Configuring FCoE VLANs and Virtual Interfaces

This chapter contains the following sections:

Information About Virtual Interfaces

Cisco Nexus devices support Fibre Channel over Ethernet (FCoE), which 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 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 Cisco Nexus device), a MAC address (when the CNA is remotely connected over a Layer 2 bridge), or an EtherChannel when the CNA connects to the Fibre Channel Forwarder (FCF) over a virtual port channel (vPC).

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.

On the Cisco Nexus 9000 Series switches, traffic across members of a port channel that a VE_Port is bound to is load balanced based on SID, DID, and OXID.

In order to enable all links to be used in the port-channel for FCoE traffic, enter the **port-channel load-balance ethernet** *source-dest-port* command to configure 'port-channel load balancing' to 'source-dest-port'. The configuration 'source-destination-oxid' load balancing is used for FCoE traffic.

Guidelines and Limitations for FCoE VLANs and Virtual Interfaces

FCoE VLANs and Virtual Fiber Channel (vFC) interfaces have these guidelines and limitations:

- Each vFC interface must be bound to an FCoE-enabled Ethernet or EtherChannel interface or to the MAC address of a remotely connected adapter. FCoE is supported on 10-Gigabit, 25-Gigabit, 40-Gigabit, and 100-Gigabit Ethernet interfaces.

- A virtual Fibre Channel 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 Cisco Nexus device), a MAC address (when the CNA is remotely connected over a Layer 2 bridge), or an EtherChannel.

- The Ethernet or EtherChannel interface that you bind to the vFC interface must be configured as follows:

    - The Ethernet or EtherChannel interface must be a trunk port (use the **switchport mode trunk** command).

    - The FCoE VLAN that corresponds to a vFC's VSAN must be in the allowed VLAN list.

    - Set the MTU 9216 and QoS polices to the interface. You can use default (service-policy type qos input default-fcoe-in-policy) or custom QoS policies.

    - You must not configure an FCoE VLAN as the native VLAN of the trunk port.

Note The native VLAN is the default VLAN on a trunk. Any untagged frames transit the trunk as native VLAN traffic.

    - You should use an FCoE VLAN only for FCoE.

    - Do not use the default VLAN, VLAN1, as an FCoE VLAN.

    - You must configure the Ethernet interface as PortFast (use the **spanning-tree port type edge trunk** command).

Note You are not required to configure trunking on the server interface even if the switch interface is configured with trunking enabled. All non-FCoE traffic from the server is passed on the native VLAN.

- The vFC interface can be bound to Ethernet port channels with multiple member ports connected to FCoE Initialization Protocol (FIP) snooping bridges.

- Each vFC interface is associated with only one VSAN.

- You must map any VSAN with associated vFC interfaces to a dedicated FCoE-enabled VLAN.

- FCoE is not supported on private VLANs.

- If the converged access switches (in the same SAN fabric or in another) need to be connected to each other over Ethernet links for a LAN alternate path, then you must explicitly configure such links to exclude all FCoE VLANs from membership.

- You must use separate FCoE VLANs for FCoE in SAN-A and SAN-B fabrics.

- FCoE connectivity to pre-FIP CNAs over virtual port channels (vPCs) is not supported.

- The maximum number of vFCs that can be bound to a port-channel is 48.

- The maximum number of vFCs that can be bound to a port-channel is 48 (24 for the Nexus 6001).

Note   Virtual interfaces are created with the administrative state set to down. You must explicitly configure the administrative state to bring the virtual interface into operation.

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 VSAN in the SAN (for example, VLAN 1002 for VSAN 1, VLAN 1003 for VSAN 2, and so on). If Multiple Spanning Tree (MST) is enabled, a separate MST instance must be used for FCoE VLANs.

SUMMARY STEPS

1. switch# **configure terminal**
2. switch(config)# **vlan** *vlan-id*
3. switch(config-vlan)# **fcoe** [**vsan** *vsan-id*]
4. switch(config-vlan)# **exit**
5. (Optional) switch(config)# **show vlan fcoe**
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)# **vlan** *vlan-id*	Enters VLAN configuration mode. The VLAN number range is from 1 to 4096.
Step 3	switch(config-vlan)# **fcoe** [**vsan** *vsan-id*]	Enables FCoE for the specified VLAN. If you do not specify a VSAN number, a mapping is created from this VLAN to the VSAN with the same number. Configures the mapping from this VLAN to the specified VSAN.

	Command or Action	Purpose
Step 4	switch(config-vlan)# **exit**	Exits VLAN configuration mode. You must exit this mode to execute the configured commands on your Cisco Nexus device.
Step 5	(Optional) switch(config)# **show vlan fcoe**	Displays information about the FCoE configuration for a VLAN.
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.

Example

This example shows how to map VLAN 200 to VSAN 2:

```
switch(config)# vlan 200
switch(config-vlan)# fcoe vsan 2
```

Creating a Virtual Fibre Channel Interface

You can create a virtual Fibre Channel interface. You must bind the virtual Fibre Channel interface to a physical interface before it can be used.

SUMMARY STEPS

1. switch# **configure terminal**
2. switch(config)# **interface vfc** *vfc-id*
3. switch(config-if)# **bind** {**interface** {**ethernet** *slot*/*port* | **port-channel** *channel-number*} | **mac-address** *MAC-address*}
4. (Optional) switch(config-if)# **no bind** {**interface** {**ethernet** *slot*/*port* | **port-channel** *channel-number*} | **mac-address** *MAC-address*}
5. (Optional) switch(config)# **no interface vfc** *vfc-id*

DETAILED STEPS

	Command or Action	Purpose
Step 1	switch# **configure terminal**	Enters global configuration mode.
Step 2	switch(config)# **interface vfc** *vfc-id*	Creates a virtual Fibre Channel interface (if it does not already exist) and enters interface configuration mode.
		The virtual Fibre Channel interface ID range is from 1 to 8192.
Step 3	switch(config-if)# **bind** {**interface** {**ethernet** *slot*/*port*	**port-channel** *channel-number*}	**mac-address** *MAC-address*}	Binds the virtual Fibre Channel interface to the specified interface.

	Command or Action	Purpose
		Note If this is a 10G breakout port, the *slot*/*port* syntax is *QSFP-module*/*port*.
Step 4	(Optional) switch(config-if)# **no bind** {**interface** {**ethernet** *slot*/*port* | **port-channel** *channel-number*} | **mac-address** *MAC-address*}	Unbinds the virtual Fibre Channel interface from the specified interface.
		Note If this is a 10G breakout port, the *slot*/*port* syntax is *QSFP-module*/*port*.
Step 5	(Optional) switch(config)# **no interface vfc** *vfc-id*	Deletes a virtual Fibre Channel interface.

Example

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 bind a virtual Fibre Channel interface to a Cisco Nexus 2232PP Fabric Extender (FEX) Ethernet interface:

```
switch# configure terminal
switch(config)# interface vfc 1001
switch(config-if)# bind interface ethernet 100/1/1
```

This example shows how to bind a virtual Fibre Channel interface to port-channel.:

```
switch# configure terminal
switch(config)# interface vfc 3
switch(config-if)# bind interface port-channel 1
```

This example shows how to bind a virtual Fibre Channel interface on a Cisco Nexus device 2232PP FEX to create a vPC:

```
switch# configure terminal
switch(config)# interface vfc 1001
switch(config-if)# bind interface ethernet 100/1/1
```

✎

Note   An error message is displayed if you attempt to bind the interface to a Cisco Nexus FEX that does not support FCoE.

This example shows how to bind a virtual Fibre Channel interface to a MAC address:

```
switch# configure terminal
switch(config)# interface vfc 2
switch(config-if)# bind mac-address 00:0a:00:00:00:36
```

This example shows how to bind a virtual Fibre Channel interface to a Cisco Nexus 2232PP FEX MAC address:

```
switch# configure terminal
switch(config)# interface vfc 1001
switch(config-if)# bind mac-address 00:01:0b:00:00:02
```

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

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

This example shows how to unbind a virtual Fibre Channel interface from an ethernet interface:

```
switch# configure terminal
switch(config)# int vfc17
switch(config-if)# no bind interface ethernet 1/17
switch(config-if)# exit
```

Configuring vFC Interface

The following steps show how to configure vPC interface to a member port of a multi-member port-channel.

Note   You can un-configure a 4-port vPC only after removing member ports from port-channel. You can un-configure only on a single member port-channel.

SUMMARY STEPS

1. Create a multi-member port-channel.
2. Add individual member port to a multi-member port-channel.
3. Associate vPC to a member port of a multi-member port-channel.

DETAILED STEPS

Step 1   Create a multi-member port-channel.

```
switch(config-vlan)#  interface port-channel 500
```

```
switch(config-vlan)# [no]fcoe multi-vfc
```

Step 2   Add individual member port to a multi-member port-channel.

```
switch(config-vlan)# interface ethernet 100/1/1
```

```
switch(config-vlan)# channel-group 500
```

```
switch (config)# interface ethernet 100/1/2
```

```
switch(config-if)# channel-group 500
```

Step 3   Associate vPC to a member port of a multi-member port-channel.

```
switch(config)#  interface vfc 10011
```

```
switch(config-vlan)# bind interface ethernet 100/1/1
```

```
switch(config-vlan)#  interface vfc 10012
```

```
switch (config)#  bind interface ethernet 100/1/2
```

Associating a Virtual Fibre Channel Interface to a VSAN

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 1, VLAN 1003 for VSAN 2, and so on). If MST is enabled, a separate MST instance must be used for FCoE VLANs.

SUMMARY STEPS

1. switch# **configure terminal**
2. switch(config)# **vsan database**
3. switch(config-vsan)# **vsan** *vsan-id* **interface vfc** *vfc-id*
4. (Optional) switch(config-vsan)# **no vsan** *vsan-id* **interface vfc** *vfc-id*

DETAILED STEPS

	Command or Action	Purpose
Step 1	switch# **configure terminal**	Enters global configuration mode.
Step 2	switch(config)# **vsan database**	Enters VSAN configuration mode.
Step 3	switch(config-vsan)# **vsan** *vsan-id* **interface vfc** *vfc-id*	Configures the association between the VSAN and virtual Fibre Channel interface. The VSAN number must map to a VLAN on the physical Ethernet interface that is bound to the virtual Fibre Channel interface.
Step 4	(Optional) switch(config-vsan)# **no vsan** *vsan-id* **interface vfc** *vfc-id*	Disassociates the connection between the VSAN and virtual Fibre Channel interface.

Example

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

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

Creating an Implicit Virtual Fibre Channel Port Channel Interface

You can create a virtual Fibre Channel (vFC), and implicitly bind it to an Ethernet interface or a port-channel using a single command. For this, the vFC identifier must match the Ethernet interface or port-channel identifier. The Ethernet interface can be a module (slot or port) interface (slot/QSFP-module/port).

> ✎
>
> | Note | You cannot create an implicit vFC in a breakout port. |

Configuring virtual Fibre Channel Interface

Before you begin

- Ensure you have installed the correct license for FCoE.

- Ensure you have enabled FCoE.

Step 1 Enter global configuration mode:

switch# **configure terminal**

Step 2 Create a VFC (if it does not already exist):

Additionally, *vfc slot/port* binds the vFC to an Ethernet *slot/port* interface. The vFC *slot/QSFP-module/port* binds the vFC to a breakout interface.

switch(config) # **interface vfc** {id | *slot/port* | *slot/QSFP-module/port* }

Step 3 Bring up the vFC interface:

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

Step 4 Required: Exit the interface configuration mode:

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

Configuring virtual Fibre Channel Interface

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

```
switch# configure terminal
switch(config)# interface eth1/11
switch(config-if)# switchport mode trunk
switch(config-if)# mtu 9216
switch(config-if)# service-policy type qos input default-fcoe-in-policy
switch(config-if)# no shutdown

switch(config)# interface vfc1/11
switch(config-if)# no shutdown
switch(config-if)# exit
switch(config)#

switch(config)# vsan database
switch(config-vsan-db)# vsan 10
switch(config-vsan-db)# exit
switch(config)#

switch(config)# vlan 10
switch(config-vlan)# fcoe vsan 10
switch(config-vlan)# exit
switch(config)#
```

```
switch(config)# vsan database
switch(config-vsan-db)# vsan 10 interface vfc1/11
switch(config-vsan-db)# exit
switch(config)#
switch(config)# show interface vfc1/11
vfc1/11 is trunking (Not all VSANs UP on the trunk)
Bound interface is Ethernet1/11
Hardware is Ethernet
Port WWN is 20:0b:00:de:fb:9d:0e:a0
Admin port mode is F, trunk mode is on
snmp link state traps are enabled
Port mode is TF
Port vsan is 10
Operating Speed is 10 Gbps
Admin Speed is auto
Trunk vsans (admin allowed and active) (1,10)
Trunk vsans (up) (10)
Trunk vsans (isolated) ()
Trunk vsans (initializing) (1)
11 fcoe in packets
1692 fcoe in octets
0 fcoe out packets
0 fcoe out octets
Interface last changed at Mon Dec 16 09:03:33 2019

switch(config)#
```

Configuring virtual Fibre Channel – Port Channel Interface

Step 1   Enter global configuration mode:

switch# **configure terminal**

Step 2   Create a vFC that implicitly binds to the Ethernet port-channel based on its number:

The port number range is from 1 to 4096.

switch(config) # **interface vfc-port-channel** *port number*

Step 3   Bring up the vFC port:

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

Step 4   Required: Exit from the current interface configuration mode:

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

Configuring virtual Fibre Channel - Port Channel Interface

The example shows how you can create a vFC-port-channel that implicitly binds to Ethernet port-channel:

```
switch# configure terminal
switch(config)# interface port-channel 10
switch(config-if)# switchport
switch(config-if)# switchport mode trunk
```

```
switch(config-if)# mtu 9216
switch(config-if)# service-policy type qos input default-fcoe-in-policy
switch(config-if)# no shutdown
switch(config-if)# exit

switch(config)# interface eth1/49
switch(config-if)# channel-group 10 force
switch(config-if)# no shutdown
switch(config-if)# exit

switch# configure terminal
switch(config)# interface vfc-port-channel 10
switch(config-if)# no shutdown
switch(config-if)# exit

switch(config)# vlan 10
switch(config-vlan)# fcoe vsan 10
switch(config-vlan)# exit
switch(config)#

switch(config)# vsan database
switch(config-vsan-db)# vsan 10 interface vfc-port-channel 10
switch(config-vsan-db)# exit

switch(config)# show interface vfc-port-channel 10
vfc-po10 is trunking (Not all VSANs UP on the trunk)
Bound interface is port-channel10
Hardware is Ethernet
Port WWN is 25:1b:00:de:fb:9d:0e:a0
Admin port mode is F, trunk mode is on
snmp link state traps are enabled
Port mode is TF
Port vsan is 10
Operating Speed is 40 Gbps
Admin Speed is auto
Trunk vsans (admin allowed and active) (1,10)
Trunk vsans (up) (10)
Trunk vsans (isolated) ()
Trunk vsans (initializing) (1)
11 fcoe in packets
1236 fcoe in octets
0 fcoe out packets
0 fcoe out octets
Interface last changed at Mon Dec 16 08:56:13 2019
```

Verifying the Virtual Interface

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

Command	Purpose
switch# **show interface vfc** *vfc-id*	Displays the detailed configuration of the specified Fibre Channel interface.
switch# **show interface brief**	Displays the status of all interfaces.
switch# **show vlan fcoe**	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 11

vfc11 is trunking (Not all VSANs UP on the trunk)


Bound interface is Ethernet1/11
Hardware is Ethernet
Port WWN is 20:0a:00:de:fb:9d:0e:df
Admin port mode is F, trunk mode is on
snmp link state traps are enabled
Port mode is TF
Port vsan is 10
Operating Speed is 10 Gbps
Admin Speed is auto
Trunk vsans (admin allowed and active) (1,10)
Trunk vsans (up) (10)
Trunk vsans (isolated) ()
Trunk vsans (initializing) (1)
2 fcoe in packets
152 fcoe in octets
0 fcoe out packets
0 fcoe out octets
Interface last changed at Wed Dec 18 10:36:58 2019
```

This example shows how to display a virtual Fibre Channel interface bound to a MAC address:

```
switch# show interface vfc 11


vfc11 is trunking (Not all VSANs UP on the trunk)
Bound MAC is 0090.faf8.7513
Hardware is Ethernet
Port WWN is 20:0a:00:de:fb:9d:0e:df
Admin port mode is F, trunk mode is on
snmp link state traps are enabled
Port mode is TF
Port vsan is 10
Operating Speed is 10 Gbps
Admin Speed is auto
Trunk vsans (admin allowed and active) (1,10)
Trunk vsans (up) (10)
Trunk vsans (isolated) ()
Trunk vsans (initializing) (1)
3 fcoe in packets
228 fcoe in octets
0 fcoe out packets
0 fcoe out octets
Interface last changed at Mon Dec 16 09:09:02 2019
```

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


--------------------------------------------------------------------------------
Port VRF Status IP Address Speed MTU
--------------------------------------------------------------------------------
mgmt0 -- up 9.9.9.9 1000 1500
--------------------------------------------------------------------------------
Ethernet VLAN Type Mode Status Reason Speed Port
Interface Ch #
--------------------------------------------------------------------------------
Eth1/1 1 eth trunk up none 100G(D) 1
Eth1/2 1 eth trunk up none 100G(D) 1
```

```
Eth1/3 -- eth routed down Administratively down auto(D) --
Eth1/4 -- eth routed down XCVR not inserted auto(D) --
Eth1/5 -- eth routed down Administratively down auto(D) --
Eth1/6 -- eth routed down Administratively down auto(D) --
Eth1/7 1 eth trunk up none 40G(D) 601
Eth1/8 -- eth routed down XCVR not inserted auto(D) --
Eth1/14 -- eth routed down XCVR not inserted auto(D) --
Eth1/16 -- eth routed down XCVR not inserted auto(D) --
Eth1/17 -- eth routed down XCVR not inserted auto(D) --
Eth1/18/1 1 eth trunk up none 10G(D) 181
Eth1/18/2 1 eth trunk up none 10G(D) 560
Eth1/18/3 1 eth trunk up none 10G(D) 560
Eth1/18/4 1 eth trunk up none 10G(D) 560
Eth1/19 -- eth routed down Administratively down auto(D) --
Eth1/20 -- eth routed down Administratively down auto(D) --
Eth1/21 -- eth routed down XCVR not inserted auto(D) --
Eth1/22 -- eth routed down XCVR not inserted auto(D) --
Eth1/23 -- eth routed down XCVR not inserted auto(D) --
Eth1/24 -- eth routed down XCVR not inserted auto(D) --
Eth1/25 1 eth trunk up none 100G(D) 2500
Eth1/26 1 eth trunk up none 40G(D) 26
Eth1/27 -- eth routed down XCVR not inserted auto(D) --
Eth1/28 -- eth routed down XCVR not inserted auto(D) --
Eth1/29 -- eth routed down XCVR not inserted auto(D) --
Eth1/31 1 eth trunk up none 40G(D) 559
Eth1/32 -- eth routed down XCVR not inserted auto(D) --
Eth1/33 -- eth routed down XCVR not inserted auto(D) --
Eth1/34 -- eth routed down XCVR not inserted auto(D) --
Eth1/35 -- eth routed down Administratively down auto(D) --
Eth1/36/1 -- eth routed down Administratively down auto(D) --
Eth1/36/2 -- eth routed down Administratively down auto(D) --
Eth1/36/3 -- eth routed down Administratively down auto(D) --
Eth1/36/4 -- eth routed down Administratively down auto(D) --

--------------------------------------------------------------------------------------------
Port-channel VLAN Type Mode Status Reason Speed Protocol
Interface
--------------------------------------------------------------------------------------------
Po1 1 eth trunk up none a-100G(D) lacp
Po26 1 eth trunk up none a-40G(D) none
Po181 1 eth trunk up none a-10G(D) none
Po559 1 eth trunk up none a-40G(D) none
Po560 1 eth trunk up none a-10G(D) none
Po601 1 eth trunk up none a-40G(D) none
Po2500 1 eth trunk up none a-100G(D) none

------------------------------------------------------------------------------
Interface Vsan Admin Admin Status SFP Oper Oper Port
Mode Trunk Mode Speed Channel
Mode (Gbps)
------------------------------------------------------------------------------
fc1/9/1 1 E on trunking swl TE 8 224
fc1/9/2 1 E on trunking swl TE 8 224
fc1/9/3 1 E on trunking swl TE 8 224
fc1/9/4 1 E on trunking swl TE 8 224
fc1/10/1 1 E on trunking swl TE 8 224
fc1/10/2 1 E on trunking swl TE 8 224
fc1/10/3 1 E on trunking swl TE 8 224
fc1/10/4 1 E on trunking swl TE 8 224
fc1/11/1 1 E on trunking swl TE 8 224
fc1/11/2 1 E on trunking swl TE 8 224
fc1/11/3 1 E on trunking swl TE 8 224
fc1/11/4 1 E on trunking swl TE 8 224
fc1/12/1 1 auto on down swl -- -- --
```

```
fc1/12/2 1 auto on down swl -- -- --
fc1/12/3 1 auto on down swl -- -- --
fc1/12/4 1 auto on down swl -- -- --
fc1/13/1 1 E on trunking swl TE 8 225
fc1/13/2 1 E on trunking swl TE 8 225
fc1/13/3 1 E on trunking swl TE 8 225
fc1/13/4 1 E on trunking swl TE 8 225
fc1/15/1 501 auto off up swl F 32 --
fc1/15/2 501 F on trunking swl TF 32 114
fc1/15/3 501 F off up swl F 32 --
fc1/15/4 1 F on trunking swl TF 32 118
fc1/30/1 1 E off notConnected swl -- -- --
fc1/30/2 1 E off notConnected swl -- -- --
fc1/30/3 1 E on trunking swl TE 32 --
fc1/30/4 1 E on notConnected swl -- -- --


--------------------------------------------------------------------------------
Interface Vsan Admin Status Oper Oper IP
Trunk Mode Speed Address
Mode (Gbps)
--------------------------------------------------------------------------------
san-port-channel114 501 on trunking TF 32 --
san-port-channel118 1 on trunking TF 32 --
san-port-channel224 1 on trunking TE 88 --
san-port-channel225 1 on trunking TE 32 --


--------------------------------------------------------------------------------
Interface Vsan Admin Admin Status Bind Oper Oper
Mode Trunk Info Mode Speed
Mode (Gbps)
--------------------------------------------------------------------------------
vfc1 501 F on trunking Ethernet1/26 TF 40
vfc2 501 F on trunking e02f.6d08.cda9 TF auto
vfc560 1 F on trunking port-channel560 TF 30
vfc1/25 501 F on trunking Ethernet1/25 TF 100


--------------------------------------------------------------------------------
Interface Vsan Admin Admin Status Bind Oper Oper
Mode Trunk Info Mode Speed
Mode (Gbps)
--------------------------------------------------------------------------------
vfc-po559 1 F on trunking port-channel559 TF 40
vfc-po601 501 F on trunking port-channel601 TF 40
```

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
```

Mapping VSANs to VLANs Example Configuration

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

SUMMARY STEPS

1. Enable the associated VLAN and map the VLAN to a VSAN.
2. Configure the VLAN on a physical Ethernet interface.
3. Create a virtual Fibre Channel interface and bind it to a physical Ethernet interface.
4. Associate the virtual Fibre Channel interface to the VSAN.
5. (Optional) Display membership information for the VSAN.
6. (Optional) Display the interface information for the virtual Fibre Channel interface.

DETAILED STEPS

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

```
switch(config)# vlan 200
switch(config-vlan)# fcoe vsan 2
switch(config-vlan)# exit
```

Step 2 Configure the VLAN on a physical Ethernet interface.

```
switch(config)# interface eth1/11
switch(config)# spanning-tree port type edge trunk
switch(config-if)# switchport mode trunk
switch(config-if)# switchport trunk allowed vlan 1,200
switch(config-if)# mtu 9216
switch(config-if)# service-policy type qos input default-fcoe-in-policy
switch(config-if)# exit
```

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

```
switch(config)# interface vfc 11
switch(config-if)# bind interface ethernet 1/4
switch(config-if)# no shutdown
switch(config-if)# exit
```

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-db)# vsan 2
switch(config-vsan-db)# vsan 2 interface vfc 11
switch(config-vsan)# exit
```

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

```
switch# show vsan 2 membership
vsan 2 interfaces
          vfc 11
```

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

```
switch# show interface vfc 11

vfc11 is trunking (Not all VSANs UP on the trunk)
Bound interface is Ethernet1/11
Hardware is Ethernet
Port WWN is 20:0a:00:de:fb:9d:0e:df
Admin port mode is F, trunk mode is on
snmp link state traps are enabled
Port mode is TF
Port vsan is 2
Operating Speed is 10 Gbps
Admin Speed is auto
Trunk vsans (admin allowed and active) (1-2,10)
Trunk vsans (up) (2)
Trunk vsans (isolated) ()
Trunk vsans (initializing) (1,10)
2 fcoe in packets
152 fcoe in octets
0 fcoe out packets
0 fcoe out octets
Interface last changed at Mon Dec 16 09:22:25 2019
```
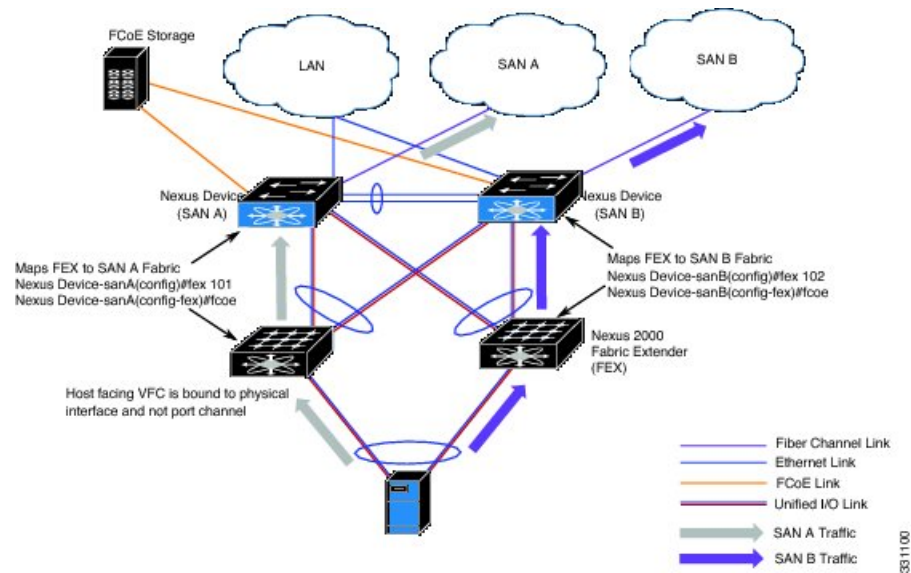
FCoE over Enhanced vPC

Although Ethernet traffic is dual homed between a FEX and a switch pair in an enhanced vPC topology, FCoE traffic must be single-homed to maintain SAN isolation. Therefore, while enhanced vPC supports FCoE, a single homed FEX topology can be a better choice when SAN isolation and high FCoE bandwidth are required.

Consider the following disadvantages of enhanced vPC for a single-homed topology:

- A typical SAN network maintains two fabrics, SAN A and SAN B, with traffic isolated between the two. In an enhanced vPC topology, each switch must be paired (single homed) with a FEX to ensure that FCoE traffic from one FEX is sent to only one switch, while Ethernet traffic is dual homed between each FEX and both switches. Because FCoE traffic from the FEX flows to only one switch while Ethernet traffic flows to both, the traffic load for the FEX uplinks is not evenly balanced.

- In a FEX with eight uplink ports, Ethernet traffic can use all eight ports, while the single-homed FCoE traffic is limited by this topology to using only four of those ports, restricting the maximum bandwidth available for FCoE. As a further restriction, the default QoS template for the shared link allocates only half the link bandwidth to FCoE traffic, with the other half allocated to Ethernet traffic.

- In an enhanced vPC topology with FCoE, the host vPC is limited to two ports, one to each FEX.

The following figure shows the FCoE traffic flow in a system with two Cisco Nexus 2000 FEXs, each associated with a different Cisco Nexus device.

Figure 1: FCoE over Enhanced vPC

Configuring FCoE over Enhanced vPC

FCoE traffic must be single homed to maintain SAN isolation. You must first associate a FEX with only one switch. When the FEX and switch are associated, you can then create a virtual Fibre Channel (vFC) interface and bind it to a port.

After pairing the FEX and switch on the first peer, you repeat the configuration on the second peer using a different port number to ensure SAN traffic isolation. The different configuration will not cause a consistency error because the FCoE portion of the enhanced vPC configuration is not subject to the vPC consistency check.

Before you begin

Review the limitations in FCoE over Enhanced vPC, on page 15.

SUMMARY STEPS

1. switch# **configure terminal**
2. switch(config) # **fex** *fex-chassis_ID*
3. switch(config-fex) # **fcoe**
4. switch(config-fex) # **interface vfc** *vfc-id*
5. switch(config-if) # **bind interface ethernet** [*fex-chassis-ID/*]*slot*/*port*
6. switch(config-if) # **no shutdown**
7. (Optional) switch(config-if) # **end**
8. (Optional) switch(config)# **copy running-config startup-config**

DETAILED STEPS

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

	Command or Action	Purpose
Step 2	switch(config) # **fex** *fex-chassis_ID*	Enters configuration mode for the specified FEX.
		The range for *fex-chassis_ID* is from 100 to 199.
Step 3	switch(config-fex) # **fcoe**	Configures the FEX to send FCoE traffic only to this switch.
Step 4	switch(config-fex) # **interface vfc** *vfc-id*	Enters configuration mode for the virtual Fibre Channel interface. If the interface does not already exist, this command also creates that interface.
		The range of *vfc-id* is from 1 to 8192.
Step 5	switch(config-if) # **bind interface ethernet** [*fex-chassis-ID*/]*slot*/*port*	Binds the vFC interface to the specified physical Ethernet interface.
		The range for *fex-chassis_ID* is from 100 to 199. The *slot* must be 1. For FCoE, the range for *port* is from 1 to 32.
		Note If this is a 10G breakout port, the *slot*/*port* syntax is *QSFP-module*/*port*.
Step 6	switch(config-if) # **no shutdown**	Returns the interface to its default operational state.
Step 7	(Optional) switch(config-if) # **end**	Return to privileged EXEC mode.
Step 8	(Optional) switch(config)# **copy running-config startup-config**	Saves the change persistently through reboots and restarts by copying the running configuration to the startup configuration.

Example

This example shows how to pair each FEX to a switch for FCoE traffic:

```
nexus5000-sanA# configure terminal
nexus5000-sanA(config) # fex 101
nexus5000-sanA(config-fex) # fcoe
nexus5000-sanA(config-fex) # interface vfc 1
nexus5000-sanA(config-if) # bind interface ethernet 101/1/1
nexus5000-sanA(config-if) # no shutdown
nexus5000-sanA(config-if) # end
nexus5000-sanA# copy running-config startup-config
nexus5000-sanA#

nexus5000-sanB# configure terminal
nexus5000-sanB(config) # fex 102
nexus5000-sanB(config-fex) # fcoe
nexus5000-sanB(config-fex) # interface vfc 1
nexus5000-sanB(config-if) # bind interface ethernet 102/1/1
nexus5000-sanB(config-if) # no shutdown
nexus5000-sanB(config-if) # end
nexus5000-sanB# copy running-config startup-config
nexus5000-sanB#

nexus5500-sanA# configure terminal
nexus5500-sanA(config) # fex 101
```

```
nexus5500-sanA(config-fex) # fcoe
nexus5500-sanA(config-fex) # interface vfc 1
nexus5500-sanA(config-if) # bind interface ethernet 101/1/1
nexus5500-sanA(config-if) # no shutdown
nexus5500-sanA(config-if) # end
nexus5500-sanA# copy running-config startup-config
nexus5500-sanA#

nexus5500-sanB# configure terminal
nexus5500-sanB(config) # fex 102
nexus5500-sanB(config-fex) # fcoe
nexus5500-sanB(config-fex) # interface vfc 1
nexus5500-sanB(config-if) # bind interface ethernet 102/1/1
nexus5500-sanB(config-if) # no shutdown
nexus5500-sanB(config-if) # end
nexus5500-sanB# copy running-config startup-config
nexus5500-sanB#


nexus6000-sanA# configure terminal
nexus6000-sanA(config) # fex 101
nexus6000-sanA(config-fex) # fcoe
nexus6000-sanA(config-fex) # interface vfc 1
nexus6000-sanA(config-if) # bind interface ethernet 101/1/1
nexus6000-sanA(config-if) # no shutdown
nexus6000-sanA(config-if) # end
nexus6000-sanA# copy running-config startup-config
nexus6000-sanA#

nexus6000-sanB# configure terminal
nexus6000-sanB(config) # fex 102
nexus6000-sanB(config-fex) # fcoe
nexus6000-sanB(config-fex) # interface vfc 1
nexus6000-sanB(config-if) # bind interface ethernet 102/1/1
nexus6000-sanB(config-if) # no shutdown
nexus6000-sanB(config-if) # end
nexus6000-sanB# copy running-config startup-config
nexus6000-sanB#
```

SAN Boot with vPC

A Cisco Nexus Series switch can use SAN boot if one VFC interface is bound to a vPC member. You cannot bind multiple interfaces to multiple members.

- The FEX that contains the port assigned to the vPC must be associated with the Cisco Nexus switch.

- Only one VFC interface is bound to a vPC member. You cannot bind multiple interfaces to multiple members.

Note If you want to ensure backward compatibility for all previous configurations and supported topologies, you must configure the FEX in a straight-through FEX topology that does not use Enhanced vPC.

SAN Boot with vPC Configuration Example

In this example, virtual Fibre Channel interface 1 is bound to physical Ethernet interface 101/1/1 on Fabric A and on interface 102/1/1 on Fabric B. The interface is also associated with virtual port channel 1 on both fabrics.

```
nexus5000-sanA(config) # interface vfc 1
nexus5000-sanA(config-if) # bind interface eth 101/1/1
nexus5000-sanA(config) # interface eth 101/1/1
nexus5000-sanA(config-if) # channel-group 1 mode active
nexus5000-sanA(config-if) # interface port-channel 1
nexus5000-sanA(config-if) # vpc 1
nexus5000-sanA(config-if) #

nexus5000-sanB(config) # interface vfc 1
nexus5000-sanB(config-if) # bind interface eth 102/1/1
nexus5000-sanB(config) # interface eth 102/1/1
nexus5000-sanB(config-if) # channel-group 1 mode active
nexus5000-sanB(config-if) # interface port-channel 1
nexus5000-sanB(config-if) # vpc 1
nexus5000-sanB(config-if) #

nexus5500-sanA(config) # interface vfc 1
nexus5500-sanA(config-if) # bind interface eth 101/1/1
nexus5500-sanA(config) # interface eth 101/1/1
nexus5500-sanA(config-if) # channel-group 1 mode active
nexus5500-sanA(config-if) # interface port-channel 1
nexus5500-sanA(config-if) # vpc 1
nexus5500-sanA(config-if) #

nexus5500-sanB(config) # interface vfc 1
nexus5500-sanB(config-if) # bind interface eth 102/1/1
nexus5500-sanB(config) # interface eth 102/1/1
nexus5500-sanB(config-if) # channel-group 1 mode active
nexus5500-sanB(config-if) # interface port-channel 1
nexus5500-sanB(config-if) # vpc 1
nexus5500-sanB(config-if) #

nexus5600-sanA(config) # interface vfc 1
nexus5600-sanA(config-if) # bind interface eth 101/1/1
nexus5600-sanA(config) # interface eth 101/1/1
nexus5600-sanA(config-if) # channel-group 1 mode active
nexus5600-sanA(config-if) # interface port-channel 1
nexus5600-sanA(config-if) # vpc 1
nexus5600-sanA(config-if) #

nexus5600-sanB(config) # interface vfc 1
nexus5600-sanB(config-if) # bind interface eth 102/1/1
nexus5600-sanB(config) # interface eth 102/1/1
nexus5600-sanB(config-if) # channel-group 1 mode active
nexus5600-sanB(config-if) # interface port-channel 1
nexus5600-sanB(config-if) # vpc 1
nexus5600-sanB(config-if) #

nexus6000-sanA(config) # interface vfc 1
nexus6000-sanA(config-if) # bind interface eth 101/1/1
nexus6000-sanA(config) # interface eth 101/1/1
nexus6000-sanA(config-if) # channel-group 1 mode active
nexus6000-sanA(config-if) # interface port-channel 1
nexus6000-sanA(config-if) # vpc 1
nexus6000-sanA(config-if) #

nexus6000-sanB(config) # interface vfc 1
```

```
nexus6000-sanB(config-if) # bind interface eth 102/1/1
nexus6000-sanB(config) # interface eth 102/1/1
nexus6000-sanB(config-if) # channel-group 1 mode active
nexus6000-sanB(config-if) # interface port-channel 1
nexus6000-sanB(config-if) # vpc 1
nexus6000-sanB(config-if) #
```