



# Configuring FCoE VLANs and Virtual Fibre Channel Interfaces

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## Information About Virtual Fibre Channel (VFC) Interfaces

Fibre Channel over Ethernet (FCoE) allows Fibre Channel and Ethernet traffic to be carried on the same physical Ethernet connection between the switch and the servers.

The Fibre Channel portion of FCoE is configured as a virtual Fibre Channel interface. Logical Fibre Channel features (such as interface mode) can be configured on virtual Fibre Channel interfaces.

A virtual Fibre Channel (vfc) interface must be bound to an interface before it can be used. The binding is to a physical Ethernet interface when the converged network adapter (CNA) is directly connected to the switch or port channel when the CNA connects to the Fibre Channel Forwarder (FCF) over a virtual port channel (vPC).

## VF Port

A virtual fabric (VF) port in an FCoE network acts as a fabric port that connects to a peripheral device (host or disk) operating as an N port. A VF port can be attached to only one N port.

## VE Port

A virtual expansion (VE) port acts as an expansion port in an FCoE network. VE ports can connect multiple FCoE switches together in the network. You can bind a VE port to a physical ethernet port or a port channel.

Traffic is load balanced across equal cost E\_Ports and VE\_Ports based on SID, DID, and OXID. Traffic across members of a port channel that a VE\_Port is bound to is load balanced based on SID, DID, and OXID.

## VNP Ports

Connectivity from an FCoE NPV bridge to the FCF is supported only over point-to-point links. These links can be individual Ethernet interfaces or port channel interfaces. For each FCF connected to an Ethernet/port-channel interface, a vFC interface must be created and bound to it. These vFC interfaces must be configured as VNP ports.

On the VNP port, the FCoE NPV bridge emulates an FCoE-capable host with multiple FCoE nodes (ENodes), each with a unique ENodes MAC address. 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.

## Default Settings for FCoE

This table lists the default settings for FCoE parameters.

**Table 1: Default FCoE Parameter Settings**

Parameters	Default
FCoE feature	Not installed, disabled
FC-Map	0E.FC.00
Fabric priority	128
Advertisement interval	8 seconds

# Guidelines and Limitations

## Configuring Virtual Interfaces

### Mapping a VSAN to a VLAN

A unique, dedicated VLAN must be configured at every converged access switch to carry traffic for each virtual fabric (VSAN) in the SAN (for example, VLAN 1002 for VSAN 10, VLAN 1003 for VSAN 2, and so on). If you enable MST, you must use a separate Multiple Spanning Tree (MST) instance for FCoE VLANs.

#### Before You Begin

- Ensure you have installed the correct license for FCoE.
- Ensure you have enabled FCoE.

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#### Step 1 **configure terminal**

**Example:**

```
switch# configure terminal
switch(config)#
Enters configuration mode.
```

#### Step 2 **vsan database**

**Example:**

```
switch(config)# vsan database
switch(config-vsan-db)#
Enters VSAN database configuration mode.
```

#### Step 3 **vsan vsan-id**

**Example:**

```
switch(config-vsan-db)# vsan 200
Defines the VSAN. The VSAN number range is from 1 to 4094.
```

#### Step 4 **vlan vlan-id**

**Example:**

```
switch(config-vsan-db)# vlan 200
switch(config-vlan)#
Enters VLAN configuration mode. The VLAN number range is from 1 to 4096.
```

#### Step 5 **fcoe [vsan vsan-id]**

**Example:**

```
switch(config-vlan)# fcoe vsan 200
```

Enables FCoE for the specified VLAN and configures the mapping from this VLAN to the specified VSAN. If you do not specify a VSAN number, a mapping is created from this VLAN to the VSAN with the same number.

**Step 6**    **exit****Example:**

```
switch(config-vlan)# exit
switch(config)#
```

**Step 7**    (Optional) **show vlan fcoe****Example:**

```
switch(config-vlan)# show vlan fcoe
```

Displays information about the FCoE configuration for a VLAN.

**Step 8**    (Optional) **copy running-config startup-config****Example:**

```
switch(config-vlan)# copy running-config startup-config
```

Copies the running configuration to the startup configuration.

---

This example shows how to map VLAN 200 to VSAN 200 on a Cisco MDS 9000 Series Switch:

```
switch(config)# vlan 200
switch(config-vlan)# fcoe vsan 200
```

## Creating a Virtual Fibre Channel Interface

To use FCoE, you must first create Virtual Fibre Channel (VFC) interfaces. Then, you must bind the VFC interfaces to physical interfaces before FCoE can be used.

### Before You Begin

- Ensure you have installed the correct license for FCoE.
- Ensure you have enabled FCoE.

**Step 1**    **configure terminal****Example:**

```
switch# configure terminal
switch(config)#
```

Enters configuration mode.

**Step 2**    **interface vfc vfc-id****Example:**

```
switch(config)# interface vfc 4
switch(config-if)#
```

Creates a virtual Fibre Channel interface (if it does not already exist) and enters interface configuration mode. The *vfc-id* range is from 1 to 8192.

**Step 3** `switchport mode mode`

**Example:**

```
switch(config-if)# switchport mode e
```

Configures the switchport mode for a virtual Fibre Channel interface. The *mode* is E or F. The default is F mode.

**Step 4** `bind {interface {ethernet slot/port | ethernet-port-channel number}}`

**Example:**

```
switch(config-if)# bind interface ethernet 1/4
```

Binds the virtual Fibre Channel interface to the specified interface. Use ? to see the supported interfaces and port channels. Use the **no** form of this command to unbind the virtual Fibre Channel interface from the specified interface.

**Step 5** (Optional) `show interface vfc`

**Example:**

```
switch(config-if)# show interface vfc
```

Displays information about the virtual Fibre Channel interfaces.

**Step 6** (Optional) `copy running-config startup-config`

**Example:**

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

Copies the running configuration to the startup configuration.

---

This example shows how to bind a virtual Fibre Channel interface to an Ethernet interface:

```
switch# configure terminal
switch(config)# interface vfc 4
switch(config-if)# bind interface ethernet 1/4
```

This example shows how to delete a virtual Fibre Channel interface:

```
switch# configure terminal
switch(config)# no interface vfc 4
```

## Creating a Virtual Fibre Channel Port Channel Interface

You can create a virtual Fibre Channel port channel interface that automatically binds to the port channel with the same interface number.

### Before You Begin

For the Cisco MDS 9700 switches, MDS 9500 switches, and MDS 9250i switch, ensure that you create the Ethernet port channel interface before you create the virtual Fibre Channel port channel interface.

---

**Step 1** `configure terminal`

**Example:**

```
switch# configure terminal
switch(config)#
Enters configuration mode.
```

**Step 2** **interface vfc-port-channel** *int-number***Example:**

```
switch(config)# interface vfc-port-channel 2
switch(config-if)#
```

Creates a virtual Fibre Channel interface (if it does not already exist) that is bound to the port channel with the same interface number and enters interface configuration mode.

The *int-number* range is from 257 to 4095.

The default switchport mode for this interface is E.

**Note** Starting from the MDS 9710, MDS 9700, MDS 9250i, and newer switches, we support only the Ethernet port channel or the channel group ID numbers ranging from 513 to 4096. However, we support ID numbers ranging from 257 to 4096 on the MDS Ethernet port channel.

**Step 3** **switchport mode** *mode***Example:**

```
switch(config-if)# switchport mode e
```

Configures the switchport mode for a virtual Fibre Channel interface. The *mode* is E or F. The default is F mode.

**Step 4** (Optional) **show interface vfc-port-channel** *int-number***Example:**

```
switch(config-if)# show interface vfc-port-channel 2
```

Displays information about the virtual Fibre Channel interfaces bound to port channel interfaces.

**Step 5** (Optional) **copy running-config startup-config****Example:**

```
switch(config)# copy running-config startup-config
[#####] 100%
Copy complete.
```

Copies the running configuration to the startup configuration.

**Step 6** (Optional) **show running-config interface vfcid/slot****Example:**

```
awitch# show running-config interface vfc-po540
!Command: show running-config interface vfc-po540
!Time: Fri Dec 2 15:36:07 2016
```

```
version 7.3(0)D1(1)
```

```
interface vfc-po540
bind interface ethernet-port-channel1540
switchport mode E
no shutdown
```

Displays the virtual Fibre Channel interface configuration information.

## Associating a Virtual Fibre Channel Interface to a VSAN

You must configure unique, dedicated VLAN at every converged access switch to carry traffic for each Virtual Fabric (VSAN) in the SAN (for example, VLAN 1002 for VSAN 1, VLAN 1003 for VSAN 2, and so on). If you enable MST, you must use a separate MST instance for FCoE VLANs.

### Before You Begin

---

#### Step 1 **configure terminal**

**Example:**

```
switch# configure terminal
switch(config)#
```

Enters configuration mode.

#### Step 2 **vsan database**

**Example:**

```
switch(config)# vsan database
switch(config-vsan-db)#
```

Enters VSAN configuration mode.

#### Step 3 (Optional) **vsan vsan-id**

**Example:**

```
switch(config-vsan-db)# vsan 2
```

Creates the VSAN. The *vsan-id* range is from 1 to 4094 and must map to a VLAN on the physical Ethernet interface that is bound to the virtual Fibre Channel interface.

#### Step 4 Enter one of the following commands:

- **vsan vsan-id interface vfc vfc-id**
- **vsan vsan-id interface vfc-port-channel vfc-id**

**Example:**

```
switch(config-vsan-db)# vsan 2 interface vfc 4
```

Configures the association between the VSAN and virtual Fibre Channel interface or virtual Fibre Channel port channel. The *vsan-id* range is from 1 to 4094 and must map to a VLAN on the physical Ethernet interface or port channel that is bound to the virtual Fibre Channel interface or virtual Fibre Channel port channel. The *vfc-id* range is from 1 to 8192. Use the **no** form of this command to disassociate the connection between the VSAN and virtual Fibre Channel interface or virtual Fibre Channel port channel.

#### Step 5 (Optional) **show vsan**

**Example:**

```
switch(config-vsan-db)# show vsan
```

Displays information about the VSAN.

#### Step 6 (Optional) **copy running-config startup-config**

**Example:**

```
switch(config-vsantdb)# copy running-config startup-config
```

Copies the running configuration to the startup configuration.

---

This example shows how to associate a virtual Fibre Channel interface to a VSAN:

```
switch# configure terminal
switch(config)# vsan database
switch(config-vsantdb)# vsan 2 interface vfc 4
```

## Enabling VE Loopback Configuration

The VFID check verifies that the VSAN configuration is correct on both ends of a VE link. You can turn off the VFID check for VE ports to allow VE loopback configuration between to VE ports on the same switch.

### Before You Begin

---

#### Step 1 configure terminal

**Example:**

```
fcoe# configure terminal
fcoe(config)#
```

Enters configuration mode.

#### Step 2 fcoe velloopback

**Example:**

```
fcoe(config)# fcoe velloopback
```

Enables the VFID check for all VE ports.

---

This example shows how to enable VE loopback for a Cisco MDS 9700 or MDS 9500, or an MDS 9250i switch:

```
switch# configure terminal
switch(config)# fcoe velloopback
```

## Verifying the Virtual Fibre Channel Interface

To display configuration information about virtual Fibre Channel interfaces, perform one of the following tasks:



Command	Purpose
<b>show interface vfc <i>vfc-id</i></b>	Displays the detailed configuration of the specified Fibre Channel interface.
<b>show interface brief</b>	Displays the status of all interfaces.
<b>show vlan fcoe</b>	Displays the mapping of FCoE VLANs to VSANs.

This example shows how to display a virtual Fibre Channel interface bound to an Ethernet interface:

```
switch# show interface vfc 3
vfc3 is up
  Bound interface is Ethernet1/37
  Hardware is Virtual Fibre Channel
  Port WWN is 20:02:00:0d:ec:6d:95:3f
  Admin port mode is F, trunk mode is on
  snmp link state traps are enabled
  Port mode is F, FCID is 0x490100
  Port vsan is 931
  1 minute input rate 0 bits/sec, 0 bytes/sec, 0 frames/sec
  1 minute output rate 0 bits/sec, 0 bytes/sec, 0 frames/sec
    0 frames input, 0 bytes
      0 discards, 0 errors
    0 frames output, 0 bytes
      0 discards, 0 errors
  Interface last changed at Thu May 21 04:44:42 2009
```

This example shows how to display the status of all the interfaces on the switch (some output has been removed for brevity):

```
switch# show interface brief
-----
Interface  Vsan    Admin  Admin  Status          SFP    Oper  Oper  Port
          Mode    Mode   Mode                                     Mode  Speed  Channel
          (Gbps)
-----
fc3/1      1       auto   on      trunking        swl    TE    2     --
fc3/2      1       auto   on      sfpAbsent       --     --    --    --
...
fc3/8      1       auto   on      sfpAbsent       --     --    --    --
-----
Interface          Status      IP Address      Speed      MTU      Port
                  Channel
-----
Ethernet1/1        hwFailure   --              --          1500     --
Ethernet1/2        hwFailure   --              --          1500     --
Ethernet1/3        up          --              10000      1500     --
...
Ethernet1/39       sfpIsAbsen --              --          1500     --
Ethernet1/40       sfpIsAbsen --              --          1500     --
-----
Interface          Status      IP Address      Speed      MTU
-----
mgmt0              up          172.16.24.41    100        1500
-----
Interface  Vsan    Admin  Admin  Status          SFP    Oper  Oper  Port
          Mode    Mode   Mode                                     Mode  Speed  Channel
          (Gbps)
-----
vfc 1      1       F      --     down            --     --    --    --
...

```

This example shows how to display the mapping between the VLANs and VSANs on the switch:

```
switch# show vlan fcoe
VLAN      VSAN      Status
-----
15        15        Operational
20        20        Operational
25        25        Operational
30        30        Non-operational
```

## Example: Mapping VSANs to VLANs

The following example shows how to configure the FCoE VLAN and a virtual Fibre Channel interface:

**Step 1** Enable the associated VLAN and map the VLAN to a VSAN.

```
switch(config)# vlan 200
switch(config-vlan)# fcoe vsan 200
switch(config-vlan)# exit
```

**Step 2** Configure the VLAN on a physical Ethernet interface.

```
switch# configure terminal
switch(config)# interface ethernet 1/4
switch(config-if)# spanning-tree port type edge trunk
switch(config-if)# switchport mode trunk
switch(config-if)# switchport trunk allowed vlan 1,200
switch(config-if)# exit
```

**Step 3** Create a virtual Fibre Channel interface and bind it to a physical Ethernet interface.

```
switch(config)# interface vfc 4
switch(config-if)# bind interface ethernet 1/4
```

**Note** By default, all virtual Fibre Channel interfaces reside on VSAN 1. If the VLAN to VSAN mapping is to a VSAN other than VSAN 1, then proceed to Step 4.

**Step 4** Associate the virtual Fibre Channel interface to the VSAN.

```
switch(config)# vsan database
switch(config-vsan)# vsan 200 interface vfc 4
switch(config-vsan)# exit
```

**Step 5** (Optional) Display membership information for the VSAN.

```
switch# show vsan 200 membership
vsan 200 interfaces
    vfc 4
```

**Step 6** (Optional) Display the interface information for the virtual Fibre Channel interface.

```
switch# show interface vfc 4

vfc4 is up
Bound interface is Ethernet1/4
Hardware is Virtual Fibre Channel
Port WWN is 20:02:00:0d:ec:6d:95:3f
Port WWN is 20:02:00:0d:ec:6d:95:3f
```

```

snmp link state traps are enabled
Port WWN is 20:02:00:0d:ec:6d:95:3f
APort WWN is 20:02:00:0d:ec:6d:95:3f
snmp link state traps are enabled
Port mode is F, FCID is 0x490100
Port vsan is 200
1 minute input rate 0 bits/sec, 0 bytes/sec, 0 frames/sec
1 minute output rate 0 bits/sec, 0 bytes/sec, 0 frames/sec
0 frames input, 0 bytes 0 discards, 0 errors
0 frames output, 0 bytes 0 discards, 0 errors
Interface last changed at Thu Mar 11 04:44:42 2010
    
```

## Verifying the FCoE Configuration

To display FCoE configuration information, perform one of these tasks in the context of storage VDC:

Command	Purpose
<b>show fcoe</b>	Displays whether FCoE is enabled on the switch.
<b>show fcoe database</b>	Displays the contents of the FCoE database.  <b>Note</b> This command is effective when interfaces are configured.
<b>show interface vfc [number]</b>	Displays information about the vFC interfaces.
<b>show interface [interface number] fcoe</b>	Displays the FCoE settings for an interface or all interfaces.

This example shows how to verify that the FCoE capability is enabled:

```

switch# show fcoe
Global FCF details
  FCF-MAC is 00:0d:ec:6d:95:00
  FC-MAP is 0e:fc:00
  FCF Priority is 128
  FKA Advertisement period for FCF is 8 seconds
    
```

This example shows how to display the FCoE database:

```

switch# show fcoe database
-----
INTERFACE          FCID          PORT NAME          MAC ADDRESS
-----
vfc3                0x490100      21:00:00:1b:32:0a:e7:b8 00:c0:dd:0e:5f:76
    
```

This example shows how to display the FCoE settings for an interface.

```
switch# show interface ethernet 1/37 fcoe
Ethernet1/37 is FCoE UP
  vfc3 is Up
    FCID is 0x490100
    PWWN is 21:00:00:1b:32:0a:e7:b8
    MAC addr is 00:c0:dd:0e:5f:76
```

## Additional References for FCoE

### Related Documents

Related Topic	Document Title
Command reference	<a href="#">Cisco NX-OS FCoE Command Reference Guide, Nexus 7000 and MDS 9500</a>
Configuration guide	<a href="#">Cisco MDS 9000 Series NX-OS Quality of Service Configuration Guide</a>
Cisco NX-OS licensing	<a href="#">Cisco MDS 9000 Series Licensing Guide</a>

### Standards and RFCs

Standard/RFC	Title
T11 FC BB-5	Fibre Channel Backbone 5

### MIBs

MIB	MIBs Link
	To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL:  <a href="http://www.cisco.com/go/mibs">http://www.cisco.com/go/mibs</a>

**Technical Assistance**

Description	Link
<p>The Cisco Support website provides extensive online resources, including documentation and tools for troubleshooting and resolving technical issues with Cisco products and technologies.</p> <p>To receive security and technical information about your products, you can subscribe to various services, such as the Product Alert Tool (accessed from Field Notices), the Cisco Technical Services Newsletter, and Really Simple Syndication (RSS) Feeds.</p> <p>Access to most tools on the Cisco Support website requires a Cisco.com user ID and password.</p>	<p><a href="http://www.cisco.com/support">http://www.cisco.com/support</a></p>

