



Configuring Fibre Channel Interfaces

This chapter contains the following sections:

- [Information About Fibre Channel Interfaces, on page 1](#)
- [Information About Fibre Channel Interfaces, on page 1](#)
- [Configuring Fibre Channel Interfaces, on page 21](#)
- [Configuring Global Attributes for Fibre Channel Interfaces, on page 35](#)
- [Verifying Fibre Channel Interfaces, on page 37](#)
- [Default Fibre Channel Interface Settings, on page 40](#)
- [Configuring Fibre Channel Interfaces, on page 41](#)

Information About Fibre Channel Interfaces

Information About Fibre Channel Interfaces

Virtual Fibre Channel Interfaces

Fibre Channel over Ethernet (FCoE) encapsulation allows a physical Ethernet cable to simultaneously carry Fibre Channel and Ethernet traffic. In Cisco Nexus devices, an FCoE-capable physical Ethernet interface can carry traffic for one virtual Fibre Channel (vFC) interface.

Like any interface in Cisco NX-OS, vFC interfaces are manipulable objects with properties such as configuration and state. Native Fibre Channel and vFC interfaces are configured using the same CLI commands.

The following capabilities are not supported for virtual Fibre Channel interfaces:

- SAN port channels.
- The SPAN destination cannot be a vFC interface.
- Buffer-to-buffer credits.
- Exchange link parameters (ELP).
- Configuration of physical attributes (speed, rate, mode, transmitter information, MTU size).
- Port tracking.

VF Port

vFC interfaces always operate in trunk mode; vFC interfaces do not operate in any other mode. You can configure allowed VSANs on a vFC by using the **switchport trunk allowed vsan** command under the vfc interface (which is similar to FC TF and TE ports). For vFC interfaces that are connected to hosts, port VSAN is the only VSAN that supports logins (FLOGI). We recommend that you restrict the allowed VSANs for such vFC interfaces to the port VSAN by using the **switchport trunk allowed vsan** command in the interface mode to configure a VF port.

Includes support for 160 vFC interfaces.

The vFC VSAN assignment and the global VLAN-to-VSAN mapping table enables the Cisco Nexus device to choose the appropriate VLAN for a VF port.

The VF port support over 10G-FEX interfaces feature is supported only in Cisco Nexus Fabric Extender straight-through topologies where each Fabric Extender is directly connected to a Cisco Nexus device.

VE Ports

A virtual E port (VE port) is a port that emulates an E port over a non-Fibre Channel link. VE port connectivity between Fibre Channel Forwarders (FCFs) is supported over point-to-point links. These links can be individual Ethernet interfaces or members of an Ethernet port-channel interface. For each of the FCF connected Ethernet interfaces, you must create and bind an vFC interface to the Ethernet interface. Configure vFC interfaces as VE ports by using the **switchport mode E** command in interface mode.

VE ports have the following guidelines:

- Auto mode on the vFC is not supported.
- VE Port trunking is supported over FCoE-enabled VLANs.
- VE Port interface binding to MAC addresses is not supported.
- By default the VE Port is enabled for trunk mode.

You can configure multiple VSANs on the VE port. You must configure the FCoE VLANs that correspond to the VE port's VSANs on the bound Ethernet interface.

- The Spanning Tree Protocol is disabled on the FCoE VLANs on any interface that a vFC interface is bound to, which includes the interfaces that the VE ports are bound to.

The number of VE port pairs that can be supported between a given FCF and a peer FCF depends on the FCF-MAC advertising capability of the peer FCF:

- If a peer FCF advertises the same FCF-MAC address over all its interfaces, the FCF can connect to it over one VE port. In such a topology, we recommended that you use one port-channel interface for redundancy.
- If a peer FCF advertises multiple FCF-MAC addresses, the limits in the [VE Port Configuration Limits](#) table are applicable.

VE Ports in a vPC Topology

VE ports in a vPC topology have the following guidelines:

- Dedicated links are required for FCoE VLANs between FCFs connected over a vPC for LAN traffic.
- FCoE VLANs must not be configured on the inter-switch vPC interfaces.

- VE port can get flapped during congestion if FCoE payload size is larger than 2112.

FSPF Parameters

FSPF operates on a per-VSAN basis over a VE port once it is brought up on the VSAN. The default FSPF cost (metric) of the vFC interface is as per 10-Gbps bandwidth. For VE ports that are bound to Ethernet port channels, the cost is adjusted based on the number of operational member ports.

VE Port Configuration Limits

Interface Type	Platform			
	N9K-C9336C-FX2-E	N9K-C93360YC-FX2	N9K-C93180YC-FX	FEX
vFC (VE and VF) Port that is bound to an Ethernet Port-Channel Interface	8 (max limit)	8 (max limit)	8 (max limit)	Not supported

VNP Ports

Connectivity from an FCoE NPV bridge to the FCF is only supported over point-to-point links. These links can be individual Ethernet interfaces or members of an Ethernet port channel interface. For each FCF connected Ethernet interfaces, a vFC interface must be created and bound to the Ethernet interface. These vFC interfaces must be configured as VNP ports. On the VNP port, an FCoE NPV bridge emulates an FCoE-capable host with multiple enodes, each with a unique enode MAC address. A VNP port interface binding to MAC address is not supported. By default, the VNP port is enabled in trunk mode. Multiple VSANs can be configured on the VNP port. The FCoE VLANs that correspond to the VNP port VSANs must be configured on the bound Ethernet interface.

The spanning-tree protocol (STP) is automatically disabled in the FCoE VLAN on the interfaces that the VNP port are bound to.

Interface Modes

Each physical Fibre Channel interface in a switch may operate in one of several port modes: E mode, TE mode, F mode, and TF mode, and TNP mode. A physical Fibre Channel interface can be configured as an E port or an F port, an F port, or an SD port. Interfaces may also be configured in Auto mode; the port type is determined during interface initialization.

In NPV mode, Fibre Channel interfaces may operate in E mode or an F mode. NP mode, F mode, or SD mode.

Virtual Fibre Channel interfaces can be configured in E mode or F mode.

Interfaces are automatically assigned VSAN 1 by default.

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 may not be valid when the interface is down (for example, the operational speed).

E Port

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

An E port connected to another switch may also be configured to form a SAN port channel.

Related Topics

[Configuring SAN Port Channels](#)

F Port

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

NP Port

When the switch is operating in NPV mode, the interfaces that connect the switch to the core network switch are configured as NP ports. NP ports operate like N ports that function as proxies for multiple physical N ports.

Related Topics

[Configuring N Port Virtualization](#)

TE Port

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

- VSAN trunking
- Fibre Channel trace (fctrace) feature

In TE port mode, all frames are transmitted in EISL frame format, which contains VSAN information. Interconnected switches use the VSAN ID to multiplex traffic from one or more VSANs across the same physical link. This feature is referred to as VSAN trunking in the Cisco Nexus device. TE ports support class 3 and class F service.

Related Topics

[Configuring VSAN Trunking](#)

TF Port

When the switch is operating in NPV mode, the interfaces that connect the switch to the core network switch are configured as NP ports. NP ports operate like N ports that function as proxies for multiple physical N ports.

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

In TF port mode, all frames are transmitted in an 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 VSAN trunking in Cisco Nexus devices. TF ports support class 3 and class F service.

TNP Port

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

SD Port

In SPAN destination port (SD port) mode, an interface functions as a switched port analyzer (SPAN). The SPAN feature monitors network traffic that passes through a Fibre Channel interface. This monitoring is done using a standard Fibre Channel analyzer (or a similar switch probe) that is attached to an SD port. SD ports do not receive frames, instead they transmit a copy of the source traffic. The SPAN feature is nonintrusive and does not affect switching of network traffic for any SPAN source ports.

Auto Mode

Interfaces configured in auto mode can operate in one of the following modes: E, F, TE, and TF, NP, and TNP port. The port mode is determined during interface initialization. For example, if the interface is connected to a node (host or disk), it operates in F port 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 Nexus device or Cisco MDS 9000 Family, it may become operational in TE port mode.

Related Topics

[Configuring VSAN Trunking](#)

Interface States

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

Administrative States

The administrative state refers to the administrative configuration of the interface. The table below describes the administrative states.

Table 1: Administrative States

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

Operational States

The operational state indicates the current operational state of the interface. The table below describes the operational states.

Table 2: Operational States

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

Reason Codes

Reason codes are dependent on the operational state of the interface. The following table describes the reason codes for operational states.

Table 3: Reason Codes for Interface States

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

If the administrative state is up and the operational state is down, the reason code differs based on the nonoperational reason code. The table below describes the reason codes for nonoperational states.



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

Table 4: Reason Codes for Nonoperational States

Reason Code (long version)	Description	Applicable Modes
Link failure or not connected	The physical layer link is not operational.	All
SFP not present	The small form-factor pluggable (SFP) hardware is not plugged in.	All
Initializing	The physical layer link is operational and the protocol initialization is in progress.	All
Reconfigure fabric in progress	The fabric is currently being reconfigured.	
Offline	The switch software waits for the specified R_A_TOV time before retrying initialization.	
Inactive	The interface VSAN is deleted or is in a suspended state. To make the interface operational, assign that port to a configured and active VSAN.	
Hardware failure	A hardware failure is detected.	
Error disabled	Error conditions require administrative attention. Interfaces may be error-disabled for various reasons. For example: <ul style="list-style-type: none"> • Configuration failure. • Incompatible buffer-to-buffer credit configuration. To make the interface operational, you must first fix the error conditions causing this state and then administratively shut down and/or enable the interface.	
Isolation because limit of active port channels is exceeded.	The interface is isolated because the switch is already configured with the maximum number of active SAN port channels.	
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.	

Reason Code (long version)	Description	Applicable Modes
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.	
port channel administratively down	The interfaces belonging to the SAN port channel are down.	Only SAN port channel interfaces
Suspended due to incompatible speed	The interfaces belonging to the SAN port channel have incompatible speeds.	
Suspended due to incompatible mode	The interfaces belonging to the SAN port channel have incompatible modes.	
Suspended due to incompatible remote switch WWN	An improper connection is detected. All interfaces in a SAN port channel must be connected to the same switch.pair of switches.	
Bound physical interface down	The Ethernet interface bound to a virtual Fibre Channel interface is not operational.	Only virtual Fibre Channel interfaces
STP not forwarding in FCoE mapped VLAN	The Ethernet interface bound to a virtual Fibre Channel interface is not in an STP forwarding state for the VLAN associated with the virtual Fibre Channel interface	Only virtual Fibre Channel interfaces

Buffer-to-Buffer Credits

Buffer-to-buffer credits (BB_credits) are a flow-control mechanism to ensure that Fibre Channel interfaces do not drop frames. BB_credits are negotiated on a per-hop basis.

The BB_credit mechanism is used on Fibre Channel interfaces but not on virtual Fibre Channel interfaces. The receive BB_credit determines the receive buffering capability on the receive side without having to acknowledge the peer. This is important for links with large bandwidth-delays (long links with large latency) to be able to sustain line-rate traffic with increased latency.

The receive BB_credit value (fcrxbbcredit) may be configured for each Fibre Channel interface. In most cases, you do not need to modify the default configuration.

For virtual Fibre Channel interfaces, BB_credits are not used. Virtual Fibre Channel interfaces provide flow control based on a class based pause mechanism named Priority Flow Control.Priority-Flow_control.



-
- Note**
- Buffer-to-buffer (B2B) credits are not configurable.
 - Fill pattern in the 8G links must be IDLE. You must set the fill pattern in the 8G links to IDLE on both the peers. Use the command **switchport fill-pattern IDLE speed *speed*** to set the fill pattern to IDLE on Cisco Nexus 9000 switches.

```
switch (config)# interface fc1/1
switch (config-if)# switchport fill-pattern IDLE speed 8000
```



-
- Note** The receive BB_credit values depend on the port mode. For physical Fibre Channel interfaces, the default value is 64 for F mode and E mode interfaces. This value can be changed as required. The maximum value is 240 .

The receive BB_credit value is 64 in N9K-C93180YC-FX and 32 in N9K-C93360YC-FX2 and N9K-C9336C-FX2-E. This is applicable for all port modes (F,E) in both platforms and cannot be changed.

Licensing Requirements for Fibre Channel

Ensure that you have the correct license installed before using Fibre Channel interfaces and capabilities. For more information on licensing, see *Enabling FC/FCoE* chapter in this guide.



-
- Note** You can configure virtual Fibre Channel interfaces without a Storage Protocol Services license, but these interfaces will not become operational until the license is activated.
-

Enabling the Fibre Channel Port License

This section explains how to enable the licensing for SAN Switching.

Before you begin

To enable the port license, you must shut down the fibre channel (FC) ports.



-
- Note** For information about converting to FC ports, see [Configuring Unified Ports](#).
-

SUMMARY STEPS

1. Enable the port license.

DETAILED STEPS

Enable the port license.

Example:

```
Switch(config)# int fc1/1
Switch(config-if)# port-license acquire
```

QoS Requirements for Fibre Channel

The FCoE QoS must be configured if the following types of interfaces are in use:

- Native FC - for FC
- FCoE - for vFC
- FC and FCoE - for FC and vFC

The FCoE QoS must be added even if Ethernet is not configured on the switch.

The following commands will enable the default QoS configuration which must be configured for native FC or FCoE or FC and FCoE:

```
switch(config)# system qos
switch(config-sys-qos)# service-policy type queuing input fcoe-default-in-policy
switch(config-sys-qos)# service-policy type queuing output fcoe-default-out-policy
switch(config-sys-qos)# service-policy type qos input fcoe-default-in-policy
switch(config-sys-qos)# service-policy type network-qos fcoe-default-nq-policy
```

Configuring QoS for no-drop Support

A qos ingress policy is used to mark ingress FC/FCoE frames. The qos ingress policy must be applied to the interfaces that handle FC/FCoE traffic (such as, all ethernet/port-channel interfaces bound to vFCs).



Note

Check to ensure that the port qos region has hardware TCAM space reserved. Whenever an ingress PACL TCAM threshold is seen in the syslog, increase the TCAM size and reload the switch.

This step is mandatory for FC/FCoE to work.

- Reserve TCAM space for the ACL region.

You may need to acquire TCAM space reserved for other regions.

- Save the configuration.

- Reload the line cards or switch.

Reload the switch.

- Confirm the ACL region TCAM space.

- Example for TCAM carving on N9K-C93180YC-FX, N9K-C93360YC-FX2, and N9K-C9336C-FX2-E:

```
hardware access-list tcam region ing-racl 1536
hardware access-list tcam region ing-ifacl 256
hardware access-list tcam region ing-redirect 256
```

- Example for TCAM carving on N9K-C92160YC-X, N9K-C9272Q, N9K-C9236C, N9K-C93180YC-EX, or N9K-C93180YC-FX:

```
hardware access-list tcam region ing-racl 1536
hardware access-list tcam region ing-redirect 256
```

Example:

```
switch# show hardware access-list tcam region | i i ifacl
Ingress PACL [ing-ifacl] size = 256
switch# config
```

```
switch(config)# hardware access-list tcam region ing-racl 1536
switch(config)# hardware access-list tcam region ing-ifacl 256
switch(config)# hardware access-list tcam region ing-redirect 256
```

```
switch# copy running-config startup-config
switch# reload
```

```
switch# show hardware access-list tcam region | i i ifacl
Ingress PACL [ing-ifacl] size = 256
```

```
switch# show hardware access-list tcam region | i "IPV4 Port QoS \[qos\] size"
Ingress PACL [ing-ifacl] size = 256
switch# config
```

```
switch(config)# hardware access-list tcam region ing-racl 1536
switch(config)# hardware access-list tcam region ing-ifacl 256
switch(config)# hardware access-list tcam region ing-redirect 256
```

```
switch# copy running-config startup-config
```

```
switch# reload

switch# show hardware access-list tcam region | i "IPv4 Port QoS \[qos\] size"
Ingress PAACL [ing-ifacl] size = 256
```

Configuring FCoE QoS policies

- There are four types of FCoE default policies: network-qos, output queuing, input queuing.
- You can activate the FCoE default policies by enabling the FCoE-NPV feature using the **feature-set fcoe-npv** command and remove the FCoE default policies by executing the **no feature-set fcoe-npv** command.
- Before entering **no feature-set fcoe-npv**, remove all FCoE policies from the interface and system level. The **no feature-set fcoe-npv** command is allowed only when there are no FC ports configured.



Note Cisco recommends using the FCoE default policies. All policies applied must be of the same type, either 4q or 8q mode, and must be explicitly applied or removed at the system and interface level.

- When configuring QoS policies for an active-active FEX topology that is enabled for FCoE, you must configure the QoS policies on the FEX HIF port on both VPC peers to avoid unpredictable results.



Note Only the following support an active-active FEX topology:

- N2K-C2232PP
 - N2K-C2348UPQ
 - NB22HP
 - NB22IBM
-

- To use a different queue or cos value for FCoE traffic, create user-defined policies.

Configuring QoS Policies for FC/FCoE

- There are four types of FC/FCoE default policies: network-qos, output queuing, input queuing, and input qos.
- To use a different queue or cos value for FC/FCoE traffic, create user-defined policies.
- You can configure a QoS policy by following one of these methods:
 - Predefined policies—You can apply a predefined QoS policy: **default-fcoe-in-policy**.



Note

- No policy will be applied by default for FCoE.
- We recommend to apply **no-stats** to QoS policy.

- User-defined policy—You can create a QoS policy that conforms to one of the system-defined policies.

Configuring System-wide QoS Policy



Note The network-qos policy and output/input queuing policies should be applied at the system level and the qos policy should be applied at the interface level, for every interface that carries the FC/FCoE traffic.

```
switch(config)# system qos
switch(config-sys-qos)# service-policy type queuing input default-fcoe-in-que-policy
switch(config-sys-qos)# service-policy type queuing output { default-fcoe-8q-out-policy |
default-fcoe-out-policy }
switch(config-sys-qos)# service-policy type network-qos { default-fcoe-8q-nq-policy |
default-fcoe-nq-policy }
```

Configuration Example for user-defined policies

```
switch(config)# policy-map type network-qos fcoe_nq
switch(config-pmap-nqos)# class type network-qos c-nq1
switch(config-pmap-nqos-c)# pause pfc-cos 3
switch(config-pmap-nqos-c)# mtu 9216
switch(config-pmap-nqos-c)# class type network-qos c-nq2
switch(config-pmap-nqos-c)# mtu 1500
switch(config-pmap-nqos-c)# class type network-qos c-nq3
switch(config-pmap-nqos-c)# mtu 1500
switch(config-pmap-nqos-c)# class type network-qos c-nq-default
switch(config-pmap-nqos-c)# mtu 1500
switch(config-pmap-nqos-c)# exit
switch(config-pmap-nqos)# exit
switch(config)#
switch(config)# policy-map type queuing fcoe-in-policy
switch(config-pmap-que)# class type queuing c-in-q1
switch(config-pmap-c-que)# bandwidth percent 50
switch(config-pmap-c-que)# class type queuing c-in-q-default
switch(config-pmap-c-que)# bandwidth percent 50
switch(config-pmap-c-que)# exit
switch(config)#
switch(config)# policy-map type queuing fcoe-out-policy
switch(config-pmap-que)# class type queuing c-out-q3
switch(config-pmap-c-que)# priority level 1
switch(config-pmap-c-que)# class type queuing c-out-q-default
switch(config-pmap-c-que)# bandwidth remaining percent 50
switch(config-pmap-c-que)# class type queuing c-out-q1
switch(config-pmap-c-que)# bandwidth remaining percent 50
switch(config-pmap-c-que)# class type queuing c-out-q2
switch(config-pmap-c-que)# bandwidth remaining percent 0
switch(config-pmap-c-que)# exit
switch(config)#
switch(config)# class-map type qos match-any fcoe
switch(config-cmap-qos)# match protocol fcoe
switch(config-cmap-qos)# match cos 3
switch(config-cmap-qos)# exit
switch(config)#
switch(config)# policy-map type qos fcoe_qos_policy
switch(config-pmap-qos)# class fcoe
switch(config-pmap-c-qos)# set cos 3
```

```

switch(config-pmap-c-qos)# set qos-group 1
switch(config-pmap-c-qos)# exit
switch(config-pmap-qos)# exit
switch(config)#
switch(config)# system qos
switch(config-sys-qos)# service-policy type queuing input fcoe-in-policy
switch(config-sys-qos)# service-policy type queuing output fcoe-out-policy
switch(config-sys-qos)# service-policy type network-qos fcoe_nq

```



Note The `set qos 3` command under the QoS policy is mandatory only when there are native fiber channel ports and the command is applicable only for N9K-C93180YC-FX platform, N9K-C93360YC-FX2 platforms, and N9K-C9336C-FX2-E. For all the other Cisco Nexus 9000 Platform switches, this step is optional.



Note When FEX is connected:

- Apply the QoS policy to the system level and to the HIF port to honor the pause frames in the FCoE traffic.
- 8q policies are not supported when FEX is online.

```

switch(config)# system qos
switch(config-sys-qos)# service-policy type queuing input policy-name
switch(config-sys-qos)# service-policy type queuing output policy-name
switch(config-sys-qos)# service-policy type network-qos policy-name
switch(config-sys-qos)# service-policy type qos input policy-name

```

Applying the ingress QoS policy to each Ethernet/port-channel interface that is bound to vFC interface for FC/FCoE.

```

switch(config)# interface ethernet 2/1
switch(config-if)# switchport mode trunk
switch(config-if)# mtu 9216 /* Or maximum allowed value */
switch(config-if)# service-policy type qos input { default-fcoe-in-policy | fcoe_qos_policy
) no-stats
switch(config-if)# exit
switch(config)#

```



Note The QoS policy needs to be attached to an HIF interface or the port-channel of an HIF interface:

- HIF interface

```

interface "HIF port"
service-policy type qos input policy-name

```

- Port-channel of an HIF interface

```

interface port-channel
service-policy type qos input policy-name

```



Note The following platforms do not support 8q policies:

- Cisco Nexus C9332PQ switch
- Cisco Nexus C9372PX switch
- Cisco Nexus C9396PX switch
- Cisco Nexus C9372PX-E switch
- Cisco Nexus X9536PQ line card
- Cisco Nexus X9564PX line card

• Configuring FC/FCoE QoS policies

- There are four types of FC/FCoE default policies: network QoS, output queuing, input queuing, and QoS.
- You can activate the FCoE default policies by enabling the FCoE-NPV feature using the **feature-set fcoe-npv** command and remove the FCoE default policies by executing the **no feature-set fcoe-npv** command.
- Before entering **no feature-set fcoe-npv**, remove all FCoE policies from the interface and system level.



Note Cisco recommends using the FCoE default policies. All policies applied must be of the same type, either 4q or 8q mode, and must be explicitly applied or removed at the system and interface level.

-
- To use a different queue or cos value for FC/FCoE traffic, create user-defined policies.

• Configuring Network QoS Policies for FC/FCoE

- You can configure a network QoS policy by following one of these methods:
 - Predefined policies—You can apply a predefined network QoS policy that fits your requirement. You have the option to choose either **default-fcoe-8q-nq-policy** or **default-fcoe-nq-policy**.



Note No policy will be applied by default for FC/FCoE.

-
- User-defined policy—You can create a network QoS policy that conforms to one of the system-defined policies.

• Configuring Output Queuing Policies for FC/FCoE

- You can configure an output queuing policy by following one of these methods:

- Predefined policies—You can apply a predefined output queuing policy that fits your requirement. You have the option to choose either **default-fcoe-8q-out-policy** or **default-fcoe-out-policy**.



Note No policy will be applied by default for FC/FCoE.

- User-defined policy—You can create a output queuing policy that conforms to one of the system-defined policies.
- Configuring Input Queuing Policies for FC/FCoE
 - You can configure an input queuing policy by following one of these methods:
 - Predefined policies—You can apply a predefined input queuing policy: **default-fcoe-in-que-policy**.



Note No policy will be applied by default for FCoE.

- User-defined policy—You can create a input queuing policy that conforms to one of the system-defined policies.
- Configuring QoS Policies for FCoE
 - You can configure a QoS policy by following one of these methods:
 - Predefined policies—You can apply a predefined QoS policy: **default-fcoe-in-policy**.



Note

- No policy will be applied by default for FCoE.
- We recommend to apply **no-stats** to QoS policy.

- User-defined policy—You can create a QoS policy that conforms to one of the system-defined policies.

- Configuring System-wide QoS Policy



Note The network-qos policy and output/input queuing policies should be applied at the system level and the qos policy should be applied at the interface level, for every interface that carries the FCoE traffic.

```
switch(config)# system qos
switch(config-sys-qos)# service-policy type queuing input default-fcoe-in-que-policy
switch(config-sys-qos)# service-policy type queuing output { default-fcoe-8q-out-policy
| default-fcoe-out-policy }
```

```
switch(config-sys-qos)# service-policy type network-qos { default-fcoe-8q-nq-policy |
default-fcoe-nq-policy }
```

- Configuration Example for user-defined policies

```
switch(config)# policy-map type network-qos fcoe_nq
switch(config-pmap-nqos)# class type network-qos c-nq1
switch(config-pmap-nqos-c)# pause pfc-cos 3
switch(config-pmap-nqos-c)# mtu 9216
switch(config-pmap-nqos-c)# class type network-qos c-nq2
switch(config-pmap-nqos-c)# mtu 1500
switch(config-pmap-nqos-c)# class type network-qos c-nq3
switch(config-pmap-nqos-c)# mtu 1500
switch(config-pmap-nqos-c)# class type network-qos c-nq-default
switch(config-pmap-nqos-c)# mtu 1500
switch(config-pmap-nqos-c)# exit
switch(config-pmap-nqos)# exit
switch(config)#
switch(config)# policy-map type queuing fcoe-in-policy
switch(config-pmap-que)# class type queuing c-in-q1
switch(config-pmap-c-que)# bandwidth percent 50
switch(config-pmap-c-que)# class type queuing c-in-q-default
switch(config-pmap-c-que)# bandwidth percent 50
switch(config-pmap-c-que)# exit
switch(config)#
switch(config)# policy-map type queuing fcoe-out-policy
switch(config-pmap-que)# class type queuing c-out-q3
switch(config-pmap-c-que)# priority level 1
switch(config-pmap-c-que)# class type queuing c-out-q-default
switch(config-pmap-c-que)# bandwidth remaining percent 50
switch(config-pmap-c-que)# class type queuing c-out-q1
switch(config-pmap-c-que)# bandwidth remaining percent 50
switch(config-pmap-c-que)# class type queuing c-out-q2
switch(config-pmap-c-que)# bandwidth remaining percent 0
switch(config-pmap-c-que)# exit
switch(config)#
switch(config)# class-map type qos match-any fcoe
switch(config-cmap-qos)# match protocol fcoe
switch(config-cmap-qos)# match cos 3
switch(config-cmap-qos)# exit
switch(config)#
switch(config)# policy-map type qos fcoe_qos_policy
switch(config-pmap-qos)# class fcoe
switch(config-pmap-c-qos)# set cos 3
switch(config-pmap-c-qos)# set qos-group 1
switch(config-pmap-c-qos)# exit
switch(config-pmap-qos)# exit
switch(config)#
switch(config)# system qos
switch(config-sys-qos)# service-policy type queuing input fcoe-in-policy
switch(config-sys-qos)# service-policy type queuing output fcoe-out-policy
switch(config-sys-qos)# service-policy type network-qos fcoe_nq
```



Note The **set cos 3** command under the QoS policy is mandatory only when there are native fiber channel ports and the command is applicable only for N9K-C93180YC-FX platform. For all the other Cisco Nexus 9000 Platform switches, this step is optional.



Note When FEX is connected:

- Apply the QoS policy to the system level and to the HIF port to honor the pause frames in the FCoE traffic.
- 8q policies are not supported when FEX is online.

```
switch(config)# system qos
switch(config-sys-qos)# service-policy type queuing input
policy-name
switch(config-sys-qos)# service-policy type queuing output
policy-name
switch(config-sys-qos)# service-policy type network-qos
policy-name
switch(config-sys-qos)# service-policy type qos input policy-name
```

Applying the ingress QoS policy to each Ethernet/port-channel interface that is bound to vFC interface for FCoE.

```
switch(config)# interface ethernet 2/1
switch(config-if)# switchport mode trunk
switch(config-if)# mtu 9216 /* Or maximum allowed value */
switch(config-if)# service-policy type qos input { default-fcoe-in-policy |
fcoe_qos_policy }
switch(config-if)# exit
switch(config)#
```



Note The QoS policy needs to be attached to an HIF interface or the port-channel of an HIF interface:

- HIF interface

```
interface "HIF port"
service-policy type qos input policy-name
```

- Port-channel of an HIF interface

```
interface port-channel
service-policy type qos input policy-name
```



Note The following platforms do not support 8q policies:

- Cisco Nexus C9332PQ switch
- Cisco Nexus C9372PX switch
- Cisco Nexus C9396PX switch
- Cisco Nexus C9372PX-E switch
- Cisco Nexus X9536PQ line card
- Cisco Nexus X9564PX line card



Note Whenever you see label allocation failure in the syslog, there is a possibility of FC/FCoE ACL not getting applied on interfaces. You must then check whether the QoS policy is applied with no-stats on the interfaces.

Physical Fibre Channel Interfaces

Cisco Nexus C93180YC-FX and C93360YC-FX2 switches support up to 48 and 96 physical fibre channel (FC) interfaces respectively as either uplinks connected to SAN network or as downlinks (connected to server or target). Cisco Nexus N9K-C9336C-FX2-E switches can have up to 112 physical fibre channel (FC) breakout interfaces as either uplinks connected to SAN network or as downlinks (connected to server or target). Only ports from 9 to 36 can be converted in FC breakout.

Each Fibre Channel port can be used as a downlink (connected to a server) or as an uplink (connected to the data center SAN network). The Fibre Channel interfaces support the following modes: E, F, NP, SD, TE, and TF and TNP.



Note NP and TNP are only supported with feature fcoe-npv.

Long-Distance ISLs

Beginning with Cisco NX-OS Release 10.2(1)F, the Cisco Nexus N9K-C93180YC-FX and N9K-C93360YC-FX2 switches support long distance on 32-Gbps Fibre Channel Inter-Switch Link (ISL).

The formula for computing long-distance ISL BB_credits assumes a typical Fibre Channel frame of 2 KB and factors in the interface speed. With fixed (64) buffer-to-buffer credits, the new switch now provide support for 32-Gbps Fibre Channel ISLs across distances of up to 3 kilometers.

Table 5: FC Long Distance across different speeds

Speed	Distance
32G	3 KM

Speed	Distance
16G	5 KM
8G	10 KM

Table 6: FC Long Distance across different speeds

Speed	Distance	Throughput
32G	3 KM	25.45G
16G	5 KM	13.35G
8G	10 KM	6.67G

Configuring Fibre Channel Interfaces

Configuring a Fibre Channel Interface

To configure a Fibre Channel interface, perform this task:



Note For information about creating FC ports or port conversion, see the [Configuring Unified Ports](#) section.

SUMMARY STEPS

1. switch# **configuration terminal**
2. switch(config)# **interface {fc slot/port}|{vfc vfc-id}**

DETAILED STEPS

	Command or Action	Purpose
Step 1	switch# configuration terminal	Enters configuration mode.
Step 2	switch(config)# interface {fc slot/port} {vfc vfc-id}	<p>Selects a Fibre Channel interface and enters interface configuration mode.</p> <p>Note When a Fibre Channel interface is configured, it is automatically assigned a unique world wide name (WWN). If the interface's operational state is up, it is also assigned a Fibre Channel ID (FC ID).</p> <p>Note If this is a 10G breakout port, the <i>slot/port</i> syntax is <i>QSFP-module/port</i>.</p>

	Command or Action	Purpose
		Note If this is a QSFP+ GEM or a breakout port, the <i>port</i> syntax is <i>QSFP-module/port</i> .

Configuring a Range of Fibre Channel Interfaces

To configure a range of Fibre Channel interfaces, perform this task:

SUMMARY STEPS

1. switch# **configuration terminal**
2. switch(config)# **interface** { **fc slot/port - port** [, **fc slot/port - port**] | **vfc vfc-id - vfc-id** [, **vfc vfc-id - vfc-id**] }

DETAILED STEPS

	Command or Action	Purpose
Step 1	switch# configuration terminal	Enters configuration mode.
Step 2	switch(config)# interface { fc slot/port - port [, fc slot/port - port] vfc vfc-id - vfc-id [, vfc vfc-id - vfc-id] }	Selects the range of Fibre Channel interfaces and enters interface configuration mode. Note If this is a QSFP+ GEM or a breakout port, the <i>port</i> syntax is <i>QSFP-module/port</i> .

Setting the Interface Administrative State

To gracefully shut down an interface, perform this task:

To enabledisable traffic flow, perform this task:

SUMMARY STEPS

1. switch# **configuration terminal**
2. switch(config)# **interface** {**fc slot/port**}|{**vfc vfc-id**}
3. switch(config-if)# **shutdown**

DETAILED STEPS

	Command or Action	Purpose
Step 1	switch# configuration terminal	Enters configuration mode.
Step 2	switch(config)# interface { fc slot/port } { vfc vfc-id }	Selects a Fibre Channel interface and enters interface configuration mode. Note If this is a 10G breakout port, the <i>slot/port</i> syntax is <i>QSFP-module/port</i> .

	Command or Action	Purpose
		Note If this is a QSFP+ GEM or a breakout port, the <i>port</i> syntax is <i>QSFP-module/port</i> .
Step 3	switch(config-if)# shutdown	Gracefully shuts down the interface and administratively disables traffic flow (default).

Configuring Interface Modes

SUMMARY STEPS

1. **configure terminal**
2. switch(config) # **interface vfc vfc-id**
3. switch(config-if) # **switchport mode {F}**

DETAILED STEPS

	Command or Action	Purpose
Step 1	configure terminal Example: switch# configure terminal switch(config)#	Enters global configuration mode.
Step 2	switch(config) # interface vfc vfc-id Example: switch(config) # interface vfc 20 switch(config-if) #	Selects a virtual Fibre Channel interface and enters interface configuration mode.
Step 3	switch(config-if) # switchport mode {F} Example: switch(config-if) # switchport mode F switch(config-if) #	Sets the port mode. vFC interfaces support only F mode. Note SD ports cannot be configured automatically. They must be administratively configured.

Example

This example shows how to configure VE port 20 and bind it to Ethernet slot 1, port 3:

```
switch# config t
switch(config) # interface vfc 20
switch(config-if) # bind interface ethernet 1/3
switch(config-if) # switchport mode F
switch(config-if) # exit
switch#
```

This example shows the running configuration for vFC 20 bound to the Ethernet slot1,port 3 interface.

```
switch# show running-config
switch(config) # interface vfc20
switch(config-if) # bind interface Ethernet 1/3
switch(config-if) # switchport mode F
switch(config-if) # no shutdown
```

This example shows how to configure VNP port 10 and bind it to Ethernet slot 1, port 1:

```
switch # config t
switch(config) # interface vfc 10
switch(config-if) # bind interface ethernet 2/1
switch(config-if) # switchport mode NP
switch(config-if) # exit
switch#
```

Configuring the Interface Description

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

To configure a description for an interface, perform this task:

SUMMARY STEPS

1. switch# **configuration terminal**
2. switch(config)# **interface** {fc slot/port}||{vfc vfc-id}
3. switch(config-if)# **switchport description cisco-HBA2**
4. switch(config-if)# **no switchport description**

DETAILED STEPS

	Command or Action	Purpose
Step 1	switch# configuration terminal	Enters configuration mode.
Step 2	switch(config)# interface {fc slot/port} {vfc vfc-id}	Selects a Fibre Channel interface and enters interface configuration mode. Note If this is a 10G breakout port, the <i>slot/port</i> syntax is <i>QSFP-module/port</i> . Note If this is a QSFP+ GEM or a breakout port, the <i>port</i> syntax is <i>QSFP-module/port</i> .
Step 3	switch(config-if)# switchport description cisco-HBA2	Configures the description of the interface. The string can be up to 80 characters long.
Step 4	switch(config-if)# no switchport description	Clears the description of the interface.

Configuring Unified Ports

Before you begin

Confirm that you have a supported Cisco Nexus switch. Unified Ports are available on the Cisco Nexus C93180YC-FX switch, N9K-C9336C-FX2-E, and C93360YC-FX2 switches.

- Cisco Nexus 5672UP
- Cisco Nexus 5672UP-16G
- Cisco Nexus 56128P with N56-M24UP2Q LEMs
- Cisco Nexus 5696Q with N5696-M20UP LEMs



Note For information about the C93180YC-FX, N9K-C9336C-FX2-E, or C93360YC-FX2 platform details, see the *Cisco Nexus 9000 Series Hardware Installation Guide*.

If you're configuring a unified port as Fibre Channel or FCoE, confirm that you have enabled the **install feature-set fcoe** and **feature-set fcoe** commands.

Procedure

	Command or Action	Purpose
Step 1	switch# configure terminal	Enters global configuration mode.
Step 2	switch(config) # slot slot number	Identifies the slot on the switch. Note If this is a QSFP+ GEM or a breakout port, the <i>port</i> syntax is <i>QSFP-module/port</i> .
Step 3	switch(config-slot) # port port number type {ethernet fc}	Configures a unified port as a native Fibre Channel port and an Ethernet port. <ul style="list-style-type: none"> • type —Specifies the type of port to configure on a slot in a chassis. • ethernet —Specifies an Ethernet port. • fc —Specifies a Fibre Channel (FC) port. • breakout —Changes or breaks out the port type from Ethernet port to FC port. However, this option is supported only on N9K-C9336C-FX2-E.

	Command or Action	Purpose
		<p>Note</p> <ul style="list-style-type: none"> • Changing unified ports on an expansion module requires that you power cycle the GEM card. You do not have to reboot the entire switch for changes to take effect. • When you configure unified ports as Fibre Channel, the existing configuration for Fibre Channel interfaces and VSAN memberships are unaffected. • In N9K-C93180YC-FX switches, the FC port range must be in multiples of 4, and can be discontinuous also. Reload the switch for the change to take effect. • In N9K-C93360YC-FX2 switches, you must convert all the four front panel ports in a column to FC/Ethernet together. In this switch, four ports form a port group. For example, the first port group is 1,2,49,50; the second port group is 3,4,51,52 and so on. • In N9K-C9336C-FX2-E switches, you can convert port types, for example, 9–36, as FC breakout ports. You can also convert ports as FC breakout ports either in contiguous range (for example, 9–11), discontinuous range (for example, 18, 23, 30), or as a single port (for example, 36). <p>Note</p> <p>When configuring an FC port on N5672-16G, the fabric mode should be in the 40-G mode to support 16-G. When the ports are changed from Ethernet to FC, the fabric mode changes to 40-G on the next reload. When the ports are changed to FC for the first time, the following message is displayed: "Port type is changed. Fabric mode is also changed. Please copy configuration and reload the switch."</p> <p>Use show fabric-mode to verify the current fabric mode configuration.</p> <p>The FC port range must be in multiples of 4, and can be discontinuous also. Reload the switch for the change to take effect.</p>

	Command or Action	Purpose
Step 4	switch(config-slot) # copy running-config startup-config	Copies the running configuration to the startup configuration.
Step 5	switch(config-slot) # reload	Reboots the switch.
Step 6	switch(config) # slot slot number	Identifies the slot on the switch.
Step 7	switch(config-slot) # no port port number type fc	Change the port back as an ethernet port, after you perform copy r s and reload the switch. Note When all the FC ports are removed, the fabric mode changes to the 10-G mode. When all the ports are changed to Ethernet, the following message is displayed: "Port type is changed. Fabric mode is also changed. Please copy configuration and reload the switch."

Example

This example shows how to configure a unified port on a Cisco N9K-C93180YC-FX expansion module:

```
switch# configure terminal
switch(config)# slot 1
switch(config-slot)# port 1-16 type fc
switch(config-slot)# copy running-config startup-config
switch(config-slot)# reload
switch(config-slot)#
```



Note Individual ports cannot be converted to FC ports on N9K-C93180YC-FX and N9K-C93360YC-FX2 switches.. In N5672UP-16G, only Slot 2 has UP ports.

```
switch# configure terminal
switch(config)# slot 1
switch(config-slot)# port 1-24 type fc
Port type is changed. ACTION REQUIRED: Please save configurations and reload the switch
switch(config-slot)#
```

Or

```
switch# configure terminal
switch(config)# slot 2
switch(config-slot)# port 13-24 type fc
Port type is changed. Please power-off and no power-off the module
switch(config-slot)#
```

The following example shows how to configure slot 1, 10 ports as FC ports on a Cisco N6004X-M20UP module:

```
switch# configure terminal
switch(config)# slot 1
switch(config-slot)# port 1-10 type fc
switch(config-slot)# copy running-config startup-config
switch(config-slot)# reload
```

Configuring Port Speeds

Port speed can be configured on a physical Fibre Channel interface but not on a virtual Fibre Channel interface. The minimum supported speed is 4G and the maximum is 32G for all the supported platform switches. However, the minimum supported speed for N9K-C9336C-FX2-E switches is 8G, and the maximum supported speed remains the same at 32G. By default, the port speed for an interface is automatically calculated by the switch.



Note 8G speed is not supported for server and target interfaces.



Caution Changing the interface speed is a disruptive operation.

To configure the port speed of the interface, perform this task:

SUMMARY STEPS

1. switch# **configuration terminal**
2. switch(config)# **interface fc slot/port**
3. switch(config-if)# **switchport speed 16000**
4. switch(config-if)# **no switchport speed**

DETAILED STEPS

	Command or Action	Purpose
Step 1	switch# configuration terminal	Enters configuration mode.
Step 2	switch(config)# interface fc slot/port	<p>Selects the specified interface and enters interface configuration mode.</p> <p>Note You cannot configure the port speed of a virtual Fibre Channel interface.</p> <p>Note If this is a 10G breakout port, the <i>slot/port</i> syntax is <i>QSFP-module/port</i>.</p> <p>Note If this is a QSFP+ GEM or a breakout port, the <i>port</i> syntax is <i>QSFP-module/port</i>.</p>
Step 3	switch(config-if)# switchport speed 16000	Configures the port speed of the interface to 16G.

	Command or Action	Purpose
		The number indicates the speed in megabits per second (Mbps). You can set the speed to 4000 (for 4-Gbps interfaces), 8000 (for 8-Gbps interfaces), 16000 (for 16-Gbps interfaces), 32000 (for 32-Gbps interfaces), or auto (default). Note When you connect a 16G host adapter to a 32G SFP port on a Cisco Nexus 9000 switch, if the link does not come up when the speed is configured as auto speed or if it defaults to 8G speed, then, you must manually configure the port using the command switchport speed 16000 .
Step 4	switch(config-if)# no switchport speed	Reverts to the factory default (auto) administrative speed of the interface.

Configuring Trunk Mode

To configure trunk mode perform this task:

SUMMARY STEPS

1. switch# **configuration terminal**
2. switch(config)# **interface fc slot/port**
3. switch(config-if)# **switchport trunk mode on**
4. switch(config-if)# **switchport trunk mode off**
5. switch(config-if)# **switchport trunk mode auto**

DETAILED STEPS

	Command or Action	Purpose
Step 1	switch# configuration terminal	Enters configuration mode.
Step 2	switch(config)# interface fc slot/port	Configures the specified interface and enters interface configuration mode.
Step 3	switch(config-if)# switchport trunk mode on	Enables (default) the trunk mode for the specified interface.
Step 4	switch(config-if)# switchport trunk mode off	Disables the trunk mode for the specified interface.
Step 5	switch(config-if)# switchport trunk mode auto	Configures the trunk mode to auto mode, which provides automatic sensing for the interface.

Note

For FC ports with trunking mode on and SAN-PO links to come up between two switches, both switches should be configured with the OUI of each other.

Configure the OUI on the switches only if the OUI value is not registered by default on either of them. The OUI is found and configured as follows:

```
N9K(config-if)# show wwn switch
Switch WWN is 20:00:2c:d0:2d:50:ea:64
N9K(config-if)#
```

On the switch, you can see the below output if the OUI (0x2cd02d) is already registered.

```
MDS9710(config-if)# sh wwn oui | i 2cd02d
0x2cd02d Cisco Default
MDS9710(config-if) #
If the OUI is not registered, configure it manually.
MDS9710(config-if)# wwn oui 0x2cd02d
```

Beginning with Cisco NX-OS Release 7.3(0)D1(1), the OUI is configurable on a Cisco MDS 9700 Series core switches.

Autosensing

Autosensing is enabled on all interfaces irrespective of the speed. If an 8G Small Form-Factor Pluggable (SFP) is inserted, the interface operates at 8G and 4G speed. If a 16G SFP is inserted, the interface operates only at 16G, 8G and 4G speeds and with a 32G SFP, the interface operates at 32G, 16G, and 8G speeds.



Note Cisco Nexus C93180YC-FX switch supports 10G SFP. On Cisco Nexus 2348UPQ, 16G is not autosensed. See *Configuring Cisco Unified FEX Nexus 2348UPQ with Fiber Channel Interfaces* to explicitly configure 16G speed.

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

Converting FC Ports with Breakout

Breakout interfaces for Fibre Channel (FC) ports are the only supported interfaces for FC on the Cisco Nexus N9K-C9336C-FX2-E platform switch. The LCM component supports FC port breakout or conversion.

To convert FCoE port to FC port, perform the following steps:

SUMMARY STEPS

1. switch# **configuration terminal**
2. switch(config)# **slot1**
3. switch(config-slot)# **port 9 type fc breakout**
4. switch(config-slot)# **reload**

DETAILED STEPS

	Command or Action	Purpose
Step 1	switch# configuration terminal	Enters configuration mode.

	Command or Action	Purpose
Step 2	switch(config)# slot1	Enables preprovisioning on a slot in a chassis.
Step 3	switch(config-slot)# port 9 type fc breakout	Changes or breaks out the port type from FCoE port to fibre channel port. Note You can convert port types, for example, 9–36, as FC breakout ports. You can convert ports as FC breakout ports either in contiguous range (for example, 9–11), discontinuous range (for example, 18, 23, 30) or as a single port (for example, 36).
Step 4	switch(config-slot)# reload	Reloads the switch.

When the switch is reloaded, the switch comes online with FC breakout ports, for example, fc1/9/1...fc1/9/4.

Changing Speed at Breakout Interface

You can change speed at each breakout interface. However, speed will be changed for all breakout ports.

Command Example:

```
switch(config)# int fc1/9/1-4
switch(config-if)# switchport speed 32000
!!!WARNING! This command affects all interfaces of a breakout port!!!
switch(config-if)#
```



Note The default speed for the FC breakout ports is 32G.

Configuring SD Port Frame Encapsulation

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

The **switchport encap eisl** command is disabled by default. If you enable encapsulation, all outgoing frames are encapsulated, and you will see a new line (Encapsulation is eisl) in the **show interface SD_port_interface** command output.

Configuring Receive Data Field Size

You can configure the receive data field size for native Fibre Channel interfaces (but not for virtual Fibre Channel interfaces). If the default data field size is 2112 bytes, the frame length will be 2148 bytes.

To configure the receive data field size, perform this task:

SUMMARY STEPS

1. switch# **configuration terminal**
2. switch(config)# **interface fc slot/port**
3. switch(config-if)# **switchport fcrxbufsize 2000**

DETAILED STEPS

	Command or Action	Purpose
Step 1	switch# configuration terminal	Enters configuration mode.
Step 2	switch(config)# interface fc slot/port	<p>Selects a Fibre Channel interface and enters interface configuration mode.</p> <p>Note If this is a 10G breakout port, the <i>slot/port</i> syntax is <i>QSFP-module/port</i>.</p> <p>Note If this is a QSFP+ GEM or a breakout port, the <i>port</i> syntax is <i>QSFP-module/port</i>.</p>
Step 3	switch(config-if)# switchport fcrxbufsize 2000	Reduces the data field size for the selected interface to 2000 bytes. The default is 2112 bytes and the range is from 256 to 2112 bytes.

Understanding Bit Error Thresholds

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

The bit errors can occur for the following reasons:

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

A bit error rate threshold is detected when 15 error bursts occur in a 5-minute period. By default, the switch disables the interface when the threshold is reached.

You can enter the **shutdown/no shutdown** command sequence to reenable the interface.

You can configure the switch to not disable an interface when the threshold is crossed.



Note The switch generates a syslog message when bit error threshold events are detected, even if the interface is configured not to be disabled by bit-error threshold events.

To disable the bit error threshold for an interface, perform this task:

SUMMARY STEPS

1. switch# **configuration terminal**
2. switch(config)# **interface fc slot/port**
3. switch(config-if)# **switchport ignore bit-errors**
4. switch(config-if)# **no switchport ignore bit-errors**

DETAILED STEPS

	Command or Action	Purpose
Step 1	switch# configuration terminal	Enters configuration mode.
Step 2	switch(config)# interface fc slot/port	Selects a Fibre Channel interface and enters interface configuration mode. Note If this is a 10G breakout port, the <i>slot/port</i> syntax is <i>QSFP-module/port</i> . Note If this is a QSFP+ GEM or a breakout port, the <i>port</i> syntax is <i>QSFP-module/port</i> .
Step 3	switch(config-if)# switchport ignore bit-errors	Prevents the detection of bit error threshold events from disabling the interface.
Step 4	switch(config-if)# no switchport ignore bit-errors	Prevents the detection of bit error threshold events from enabling the interface.

Configuring Buffer-to-Buffer Credits



Caution

After configuring an interface using the **switchport fcrxbbcredit** command, the interface automatically flaps for the configuration changes to be applied immediately. Hence, we recommend that you plan for such configurations only during a scheduled maintenance window to minimize the effect of such configurations on the production environment.

SUMMARY STEPS

1. switch# **configure terminal**
2. switch(config)# **interface fc slot/port**
3. switch(config-if)# **switchport fcrxbbcredit default**
4. switch(config-if)# **switchport fcrxbbcredit number mode {E | F | TE}**
5. switch(config-if)# **do show int fc slot/port**
6. (Optional) switch(config-if)# **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose
Step 1	switch# configure terminal	Enters global configuration mode.
Step 2	switch(config)# interface fc slot/port	<p>Selects a Fibre Channel interface and enters interface configuration mode.</p> <p>Note If this is a 10G breakout port, the <i>slot/port</i> syntax is <i>QSFP-module/port</i>.</p> <p>Note If this is a QSFP+ GEM or a breakout port, the <i>port</i> syntax is <i>QSFP-module/port</i>.</p>
Step 3	switch(config-if)# switchport fcxbbcredit default	<p>Applies the default operational value to the selected interface. The operational value depends on the port mode.</p> <p>The default values are assigned based on the port capabilities.</p>
Step 4	switch(config-if)# switchport fcxbbcredit number mode {E F TE}	<p>Assigns a buffer-to-buffer credit number to the selected interface and optionally specifies if the port is operating in E, F, or TE mode.</p> <p>Note If you specify E, F, or TE for the mode, the buffer-to-buffer credit value is applicable only when the port is set to that particular mode.</p> <p>The <i>number</i> range for buffer-to-buffer credits is between 1 and 240.</p> <p>The default value is 16.</p>
Step 5	switch(config-if)# do show int fc slot/port	<p>Displays the receive and transmit buffer-to-buffer credit along with other pertinent interface information for this interface.</p> <p>Note The buffer-to-buffer credit values are correct at the time the registers are read. They are useful to verify situations when the data traffic is slow.</p> <p>Note If this is a 10G breakout port, the <i>slot/port</i> syntax is <i>QSFP-module/port</i>.</p> <p>Note If this is a QSFP+ GEM or a breakout port, the <i>port</i> syntax is <i>QSFP-module/port</i>.</p>
Step 6	(Optional) switch(config-if)# copy running-config startup-config	Saves the change persistently through reboots and restarts by copying the running configuration to the startup configuration.

Configuring Global Attributes for Fibre Channel Interfaces

Configuring Switch Port Attribute Default Values

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

To configure switch port attributes, perform this task:

SUMMARY STEPS

1. switch# **configuration terminal**
2. switch(config)# **no system default switchport shutdown san**
3. switch(config)# **system default switchport shutdown san**
4. switch(config)# **system default switchport trunk mode auto**

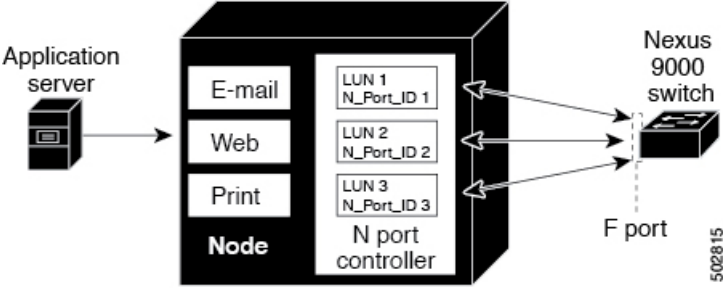
DETAILED STEPS

	Command or Action	Purpose
Step 1	switch# configuration terminal	Enters configuration mode.
Step 2	switch(config)# no system default switchport shutdown san	Configures the default setting for administrative state of an interface as Up. (The factory default setting is Down). Tip This command is applicable only to interfaces for which no user configuration exists for the administrative state.
Step 3	switch(config)# system default switchport shutdown san	Configures the default setting for administrative state of an interface as Down. This is the factory default setting. Tip This command is applicable only to interfaces for which no user configuration exists for the administrative state.
Step 4	switch(config)# system default switchport trunk mode auto	Configures the default setting for administrative trunk mode state of an interface as Auto. Note The default setting is trunk mode on.

Information About N Port Identifier Virtualization

N port identifier virtualization (NPIV) provides a means to assign multiple FC IDs to a single N port. This feature allows multiple applications on the N port to use different identifiers and allows access control, zoning, and port security to be implemented at the application level. The following figure shows an example application using NPIV.

Figure 1: NPIV Example



Enabling N Port Identifier Virtualization

You can enable or disable NPIV on the switch. Feature NPIV will be enabled by default when **feature-set fcoe** is enabled.

Before you begin

You must globally enable NPIV for all VSANs on the switch to allow the NPIV-enabled applications to use multiple N port identifiers.



Note All of the N port identifiers are allocated in the same VSAN.

SUMMARY STEPS

1. **configure terminal**
2. **feature npiv**
3. **no feature npiv**

DETAILED STEPS

	Command or Action	Purpose
Step 1	configure terminal Example: switch# configure terminal switch(config)#	Enters configuration mode.
Step 2	feature npiv Example: switch(config)# feature npiv	Enables NPIV for all VSANs on the switch.
Step 3	no feature npiv Example: switch(config)# no feature npiv	Disables (default) NPIV on the switch.

Example Port Channel Configurations

This section shows examples on how to configure an F port channel in shared mode and how to bring up the link between F ports on the NPIV core switches and NP ports on the NPV switches. Before you configure the F port channel, ensure that F port trunking, F port channeling, and NPIV are enabled.

Example

This example shows how to create the port channel:

```
switch(config)# interface san-po-channel 2
switch(config-if)# switchport mode F
switch(config-if)# channel mode active
switch(config-if)# exit
```

This example shows how to configure the port channel member interfaces on the core switch in dedicated mode:

```
switch(config)# interface fc1/4-6
switch(config-if)# shut
switch(config-if)# switchport mode F
switch(config-if)# switchport speed 32000
switch(config-if)# switchport trunk mode on
switch(config-if)# channel-group 2
switch(config-if)# no shut
switch(config-if)# exit
```

Verifying Fibre Channel Interfaces

Verifying SFP Transmitter Types

The SFP transmitter type can be displayed for a physical Fibre Channel interface (but not for a virtual Fibre Channel).

The small form-factor pluggable (SFP) hardware transmitters are identified by their acronyms when displayed in the **show interface brief** command. If the related SFP has a Cisco-assigned extended ID, then the **show interface** and **show interface brief** commands display the ID instead of the transmitter type. The **show interface transceiver** command and the **show interface fc slot/port** transceiver command display both values for Cisco supported SFPs.

Verifying Interface Information

The **show interface** command displays interface configurations. If no arguments are provided, this command displays the information for all the configured interfaces in the switch.

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 entering a command with the following example format:
interface fc2/1 - 4 , fc3/2 - 3

The following example shows how to display all interfaces:

```
switch# show interface

fc3/1 is up
...
fc3/3 is up
...
Ethernet1/3 is up
...
mgmt0 is up
...
vethernet1/1 is up
...
vfc 1 is up
```

The following example shows how to display multiple specified interfaces:

```
switch# show interface fc3/1 , fc3/3
fc3/1 is up
...
fc3/3 is up
...
```

The following example shows how to display a specific interface:

```
switch# show interface vfc 1
vfc 1 is up
...
```

The following example shows how to display interface descriptions:

```
switch# show interface description
-----
Interface          Description
-----
fc3/1              test intest
Ethernet1/1        --
vfc 1              --
...
```

The following example shows how to display all interfaces in brief:

```
switch# show interface brief
```

The following example shows how to display interface counters:

```
switch# show interface counters
```

The following example shows how to display transceiver information for a specific interface:

```
switch# show interface fc3/1 transceiver
```



Note The **show interface transceiver** command is only valid if the SFP is present.

The **show running-configurations show running-config** command displays the entire running configuration with information for all interfaces. The interfaces have multiple entries in the configuration files to ensure that the interface configuration commands execute in the correct order when the switch reloads. If you display the running configuration for a specific interface, all the configuration commands for that interface are grouped together.

The following example shows the interface display when showing the running configuration for all interfaces:

```
switch# show running configurations show running-config
...
interface fc3/5
  switchport speed 200016000
...
interface fc3/5
  switchport mode E
...
interface fc3/5
  channel-group 11 force
  no shutdown
```

The following example shows the interface display when showing the running configuration for a specific interface:

```
switch# show running configuration fc3/5 show running-config fc3/5
interface fc3/5
  switchport speed 200016000
  switchport mode E
  channel-group 11 force
  no shutdown
```

Verifying BB_Credit Information

The following example shows how to display the BB_credit information for all Fibre Channel interfaces:

```
switch# show interface fc1/7
...
fc1/7 is up
Hardware is Fibre Channel, SFP is short wave laser w/o OFC (SN)
Port WWN is 20:07:2c:d0:2d:50:e5:24
Admin port mode is auto, trunk mode is off
snmp link state traps are enabled
Port mode is F, FCID is 0xe10280
Port vsan is 500
Operating Speed is 32 Gbps
Admin Speed is auto
Transmit B2B Credit is 12
Receive B2B Credit is 64
Receive data field Size is 2112
Beacon is turned off
fec state is enabled by default
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
16705 frames input,1225588 bytes
0 discards,0 errors
0 invalid CRC/FCS,0 unknown class
0 too long,0 too short
16714 frames output,1345676 bytes
0 discards,0 errors
0 input OLS,0 LRR,0 NOS,0 loop inits
7 output OLS,4 LRR, 0 NOS, 0 loop inits
```

```
Receive B2B Credit performance buffers is 0
12 transmit B2B credit remaining
0 low priority transmit B2B credit remaining
Interface last changed at Thu Nov 14 11:59:40 2019
```

Default Fibre Channel Interface Settings

The following table lists the default settings for native Fibre Channel interface parameters.

Table 7: Default Native Fibre Channel 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)
Trunk-allowed VSANs	1 to 4093
Interface VSAN	Default VSAN (1)
Beacon mode	Off (disabled)
EISL encapsulation	Disabled
Data field size	2112 bytes

The following table lists the default settings for virtual Fibre Channel interface parameters.

Table 8: Default Virtual Fibre Channel Interface Parameters

Parameters	Default
Interface mode	F mode
Interface speed	n/a
Administrative state	Shutdown (unless changed during initial setup)
Trunk mode	On
Trunk-allowed VSANs	All VSANs
Interface VSAN	Default VSAN (1)
EISL encapsulation	n/a
Data field size	n/a

Configuring Fibre Channel Interfaces

