release 8.5(1)

switch(config-port-monitor)# **monitor counter** {**credit-loss-reco** | **err-pkt-from-port** | **err-pkt-from-xbar** | **err-pkt-to-xbar** | **input-errors** | **invalid-crc** | **invalid-words** | **link-loss** | **lr-rx** | **lr-tx** | **rx-datarate** | **signal-loss** | **state-change** | **sync-loss** | **timeout-discards** | **tx-credit-not-available** | **tx-datarate** | **tx-discards** | **tx-slowport-count** | **tx-slowport-oper-delay** | **txwait**}

Cisco MDS NX-OS Release 8.5(1) and later releases

switch(config-port-monitor)# **monitor counter** {**credit-loss-reco** | **err-pkt-from-port** | **err-pkt-from-xbar** | **err-pkt-to-xbar** | **input-errors** | **invalid-crc** | **invalid-words** | **link-loss** | **lr-rx** | **lr-tx** | **rx-datarate** | **rx-datarate-burst** | **sfp-rx-power-low-warn** | **sfp-tx-power-low-warn** | **signal-loss** | **state-change** | **sync-loss** | **timeout-discards** | **tx-credit-not-available** | **tx-datarate** | **tx-datarate-burst** | **tx-discards** | **tx-slowport-count** | **tx-slowport-oper-delay** | **txwait**}

A port monitor currently recognizes two kinds of ports:

- Logical-type edge ports are normally F ports that are connected to end devices.
- Logical-type core ports are E ports (ISLs) or (T)F ports connected to Cisco NPV switches. Some of the edge port counter thresholds and port-guard actions might not be appropriate on the TF ports in the port-monitor configurations. Specifically, portguard *disable*, *flap*, and *isolate* actions can affect multiple end devices on the F ports. Therefore, performing disable, flap, or isolate actions should be avoided on an N-Port Identifier Virtualization (NPIV) system.

Activating a Port Monitor Policy

To activate a port monitor policy, perform these steps:

Step 1 Enter configuration mode:

switch# **configure terminal**

Step 2 Activate the specified port monitor policy:

switch(config)# **port-monitor activate** *policyname*

(Optional) Activate the default port monitor policy:

switch(config)# **port-monitor activate**

(Optional) Deactivate the specified port monitoring policy:

switch(config)# **no port-monitor activate** *policyname*

Configuring Logging Level for Port Monitor

To configure logging level for port monitor syslog messages, perform the steps below:

Step 1 Enter configuration mode:

switch# **configure terminal**

Step 2 Configure a logging level for port monitor syslog messages:

switch(config)# **logging level pmon** *severity-level*

(Optional) Revert to the default logging level for the port monitor syslog messages:

switch(config)# **no logging level pmon**

Configuring Port Monitor Portguard

To configure a port monitor portguard action, perform these steps:

Step 1 Enter configuration mode:

switch# **configure terminal**

Step 2 Specify the policy name and enter port monitoring policy configuration mode:

switch(config)# **port-monitor name** *policyname*

(Optional) Remove the policy:

switch(config)# **no port-monitor name** *policyname*

Step 3 Specify a counter, its parameters, and a portguard action for a counter:

Releases prior to Cisco MDS NX-OS Release 8.5(1)

switch(config-port-monitor)# **counter** {**credit-loss-reco** | **err-pkt-from-port** | **err-pkt-from-xbar** | **err-pkt-to-xbar** | **invalid-crc** | **invalid-words** | **link-loss** | **lr-rx** | **lr-tx** | **rx-datarate** | **signal-loss** | **state-change** | **sync-loss** | **timeout-discards** | **tx-credit-not-available** | **tx-datarate** | **tx-discards** | **tx-slowport-oper-delay** | **txwait**} **poll-interval** *seconds* {**absolute** | **delta**} **rising-threshold** *count1* **event** *RMON-ID* **warning-threshold** *count2* **falling-threshold** *count3* **event** *RMON-ID* **portguard** { **cong-isolate** | **errordisable** | **flap**}

Cisco MDS NX-OS Release 8.5(1) and later releases

switch(config-port-monitor)# **counter** {**credit-loss-reco** | **err-pkt-from-port** | **err-pkt-from-xbar** | **err-pkt-to-xbar** | **input-errors** | **invalid-crc** | **invalid-words** | **link-loss** | **lr-rx** | **lr-tx** | **rx-datarate** | **rx-datarate-burst** | **sfp-rx-power-low-warn** | **sfp-tx-power-low-warn** | **signal-loss** | **state-change** | **sync-loss** | **timeout-discards** | **tx-credit-not-available** | **tx-datarate** | **tx-datarate-burst** | **tx-discards** | **tx-slowport-oper-delay** | **txwait** [**warning-signal-threshold** *count1* **alarm-signal-threshold** *count2* **portguard congestion-signals**]} **poll-interval** *seconds* {**absolute** | **delta**} **rising-threshold** *count3* **event** *RMON-ID* [**warning-threshold** *count4*] [**alerts** [**obfl rmon syslog** | **none**]] [**datarate** *count5*] [**falling-threshold** *count6*] [**portguard** {**DIRL** | **FPIN** | **cong-isolate** | **cong-isolate-recover** | **errordisable** | **flap**]}

Note

- A port monitor policy cannot be configured as a combination of cong-isolate, cong-isolate-recover, DIRL, and FPIN port guard actions. For example, if in a policy you configure the tx-datarate, tx-datarate-burst, and txwait with DIRL portguard action and then configure the credit-loss-reco counter with the cong-isolate portguard action, you will not be able to activate the policy.
- Port monitor polling interval must not be more than the configured recovery interval when the cong-isolate, cong-isolate-recover, DIRL, and FPIN port guard actions are configured.
- We recommend that you use the delta threshold type for all the counters except the tx-slowport-oper-delay counter which uses absolute threshold type.
- The rx-datarate and tx-datarate are calculated using the inoctets and outoctets on an interface.
- You must activate the **err-pkt-from-port**, **err-pkt-from-xbar**, and **err-pkt-to-xbar** counters using the **monitor counter** *name* command, before specifying the counter parameters.
- Counters **err-pkt-from-xbar**, **err-pkt-from-port**, and **err-pkt-to-xbar** support delta threshold type only.
- Counter **tx-slowport-oper-delay** supports **absolute** threshold type only.
- Counter **tx-slowport-oper-delay** does not support portguard action.
- You must first enable ER_RDY flow-control mode using the **system fc flow-control er_rdy** command and then enable congestion isolation using the **feature congestion-isolation** command before setting the portguard action as congestion isolate (cong-isolate) and congestion isolation recovery (cong-isolate-recover).
- From Cisco MDS NX-OS Release 8.5(1), a new default *fabricmon_edge_policy* is introduced where FPIN is already configured for the supported counters.
- From Cisco MDS NX-OS Release 8.5(1), switches operating in the Cisco NPV mode do not support cong-isolate, cong-isolate-recover, DIRL, and FPIN portguard actions and the default *fabricmon_edge_policy*.
- When you configure a policy with the cong-isolate, cong-isolate-recover, DIRL, or FPIN portguard actions, you can expect multiple rising thresholds without waiting for a falling threshold.
- You must configure Exchange Diagnostic Capabilities (EDC) interval for congestion signal before configuring the TxWait **warning-signal-threshold** and **alarm-signal-threshold** values. For more information, see Configuring EDC Congestion Signal.
- The **cong-isolate**, **cong-isolate-recover**, **DIRL**, and **FPIN** portguard actions are applicable only for logical-type edge policies.
- The **cong-isolate** and **cong-isolate-recover** port monitor portguard actions are supported only for the credit-loss-reco, tx-credit-not-available, tx-slowport-oper-delay, and txwait counters.
- The **DIRL** port monitor portguard action is supported only for the tx-datarate, tx-datarate-burst, and txwait counters.
- The **FPIN** port monitor portguard action is supported only for the link-loss, sync-loss, signal-loss, invalid-words, invalid-crc, and txwait counters.
- For SFP counters, **sfp-rx-power-low-warn** and **sfp-tx-power-low-warn**, the polling interval must be configured in multiples of 600 (10 minutes) and the rising threshold value should not exceed the multiple value of the polling interval. For example, if the polling interval is configure as 1800, which is 3 times 600, then the rising threshold value should not be more than 3.

- The rx-datarate-burst and tx-datarate-burst counters are configured as the number of 1-second bursts above 90% (default) detected in a polling interval. You can change the default datarate burst threshold using the **counter tx-datarate-burst poll-interval** *seconds* **delta rising-threshold** *count* **event** *RMON-ID* **datarate** *percentage* command.

Configuring Port Group Monitor

Enabling a Port Group Monitor

To enable a port group monitor, perform these steps:

Step 1 Enter configuration mode:

switch# **configure terminal**

Step 2 Enable port monitoring:

switch(config)# **port-group-monitor enable**

(Optional) Disable port monitoring:

switch(config)# **no port-group-monitor enable**

Configuring a Port Group Monitor Policy

To configure a port group monitor policy, perform these steps:

Step 1 Enter configuration mode:

switch# **configure terminal**

Step 2 Specify the policy name and enter port group monitoring policy configuration mode:

switch(config)# **port-group-monitor name** *policyname*

(Optional) Remove the policy:

switch(config)# **no port-group-monitor name** *policyname*

Step 3 Specify the delta receive or transmit counter poll interval (in seconds) and thresholds (in percentage):

switch(config-port-group-monitor)# **counter** {**rx-datarate** | **tx-datarate**} **poll-interval** *seconds* **delta rising-threshold** *percentage1* **falling-threshold** *percentage2*

(Optional) Revert to the default policy:

switch(config-port-group-monitor)# **no counter tx-datarate**

For more information on reverting to the default policy, see Reverting to the Default Policy for a Specific Counter and Port Group Monitor.

Step 4 Turn on datarate monitoring:

switch(config-port-group-monitor)# **monitor counter** {**rx-datarate** | **tx-datarate**}

(Optional) Turn off datarate monitoring:

switch(config-port-group-monitor)# **no monitor counter** {**rx-datarate** | **tx-datarate**}

For more information on turning off transmit datarate monitoring, see Turning Off Specific Counter Monitoring.

Note On 8-Gbps and higher speed modules, port errors are monitored using the **invalid-crc** and **invalid-words** counters. The **err-pkt-from-port** counter is supported only on 4-Gbps modules.

Reverting to the Default Policy for a Specific Counter

The following examples display the default values for counters:

```
switch(config)# port-group-monitor name PGMON_policy
switch(config-port-group-monitor)# counter tx-datarate poll-interval 200 delta
rising-threshold 75 falling-threshold 0
 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
-------          ---------  -------- -------------------- ---------------------
RX Datarate   Delta      200       75                    0
TX Datarate   Delta      60        80                    20

switch(config-port-group-monitor)# no counter tx-datarate
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
-------          ---------  -------- -------------------- ---------------------
RX Datarate   Delta      60       80                   10
TX Datarate   Delta      60       80                   10
--------------------------------------------------------------------------------
```

Turning Off Specific Counter Monitoring

The following examples display turning off counter monitoring:

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

```
TX Datarate   Delta      60       100                 80
-----------------------------------------------------------------------------------------------
```

Activating a Port Group Monitor Policy

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

Step 1 Enter configuration mode:

switch# **configure terminal**

Step 2 Activate the specified port group monitor policy:

switch(config)# **port-group-monitor activate** *policyname*

(Optional) Activate the default port group monitor policy:

switch(config)# **port-group-monitor activate**

(Optional) Deactivate the specified port group monitor policy:

switch(config)# **no port-group-monitor activate** *policyname*

Configuring Management Interfaces

Configuring the Management Interface Over IPv4

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

Step 1 Enter configuration mode:

switch# **configure terminal**

Step 2 Select the management Ethernet interface on the switch and enter interface configuration submode:

switch(config)# **interface mgmt0**

Step 3 Configure the IPv4 address and IPv4 subnet mask:

switch(config-if)# **ip address 10.16.1.2 255.255.255.0**

Step 4 Enable the interface:

switch(config-if)# **no shutdown**

Step 5 Return to configuration mode:

switch(config-if)# **exit**

Step 6 Configure the default gateway IPv4 address:

switch(config)# **ip default-gateway 1.1.1.4**

Step 7 Return to user EXEC mode:

switch(config)# **exit**

(Optional) Save your configuration changes to the file system:

switch# **copy running-config startup-config**

Configuring the Management Interface Over IPv6

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

Step 1 Enter configuration mode:

switch# **configure terminal**

Step 2 Select the management Ethernet interface on the switch and enter interface configuration submode:

switch(config)# **interface mgmt0**

Step 3 Enable IPv6 and assign a link-local address on the interface:

switch(config-if)# **ipv6 enable**

Step 4 Specify an IPv6 unicast address and prefix length on the interface:

switch(config-if)# **ipv6 address 2001:0db8:800:200c::417a/64**

Step 5 Enable the interface:

switch(config-if)# **no shutdown**

Step 6 Return to user EXEC mode:

switch(config)# **exit**

(Optional) Save your configuration changes to the file system:

switch# **copy running-config startup-config**

Creating VSAN Interfaces

To create a VSAN interface, perform these steps:

Step 1 Enter configuration mode:

switch# **configure terminal**

Step 2 Configure a VSAN with the ID 2:

switch(config)# **interface vsan 2**

Step 3 Enable the VSAN interface:

```
switch(config-if)# no shutdown
```

Verifying Interface Configuration

Displaying Interface Information

Run the **show interface** command from user EXEC mode. This command displays the interface configurations. Without any arguments, this command displays the information for all the configured interfaces in the switch.

The following example displays the status of interfaces:

Displays All Interfaces

```
switch# show interface
fc1/1 is up
    Hardware is Fibre Channel, SFP is short wave laser w/o OFC (SN)
    Port WWN is 20:01:54:7f:ee:de:c5:00
    Admin port mode is SD
    snmp link state traps are enabled
    Port mode is SD
    Port vsan is 1
    Admin Speed is 8 Gbps
    Operating Speed is 8 Gbps
    Rate mode is dedicated
    Beacon is turned off
    Logical type is Unknown(0)
    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
      4 frames input,304 bytes
        0 discards,0 errors
        0 invalid CRC/FCS,0 unknown class
        0 too long,0 too short
      4 frames output,304 bytes
        0 discards,0 errors
      0 input OLS,0  LRR,0 NOS,0 loop inits
      0 output OLS,0 LRR, 0 NOS, 0 loop inits
      1 receive B2B credit remaining
      0 transmit B2B credit remaining
      0 low priority transmit B2B credit remaining
    Interface last changed at Mon Apr 24 23:10:49 2017

    Last clearing of "show interface" counters :  never
.
.
.
fc3/8 is trunking
    Hardware is Fibre Channel, SFP is short wave laser w/o OFC (SN)
    Port WWN is 20:88:54:7f:ee:de:c5:00
    Admin port mode is auto, trunk mode is on
    snmp link state traps are enabled
    Port mode is TF
    Port vsan is 1
    Admin Speed is auto max 32 Gbps
    Operating Speed is 16 Gbps
    Rate mode is dedicated
    Port flow-control is R_RDY

    Transmit B2B Credit is 64
    Receive B2B Credit is 32
```

```
    Receive data field Size is 2112
    Beacon is turned off
    Logical type is core
    Trunk vsans (admin allowed and active) (1-7,200,400)
    Trunk vsans (up)                       (1-2)
    Trunk vsans (isolated)                 (6-7,200,400)
    Trunk vsans (initializing)             (3-5)
    5 minutes input rate 13438472736 bits/sec,1679809092 bytes/sec, 779072 frames/sec
    5 minutes output rate 13438477920 bits/sec,1679809740 bytes/sec, 779073 frames/sec
      99483764407 frames input,213691124011124 bytes
        0 discards,0 errors
        0 invalid CRC/FCS,0 unknown class
        0 too long,0 too short
      99485576094 frames output,213695013798564 bytes
        0 discards,0 errors
      0 input OLS,0  LRR,0 NOS,0 loop inits
      1 output OLS,1 LRR, 0 NOS, 0 loop inits
      32 receive B2B credit remaining
      62 transmit B2B credit remaining
      62 low priority transmit B2B credit remaining
    Interface last changed at Mon Apr 24 23:11:47 2017

    Last clearing of "show interface" counters :  never
.
.
.
fc3/15 is up
    Hardware is Fibre Channel, SFP is short wave laser w/o OFC (SN)
    Port WWN is 20:8f:54:7f:ee:de:c5:00
    Admin port mode is F, trunk mode is off
    snmp link state traps are enabled
    Port mode is F, FCID is 0xe003c0
    Port vsan is 1
    Admin Speed is auto max 32 Gbps
    Operating Speed is 16 Gbps
    Rate mode is dedicated
    Port flow-control is R_RDY

    Transmit B2B Credit is 80
    Receive B2B Credit is 32
    Receive data field Size is 2112
    Beacon is turned off
    Logical type is edge
    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
      29 frames input,2600 bytes
        0 discards,0 errors
        0 invalid CRC/FCS,0 unknown class
        0 too long,0 too short
      36 frames output,2948 bytes
        0 discards,0 errors
      0 input OLS,0  LRR,0 NOS,0 loop inits
      1 output OLS,1 LRR, 0 NOS, 0 loop inits
      32 receive B2B credit remaining
      80 transmit B2B credit remaining
      80 low priority transmit B2B credit remaining
    Interface last changed at Mon Apr 24 23:11:50 2017

    Last clearing of "show interface" counters :  never
```

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 in the following format:

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

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

The following example displays the status of a range of interfaces:

Displays Multiple, Specified Interfaces

```
switch# show interface fc3/9 , fc3/12
fc3/9 is trunking
    Hardware is Fibre Channel, SFP is short wave laser w/o OFC (SN)
    Port WWN is 20:89:54:7f:ee:de:c5:00
    Peer port WWN is 20:09:00:2a:6a:a4:0b:00
    Admin port mode is E, trunk mode is on
    snmp link state traps are enabled
    Port mode is TE
    Port vsan is 1
    Admin Speed is auto
    Operating Speed is 32 Gbps
    Rate mode is dedicated
    Port flow-control is ER_RDY

    Transmit B2B Credit for vl0 is 15
    Transmit B2B Credit for vl1 is 15
    Transmit B2B Credit for vl2 is 40
    Transmit B2B Credit for vl3 is 430
    Receive B2B Credit for vl0 is 15
    Receive B2B Credit for vl1 is 15
    Receive B2B Credit for vl2 is 40
    Receive B2B Credit for vl3 is 430
    B2B State Change Number is 14
    Receive data field Size is 2112
    Beacon is turned off
    fec is enabled by default
    Logical type is core
    FCSP Status: Successfully authenticated
    Trunk vsans (admin allowed and active) (1-7,200,400)
    Trunk vsans (up)                       (1-7)
    Trunk vsans (isolated)                 (200,400)
    Trunk vsans (initializing)             ()
    5 minutes input rate 1175267552 bits/sec,146908444 bytes/sec, 67007 frames/sec
    5 minutes output rate 1175268256 bits/sec,146908532 bytes/sec, 67005 frames/sec
      8563890817 frames input,18703349820904 bytes
        0 discards,0 errors
        0 invalid CRC/FCS,0 unknown class
        0 too long,0 too short
      8563735031 frames output,18703009725636 bytes
        0 discards,0 errors
      0 input OLS,0  LRR,0 NOS,0 loop inits
      1 output OLS,3 LRR, 0 NOS, 0 loop inits
      70 receive B2B credit remaining
      500 transmit B2B credit remaining
      485 low priority transmit B2B credit remaining
    Interface last changed at Mon Apr 24 23:11:49 2017

    Last clearing of "show interface" counters :  never

fc3/12 is trunking
```

```
    Hardware is Fibre Channel, SFP is short wave laser w/o OFC (SN)
    Port WWN is 20:8c:54:7f:ee:de:c5:00
    Peer port WWN is 20:0c:00:2a:6a:a4:0b:00
    Admin port mode is E, trunk mode is on
    snmp link state traps are enabled
    Port mode is TE
    Port vsan is 1
    Admin Speed is auto
    Operating Speed is 32 Gbps
    Rate mode is dedicated
    Port flow-control is ER_RDY

    Transmit B2B Credit for vl0 is 15
    Transmit B2B Credit for vl1 is 15
    Transmit B2B Credit for vl2 is 40
    Transmit B2B Credit for vl3 is 430
    Receive B2B Credit for vl0 is 15
    Receive B2B Credit for vl1 is 15
    Receive B2B Credit for vl2 is 40
    Receive B2B Credit for vl3 is 430
    B2B State Change Number is 14
    Receive data field Size is 2112
    Beacon is turned off
    fec is enabled by default
    Logical type is core
    FCSP Status: Successfully authenticated
    Trunk vsans (admin allowed and active) (1-7,200,400)
    Trunk vsans (up)                       (1-7)
    Trunk vsans (isolated)                 (200,400)
    Trunk vsans (initializing)             ()
    5 minutes input rate 1175267840 bits/sec,146908480 bytes/sec, 67008 frames/sec
    5 minutes output rate 1175265056 bits/sec,146908132 bytes/sec, 67007 frames/sec
      8564034952 frames input,18703367929364 bytes
        0 discards,0 errors
        0 invalid CRC/FCS,0 unknown class
        0 too long,0 too short
      8563736100 frames output,18703012026724 bytes
        0 discards,0 errors
      1 input OLS,1  LRR,1 NOS,0 loop inits
      1 output OLS,2 LRR, 0 NOS, 0 loop inits
      70 receive B2B credit remaining
      500 transmit B2B credit remaining
      485 low priority transmit B2B credit remaining
    Interface last changed at Mon Apr 24 23:11:50 2017

    Last clearing of "show interface" counters :  never
```

The following example displays the status of a specified interface:

Displays a Specific Interface

```
switch# show interface fc3/9
fc3/9 is trunking
    Hardware is Fibre Channel, SFP is short wave laser w/o OFC (SN)
    Port WWN is 20:89:54:7f:ee:de:c5:00
    Peer port WWN is 20:09:00:2a:6a:a4:0b:00
    Admin port mode is E, trunk mode is on
    snmp link state traps are enabled
    Port mode is TE
```

```
Port vsan is 1
Admin Speed is auto
Operating Speed is 32 Gbps
Rate mode is dedicated
Port flow-control is ER_RDY

Transmit B2B Credit for vl0 is 15
Transmit B2B Credit for vl1 is 15
Transmit B2B Credit for vl2 is 40
Transmit B2B Credit for vl3 is 430
Receive B2B Credit for vl0 is 15
Receive B2B Credit for vl1 is 15
Receive B2B Credit for vl2 is 40
Receive B2B Credit for vl3 is 430
B2B State Change Number is 14
Receive data field Size is 2112
Beacon is turned off
fec is enabled by default
Logical type is core
FCSP Status: Successfully authenticated
Trunk vsans (admin allowed and active) (1-7,200,400)
Trunk vsans (up)                       (1-7)
Trunk vsans (isolated)                 (200,400)
Trunk vsans (initializing)             ()
5 minutes input rate 1175263296 bits/sec,146907912 bytes/sec, 67007 frames/sec
5 minutes output rate 1175266272 bits/sec,146908284 bytes/sec, 67007 frames/sec
  8570830922 frames input,18718506849280 bytes
    0 discards,0 errors
    0 invalid CRC/FCS,0 unknown class
    0 too long,0 too short
  8570675128 frames output,18718166747180 bytes
    0 discards,0 errors
  0 input OLS,0  LRR,0 NOS,0 loop inits
  1 output OLS,3 LRR, 0 NOS, 0 loop inits
  70 receive B2B credit remaining
  500 transmit B2B credit remaining
  485 low priority transmit B2B credit remaining
Interface last changed at Mon Apr 24 23:11:49 2017

Last clearing of "show interface" counters :  never
```

The following example displays the description of interfaces:

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     --
```

The following example displays a summary of information:

Displays Interface Information in a Brief Format

```
switch# show interface brief
--------------------------------------------------------------------------------

Interface  Vsan   Admin  Admin   Status       SFP    Oper  Oper   Port     Logical

                  Mode   Trunk                       Mode  Speed  Channel   Type
                         Mode                              (Gbps)
--------------------------------------------------------------------------------

fc1/1       1      E      on      up           swl    E     8      --       core

fc1/2       1      auto   on      sfpAbsent    --     --    --     --     --

fc1/3       1      F      on      up           swl    F     8      --       core
```

The following example displays a summary of information:

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.

The following example displays the brief counter information of interfaces:

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
```

You can run the **show interface transceiver** command only on a switch in the Cisco MDS 9100 Series if the SFP is present, as show in the following example:

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)
...
```

The following example displays the entire running configuration, with information about all the 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.

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
```

The following example displays the running configuration information for a specified interface. The interface configuration commands are grouped together:

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
```

Displays the Running Configuration after the System Default Switchport Mode F Command is Executed, on page 70 displays the running configuration after the **system default switchport mode F** command is executed.

The following example displays the running configuration after the **system default switchport mode F** command is executed:

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
```

The following example displays the running configuration after two interfaces are individually configured for FL mode:

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
```

The following example displays interface information in a brief format after the **system default switchport mode F** command is executed:

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      Logical
                  Mode   Trunk                         Mode  Speed  Channel   Type
                         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        --     --           --         --
```

The following example displays interface information in a brief format after two interfaces are individually configured for FL mode:

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       Logical
                  Mode   Trunk                         Mode  Speed  Channel    Type
                         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        --     --           --          --
```

Displaying the Port-Level Portguard

The following command displays information about an interface that is set to error-disabled state by the portguard because of a TrustSec violation:

```
switch# show 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
```

An interface may be error disabled for several reasons. To recover an error-disabled interface, use the **shutdown** and **no shutdown** commands in interface configuration mode to re-enable the link.

Displaying Port Monitor Status and Policies

The following commands display information about the Port Monitor feature:

Note The port *Logical type* is displayed as the *Port type*.

```
switch# show port-monitor
--------------------------------------------------------------------------------
Port Monitor : enabled
--------------------------------------------------------------------------------
Congestion-Isolation : enabled
--------------------------------------------------------------------------------
Policy Name  : default
Admin status : Not Active
Oper status  : Not Active
Port type    : All Ports
--------------------------------------------------------------------------------
Counter       Threshold  Interval Rising      event Falling    event  Warning     PMON
                                  Threshold         Threshold        Threshold   Portguard
-------       ---------  -------- ----------- ----- ---------  ------ ----------- -----------
Link Loss     Delta      60       5           4     1          4      Not enabled  Not enabled
Sync Loss     Delta      60       5           4     1          4      Not enabled  Not enabled
Signal Loss   Delta      60       5           4     1          4      Not enabled  Not enabled
Invalid Words Delta      60       1           4     0          4      Not enabled  Not enabled
Invalid CRC's Delta      60       5           4     1          4      Not enabled  Not enabled
State Change  Delta      60       5           4     0          4      Not enabled  Not enabled
TX Discards   Delta      60       200         4     10         4      Not enabled  Not enabled
LR RX         Delta      60       5           4     1          4      Not enabled  Not enabled
LR TX         Delta      60       5           4     1          4      Not enabled  Not enabled
Timeout
Discards      Delta      60       200         4     10         4      Not enabled  Not enabled
Credit
Loss Reco     Delta      60       1           4     0          4      Not enabled  Not enabled
TX Credit
Not Available Delta      60       10%         4     0%         4      Not enabled  Not enabled
RX Datarate   Delta      60       80%         4     20%        4      Not enabled  Not enabled
TX Datarate   Delta      60       80%         4     20%        4      Not enabled  Not enabled
TX-Slowport-
Oper-Delay    Absolute   60       50ms        4     0ms        4      Not enabled  Not enabled
```

```
TXWait        Delta      60       40%          4     0%         4     Not enabled  Not enabled
-------------------------------------------------------------------------------------------------
```

```
switch# show port-monitor active
Policy Name  : sample
Admin status : Active
Oper status  : Active
Port type    : All Ports
-------------------------------------------------------------------------------------------------
Counter        Threshold  Interval Rising     event  Falling    event  Warning      PMON
                                   Threshold         Threshold         Threshold    Portguard
-------        ---------  -------- ---------- ------ ---------- ------ ------------ ------------
Link Loss       Delta      60       5          4      1          4      Not enabled Not enabled
Sync Loss       Delta      60       5          4      1          4      Not enabled Not enabled
Signal Loss     Delta      60       5          4      1          4      Not enabled Not enabled
Invalid Words   Delta      60       5          4      1          4      Not enabled Not enabled
Invalid CRC's   Delta      60       5          4      1          4      Not enabled Not enabled
State Change    Delta      60       5          4      0          4      Not enabled Not enabled
TX Discards     Delta      60       50         4      0          4      Not enabled Not enabled
LR RX           Delta      60       5          4      1          4      Not enabled Not enabled
LR TX           Delta      60       5          4      1          4      Not enabled Not enabled
Timeout
Discards        Delta      60       200        4      10         4      Not enabled Not enabled
Credit
Loss Reco       Delta      1        1          4      0          4      Not enabled Cong-isolate
TX Credit
Not Available   Delta      1        10%        4      0%         4      Not enabled Cong-isolate
RX Datarate     Delta      60       80%        4      70%        4      Not enabled Not enabled
TX Datarate     Delta      60       80%        4      70%        4      Not enabled Not enabled
ASIC Error
Pkt from Port   Delta      60       50         4      10         4      Not enabled Not enabled
ASIC Error
Pkt to xbar     Delta      60       50         4      10         4      Not enabled Not enabled
ASIC Error
Pkt from xbar   Delta      60       50         4      10         4      Not enabled Not enabled
TX-Slowport-
Oper-Delay      Absolute   1        50ms       4      0ms        4      Not enabled Cong-isolate
TXWait          Delta      1        40%        4      0%         4      Not enabled Cong-isolate
-------------------------------------------------------------------------------------------------
```

```
switch# show port-monitor sample
Policy Name  : sample
Admin status : Active
Oper status  : Active
Port type    : All Edge Ports
-------------------------------------------------------------------------------
Counter          Threshold  Interval Rising     event Falling     event  portgurard
                                     Threshold       Threshold
-------------------------------------------------------------------------------
Link Loss         Delta      60       5          4       1          4     Not enabled
Sync Loss         Delta      60       5          4       1          4     Not enabled
Signal Loss       Delta      60       5          4       1          4     Not enabled
Invalid Words     Delta      60       1          4       0          4     Not enabled
Invalid CRC's     Delta      60       5          4       1          4     Not enabled
TX Discards       Delta      60       200        4       10         4     Not enabled
LR RX             Delta      60       5          4       1          4     Not enabled
LR TX             Delta      60       5          4       1          4     Not enabled
Timeout Discards  Delta      60       200        4       10         4     Not enabled
Credit Loss Reco  Delta      1        1          4       0          4     Not enabled
TX Credit Not
Available         Delta      1        10%        4       0%         4     Not enabled
RX Datarate       Delta      60       80%        4       20%        4     Not enabled
TX Datarate       Delta      60       80%        4       20%        4     Not enabled
TX-Slowport-Count Delta      1        5          4       0          4     Not enabled
TX-Slowport-Oper
```

```
-Delay            Absolute   1        50ms       4       0ms       4     Not enabled
TXWait            Delta      1        40%        4       0%        4     Not enabled
-------------------------------------------------------------------------------------
```

```
switch# show port-monitor default
Policy Name  : default
Admin status : Not Active
Oper status  : Not Active
Port type    : All Ports
-------------------------------------------------------------------------------------------------
Counter           Threshold  Interval Rising    event  Falling     event  Warning      PMON
                                      Threshold        Threshold          Threshold    Portguard
-------------------------------------------------------------------------------------------------
Link Loss          Delta      60       5          4     1           4     Not enabled  Not enabled
Sync Loss          Delta      60       5          4     1           4     Not enabled  Not enabled
Signal Loss        Delta      60       5          4     1           4     Not enabled  Not enabled
Invalid Words      Delta      60       1          4     0           4     Not enabled  Not enabled
Invalid CRC's      Delta      60       5          4     1           4     Not enabled  Not enabled
State Change       Delta      60       5          4     0           4     Not enabled  Not enabled
TX Discards        Delta      60       200        4     10          4     Not enabled  Not enabled
LR RX              Delta      60       5          4     1           4     Not enabled  Not enabled
LR TX              Delta      60       5          4     1           4     Not enabled  Not enabled
Timeout Discards   Delta      60       200        4     10          4     Not enabled  Not enabled
Credit Loss Reco   Delta      60       1          4     0           4     Not enabled  Not enabled
TX Credit Not      Delta      60       10%        4     0%          4     Not enabled  Not enabled
Available
RX Datarate        Delta      60       80%        4     20%         4     Not enabled  Not enabled
TX Datarate        Delta      60       80%        4     20%         4     Not enabled  Not enabled
TX-Slowport-       Absolute   60       50ms       4     0ms         4     Not enabled  Not enabled
Oper-Delay
TXWait             Delta      60       40%        4     0%          4     Not enabled  Not enabled
-------------------------------------------------------------------------------------------------
```

```
switch# show port-monitor slowdrain
Policy Name  : slowdrain
Admin status : Not Active
Oper status  : Not Active
Port type    : All Edge Ports
-------------------------------------------------------------------------------------
Counter           Threshold    Interval    Rising      event    Falling     event    PMON
                                           Threshold            Threshold            Portguard
-------------------------------------------------------------------------------------
Credit Loss Reco  Delta         1           1          4        0          4      Not enabled
TX Credit Not
Available         Delta         1           10%        4        0%         4      Not enabled
-------------------------------------------------------------------------------------
```

```
switch# show port-monitor slowportdetect
Policy Name  : slowportdetect
Admin status : Not Active
Oper status  : Not Active
Port type    : All Ports
-------------------------------------------------------------------------------------
Counter        Threshold  Interval Rising  event  Falling    event  Warning      PMON
                                               Threshold         Threshold    Portguard
-------------------------------------------------------------------------------------
Credit
Loss Reco       Delta        1        2        2        0         2  Not enabled  Cong-isolate
TX Credit
Not Available   Delta        1        2%       2        0%        2  Not enabled  Cong-isolate
TX-Slowport-
Oper-Delay      Absolute     1        2ms      2        0ms       2  Not enabled  Cong-isolate
TXWait          Delta        1        2%       2        0%        2  Not enabled  Cong-isolate
-------------------------------------------------------------------------------------
```

```
switch# show logging level pmon
```

```
Facility        Default Severity        Current Session Severity
--------        ----------------        ------------------------
PMon                  4                          4
```

Note The port monitor process does not display in the list of processes when you run the **show logging level** command. The **show logging level pmon** command must be issued to determine the logging level of port monitor.

Displaying Port Group Monitor Status and Policies

The following examples display information about the port group monitor:

```
switch# show port-group-monitor status
Port Group Monitor : Enabled
Active Policies : pgm2
Last 100 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
-------      ---------  -------- -------------------- ----------------------
RX Datarate   Delta      60       50                   10
TX Datarate   Delta      60       50                   10
--------------------------------------------------------------------------------------------
Policy Name  : pgm2
Admin status : Active
Oper status  : Active
Port type    : All Port Groups
--------------------------------------------------------------------------------------------
Counter       Threshold  Interval %ge Rising Threshold %ge Falling Threshold
-------      ---------  -------- -------------------- ----------------------
RX Datarate   Delta      60       80                   10
TX Datarate   Delta      60       80                   10
--------------------------------------------------------------------------------------------
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
-------      ---------  -------- -------------------- ----------------------
RX Datarate   Delta      60       80                   20
TX Datarate   Delta      60       80                   20
--------------------------------------------------------------------------------------------
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
-------       ---------  -------- -------------------- ----------------------
RX Datarate   Delta      60       80                   10
TX Datarate   Delta      60       80                   10
--------------------------------------------------------------------------------
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
-------      ---------  -------- -------------------- ----------------------
RX Datarate   Delta      26       450                  250
TX Datarate   Delta      60       100                  80
--------------------------------------------------------------------------------
```

Displaying the Management Interface Configuration

The following command displays the management interface configuration:

```
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
```

Displaying VSAN Interface Information

To following example displays the VSAN interface information:

```
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
```

Transmit-Wait History Graph

The transmit-wait history for the slow ports on 16-Gbps and 32-Gbps modules and switches can be displayed in the form of a graph over a period of time. The total transmit-wait time for each time period is displayed as a column of #. The actual value appears above each column as a vertically printed number. The following graphs can be displayed:

- Seconds scale—The transmit-wait history for the port over the last 60 seconds. The Y-axis value is the total transmit-wait time for each second, in milliseconds.
- Minutes scale—The transmit-wait history for the port over the last 60 seconds. The Y-axis value is the total transmit-wait time for each minute, in seconds, to one decimal place.
- Hours scale—The transmit-wait history for the port over the last 60 seconds. The Y-axis value is the total transmit-wait time for each hour, in minutes.

To display the transmit-wait history for a given interval of time, use the following commands:

Display the transmit-wait history graph for the period when transmit credit is not available for a given interval of time (seconds, minutes, or hours):

switch# **show process creditmon txwait-history [module x [port y]]**

Display the transmit-wait time in 2.5 microsecond units, as well as in seconds:

switch# **show logging onboard txwait**

Note The transmit-wait delta values are logged periodically (every 20 seconds) into the OBFL when transmit wait increases by at least 100 ms in the 20-second interval.

Display the total transmit-wait value for a particular interface in 2.5-microsecond units:

switch# **show interface fc***x/y* **counters**

The following example displays the transmit-wait history graph, in seconds, for 16-Gbps modules:

```
switch(config)# show process creditmon txwait-history module 1 port 81

TxWait history for port fc1/81:
===============================

   455555555455555455555455559999999999999999999999999999999999
     900000000800009000008100011111231922322211321121112112113111
     433799991899990359909838608935137962088988254848894870461938
1000                                 #
900                            ###################################
800                            ###################################
700                            ###################################
600                            ###################################
500 ###########################################################
400 ###########################################################
300 ###########################################################
200 ###########################################################
100 ###########################################################
    0....5....1....1....2....2....3....3....4....4....5....5....6
              0    5    0    5    0    5    0    5    0    5    0
```

```
  Tx Credit Not Available per second (last 60 seconds)
                # = TxWait (ms)
```

The following example displays the transmit-wait history graph, in minutes, for 16-Gbps modules:

```
   5555555555555555555555555555555555555555555555555555555555555555
   0555555555555555555555555555555555555555555555555555555555555555
   ............................................................
   0354444454444454454544444444456353635343754344533435545453 44
60
54  ############################################################
48 ############################################################
42 ############################################################
36 ############################################################
30 ############################################################
24 ############################################################
18 ############################################################
12 ############################################################
6 ############################################################
  0....5....1....1....2....2....3....3....4....4....5....5....6
            0    5    0    5    0    5    0    5    0    5    0

          Tx Credit Not Available per minute (last 60 minutes)
                # = TxWait (secs)
```

The following example displays the transmit wait history graph, in hours, for 16-Gbps modules:

```
  3333333333333333333333333333333333333333
  3333333333333333333333333333333333333332
     2222222222222222222222222222222222222229
     7777887777778778777787778776777777778767900000000000000000000000000000000
3600
3240 ########################################
2880 ########################################
2520 ########################################
2160 ########################################
1800 ########################################
1440 ########################################
1080 ########################################
 720 ########################################
 360 ########################################
    0....5....1....1....2....2....3....3....4....4....5....5....6....6....7.7
              0    5    0    5    0    5    0    5    0    5    0    5    0 2

          Tx Credit Not Available per hour (last 72 hours)
                # = TxWait (secs)
```

The following example displays the transmit-wait OBFL logging for 16-Gbps modules:

```
module-4# show logging onboard txwait

---------------------------------
 Module: 4 txwait count
---------------------------------

-----------------------------
 Show Clock
-----------------------------
2018-11-26 14:33:11

---------------------------------
 Module: 4 txwait
```

```
---------------------------------
 Notes:
     - Sampling period is 20 seconds
     - Only txwait delta >= 100 ms are logged

-------------------------------------------------------------------------------
|   Interface     | Delta TxWait Time     | Congestion | Timestamp               |
|                 | 2.5us ticks | seconds |            |                         |
-------------------------------------------------------------------------------
|   Eth4/1(VL3)   |  2758526    |    6    |      34%   | Mon Nov 26 14:32:28 2018 |
|   Eth4/1(VL3)   |  7982000    |   19    |      99%   | Mon Nov 26 14:32:08 2018 |
|   Eth4/1(VL3)   |  7976978    |   19    |      99%   | Mon Nov 26 14:31:48 2018 |
|   Eth4/1(VL3)   |  7974588    |   19    |      99%   | Mon Nov 26 14:31:28 2018 |
|   Eth4/1(VL3)   |  7970818    |   19    |      99%   | Mon Nov 26 14:31:08 2018 |
|   Eth4/1(VL3)   |  7965766    |   19    |      99%   | Mon Nov 26 14:30:48 2018 |
|   Eth4/1(VL3)   |  7976161    |   19    |      99%   | Mon Nov 26 14:30:28 2018 |
|   Eth4/1(VL3)   |  7538726    |   18    |      94%   | Mon Nov 26 14:30:08 2018 |
|   Eth4/1(VL3)   |  7968258    |   19    |      99%   | Mon Nov 26 14:29:48 2018 |
|      fc4/9      |  7987745    |   19    |      99%   | Mon Nov 26 14:33:08 2018 |
|      fc4/9      |  7991818    |   19    |      99%   | Mon Nov 26 14:32:48 2018 |
|      fc4/9      |  7992774    |   19    |      99%   | Mon Nov 26 14:32:28 2018 |
|      fc4/9      |  7992052    |   19    |      99%   | Mon Nov 26 14:32:08 2018 |
|      fc4/9      |  7991918    |   19    |      99%   | Mon Nov 26 14:31:48 2018 |
|      fc4/9      |  7991993    |   19    |      99%   | Mon Nov 26 14:31:28 2018 |
|      fc4/9      |  7987967    |   19    |      99%   | Mon Nov 26 14:31:08 2018 |
|      fc4/9      |  7992034    |   19    |      99%   | Mon Nov 26 14:30:48 2018 |
|      fc4/9      |  7991966    |   19    |      99%   | Mon Nov 26 14:30:28 2018 |
|      fc4/9      |  7990076    |   19    |      99%   | Mon Nov 26 14:30:08 2018 |
|      fc4/9      |  7991890    |   19    |      99%   | Mon Nov 26 14:29:48 2018 |
```