# Configuring Virtual Port Channels

This chapter contains the following sections:

# Information About vPCs

## vPC Overview

A virtual port channel (vPC) allows links that are physically connected to two Cisco Nexus devices or Cisco Nexus Fabric Extenders to appear as a single port channel by a third device (see the following figure). The third device can be a switch, server, or any other networking device. You can configure vPCs in topologies that include Cisco Nexus devices connected to Cisco Nexus Fabric Extenders. A vPC can provide multipathing, which allows you to create redundancy by enabling multiple parallel paths between nodes and load balancing traffic where alternative paths exist.

You configure the EtherChannels by using one of the following:

- No protocol
- Link Aggregation Control Protocol (LACP)

When you configure the EtherChannels in a vPC—including the vPC peer link channel—each switch can have up to 16 active links in a single EtherChannel.

**Note** You must enable the vPC feature before you can configure or run the vPC functionality.

To enable the vPC functionality, you must create a peer-keepalive link and a peer-link under the vPC domain for the two vPC peer switches to provide the vPC functionality.

To create a vPC peer link you configure an EtherChannel on one Cisco Nexus device by using two or more Ethernet ports. On the other switch, you configure another EtherChannel again using two or more Ethernet ports. Connecting these two EtherChannels together creates a vPC peer link.

**Note** We recommend that you configure the vPC peer-link EtherChannels as trunks.

The vPC domain includes both vPC peer devices, the vPC peer-keepalive link, the vPC peer link, and all of the EtherChannels in the vPC domain connected to the downstream device. You can have only one vPC domain ID on each vPC peer device.

**Note** Always attach all vPC devices using EtherChannels to both vPC peer devices.

A vPC provides the following benefits:

- Allows a single device to use an EtherChannel across two upstream devices
- Eliminates Spanning Tree Protocol (STP) blocked ports
- Provides a loop-free topology
- Uses all available uplink bandwidth
- Provides fast convergence if either the link or a switch fails
- Provides link-level resiliency
- Assures high availability

# Terminology

## vPC Terminology

The terminology used in vPCs is as follows:

- vPC—combined EtherChannel between the vPC peer devices and the downstream device.
- vPC peer device—One of a pair of devices that are connected with the special EtherChannel known as the vPC peer link.
- vPC peer link—link used to synchronize states between the vPC peer devices.
- vPC member port—Interfaces that belong to the vPCs.
- vPC domain—domain that includes both vPC peer devices, the vPC peer-keepalive link, and all of the port channels in the vPC connected to the downstream devices. It is also associated to the configuration mode that you must use to assign vPC global parameters. The vPC domain ID must be the same on both switches.

- vPC peer-keepalive link—The peer-keepalive link monitors the vitality of a vPC peer Cisco Nexus device. The peer-keepalive link sends configurable, periodic keepalive messages between vPC peer devices.

  No data or synchronization traffic moves over the vPC peer-keepalive link; the only traffic on this link is a message that indicates that the originating switch is operating and running vPCs.

# Supported vPC Topologies

## Cisco Nexus Device vPC Topology

# vPC Domain

To create a vPC domain, you must first create a vPC domain ID on each vPC peer switch using a number from 1 to 1000. This ID must be the same on a set of vPC peer devices.

You can configure the EtherChannels and vPC peer links by using LACP or no protocol. When possible, we recommend that you use LACP on the peer-link, because LACP provides configuration checks against a configuration mismatch on the EtherChannel.

The vPC peer switches use the vPC domain ID that you configure to automatically assign a unique vPC system MAC address. Each vPC domain has a unique MAC address that is used as a unique identifier for the specific vPC-related operations, although the switches use the vPC system MAC addresses only for link-scope operations, such as LACP. We recommend that you create each vPC domain within the contiguous network with a unique domain ID. You can also configure a specific MAC address for the vPC domain, rather than having the Cisco NX-OS software assign the address.

The vPC peer switches use the vPC domain ID that you configure to automatically assign a unique vPC system MAC address. The switches use the vPC system MAC addresses only for link-scope operations, such as LACP or BPDUs. You can also configure a specific MAC address for the vPC domain.

We recommend that you configure the same VPC domain ID on both peers and, the domain ID should be unique in the network. For example, if there are two different VPCs (one in access and one in aggregation) then each vPC should have a unique domain ID.

After you create a vPC domain, the Cisco NX-OS software automatically creates a system priority for the vPC domain. You can also manually configure a specific system priority for the vPC domain.

**Note** If you manually configure the system priority, you must ensure that you assign the same priority value on both vPC peer switches. If the vPC peer switches have different system priority values, the vPC will not come up.

# Peer-Keepalive Link and Messages

The Cisco NX-OS software uses a peer-keepalive link between the vPC peers to transmit periodic, configurable keepalive messages. You must have Layer 3 connectivity between the peer switches to transmit these messages; the system cannot bring up the vPC peer link unless a peer-keepalive link is already up and running.

You can configure a hold-timeout and a timeout value simultaneously.

**Hold-timeout value**—The hold-timeout value range is between 3 to 10 seconds, with a default value of 3 seconds. This timer starts when the vPC peer link goes down. The purpose of the hold-timeout period is to prevent false-positive cases.

If you configure a hold-timeout value that is lower than the timeout value, then the vPC system ignores vPC peer-keepalive messages for the hold-timeout period and considers messages for the reminder of the timeout period. If no keepalive message is received for this period, the vPC secondary device takes over the role of the primary device. For example, if the hold-timeout value is 3 seconds and the timeout value is 5 seconds, for the first 3 seconds vPC keepalive messages are ignored (such as, when accommodating a supervisor failure for a few seconds after peer link failure) and keepalive messages are considered for the remaining timeout period of 2 seconds. After this period, the vPC secondary device takes over as the primary device, in case there is no keep alive message.

**Timeout value**—The timeout value range is between 3 to 20 seconds, with a default value of 5 seconds. This timer starts at the end of the hold-timeout interval. If you configure a timeout value that is lower than or equal to the hold-timeout value, then the timeout duration is initiated after the hold-timeout period. For example, if the timeout value is 3 seconds and the hold-timeout value is 5 seconds, the timeout period starts after 5 seconds.

**Note** We recommend that you configure the vPC peer-keepalive link on the Cisco Nexus device to run in the management VRF using the mgmt 0 interfaces. If you configure the default VRF, ensure that the vPC peer link is not used to carry the vPC peer-keepalive messages.

# Compatibility Parameters for vPC Peer Links

Many configuration and operational parameters must be identical on all interfaces in the vPC. After you enable the vPC feature and configure the peer link on both vPC peer switches, Cisco Fabric Services (CFS) messages provide a copy of the configuration on the local vPC peer switch configuration to the remote vPC peer switch. The system then determines whether any of the crucial configuration parameters differ on the two switches.

Enter the **show vpc consistency-parameters** command to display the configured values on all interfaces in the vPC. The displayed configurations are only those configurations that would limit the vPC peer link and vPC from coming up.

The compatibility check process for vPCs differs from the compatibility check for regular EtherChannels.

## Configuration Parameters That Must Be Identical

The configuration parameters in this section must be configured identically on both switches at either end of the vPC peer link.

**Note** You must ensure that all interfaces in the vPC have the identical operational and configuration parameters listed in this section.

Enter the **show vpc consistency-parameters** command to display the configured values on all interfaces in the vPC. The displayed configurations are only those configurations that would limit the vPC peer link and vPC from coming up.

The switch automatically checks for compatibility of these parameters on the vPC interfaces. The per-interface parameters must be consistent per interface, and the global parameters must be consistent globally.

- Port-channel mode: on, off, or active
- Link speed per channel
- Duplex mode per channel
- Trunk mode per channel:
    - Native VLAN
    - VLANs allowed on trunk
    - Tagging of native VLAN traffic
- Spanning Tree Protocol (STP) mode
- STP region configuration for Multiple Spanning Tree (MST)
- Enable or disable state per VLAN
- STP global settings:
    - Bridge Assurance setting
    - Port type setting—We recommend that you set all vPC interfaces as normal ports
    - Loop Guard settings
- STP interface settings:
    - Port type setting
    - Loop Guard
    - Root Guard

If any of these parameters are not enabled or defined on either switch, the vPC consistency check ignores those parameters.

**Note** To ensure that none of the vPC interfaces are in the suspend mode, enter the **show vpc brief** and **show vpc consistency-parameters** commands and check the syslog messages.

## Configuration Parameters That Should Be Identical

When any of the following parameters are not configured identically on both vPC peer switches, a misconfiguration might cause undesirable behavior in the traffic flow:

- MAC aging timers
- Static MAC entries
- VLAN interface—Each switch on the end of the vPC peer link must have a VLAN interface configured for the same VLAN on both ends and they must be in the same administrative and operational mode. Those VLANs configured on only one switch of the peer link do not pass traffic using the vPC or peer link. You must create all VLANs on both the primary and secondary vPC switches, or the VLAN will be suspended.
- Private VLAN configuration
- All ACL configurations and parameters
- Quality of service (QoS) configuration and parameters—Local parameters; global parameters must be identical
- STP interface settings:
    - BPDU Filter
    - BPDU Guard

- Cost
- Link type
- Priority
- VLANs (Rapid PVST+)

To ensure that all the configuration parameters are compatible, we recommend that you display the configurations for each vPC peer switch once you configure the vPC.

# Graceful Type-1 Check

# Per-VLAN Consistency Check

Type-1 consistency checks are performed on a per-VLAN basis when spanning tree is enabled or disabled on a VLAN. VLANs that do not pass the consistency check are brought down on both the primary and secondary switches while other VLANs are not affected.

# vPC Auto-Recovery

When both vPC peer switches reload and only one switch reboots, auto-recovery allows that switch to assume the role of the primary switch and the vPC links will be allowed to come up after a predetermined period of time. The reload delay period in this scenario can range from 240 to 3600 seconds.

When vPCs are disabled on a secondary vPC switch due to a peer-link failure and then the primary vPC switch fails or is unable to forward traffic, the secondary switch reenables the vPCs. In this scenario, the vPC waits for three consecutive keepalive failures to recover the vPC links.

By default, auto-recovery is enabled on vPC. If you choose to disable auto-recovery and reload the switch, the disabled auto-recovery mode will be reset and auto-recovery will be enabled again after the switch reloads.

# vPC Peer Links

A vPC peer link is the link that is used to synchronize the states between the vPC peer devices.

**Note** You must configure the peer-keepalive link before you configure the vPC peer link or the peer link will not come up.

## vPC Peer Link Overview

You can have only two switches as vPC peers; each switch can serve as a vPC peer to only one other vPC peer. The vPC peer switches can also have non-vPC links to other switches.

To make a valid configuration, you configure an EtherChannel on each switch and then configure the vPC domain. You assign the EtherChannel on each switch as a peer link. For redundancy, we recommend that you should configure at least two dedicated ports into the EtherChannel; if one of the interfaces in the vPC peer link fails, the switch automatically falls back to use another interface in the peer link.

**Note** We recommend that you configure the EtherChannels in trunk mode.

Many operational parameters and configuration parameters must be the same in each switch connected by a vPC peer link. Because each switch is completely independent on the management plane, you must ensure that the switches are compatible on the critical parameters. vPC peer switches have separate control planes. After configuring the vPC peer link, you should display the configuration on each vPC peer switch to ensure that the configurations are compatible.

**Note** You must ensure that the two switches connected by the vPC peer link have certain identical operational and configuration parameters.

When you configure the vPC peer link, the vPC peer switches negotiate that one of the connected switches is the primary switch and the other connected switch is the secondary switch. By default, the Cisco NX-OS software uses the lowest MAC address to elect the primary switch. The software takes different actions on each switch—that is, the primary and secondary—only in certain failover conditions. If the primary switch fails, the secondary switch becomes the operational primary switch when the system recovers, and the previously primary switch is now the secondary switch.

You can also configure which of the vPC switches is the primary switch. If you want to configure the role priority again to make one vPC switch the primary switch, configure the role priority on both the primary and secondary vPC switches with the appropriate values, shut down the EtherChannel that is the vPC peer link on both switches by entering the **shutdown** command, and reenable the EtherChannel on both switches by entering the **no shutdown** command.

MAC addresses that are learned over vPC links are also synchronized between the peers.

Configuration information flows across the vPC peer links using the Cisco Fabric Services over Ethernet (CFSoE) protocol. All MAC addresses for those VLANs configured on both switches are synchronized between vPC peer switches. The software uses CFSoE for this synchronization.

If the vPC peer link fails, the software checks the status of the remote vPC peer switch using the peer-keepalive link, which is a link between vPC peer switches, to ensure that both switches are up. If the vPC peer switch is up, the secondary vPC switch disables all vPC ports on its switch. The data then forwards down the remaining active links of the EtherChannel.

The software learns of a vPC peer switch failure when the keepalive messages are not returned over the peer-keepalive link.

Use a separate link (vPC peer-keepalive link) to send configurable keepalive messages between the vPC peer switches. The keepalive messages on the vPC peer-keepalive link determines whether a failure is on the vPC peer link only or on the vPC peer switch. The keepalive messages are used only when all the links in the peer link fail.

# vPC Number

Once you have created the vPC domain ID and the vPC peer link, you can create EtherChannels to attach the downstream switch to each vPC peer switch. That is, you create one single EtherChannel on the downstream switch with half of the ports to the primary vPC peer switch and the other half of the ports to the secondary peer switch.

On each vPC peer switch, you assign the same vPC number to the EtherChannel that connects to the downstream switch. You will experience minimal traffic disruption when you are creating vPCs. To simplify the configuration, you can assign the vPC ID number for each EtherChannel to be the same as the EtherChannel itself (that is, vPC ID 10 for EtherChannel 10).

**Note** The vPC number that you assign to the EtherChannel that connects to the downstream switch from the vPC peer switch must be identical on both vPC peer switches.

## Layer 3 over vPC

From Cisco NX-OS Release 7.3(0)N1(1), a Layer 3 (L3) device can form peering adjacency with both the vPC peers in a vPC domain. Traffic sent over a peer link will not have Time To Live (TTL) decremented.

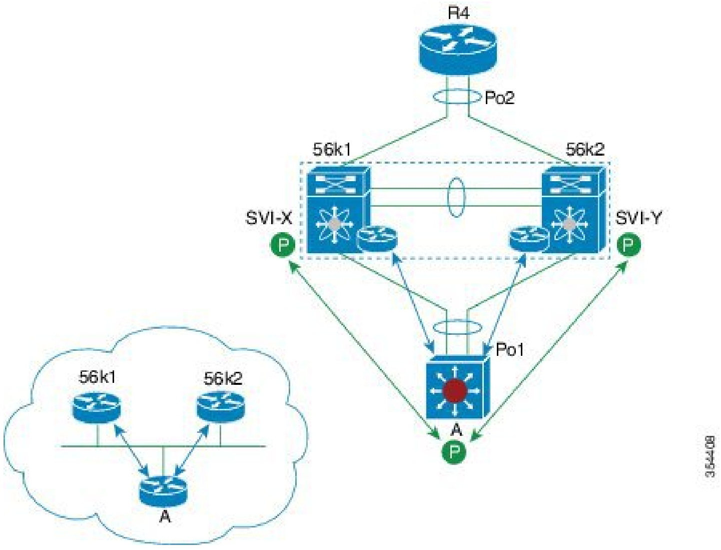
The peer-gateway feature should be enabled before configuring the Layer 3 over vPC feature.

The following are the benefits of configuring this feature:

- You can set up peer adjacency between Layer 3 device and a vPC peer without separate Layer 3 links. Both bridged and routed traffic can flow over the same link.
- Peer adjacency can be formed on vPC VLANs .
- Peer adjacency helps in faster convergence if link or device failure occurs in traffic.

The following illustration shows that peer-gateway feature allows the vPC peer (SVI X) to forward packets on behalf of the other peer (SVI Y). This saves bandwidth by avoiding traffic over the peer link.

***Figure 1: Layer 3 over vPC Solution***



## Layer 3 over vPC: Supported Designs

The following figures illustrate the designs that are supported for configuring Layer 3 over vPC.

*Figure 2: Router Peers with Both vPC Peers*

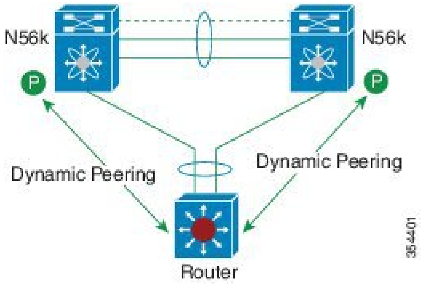
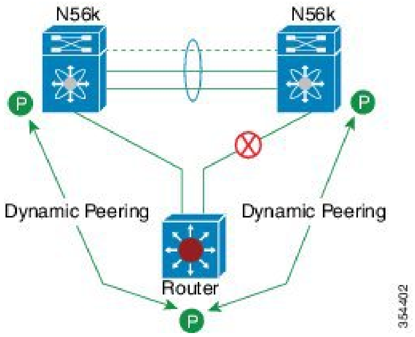


*Figure 3: Peering Established Over an STP Interconnection Using a vPC VLAN.*



Router peers with both vPC peers.

*Figure 4: Route Peering of Orphan Device with both the vPC peers*

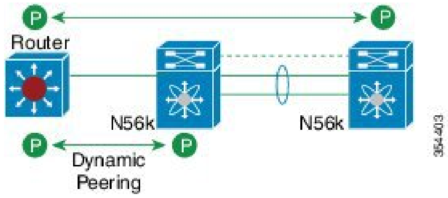
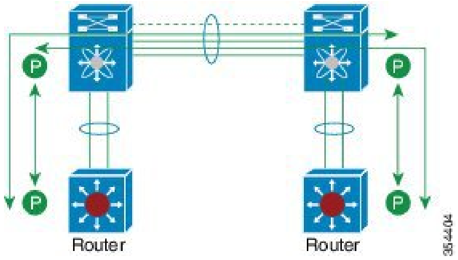
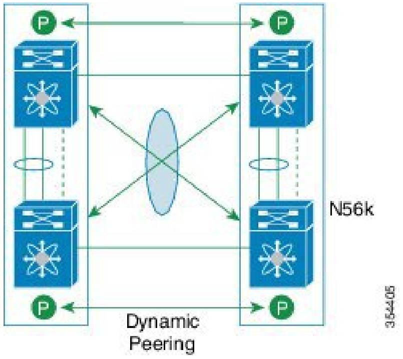


*Figure 5: Peering over PC Interconnection and Over vPC peer Link Using vPC VLAN.*



Both the Routers peer with both vPC peers.

*Figure 6: Peering Over a vPC Interconnection (DCI Case)*

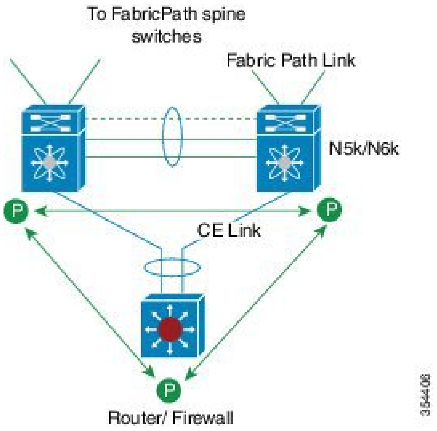


Each Nexus device peers with two vPC peers.

**Peering with vPC+** (supported since Release 6.0(2)N2(1)):

- The peer link ports are configured as FabricPath core ports.
- North facing ports function as FabricPath spine port.
- North facing ports can also be Layer 3 ports in non-FabricPath topology.

*Figure 7: Peering with vPC+*



## Layer 3 over vPC: Unsupported Designs

The following figures illustrate the designs that are not supported for configuring the Layer 3 over vPC feature.

The following design is not supported because the TTL distance between the two orphan devices is 2. This leads to the loss of control packets at the vPC while forming routing adjacencies.

*Figure 8: Orphan Device Peering over vPC Interconnection (DCI Case)*

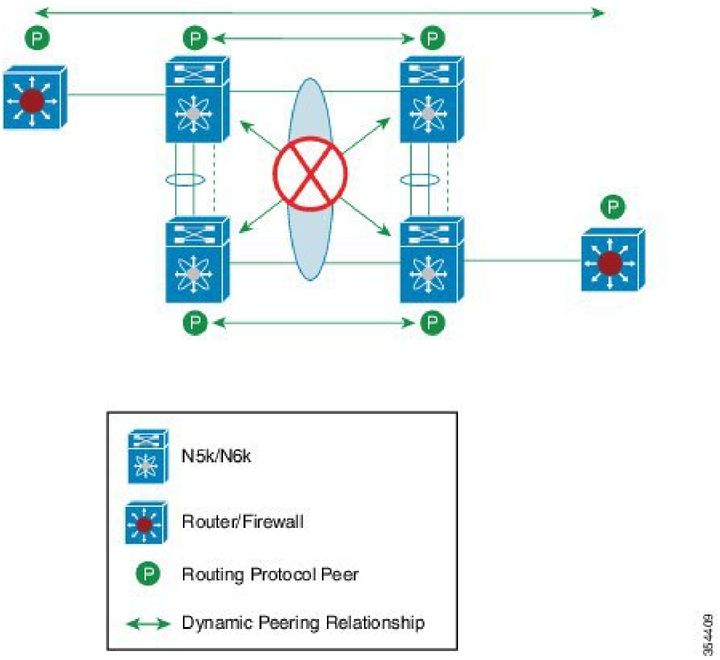


*Figure 9: Peering with vPC Peers Over FEX vPC Host Interfaces*

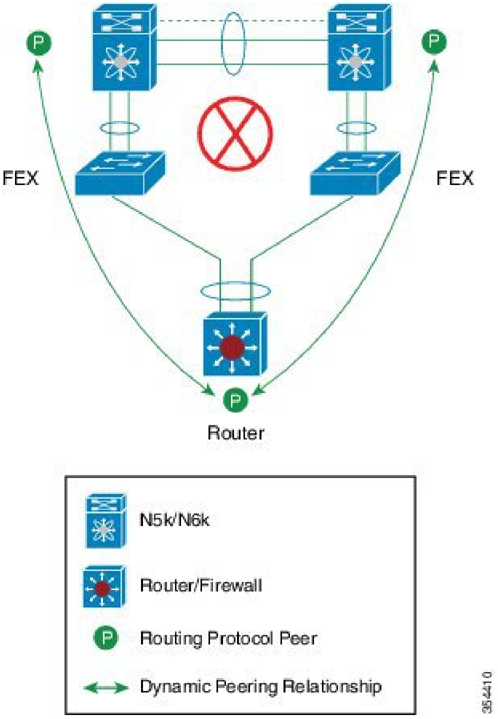


*Figure 10: Peering Across vPC Interfaces with Unequal L3 metrics*

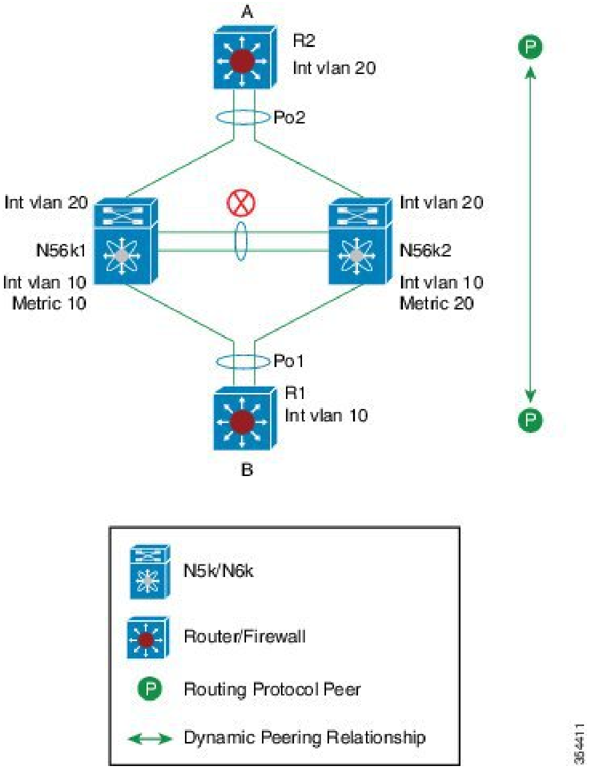


*Figure 11: Peering with vPC+ Peers and STP Interconnection Using a vPC+ VLAN*

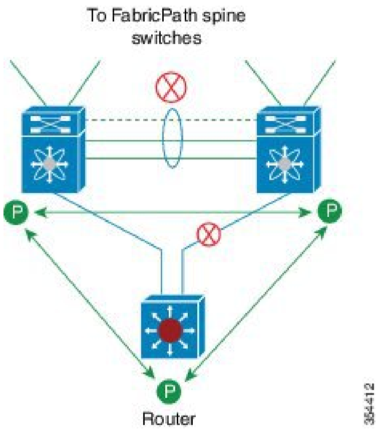


*Figure 12: Route Peering with Orphan Device with Both the vPC+ peers*

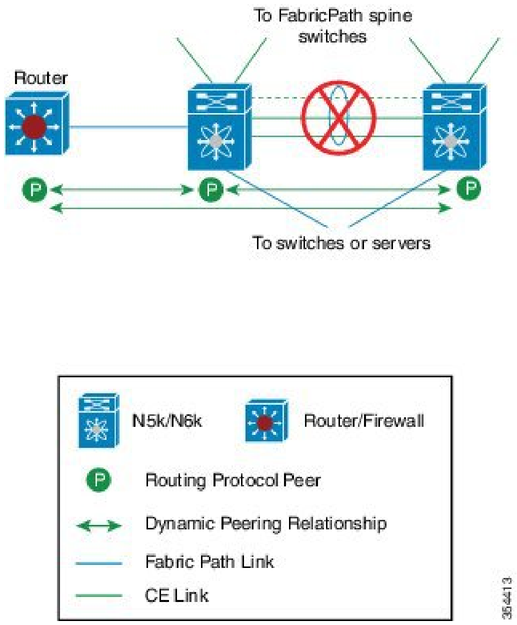
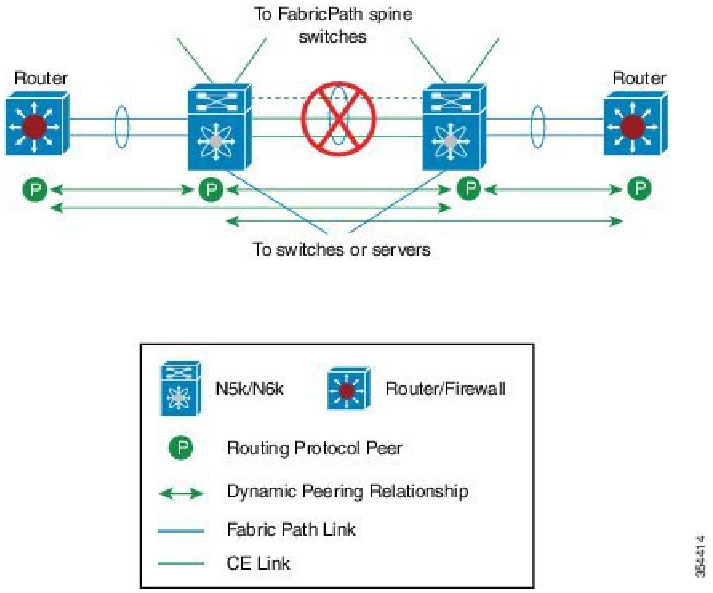


*Figure 13: Peering over PC Interconnection and Over vPC+ Peer Link Using vPC VLAN*



# vPC Interactions with Other Features

## Configuring vPC Peer Links and Links to the Core

Configure the command line interface by using a track object and a track list that is associated with the Layer 3 link to the core and on all vPC peer links on both vPC peer devices. You use this configuration to avoid dropping traffic if that particular module goes down because when all the tracked objects on the track list go down, the system does the following:

- Stops the vPC primary peer device sending peer-keepalive messages which forces the vPC secondary peer device to take over.
- Brings down all the downstream vPCs on that vPC peer device, which forces all the traffic to be rerouted in the access switch toward the other vPC peer device.

Once you configure this feature and if the module fails, the system automatically suspends all the vPC links on the primary vPC peer device and stops the peer-keepalive messages. This action forces the vPC secondary device to take over the primary role and all the vPC traffic to go to this new vPC primary device until the system stabilizes.

Create a track list that contains all the links to the core and all the vPC peer links as its object. Enable tracking for the specified vPC domain for this track list. Apply this same configuration to the other vPC peer device.

### Before you begin

To configure a track list to switch over vPC to the remote peer when all related interfaces fail:

### Procedure

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | switch# **configure terminal** | Enters global configuration mode. |
| **Step 2** | switch(config)# **interface** *type slot*/*port* | Enters interface configuration mode. |
| **Step 3** | switch(config-if)# **track** *track-id* **interface** *type slot*/*port* **line-protocol** | Configures the track objects on an interface (Layer 3 to core). |
| **Step 4** | switch(config-track)# **track** *track-id* **interface** *type slot*/*port* **line-protocol** | Tracks the objects on an interface (Layer 3 to core). |
| **Step 5** | switch(config)# **track** *track-id* **interface port-channel** *port* **line-protocol** | Configures the track objects on a port channel (vPC peer link). |
| **Step 6** | switch(config)# **track** *track-id* **list boolean** [**OR** \| **AND**] | Creates a track list that contains all the interfaces in the track list using the Boolean OR to trigger when all the objects fail. or trigger a switchover when any core interface or peer-link goes down using Boolean AND. |
| **Step 7** | switch(config-track)# **object** *number* | Specifiecs the object number. |
| **Step 8** | switch(config-track)# **end** | Exits track configuration mode. |
| **Step 9** | switch(config)# **vpc domain** *domain-id* | Enters vPC domain configuration. |
| **Step 10** | switch(config-vpc-domain)# **track** *number* | Adds the track object to the vPC domain. |
| **Step 11** | (Optional) switch(config)# **show vpc brief** | Displays the track object. |

| | Command or Action | Purpose |
|---|---|---|
| **Step 12** | (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 configure a track list to trigger when all the objects fail using Boolean OR:

```
switch# configure terminal
switch(config)# interface ethernet 8/35
switch(config-if)# track 35 interface ethernet 8/35 line-protocol
switch(config-track)# track 23 interface ethernet 8/33 line-protocol
switch(config)# track 55 interface port-channel 100 line-protocol
switch(config)# track 44 list boolean OR
switch(config-track)# object 23
switch(config-track)# object 35
switch(config-track)# object 55
switch(config-track)# end
switch(config)# vpc domain 1
switch(config-vpc-domain)# track 44
switch(config)# copy running-config startup-config
```

## vPC and LACP

The Link Aggregation Control Protocol (LACP) uses the system MAC address of the vPC domain to form the LACP Aggregation Group (LAG) ID for the vPC.

You can use LACP on all the vPC EtherChannels, including those channels from the downstream switch. We recommend that you configure LACP with active mode on the interfaces on each EtherChannel on the vPC peer switches. This configuration allows you to more easily detect compatibility between switches, unidirectional links, and multihop connections, and provides dynamic reaction to run-time changes and link failures.

The vPC peer link supports 16 EtherChannel interfaces.

**Note** When you manually configure the system priority, you must ensure that you assign the same priority value on both vPC peer switches. If the vPC peer switches have different system priority values, vPC does not come up.

## vPC Peer Links and STP

When you first bring up the vPC functionality, STP reconverges. STP treats the vPC peer link as a special link and always includes the vPC peer link in the STP active topology.

We recommend that you set all the vPC peer link interfaces to the STP network port type so that Bridge Assurance is automatically enabled on all vPC peer links. We also recommend that you do not enable any of the STP enhancement features on VPC peer links.

You must configure a list of parameters to be identical on the vPC peer switches on both sides of the vPC peer link.

STP is distributed; that is, the protocol continues running on both vPC peer switches. However, the configuration on the vPC peer switch elected as the primary switch controls the STP process for the vPC interfaces on the secondary vPC peer switch.

The primary vPC switch synchronizes the STP state on the vPC secondary peer switch using Cisco Fabric Services over Ethernet (CFSoE).

The vPC manager performs a proposal/handshake agreement between the vPC peer switches that sets the primary and secondary switches and coordinates the two switches for STP. The primary vPC peer switch then controls the STP protocol for vPC interfaces on both the primary and secondary switches.

The Bridge Protocol Data Units (BPDUs) use the MAC address set for the vPC for the STP bridge ID in the designated bridge ID field. The vPC primary switch sends these BPDUs on the vPC interfaces.

**Note** Display the configuration on both sides of the vPC peer link to ensure that the settings are identical. Use the **show spanning-tree** command to display information about the vPC.

## vPC and ARP

Table synchronization across vPC peers is managed in Cisco NX-OS using the reliable transport mechanism of the Cisco Fabric Services over Ethernet (CFSoE) protocol. To support faster convergence of address tables between the vPC peers, the **ip arp synchronize** command must be enabled. This convergence is designed to overcome the delay involved in ARP table restoration when the peer-link port channel flaps or when a vPC peer comes back online.

To improve performance, we recommend that you turn on the ARP sync feature. By default, it is not enabled.

To check whether or not ARP sync is enabled, enter the following command:

```
switch# show running
```

To enable ARP sync, enter the following command:

```
switch(config-vpc-domain) # ip arp synchronize
```

## CFSoE

The Cisco Fabric Services over Ethernet (CFSoE) is a reliable state transport mechanism that you can use to synchronize the actions of the vPC peer devices. CFSoE carries messages and packets for many features linked with vPC, such as STP and IGMP. Information is carried in CFS/CFSoE protocol data units (PDUs).

When you enable the vPC feature, the device automatically enables CFSoE, and you do not have to configure anything. CFSoE distributions for vPCs do not need the capabilities to distribute over IP or the CFS regions. You do not need to configure anything for the CFSoE feature to work correctly on vPCs.

You can use the **show mac address-table** command to display the MAC addresses that CFSoE synchronizes for the vPC peer link.

**Note** Do not enter the **no cfs eth distribute** or the **no cfs distribute** command. CFSoE must be enabled for vPC functionality. If you do enter either of these commands when vPC is enabled, the system displays an error message.

When you enter the **show cfs application** command, the output displays "Physical-eth," which shows the applications that are using CFSoE.

## vPC Peer Switch

The vPC peer switch feature addresses performance concerns around STP convergence. This feature allows a pair of Cisco Nexus devices to appear as a single STP root in the Layer 2 topology. This feature eliminates the need to pin the STP root to the vPC primary switch and improves vPC convergence if the vPC primary switch fails.

To avoid loops, the vPC peer link is excluded from the STP computation. In vPC peer switch mode, STP BPDUs are sent from both vPC peer devices to avoid issues related to STP BPDU timeout on the downstream switches, which can cause traffic disruption.

This feature can be used with the pure peer switch topology in which the devices all belong to the vPC.

**Note** Peer-switch feature is supported on networks that use vPC and STP-based redundancy is not supported. If the vPC peer-link fail in a hybrid peer-switch configuration, you can lose traffic. In this scenario, the vPC peers use the same STP root ID as well same bridge ID. The access switch traffic is split in two with half going to the first vPC peer and the other half to the second vPC peer. With the peer link failed, there is no impact on north/south traffic but east-west traffic will be lost (black-holed).

For information on STP enhancement features and Rapid PVST+, see the *Layer 2 Switching Configuration Guide* for your device.

# Guidelines and Limitations for vPCs

vPC has the following configuration guidelines and limitations:

- You must enable the vPC feature before you can configure vPC peer-link and vPC interfaces.
- You must configure the peer-keepalive link before the system can form the vPC peer link.
- The vPC peer-link needs to be formed using a minimum of two 10-Gigabit Ethernet interfaces.
- You can connect a pair of Cisco Nexus 5600 series switches in a vPC directly to another switch or to a server. vPC peer switches must be of the same type ((including same switch type, and LEM type). For example, you can connect a pair of Cisco Nexus 5600 series switches, but you cannot connect a Cisco Nexus 5600 series switch to a Cisco Nexus 6000 series switch, or a Cisco Nexus 5500 series switch in a vPC topology. For a Cisco Nexus 5696 switch, you can use Cisco Nexus 5600 LEMs as well as Cisco Nexus 6000 LEMs, but you cannot use different LEM versions in a vPC domain.
- Only port channels can be in vPCs. A vPC can be configured on a normal port channel (switch-to-switch vPC topology), on a port channel fabric interface (fabric extender vPC topology), and on a port channel host interface (host interface vPC topology).
- A Fabric Extender can be a member of a Host Interface vPC topology or a Fabric Extender vPC topology but not both simultaneously.
- You must configure both vPC peer switches; the configuration is not automatically synchronized between the vPC peer devices.

- Check that the necessary configuration parameters are compatible on both sides of the vPC peer link.
- You may experience minimal traffic disruption while configuring vPCs.
- You should configure all the port channels in the vPC using LACP with the interfaces in active mode.
- When the **peer-switch** command is configured and vPC keepalive messages exchanged through an SVI instead of a management interface, additional Spanning Tree Protocol (STP) configuration is required. STP needs to be disabled on the dedicated link that carries the keepalive traffic between the vPC peers. You can disable STP on the dedicated link by configuring STP BPDUfilter on the both ends of the dedicated link. We recommend that the VLAN of the vPC keepalive SVI be allowed on only the interconnecting dedicated link and disallowed on all other links, including the peer link.
- You should configure both the SVIs as active/active, otherwise this can lead to traffic blackhole.
- A Cisco Nexus 6000 Series Switch that is connected to a router and a vPC peer creates an OSPF association with the attached router but not with the vPC peer. This situation happens if a non-vpc VLAN is on a separate trunk between the VPC peers. If the non-vpc VLAN is on the vpc-peer link, then OSPF works for both vPC peers. This situation only happens when peer-gateway is enabled.
- In some vPC failure scenarios, vPC secondary switch suspends its vPC port-channels after the vPC primary switch failure. To avoid vPC secondary switch suspensions, disable vPC peer-keepalive before bringing down the vPC primary switch (in case of scheduled power down).
- When you enable the vPC Peer Gateway feature, Cisco NX-OS automatically disables IP redirects on all the interface VLANs that are mapped over a vPC VLAN, to avoid generation of IP redirect messages for packets switched through the peer gateway router.

# Configuring vPCs

## Enabling vPCs

You must enable the vPC feature before you can configure and use vPCs.

### Procedure

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | switch# **configure terminal** | Enters global configuration mode. |
| **Step 2** | switch(config)# **feature vpc** | Enables vPCs on the switch. |
| **Step 3** | (Optional) switch# **show feature** | Displays which features are enabled on the switch. |
| **Step 4** | (Optional) switch# **copy running-config startup-config** | Copies the running configuration to the startup configuration. |

### Example

This example shows how to enable the vPC feature:

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

# Disabling vPCs

You can disable the vPC feature.

**Note** When you disable the vPC feature, the Cisco Nexus device clears all the vPC configurations.

### Procedure

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | switch# **configure terminal** | Enters global configuration mode. |
| **Step 2** | switch(config)# **no feature vpc** | Disables vPCs on the switch. |
| **Step 3** | (Optional) switch# **show feature** | Displays which features are enabled on the switch. |
| **Step 4** | (Optional) switch# **copy running-config startup-config** | Copies the running configuration to the startup configuration. |

### Example

This example shows how to disable the vPC feature:

```
switch# configure terminal
switch(config)# no feature vpc
```

# Creating a vPC Domain

You must create identical vPC domain IDs on both the vPC peer devices. This domain ID is used to automatically form the vPC system MAC address.

### Before you begin

Ensure that you have enabled the vPC feature.

You must configure both switches on either side of the vPC peer link.

### Procedure

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | switch# **configure terminal** | Enters global configuration mode. |
| **Step 2** | switch(config)# **vpc domain** *domain-id* | Creates a vPC domain on the switch, and enters the vpc-domain configuration mode. There is |

| | Command or Action | Purpose |
|---|---|---|
| | | no default *domain-id* ; the range is from 1 to 1000.<br>**Note** You can also use the **vpc domain** command to enter the vpc-domain configuration mode for an existing vPC domain. |
| **Step 3** | (Optional) switch# **show vpc brief** | Displays brief information about each vPC domain. |
| **Step 4** | (Optional) switch# **copy running-config startup-config** | Copies the running configuration to the startup configuration. |

### Example

This example shows how to create a vPC domain:

```
switch# configure terminal
switch(config)# vpc domain 5
```

## Configuring a vPC Keepalive Link and Messages

You can configure the destination IP for the peer-keepalive link that carries the keepalive messages. Optionally, you can configure other parameters for the keepalive messages.

The Cisco NX-OS software uses the peer-keepalive link between the vPC peers to transmit periodic, configurable keepalive messages. You must have Layer 3 connectivity between the peer devices to transmit these messages. The system cannot bring up the vPC peer link unless the peer-keepalive link is already up and running.

Ensure that both the source and destination IP addresses used for the peer-keepalive message are unique in your network and these IP addresses are reachable from the Virtual Routing and Forwarding (VRF) instance associated with the vPC peer-keepalive link.

**Note** We recommend that you configure a separate VRF instance and put a Layer 3 port from each vPC peer switch into that VRF instance for the vPC peer-keepalive link. Do not use the peer link itself to send vPC peer-keepalive messages.

### Before you begin

Ensure that you have enabled the vPC feature.

You must configure the vPC peer-keepalive link before the system can form the vPC peer link.

You must configure both switches on either side of the vPC peer link.

### Procedure

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | switch# **configure terminal** | Enters global configuration mode. |
| **Step 2** | switch(config)# **vpc domain** *domain-id* | Creates a vPC domain on the switch if it does not already exist, and enters the vpc-domain configuration mode. |
| **Step 3** | switch(config-vpc-domain)# **peer-keepalive destination** *ipaddress* [**hold-timeout** *secs* \| **interval** *msecs* {**timeout** *secs*} \| **precedence** {*prec-value* \| **network** \| **internet** \| **critical** \| **flash-override** \| **flash** \| **immediate priority** \| **routine**} \| **tos** {*tos-value* \| **max-reliability** \| **max-throughput** \| **min-delay** \| **min-monetary-cost** \| **normal**} \| **tos-byte** *tos-byte-value*} \| **source** *ipaddress* \| **vrf** {*name* \| **management vpc-keepalive**}] | Configures the IPv4 address for the remote end of the vPC peer-keepalive link.<br>**Note** The system does not form the vPC peer link until you configure a vPC peer-keepalive link.<br>The management ports and VRF are the defaults. |
| **Step 4** | (Optional) switch(config-vpc-domain)# **vpc peer-keepalive destination** *ipaddress* **source** *ipaddress* | Configures a separate VRF instance and puts a Layer 3 port from each vPC peer device into that VRF for the vPC peer-keepalive link. |
| **Step 5** | (Optional) switch# **show vpc peer-keepalive** | Displays information about the configuration for the keepalive messages. |
| **Step 6** | (Optional) switch# **copy running-config startup-config** | Copies the running configuration to the startup configuration. |

### Example

This example shows how to configure the destination IP address for the vPC-peer-keepalive link:

```
switch# configure terminal
switch(config)# vpc domain 5
switch(config-vpc-domain)# peer-keepalive destination 10.10.10.42
```

This example shows how to set up the peer keepalive link connection between the primary and secondary vPC device:

```
switch(config)# vpc domain 100
switch(config-vpc-domain)# peer-keepalive destination 192.168.2.2 source 192.168.2.1
Note:--------:: Management VRF will be used as the default VRF ::--------
switch(config-vpc-domain)#
```

This example shows how to create a separate VRF named vpc_keepalive for the vPC keepalive link and how to verify the new VRF:

```
vrf context vpc_keepalive
interface Ethernet1/31
  switchport access vlan 123
interface Vlan123
```

```
  vrf member vpc_keepalive
  ip address 123.1.1.2/30
  no shutdown
vpc domain 1
  peer-keepalive destination 123.1.1.1 source 123.1.1.2 vrf
vpc_keepalive

L3-NEXUS-2# show vpc peer-keepalive

vPC keep-alive status           : peer is alive
--Peer is alive for             : (154477) seconds, (908) msec
--Send status                   : Success
--Last send at                  : 2011.01.14 19:02:50 100 ms
--Sent on interface             : Vlan123
--Receive status                : Success
--Last receive at               : 2011.01.14 19:02:50 103 ms
--Received on interface         : Vlan123
--Last update from peer         : (0) seconds, (524) msec

vPC Keep-alive parameters
--Destination                   : 123.1.1.1
--Keepalive interval            : 1000 msec
--Keepalive timeout             : 5 seconds
--Keepalive hold timeout        : 3 seconds
--Keepalive vrf                 : vpc_keepalive
--Keepalive udp port            : 3200
--Keepalive tos                 : 192

The services provided by the switch , such as ping, ssh, telnet,
radius, are VRF aware. The VRF name need to be configured or
specified in order for the correct routing table to be used.
L3-NEXUS-2# ping 123.1.1.1 vrf vpc_keepalive
PING 123.1.1.1 (123.1.1.1): 56 data bytes
64 bytes from 123.1.1.1: icmp_seq=0 ttl=254 time=3.234 ms
64 bytes from 123.1.1.1: icmp_seq=1 ttl=254 time=4.931 ms
64 bytes from 123.1.1.1: icmp_seq=2 ttl=254 time=4.965 ms
64 bytes from 123.1.1.1: icmp_seq=3 ttl=254 time=4.971 ms
64 bytes from 123.1.1.1: icmp_seq=4 ttl=254 time=4.915 ms

--- 123.1.1.1 ping statistics ---
5 packets transmitted, 5 packets received, 0.00% packet loss
round-trip min/avg/max = 3.234/4.603/4.971 ms
```

# Creating a vPC Peer Link

You can create a vPC peer link by designating the EtherChannel that you want on each switch as the peer link for the specified vPC domain. We recommend that you configure the EtherChannels that you are designating as the vPC peer link in trunk mode and that you use two ports on separate modules on each vPC peer switch for redundancy.

### Before you begin

Ensure that you have enabled the vPC feature.

You must configure both switches on either side of the vPC peer link

### Procedure

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | switch# **configure terminal** | Enters global configuration mode. |
| **Step 2** | switch(config)# **interface port-channel** *channel-number* | Selects the EtherChannel that you want to use as the vPC peer link for this switch, and enters the interface configuration mode. |
| **Step 3** | switch(config-if)# **vpc peer-link** | Configures the selected EtherChannel as the vPC peer link, and enters the vpc-domain configuration mode. |
| **Step 4** | (Optional) switch# **show vpc brief** | Displays information about each vPC, including information about the vPC peer link. |
| **Step 5** | (Optional) switch# **copy running-config startup-config** | Copies the running configuration to the startup configuration. |

### Example

This example shows how to configure a vPC peer link:

```
switch# configure terminal
switch(config)# interface port-channel 20
switch(config-if)# vpc peer-link
```

## Checking the Configuration Compatibility

After you have configured the vPC peer link on both vPC peer switches, check that the configurations are consistent on all vPC interfaces.

**Note** The following QoS parameters support Type 2 consistency checks:

- Network QoS—MTU and Pause
- Input Queuing —Bandwidth and Absolute Priority
- Output Queuing—Bandwidth and Absolute Priority

In the case of a Type 2 mismatch, the vPC is not suspended. Type 1 mismatches suspend the vPC.

| Command or Action | Purpose |
|---|---|
| switch# **show vpc consistency-parameters** {**global** \| **interface port-channel** *channel-number*} | Displays the status of those parameters that must be consistent across all vPC interfaces. |

This example shows how to check that the required configurations are compatible across all the vPC interfaces:

```
switch# show vpc consistency-parameters global
     Legend:
         Type 1 : vPC will be suspended in case of mismatch
```

```
Name                        Type  Local Value            Peer Value

------------- ----  ---------------------- ----------------------
QoS                         2     ([], [], [], [], [],   ([], [], [], [], [],
                                   [])                    [])

Network QoS (MTU)           2     (1538, 0, 0, 0, 0, 0)  (1538, 0, 0, 0, 0, 0)
Network Qos (Pause)         2     (F, F, F, F, F, F)     (1538, 0, 0, 0, 0, 0)
Input Queuing (Bandwidth)   2     (100, 0, 0, 0, 0, 0)   (100, 0, 0, 0, 0, 0)
Input Queuing (Absolute     2     (F, F, F, F, F, F)     (100, 0, 0, 0, 0, 0)
Priority)
Output Queuing (Bandwidth)  2     (100, 0, 0, 0, 0, 0)   (100, 0, 0, 0, 0, 0)
Output Queuing (Absolute    2     (F, F, F, F, F, F)     (100, 0, 0, 0, 0, 0)
Priority)
STP Mode                    1     Rapid-PVST             Rapid-PVST
STP Disabled                1     None                   None
STP MST Region Name         1     ""                     ""
STP MST Region Revision     1     0                      0
STP MST Region Instance to  1
  VLAN Mapping

STP Loopguard               1     Disabled               Disabled
STP Bridge Assurance        1     Enabled                Enabled
STP Port Type, Edge         1     Normal, Disabled,      Normal, Disabled,
BPDUFilter, Edge BPDUGuard        Disabled               Disabled
STP MST Simulate PVST       1     Enabled                Enabled
Allowed VLANs               -     1,624                  1
Local suspended VLANs       -     624                    -
switch#
```

# Enabling vPC Auto-Recovery

### Procedure

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | switch# **configure terminal** | Enters global configuration mode. |
| **Step 2** | switch(config)# **vpc domain** *domain-id* | Enters vpc-domain configuration mode for an existing vPC domain. |
| **Step 3** | switch(config-vpc-domain)# **auto-recovery reload-delay** *delay* | Enables the auto-recovery feature and sets the reload delay period. The default is disabled. |

### Example

This example shows how to enable the auto-recovery feature in vPC domain 10 and set the delay period for 240 seconds:

```
switch(config)# vpc domain 10
switch(config-vpc-domain)# auto-recovery reload-delay 240
Warning:
 Enables restoring of vPCs in a peer-detached state after reload, will wait for 240 seconds
 (by default) to determine if peer is un-reachable
```

This example shows how to view the status of the auto-recovery feature in vPC domain 10:

```
switch(config-vpc-domain)# show running-config vpc
!Command: show running-config vpc
!Time: Tue Dec  7 02:38:44 2010


feature vpc
vpc domain 10
  peer-keepalive destination 10.193.51.170
  auto-recovery
```

# Configuring the Restore Time Delay

You can configure a restore timer that delays the vPC from coming back up until after the peer adjacency forms and the VLAN interfaces are back up. This feature avoids packet drops if the routing tables fail to converge before the vPC is once again passing traffic.

### Before you begin

Ensure that you have enabled the vPC feature.

You must configure both switches on either side of the vPC peer link with the following procedures.

### Procedure

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | switch# **configure terminal** | Enters global configuration mode. |
| **Step 2** | switch(config)# **vpc domain** *domain-id* | Creates a vPC domain on the switch if it does not already exist, and enters vpc-domain configuration mode. |
| **Step 3** | switch(config-vpc-domain)# **delay restore** *time* | Configures the time delay before the vPC is restored.<br>The restore time is the number of seconds to delay bringing up the restored vPC peer device. The range is from 1 to 3600. The default is 30 seconds. |
| **Step 4** | (Optional) switch# **copy running-config startup-config** | Copies the running configuration to the startup configuration. |

### Example

This example shows how to configure the delay reload time for a vPC link:

```
switch(config)# vpc domain 1
switch(config-vpc-domain)# delay restore 10
switch(config-vpc-domain)#
```

# Excluding VLAN Interfaces from Shutting Down a vPC Peer Link Fails

When a vPC peer-link is lost, the vPC secondary switch suspends its vPC member ports and its switch virtual interface (SVI) interfaces. All Layer 3 forwarding is disabled for all VLANs on the vPC secondary switch. You can exclude specific SVI interfaces so that they are not suspended.

### Before you begin

Ensure that the VLAN interfaces have been configured.

### Procedure

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | switch# **configure terminal** | Enters global configuration mode. |
| **Step 2** | switch(config)# **vpc domain** *domain-id* | Creates a vPC domain on the switch if it does not already exist, and enters vpc-domain configuration mode. |
| **Step 3** | switch(config-vpc-domain))# **dual-active exclude interface-vlan** *range* | Specifies the VLAN interfaces that should remain up when a vPC peer-link is lost.<br>range—Range of VLAN interfaces that you want to exclude from shutting down. The range is from 1 to 4094. |

### Example

This example shows how to keep the interfaces on VLAN 10 up on the vPC peer switch if a peer link fails:

```
switch# configure terminal
switch(config)# vpc domain 5
switch(config-vpc-domain)# dual-active exclude interface-vlan 10
switch(config-vpc-domain)#
```

# Configuring the VRF Name

The switch services, such as ping, ssh, telnet, radius, are VRF aware. You must configure the VRF name in order for the correct routing table to be used.

You can specify the VRF name.

### Procedure

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | switch# **ping** *ipaddress* **vrf** *vrf-name* | Specifies the virtual routing and forwarding (VRF) name to use. The VRF name is case sensitive and can be a maximum of 32 characters.. |

### Example

This example shows how to specifiy the VRF named vpc_keepalive:

```
switch# ping 123.1.1.1 vrf vpc_keepalive
PING 123.1.1.1 (123.1.1.1): 56 data bytes
64 bytes from 123.1.1.1: icmp_seq=0 ttl=254 time=3.234 ms
64 bytes from 123.1.1.1: icmp_seq=1 ttl=254 time=4.931 ms
64 bytes from 123.1.1.1: icmp_seq=2 ttl=254 time=4.965 ms
64 bytes from 123.1.1.1: icmp_seq=3 ttl=254 time=4.971 ms
64 bytes from 123.1.1.1: icmp_seq=4 ttl=254 time=4.915 ms

--- 123.1.1.1 ping statistics ---
5 packets transmitted, 5 packets received, 0.00% packet loss
round-trip min/avg/max = 3.234/4.603/4.971 ms
```

## Binding a VRF Instance to a vPC

You can bind a VRF instance to a vPC. One reserved VLAN is required for each VRF. Without this command, the receivers in a non-vPC VLAN and the receivers connected to a Layer 3 interface might not receive multicast traffic. The non-vPC VLANs are the VLANs that are not trunked over a peerlink.

**Note** If you configure the **vpc bind-vrf** command to forward multicast traffic over the vPC peer link, you need to reload the switches to avoid any traffic loss.

### Before you begin

Use the **show interfaces brief** command to view the interfaces that are in use on a switch. To bind the VRF instance to the vPC, you must use a VLAN that is not already in use.

### Procedure

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | switch# **configure terminal** | Enters global configuration mode. |
| **Step 2** | switch(config)# **vpc bind-vrf** *vrf-name* **vlan** *vlan-id* | Binds a VRF instance to a vPC and specifies the VLAN to bind to the vPC. The VLAN ID range is from 1 to 3967 and from 4049 to 4093. |

### Example

This example shows how to bind a vPC to the default VRF instance using VLAN 2:

```
switch(config)# vpc bind-vrf default vlan vlan2
```

# Moving Other Port Channels into a vPC

### Before you begin

Ensure that you have enabled the vPC feature.

You must configure both switches on either side of the vPC peer link with the following procedure.

### Procedure

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | switch# **configure terminal** | Enters global configuration mode. |
| **Step 2** | switch(config)# **interface port-channel** *channel-number* | Selects the port channel that you want to put into the vPC to connect to the downstream switch, and enters interface configuration mode.<br>**Note** A vPC can be configured on a normal port channel (physical vPC topology) and on a port channel host interface (host interface vPC topology) |
| **Step 3** | switch(config-if)# **vpc** *number* | Configures the selected port channel into the vPC to connect to the downstream switch. The range is from 1 to 4096.<br>The vPC *number* that you assign to the port channel that connects to the downstream switch from the vPC peer switch must be identical on both vPC peer switches. |
| **Step 4** | (Optional) switch# **show vpc brief** | Displays information about each vPC. |
| **Step 5** | (Optional) switch# **copy running-config startup-config** | Copies the running configuration to the startup configuration. |

### Example

This example shows how to configure a port channel that will connect to the downstream device:

```
switch# configure terminal

switch(config)# interface port-channel 20

switch(config-if)# vpc 5
```

# Manually Configuring a vPC Domain MAC Address

**Note** Configuring the system address is an optional configuration step.

### Before you begin

Ensure that you have enabled the vPC feature.

You must configure both switches on either side of the vPC peer link.

### Procedure

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | switch# **configure terminal** | Enters global configuration mode. |
| **Step 2** | switch(config)# **vpc domain** *domain-id* | Selects an existing vPC domain on the switch, or creates a new vPC domain, and enters the vpc-domain configuration mode. There is no default *domain-id*; the range is from 1 to 1000. |
| **Step 3** | switch(config-vpc-domain)# **system-mac** *mac-address* | Enters the MAC address that you want for the specified vPC domain in the following format: aaaa.bbbb.cccc. |
| **Step 4** | (Optional) switch# **show vpc role** | Displays the vPC system MAC address. |
| **Step 5** | (Optional) switch# **copy running-config startup-config** | Copies the running configuration to the startup configuration. |

### Example

This example shows how to configure a vPC domain MAC address:

```
switch# configure terminal

switch(config)# vpc domain 5

switch(config-if)# system-mac 23fb.4ab5.4c4e
```

# Manually Configuring the System Priority

When you create a vPC domain, the system automatically creates a vPC system priority. However, you can also manually configure a system priority for the vPC domain.

### Before you begin

Ensure that you have enabled the vPC feature.

You must configure both switches on either side of the vPC peer link.

### Procedure

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | switch# **configure terminal** | Enters global configuration mode. |
| **Step 2** | switch(config)# **vpc domain** *domain-id* | Selects an existing vPC domain on the switch, or creates a new vPC domain, and enters the vpc-domain configuration mode. There is no default *domain-id*; the range is from 1 to 1000. |
| **Step 3** | switch(config-vpc-domain)# **system-priority** *priority* | Enters the system priority that you want for the specified vPC domain. The range of values is from 1 to 65535. The default value is 32667. |
| **Step 4** | (Optional) switch# **show vpc brief** | Displays information about each vPC, including information about the vPC peer link. |
| **Step 5** | (Optional) switch# **copy running-config startup-config** | Copies the running configuration to the startup configuration. |

### Example

This example shows how to configure a vPC peer link:

```
switch# configure terminal

switch(config)# vpc domain 5

switch(config-if)# system-priority 4000
```

## Manually Configuring a vPC Peer Switch Role

By default, the Cisco NX-OS software elects a primary and secondary vPC peer switch after you configure the vPC domain and both sides of the vPC peer link. However, you may want to elect a specific vPC peer switch as the primary switch for the vPC. Then, you would manually configure the role value for the vPC peer switch that you want as the primary switch to be lower than the other vPC peer switch.

vPC does not support role preemption. If the primary vPC peer switch fails, the secondary vPC peer switch takes over to become operationally the vPC primary switch. However, the original operational roles are not restored when the formerly primary vPC comes up again.

### Before you begin

Ensure that you have enabled the vPC feature.

You must configure both switches on either side of the vPC peer link.

### Procedure

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

| | Command or Action | Purpose |
|---|---|---|
| **Step 2** | switch(config)# **vpc domain** *domain-id* | Selects an existing vPC domain on the switch, or creates a new vPC domain, and enters the vpc-domain configuration mode. There is no default *domain-id*; the range is from 1 to 1000. |
| **Step 3** | switch(config-vpc-domain)# **role priority** *priority* | Enters the role priority that you want for the vPC system priority. The range of values is from 1 to 65535. The default value is 32667. |
| **Step 4** | (Optional) switch# **show vpc brief** | Displays information about each vPC, including information about the vPC peer link. |
| **Step 5** | (Optional) switch# **copy running-config startup-config** | Copies the running configuration to the startup configuration. |

### Example

This example shows how to configure a vPC peer link:

```
switch# configure terminal

switch(config)# vpc domain 5

switch(config-if)# role priority 4000
```

# Configuring the vPC Peer Switch

## Configuring a Pure vPC Peer Switch Topology

You can configure a pure vPC peer switch topology using the **peer-switch** command and then you set the best possible (lowest) spanning tree bridge priority value.

**Note** The values you apply for the spanning tree priority must be identical on both vPC peers.

### Before you begin

Ensure that you have enabled the vPC feature.

### Procedure

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

| | Command or Action | Purpose |
|---|---|---|
| **Step 2** | switch(config)# **vpc domain** *domain-id* | Enters the vPC domain number that you want to configure. The system enters the vpc-domain configuration mode. |
| **Step 3** | switch(config-vpc-domain)# **peer-switch** | Enables the vPC switch pair to appear as a single STP root in the Layer 2 topology.<br>Use the **no** form of the command to disable the peer switch vPC topology. |
| **Step 4** | switch(config-vpc-domain)# **spanning-tree vlan** *vlan-range* **priority** *value* | Configures the bridge priority of the VLAN. Valid values are multiples of 4096. The default value is 32768.<br>**Note** This value must be identical on both vPC peers. |
| **Step 5** | switch(config-vpn-domain)# **exit** | Exits the vpc-domain configuration mode. |
| **Step 6** | (Optional) switch(config)# **show spanning-tree summary** | Displays a summary of the spanning tree port states including the vPC peer switch.<br>Look for the following line in the command output:<br>`vPC peer-switch is enabled (operational)` |
| **Step 7** | (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 configure a pure vPC peer switch topology:

```
switch# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
switch(config)# vpc domain 5
switch(config-vpc-domain)# peer-switch
2010 Apr 28 14:44:44 switch %STP-2-VPC_PEERSWITCH_CONFIG_ENABLED: vPC peer-switch
configuration is enabled. Please make sure to configure spanning tree "bridge" priority as

per recommended guidelines to make vPC peer-switch operational.
switch(config-vpc-domain)# exit
switch(config)# spanning-tree vlan 1 priority 8192
switch(config)# show spanning-tree summary
Switch is in rapid-pvst mode
Root bridge for: VLAN0001-VLAN0050, VLAN0100-VLAN0149, VLAN0200-VLAN0249
  VLAN0300-VLAN0349, VLAN0400-VLAN0599, VLAN0900-VLAN0999
Port Type Default                        is disable
Edge Port [PortFast] BPDU Guard Default  is disabled
Edge Port [PortFast] BPDU Filter Default is disabled
Bridge Assurance                         is enabled
Loopguard Default                        is disabled
Pathcost method used                     is short
```

```
vPC peer-switch                          is enabled (operational)
Name                   Blocking Listening Learning Forwarding STP Active
---------------------- -------- --------- -------- ---------- ----------
VLAN0001                     0         0        0         16         16
VLAN0002                     0         0        0         16         16
switch(config)# copy running-config startup-config
switch(config)#
```

## Configuring a Hybrid vPC Peer Switch Topology

You can configure a hybrid vPC and non-vPC peer switch topology by using the spanning-tree pseudo-information command to change the designated bridge ID so that it meets the STP VLAN-based load-balancing criteria and then change the root bridge ID priority to a value that is better than the best bridge priority. You then enable the peer switch. For more information, see the command reference for your device.

**Note** If you previously configured global spanning tree parameters and you subsequently configure spanning tree pseudo information parameters, be aware that the pseudo information parameters take precedence over the global parameters.

### Before you begin

Ensure that you have enabled the vPC feature.

### Procedure

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | switch# **configure terminal** | Enters global configuration mode. |
| **Step 2** | switch(config)# **spanning-tree pseudo-information** | Configures the spanning tree pseudo information.<br>**Note** This configuration takes precedence over any global spanning tree configurations. |
| **Step 3** | switch(config-pseudo)# **vlan** *vlan-id* **designated priority** *priority* | Configures the designated bridge priority of the VLAN. Valid values are multiples of 4096 from 0 to 61440. |
| **Step 4** | switch(config-pseudo)# **vlan** *vlan-id* **root priority** *priority* | Configures the root bridge priority of the VLAN. Valid values are multiples of 4096 from 0 to 61440.<br>**Note** This value must be identical on both vPC peers to have an operational peer switch. |
| **Step 5** | switch(config-pseudo)# **exit** | Exists spanning tree pseudo information configuration mode. |

| | Command or Action | Purpose |
|---|---|---|
| **Step 6** | switch(config)# **vpc domain** *domain-id* | Enters the vPC domain number that you want to configure. The system enters the vpc-domain configuration mode. |
| **Step 7** | switch(config-vpc-domain)# **peer-switch** | Enables the vPC switch pair to appear as a single STP root in the Layer 2 topology.<br>Use the **no** form of the command to disable the peer switch vPC topology. |
| **Step 8** | switch(config-vpc-domain)# **exit** | Exits the vpc-domain configuration mode. |
| **Step 9** | (Optional) switch(config)# **show spanning-tree summary** | Displays a summary of the spanning tree port states including the vPC peer switch.<br>Look for the following line in the command output:<br>`vPC peer-switch is enabled (operational)` |
| **Step 10** | (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 configure a hybrid vPC peer switch topology:

```
switch# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
switch(config)# spanning-tree pseudo-information
switch(config-pseudo)# vlan 1 designated priority 8192
switch(config-pseudo)# vlan 1 root priority 4096
switch(config-pseudo)# exit
switch(config)# vpc domain 5
switch(config-vpc-domain)# peer-switch
switch(config-vpc-domain)# exit
switch(config)# copy running-config startup-config
```

# Configuring Layer 3 over vPC

### Before you begin

- Ensure that the peer-gateway feature is enabled and configured on both the vPC peers.
- Ensure that both the peers are running an image that supports the Layer 3 over vPC feature.
- Ensure that the **mac move notify enabled** flag is set to 1 on both the vPC peers . To view the flag status, use the **show platform fwm info global | grep "mac move"** command in Privilege Exec mode.

On Cisco Nexus devices with Cisco NX-OS Release 7.3.(0)N1(1) and 7.3.(1)N1(1), if the **mac move notify enabled** flag is set to 0, then use the **no debug platform fwm mac_move_notify_disable** command to set the flag to 1.

### Procedure

**Step 1** Enter global configuration mode:

switch# **configure terminal**

**Step 2** Enter the vpc-domain configuration mode for an existing vpc domain:

switch(config)# **vpc domain** *domain_id*

**Step 3** Enable peer gateway on both the vPC peers:

switch(config-vpc-domain)# **peer-gateway**

**Step 4** Enable the Layer 3 peer-router on both the vPC peers, to form peering adjacency with both the peers:

switch(config-vpc-domain)# **layer3 peer-router**

**Note** If you enable the layer 3 peer-router without enabling the peer-gateway feature, the following syslog message is displayed:

```
"Please enable peer-gateway before configuring this feature."
```

**Step 5** Exit the vpc-domain configuration mode:

switch(config-vpc-domain)# **end**

**Step 6** (Optional) Verify the configuration by displaying brief information about each vPC domain:

switch# **show vpc brief**

### Example

This example shows how to configure Layer 3 over vPC:

```
switch# configure terminal
switch(config)# vpc domain 5
switch(config-vpc-domain)# peer-gateway
switch(config-vpc-domain)# layer3 peer-router
switch(config-vpc-domain)# end
```

This example shows how to verify if the Layer 3 over vPC feature is configured:

```
switch# show vpc brief
vPC domain id : 1
Peer status : peer adjacency formed ok
vPC keep-alive status : peer is alive
Configuration consistency status : success
Per-vlan consistency status : failed
Type-2 consistency status : success
vPC role : secondary
Number of vPCs configured : 2
Peer Gateway : Enabled
Peer gateway excluded VLANs : -
Dual-active excluded VLANs : -
Graceful Consistency Check : Enabled
Auto-recovery status : Enabled (timeout = 240 seconds)
Operational Layer3 Peer : Enabled
```

# Isolating and Restoring a Switch from the vPC Complex

## Configuring vPC Shutdown

Isolates a switch from the vPC complex. Once the switch is isolated, the switch can be debugged, reloaded, or even removed physically, without affecting the vPC traffic going through the non-isolated switch.

**Note** When vPC switches are isolated, configuration changes are not allowed on both the isolated and non-isolated switches.

Only a disruptive upgrade is supported on an isolated switch.

### Procedure

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | switch# **configure terminal** | Enters global configuration mode. |
| **Step 2** | switch(config)# **vpc domain** *domain-id* | Creates a vPC domain on the switch and enters the vpc-domain configuration mode. There is no default domain-id. The range is from 1 to 1000. |
| **Step 3** | switch(config-vpc)# **shutdown** | Isolates the switch from the vPC domain. |
| **Step 4** | switch(config-vpc)# **copy running-config startup-config** | Saves the running configuration to the startup configuration file so that all current configuration details are available after a reboot. |

### Example

This example shows how to shutdown traffic on vPC domain 100.

```
switch# configure terminal
switch(config)# vpc domain 100
switch(config-vpc)# shutdown
switch(config-vpc)# copy running-config startup-config
```

## Restoring a vPC Shutdown Switch

Brings an isolated switch back into the vPC complex with minimal disruption.

### Procedure

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | switch# **configure terminal** | Enters global configuration mode. |
| **Step 2** | switch(config)# **vpc domain** *domain-id* | Creates a vPC domain on the switch and enters the vpc-domain configuration mode. There is no default domain-id. The range is from 1 to 1000. |
| **Step 3** | switch(config-vpc)# **no shutdown** | Restores the switch to the vPC domain. |
| **Step 4** | switch(config-vpc)# **copy running-config startup-config** | Saves the running configuration to the startup configuration file so that all current configuration details are available after a reboot. |

### Example

This example shows how to restore traffic on vPC domain 100.

```
switch# configure terminal
switch(config)# vpc domain 100
switch(config-vpc)# no shutdown
switch(config-vpc)# copy running-config startup-config
```

# Verifying the vPC Configuration

Use the following commands to display vPC configuration information:

| Command | Purpose |
|---|---|
| switch# **show feature** | Displays whether vPC is enabled or not. |
| switch# **show port-channel capacity** | Displays how many EtherChannels are configured and how many are still available on the switch. |
| switch# **show running-config vpc** | Displays running configuration information for vPCs. |
| switch# **show vpc brief** | Displays brief information on the vPCs. |
| switch# **show vpc consistency-parameters** | Displays the status of those parameters that must be consistent across all vPC interfaces. |
| switch# **show vpc peer-keepalive** | Displays information on the peer-keepalive messages. |
| switch# **show vpc role** | Displays the peer status, the role of the local switch, the vPC system MAC address and system priority, and the MAC address and priority for the local vPC switch. |

| Command | Purpose |
|---|---|
| switch# **show vpc statistics** | Displays statistics on the vPCs.<br>**Note** This command displays the vPC statistics only for the vPC peer device that you are working on. |

For information about the switch output, see the Command Reference for your Cisco Nexus Series switch.

# Viewing the Graceful Type-1 Check Status

This example shows how to display the current status of the graceful Type-1 consistency check:

```
switch# show vpc brief
Legend:
                (*) - local vPC is down, forwarding via vPC peer-link

vPC domain id                    : 10
Peer status                      : peer adjacency formed ok
vPC keep-alive status            : peer is alive
Configuration consistency status: success
Per-vlan consistency status      : success
Type-2 consistency status        : success
vPC role                         : secondary
Number of vPCs configured        : 34
Peer Gateway                     : Disabled
Dual-active excluded VLANs       : -
Graceful Consistency Check       : Enabled

vPC Peer-link status
---------------------------------------------------------------------
id   Port   Status Active vlans
--   ----   ------ --------------------------------------------------
1    Po1    up     1
```

# Viewing a Global Type-1 Inconsistency

When a global Type-1 inconsistency occurs, the vPCs on the secondary switch are brought down. The following example shows this type of inconsistency when there is a spanning-tree mode mismatch.

The example shows how to display the status of the suspended vPC VLANs on the secondary switch:

```
switch(config)# show vpc
Legend:
                (*) - local vPC is down, forwarding via vPC peer-link

vPC domain id                    : 10
Peer status                      : peer adjacency formed ok
vPC keep-alive status            : peer is alive
Configuration consistency status: failed
Per-vlan consistency status      : success
Configuration consistency reason: vPC type-1 configuration incompatible - STP
                                  Mode inconsistent
Type-2 consistency status        : success
vPC role                         : secondary
Number of vPCs configured        : 2
Peer Gateway                     : Disabled
Dual-active excluded VLANs       : -
Graceful Consistency Check       : Enabled
```

```
vPC Peer-link status
---------------------------------------------------------------------
id   Port   Status Active vlans
--   ----   ------ --------------------------------------------------
1    Po1    up     1-10

vPC status
----------------------------------------------------------------------------
id     Port        Status Consistency Reason                     Active vlans
------ ----------- ------ ----------- -------------------------- -----------
20     Po20        down*  failed      Global compat check failed -
30     Po30        down*  failed      Global compat check failed -
```

The example shows how to display the inconsistent status ( the VLANs on the primary vPC are not suspended) on the primary switch:

```
switch(config)# show vpc
Legend:
                (*) - local vPC is down, forwarding via vPC peer-link

vPC domain id                  : 10
Peer status                    : peer adjacency formed ok
vPC keep-alive status          : peer is alive
Configuration consistency status: failed
Per-vlan consistency status    : success
Configuration consistency reason: vPC type-1 configuration incompatible - STP Mo
de inconsistent
Type-2 consistency status      : success
vPC role                       : primary
Number of vPCs configured      : 2
Peer Gateway                   : Disabled
Dual-active excluded VLANs     : -
Graceful Consistency Check     : Enabled

vPC Peer-link status
---------------------------------------------------------------------
id   Port   Status Active vlans
--   ----   ------ --------------------------------------------------
1    Po1    up     1-10

vPC status
----------------------------------------------------------------------------
id     Port        Status Consistency Reason                     Active vlans
------ ----------- ------ ----------- -------------------------- -----------
20     Po20        up     failed      Global compat check failed 1-10
30     Po30        up     failed      Global compat check failed 1-10
```

# Viewing an Interface-Specific Type-1 Inconsistency

When an interface-specific Type-1 inconsistency occurs, the vPC port on the secondary switch is brought down while the primary switch vPC ports remain up.The following example shows this type of inconsistency when there is a switchport mode mismatch.

This example shows how to display the status of the suspended vPC VLAN on the secondary switch:

```
switch(config-if)# show vpc brief
Legend:
                (*) - local vPC is down, forwarding via vPC peer-link

vPC domain id                  : 10
```

```
Peer status                     : peer adjacency formed ok
vPC keep-alive status           : peer is alive
Configuration consistency status: success
Per-vlan consistency status     : success
Type-2 consistency status       : success
vPC role                        : secondary
Number of vPCs configured       : 2
Peer Gateway                    : Disabled
Dual-active excluded VLANs      : -
Graceful Consistency Check      : Enabled

vPC Peer-link status
---------------------------------------------------------------------
id   Port   Status Active vlans
--   ----   ------  -------------------------------------------------
1    Po1    up     1

vPC status
----------------------------------------------------------------------------
id     Port        Status Consistency Reason                     Active vlans
------ ----------- ------ ----------- -------------------------- -----------
20     Po20        up     success     success                    1
30     Po30        down*  failed      Compatibility check failed -
                                       for port mode
```

This example shows how to display the inconsistent status (the VLANs on the primary vPC are not suspended) on the primary switch:

```
switch(config-if)# show vpc brief
Legend:
                (*) - local vPC is down, forwarding via vPC peer-link

vPC domain id                   : 10
Peer status                     : peer adjacency formed ok
vPC keep-alive status           : peer is alive
Configuration consistency status: success
Per-vlan consistency status     : success
Type-2 consistency status       : success
vPC role                        : primary
Number of vPCs configured       : 2
Peer Gateway                    : Disabled
Dual-active excluded VLANs      : -
Graceful Consistency Check      : Enabled

vPC Peer-link status
---------------------------------------------------------------------
id   Port   Status Active vlans
--   ----   ------ --------------------------------------------------
1    Po1    up     1

vPC status
----------------------------------------------------------------------------
id     Port        Status Consistency Reason                     Active vlans
------ ----------- ------ ----------- -------------------------- -----------
20     Po20        up     success     success                    1
30     Po30        up     failed      Compatibility check failed 1
                                       for port mode
```

# Viewing a Per-VLAN Consistency Status

To view the per-VLAN consistency or inconsistency status, enter the **show vpc consistency-parameters vlans** command.

### Example

This example shows how to display the consistent status of the VLANs on the primary and the secondary switches.

```
switch(config-if)# show vpc brief
Legend:
                (*) - local vPC is down, forwarding via vPC peer-link

vPC domain id                   : 10
Peer status                     : peer adjacency formed ok
vPC keep-alive status           : peer is alive
Configuration consistency status: success
Per-vlan consistency status     : success
Type-2 consistency status       : success
vPC role                        : secondary
Number of vPCs configured       : 2
Peer Gateway                    : Disabled
Dual-active excluded VLANs      : -
Graceful Consistency Check      : Enabled

vPC Peer-link status
---------------------------------------------------------------------
id   Port   Status Active vlans
--   ----   ------ --------------------------------------------------
1    Po1    up     1-10

vPC status
----------------------------------------------------------------------------
id     Port        Status Consistency Reason                     Active vlans
------ ----------- ------ ----------- -------------------------- -----------
20     Po20        up     success     success                    1-10
30     Po30        up     success     success                    1-10
```

Entering **no spanning-tree vlan 5** command triggers the inconsistency on the primary and secondary VLANs:

```
switch(config)# no spanning-tree vlan 5
```

This example shows how to display the per-VLAN consistency status as Failed on the secondary switch:

```
switch(config)# show vpc brief
Legend:
                (*) - local vPC is down, forwarding via vPC peer-link

vPC domain id                   : 10
Peer status                     : peer adjacency formed ok
vPC keep-alive status           : peer is alive
Configuration consistency status: success
Per-vlan consistency status     : failed
Type-2 consistency status       : success
vPC role                        : secondary
Number of vPCs configured       : 2
Peer Gateway                    : Disabled
Dual-active excluded VLANs      : -
```

```
Graceful Consistency Check      : Enabled

vPC Peer-link status
---------------------------------------------------------------------
id   Port   Status Active vlans
--   ----   ------ --------------------------------------------------
1    Po1    up     1-4,6-10

vPC status
----------------------------------------------------------------------------
id     Port        Status Consistency Reason                     Active vlans
------ ----------- ------ ----------- -------------------------- -----------
20     Po20        up     success     success                    1-4,6-10
30     Po30        up     success     success                    1-4,6-10
```

This example shows how to display the per-VLAN consistency status as Failed on the primary switch:

```
switch(config)# show vpc brief
Legend:
                (*) - local vPC is down, forwarding via vPC peer-link

vPC domain id                   : 10
Peer status                     : peer adjacency formed ok
vPC keep-alive status           : peer is alive
Configuration consistency status: success
Per-vlan consistency status     : failed
Type-2 consistency status       : success
vPC role                        : primary
Number of vPCs configured       : 2
Peer Gateway                    : Disabled
Dual-active excluded VLANs      : -
Graceful Consistency Check      : Enabled

vPC Peer-link status
---------------------------------------------------------------------
id   Port   Status Active vlans
--   ----   ------ --------------------------------------------------
1    Po1    up     1-4,6-10

vPC status
----------------------------------------------------------------------------
id     Port        Status Consistency Reason                     Active vlans
------ ----------- ------ ----------- -------------------------- -----------
20     Po20        up     success     success                    1-4,6-10
30     Po30        up     success     success                    1-4,6-10
```

This example shows the inconsistency as STP Disabled:

```
switch(config)# show vpc consistency-parameters vlans

Name                        Type  Reason Code             Pass Vlans

-------------               ----  ---------------------- -----------------------
STP Mode                    1     success                0-4095
STP Disabled                1     vPC type-1             0-4,6-4095
                                  configuration
                                  incompatible - STP is
                                  enabled or disabled on
                                   some or all vlans
STP MST Region Name         1     success                0-4095
STP MST Region Revision     1     success                0-4095
STP MST Region Instance to  1     success                0-4095
 VLAN Mapping
STP Loopguard               1     success                0-4095
STP Bridge Assurance        1     success                0-4095
STP Port Type, Edge         1     success                0-4095
BPDUFilter, Edge BPDUGuard
STP MST Simulate PVST       1     success                0-4095
Pass Vlans                  -                            0-4,6-4095
```

# Viewing Dual Active Detection Status

When MCT (Multichassis EtherChannel Trunk) is down and keepalive is up, dual active situation arises. The dual active detection status is set to 1 on operational secondary device.

This example displays dual active detection status on operational secondary device:

```
switch# show vpc role
vPC Role status
----------------------------------------------------
vPC role : primary, operational secondary
Dual Active Detection Status : 1
vPC system-mac : 00:23:04:ee:be:01
vPC system-priority : 32667
vPC local system-mac : 8c:60:4f:17:e6:41
vPC local role-priority : 3000
Leaf-ACC-4#
```

This example displays the dual active detection status on operational primary device:

```
switch# show vpc role
vPC Role status
----------------------------------------------------
vPC role : secondary, operational primary
Dual Active Detection Status : 0
vPC system-mac : 00:23:04:ee:be:01
vPC system-priority : 32667
vPC local system-mac : 8c:60:4f:17:e5:fc
vPC local role-priority : 4000
```

# vPC Default Settings

The following table lists the default settings for vPC parameters.

*Table 1: Default vPC Parameters*

| Parameters | Default |
|---|---|
| vPC system priority | 32667 |
| vPC peer-keepalive message | Disabled |
| vPC peer-keepalive interval | 1 second |
| vPC peer-keepalive timeout | 5 seconds |
| vPC peer-keepalive UDP port | 3200 |