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Deploying Virtual Port Channel in NX-OS

BRKDCT-2048

Gerard Chami

Customer Support Engineer

Cisco live!

Session Abstract

- This session is targeted to Network Engineers, Network Architects and IT administrators who have deployed or are considering the deployment of vPC to improve Layer 2 scalability and the network operational efficiency.
- Session introduces basic concepts and terminology of the virtual Port-Channel technology & also covers actual designs and best practices of the vPC technology. Designs are targeted for aggregation/access layer and also for Data-Centre Interconnect.
- VPC+ will be briefly covered in this session
- Nexus 2000 (FEX) will only be addressed from vPC standpoint.
- vPC troubleshooting will not be covered in this session
- The presentation includes hidden and reference slides

For Your Reference

Agenda

- Feature Overview
- vPC Design Guidance and Best Practices
- vPC Enhancements
- Convergence

Agenda

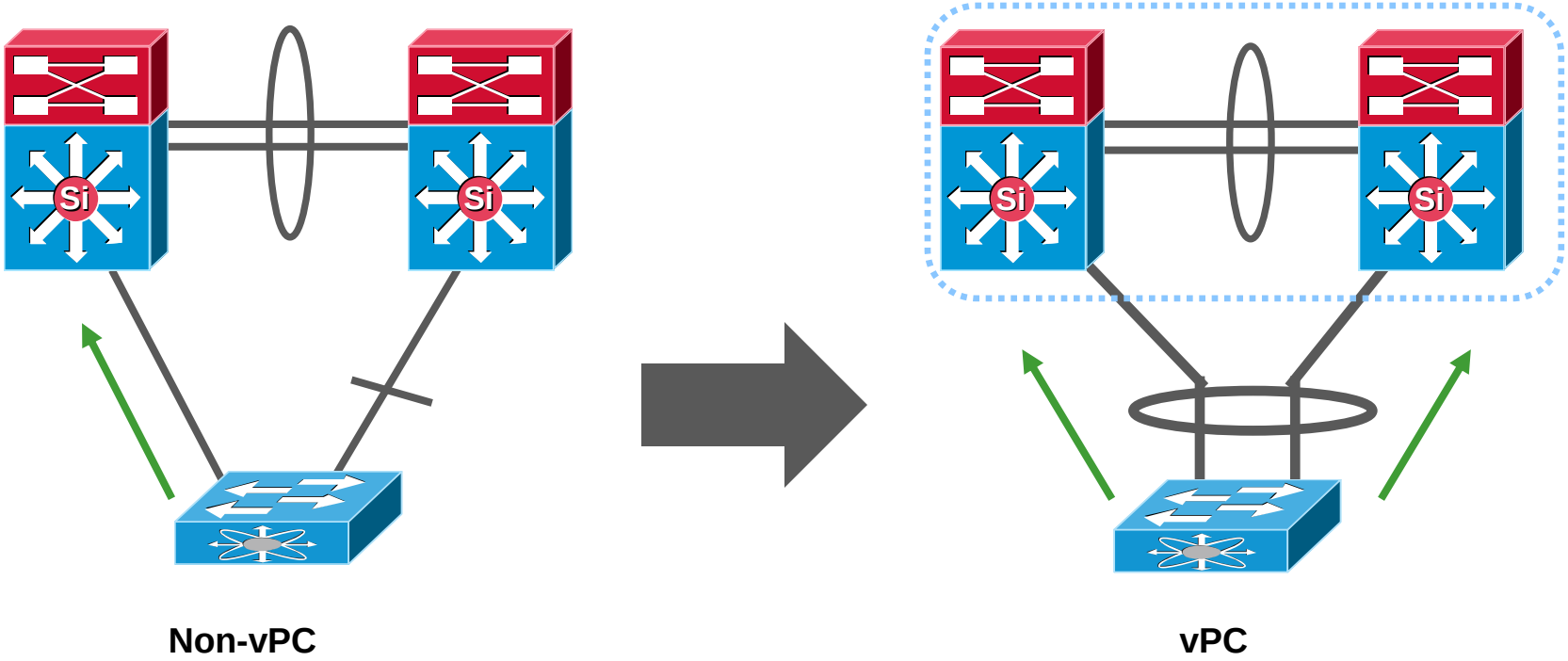
- Feature Overview
  - vPC Concept & Benefits
  - How does vPC help with STP?
  - vPC Terminology
  - Data-Plane Loop Avoidance with vPC
  - vPC vs vPC+
- vPC Design Guidance and Best Practices
- vPC Enhancements
- Convergence




VPC Feature Overview

vPC Feature Overview

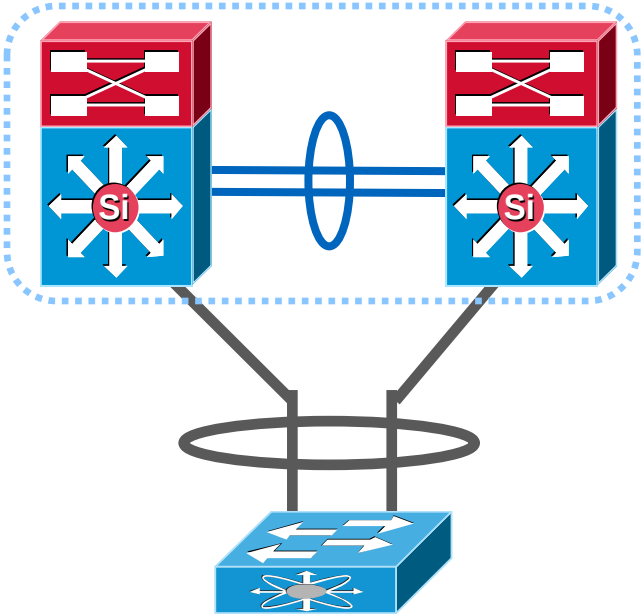
vPC Concept & Benefits



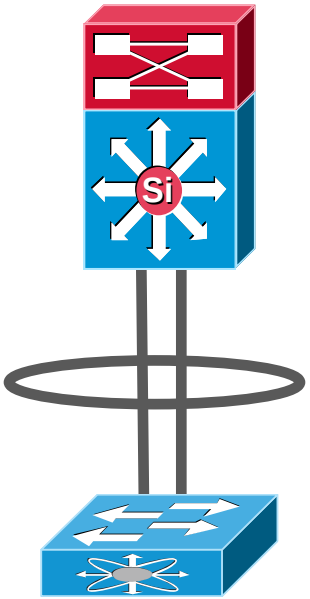
Non-vPC **vPC**

vPC Feature Overview

vPC Concept & Benefits



Physical Topology



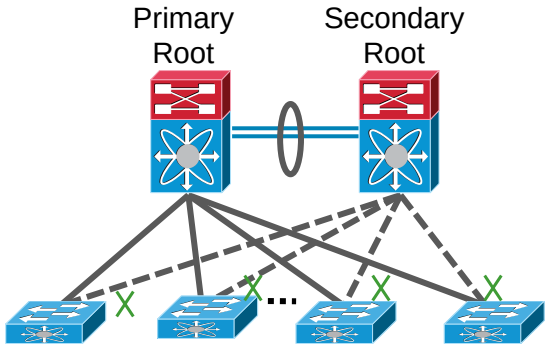
Logical Topology

- Simplicity
- Redundancy
- Efficiency
- Fast-Convergence

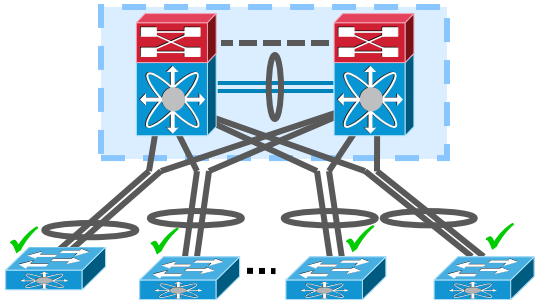
Feature Overview

How does vPC help with STP? (1 of 2)

- Before vPC
  - STP blocks redundant uplinks
  - VLAN based load balancing
  - Loop Resolution relies on STP
  - Protocol Failure → 💣



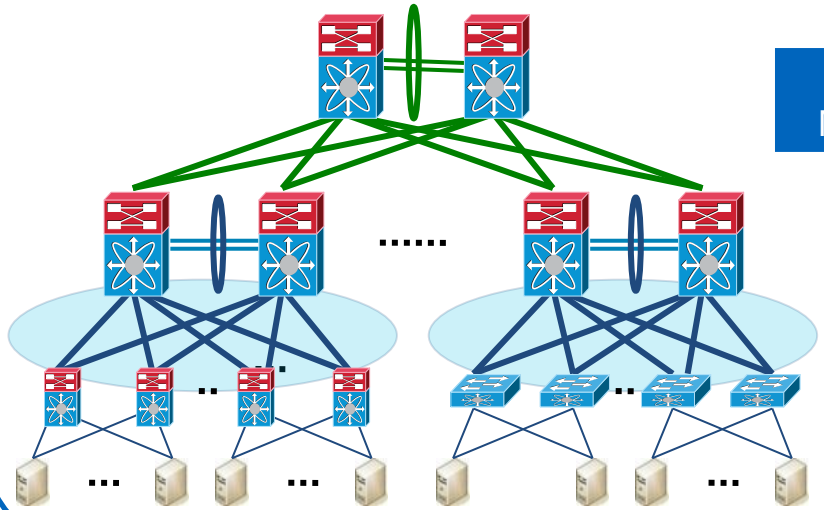
- With vPC
  - No blocked uplinks
  - EtherChannel load balancing (hash)
  - Loop Free Topology
  - Lower oversubscription



Feature Overview

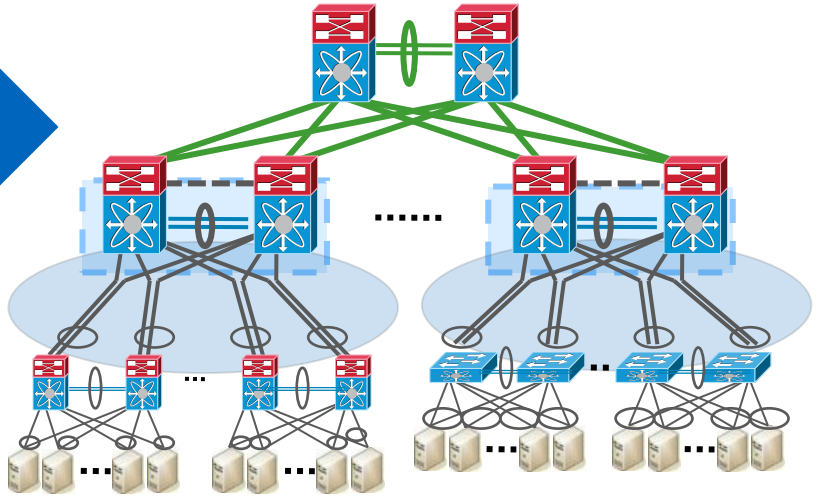
How does vPC help with STP? (2 of 2)

Reuse existing infrastructure



Smooth Migration

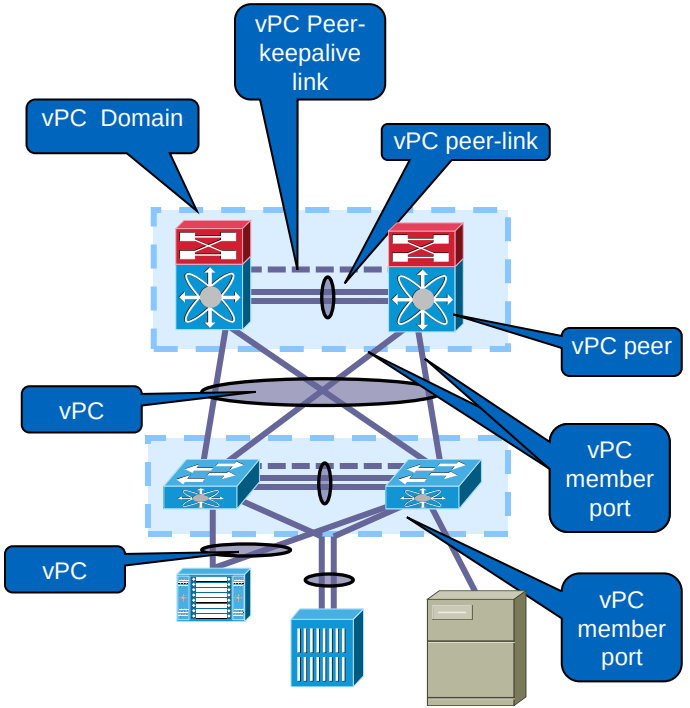
Build Loop-Free Networks



Feature Overview

vPC Terminology (1 of 2)

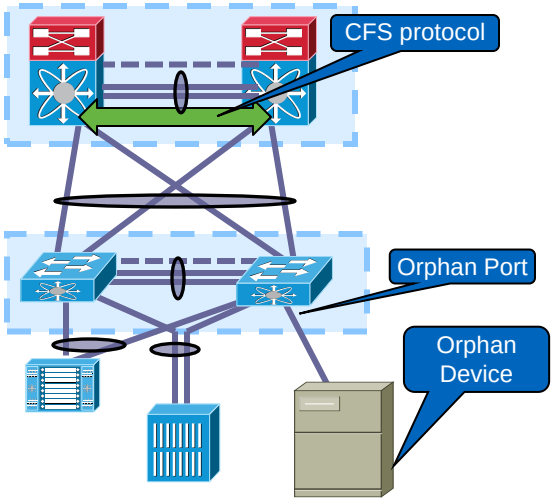
- **vPC Domain** - A pair of vPC switches in a vpc system
- **vPC Pee**r - A vPC switch, one of a pair
- **vPC member port** - one of a set of ports (port channels) that form a vPC
- **vPC** - the port channel between the vPC peer and the downstream device
- **vPC peer-link** - Link used to synchronise state between vPC peer devices, must be 10GE
- **vPC peer-keepalive link** - The keep-alive link between vPC peer devices



Feature Overview

vPC Terminology (2 of 2)

- **vPC VLAN** - Any of the VLANs carried over the peer-link and used to communicate via vPC with a peer device
- **Non-vPC VLAN -** Any of the STP VLANs not carried over the peer-link
- **CFS** - Cisco Fabric Services protocol, used for state synchronisation and configuration validation between peer devices
- **Orphan Device** – An orphan device is a device which is on a VPC vlan but only connected to one VPC peer and not to both
- **Orphan Port** – An orphan port is a interface which connects to an orphan device

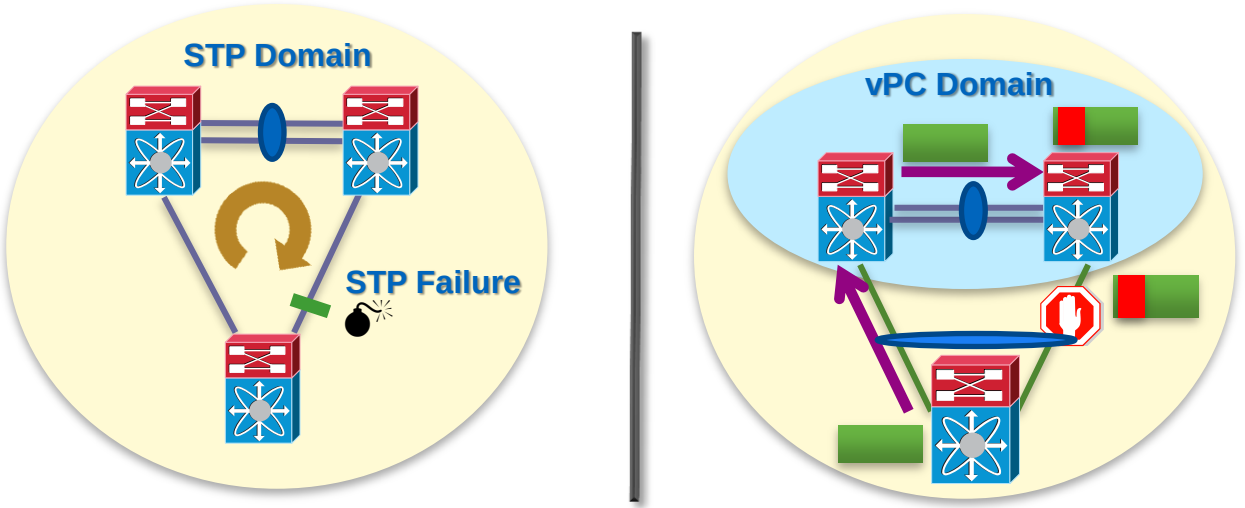


Feature Overview

Data-Plane Loop Avoidance with vPC (1 of 2)

Data-Plane vs. **Control-Plane** Loop control

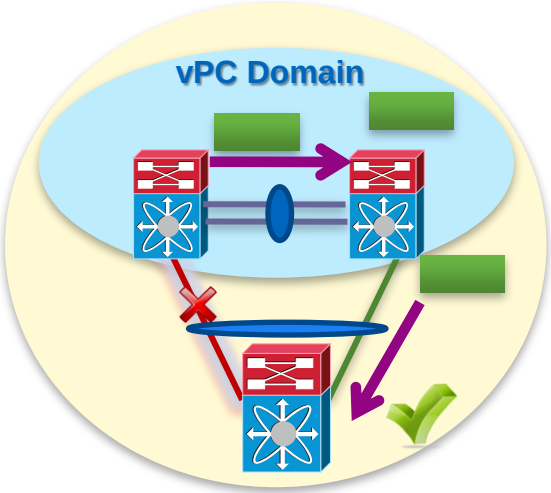
- vPC peers can forward all traffic locally
- Peer-link does not typically forward data packets (control plane extension)
- Traffic on the Peer-link is marked and not allowed to egress on a vPC



Feature Overview

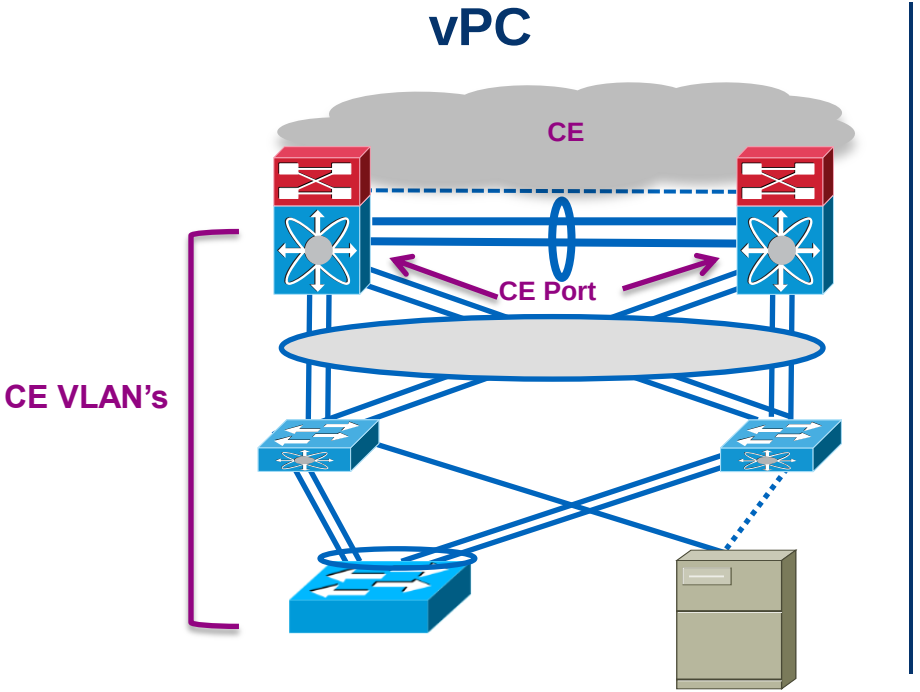
Data-Plane Loop Avoidance with vPC (2 of 2)

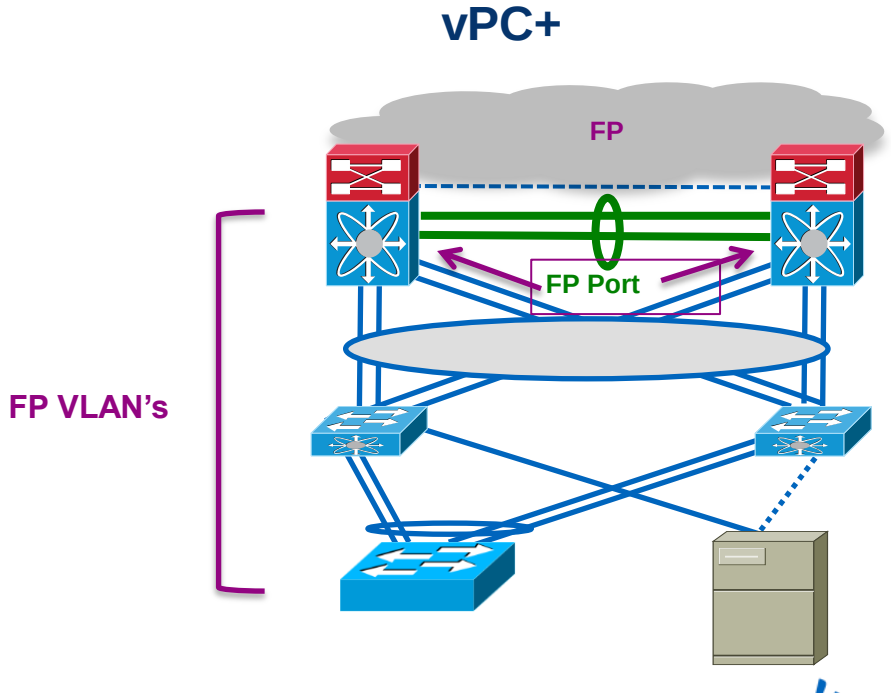
- Exception for single-sided vPC failures
- Peer-link used as Backup path for optimal resiliency



VPC vs VPC+

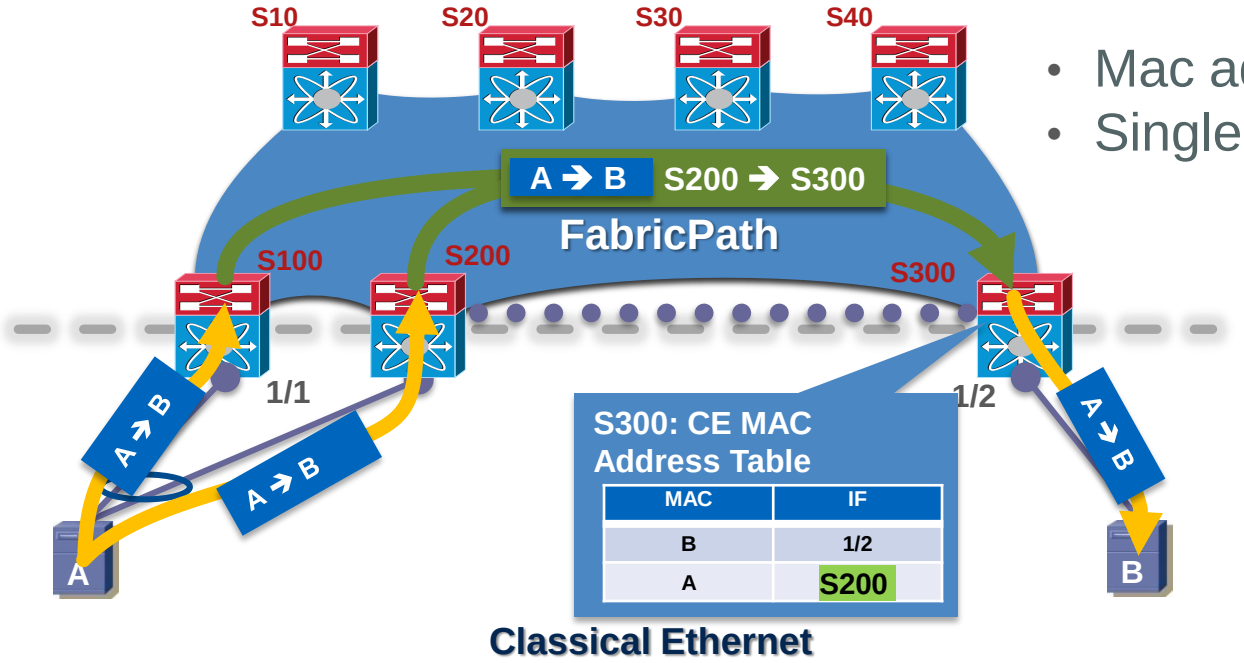
Architecture of vPC and FabricPath with vPC+





Technical Challenges

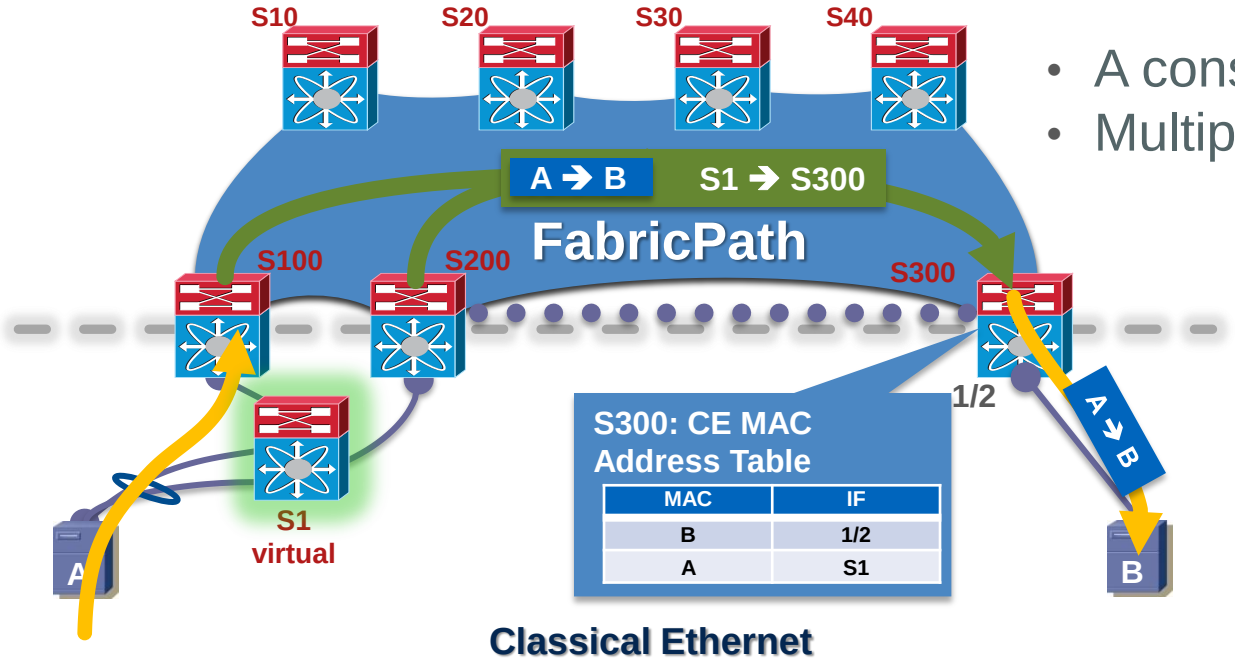
vPC vs vPC+



- Mac address flapping on S300
- Single path to A

VPC+ Virtual Switch

vPC vs vPC+



- A consistently associated to S1
- Multipathing to A

VPC Design Guidance & Best Practices

VPC Benefits :
High-availability, Redundancy, Low convergence & Full use of available bandwidth

Agenda

- Feature Overview
- vPC Design Guidance and Best Practices
  - Building a vPC Domain
  - Mixed Chassis Mode
  - Attaching to a vPC Domain
  - Layer 3 and vPC
  - Spanning Tree Recommendations
  - Data Centre Interconnect
  - HSRP with vPC
  - vPC / FEX Supported Topologies
- vPC Enhancements
- Convergence and Scalability
- Reference Material

Building a vPC Domain

Configuration Steps

Following steps are needed to build a vPC
(Order does Matter!)

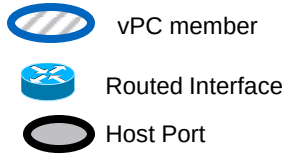
Define domains*

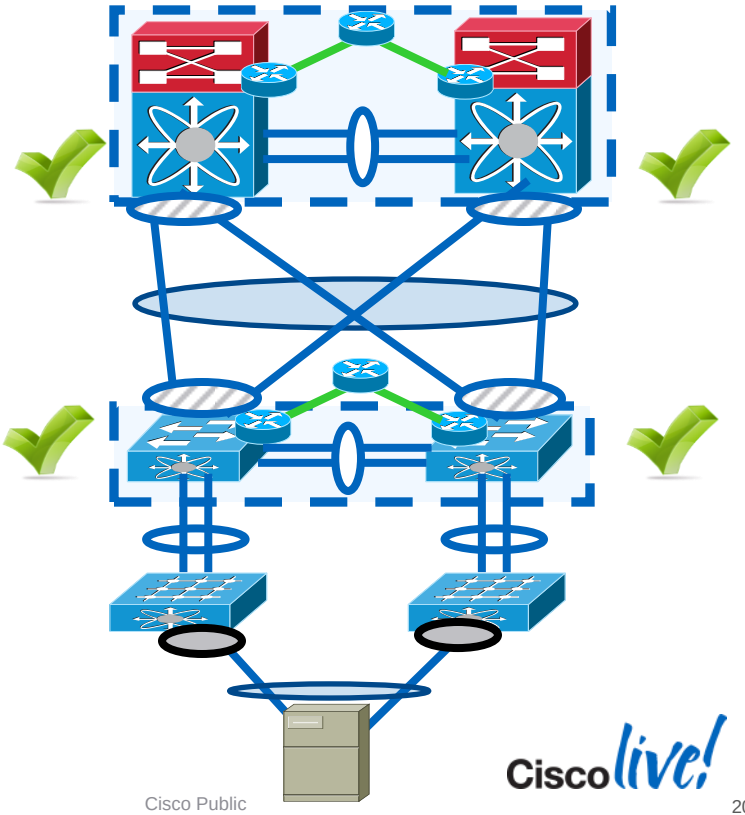
Establish Peer Keepalive connectivity

Create a Peer link

Reuse port-channels and Create vPCs

Make Sure Configurations are Consistent





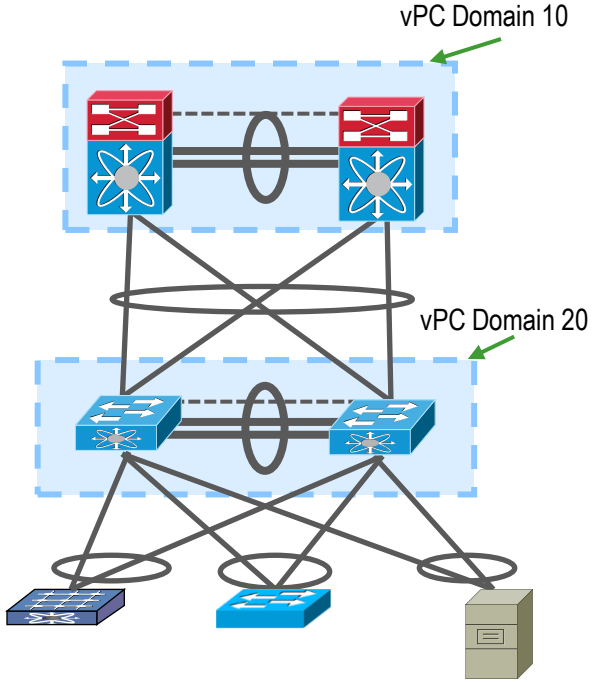
Building a vPC Domain

vPC Domains

- vPC Domain defines the grouping of switches participating in the vPC
- Provides for definition of global vPC system parameters
- The vPC peer devices use the vPC domain ID to automatically assign a unique vPC system MAC address
- You ***MUST*** utilise ***unique*** Domain id's for all vPC pairs defined in a contiguous layer 2 domain

```
! Configure the vPC Domain ID – It should be unique within the layer 2 domain
NX-1(config)# vpc domain 20

! Check the vPC system MAC address
NX-1# show vpc role
<snip>
vPC system-mac                  : 00:23:04:ee:be:14
```

vPC System MAC identifies the Logical Switch in the network topology



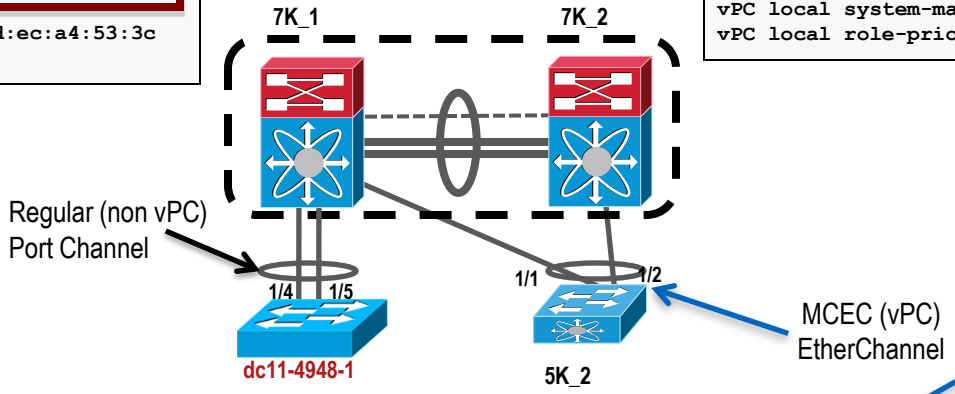
Building a vPC Domain

Independent Control Plane + Synchronised L2 State

- LACP neighbour sees the same System ID from both vPC peers
- The vPC 'system-mac' is used by both vPC peers

```
7K_1# sh vpc role
<snip>
vPC system-mac                 : 00:23:04:ee:be:14
vPC system-priority            : 1024
vPC local system-mac           : 00:0d:ec:a4:53:3c
vPC local role-priority        : 1024
```

```
7K_2 # sh vpc role
<snip>
vPC system-mac                 : 00:23:04:ee:be:14
vPC system-priority            : 1024
vPC local system-mac           : 00:0d:ec:a4:5f:7c
vPC local role-priority        : 32667
```



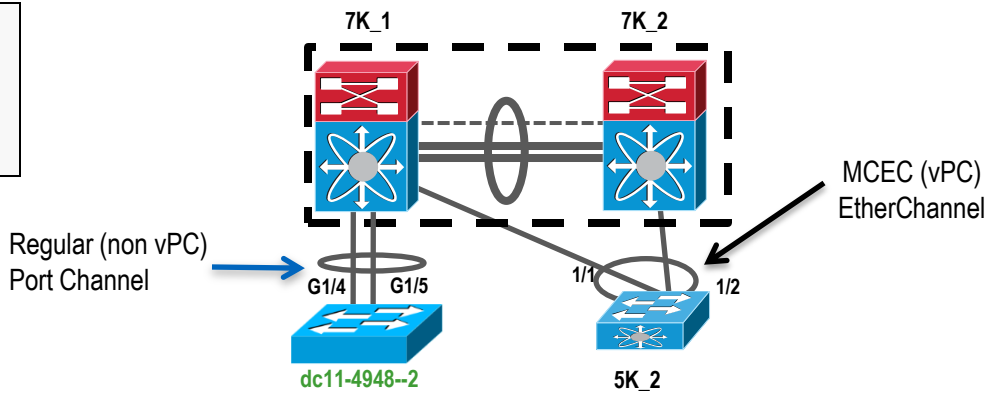

```
5K_2#sh lacp neighbor
<snip>
                  LACP port                          Admin  Oper   Port   Port
Port      Flags   Priority  Dev ID          Age      key    Key    Number State
E1/1      SA      32768     0023.04ee.be14   9s      0x0    0x801E 0x4104 0x3D
E1/2      SA      32768     0023.04ee.be14   21s     0x0    0x801E 0x104  0x3D
```

Building a vPC Domain

Independent Control Plane + Synchronised L2 State

- vPC peers function as independent devices as well as peers
- **Local** 'system-mac' is used for all **non vPC** PDUs (LACP, STP, …)

```
7k_1 # sh vpc role
<snip>
vPC system-mac                  : 00:23:04:ee:be:14
vPC system-priority             : 1024
vPC local system-mac            : 00:0d:ec:a4:53:3c
vPC local role-priority         : 1024
```

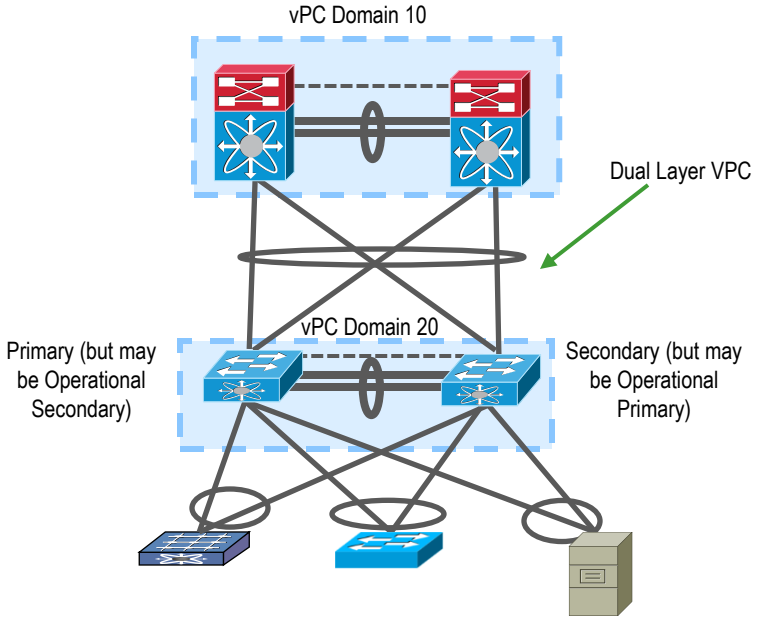



```
dc11-4948-2#sh lacp neighbor
<snip>
                  LACP port                          Admin  Oper   Port    Port
Port      Flags   Priority  Dev ID           Age     key    Key    Number  State
Gi1/4     SA      32768     000d.eca4.533c   8s      0x0    0x1D   0x108   0x3D
Gi1/5     SA      32768     000d.eca4.533c   8s      0x0    0x1D   0x108   0x3D
```

Building a vPC Domain

vPC Roles

- vPC primary switch election is based on role priority
- Lower priority wins if not, lower system mac wins
- Role is non-preemptive, So operational role is what matters and not configured role
- Operational role may different from the priorities configured under the domain
- vPC role defines which of the two vPC peers processes BPDUs
- Role matters for the behaviour with peer-link failures!

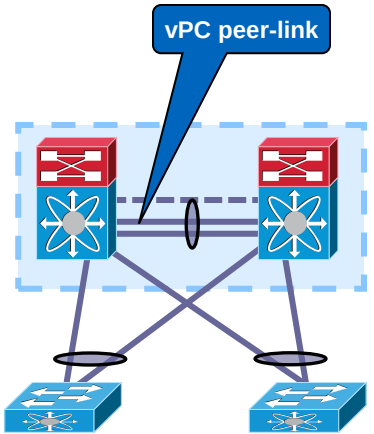



```
dc11-5020-3(config-vpc-domain)# role priority ?
<1-65535>  Specify priority value

dc11-5020-3# sh vpc
<snip>
vPC role                          : secondary, operational primary
```

Building a vPC Domain

vPC Peer-Link (aka VPC PL aka MCT)

- **Definition:**
  - Standard 802.1Q Trunk which carries CFS (Cisco Fabric Services) messages
  - Carries flooded traffic from the vPC peer , STP BPDUs, HSRP Hellos, IGMP updates, etc.
- **Peer-Link member ports must be 10/40/100GE interfaces**
- **Peer-Link must be a point-to-point link**



Recommendations (strong ones!)

- Minimum 2x 10GE ports
- Use 2 separate cards for best resiliency)
- 10GE ports in dedicated mode for oversubscribed modules

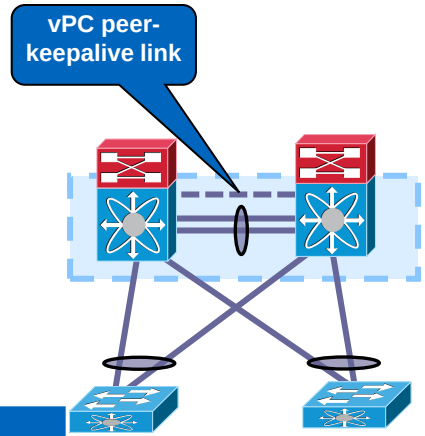
The *peer link is **always** forwarding for any VLAN that is a member !*

Building a vPC Domain

vPC Peer-Keepalive link (aka VPC PKL)

*vPC PKL messages should **NOT** be routed over the vPC PL !*

- **Definition:**
  - Heartbeat between vPC peers
  - Active/Active detection (in case vPC Peer-Link is down)
- **Packet Structure:**
  - UDP message on port 3200, 96 bytes long (32 byte payload), includes version, time stamp, local and remote IPs, and domain ID
  - Default timers : interval 1 sec / timeout 5sec

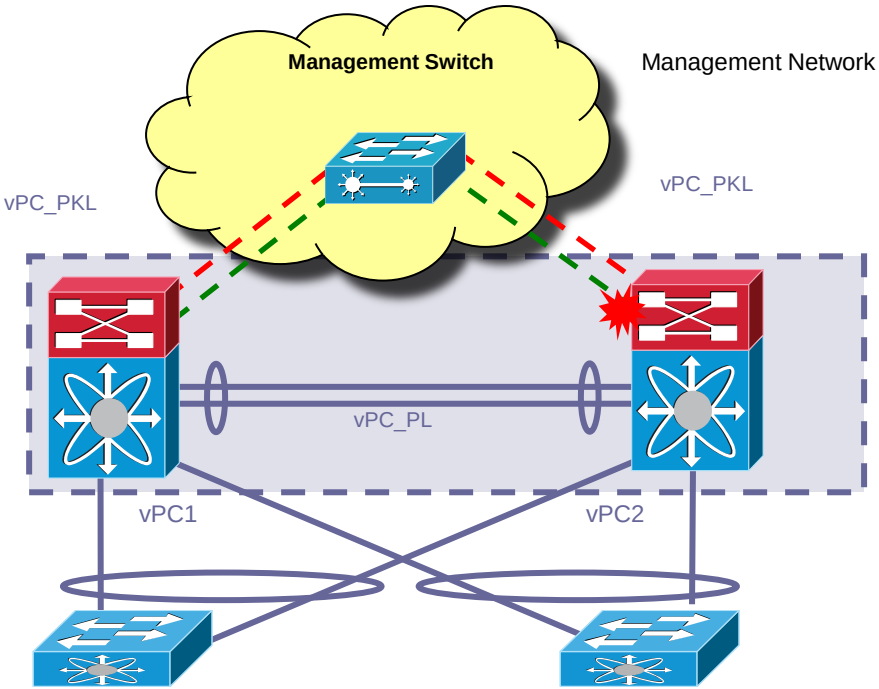


Recommendations (in order of preference):

NEXUS 7000 /Nexus 7700	NEXUS 5000/5500/Nexus 6000
1- Dedicated link(s) (1GE/10GE LC)	1- mgmt0 interface (along with management traffic)
2- mgmt0 interface (along with management traffic)	2- Dedicated link(s) (1/10GE front panel ports)
3- As last resort, can be routed over L3 infrastructure	3 - As last resort, can be routed over L3 infrastructure

Building a vPC Domain

vPC Peer-Keepalive link – Dual Supervisors on Nexus 7000



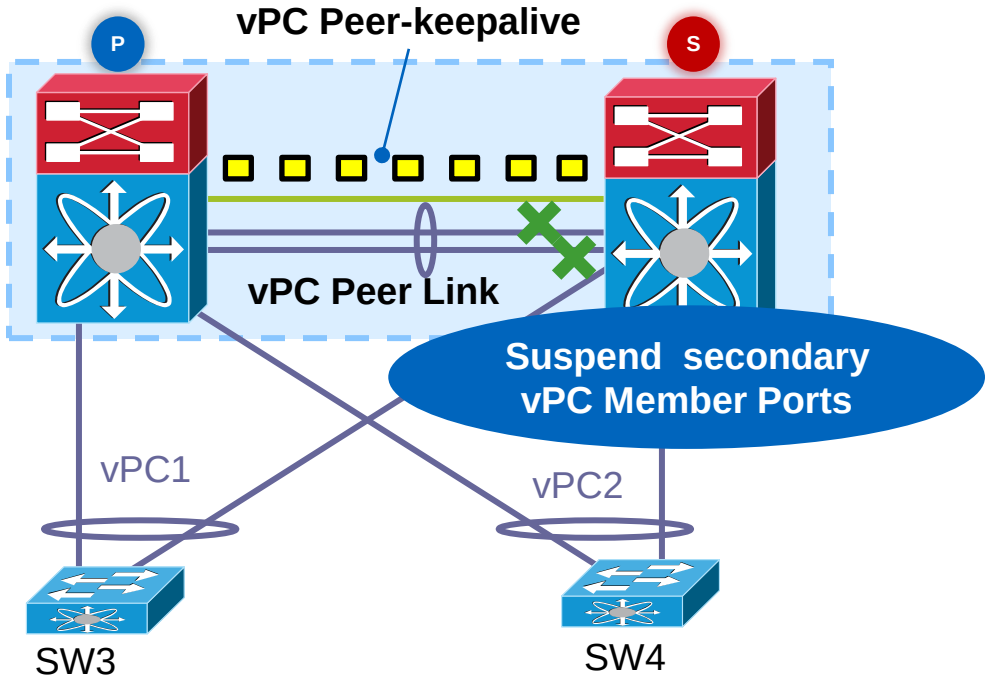
Do **NOT** use back to back mgt0 connections on Nexus 7000 with Dual Supervisors

Standby Management Interface

Active Management Interface

vPC Failure Scenario

vPC Peer-Keepalive Link up & vPC Peer-Link down



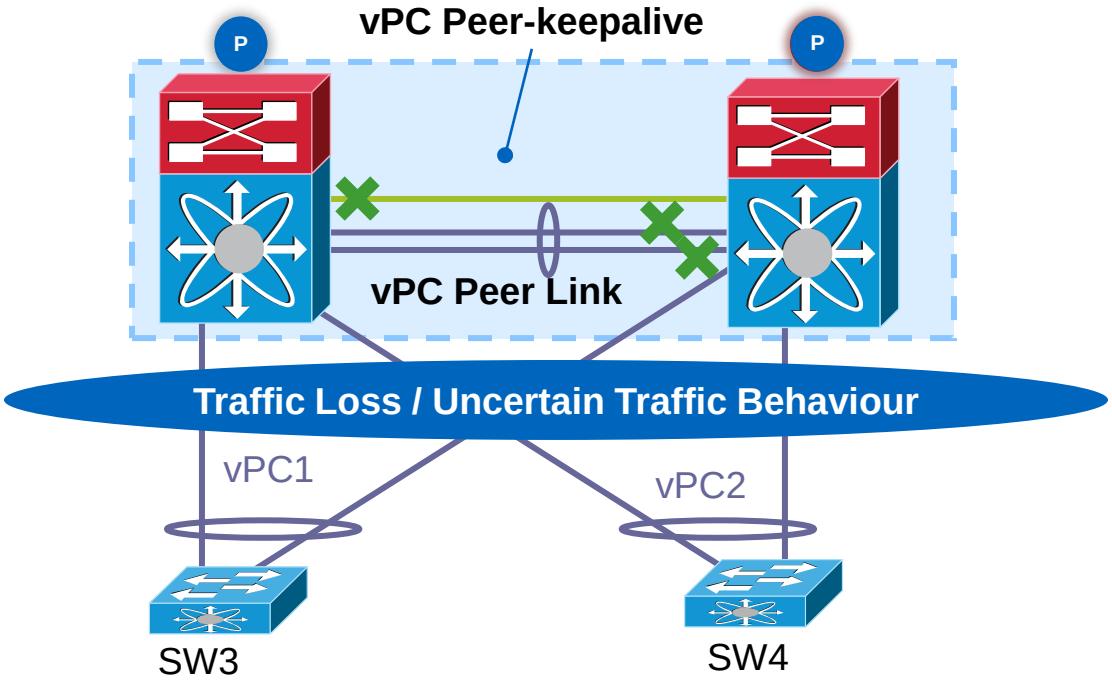
P — Primary vPC Switch

S — Secondary vPC Switch

Keepalive Heartbeat

vPC Failure Scenario

vPC Peer-Keepalive Link up & vPC Peer-Link down



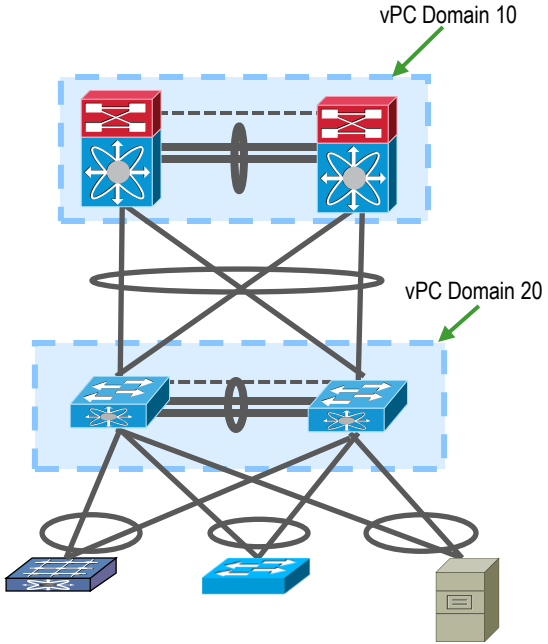
P — Primary vPC Switch

S — Secondary vPC Switch

vPC Configuration Consistency

vPC Control Plane - Consistency Check

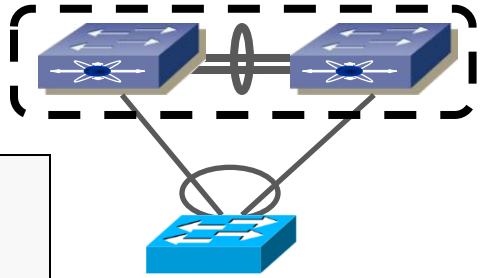
- Both switches in the vPC Domain maintain distinct control planes
- CFS provides for protocol state sync between both peers (MAC Address table, IGMP state, …)
- System configuration must also be kept in sync
- Two types of interface consistency checks
  - **Type 1** – Will put interfaces into suspend state to prevent incorrect forwarding of packets. With Graceful Consistency check (5.2 & later), we only suspend on secondary peer
  - **Type 2** – Error messages to indicate potential for undesired forwarding behaviour



vPC Configuration Consistency

vPC Control Plane – Type 1 Consistency Check

- **Type 1 Consistency Checks** are intended to prevent network failures
- Incorrect forwarding of traffic
- Physical network incompatibilities



```
dc11-5020-1# sh run int po 201

interface port-channel201
  switchport mode trunk
  switchport trunk native vlan 100
  switchport trunk allowed vlan 100-105
  vpc 201
  spanning-tree port type network
```

```
dc11-5020-2# sh run int po 201

interface port-channel201
  switchport mode trunk
  switchport trunk native vlan 100
  switchport trunk allowed vlan 100-105
  vpc 201
  spanning-tree port type network
  spanning-tree guard root
```

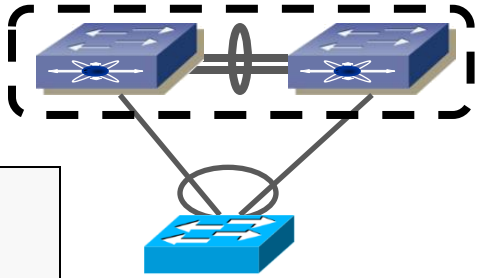
```
dc11-5020-2# show vpc brief
Legend:
                (*) - local vPC is down, forwarding via vPC peer-link
<snip>
vPC status
----------------------------------------------------------------------------------------------------
id     Port                       Status       Consistency Reason              Active vlans
------ ---------- ------ ---------- ------------------------- ------------------------------
201    Po201       up           failed      vPC type-1 configuration              -
                                            incompatible - STP interface
                                              port guard - Root or loop guard
                                            inconsistent
```

“vPC will be suspended”

vPC Configuration Consistency

vPC Control Plane – Type 2 Consistency Check

- **Type 2 Consistency Checks** are intended to prevent undesired forwarding
- vPC will be modified in certain cases (e.g. VLAN mismatch)



```
dc11-5020-1# sh run int po 201
version 4.1(3)N1(1)

interface port-channel201
  switchport mode trunk
  switchport trunk native vlan 100
  switchport trunk allowed vlan 100-105
  vpc 201
  spanning-tree port type network
```

```
dc11-5020-2# sh run int po 201
version 4.1(3)N1(1)

interface port-channel201
  switchport mode trunk
  switchport trunk native vlan 100
  switchport trunk allowed vlan 100-104
  vpc 201
  spanning-tree port type network
```

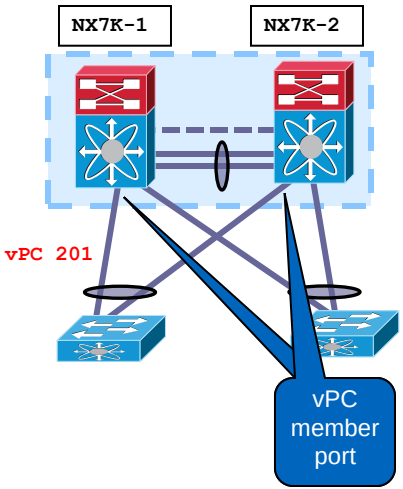
```
dc11-5020-1# show vpc brief vpc 201

vPC status
----------------------------------------------------------------------------
id     Port        Status Consistency Reason                     Active vlans
------ ----------- ------ ----------- -------------------------- -----------
201    Po201       up     success     success                    100-104

2009 May 17 21:56:28 dc11-5020-1 %ETHPORT-5-IF_ERROR_VLANS_SUSPENDED: VLANs 105 on Interface port-
channel201 are being suspended. (Reason: Vlan is not configured on remote vPC interface)
```

“Inconsistent config will be disabled”

Virtual Port Channel (vPC)

vPC Member Port

- **Definition:**
  - Port-channel member of a vPC
- **Requirements**
  - Configuration needs to match other vPC peer member
  - In case of inconsistency a VLAN or the entire port-channel may be suspended (e.g. MTU mismatch)
  - Up to 16 active ports between both vPC peers with M series LC.
  - Up to 32 active ports between both vPC peers with F series LC

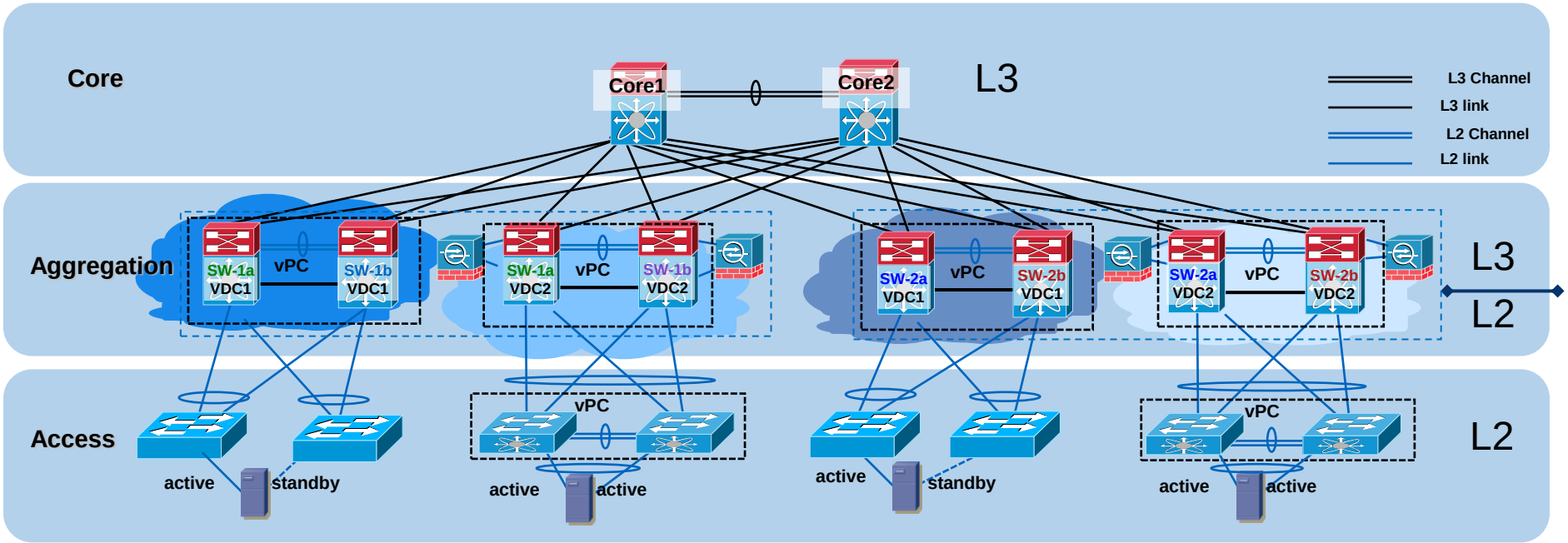



```
NX7K-1 :
interface port-channel201
  switchport mode trunk
  switchport trunk native vlan 100
  switchport trunk allowed vlan 100-
105
  vpc 201
```

```
NX7K-2 :
interface port-channel201
  switchport mode trunk
  switchport trunk native vlan 100
  switchport trunk allowed vlan 100-
105
  vpc 201
```

Virtual Port Channel (vPC)

VDC Interaction

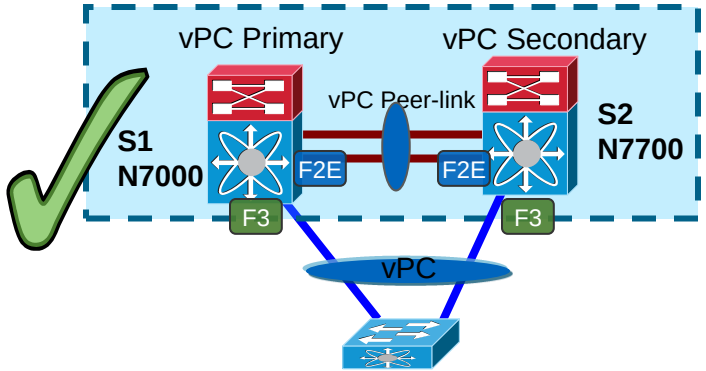


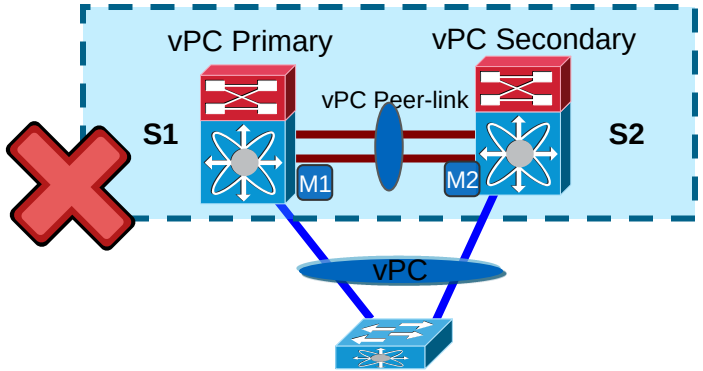
Mixed Chassis Mode

Rule of Thumb!

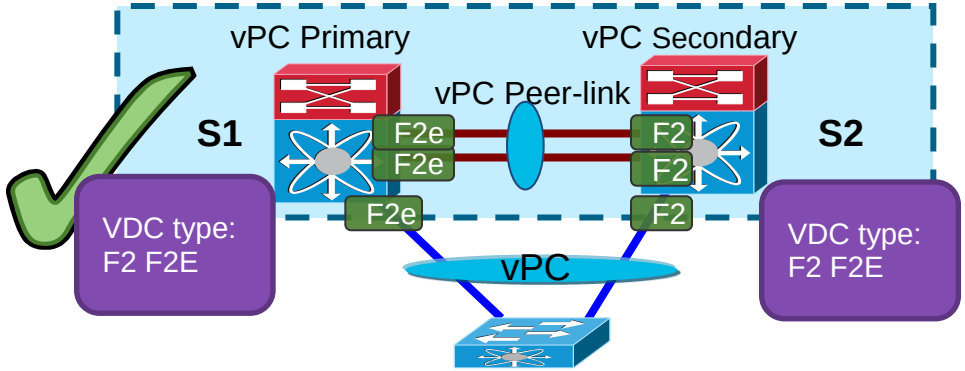
Always use identical line cards on either sides of the peer link and VPC legs !

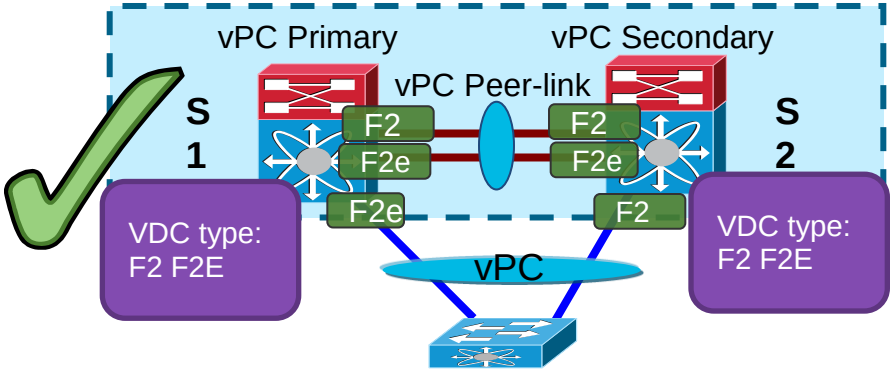
Examples



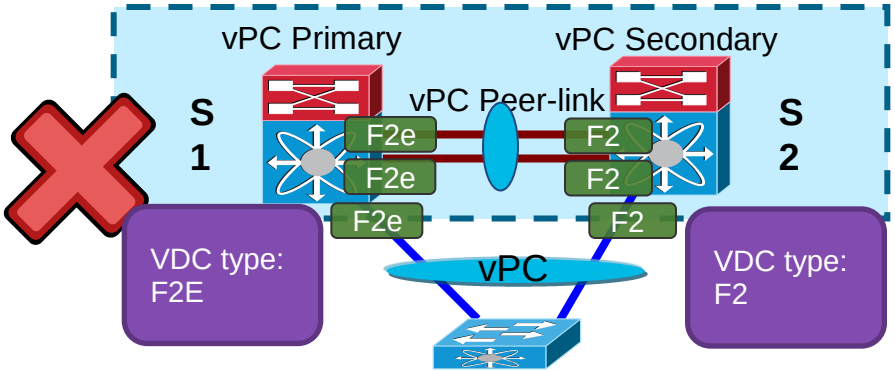


F2/F2E VDC – NX-OS 6.2(2) and Onwards





*Always use identical **VDC type** on both vPC peer devices*



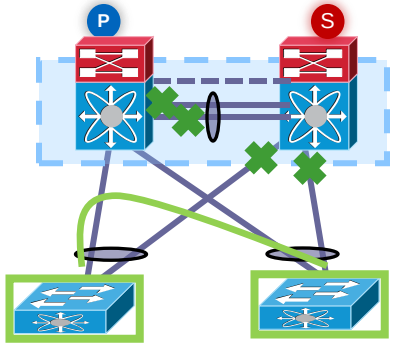
Attaching to a vPC Domain

The Most Important Rule…

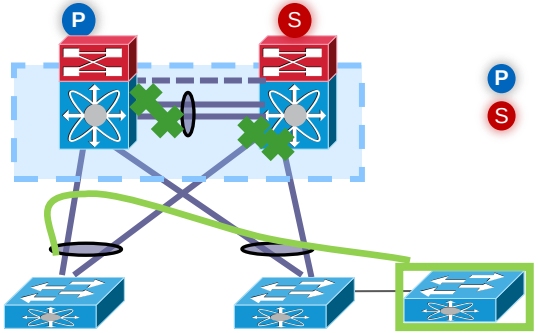
Always Dual Attach Devices to a vPC Domain!!!

Attaching to a vPC Domain

Dual Homed vs. Single Attached



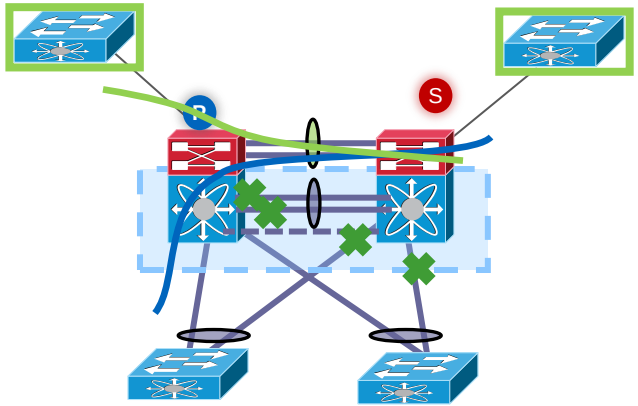
1. Dual Attached



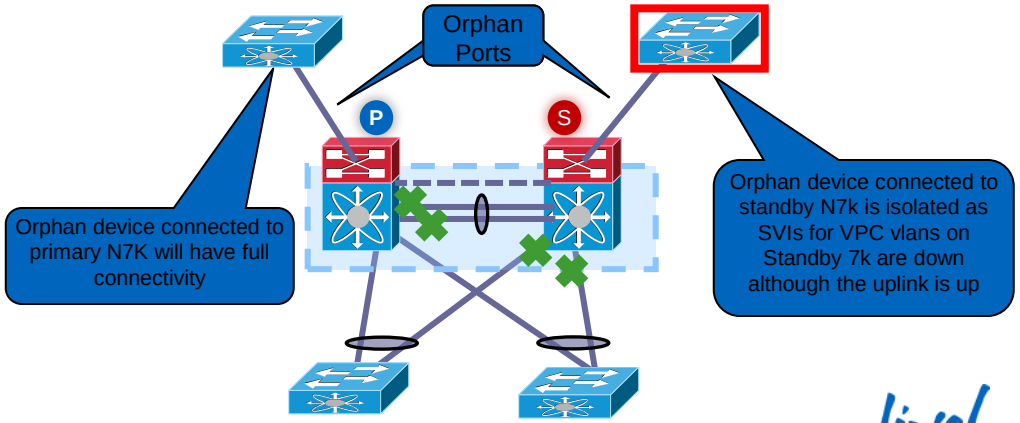
2. Attached via VDC/Secondary Switch

P Primary vPC

S Secondary vPC



3. Secondary inter switch Port-Channel (non-vPC VLAN)

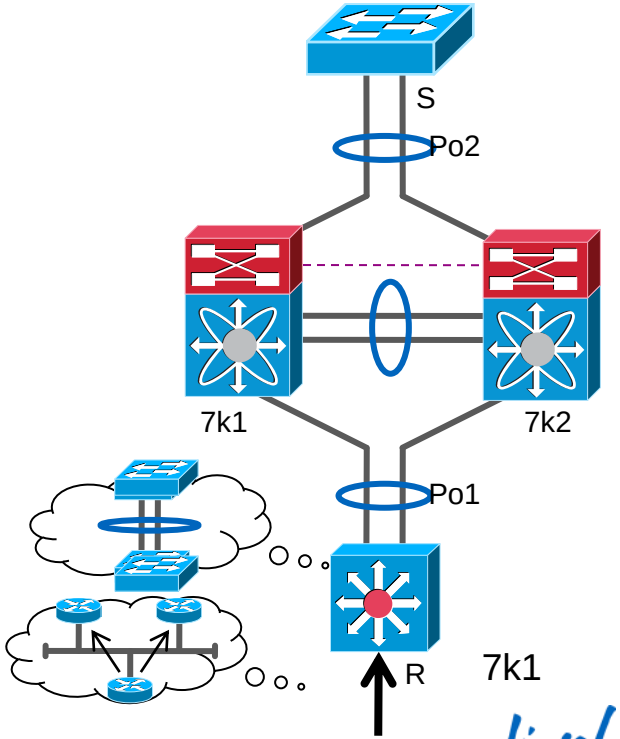


4. Single Attached to vPC Device

Layer 3 and vPC Interactions

Router Interconnection: Forwarding Sequence

1) Packet arrives at R with a destination address of S
2) R does lookup in routing table and sees 2 equal paths going north (to 7k1 & 7k2)
3) Assume it chooses 7k1 (ECMP decision)
4) R now has rewrite information to which router it needs to go (router MAC 7k1 or 7k2)
5) L2 lookup happens and outgoing interface is port-channel 1
6) Hashing determines which port-channel member is chosen (say to 7k2)
7) Packet is sent to 7k2
8) 7k2 sees that it needs to send it over the peer-link to based on MAC address

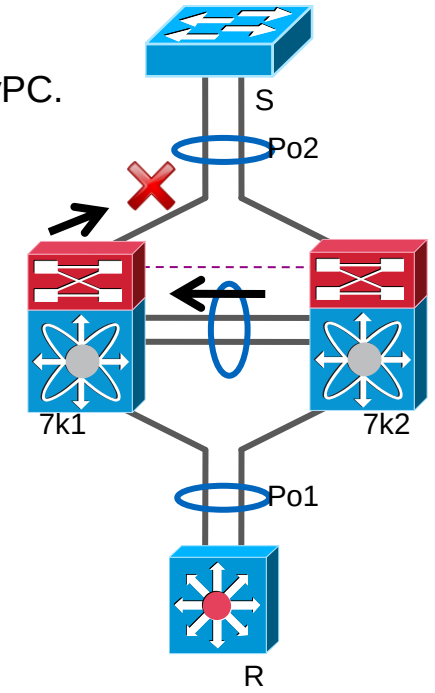


Layer 3 and vPC Interactions

Router Interconnection: Forwarding Sequence (continued)

9. 7k1 performs lookup and sees that it needs to send to S
10. 7k1 performs check if the frame came over peer link & is going out on a vPC.

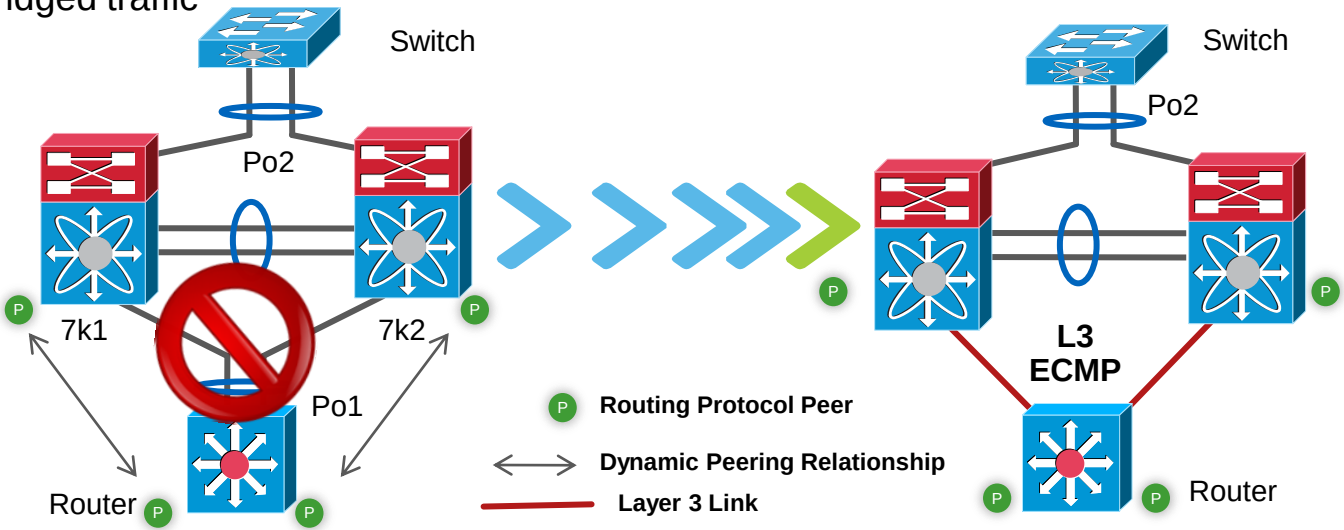
- Frame will ONLY be forwarded if:
  - Outgoing interface is NOT a vPC or
  - Outgoing vPC doesn't have active interface on other vPC peer (in our example 7k2)



N7K Layer 3 and vPC Designs

Layer 3 and vPC Design Recommendation

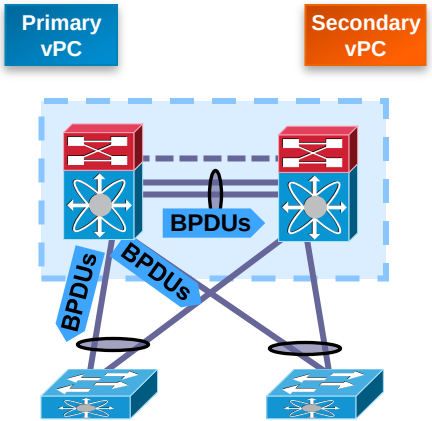
- Use L3 links to hook up routers and peer with a vPC domain
- Don’t use L2 port channel to attach routers to a vPC domain unless you statically route to HSRP address
- If both, routed and bridged traffic is required, use individual L3 links for routed traffic and L2 port-channel for bridged traffic



Spanning Tree with vPC

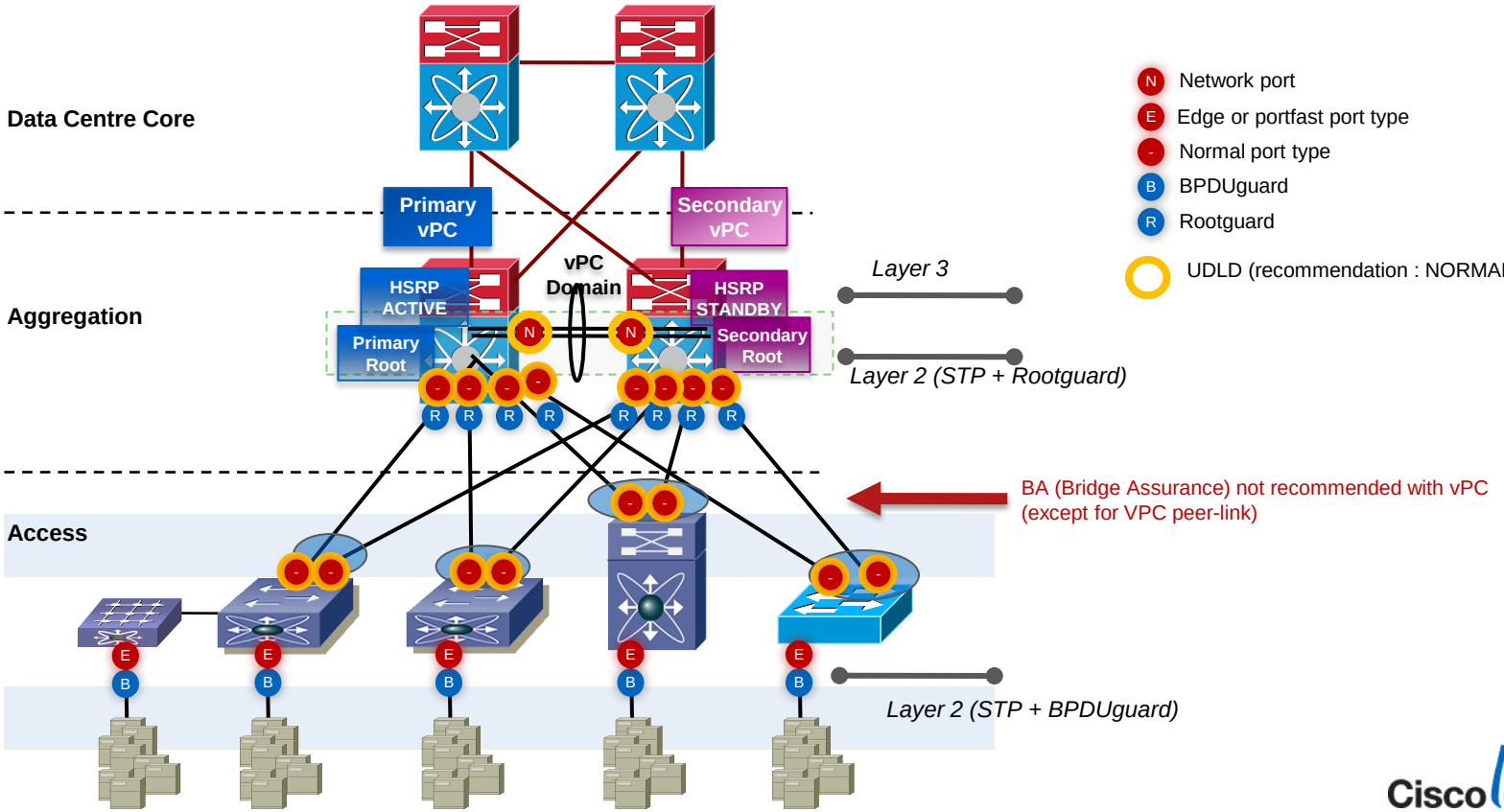
vPC and STP BPDUs

- STP for vPCs is controlled by the vPC operationally primary switch and only such device sends out BPDUs on STP designated ports
- This happens irrespectively of where the designated STP Root is located
- The vPC operationally secondary device proxies STP BPDU messages from access switches toward the primary vPC switch



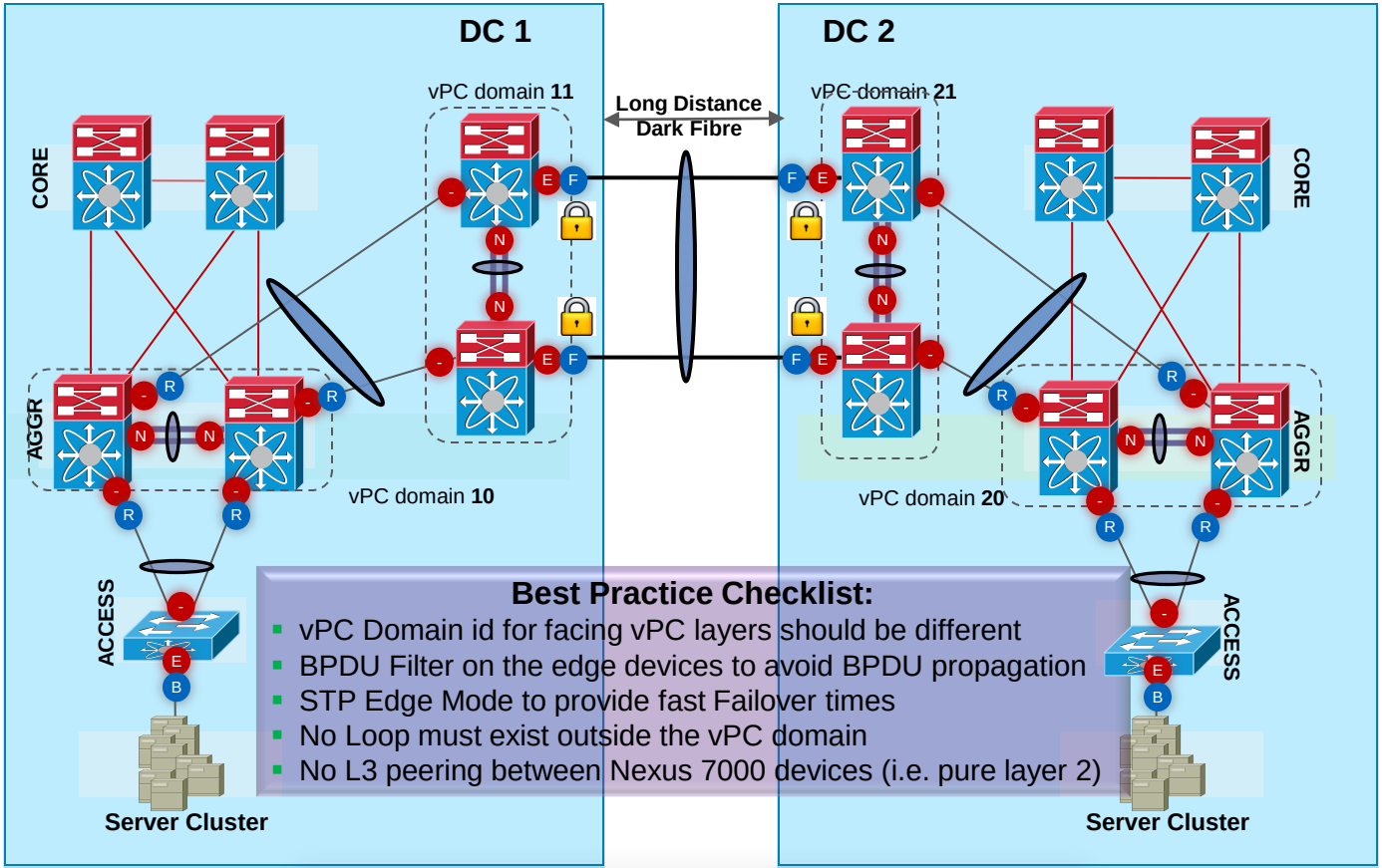
STP Recommendations
Port Configuration Overview

For Your Reference



Data Centre Interconnect

Multi-layer vPC for Aggregation and DCI

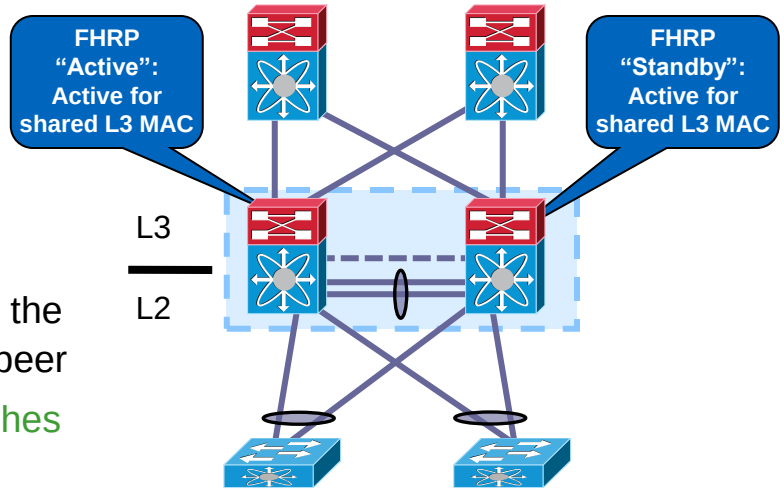


- N Network port
- E Edge or portfast
- - Normal port type
- B BPDUguard
- F BPDUfilter
- R Rootguard
- 802.1AE (Optional)

FHRP with vPC

HSRP / VRRP/ GLBP Active/Active

- Support for all FHRP protocols in Active/Active mode with vPC
- No additional configuration required
- Standby device communicates with vPC manager to determine if vPC peer is “Active” FHRP peer
- When running active/active, aggressive timers can be relaxed (i.e. 2-router vPC case)
- **‘peer-gateway’** command allows a vPC peer to respond both the FHRP virtual and the real MAC address of both itself and it’s peer
- Recommendation is to use default FHRP timers as both switches are active

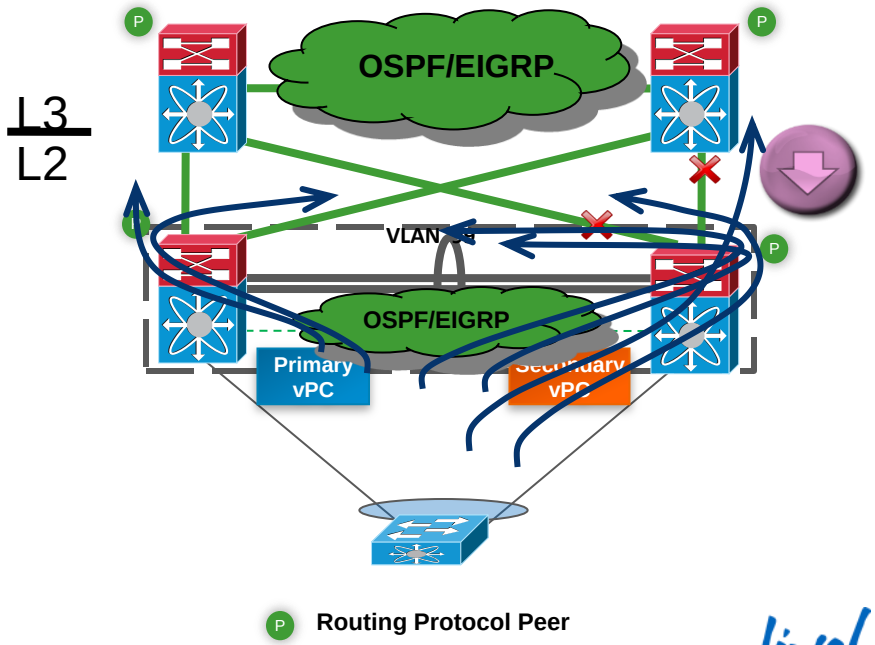


FHRP with vPC

Backup Routing Path

Use one transit vlan to establish L3 routing backup path over the VPC peerlink in case L3 uplinks were to fail, all other SVIs can use passive-interfaces

- Point-to-point dynamic routing protocol adjacency between the vPC peers to establish a L3 backup path to the core through PL in case of uplinks failure
- Define SVIs associated with FHRP as routing passive-interfaces in order to avoid routing adjacencies over vPC peer-link
- A single point-to-point VLAN/SVI (aka transit vlan) will suffice to establish a L3 neighbour
- Alternatively, use an L3 point-to-point link between the vPC peers to establish a L3 backup path

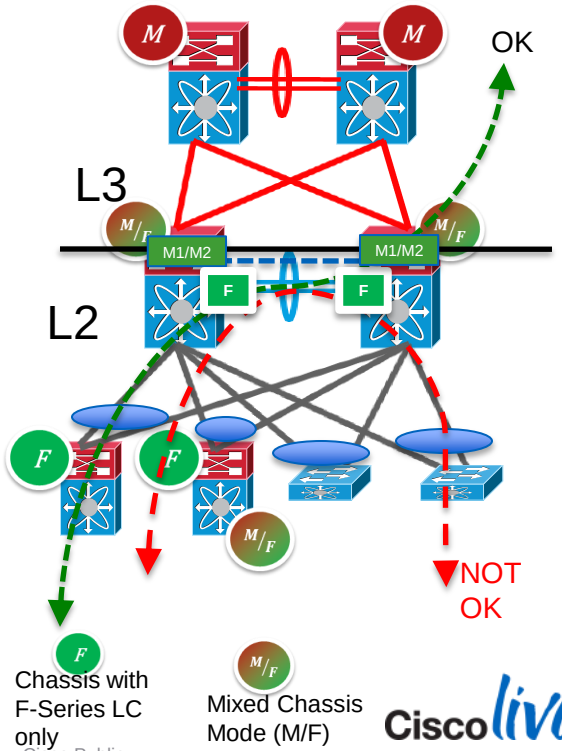


Proxy Routing Design Considerations

Dual Proxy Line Card for Redundancy

- When M1/M2 LC fails down on one of the N7Ks:
  1. Inter-VLAN traffic (vPC -> FHRP -> vPC) :
     traffic gets dropped because of vPC loop avoidance rule
  2. Upstream traffic (vPC -> FHRP -> L3) :
     traffic gets bridged on vPC peer-link to other NEXUS 7000 FHRP vMAC and then routed to L3 point

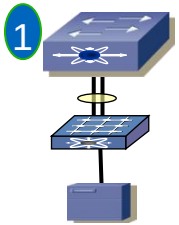
Recommendation is to use at least 2 M1/M2 LC in mixed mode chassis (M/F) in order to provide redundancy for Proxy L3 Routing.

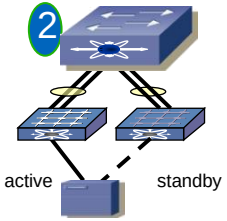


vPC Supported Topologies

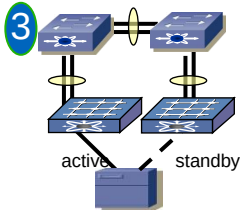
Nexus 7000 and 5000/5500

For Your Reference

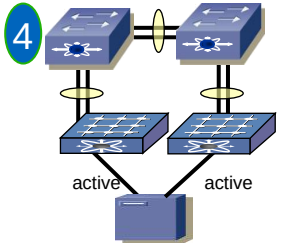




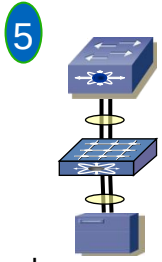
server: active/standby NIC teaming



server: active/standby NIC teaming

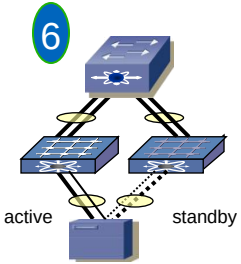


server: active/active no NIC teaming

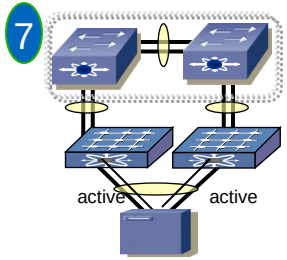


Local FEX port-Channel

server:NIC teaming (active-active)



server: active/standby NIC teaming



server: NIC teaming (active-active)

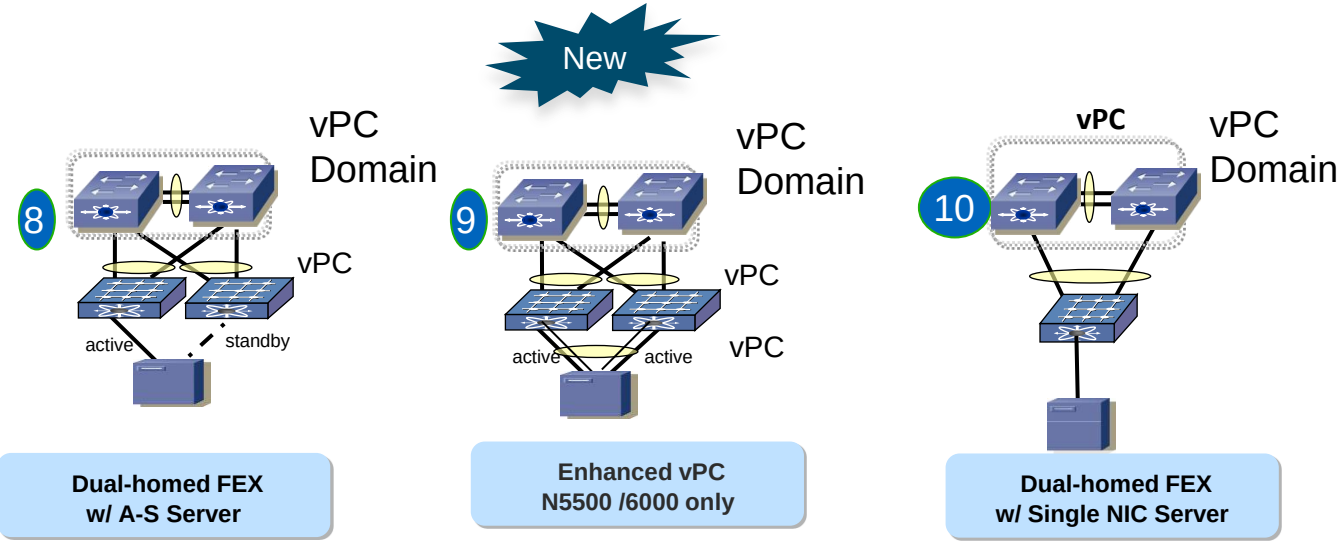
Port-Channel on HIF
(Host Interfaces supported)

-vPC to Host supported

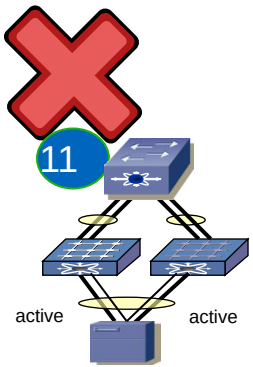
vPC Supported Topologies

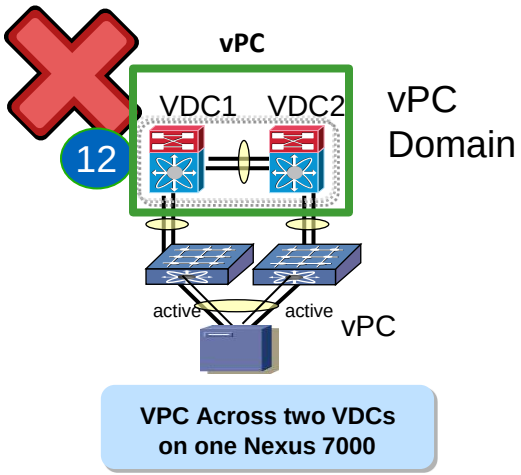
Nexus 5000 / 5500 / 6000 Only

For Your Reference

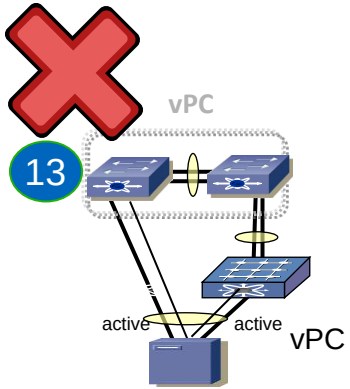


vPC Unsupported Topologies





VPC Across two VDCs
on one Nexus 7000



Agenda

- Feature Overview
- vPC Design Guidance and Best Practices
- vPC Enhancements
- Convergence




vPC Enhancements

Redundancy with Enhanced vPC

Data, Control and Management Plane Redundancy

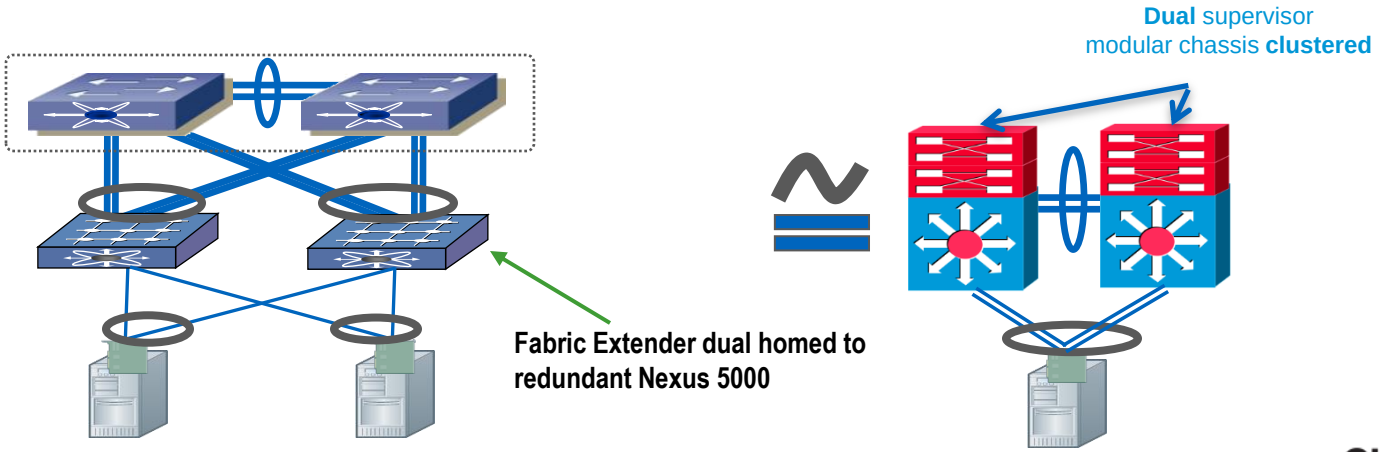
Suited for all types of servers

New vPC Option — Port-channel connectivity to dual-homed FEXs

–From the server perspective a single access switch with port-channel support – each line card supported by redundant supervisors

–Full redundancy for supervisor, linecard, fabric via vPC and cable or NIC failure **via Port-channeling**

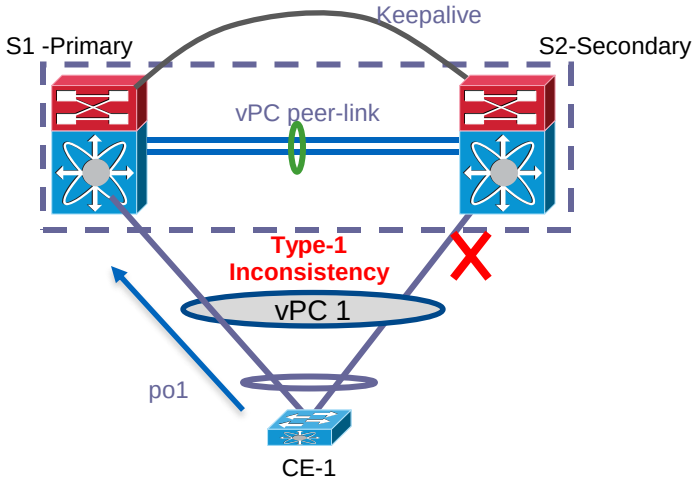
–Logically a similar HA model to that currently provided by dual supervisor based modular switch.



vPC Graceful Type-1 Check

NX-OS
N7K - 5.2
N5K - 5.0(3)N1(1)

- vPC member ports on S1 and S2 should have identical parameters (MTU, speed, …)
- Any inconsistency in such parameters is Type 1➔ all vlans on both vpc legs are brought down in such Inconsistency
- With graceful type-1 check, only Secondary vPC members are brought down.
- vPC member ports on primary peer device remain up



- S1(config-vpc-domain)# graceful consistency-check
- S2(config-vpc-domain)# graceful consistency-check
- Graceful Type-1 check enabled by default.

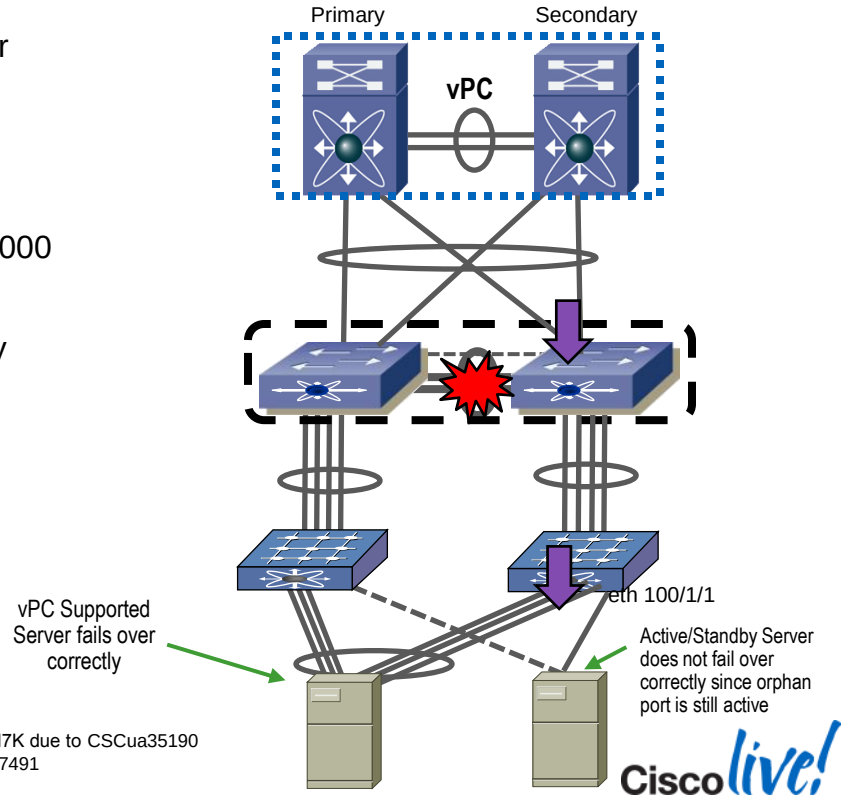
Orphan-Port Suspend

vPC Active / Standby NIC Teaming Support

NX-OS
N7K - 5.2
N5K - 5.0(3)N2

- A vPC orphan port is an non-vPC interface on a switch where other ports in the same VLAN are configured as vPC interfaces
- vPC orphan ports have historically been problematic for mixed server topologies
- Prior to release 5.0(3)N2 on Nexus 5000/5500 and 5.2 on Nexus 7000 an orphan port was ***'not'*** shut down on loss of vPC peer-links
- With the supported release the orphan ports on the vPC secondary peer can (configurable) also be shut down triggering NIC teaming recovery for all teaming configurations
- Configuration is applied to the physical port*

```
N5K-2(config)# int eth 100/1/1
N5K-2(config-if)# vpc orphan-port suspend
```



• prior to 6.1.2 release, 'VPC orphan-port suspend' command may not work with FEX interface for a FEX connected to N7K due to CSCua35190
* prior to 6..2 release, 'VPC orphan-port suspend' command may not be applied to port-channel interface due to CSCua37491

VPC / FP Config Simplification
VPC Config Macro

N7K - 6.2

New knob to enable VPC /FP Best practice features with a single CLI command

Simplifies the configuration and improves user experience

Automates the configuration tasks using a macro
Applies only to enabled features , the disabled features commands are ignored
ie if only vpc is enabled on the switch
→ FP and IPv6 commands are ignored

- **Single command enables /disables the best practices features**
- **Switch(config-vpc-domain)#mode auto**
  The following commands are executed:
  peer-gateway;
  auto-recovery;
  fabricpath multicast load-balance;
  ip arp synchronize;
  ipv6 nd synchronize;
- **'Mode auto' command does not show up in the configuration (just a macro !)**

```
root@siwtch(config-vpc-domain)# mode auto
The following commands are executed:
peer-gateway ;
auto-recovery ;
fabricpath multicast load-balance ;
ip arp synchronize ;
ipv6 nd synchronize ;
```




Convergence

Agenda

- Feature Overview
- vPC Design Guidance and Best Practices
- vPC Enhancements
- Convergence

vPC Convergence

vPC Convergence Results

N7K - 5.2 , 6.0 & 6.1

For Your Reference

- Measured Unicast vPC failover and recovery time
- Converge time is measured in the following scenarios*
  - vPC link member failure → Sub-second
  - vPC port-channel failover →Sub-Second
  - vPC Peer-link Failure → Sub-Second
  - vPC peer-keep-alive Failure → Hitless
  - vPC primary/secondary device failure → Sub-Second
  - vPC Supervisor Failover/Switchover → Hitless
  - vPC ISSU device Upgrade/Downgrade → Hitless

*NOTE: Convergence numbers may vary depending on the specific configuration (i.e. scaled number of VLANs/SVIs or HSRP groups) and traffic patterns (i.e. L2 vs. L3 flows).

Key Takeaways

NX-OS vPC Key Takeaways

- vPC is a very popular feature which makes it possible to use all available bandwidth while providing redundancy in L2 environments.
- Leverage vPC technology to get the benefits of high availability and avoid convergence in Layer 2 Networks.
- Follow the design guidelines and best Practices to successfully deploy your vPC architecture.
- Use recent vPC enhancements to optimise the vPC behaviour
- Use recommended NX-OS release to leverage convergence, scalability & stability optimizations. Cisco N7K NX-OS recommended release page : http://www.cisco.com/en/US/docs/switches/datacenter/sw/nx-os/recommended_releases/recommended_nx-os_releases.html




Q & A

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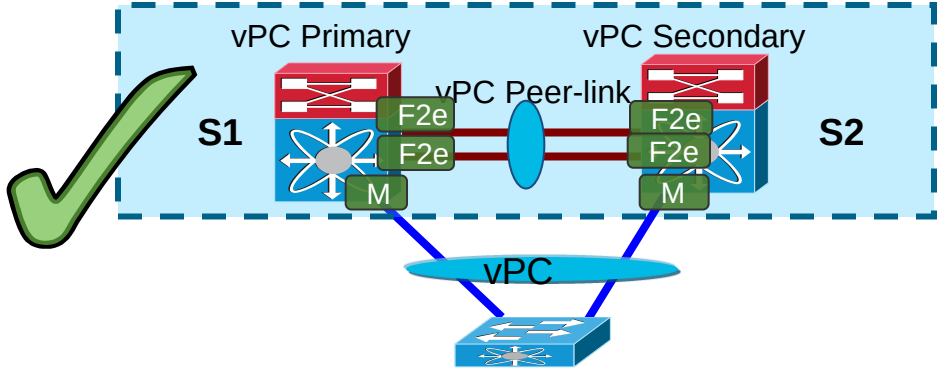
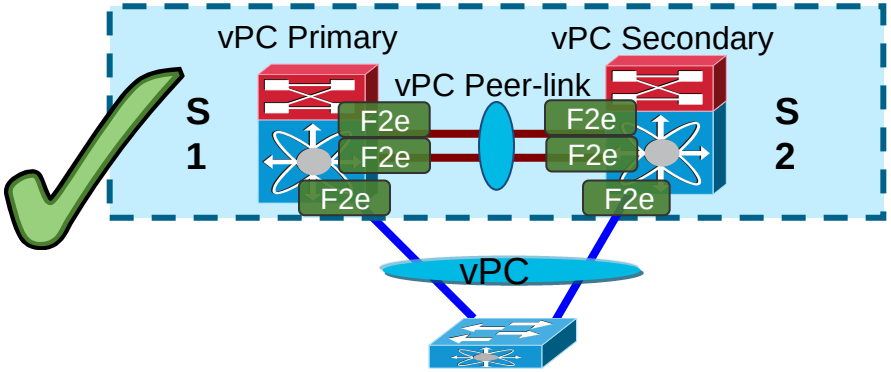
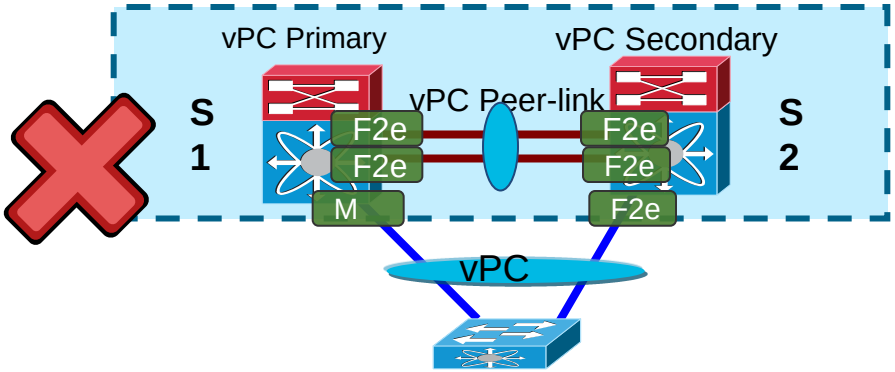
Appendix

M1/M2 - F1/F2/F2e LC Design Considerations

M/F2E – NX-OS 6.2(2) and Onwards





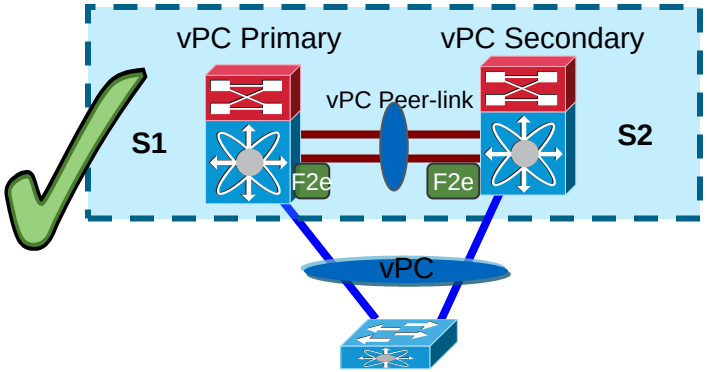


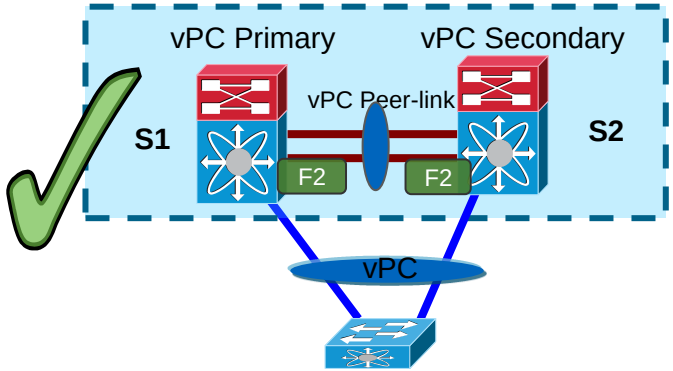
Always use identical line cards on either sides of the vPC Peer Link and vPC legs !

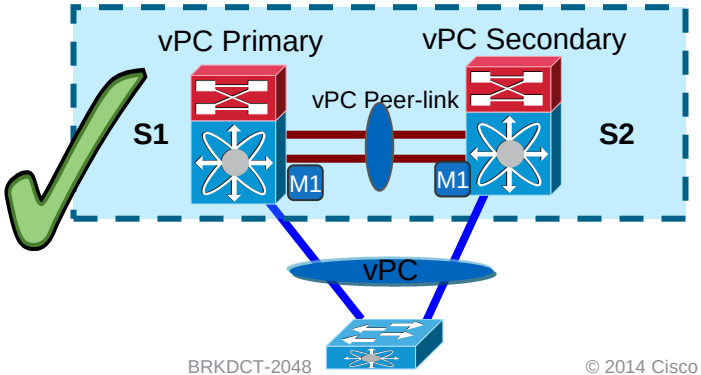
M1/M2 - F1/F2/F2e LC Design Considerations

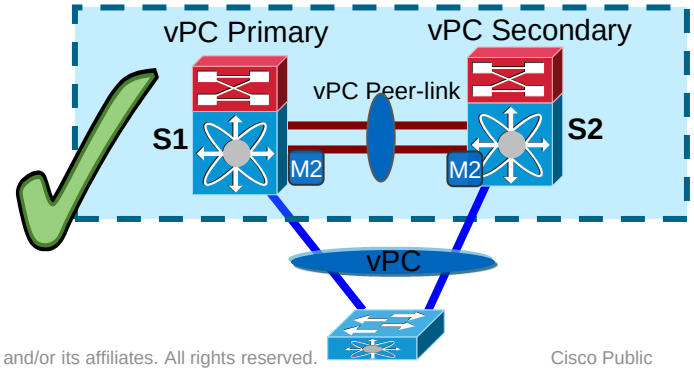
vPC / Port-channel

Always use identical line cards on either sides of the peer link !







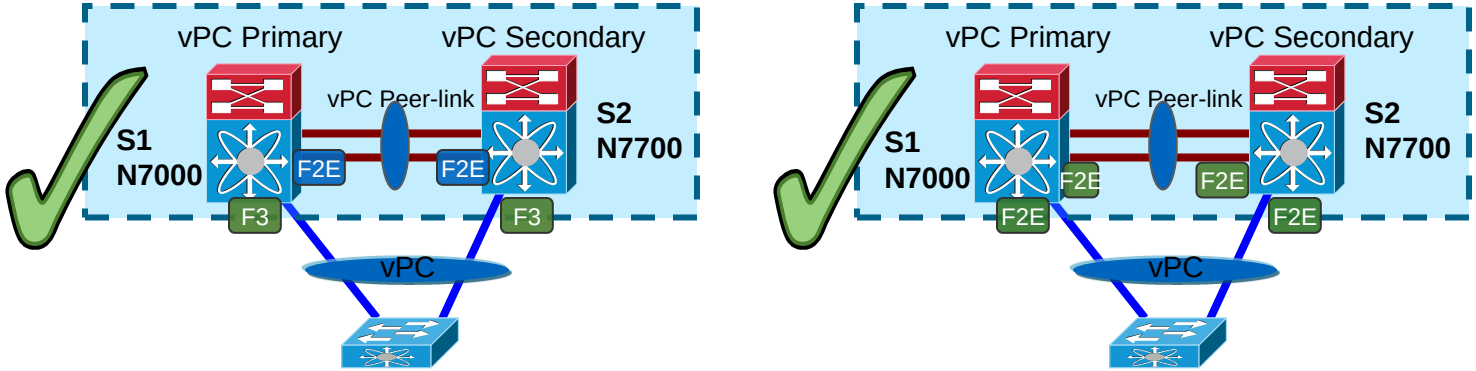


N7000 – N7700 VPC Design Considerations

vPC / Port-channel

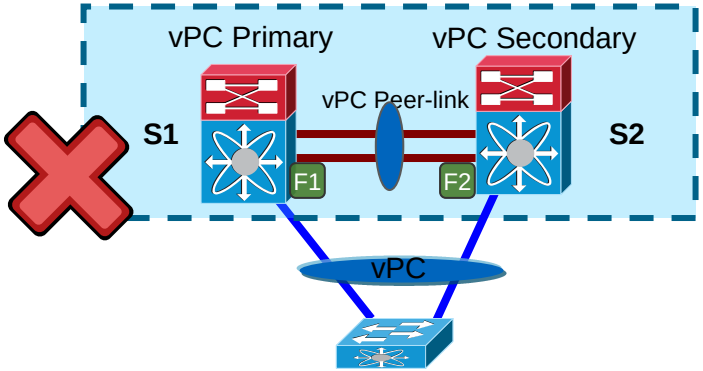
Always use identical line cards on either sides of the peer link !

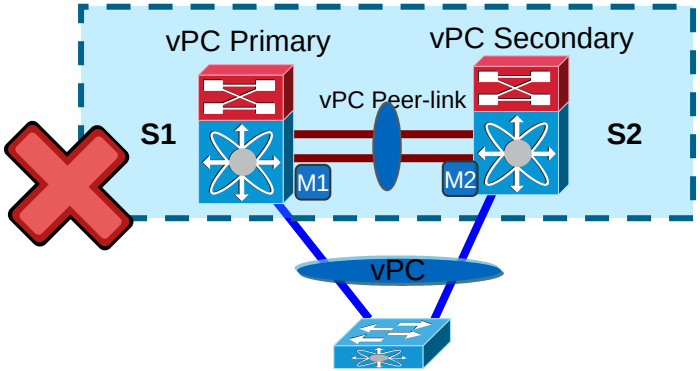
- N7000 and N7700 in same VPC Construct
- VDC type should match on both peer device

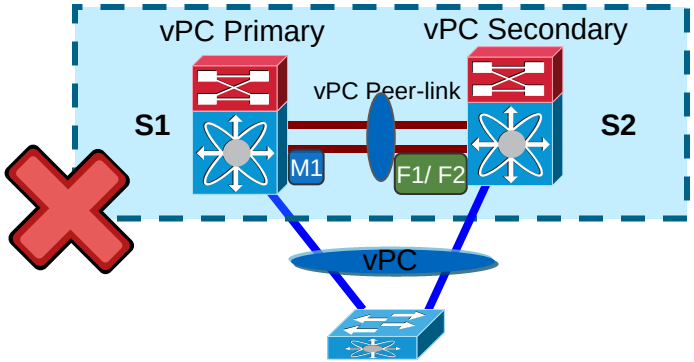


M1/M2 - F1/F2/F2e LC Design Considerations

vPC / Port-channel

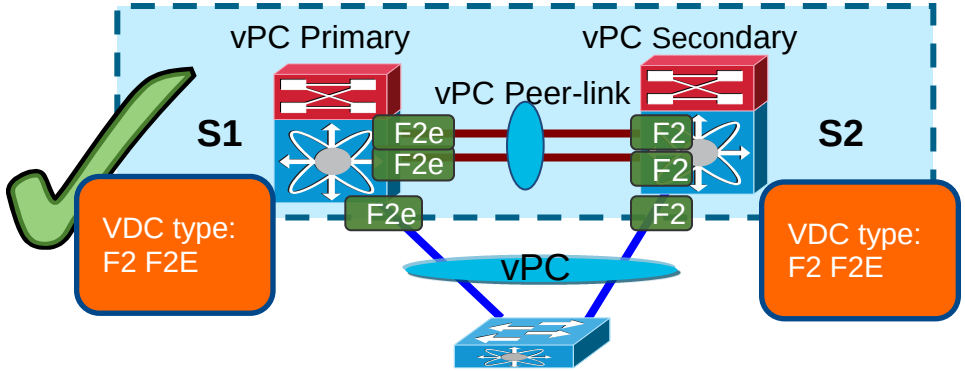


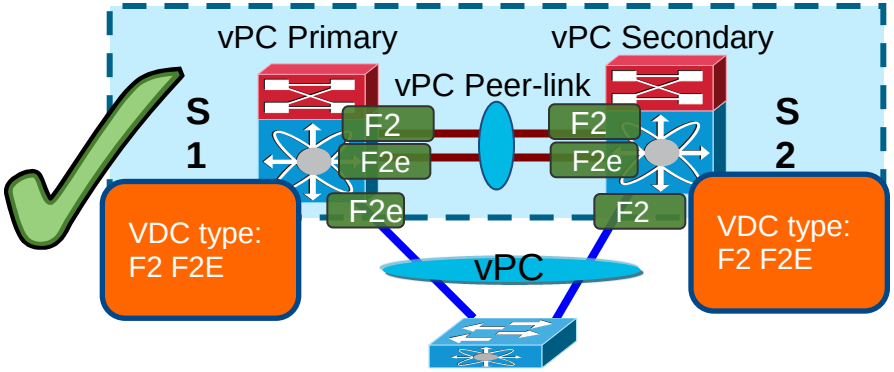




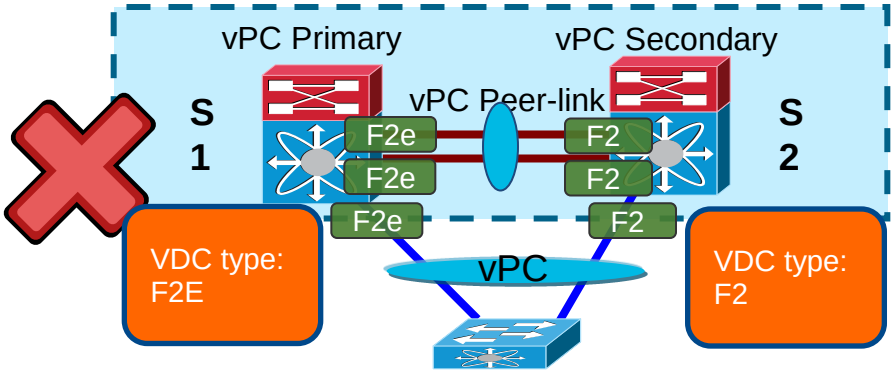
Always use identical line cards on either sides of the peer link !

F2/F2E VDC – NX-OS 6.2(2) and Onwards





*Always use identical **VDC type** on both vPC peer devices*



M1/M2 – F2E LC Design Considerations

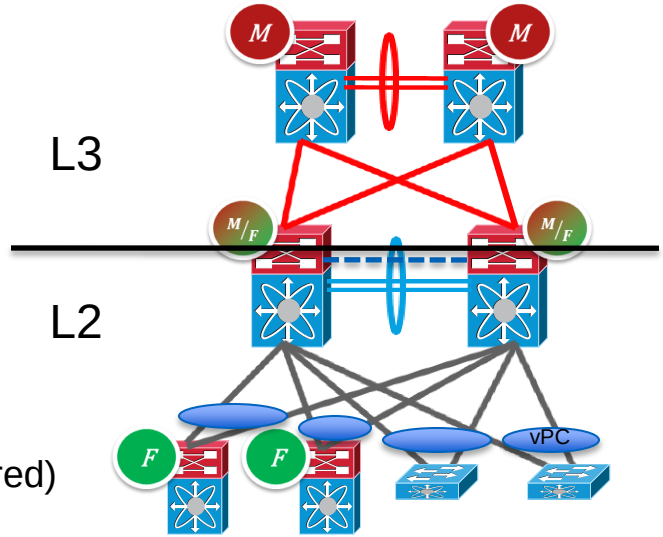
Mixed Chassis Mode

- M-Series provides scalable L2 and L3 tables
- F2E-Series provides high-density cost-effective Layer 2 10GbE connectivity
- Mixing M-Series and F2E-Series in aggregation switch (mixed chassis mode) provides several benefits :

  Bridging traffic remain in F2E-Series LC

  Internal proxy routing via M-Series LC for routed traffic coming from F-Series LC

- NEXUS 7000 with F2E-series LC only can be used as modular access switch (no need for M-Series LC if L3 function is not required)



M Chassis with M-Series LC only

F Chassis with F2E-Series LC only

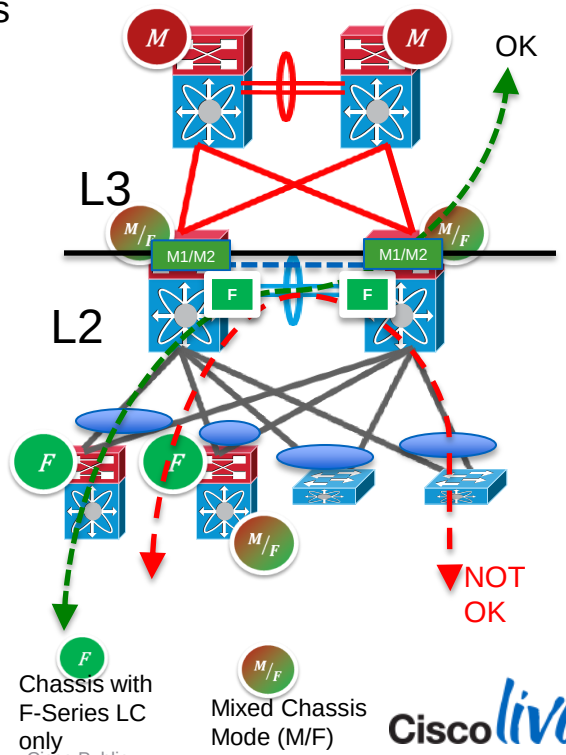
M/F Mixed Chassis Mode (M/F)

M1/M2 – F2E LC Design Considerations

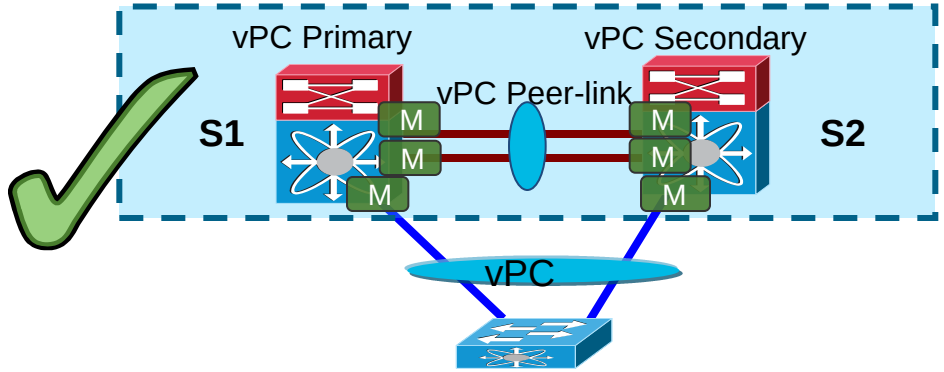
Mixed Chassis (M/F) Mode – 1 M1/M2 LC only ; Peer-link on F2E Ports

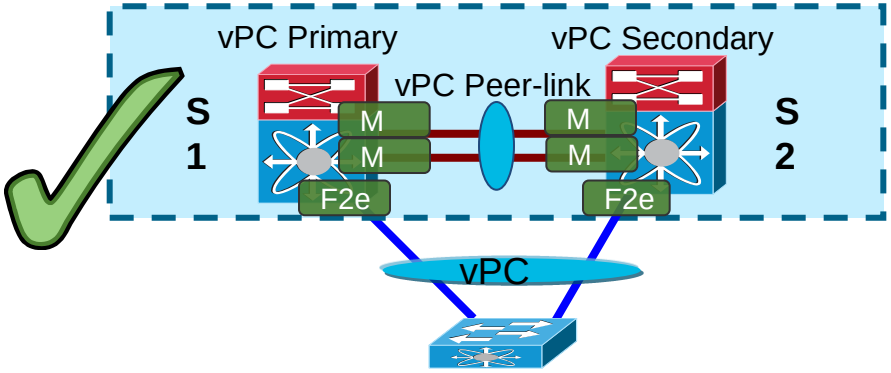
- Mixed chassis (M/F) can operate with 1 M1/M2 LC per chassis but it is not recommended:
- M1/M2 LC will provide all local routing capabilities for the chassis : inter-vlan routing and L3 northbound traffic
- When M1/M2 LC fails down on one of the N7Ks:
  1. Inter-VLAN traffic (vPC -> FHRP -> vPC) : traffic gets dropped because of vPC loop avoidance rule
  2. Upstream traffic (vPC -> FHRP -> L3) : traffic gets bridged on vPC peer-link to other NEXUS 7000 FHRP vMAC and then routed to L3 point

Recommendation is to use at least 2 M1/M2 LC in mixed mode chassis (M/F) in order to provide redundancy for Proxy L3 Routing.

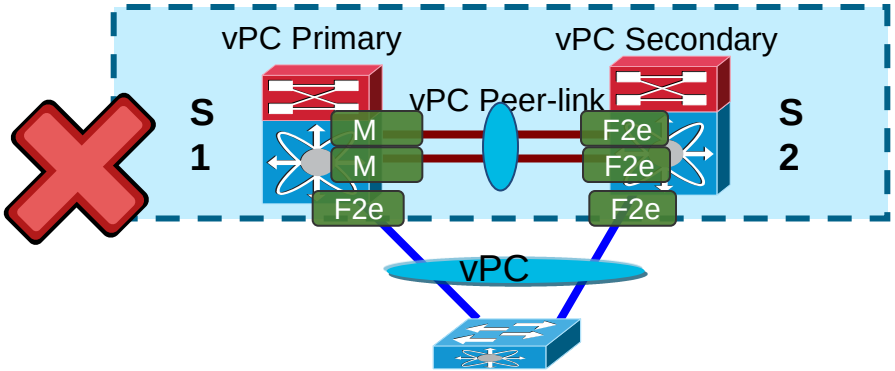


M1/M2 - F1/F2/F2e LC Design Considerations

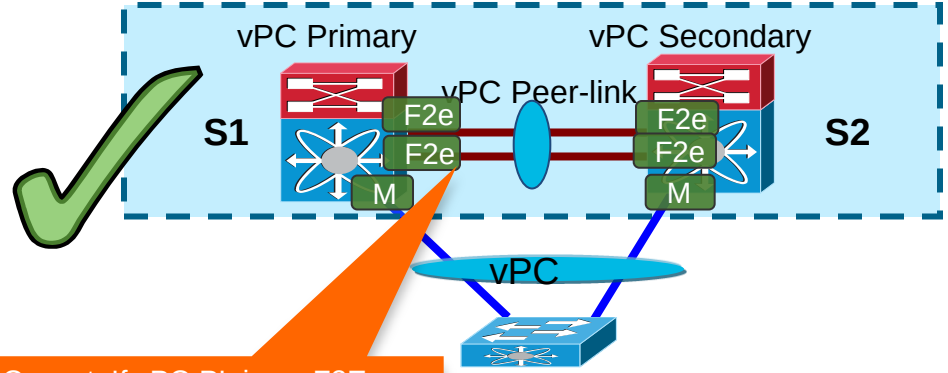


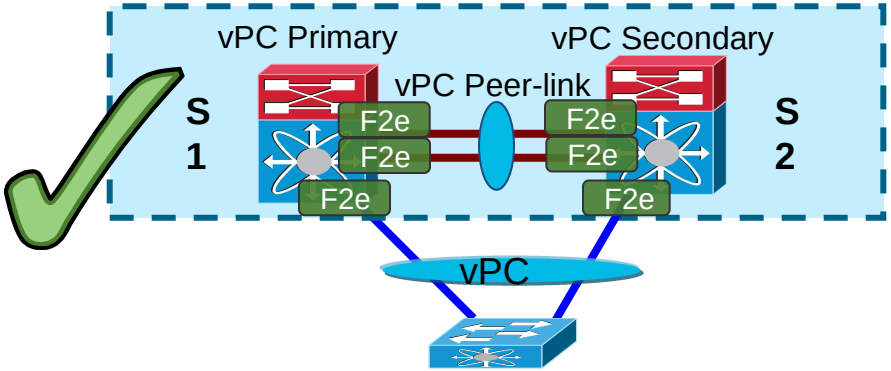


Always use identical line cards on either sides of the vPC Peer Link and vPC legs !

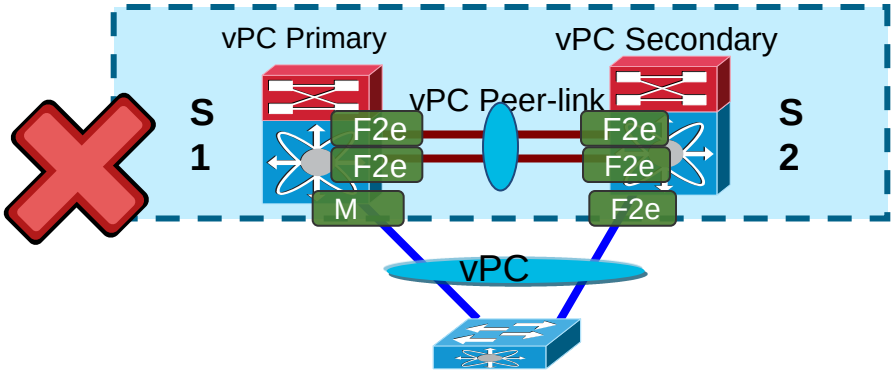


M/F2E – NX-OS 6.2(2) and Onwards



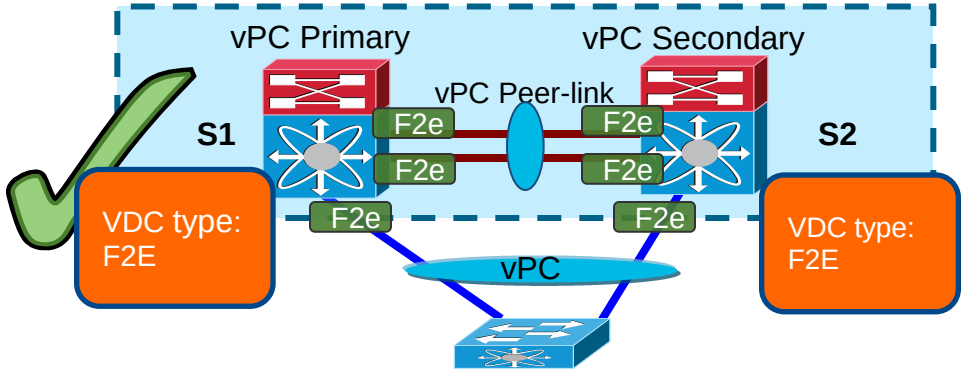


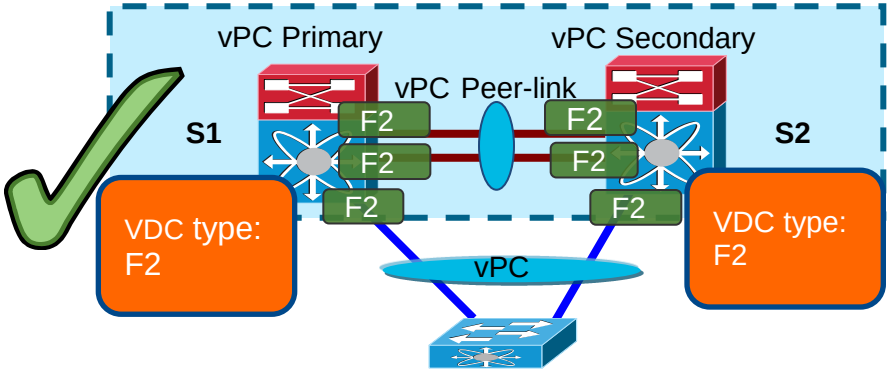
Caveat: If vPC PL is on F2E, doNOT use L3 backup routing path over vPC PL (deploy dedicated L3 backup routing path using additional inter-switch port-channel link)



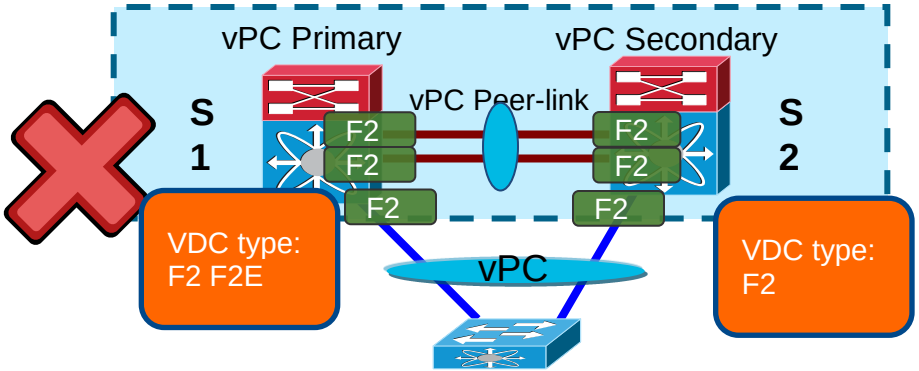
Always use identical line cards on either sides of the vPC Peer Link and vPC legs !

F2/F2E VDC – NX-OS 6.2(2) and Onwards

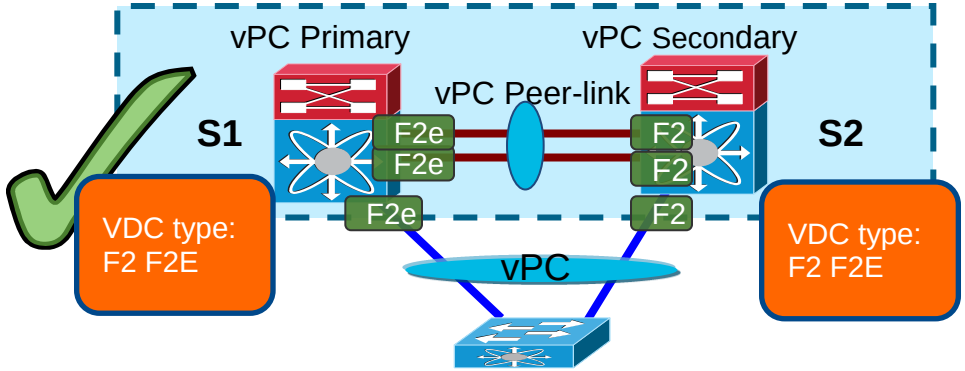


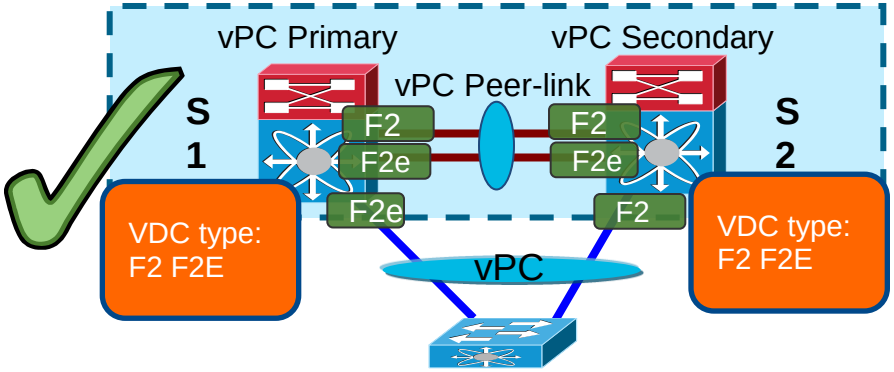


*Always use identical **VDC type** on both vPC peer devices*

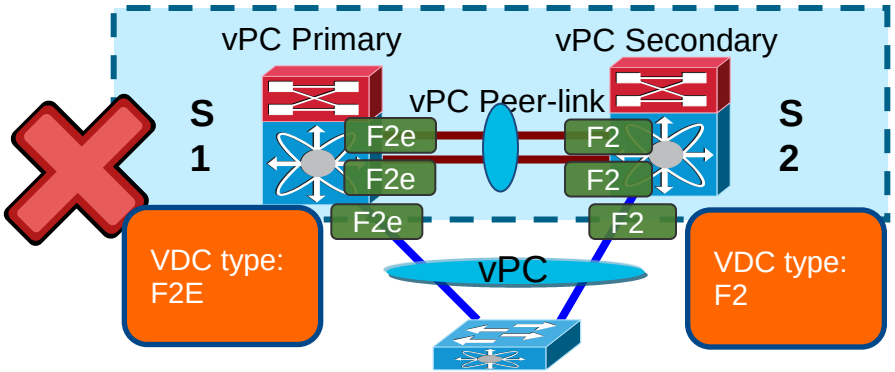


F2/F2E VDC – NX-OS 6.2(2) and Onwards

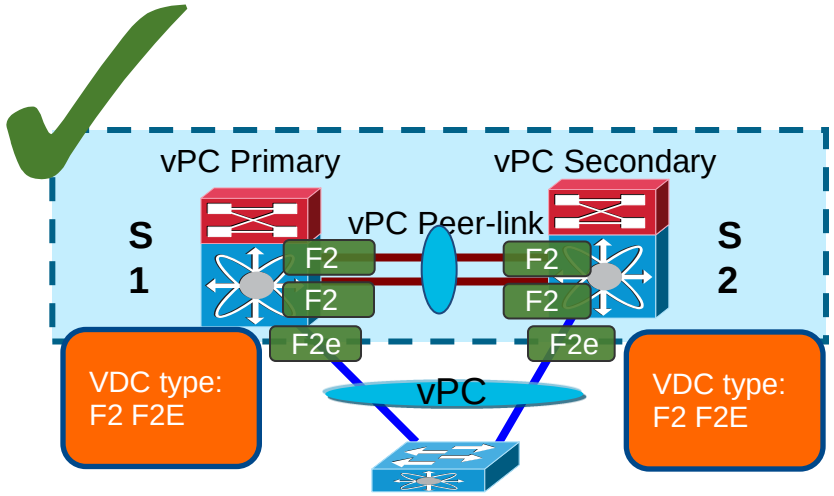




*Always use identical **VDC type** on both vPC peer devices*



F2/F2E – NX-OS 6.2(2) and Onwards

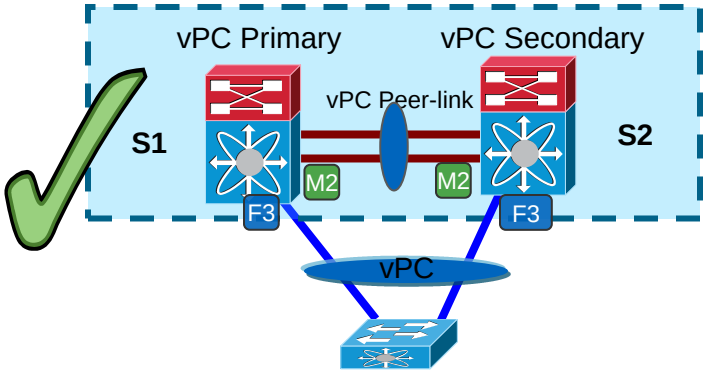


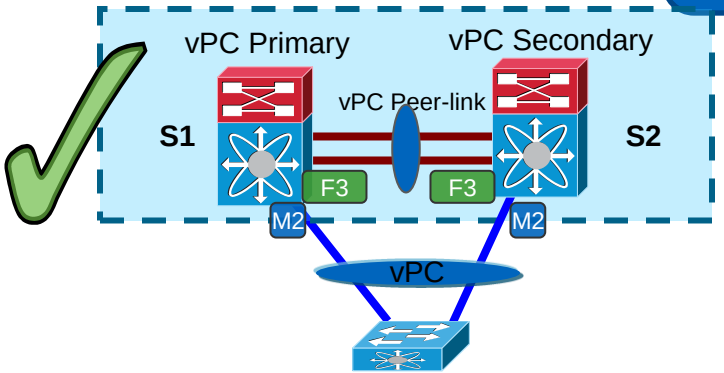
Always use identical ***VDC type*** *on both vPC peer devices*

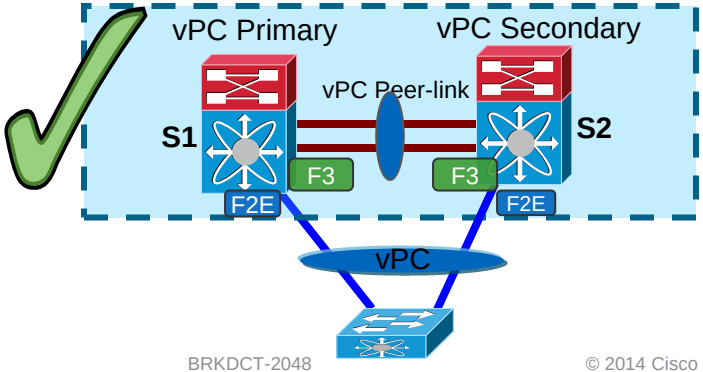
F3 – M2 / F2E LC Design Considerations

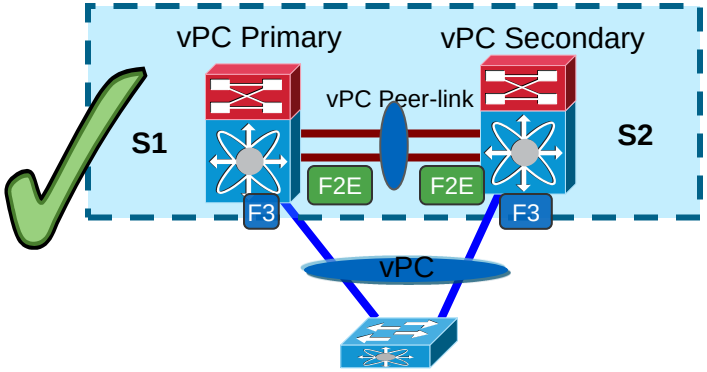
vPC / Port-channel

Always use identical line cards on either sides of the peer link !



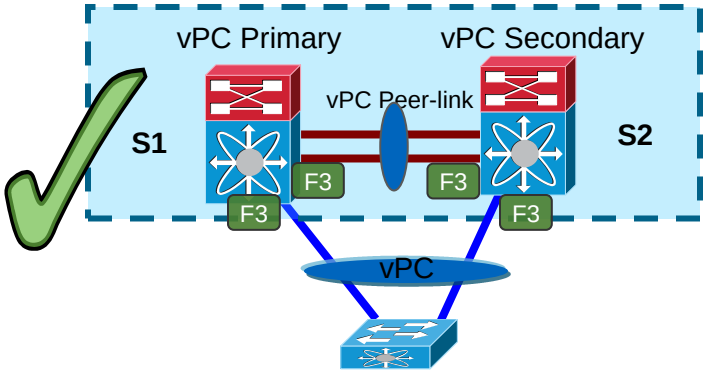






F3 – M2 / F2E LC Design Considerations

vPC / Port-channel



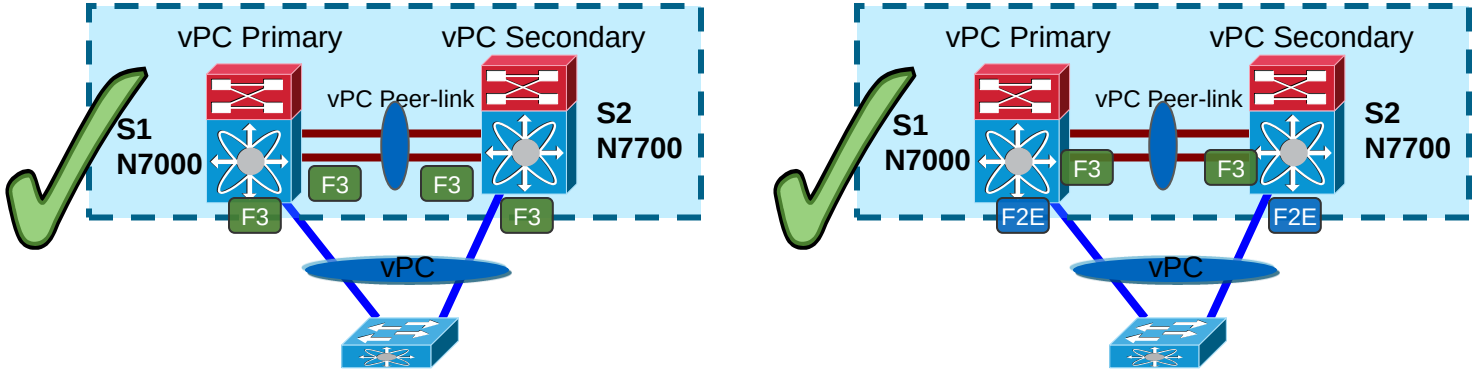
Always use identical line cards on either sides of the peer link !

N7000 – N7700 VPC Design Considerations

vPC / Port-channel

Always use identical line cards on either sides of the peer link !

- N7000 and N7700 in same VPC Construct
- VDC type should match on both peer device

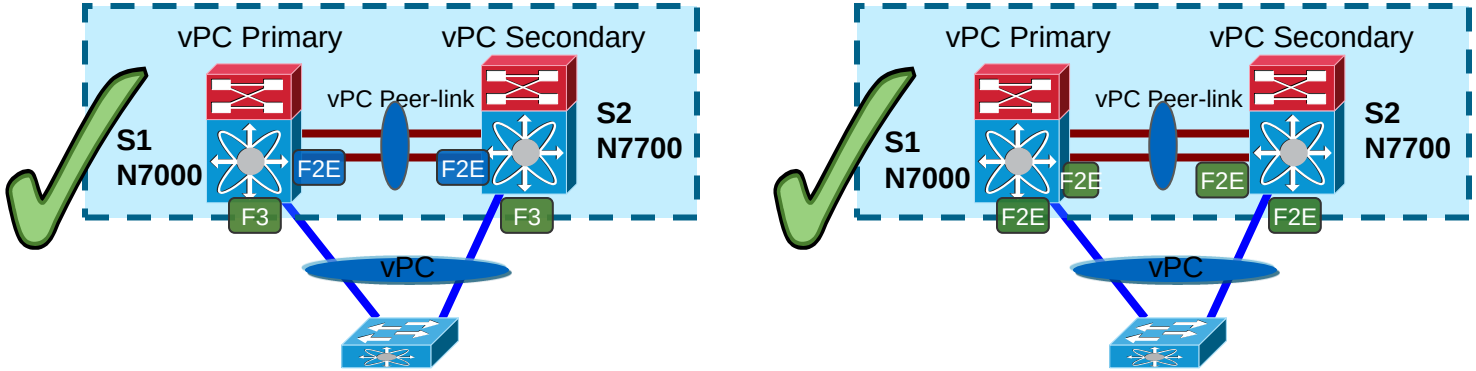


N7000 – N7700 VPC Design Considerations

vPC / Port-channel

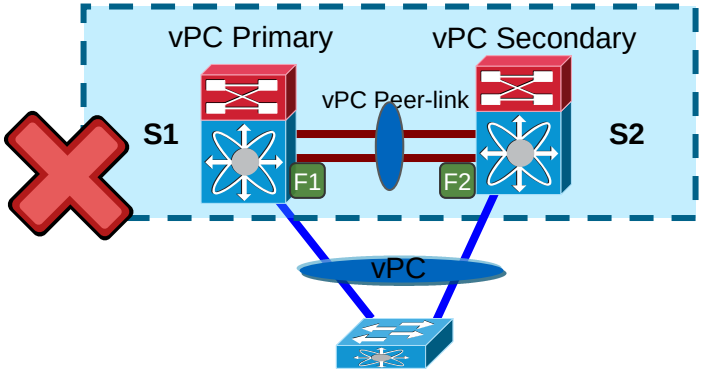
Always use identical line cards on either sides of the peer link !

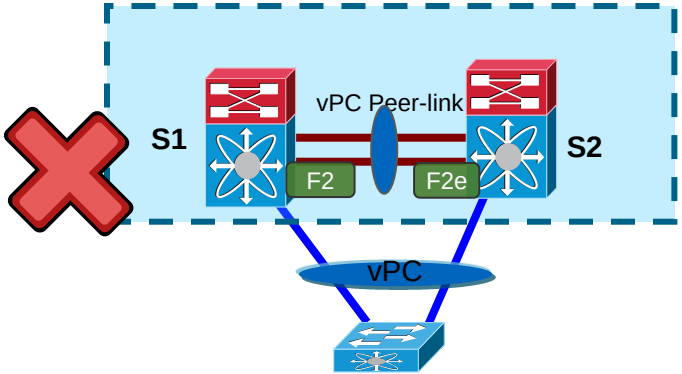
- N7000 and N7700 in same VPC Construct
- VDC type should match on both peer device

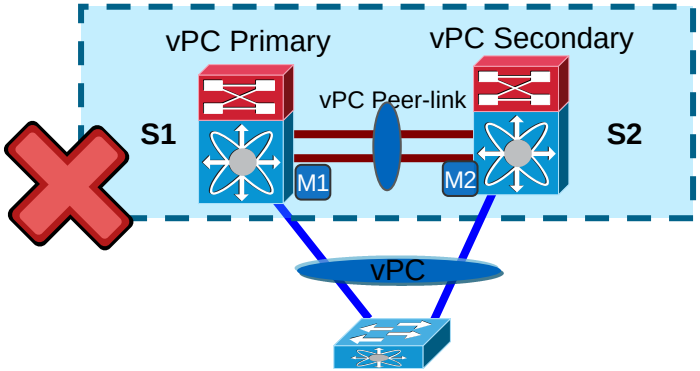


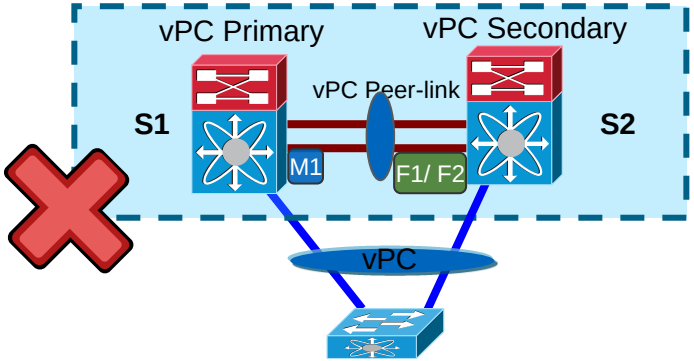
M1/M2 - F1/F2/F2e LC Design Considerations

vPC / Port-channel









Always use identical line cards on either sides of the peer link !




Appendix

vPC Hardware Support

vPC - Supported Hardware

Nexus 7000

For Your Reference

I/O Module		vPC Peer-link (10 GE Only)	VPC Interfaces
N7K-M132XP-12 N7K-M132XP-12L		✓	✓
N7K-M148GT-11L N7K-M148GS-11L		✗	✓
N7K-M108X2-12L		✓	✓
N7K-F132XP-15		✓	✓
N7K-F248XP-25 N7K-F248XP-25E N7K-F248XT-25E N77-F248XP-23E		✓	✓
N7K-M224XP-23L N7K-M206FQ-23L N7K-M202CF-22L		✓	✓

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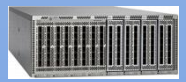
vPC - Supported Hardware

Nexus 5000/5500

For Your Reference

Part Number / Chassis		vPC Peer-link (10 GE Only)	VPC Member Port
N5K-C5010P-BF		✓	✓
N5K-C5020P-BF		✓	✓
N5K-C5548P-FA		✓	✓
N5K-C5548UP-FA		✓	✓
N5K-C5596UP-FA		✓	✓
N5K-C5596T-FA		✓	✓
Nexus 6000		✓	✓

vPC - Supported Hardware

Nexus 2000 Platform

For Your Reference

FEX	vPC Peerlink	VPC Member Port	
		NEXUS 5000/5500 parent switch	NEXUS 7000 parent switch
N2K-C2148T-1GE 	✗	✓	✗
N2K-C2224TP-1GE / N2K-C2248TP-1GE 	✗	✓	✓
N2K-C2232PP-10GE 	✗	✓	✓
N2K-C2232TM-10GE 	✗	✓	✓
N2K-C2248TP-E-1GE 	✗	✓	✓

FEX	vPC Peerlink	VPC Member Port	
		NEXUS 5000/5500 parent switch	NEXUS 7000 parent switch
N2K-B22-HP 	✗	✓	6.2.2
N2K-C2248PQ 	✗	✓	6.2.2
N2K-C2232TM-E 	✗	✓	6.2.2




Appendix

Convergence & Scalability

vPC Scalability

For Latest Scalability numbers please refer to the scalability limits pages for the platform

- **Nexus 7000/7700:**

  N7K Verified Scalability Guide :

  http://www.cisco.com/en/US/docs/switches/datacenter/sw/verified_scalability/b_Cisco_Nexus_7000_Series_NX-OS_Verified_Scalability_Guide.html

- **Nexus 5000 /5500**

  http://www.cisco.com/en/US/docs/switches/datacenter/nexus5000/sw/configuration_limits/limits_521/nexus_5000_config_limits_521.html

- **Nexus 6000**

  http://www.cisco.com/en/US/docs/switches/datacenter/nexus6000/sw/configuration_limits/b_N6000_Verified_Scalability_602N11.pdf

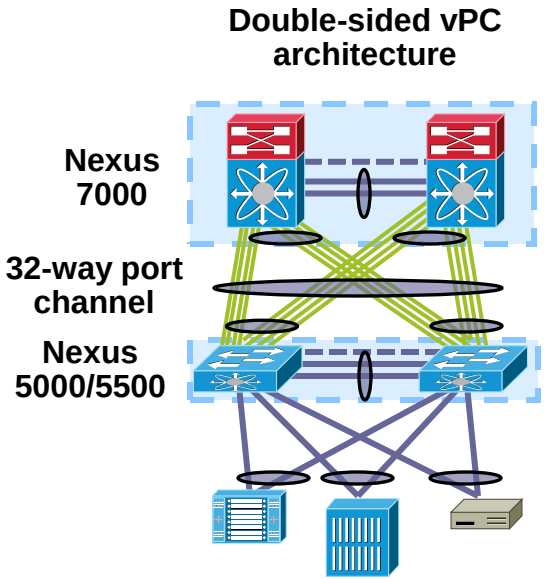
- **Nexus 3000**

  http://www.cisco.com/en/US/docs/switches/datacenter/nexus3000/sw/configuration_limits/503_u5_1/b_Nexus3k_Verified_Scalability_503U51.html

Attaching to a vPC Domain

Up to 32-Way Port-Channel – Double-sided VPC

- Multilayer vPC can join eight active member ports of the port-channels in a unique 16-way port-channel*
- vPC peer load-balancing is LOCAL to the peer device
- Each vPC peer has only eight active links, but the pair has 16 active load balanced links (M-series LC)
- F-series Nexus 7000 line cards support 16 way active port-channel load balancing, providing for a 32 way vPC port channel



***** Possible with Any Device Supporting vPC/MCEC and Eight-Way Active Port-Channels




Appendix

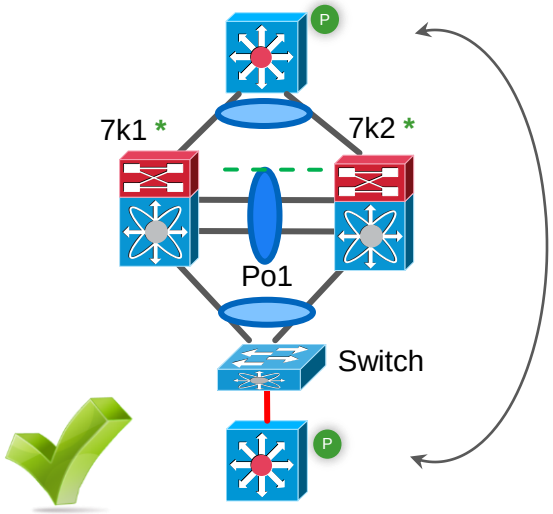
Layer 3 and vPC

N7K Layer 3 and vPC Designs

Layer 3 and vPC Interactions: Supported Designs

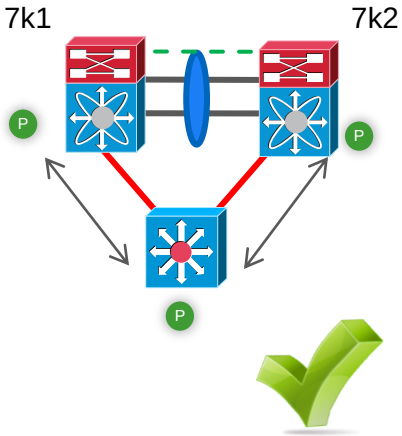
For Your Reference

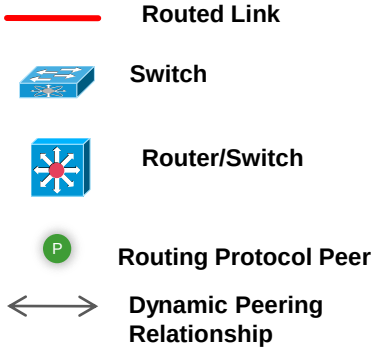
1. Peering between Routers



* Nexus 7000 configured for L2 Transport only

2. Peering with an external Router on Routed ports inter-connection

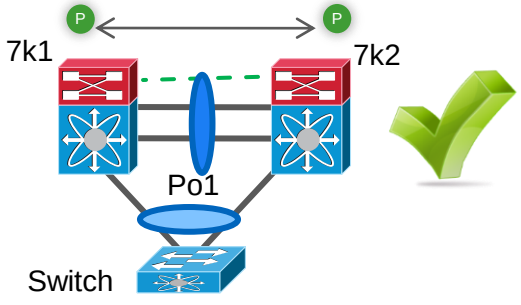




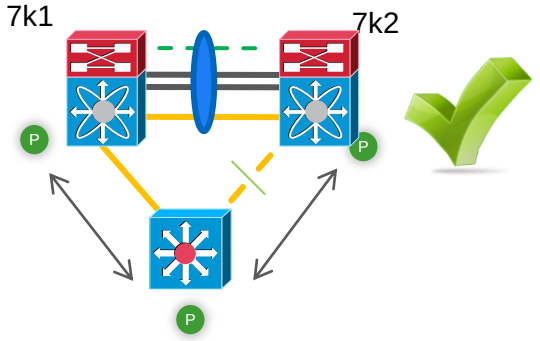
N7K Layer 3 and vPC Designs

Layer 3 and vPC Interactions: Supported Designs

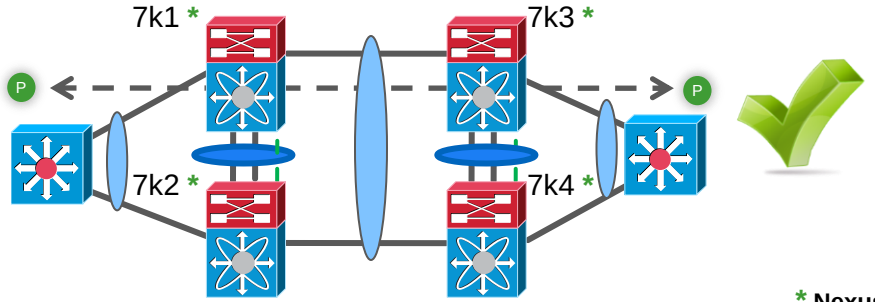
For Your Reference



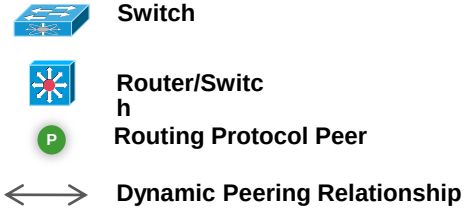
1. Peering between vPC Device



2. Peering over an STP inter-connection NOT using a vPC VLAN (Orange VLANs/Links)



3. Peering between 2 routers with vPC devices as transit Switches

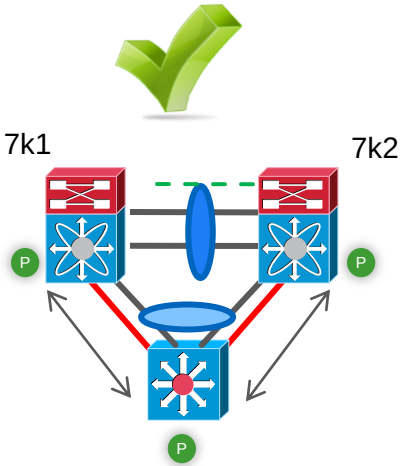


* Nexus 7000 configured for L2 Transport only

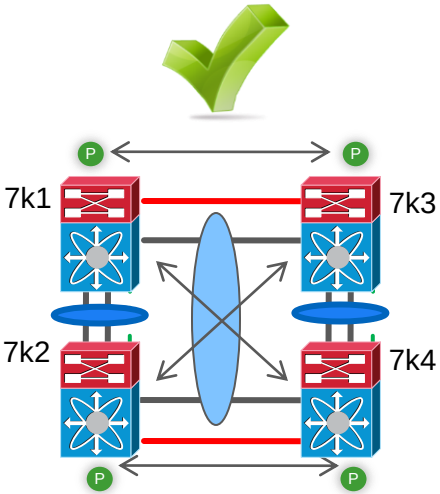
N7K Layer 3 and vPC Designs

Layer 3 and vPC Interactions: Supported Designs

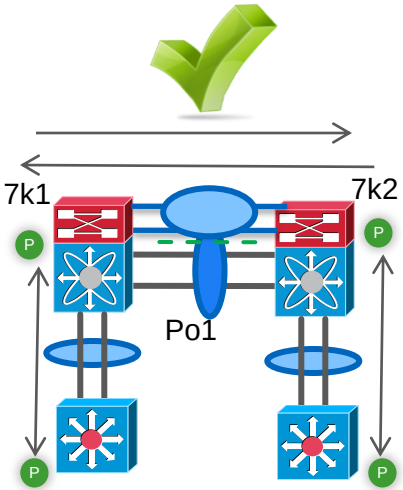
For Your Reference



1. Peering with an external Router on parallel Routed ports inter-connection



2. Peering over a vPC inter-connection (DCI case) on parallel Routed ports inter-connection

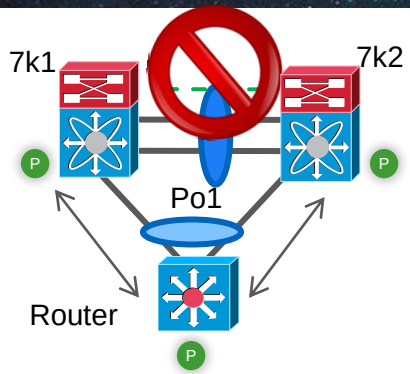


3. Peering over PC inter-connection and dedicated inter-switch link using non-vPC VLAN

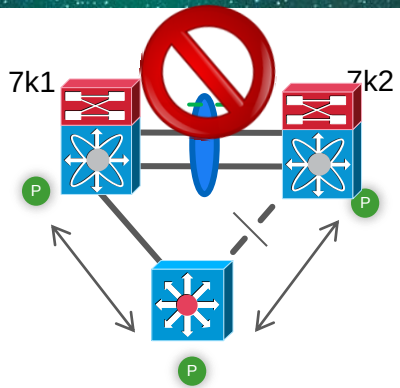
N7K Layer 3 and vPC Designs

Layer 3 and vPC Interactions: Unsupported Designs

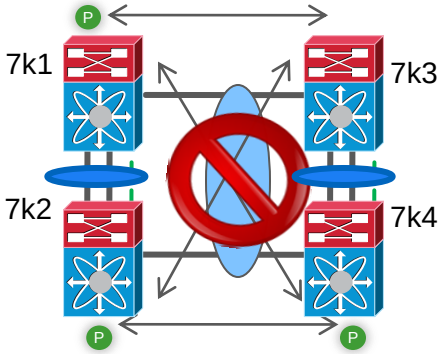
For Your Reference



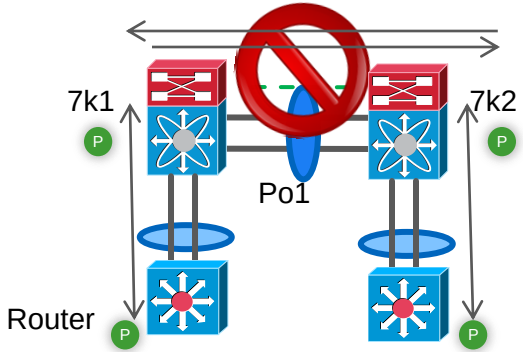
1. Peering over a vPC inter-connection



2. Peering over an STP inter-connection using a vPC VLAN



3. Peering over a vPC inter-connection (DCI case)



4. Peering over PC inter-connection and over vPC peer-link using vPC VLAN




Appendix

Reference Material

Reference Material

For Your Reference

- **vPC white Paper:**
  http://www.cisco.com/en/US/prod/collateral/switches/ps9441/ps9402/white_paper_c11-516396.html
- **vPC design guides:**
  http://www.cisco.com/en/US/partner/products/ps9670/products_implementation_design_guides_list.html
- **vPC and VSS Interoperability white Paper:**
  http://www.cisco.com/en/US/prod/collateral/switches/ps5718/ps708/white_paper_c11_589890.html
- **Data Centre Design—IP Network Infrastructure:**
  http://www.cisco.com/en/US/docs/solutions/Enterprise/Data_Center/DC_3_0/DC-3_0_IPInfra.html
- **Layer 2 Extension Between Data Centres:**
  http://www.cisco.com/en/US/prod/collateral/switches/ps5718/ps708/white_paper_c11_493718.html
- **Implementing Nexus 7000 in the Data Centre Aggregation Layer with Services:**
  https://www.cisco.com/en/US/docs/solutions/Enterprise/Data_Center/nx_7000_dc.html
- **VPC Best Practices Design Guide:**
  http://www.cisco.com/en/US/docs/switches/datacenter/sw/design/vpc_design/vpc_best_practices_design_guide.pdf
  New
- **VPC Software Upgrade Technical Note**
  http://www.cisco.com/en/US/docs/switches/datacenter/sw/nx-os/tech_note/vpc_upgrade.html
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