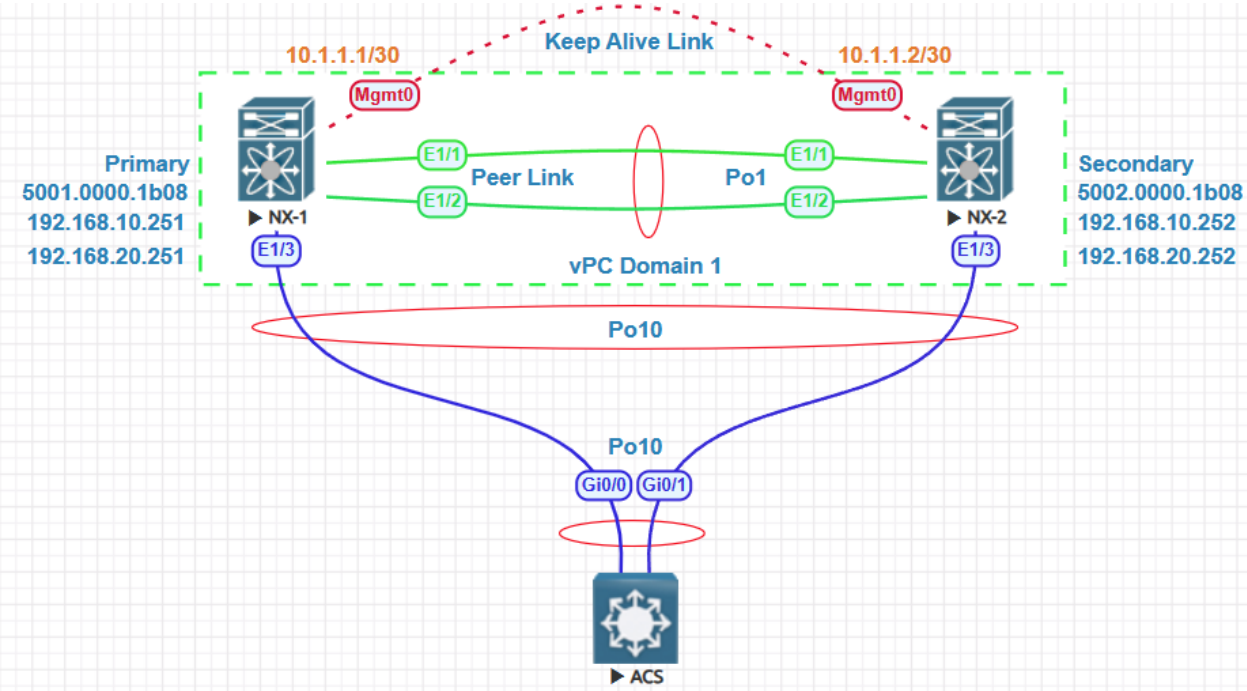
vPC Consistency Checks Lab:



NX-1 Role	Primary
NX-2 Role	Secondary
NX-1 Priority	20
NX-2 Priority	30
Peer Links	E1/1 and E1/2
Keep Alive Link	Mgmt0
NX-1 Mgmt0 IP Address	10.1.1.1/30
NX-2 Mgmt0 IP Address	10.1.1.2/30
VLAN NX-1 and NX-2	VLAN 10
NX-1 SVI 10 IP Address	192.168.10.251
NX-2 SVI 10 IP Address	192.168.10.252
vPC Domain	1
Peer Link Portchannel	1
Member Portchannel	10
Member Ports	E1/3
Member Ports vPC	10
ACS Switch Ports	G0/0 and G0/1
ACS Switch Images	viosl2-adventerprisek9-m.ssa.high_iron_20190423
Nexus Images Version	9300v 9.3.6
Nexus EVE-NG Image	nxosv9k-9.3.6

NX-1 Switch Configuration
switch(config)# hostname NX-1
NX-1(config)# feature vpc NX-1(config)# feature lacp NX-1(config)# feature interface-vlan
NX-1(config)# interface mgmt 0 NX-1(config-if)# ip address 10.1.1.1/30 NX-1(config-if)# no shutdown
NX-1(config)# vpc domain 1 NX-1(config-vpc-domain)# role priority 20 NX-1(config-vpc-domain)# peer-keepalive destination 10.1.1.2 source 10.1.1.1 vrf management NX-1(config-vpc-domain)# exit
NX-1(config)# interface ethernet 1/1-2 NX-1(config-if-range)# switchport mode trunk NX-1(config-if-range)# spanning-tree port type network NX-1(config-if-range)# channel-group 1 mode active NX-1(config-if-range)# no shutdown
NX-1(config)# interface port-channel 1 NX-1(config-if)# no shutdown NX-1(config-if)# switchport NX-1(config-if)# switchport mode trunk NX-1(config-if)# spanning-tree port type network NX-1(config-if)# vpc peer-link
NX-1(config)# interface ethernet 1/3 NX-1(config-if)# channel-group 10 mode active NX-1(config-if)# no shutdown NX-1(config-if)# exit
NX-1(config)# interface port-channel 10 NX-1(config-if)# no shutdown NX-1(config-if)# switchport NX-1(config-if)# switchport mode trunk NX-1(config-if)# vpc 10
NX-1(config)# vlan 10
NX-1(config)# interface vlan 10 NX-1(config-if)# ip address 192.168.10.251/24 NX-1(config-if)# no shutdown NX-1(config-if)# exit

NX-2 Switch Configuration
switch(config)# hostname NX-2
NX-2(config)# feature vpc NX-2(config)# feature lacp NX-2(config)# feature interface-vlan
NX-2(config)# interface mgmt 0 NX-2(config-if)# ip address 10.1.1.2/30 NX-2(config-if)# no shutdown
NX-2(config)# vpc domain 1 NX-2(config-vpc-domain)# role priority 20 NX-2(config-vpc-domain)# peer-keepalive destination 10.1.1.1 source 10.1.1.2 vrf management NX-2(config-vpc-domain)# exit
NX-2(config)# interface ethernet 1/1-2 NX-2(config-if-range)# switchport mode trunk NX-2(config-if-range)# spanning-tree port type network NX-2(config-if-range)# channel-group 1 mode active NX-2(config-if-range)# no shutdown
NX-2(config)# interface port-channel 1 NX-2(config-if)# no shutdown NX-2(config-if)# switchport NX-2(config-if)# switchport mode trunk NX-2(config-if)# spanning-tree port type network NX-2(config-if)# vpc peer-link
NX-2(config)# interface ethernet 1/3 NX-2(config-if)# channel-group 10 mode active NX-2(config-if)# no shutdown NX-2(config-if)# exit
NX-2(config)# interface port-channel 10 NX-2(config-if)# no shutdown NX-2(config-if)# switchport NX-2(config-if)# switchport mode trunk NX-2(config-if)# vpc 10
NX-2(config)# vlan 10
NX-2(config)# interface vlan 10 NX-2(config-if)# ip address 192.168.10.252/24 NX-2(config-if)# no shutdown NX-2(config-if)# exit

ACS Switch Configuration
Change hostname
Switch(config)#hostname ACS
Configure Port-channel
ACS(config)#interface range g0/0-1 ACS(config-if-range)#switchport trunk encapsulation dot1q ACS(config-if-range)#switchport mode trunk ACS(config-if-range)#channel-protocol lacp ACS(config-if-range)#channel-group 10 mode active ACS(config-if-range)#no shutdown ACS(config-if-range)#exit ACS(config)#exit
ACS(config)#vlan 10 ACS(config-vlan)#exit
ACS(config)#interface g0/2 ACS(config-if)#switchport mode access ACS(config-if)#switchport access vlan 10 ACS(config-if)#no shutdown ACS(config-if)#exit

Cisco vPC Command	Purpose
show feature	Displays whether the vPC is enabled or not
show vpc brief	Displays brief information about the vPCs
show vpc consistency-parameters	Displays the current status of parameters
show running-config vpc	Displays running configuration information for vPCs
show port-channel capacity	Displays how many port channels are configured
show vpc statistics	Displays statistics about the vPCs
show vpc peer-keepalive	Displays info about the peer-keepalive messages
show vpc role	Displays the vPC peer's state
show vpc orphan-ports	Displays orphan port details

The show vpc consistency-parameters global command lists all global consistency check parameters.

```
NX-1# show vpc consistency-parameters global

    Legend:
        Type 1 : vPC will be suspended in case of mismatch

Name                          Type  Local Value            Peer Value
-------------                 ----  ---------------------- -----------------------
STP MST Simulate PVST         1     Enabled                Enabled
STP Port Type, Edge           1     Normal, Disabled,      Normal, Disabled,
BPDUFilter, Edge BPDUGuard          Disabled               Disabled
STP MST Region Name           1     ""                     ""
STP Disabled                  1     None                   None
STP Mode                      1     Rapid-PVST             Rapid-PVST
STP Bridge Assurance          1     Enabled                Enabled
STP Loopguard                 1     Disabled               Disabled
STP MST Region Instance to    1
 VLAN Mapping
STP MST Region Revision       1     0                      0
Xconnect Vlans                1
QoS (Cos)                     2     ([0-7], [], [], [],    ([0-7], [], [], [],
                                    [], [], [], [])        [], [], [], [])
Network QoS (MTU)             2     (1500, 1500, 1500,     (1500, 1500, 1500,
                                    1500, 0, 0, 0, 0)      1500, 0, 0, 0, 0)
Network Qos (Pause:           2     (F, F, F, F, F, F, F,  (F, F, F, F, F, F, F,
T->Enabled, F->Disabled)            F)                     F)
Input Queuing (Bandwidth)     2     (0, 0, 0, 0, 0, 0, 0,  (0, 0, 0, 0, 0, 0, 0,
                                    0)                     0)
Input Queuing (Absolute       2     (F, F, F, F, F, F, F,  (F, F, F, F, F, F, F,
Priority: T->Enabled,               F)                     F)
F->Disabled)
Output Queuing (Bandwidth     2     (100, 0, 0, 0, 0, 0,   (100, 0, 0, 0, 0, 0,
Remaining)                          0, 0)                  0, 0)
Output Queuing (Absolute      2     (F, F, F, T, F, F, F,  (F, F, F, T, F, F, F,
Priority: T->Enabled,               F)                     F)
F->Disabled)
Allowed VLANs                 -     1                      1
```

Use the show vpc consistency-parameters interface port-channel number command to display the interface-level consistency parameters.

```
NX-2# show vpc consistency-parameters interface port-channel 10

    Legend:
        Type 1 : vPC will be suspended in case of mismatch

Name                        Type  Local Value            Peer Value
-------------               ----  ---------------------- -----------------------
delayed-lacp                1     disabled               disabled
mode                        1     active                 active
Switchport Isolated         1     0                      0
Interface type              1     port-channel           port-channel
LACP Mode                   1     on                     on
Virtual-ethernet-bridge     1     Disabled               Disabled
Speed                       1     1000 Mb/s              1000 Mb/s
Duplex                      1     full                   full
MTU                         1     1500                   1500
Port Mode                   1     trunk                  trunk
Native Vlan                 1     1                      1
Admin port mode             1     trunk                  trunk
STP Port Guard              1     Default                Default
STP Port Type               1     Default                Default
STP MST Simulate PVST       1     Default                Default
lag-id                      1     [(7f9b,                [(7f9b,
                                  0-23-4-ee-be-1, 800a,  0-23-4-ee-be-1, 800a,
                                  0, 0), (8000,          0, 0), (8000,
                                  50-0-0-4-80-0, a, 0,   50-0-0-4-80-0, a, 0,
                                  0)]                    0)]
Allow-Multi-Tag             1     Disabled               Disabled
Vlan xlt mapping            1     Disabled               Disabled
vPC card type               1     N9K EOR LC             N9K EOR LC
Allowed VLANs               -     1                      1
Local suspended VLANs       -     -                      -
```

The show vpc command show configuration consistency status for Type-2 is OK

```
NX-1# show vpc
Legend:
                (*) - local vPC is down, forwarding via vPC peer-link

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       : success
Type-2 consistency status         : success
vPC role                          : primary
Number of vPCs configured         : 1
Peer Gateway                      : Disabled
Dual-active excluded VLANs        : -
Graceful Consistency Check        : Enabled
Auto-recovery status              : Disabled
Delay-restore status              : Timer is off.(timeout = 30s)
Delay-restore SVI status          : Timer is off.(timeout = 10s)
Operational Layer3 Peer-router    : Disabled
Virtual-peerlink mode             : Disabled

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


vPC status
----------------------------------------------------------------------------
Id    Port          Status Consistency Reason                Active vlans
--    ------------  ------ ----------- ------                ------------
10    Po10          up     success     success               1


NX-1# show vpc
Legend:
                (*) - local vPC is down, forwarding via vPC peer-link

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       : success
Type-2 consistency status         : success
vPC role                          : primary
Number of vPCs configured         : 1
Peer Gateway                      : Disabled
Dual-active excluded VLANs        : -
Graceful Consistency Check        : Enabled
Auto-recovery status              : Disabled
Delay-restore status              : Timer is off.(timeout = 30s)
Delay-restore SVI status          : Timer is off.(timeout = 10s)
Operational Layer3 Peer-router    : Disabled
Virtual-peerlink mode             : Disabled
```

Let's verify spanning-tree mode in both switches it is rapid-pvst mode.

```
NX-1# show spanning-tree summary
Switch is in rapid-pvst mode
Root bridge for: none
L2 Gateway STP                                  is disabled
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
STP-Lite                                        is disabled
```

Type-1 Example:

NX-1 change spanning-tree mode
NX-1(config)# spanning-tree mode mst

```
NX-1(config)# show vpc consistency-parameters global

    Legend:
        Type 1 : vPC will be suspended in case of mismatch

Name                        Type  Local Value            Peer Value
-------------               ----  ---------------------- -----------------------
STP MST Simulate PVST       1     Enabled                Enabled
STP Port Type, Edge         1     Normal, Disabled,      Normal, Disabled,
BPDUFilter, Edge BPDUGuard        Disabled               Disabled
STP MST Region Name         1     ""                     ""
STP Disabled                1     None                   None
STP Mode                    1     MST                    Rapid-PVST
STP Bridge Assurance        1     Enabled                Enabled
STP Loopguard               1     Disabled               Disabled
STP MST Region Instance to  1
 VLAN Mapping
STP MST Region Revision     1     0                      0
Xconnect Vlans              1
QoS (Cos)                   2     ([0-7], [], [], [],    ([0-7], [], [], [],
                                  [], [], [], [])        [], [], [], [])
Network QoS (MTU)           2     (1500, 1500, 1500,     (1500, 1500, 1500,
                                  1500, 0, 0, 0, 0)      1500, 0, 0, 0, 0)
Network Qos (Pause:         2     (F, F, F, F, F, F, F,  (F, F, F, F, F, F, F,
--More--
```

After change STP mode lets verify in primary switch by show vpc command. the vPC ports and the VLANs remain up on the primary switch when an STP mode mismatch occurs.

```
NX-1(config)# show vpc
Legend:
                (*) - local vPC is down, forwarding via vPC peer-link

vPC domain id                     : 1
Peer status                       : peer adjacency formed ok
vPC keep-alive status             : peer is alive
Configuration consistency status  : failed
Per-vlan consistency status       : success
Configuration inconsistency reason: vPC type-1 configuration incompatible - STP
Mode inconsistent
Type-2 consistency status         : success
vPC role                          : primary
Number of vPCs configured         : 1
Peer Gateway                      : Disabled
Dual-active excluded VLANs        : -
Graceful Consistency Check        : Enabled
Auto-recovery status              : Disabled
Delay-restore status              : Timer is off.(timeout = 30s)
Delay-restore SVI status          : Timer is off.(timeout = 10s)
Operational Layer3 Peer-router    : Disabled
Virtual-peerlink mode             : Disabled

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


vPC status
----------------------------------------------------------------------------
Id    Port          Status Consistency Reason                Active vlans
--    ------------  ------ ----------- ------                ---------------
10    Po10          up     failed      Global compat check   1

                                       failed
```

```
NX-1(config)# show port-channel summary
Flags:  D - Down        P - Up in port-channel (members)
        I - Individual  H - Hot-standby (LACP only)
        s - Suspended   r - Module-removed
        b - BFD Session Wait
        S - Switched    R - Routed
        U - Up (port-channel)
        p - Up in delay-lacp mode (member)
        M - Not in use. Min-links not met
--------------------------------------------------------------------------
Group Port-       Type     Protocol  Member Ports
      Channel
--------------------------------------------------------------------------
1     Po1(SU)     Eth      LACP      Eth1/1(P)    Eth1/2(P)
10    Po10(SU)    Eth      LACP      Eth1/3(P)
NX-1(config)#
```

After change STP mode lets verify in secondary switch by show vpc command. vPC ports are down on a secondary switch when an STP mode mismatch occurs.

```
NX-2# show vpc
Legend:
                (*) - local vPC is down, forwarding via vPC peer-link

vPC domain id                     : 1
Peer status                       : peer adjacency formed ok
vPC keep-alive status             : peer is alive
Configuration consistency status  : failed
Per-vlan consistency status       : success
Configuration inconsistency reason: vPC type-1 configuration incompatible - STP
Mode inconsistent
Type-2 consistency status         : success
vPC role                          : secondary
Number of vPCs configured         : 1
Peer Gateway                      : Disabled
Dual-active excluded VLANs        : -
Graceful Consistency Check        : Enabled
Auto-recovery status              : Disabled
Delay-restore status              : Timer is off.(timeout = 30s)
Delay-restore SVI status          : Timer is off.(timeout = 10s)
Operational Layer3 Peer-router    : Disabled
Virtual-peerlink mode             : Disabled

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


vPC status
----------------------------------------------------------------------------
Id    Port          Status Consistency Reason                Active vlans
--    ------------  ------ ----------- ------                ---------------
10    Po10          down*  failed      Global compat check   -
```

```
NX-2# show port-channel summary
Flags:  D - Down        P - Up in port-channel (members)
        I - Individual  H - Hot-standby (LACP only)
        s - Suspended   r - Module-removed
        b - BFD Session Wait
        S - Switched    R - Routed
        U - Up (port-channel)
        p - Up in delay-lacp mode (member)
        M - Not in use. Min-links not met
--------------------------------------------------------------------------
Group Port-       Type     Protocol  Member Ports
      Channel
--------------------------------------------------------------------------
1     Po1(SU)     Eth      LACP      Eth1/1(P)    Eth1/2(P)
10    Po10(SD)    Eth      LACP      Eth1/3(D)
NX-2#
```

NX-1 change back spanning-tree mode
NX-1(config)# spanning-tree mode rapid-pvst
Change Bridge Assurance
NX-1(config)# no spanning-tree bridge assurance

After change bridge assurance lets verify in secondary switch by show vpc command. vPC ports are down on a secondary switch when bridge assurance mismatch occurs.

```
NX-2# show vpc
Legend:
                (*) - local vPC is down, forwarding via vPC peer-link

vPC domain id                     : 1
Peer status                       : peer adjacency formed ok
vPC keep-alive status             : peer is alive
Configuration consistency status  : failed
Per-vlan consistency status       : success
Configuration inconsistency reason: vPC type-1 configuration incompatible - STP
global Bridge Assurance inconsistent
Type-2 consistency status         : success
vPC role                          : secondary
Number of vPCs configured         : 1
Peer Gateway                      : Disabled
Dual-active excluded VLANs        : -
Graceful Consistency Check        : Enabled
Auto-recovery status              : Disabled
Delay-restore status              : Timer is off.(timeout = 30s)
Delay-restore SVI status          : Timer is off.(timeout = 10s)
Operational Layer3 Peer-router    : Disabled
Virtual-peerlink mode             : Disabled

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


vPC status
----------------------------------------------------------------------------
Id    Port          Status Consistency Reason                Active vlans
--    ------------  ------ ----------- ------                ---------------
10    Po10          down*  failed      Global compat check   -
                                       failed
```

```
NX-2# show port-channel summary
Flags:  D - Down        P - Up in port-channel (members)
        I - Individual  H - Hot-standby (LACP only)
        s - Suspended   r - Module-removed
        b - BFD Session Wait
        S - Switched    R - Routed
        U - Up (port-channel)
        p - Up in delay-lacp mode (member)
        M - Not in use. Min-links not met
--------------------------------------------------------------------------------
Group Port-       Type     Protocol  Member Ports
      Channel
--------------------------------------------------------------------------------
1     Po1(SU)     Eth      LACP      Eth1/1(P)    Eth1/2(P)
10    Po10(SD)    Eth      LACP      Eth1/3(D)
NX-2#
```

After change bridge assurance lets verify in primary switch by show vpc command. the vPC ports and the VLANs remain up on the primary switch when bridge assurance mismatch occurs.

```
NX-1(config)# show port-channel summary
Flags:  D - Down        P - Up in port-channel (members)
        I - Individual  H - Hot-standby (LACP only)
        s - Suspended   r - Module-removed
        b - BFD Session Wait
        S - Switched    R - Routed
        U - Up (port-channel)
        p - Up in delay-lacp mode (member)
        M - Not in use. Min-links not met
--------------------------------------------------------------------------------
Group Port-       Type     Protocol  Member Ports
      Channel
--------------------------------------------------------------------------------
1     Po1(SU)     Eth      LACP      Eth1/1(P)    Eth1/2(P)
10    Po10(SU)    Eth      LACP      Eth1/3(P)
NX-1(config)#
```

Change back Bridge Assurance
NX-1(config)# spanning-tree bridge assurance

Type-2 Example:

NX-1 shutdown SVI
NX-1(config)# interface vlan 10
NX-1(config-if)# ip address 10.1.1.1/24
NX-1(config-if)# shutdown

After shutdown SVI 10 on primary switch show vpc command show Type-2 consistency failed and show the reason that SVI Type-2 configuration incompatible

```
NX-2(config-if)# show vpc
Legend:
                (*) - local vPC is down, forwarding via vPC peer-link

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       : success
Type-2 consistency status         : failed
Type-2 inconsistency reason       : SVI type-2 configuration incompatible
vPC role                          : secondary
Number of vPCs configured         : 1
Peer Gateway                      : Disabled
Dual-active excluded VLANs        : -
Graceful Consistency Check        : Enabled
Auto-recovery status              : Disabled
Delay-restore status              : Timer is off.(timeout = 30s)
Delay-restore SVI status          : Timer is off.(timeout = 10s)
Operational Layer3 Peer-router    : Disabled
Virtual-peerlink mode             : Disabled
```

Type-1 PortChannel Example:

Before, do changes Let's verify consistency parameters for port-channel 10.

```
NX-1# show vpc consistency-parameters interface port-channel 10

    Legend:
        Type 1 : vPC will be suspended in case of mismatch

Name                        Type  Local Value            Peer Value
-------------               ----  ---------------------- -----------------------
delayed-lacp                1     disabled               disabled
mode                        1     active                 active
Switchport Isolated         1     0                      0
Interface type              1     port-channel           port-channel
LACP Mode                   1     on                     on
Virtual-ethernet-bridge     1     Disabled               Disabled
Speed                       1     1000 Mb/s              1000 Mb/s
Duplex                      1     full                   full
MTU                         1     1500                   1500
Port Mode                   1     trunk                  trunk
Native Vlan                 1     1                      1
Admin port mode             1     trunk                  trunk
STP Port Guard              1     Default                Default
STP Port Type               1     Default                Default
STP MST Simulate PVST       1     Default                Default
lag-id                      1     [(7f9b,                [(7f9b,
                                  0-23-4-ee-be-1, 800a,  0-23-4-ee-be-1, 800a,
                                  0, 0), (8000,          0, 0), (8000,
                                  50-0-0-4-80-0, a, 0,   50-0-0-4-80-0, a, 0,
                                  0)]                    0)]
Allow-Multi-Tag             1     Disabled               Disabled
Vlan xlt mapping            1     Disabled               Disabled
vPC card type               1     N9K EOR LC             N9K EOR LC
Allowed VLANs               -     1,10                   1,10
Local suspended VLANs       -     -                      -
NX-1#
```

NX-1 change MTU value
NX-1(config)# interface port-channel 10
NX-1(config-if)# mtu 9216

```
NX-1(config)# show vpc consistency-parameters interface port-channel 10

    Legend:
        Type 1 : vPC will be suspended in case of mismatch

Name                        Type  Local Value            Peer Value
-------------               ----  ---------------------- -----------------------
delayed-lacp                1     disabled               disabled
mode                        1     active                 active
Switchport Isolated         1     0                      0
Interface type              1     port-channel           port-channel
LACP Mode                   1     on                     on
Virtual-ethernet-bridge     1     Disabled               Disabled
Speed                       1     1000 Mb/s              1000 Mb/s
Duplex                      1     full                   full
MTU                         1     9216                   1500
Port Mode                   1     trunk                  trunk
Native Vlan                 1     1                      1
Admin port mode             1     trunk                  trunk
STP Port Guard              1     Default                Default
STP Port Type               1     Default                Default
STP MST Simulate PVST       1     Default                Default
lag-id                      1     [(7f9b,                [(7f9b,
```

After change MTU value on port-channel 10 the show vpc command show that po10 is down on secondary switch, consistency is failed and the reason is compatibility check failed for MTU,

```
NX-2# show vpc
Legend:
                (*) - local vPC is down, forwarding via vPC peer-link

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       : success
Type-2 consistency status         : success
vPC role                          : secondary
Number of vPCs configured         : 1
Peer Gateway                      : Disabled
Dual-active excluded VLANs        : -
Graceful Consistency Check        : Enabled
Auto-recovery status              : Disabled
Delay-restore status              : Timer is off.(timeout = 30s)
Delay-restore SVI status          : Timer is off.(timeout = 10s)
Operational Layer3 Peer-router    : Disabled
Virtual-peerlink mode             : Disabled

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


vPC status
----------------------------------------------------------------------------
Id    Port          Status Consistency Reason                Active vlans
--    ------------  ------ ----------- ------                ---------------
10    Po10          down*  failed      Compatibility check   -
                                       failed for MTU
```