Cisco Nexus Switch Configuration

Authored By:

Khawar Butt
Penta CCIE # 12353
CCDE # 20110020

Comprehensive Coverage of the Cisco Nexus Switch

Email: khawarb@khawarb.com

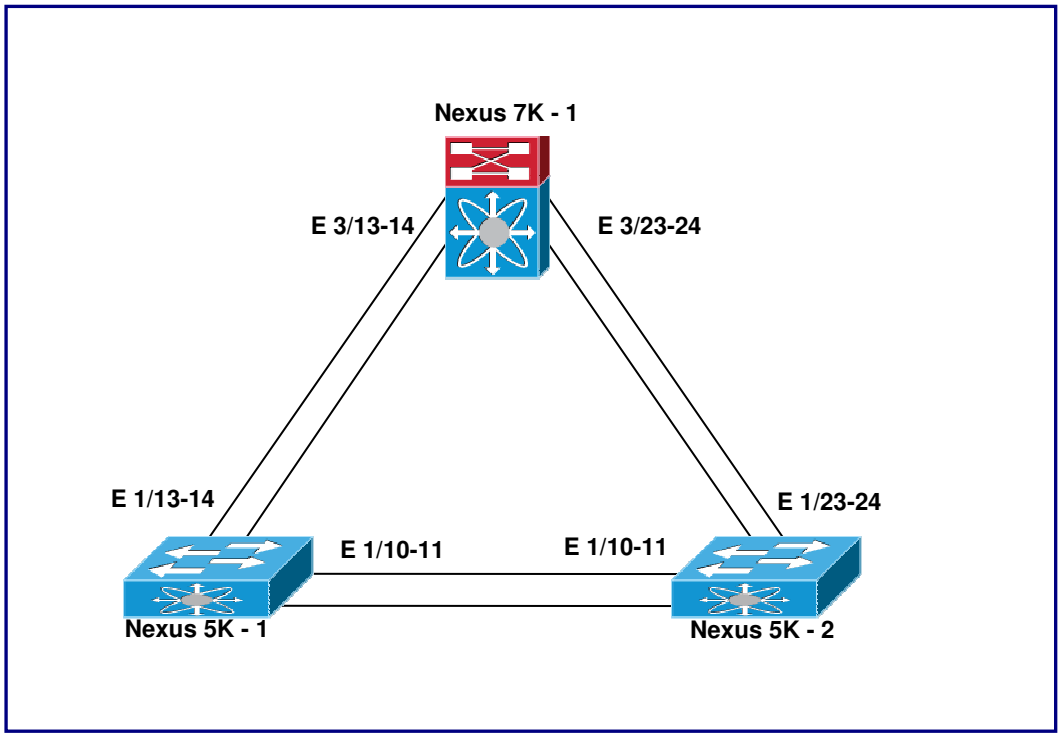
Table of Contents

Cisco Nexus Switch Configuration

Module 1 – Configuring Nexus 7K & 5K Switches

Module 1 – Configuring Nexus 7K & 5K Switches

Lab 1- Introduction to the Nexus Operating System (NX-OS)



Task 1

Configure the Switches with Hostnames of the switches based on the following:

- Nexus 7K - N7K-1
- Nexus 5K-1 - N5K-1
- Nexus 5K-2 - N5K-2

Nexus 7K-1 Hostname N7K-1 OR Switchname N7K-1	**Nexus 5K-1** Hostname N5K-1 OR Switchname N5K-1
N5K-2 Hostname N5K-1	

OR Switchname N5K-2	

Task 2
Find out the operating system that is running on the Nexus devices.

Nexus 7K-1 Show version	**Nexus 5K-1** Show version
Nexus 5K-2 Show version	

Task 3
Figure out the modules installed in your Nexus devices.

Nexus 7K-1 Show module	**Nexus 5K-1** Show module
Nexus 5K-2 Show module	

Task 4
Find out the features available on your Nexus devices.

Nexus 7K-1 Show feature	**Nexus 5K-1** Show feature
Nexus 5K-2 Show feature	

Task 5
Find out the features that are enabled by default.

Nexus 7K-1 Show feature | include enabled	**Nexus 5K-1** Show feature | include enabled
Nexus 5K-2 Show feature | include enabled	

Task 6

Find the status of the interface and its characteristics. What type of Ethernet Interface is it (Gigabit, Ten G or 100G)?

Nexus 7K-1 Show interface ethernet 3/13	**Nexus 5K-1** Show interface ethernet 3/13
Nexus 5K-2 Show interface ethernet 3/13	

Task 7

Find out the System Image files that are present in the Devices.

Nexus 7K-1 Dir	**Nexus 5K-1** Dir
Nexus 7K-2 Dir	
Note: System Image files can be updated from remote servers using FTP, SCP, SFTP or TFTP. Use the copy command to accomplish this. **Copy tftp://x.x.x.x/xxxxxx.bin bootflash:xxxxxx.bin** NX-OS offers a 120-day grace period license. To enable this license, use the following command: **License grace-period** To upgrade the license to full, download the license file from Cisco and copy it to the device bootflash using a TFTP server. Once the license file is copied, use the following command to install it on the device: **Install license bootflash:xxxxxx.lic**	

Task 8

Configure a checkpoint of your config file

Nexus 7K-1 Checkpoint CK1	**Nexus 5K-1** Checkpoint CK1
Nexus 5K-2 Checkpoint CK1	

Task 9

Change the Hostname of the devices to the following:

- Nexus 7K-1 - Bangalore
- Nexus 5K-1 - Delhi
- Nexus 5K-2 - Dubai

Nexus 7K-1 Switchname Bangalore	**Nexus 5K-1** Switchname Delhi
Nexus 5K-2 Swtichname Dubai	

Task 10

Revert the Switch back the running-config to the checkpoint created.

Nexus 7K-1 Rollback running-config checkpoint CK1
Nexus 5K-1 Rollback running-config checkpoint CK1
Nexus 5K-2 Rollback running-config checkpoint CK1

Lab 2 – Configuring Trunking & VLANs

(Builds on Lab 1)

Task 1

Configure the interfaces that connect N7K-1 to N5K-1 and N5K-2 as Trunk ports. Only use the ports shown in the Diagram (Lab1).

<table>
<tr><td colspan="2">N7K-1

Interface E 3/13 - 14 , E 3/23 - 24
Switchport
Switchport mode trunk
No shutdown</td></tr>
<tr><td>N5K-1

Interface E 1/13 - 14
Switchport
Switchport mode trunk</td><td>N5K-2

Interface E 1/23 - 24
Switchport
Switchport mode trunk</td></tr>
</table>

Task 2

Configure VLANs and assign ports to these vlans based on the following table:

- VLAN 10 - **N7K-1** - 4/23 , **N5K-1** E 1/21 , **N5K-2** E 1/29
- VLAN 20 - **N7K-1** - 4/24 , **N5K-1** E 1/22 , **N5K-2** E 1/30

<table>
<tr><td>N7K-1

VLAN 10
VLAN 20
!
interface E 4/23
switchport
switchport mode access
Switchport access vlan 10
!
interface E 4/24
switchport
switchport mode access
Switchport access vlan 20</td></tr>
<tr><td>N5K-1

VLAN 10
VLAN 20</td></tr>
</table>

```
!
interface E 1/21
 switchport
 switchport mode access
 Switchport access vlan 10
!
interface E 1/22
 switchport
 switchport mode access
 Switchport access vlan 20
```

N5K-2

```
VLAN 10
VLAN 20
!
interface E 1/29
 switchport
 switchport mode access
 Switchport access vlan 10
!
interface E 1/30
 switchport
 switchport mode access
 Switchport access vlan 20
```

Task 3

Only VLANs 10 thru 20 should be allowed to cross the trunk links.

N7K-1

```
Interface E 3/13 - 24 , E 3/23 - 24
 Switchport trunk allowed vlan 10-20
```

N5K-1

```
Interface E 1/13 - 14
 Switchport trunk allowed vlan 10-20
```

N5K-2

```
Interface E 1/13 - 14
 Switchport trunk allowed vlan 10-20
```

Lab 3 – Configuring Etherchannels

(Builds on Lab 2)

Task 1

Configure the Ports connecting N5K-1 and N5K-2 to be part of an Etherchannel. The Etherchannel should use an Industry standard protocol.

N5K-1
Feature LACP ! Interface E 1/10 - 11 Channel-group 12 mode active
N5K-2
Feature LACP ! Interface E 1/10 - 11 Channel-group 12 mode active

Task 2

Configure the Port-Channel to be a trunk.

N5K-1
Inteface Port-channel 12 Switchport Switchport mode trunk
N5K-2
Inteface Port-channel 12 Switchport Switchport mode trunk

Task 3

Configure the Load Balancing mechanism method to be done based on a combination of the Source and Destination IP.

N5K-1
Port-channel load-balance ethernet src-dst-ip-vlan
N5K-2

Port-channel load-balance ethernet src-dst-ip-vlan

Task 3
Verify the Etherchannel status.

N5K-1 Show port-channel summary
N5K-2 Show port-channel summary

Explanation:

An **EtherChannel** consists of individual Fast Ethernet or Gigabit Ethernet links bundled into a single logical link.

If a link within an EtherChannel fails, traffic previously carried over that failed link changes to the remaining links within the EtherChannel. A trap is sent for a failure, identifying the switch, the EtherChannel, and the failed link.

Inbound broadcast and multicast packets on one link in an EtherChannel are blocked from returning on any other link of the EtherChannel.

NOTE: All interfaces in each Etherchannel must be the same speed and duplex, same trunking encapsulation or the same access vlan ID, also the STP cost for each port must be the same and none of the Etherchannel ports can be involved in SPAN, RSPAN configuration or neither 802.1X.

Understanding Port-Channel Interfaces
You create an EtherChannel for Layer 2 interfaces differently from Layer 3 interfaces. Both configurations involve logical interfaces.
• With **Layer 3** interfaces, you manually create the logical interface by using the **interface port-channel** global configuration command.
• With **Layer 2** interfaces, the logical interface is dynamically created.
• With both **Layer 3** and **2** interfaces, you manually assign an interface to the EtherChannel by using the channel-group interface configuration command. This command binds the physical and logical ports together

An Etherchannel on a Nexus switch can be configured either as manual or LACP.

Lab 4 – Configuring Switch Virtual Interfaces (SVI)

(Builds on Lab 3)

Task 1

Enable the SVI feature on the Nexus Switches.

N7K-1 Feature interface-vlan	**N5K-1** Feature interface-vlan
N5K-2 Feature interface-vlan	

Task 2

Configure the SVI's on the Nexus switches based on the following table:

- **N7K-1 - VLAN 10 -** 10.1.10.1/24 **, VLAN 20 -** 10.1.20.1/24
- **N7K-1 - VLAN 10 -** 10.1.10.11/24 **, VLAN 20 -** 10.1.20.11/24
- **N7K-2 - VLAN 10 -** 10.1.10.12/24 **, VLAN 20 -** 10.1.20.12/24

N7K-1 Interface VLAN 10 Ip address 10.1.10.1/24 No shut ! Interface VLAN 20 Ip address 10.1.20.1/24 No shut
N5K-1 Interface VLAN 10 Ip address 10.1.10.11/24 No shut ! Interface VLAN 20 Ip address 10.1.20.11/24 No shut
N5K-2 Interface VLAN 10

```
 Ip address 10.1.10.12/24
 No shut
!
Interface VLAN 20
 Ip address 10.1.20.12/24
 No shut
```

Task 3

Make sure the devices are pingable within the same VLANs.

N7K-1	**N5K-1**
Ping 10.1.10.11 Ping 10.1.20.11 Ping 10.1.10.12 Ping 10.1.20.12	Ping 10.1.10.1 Ping 10.1.20.1 Ping 10.1.10.12 Ping 10.1.20.12
N5K-2	
Ping 10.1.10.1 Ping 10.1.20.1 Ping 10.1.10.11 Ping 10.1.20.11	

Lab 5 – Configuring Port Security

(Builds on Lab 4)

Task 1

Configure N5K-1 such that only MAC 0010.1111.2222 can connect to Port E 1/21. If another port tries to connect to these ports they should be shudown.

N5K-1

```
Interface E 1/21
 Switchport port-security
 Switchport port-security mac 0010.1111.2222
```

Task 2

Configure N5K-2 such that only MAC 0010.2222.4444 can connect to Port E 1/29. If another port tries to connect to these ports they should be shudown.

N5K-2

```
Interface E 1/29
 Switchport port-security
 Switchport port-security mac 0010.2222.4444
```

Task 3

Configure Port security on N7K-1 ports E 4/23 & 4/24. You would like to learn the MAC address dynamically and copy it to the running-configuration file.

N7K-1

```
Interface E 4/23-24
 Switchport port-security
 Switchport port-security mac sticky
```

Task 4

Configure E 1/22 in VLAN 10 on N5K-1. Enable Port security for this port such that 5 MAC address can be connected to it. Configure 2 MAC Address (0001-1010-AB12 and 0001-1010-AB13) statically. The rest of the MAC addresses can be learned dynamically.

N5K-1

```
Interface E 1/22
 Switchport
```

```
Switchport mode access
Switchport access vlan 10
Switchport port-security
Switchport port-security max 5
Switchport port-security mac 0001.1010.AB12
Switchport port-security mac 0001.1010.AB13
Switchport port-security mac sticky
```

Task 5

Configure the N5K-1 such that it tries to bring up the Port-security error disabled port automatically after 4 minutes.

N5K-1

```
errdisable recovery cause psecure-violation
errdisable recovery interval 240
```

Lab 6 – Preventing the Rogue DHCP Server Attack using the DHCP Snooping

(Builds on Lab 5)

Task 1

All the SALES users will be in the SALES VLAN (100). Create this VLAN. Assign ports E 1/5 – 9 on N5K-2 to this VLAN.

N5K-2

```
VLAN 100
 Names SALES
!
Interface E 1/5 – 9
 switchport
 Switchport mode access
 Switchport access vlan 100
```

Task 2

The DHCP server resides on the E 1/4 on N5K-2. Assign this port to the SALES VLAN.

N5K-2

```
Interface E 1/4
 switchport
 Switchport mode access
 Switchport access vlan 100
```

Task 3

Enable the DHCP Snooping Feature on the Nexus N5K-2.

N5K-2

```
Feature dhcp-snooping
```

Task 4

Make sure the switch only allows DHCP replies from port E 1/4 on N5K-2.

N5K-2

```
Ip dhcp snooping
```

```
Ip dhcp snooping vlan 100
!
Interface E 1/4
 Ip dhcp snooping trust
```

Lab 7 – Configuring Dynamic ARP Inspection (DAI)

(Builds on Lab 6)

Task 1

Configure N5K-2 such that it intercepts all packets received on untrusted ports in VLAN 100. It should verify valid IP-MAC mappings against the DHCP Snooping Database. This database was created by enabling DHCP Snooping for VLAN 100 in a previous lab.

N5K-2

```
Ip arp inspection vlan 100
!
Interface E 1/4
 Ip arp inspection trust
```

Lab 8 – Configuring the Source Guard Feature

(Builds on Lab 7)

Task 1

There is a Server connected to port E 1/3 on N5K-2. Turn on the IP Source Guard feature on SW2 such that only this server connects up to E 1/3. This Server has a MAC address of 0001.1010.1020 and an IP address of 192.1.50.7. This server should be in VLAN 100 and has a static IP Assignment.

N5K-2

```
ip source binding 192.1.50.7 0001.1010.1020 vlan 100 interface E 1/3
!
Interface E 1/3
 Switchport
 Switchport mode access
 Switchport access vlan 100
 Ip verify source
```

Task 2

Enable the source guard feature for the rest of the devices in this VLAN as well. Use the DHCP binding database to verify the information.

N5K-2

```
Interface E 1/4 - 9
 Ip verify source dhcp-snooping-vlan
```

Lab 9 – Configuring Storm Control

(Builds on Lab 8)

Task 1

Configure N5K-2 port E 1/14 such that broadcast and multicast traffic do not use more than 50% of the Interface bandwidth.

N5K-2

```
Interface E 1/14
Storm-control broadcast level 50.00
Storm-control multicast level 50.00
```

Lab 10 – Configuring IP ACLs

(Builds on Lab 9)

Task 1

Configure an ACL to only allow Telnet & SSH traffic coming into port E 4/23 on N7K-1

N7K-1

```
Ip access-list CONTROL
 Permit tcp any any eq 23
 Permit tcp any any eq 22
!
Interface E 4/23
 Ip access-group CONROL in
```

Lab 11 – Configuring MAC ACLs

(Builds on Lab 10)

Task 1

There is a MAC Address 0001.0012.2222 trying to attack VLAN 100 by sending a broadcast storm. You have traced this packet to port E 1/6 on N5K-2. Block this MAC address on E 1/6 on N5K-2. Do not use Storm control or VACL to accomplish this task.

N5K-2

```
mac access-list MAC-BLOCK-STORM
 deny host 0001.0012.2222 any
 permit any  any
!
Interface F 0/13
 Mac access-group MAC-BLOCK-STORM in
```

Lab 12 – Configuring VLAN ACLs (VACL)

(Builds on Lab 11)

Task 1

You have been requested to implement the following policy on N7K-1:

- Deny IGMP in VLAN 10
- Deny TFTP in VLAN 20
- There is a MAC address 0001.0012.2222 trying to attack VLAN 10. Block this MAC address from accessing any device in VLAN 10.

N7K-1

```
Ip Access-list VACL-10
 permit igmp any any
!
Ip Access-list VACL-20
 permit udp any any eq 69
!
Mac access-list MAC-VACL-10
 Permit host 0001.0012.2222 any
!
Ip access-list IP-PERMIT
 Permit ip any any
!
Vlan access-map VLAN10 10
 Match ip addr VACL-10
 Action drop
Vlan access-map VLAN10 20
 Match mac addr MAC-VACL-10
 Action drop
Vlan access-map VLAN10 100
 Match ip address IP-PERMIT
 Action forward
!
Vlan access-map VLAN20 10
 Match ip addr VACL-20
 Action drop
Vlan access-map VLAN20 100
 Match ip address IP-PERMIT
```

```
 Action forward
!
Vlan filter VLAN10 vlan-list 10
Vlan filter VLAN20 vlan-list 20
```

Lab 13 – Configuring SPAN & ERSPAN

(Builds on Lab 12)

Task 1

There is a protocol analyzer connected to N7K-1 port E 4/5. You received a request to monitor and analyze all packets for VLAN's 10 & 20 on N7K-1. Configure N7K-1 to send all traffic from VLANs 10 & 20 to Port E 4/5.

N7K-1

```
Interface E 4/5
 Switchport
 Switchport montior
 No shut
!
Monitor session 1
  Source vlan 10 rx
  Source vlan 20 rx
  Destination Interface E 4/5
  No shut
```

Task 2

There is a protocol analyzer connected to N5K-2 port E 1/5. You received a request to monitor and analyze all packets for VLAN 10 on N7K-1. Configure N7K-1 to send all traffic from VLAN 10 to Port E 1/5 on N5K-2. The communication between the 2 sessions should be IP based.

N7K-1

```
monitor session 1 type erspan-source rx
 source vlan 10 rx
 destination ip 10.1.20.12
 erspan-id 100
 vrf default
 no shut
```

N5K-2

```
interface E 1/5
 switchport
 switchport monitor
 no shut
!
```

```
monitor session 2 type erspan-destination
 source ip 10.1.20.1
 destination interface E 1/5
 erspan-id 100
 vrf default
 no shut
```

Lab 14 – Private VLANs

(Builds on Lab 13)

Task 1
Configure VLANs on N5K-1 based on the following:

- **Vlan 100** : Private-Vlan **Primary**
- **Vlan 110** : Private-Vlan **Community**
- **Vlan 120** : Private-Vlan **Isolated**

N5K-1

```
Vlan 100
  Private-vlan primary
!
Vlan 110
  Private-vlan community
!
Vlan 120
  Private-vlan isolated
```

Task 2
Configure VLAN 100 to be the primary VLAN for VLANs 110 & 120.

N5K-1

```
Vlan 100
 Private-vlan association add 110,120
```

Task 3
Configure N5K-1 such that the following is accomplished:

- PC1, connected to E 1/5, should be able to communicate to all other devices.
- PC2 and PC3, connected to E 1/6 & 7 respectively, should be able to communicate to each other and PC1 but should not have access to PC4 or PC5.
- PC4 and PC5, connected to E 1/8 & 9 respectively, should only be able to communicate to PC1. They should not be able to communicate to each other or PC2 or PC3.

N5K-1

```
Interface E 1/5
Switchport mode private-vlan promiscuous
Switchport private-vlan mapping 100 add 110 , 120
!
Interface E 1/6-7
 Switchport
 Switchport mode private-vlan host
 Switchport private-vlan host-assoc 100 110
!
Interface E 1/7-8
 switchport
 Switchport mode private-vlan host
 Switchport private-vlan host-assoc 100 120
```

Lab 15 – Remote Management

(Builds on Lab 14)

Task 1

Configure N7K-1 for Remote Management using Telnet. Configure a local username admin with a password of admin. Telnet should use the local database for authentication.

N7K-1

```
Feature telnet
!
Username admin password admin
!
Line vty 0 4
 Login local
```

Task 2

Configure N5K-1 & N5K-2 for Remote Management using SSH. Configure a local username admin with a password of admin. SSH should use the local database for authentication.

N5K-1

```
Username admin password admin
!
line vty 0 4
 Login local
```

N5K-2

```
Username admin password admin
!
line vty 0 4
 Login local
```

Cisco Nexus Switch Configuration

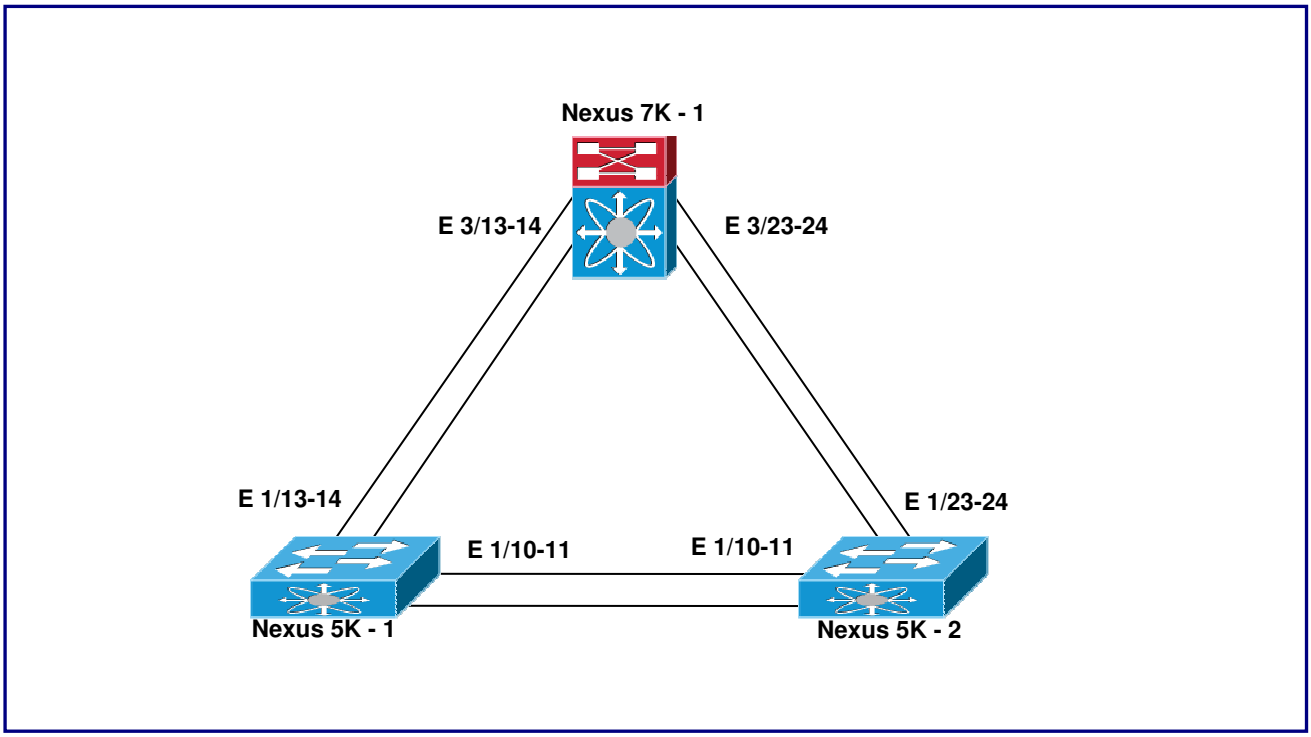
Authored By:

Khawar Butt
Penta CCIE # 12353
CCDE # 20110020

Module 2 – Configuring Spanning Tree Protocol (STP) on Nexus Switches

Lab 1- Configuring Root Bridges in a Rapid PVST Network

(Builds on Previous Module)



Task 1

Although the default STP mode is Rapid PVST, make sure you set all 3 switches to Rapid PVST manually.

N7K-1 Spanning-tree mode rapid-pvst
N5K-1 Spanning-tree mode rapid-pvst
N5K-2 Spanning-tree mode rapid-pvst

Task 2

Configure N7K-1 as the root bridge for VLANs 1 - 20. Configure N5K-1 as the secondary for VLANs 1-10 and N5K-2 as the secondary for VLANs 11-20.

N7K-1 Spanning-tree vlan 1-20 root primary Or Spanning-tree vlan 1-20 priority 0
N5K-1 Spanning-tree vlan 1-10 root secondary Or Spanning-tree vlan 1-10 priority 4096
N5K-2 Spanning-tree vlan 11-20 root secondary Or Spanning-tree vlan 11-20 priority 4096

Task 3

Verify STP information for VLAN 10 & 20 by using the **show spanning-tree vlan XX** commands on all 3 switches.

N7K-1 **Show spanning-tree vlan10** **Note:** Check the Root ID and make sure N7K-1 is the root bridge for all VLAN.
N5K-1 **Show spanning-tree vlan10** **Note:** Check the Root ID and make sure N7K-1 is the root bridge for all VLAN.
N5K-2 **Show spanning-tree vlan10** **Note:** Check the Root ID and make sure N7K-1 is the root bridge for all VLAN.

Lab 2 – Tuning STP Startup Times

(Builds on Lab 1)

Task 1

Create a VLAN 5 on N7K-1 & N5K-1. Assign port E 4/25 – E 4/26 on N7K-1 to VLAN 5. Assign port E 1/25 – E 1/27 on N5K-1 to VLAN 5.

N7K-1

```
VLAN 5
!
Interface E 4/25 – 26
 switchport
 Switchport mode access
 Switchport access vlan 5
```

N5K-1

```
VLAN 5
!
Interface E 1/25 – 27
 switchport
 Switchport mode access
 Switchport access vlan 5
```

Task 2

Users in VLAN 5 are complaining about the time it usually takes for an interface to come up after they have plugged in the network cable. Configure the TOTAL link startup delay until the port becomes forwarding to 16 seconds. Configure N7K-1 to accomplish this without jumping any state.

N7K-1

```
Spanning-tree vlan 5 forward-time 8
```

Task 3

Verify that the Timers have changed for VLAN 5 by using the **show spanning-tree vlan 5** command on N7K-1 & N5K-1 Nexus switches.

N7K-1

```
show spanning-tree vlan 5
```

Explanation:

Forwarding delay is the time spent by a port in the **learning** and **listening** states.

By default it has a value of 15 seconds so a normal port without portfast enable on it usually takes 50 seconds to start forwarding packets because it goes through learning (15 seconds) plus listening (15 seconds) and maximum age time (which is 20 seconds by default) when changing the forwarding delay to 8 the time the port for the first time a desktop is plugged into a port in a switch it would take 8 + 8 + 20 (if it's using the default value) so it would takes 36 seconds instead of 50 seconds in that case.

Lab 3 – Configuring Edge Ports

(Builds on Lab 2)

Task 1

Configure the port range from E 1/25 – 26 on N5K-1 in a way that, the link will come up as soon as someone plugs in a network cable into these ports bypassing STP learning/listening states.

N5K-1

Interface E 1/25-26
Spanning-tree port type edge

Task 2

Verifying the setting by using the **show spanning-tree interface E 1/XX**

N5K-1

show spanning-tree interface E 1/XX

Lab 4 - Configuring BPDU Guard & BPDU Filter

(Builds on Lab 3)

Task 1

The IT departament just found out that someone in the lobby area just plugged in a switch into port E 1/25 on N5K-1. Configure a command on the appropriate ports on N5K-1 such that if someone connects a hub or a switch to any of the 2 edge ports configured in the previous lab, the port will be disabled. Also make sure that after 4 minutes the disabled port comes up automatically.

N5K-1

```
Interface E 1/25 - 26
 Spanning-tree bpduguard enable
!
Errdisable recovery cause bpduguard
Errdisable recovery interval 240
```

Task 2

Verify the errdisable recovery feature by using the **show errdisable revovery** command.

N5K-1

```
show errdisable recovery
```

Task 3

Configure N5K-1 port E1/27 such that this port won't send or receive any BDPU packets.

N5K-1

```
Interface E 1/27
 Spanning-tree bpdufilter enable
```

Lab 5 – Configuring Root Guard

(Builds on Lab 4)

Task 1

N5K-2 will be connected to N2K-2 in the future on Ports E 1/1 & 2. Make sure that you prevent a superior BPDU from being processed on these ports.

N5K-2

```
Interface E 1/1-2
 Spanning-tree guard root
```

Lab 6 – Configuring Loop Guard / UDLD

(Builds on Lab 5)

Task 1

Protect the Port Channel between N5K-1 & N5K-1 from unidirectional link failures without using the UDLD feature.

N5K-1
Interface Port-channel 12 Spanning-tree guard root

Task 2

Protect the Trunk links between N7K-1 & N5K-2 from unidirectional link failures using the UDLD Aggressive feature.

N7K-1
Interface E 3/23-24 udld aggressive
N5K-2
Interface E 1/23-24 udld aggressive

Lab 7 – Configuring Bridge Assurance on Network Port Types

(Builds on Lab 6)

Task 1

Configure the Trunk links between N7K-1 and N5K-1 such that they maintain a bidirectional Keepalive using BPDU.

N7K-1
Spanning-tree bridge assurance ! Interface E 3/13-14 Spanning-tree port type network
N5K-1
Spanning-tree bridge assurance ! Interface E 1/13-14 Spanning-tree port type network

Note: The Bridge assurance feature also is an automatic pruning feature. If a particular VLAN does not have ports on the switch, the bridge assurance feature puts the VLAN into a blocking state. If the VLAN is defined, Bridge Assurance can detect the presence of BPDUs and allow it move into forwarding state.

Lab 8 – Configuring Port Profiles

(Builds on Lab 7)

Task 1

Ports E 1/25 -27 need to be assigned to VLAN 15 on N5K-2. The Ports need to have BPDUGuard & BPDUFilter features enabled. Make sure they skip the STP Listening & Learning States. Use Port Profiles to accomplish this task.

N5K-2

```
VLAN 15
!
Port-profile VLAN15
 Switchport
 Switchport mode access
 Switchport access vlan 15
 Spanning-tree port type edge
 Spanning-tree bpdufilter enable
 Spanning-tree bpduguard enable
 No shutdown
 State enabled
!
Interface E 1/25 -27
 Inherit port-profile VLAN15
 Exit
```

Lab 9 – Configuring MSTP

(Builds on Lab 8)

Task 1

Re-Configure all three Nexus switches to run STP in MST Mode.

N7K-1 Spanning-tree mode mst	**N5K-1** Spanning-tree mode mst
N5K-2 Spanning-tree mode mst	

Task 2

Configure MST based on the following requirements:

- There should be two instances of STP, instance 1 and 2
- Instance 1 should handle VLANs 1 thru 10
- Instance 2 should handle VLAN 11 thru 20
- N7K-1 should be the root bridge for both instances.
- N5K-1 should be the secondary root bridge Instance 1.
- N5K-2 should be the secondary root bridge Instance 2.
- MST configuration should use the following:
    - Name : KB-NEXUS
    - Revision : 10

N7K-1
 	
Spanning-tree mode mst
!
Spanning-tree mst configuration
  Revision 10
  Name KB-NEXUS
  Instance 1 vlan 1-10
  Instance 2 vlan 11-20
!
Spanning-tree mst 1 priority 0
Spanning-tree mst 2 priority 0
	N5K-1
	
	Spanning-tree mode mst
	!
	Spanning-tree mst configuration
	  Revision 10
	  Name KB-NEXUS
	  Instance 1 vlan 1-10
	  Instance 2 vlan 11-20
	!
	Spanning-tree mst 1 priority 4096

N5K-2 Spanning-tree mode mst !	

Spanning-tree mst configuration
  Revision 10
  Name KB-NEXUS
  Instance 1 vlan 1-10
  Instance 2 vlan 11-20
!
Spanning-tree mst 2 priority 4096	

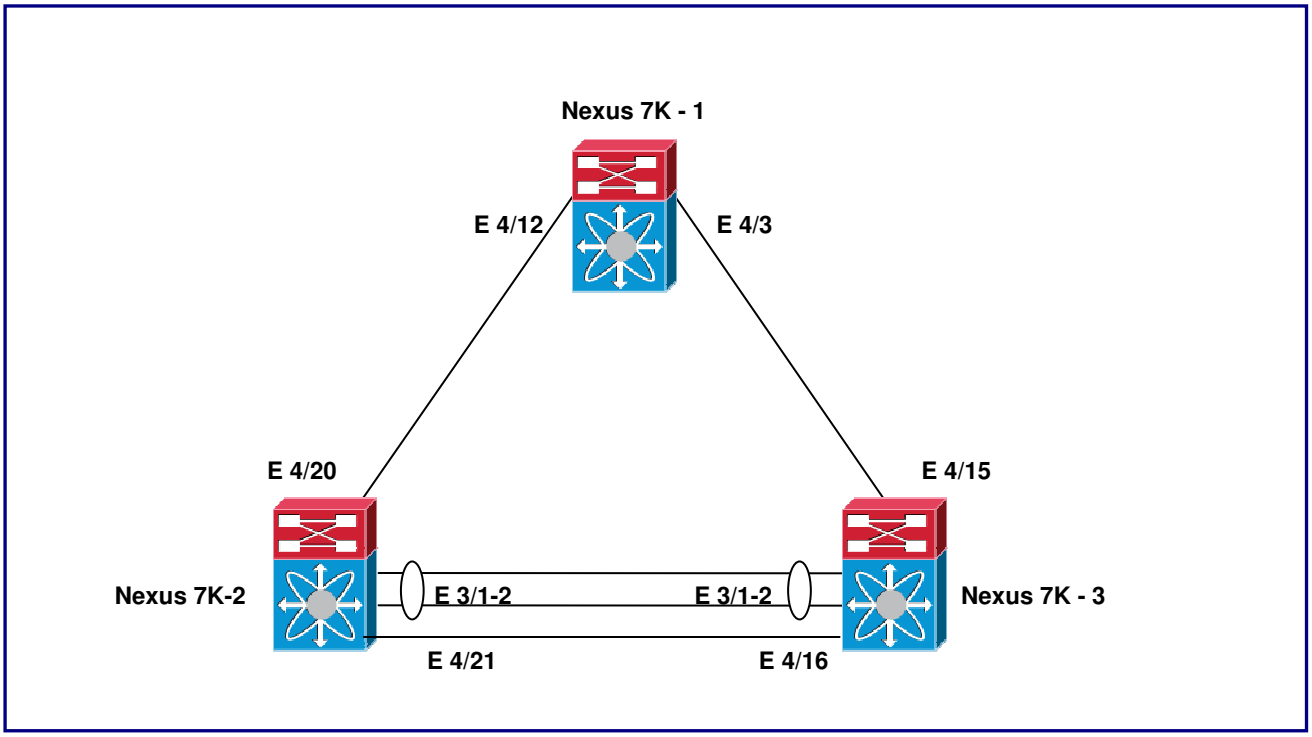
Cisco Nexus Switch Configuration

Authored By:

Khawar Butt
Penta CCIE # 12353
CCDE # 20110020

Module 3 – Configuring Virtual Device Context (VDC) & Virtual Port Channels (VPC)

Lab 1- Configuring Virtual Device Contexts (VDC)



Task 1

Connect to 7K1. Configure the admin username with a password of Cciedc01. Configure it with a hostname of 7K1.

N7K-1

Configure the password on the setup wizard as : **Cciedc01**
!
!
Hostname 7K1

Task 2
Configure 2 VDCs on 7K1 using the following information:

- VDC 2: Name : **7K2** ID: **2**
  - Interfaces : E 3/1-2, E 3/21-24, E 4/20-21, E 4/24
- VDC 3: Name : **7K3** ID: **3**
  - Interfaces : E 3/17-18, E 3/29-30, E 4/15-16

N7K-1

```
vdc 7K2 id 2
  allocate interface E 3/1-2, E 3/21-24
  allocate interface E 4/20-21, E 4/24
!
vdc 7K3 id 3
  allocate interface E 3/17-18, E 3/29-32
  allocate interface E 4/15-16
```

Note : When you allocate interfaces to VDCs, they are allocated based on Port-groups. Press **Yes** when prompted to allocate all members of the port-group.

Task 3
Verify the Creation of the VDCs by using the sh run vdc and sh vdc membership commands.

N7K-1

Show run VDC
(Displays the configuration commands for the VDCs)
!
Show VDC membership
(Displays the ports that are members of the VDCs, including the ones that were not specified by you in the command)

Task 4
Configure alias for switching to VDC 7K2 and VDC 7K3 from the default VDC as VDC2 & VDC3 respectively.

N7K-1

```
cli alias name VDC2 switchto vdc 7K2
cli alias name VDC3 switchto vdc 7K3
```

Task 5

Switch to 7K2 using the appropriate alias you created. Configure the password for the admin account as Cciedc01. Configure a alias for the **Switchback** command as SB. Switchback to the default VDC. Use the alias that you created to switchback.

N7K-1 VDC2
N7K-2 Configure the password on the setup wizard as : **Cciedc01** ! ! cli alias name SB switchback ! SB

Task 6

Switch to 7K3 using the appropriate alias you created. Configure the password for the admin account as Cciedc01. Configure a alias for the **Switchback** command as SB. Switchback to the default VDC. Use the alias that you created to switchback.

N7K-1 VDC3
N7K-3 Configure the password on the setup wizard as : **Cciedc01** ! ! cli alias name SB switchback ! SB

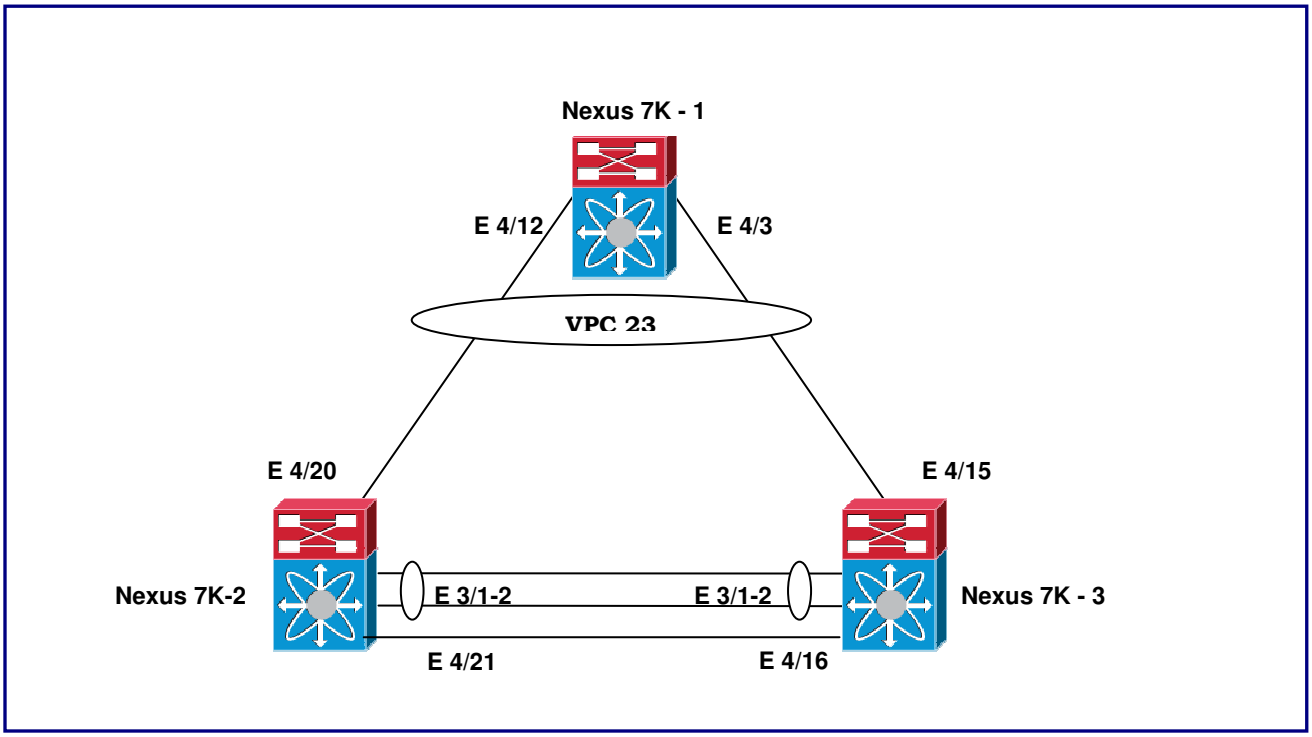
Task 7

Configure the prompt to only display the current VDC.

N7K-1 no vdc combined-hostname

Lab 2 – Configuring Virtual Port Channels (VPC) on a Nexus 7K

(Builds on Lab 1)



Task 1

We will be configuring a vPC to 7K1 to 7K2 & 7K3 based on the above diagram. Enable the vPC & LACP features on 7K2 & 7K3.

N7K-2 Feature vpc Feature lacp
N7K-3 Feature vpc Feature lacp

Task 2

Configure the parameters for the vPC Peer keepalive link based on the following:

- **7K2**

- VRF Name: **PKL-23**
- Interface: **4/21**
- IP Address: **10.1.23.2/24**

- **7K3**
  - VRF Name: **PKL-23**
  - Interface: **4/16**
  - IP Address: **10.1.23.3/24**

N7K-2

```
vrf context PKL-23
!
interface E 4/21
 vrf member PKL-23
 ip address 10.1.23.2/24
 no shut
```

N7K-3

```
vrf context PKL-23
!
interface E 4/16
 vrf member PKL-23
 ip address 10.1.23.3/24
 no shut
```

Task 3

Configure a vPC Domain between 7K2 & 7K3. Use **23** as the Domain ID. Use the Interfaces and VRFs from the previous step to configure the vPC Peer Keepalive link. Make 7K3 as the Primary vPC device.

N7K-2

```
vpc domain 23
  peer-keepalive destination 10.1.23.3 source 10.1.23.2 vrf PKL-23
```

N7K-3

```
vpc domain 23
  role priority 300
  peer-keepalive destination 10.1.23.2 source 10.1.23.3 vrf PKL-23
```

Task 4

Configure the Port-channel port type as Network. This will enable the Bridge Assurance Fault tolerance feature. Use this port channel as the vPC Peer Link. Use the following parameters:

- **7K2**
  - Port-Channel #: **23**
  - Interfaces: **3/1-2**
  - Port Type: **Network**
- **7K3**
  - Port-Channel #: **23**
  - Interface: **3/17-18**
  - Port Type: **Network**

N7K-2

```
int e 3/1-2
 channel-group 23 mode active
 no shut
!
int port-channel 23
 spanning-tree port type network
 switch mode trunk
 vpc peer-link
```

N7K-3

```
int e 3/17-18
 channel-group 23 mode active
 no shut
!
int port-channel 23
 switch mode trunk
 spanning-tree port type network
 vpc peer-link
```

Task 5

Verify the status of the vPC Port Channel. Also, make sure the vPC Peer keepalive link is up. Use the **Show VPC** command to verify it.

N7K-2

Show VPC

```
vPC domain id                     : 23
Peer status                       : peer adjacency formed ok
vPC keep-alive status             : peer is alive
Configuration consistency status : success
.
```

```
.
.
.
vPC  Peer-Link status
---------------------------------------------------
id    Port   Status Active vlans
--    -----  -------- -------------------------------
1     Po23   up     1
```

N7K-3

Show VPC

```
vPC domain id                     : 23
Peer status                       : peer adjacency formed ok
vPC keep-alive status             : peer is alive
Configuration consistency status : success
.
.
.
.
vPC  Peer-Link status
---------------------------------------------------
id    Port   Status Active vlans
--    -----  -------- -------------------------------
1     Po23   up     1
```

Task 6

Configure a vPC from 7K2 & 7K3 towards 7K1. Configure it as a L2 Trunk Port Channel. Use 12 as the Port-channel ID. Use E 4/20 on 7K2 & E 4/15 on 7K3 as the vPC member ports.

N7K-2

```
int E 4/20
 switchport
 channel-group 12 mode active
 no shut
!
int port-channel 12
 switchport mode trunk
 vpc 23
```

7K3

```
int E 4/15
```

```
 switchport
 channel-group 12 mode active
 no shut
!
int port-channel 12
 switchport mode trunk
 vpc 23
```

Task 7

Enable the LACP feature on 7K1. Configure a normal Port-Channel on 7K1. Configure it as a L2 Trunk Port Channel. Use 23 as the Port-channel ID. Use E 4/3 & E 4/12 on 7K1 as the member ports.

N7K-1

```
feature lacp
!
int E 4/3 ,  E 4/12
 switchport
 channel-group 23 mode active
 no shut
!
int port-channel 23
 switchport mode trunk
```

Task 8

Verify the status of the Port Channel on 7K1. Use the normal **Show port-channel summary** command to verify it.

show port-channel summary

```
P - Up in Port-channel (member)
S - Switched
U - Up (Port-Channel)
.
.
.
Group Port-       Type     Protocol    Member Ports
      Channel
23    Po23(SU)    Eth      LACP        Eth4/3(P)    Eth4/12(P)
```

Cisco Nexus Switch Configuration

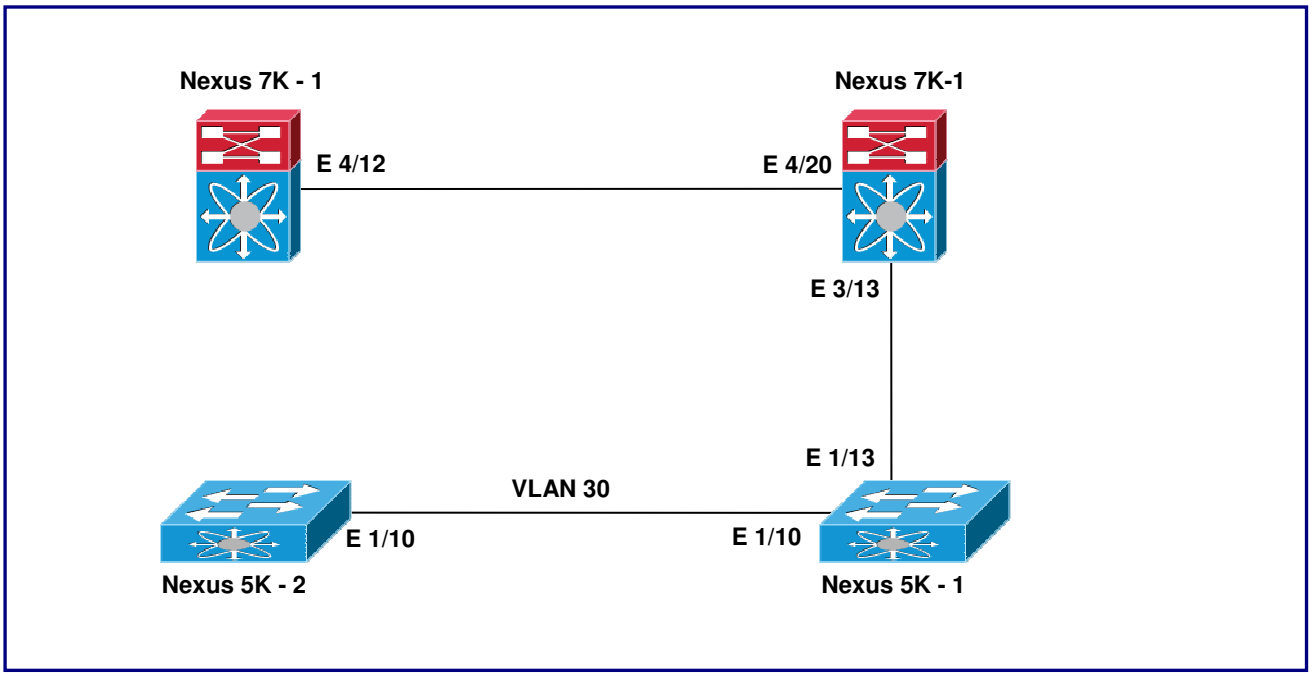
Authored By:

Khawar Butt
Penta CCIE # 12353
CCDE # 20110020

Module 4 – Configuring Nexus For Layer 3 Routing

Lab 1- Configuring Base Topology for Routing Protocols

Physical /L2 Topology



Task 1

Connect to 7K1. Configure the admin username with a password of Cciedc01. Install the Grace Period License. Configure it with a hostname of R1.

7K-1

Configure the password on the setup wizard as : **Cciedc01**
!
license grace-period
!
Hostname R1

Task 2

Configure a VDC on 7K1 using the following information:

- VDC 2: Name : **R2** ID: **2**
  Interfaces : E 3/13, E 4/20

7K-1

```
vdc R2 id 2
  limit-resource module-type f1 m1
  allocate interface E 3/13 , E 4/20
```

Note : When you allocate interfaces to VDCs, they are allocated based on Port-groups. Press **Yes** when prompted to allocate all members of the port-group.

Task 3

Verify the Creation of the VDC by using the sh run vdc and sh vdc membership commands.

7K-1

Show run VDC

(Displays the configuration commands for the VDCs)

```
!
vdc R1 id 1
.
  allocate interface Ethernet4/1-19,Ethernet4/21-48
!
vdc R2 id 2
.
  allocate interface Ethernet3/21-22
  allocate interface Ethernet4/20
```

Show VDC membership

(Displays the ports that are members of the VDCs, including the ones that were not specified by you in the command)

Task 4

Configure alias for switching to VDC R2 from the default VDC as R2.

7K-1

```
cli alias name R2 switchto vdc R2
```

Task 5

Switch to R2 using the appropriate alias you created. Configure the password for the admin account as Cciedc01. Configure a alias for the **Switchback** command as SB. Switchback to the default VDC. Use the alias that you created to switchback.

7K-1

R2
7K-2 Configure the password on the setup wizard as : **Cciedc01** ! ! cli alias name SB switchback ! SB

Task 6

Configure the password for the admin account as Cciedc01 on 5K1 & 5K2.
Configure the Hostname of 5K1 as R3 & 5K2 as R4.

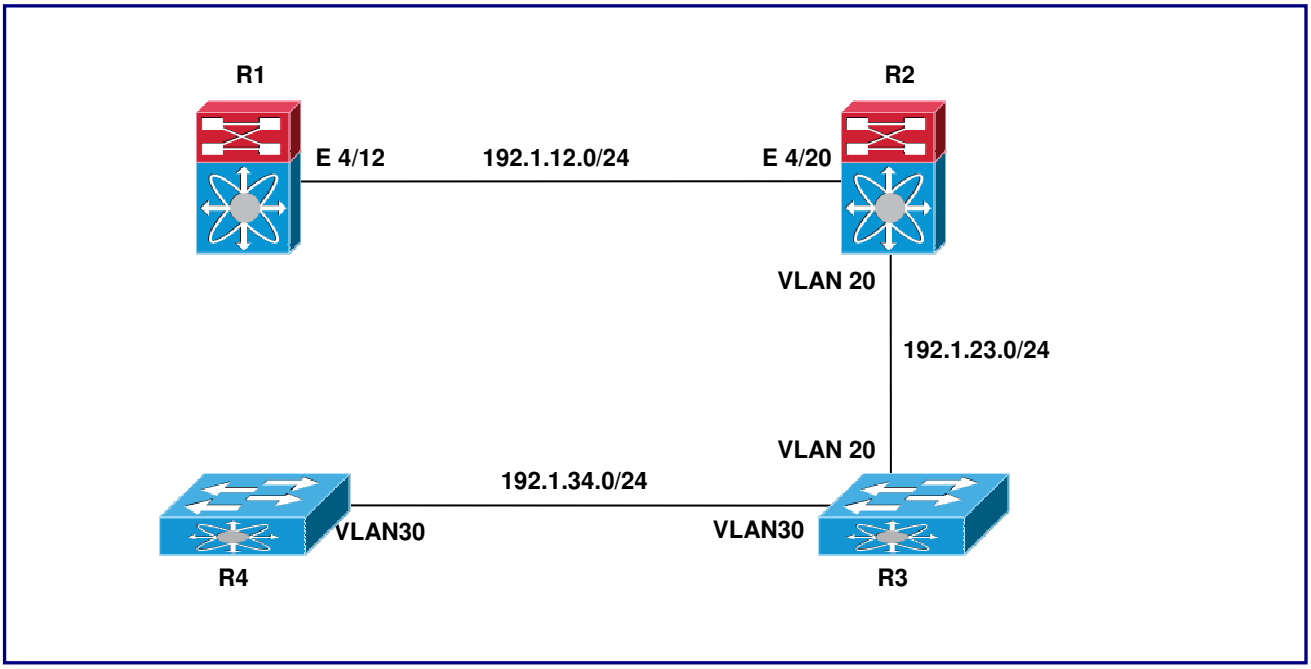
5K1 Configure the password on the setup wizard as : **Cciedc01** ! Hostname R3
5K2 Configure the password on the setup wizard as : **Cciedc01** ! Hostname R4

Task 7

Configure the prompt to only display the current VDC.

7K-1 no vdc combined-hostname

Logical Topology



Task 8

Configure VLANs and assign ports to them to create the logical topology based on the Logical Topology Diagram. Use the following to accomplish this task:

- 7K2(R2):
  - VLAN 20 : Interface : E 3/13
- 5K1(R3):
  - VLAN 20 : Interface : E 3/13
  - VLAN 30 : Interface : E 1/10
- 5K2(R4):
  - VLAN 30 : Interface : E 1/10

7K2 (R2)
Vlan 20 ! Interface E 3/13 Switchport mode access Switchport access vlan 20 No shut
5K1 (R3)

```
Vlan 20
Vlan 30
!
Interface E 3/13
 Switchport mode access
 Switchport access vlan 20
 No shut
!
Interface E 1/10
 Switchport mode access
 Switchport access vlan 30
 No shut
```

5K2 (R4)

```
Vlan 30
!
Interface E 1/10
 Switchport mode access
 Switchport access vlan 30
 No shut
```

Task 9

Configure a VRF that will be used for L3 Forwarding. Name the VRF as DATA. Assign the Interface to the Data VRF and configure IP addresses on the them based on the following:

- 7K1(R1):
  - VRF : **DATA** Interface : **E 4/12** IP Address : **192.1.12.1/24**
  - VRF : **DATA** Interface : **Loop 0** IP Address : **1.1.1.1/8**
- 7K2(R2):
  - VRF : **DATA** Interface : **E 4/20** IP Address : **192.1.12.2/24**
  - VRF : **DATA** Interface : **VLAN20** IP Address : **192.1.23.2/24**
  - VRF : **DATA** Interface : **Loop 0** IP Address : **2.2.2.2/8**
- 5K1(R3):
  - VRF : **DATA** Interface : **VLAN20** IP Address : **192.1.23.3/24**
  - VRF : **DATA** Interface : **VLAN30** IP Address : **192.1.34.3/24**
  - VRF : **DATA** Interface : **Loop 0** IP Address : **3.3.3.3/8**
- 5K2(R4):
  - VRF : **DATA** Interface : **VLAN30** IP Address : **192.1.34.4/24**
  - VRF : **DATA** Interface : **Loop 0** IP Address : **4.4.4.4/8**

7K1 (R1)

```
VRF Context DATA
!
```

```
Interface E 4/12
 Vrf member DATA
 IP address 192.1.12.1 255.255.255.0
 No shut
!
Interface loopback 0
 Vrf member DATA
 Ip address 1.1.1.1 255.0.0.0
```

7K2 (R2)

```
Feature interface-vlan
!
VRF Context DATA
!
Interface E 4/20
 Vrf member DATA
 IP address 192.1.12.2 255.255.255.0
 No shut
!
Interface VLAN 20
 Vrf member DATA
 Ip address 192.1.23.2 255.255.255.0
 No shut
!
Interface loopback 0
 Vrf member DATA
 Ip address 2.2.2.2 255.0.0.0
```

5K1(R3)

```
Feature interface-vlan
!
VRF Context DATA
!
Interface VLAN20
 Vrf member DATA
 IP address 192.1.23.3 255.255.255.0
 No shut
!
Interface VLAN 30
 Vrf member DATA
 IP address 192.1.34.3 255.255.255.0
 No shut
!
Interface loopback 0
```

Vrf member DATA Ip address 3.3.3.3 255.0.0.0
5K2(R4) Feature interface-vlan ! VRF Context DATA ! Interface VLAN 30 Vrf member DATA IP address 192.1.34.4 255.255.255.0 No shut ! Interface loopback 0 Vrf member DATA Ip address 4.4.4.4 255.0.0.0

Task 10

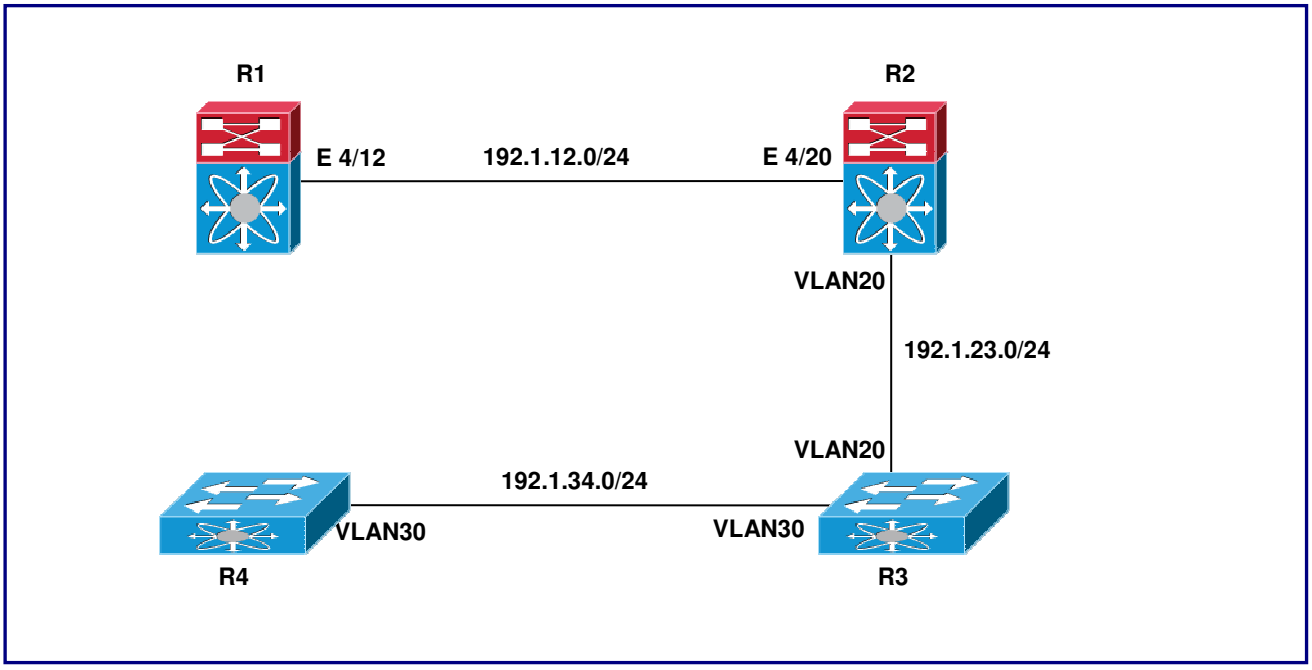
Verify IP Connectivity by pinging directly connected interfaces.

7K1(R1) Ping 192.1.12.2 vrf DATA
7K2(R2) Ping 192.1.12.1 vrf DATA Ping 192.1.23.3 vrf DATA
5K1(R3) Ping 192.1.23.2 vrf DATA Ping 192.1.34.4 vrf DATA
5K2(R4) Ping 192.1.34.4 vrf DATA

Note: Save the configurations on all the routers. Don't save during the Labs so that you can reload the topology between different Routing Protocol sections.

Lab 2 – Configuring Static Routing on Nexus 5K & 7K

(Builds on Lab 1)



Task 1

Configure R1 & R4 with default gateways pointing towards R2 & R3 respectively.

7K1(R1) Vrf context DATA Ip route 0.0.0.0/0 192.1.12.2
5K2(R4) Vrf context DATA Ip route 0.0.0.0/0 192.1.34.3

Task 2

Verify IP Connectivity by pinging 2.2.2.2 network from R1 & 3.3.3.3 from R4.

7K1(R1) Ping 2.2.2.2 vrf DATA
5K2(R4) Ping 3.3.3.3 vrf DATA

Task 3

Configure R2 & R3 with static routes to achieve full reachability based on the following table:

- 7K2(R2):
  - VRF : **DATA** Network : **1.0.0.0/8** Next-Hop : **192.1.12.1**
  - VRF : **DATA** Network : **3.0.0.0/8** Next-Hop : **192.1.23.3**
  - VRF : **DATA** Network : **4.0.0.0/8** Next-Hop : **192.1.23.3**
  - VRF : **DATA** Network : **192.1.34.0/24** Next-Hop : **192.1.23.3**
- 5K1(R3):
  - VRF : **DATA** Network : **1.0.0.0/8** Next-Hop : **192.1.23.2**
  - VRF : **DATA** Network : **2.0.0.0/8** Next-Hop : **192.1.23.2**
  - VRF : **DATA** Network : **4.0.0.0/8** Next-Hop : **192.1.34.4**
  - VRF : **DATA** Network : **192.1.12.0/24** Next-Hop : **192.1.23.2**

7K2(R2) Vrf context DATA Ip route 1.0.0.0/8 192.1.12.1 Ip route 3.0.0.0/8 192.1.23.3 Ip route 4.0.0.0/8 192.1.23.3 Ip route 192.1.34.0/24 192.1.23.3
5K1(R3) Vrf context DATA Ip route 1.0.0.0/8 192.1.23.2 Ip route 2.0.0.0/8 192.1.23.2 Ip route 4.0.0.0/8 192.1.34.4 Ip route 192.1.12.0/24 192.1.23.2

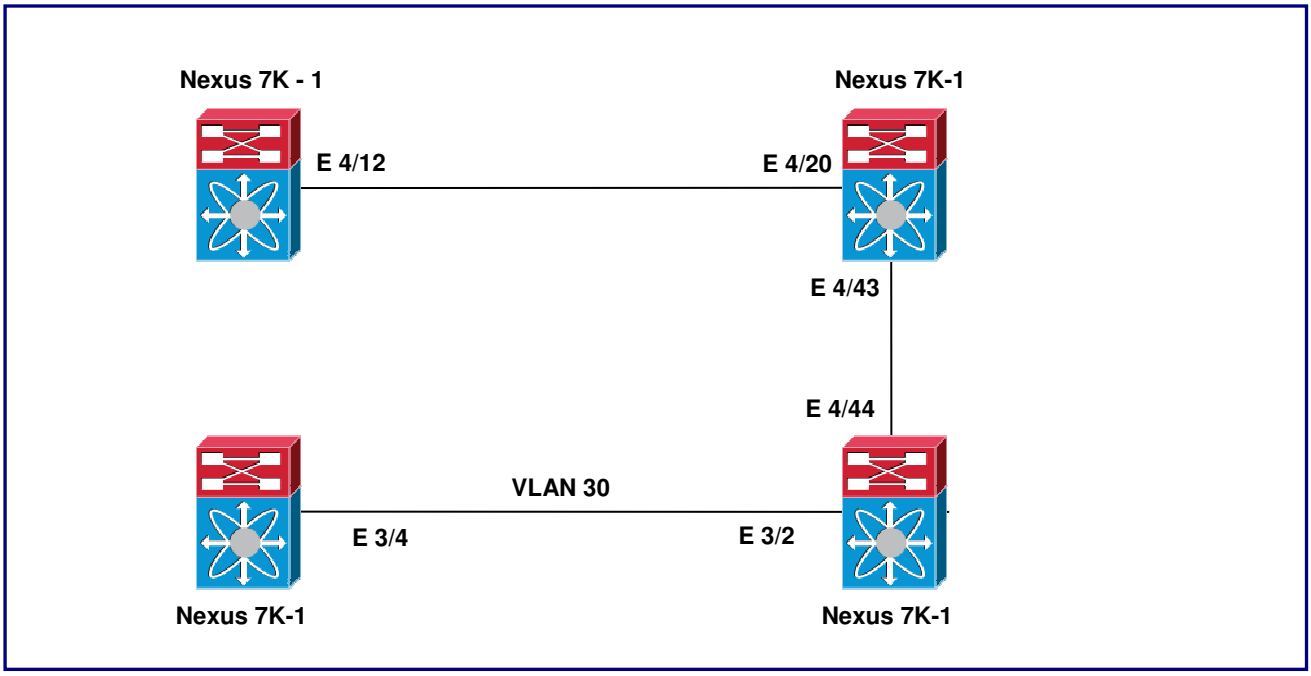
Task 4

Verify IP Connectivity by pinging 1.1.1.1 network from R4 & 4.4.4.4 from R1.

7K1(R1) Ping 4.4.4.4 vrf DATA
5K2(R4) Ping 1.1.1.1 vrf DATA

Lab 3 – Configuring EIGRP on Nexus 5K & 7K - Basic

Physical /L2 Topology



Task 1

Connect to 7K1. Configure the admin username with a password of Cciedc01. Install the Grace Period License. Configure it with a hostname of R1.

7K-1

Configure the password on the setup wizard as : **Cciedc01**
!
license grace-period
!
Hostname R1

Task 2

Configure the following VDC's on the 7K using the following information:

- VDC 2: Name : **R2** ID: **2**
  Interfaces : E 4/20 , E 4/43
- VDC 2: Name : **R3** ID: **3**
  Interfaces : E 3/2, E 4/44

- VDC 2: Name : **R4** ID: **4**
  Interfaces : E 3/4 , E 4/7

7K-1

```
vdc R2 id 2
  allocate interface E 4/20 , E 4/43
!
vdc R3 id 3
  allocate interface E 3/2 , E 4/44
!
vdc R4 id 4
  allocate interface E 3/4 , E 4/7
```

Note : When you allocate interfaces to VDCs, they are allocated based on Port-groups. Press **Yes** when prompted to allocate all members of the port-group.

Task 3

Verify the Creation of the VDC by using the sh run vdc and sh vdc membership commands.

7K-1

Show run VDC
(Displays the configuration commands for the VDCs)

Show VDC membership
(Displays the ports that are members of the VDCs, including the ones that were not specified by you in the command)

Task 4

Configure alias's for switching to VDC R2, R3 & R4 from the default VDC as R2, R3 & R4 respectively.

7K-1

```
cli alias name R2 switchto vdc R2
cli alias name R3 switchto vdc R3
cli alias name R4 switchto vdc R4
```

Task 5

Switch to R2, R3 & R4 using the appropriate alias's you created. Configure the password for the admin account as Cciedc01. Configure a alias for the

Switchback command as SB. Switchback to the default VDC. Use the alias that you created to switchback.

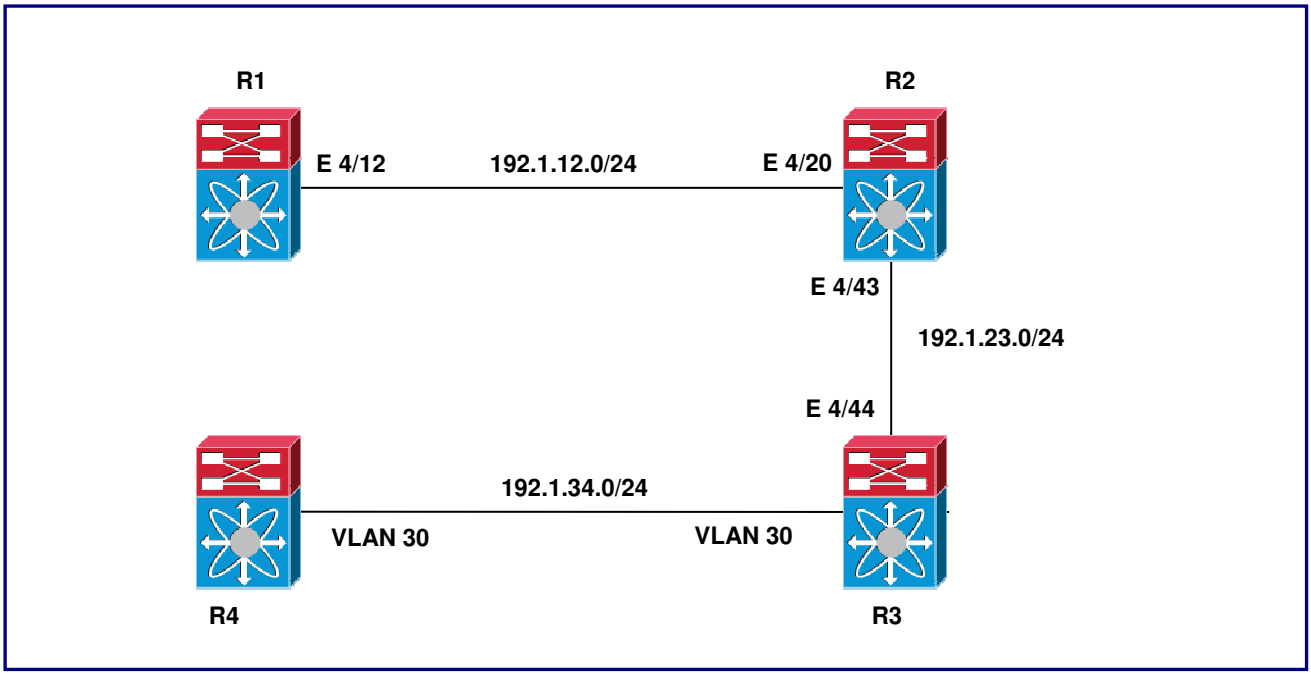
7K-1 R2
7K-2 Configure the password on the setup wizard as : **Cciedc01** ! ! cli alias name SB switchback ! SB
7K-3 Configure the password on the setup wizard as : **Cciedc01** ! ! cli alias name SB switchback ! SB
7K-4 Configure the password on the setup wizard as : **Cciedc01** ! ! cli alias name SB switchback ! SB

Task 6

Configure the prompt to only display the current VDC.

7K-1 no vdc combined-hostname

Logical Topology



Task 7

Configure VLANs and assign ports to them to create the logical topology based on the Logical Topology Diagram. Use the following to accomplish this task:

- 7K3(R3):
  - VLAN 30 : Interface : E 3/2
- 7K4(R4):
  - VLAN 30 : Interface : E 3/4

7K3 (R3)
Vlan 30 ! Interface E 3/2 Switchport mode access Switchport access vlan 30 No shut
7K4 (R4)
Vlan 30 ! Interface E 3/4 Switchport mode access

```
Switchport access vlan 30
No shut
```

Task 8

Configure a VRF that will be used for L3 Forwarding. Name the VRF as DATA. Assign the Interface to the Data VRF and configure IP addresses on the them based on the following:

- R1:
  - VRF : **DATA** Interface : **E 4/12** IP Address : **192.1.12.1/24**
  - VRF : **DATA** Interface : **Loop 0** IP Address : **1.1.1.1/8**
- R2:
  - VRF : **DATA** Interface : **E 4/20** IP Address : **192.1.12.2/24**
  - VRF : **DATA** Interface : **E 4/43** IP Address : **192.1.23.2/24**
  - VRF : **DATA** Interface : **Loop 0** IP Address : **2.2.2.2/8**
- R3:
  - VRF : **DATA** Interface : **E 4/44** IP Address : **192.1.23.3/24**
  - VRF : **DATA** Interface : **VLAN30** IP Address : **192.1.34.3/24**
  - VRF : **DATA** Interface : **Loop 0** IP Address : **3.3.3.3/8**
- R4:
  - VRF : **DATA** Interface : **VLAN30** IP Address : **192.1.34.4/24**
  - VRF : **DATA** Interface : **Loop 0** IP Address : **4.4.4.4/8**

R1

```
VRF Context DATA
!
Interface E 4/12
 Vrf member DATA
 IP address 192.1.12.1 255.255.255.0
 No shut
!
Interface loopback 0
 Vrf member DATA
 Ip address 1.1.1.1 255.0.0.0
```

R2

```
VRF Context DATA
!
Interface E 4/20
 Vrf member DATA
 IP address 192.1.12.2 255.255.255.0
 No shut
!
Interface E 4/43
```

```
 Vrf member DATA
 Ip address 192.1.23.2 255.255.255.0
 No shut
!
Interface loopback 0
 Vrf member DATA
 Ip address 2.2.2.2 255.0.0.0
```

R3

```
Feature interface-vlan
!
VRF Context DATA
!
Interface E 4/44
 Vrf member DATA
 IP address 192.1.23.3 255.255.255.0
 No shut
!
Interface VLAN 30
 Vrf member DATA
 IP address 192.1.34.3 255.255.255.0
 No shut
!
Interface loopback 0
 Vrf member DATA
 Ip address 3.3.3.3 255.0.0.0
```

R4

```
Feature interface-vlan
!
VRF Context DATA
!
Interface VLAN 30
 Vrf member DATA
 IP address 192.1.34.4 255.255.255.0
 No shut
!
Interface loopback 0
 Vrf member DATA
 Ip address 4.4.4.4 255.0.0.0
```

Task 9

Verify IP Connectivity by pinging directly connected interfaces.

R1 Ping 192.1.12.2 vrf DATA
R2 Ping 192.1.12.1 vrf DATA Ping 192.1.23.3 vrf DATA
R3 Ping 192.1.23.2 vrf DATA Ping 192.1.34.4 vrf DATA
R4 Ping 192.1.34.4 vrf DATA

Note: Save the configurations on all the routers. Don't save during the Labs so that you can reload the topology between different Routing Protocol sections.

Task 10

Enable the EIGRP feature on all 4 Devices.

R1 Feature eigrp
R2 Feature eigrp
R3 Feature eigrp
R4 Feature eigrp

Task 11

Configure EIGRP on R1, R2, R3 & R4 in AS 100. Enable the Loopbacks under EIGRP 100. Use NEXUS as the Instance Name. Set the EIGRP Router ID based on XX.XX.XX.XX, where X is the Router #.

R1
 	
Router EIGRP NEXUS
  address-family ipv4 unicast
  vrf DATA

```
    autonomous-system 100
    router-id 11.11.11.11
!
Interface E 4/12
 Ip router eigrp NEXUS
!
Interface Loopback 0
 Ip router eigrp NEXUS
```

R2

```
Router EIGRP NEXUS
  address-family ipv4 unicast
  vrf DATA
    autonomous-system 100
    router-id 22.22.22.22
!
Interface E 4/20
 Ip router eigrp NEXUS
!
Interface E 4/43
 Ip router eigrp NEXUS
!
Interface Loopback 0
 Ip router eigrp NEXUS
```

R3

```
Router EIGRP NEXUS
  address-family ipv4 unicast
  vrf DATA
    autonomous-system 100
    router-id 33.33.33.33
!
Interface E 4/44
 Ip router eigrp NEXUS
!
Interface VLAN 30
 Ip router eigrp NEXUS
!
Interface Loopback 0
 Ip router eigrp NEXUS
```

R4

```
Router EIGRP NEXUS
  address-family ipv4 unicast
```

```
  vrf DATA
    autonomous-system 100
    router-id 44.44.44.44
!
Interface VLAN 30
 Ip router eigrp NEXUS
!
Interface Loopback 0
 Ip router eigrp NEXUS
```

Task 12

Verify IP Connectivity by pinging 4.4.4.4 network from R1 & 1.1.1.1 from R4.

R1

```
Show ip route vrf DATA
!
Ping 4.4.4.4 vrf DATA
```

R4

```
Show ip route vrf DATA
!
Ping 1.1.1.1 vrf DATA
```

Task 13

Configure EGIRP Authentication between R2 - R4. R1 - R2 should not be authenticated. Use a Key of Cciedc01 with a Key ID of 12353.

R2

```
Key Chain NEXUS
 Key 12353
   Key-string Cciedc01
!
Interface E 4/43
 Ip authentication mode eigrp NEXUS MD5
 Ip authentication key-chain eigrp NEXUS NEXUS
```

R3

```
Key Chain NEXUS
 Key 12353
   Key-string Cciedc01
!
Router EIGRP NEXUS
```

```
 Address-family ipv4 unicast
 Vrf DATA
  Authentication mode MD5
  Authentication key-chain NEXUS
```

R4

```
Key Chain NEXUS
 Key 12353
   Key-string Cciedc01
!
Router EIGRP NEXUS
 Address-family ipv4 unicast
 Vrf DATA
  Authentication mode MD5
  Authentication key-chain NEXUS
```

Task 14

Verify EIGRP Authentication.

RX

```
Shosw ip eigrp NEXUS vrf DATA
!
IP-EIGRP AS 100 ID 44.44.44.44 VRF DATA
  Process-tag: NEXUS
  Instance Number: 1
  Status: running
  Authentication mode: md5
  Authentication key-chain: NEXUS
  Metric weights: K1=1 K2=0 K3=1 K4=0 K5=0
  IP proto: 88 Multicast group: 224.0.0.10
  Int distance: 90 Ext distance: 170
  Max paths: 8
  Number of EIGRP interfaces: 2 (1 loopbacks)
  Number of EIGRP passive interfaces: 0
  Number of EIGRP peers: 1
  Graceful-Restart: Enabled
  Stub-Routing: Disabled
  NSF converge time limit/expiries: 120/0
  NSF route-hold time limit/expiries: 240/0
  NSF signal time limit/expiries: 20/0
  Redistributed max-prefix: Disabled
```

Task 15

Make sure the Routers don't send EIGRP updates on the Loopback Interfaces.

R1 Interface Loopback0 Ip passive-interface eigrp NEXUS
R2 Interface Loopback0 Ip passive-interface eigrp NEXUS
R3 Interface Loopback0 Ip passive-interface eigrp NEXUS
R4 Interface Loopback0 Ip passive-interface eigrp NEXUS

Task 16

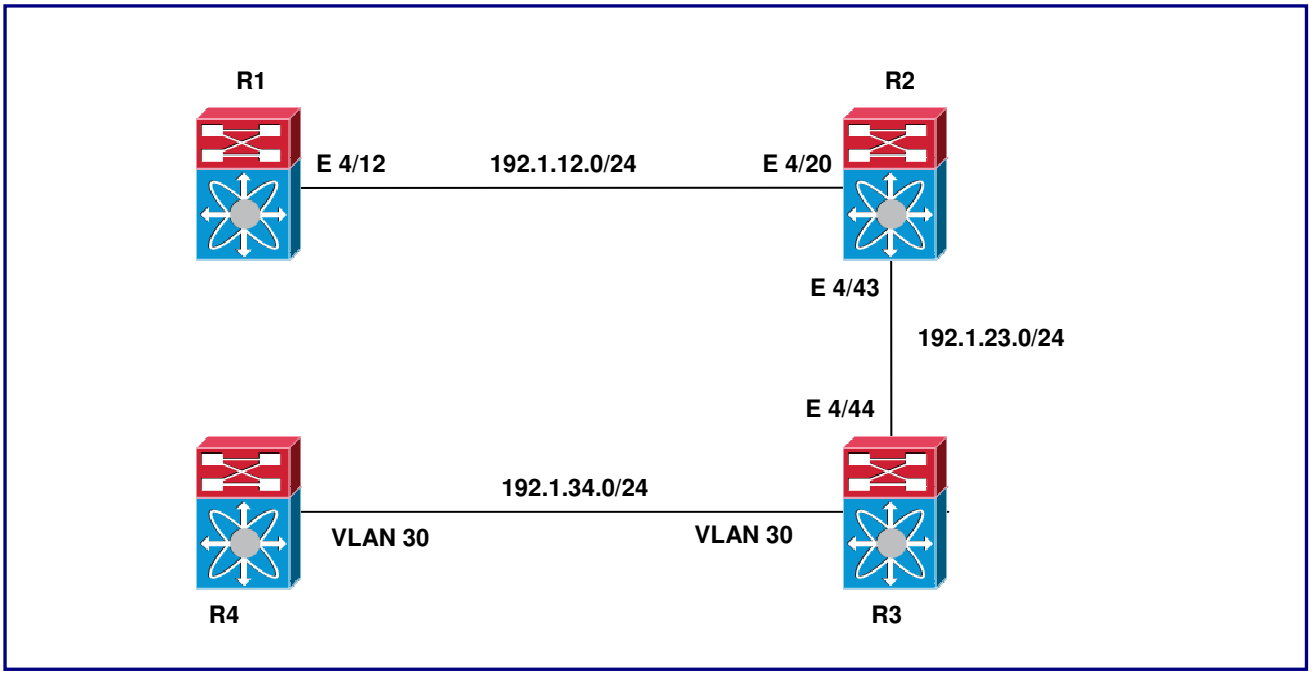
Verify that Passive Interfaces have been set.

RX Shosw ip eigrp NEXUS vrf DATA ! IP-EIGRP AS 100 ID 44.44.44.44 VRF DATA Process-tag: NEXUS Instance Number: 1 Status: running Authentication mode: md5 Authentication key-chain: NEXUS Metric weights: K1=1 K2=0 K3=1 K4=0 K5=0 IP proto: 88 Multicast group: 224.0.0.10 Int distance: 90 Ext distance: 170 Max paths: 8 Number of EIGRP interfaces: 2 (1 loopbacks) **Number of EIGRP passive interfaces: 1** Number of EIGRP peers: 1 Graceful-Restart: Enabled Stub-Routing: Disabled NSF converge time limit/expiries: 120/0 NSF route-hold time limit/expiries: 240/0 NSF signal time limit/expiries: 20/0

Redistributed max-prefix: Disabled

Lab 4 – Configuring EIGRP on Nexus 5K & 7K - Advanced

(Builds on Lab 3)



Task 1

Configure Loopback Interfaces on R1 based on the Table. Enable them under EIGRP.

- 7K1(R1):
  - VRF : **DATA** Loopback 201: **201.1.4.0/24**
  - VRF : **DATA** Loopback 202: **201.1.5.0/24**
  - VRF : **DATA** Loopback 203: **201.1.6.0/24**
  - VRF : **DATA** Loopback 204: **201.1.7.0/24**

R1

```
Interface Loopback 201
 Vrf member DATA
 Ip address 201.1.4.1 255.255.255.0
 Ip router eigrp NEXUS
!
Interface Loopback 202
 Vrf member DATA
```

```
 Ip address 201.1.5.1 255.255.255.0
 Ip router eigrp NEXUS
!
Interface Loopback 203
 Vrf member DATA
 Ip address 201.1.6.1 255.255.255.0
 Ip router eigrp NEXUS
!
Interface Loopback 204
 Vrf member DATA
 Ip address 201.1.7.1 255.255.255.0
 Ip router eigrp NEXUS
```

Task 2

Verify IP Connectivity by pinging 201.1.4.1 network from R4.

R4

```
Show ip route vrf DATA
!
Ping 201.1.4.1 vrf DATA
```

Task 3

Summarize the 201.1.X.0 routes on R1 towards R2.

R1

```
Interface E 4/12
 Ip summary-address eigrp NEXUS 201.1.4.0 255.255.252.0
```

Task 4

Verify that the appropriate route is getting propagated. (Only the 201.1.4.0/22)

RX

```
Show ip route vrf DATA | include 201.1.
```

Task 5

Make sure the R2 don't send EIGRP Queries towards R1.

R1

```
Router EIGRP NEXUS
 Address-family ipv4 unicast
```

```
 Vrf DATA
   Stub
```

Task 6

Verify that R1 is a stub router by using the **Show ip eigrp neighbor detail** command on R2.

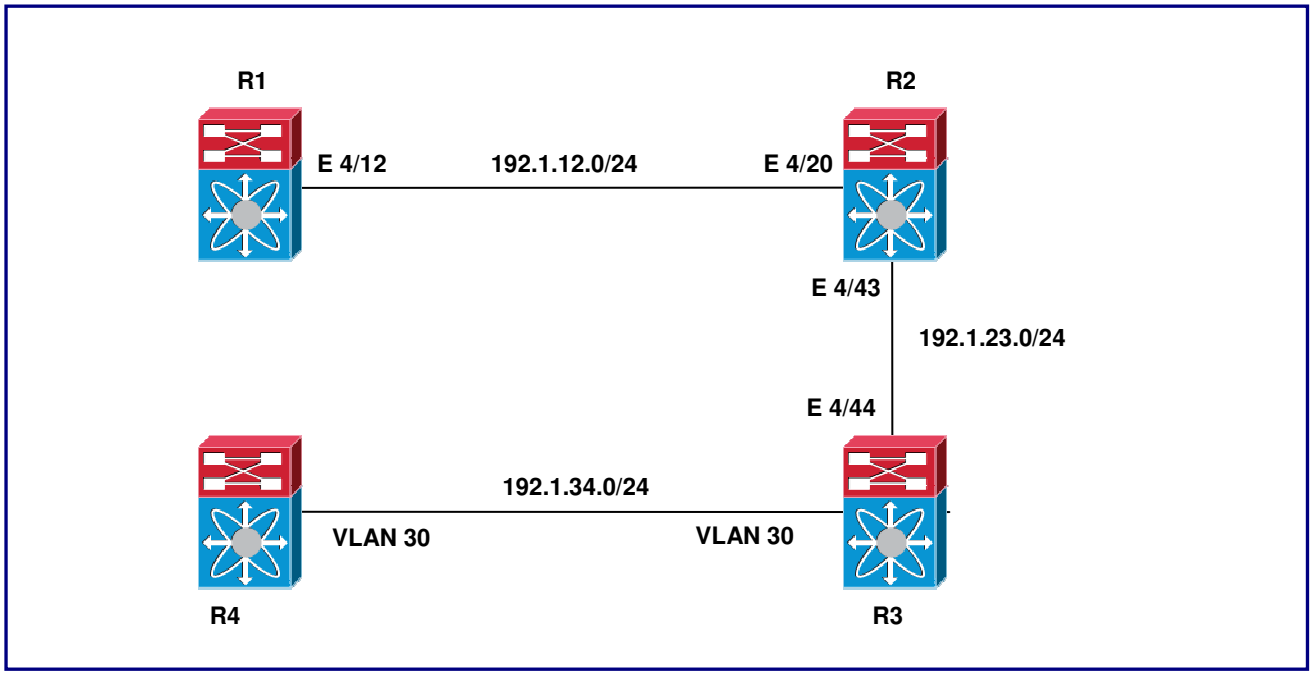
R2

Show ip eigrp neighbor detail vrf DATA

Note: Don't save during the Labs. Reload the routers. It should reload with just the IP Configuration saved during Lab 3.

Lab 5 – Configuring OSPF on Nexus 5K & 7K - Basic

(Builds on Lab 3)



Task 1

Enable the OSPF feature on all 4 Devices.

R1 Feature ospf
R2 Feature ospf
R3 Feature ospf
R4 Feature ospf

Task 2

Configure OSPF on R1, R2, R3 & R4. Enable the Loopbacks under OSPF Area 0. Use 1 as the Instance Name. Set the OSPF Router ID based on XX.XX.XX.XX, where X is the Router #.

R1

```
Router OSPF 1
  vrf DATA
    router-id 11.11.11.11
!
Interface E 4/12
 Ip router ospf 1 area 0
!
Interface Loopback 0
 Ip router ospf 1 area 0
```

R2

```
Router OSPF 1
  vrf DATA
    router-id 22.22.22.22
!
Interface E 4/20
 Ip router ospf 1 area 0
!
Interface E 4/43
 Ip router ospf 1 area 0
!
Interface Loopback 0
 Ip router ospf 1 area 0
```

R3

```
Router OSPF 1
  vrf DATA
    router-id 33.33.33.33
!
Interface E 4/44
 Ip router ospf 1 area 0
!
Interface VLAN 30
 Ip router ospf 1 area 0
!
Interface Loopback 0
 Ip router ospf 1 area 0
```

R4

```
Router OSPF 1
 Vrf DATA
   Router-id 44.44.44.44
!
Interface VLAN 30
 Ip router ospf 1 area 0
!
Interface Loopback 0
 Ip router ospf 1 area 0
```

Task 3

Verify IP Connectivity by pinging 4.4.4.4 network from R1 & 1.1.1.1 from R4.

R1

```
Show ip route vrf DATA
!
Ping 4.4.4.4 vrf DATA
```

R4

```
Show ip route vrf DATA
!
Ping 1.1.1.1 vrf DATA
```

Task 4

Configure Clear Text OSPF Authentication between R1 & R2. Use a Key of Cciedc01.

R1

```
Interface E 4/12
 Ip ospf authentication
 Ip ospf authentication-key Cciedc01
```

R2

```
Interface E 4/20
 Ip ospf authentication
 Ip ospf authentication-key Cciedc01
```

Task 5

Configure MD5 OSPF Authentication between R2 - R4. R1 - R2 should not be authenticated. Use a Key of Cciedc01 with a Key ID of 1.

R2

```
Interface E 4/43
 Ip ospf authentication message-digest
 Ip ospf message-digest-key 1 md5 Cciedc01
```

R3

```
Interface E 4/44
Ip ospf authentication message-digest
 Ip ospf message-digest-key 1 md5 Cciedc01
!
Interface VLAN 30
 Ip ospf authentication message-digest
 Ip ospf message-digest-key 1 md5 Cciedc01
```

R4

```
Interface VLAN 30
 Ip ospf authentication message-digest
 Ip ospf message-digest-key 1 md5 Cciedc01
```

Task 5

Verify OSPF Authentication.

R1

Show ip ospf interface E 4/12

```
Ethernet4/12 is up, line protocol is up
   IP address 192.1.12.1/24, Process ID 1 VRF DATA, area 0.0.0.0
   Enabled by interface configuration
   State BDR, Network type BROADCAST, cost 40
   Index 1, Transmit delay 1 sec, Router Priority 1
   Designated Router ID: 22.22.22.22, address: 192.1.12.2
   Backup Designated Router ID: 11.11.11.11, address: 192.1.12.1
   1 Neighbors, flooding to 1, adjacent with 1
   Timer intervals: Hello 10, Dead 40, Wait 40, Retransmit 5
     Hello timer due in 00:00:06
   Simple authentication
   Number of opaque link LSAs: 0, checksum sum 0
```

R2

Show ip ospf interface E 4/20
!
Ethernet4/20 is up, line protocol is up
  IP address 192.1.12.2/24, Process ID 1 **VRF DATA**, area 0.0.0.0
  Enabled by interface configuration
  State DR, Network type BROADCAST, cost 40
  Index 1, Transmit delay 1 sec, Router Priority 1
  Designated Router ID: 22.22.22.22, address: 192.1.12.2
  Backup Designated Router ID: 11.11.11.11, address: 192.1.12.1
  1 Neighbors, flooding to 1, adjacent with 1
  Timer intervals: Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello timer due in 00:00:05
  Simple authentication
  Number of opaque link LSAs: 0, checksum sum 0

Show ip ospf interface E 4/43
!
Ethernet4/43 is up, line protocol is up
  IP address 192.1.23.2/24, Process ID 1 **VRF DATA**, area 0.0.0.0
  Enabled by interface configuration
  State BDR, Network type BROADCAST, cost 40
  Index 3, Transmit delay 1 sec, Router Priority 1
  Designated Router ID: 33.33.33.33, address: 192.1.23.3
  Backup Designated Router ID: 22.22.22.22, address: 192.1.23.2
  1 Neighbors, flooding to 1, adjacent with 1
  Timer intervals: Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello timer due in 00:00:03
  Message-digest authentication, using key id 1
  Number of opaque link LSAs: 0, checksum sum 0

Task 6

Make sure they appear in the remote routing tables with the appropriate masks.

R1

Interface Loopback0
  Ip ospf network point-to-point

R2

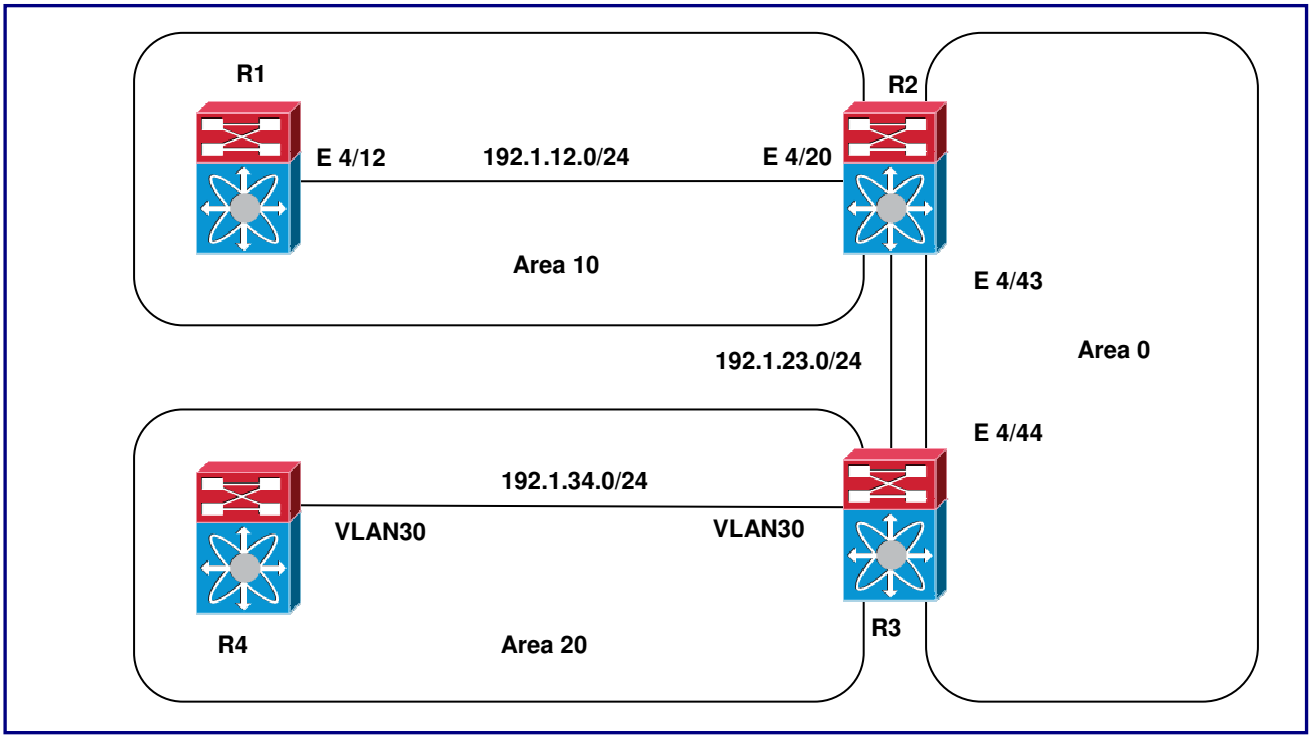
Interface Loopback0
  Ip ospf network point-to-point

R3 Interface Loopback0   Ip ospf network point-to-point
R4 Interface Loopback0   Ip ospf network point-to-point

Note: Don't save during the Labs. Reload the routers. It should reload with just the IP Configuration saved during Lab 3.

Lab 6 – Configuring OSPF on Nexus 5K & 7K - Advanced

(Builds on Lab 3)



Task 1

Enable the OSPF feature on all 4 Devices.

R1 Feature ospf
R2 Feature ospf
R3 Feature ospf
R4 Feature ospf

Task 2

Configure OSPF on R1, R2, R3 & R4. Enable the Interfaces in the appropriate Area based on the following table & figure. Use 1 as the Instance Name. Set the OSPF Router ID based on XX.XX.XX.XX, where X is the Router #. Advertise the Loopbacks with the Interface masks.

- OSPF Area 10 : **R1** - Loopback 0 , E 4/12, **R2** - Loopback 0 , E 4/20
- OSPF Area 0 : **R2** - VLAN 20, **R3** - VLAN 20
- OSPF Area 20 : **R3** - Loopback 0 , VLAN 30, **R4** - Loopback 0 , VLAN 30

R1

```
Router OSPF 1
 Vrf DATA
   Router-id 11.11.11.11
!
Interface E 4/12
 Ip router ospf 1 area 10
!
Interface Loopback 0
 Ip router ospf 1 area 10
 Ip ospf network point-to-point
```

R2

```
Router OSPF 1
 Vrf DATA
   Router-id 22.22.22.22
!
Interface E 4/20
 Ip router ospf 1 area 10
!
Interface E 4/43
 Ip router ospf 1 area 0
!
Interface Loopback 0
 Ip router ospf 1 area 10
 Ip ospf network point-to-point
```

R3

```
Router OSPF 1
 Vrf DATA
   Router-id 33.33.33.33
!
Interface E 4/44
 Ip router ospf 1 area 0
```

! Interface VLAN 30 Ip router ospf 1 area 20 ! Interface Loopback 0 Ip router ospf 1 area 20 Ip ospf network point-to-point
R4 Router OSPF 1 Vrf DATA   Router-id 44.44.44.44 ! Interface VLAN 30 Ip router ospf 1 area 20 ! Interface Loopback 0 Ip router ospf 1 area 20 Ip ospf network point-to-point

Task 3

Verify IP Connectivity by pinging 4.4.4.4 network from R1 & 1.1.1.1 from R4.

R1 Show ip route vrf DATA ! Ping 4.4.4.4 vrf DATA
R4 Show ip route vrf DATA ! Ping 1.1.1.1 vrf DATA

Task 4

Configure Loopback Interfaces on R2 & R4 based on the Table. Redistribute these routes into OSPF using Redistribute Connected. These routes should appear in OSPF as external routes.

- 7K2(R2):
  - VRF : **DATA** Loopback 201: **202.1.4.0/24**
  - VRF : **DATA** Loopback 202: **202.1.5.0/24**
  - VRF : **DATA** Loopback 203: **202.1.6.0/24**
  - VRF : **DATA** Loopback 204: **202.1.7.0/24**

- 5K2(R4):
  - VRF : **DATA** Loopback 201: **204.1.4.0/24**
  - VRF : **DATA** Loopback 202: **204.1.5.0/24**
  - VRF : **DATA** Loopback 203: **204.1.6.0/24**
  - VRF : **DATA** Loopback 204: **204.1.7.0/24**

R2

```
Interface Loopback 201
 Vrf member DATA
 Ip address 202.1.4.1 255.255.255.0
!
Interface Loopback 202
 Vrf member DATA
 Ip address 202.1.5.1 255.255.255.0
!
Interface Loopback 203
 Vrf member DATA
 Ip address 202.1.6.1 255.255.255.0
!
Interface Loopback 204
 Vrf member DATA
 Ip address 202.1.7.1 255.255.255.0
!
route-map RC permit 10
  match interface loopback201 loopback202 loopback203 loopback204
!
Router ospf 1
  Vrf DATA
  Redistribute direct route-map RC
```

R4

```
Interface Loopback 201
 Vrf member DATA
 Ip address 204.1.4.1 255.255.255.0
!
Interface Loopback 202
 Vrf member DATA
 Ip address 204.1.5.1 255.255.255.0
!
Interface Loopback 203
 Vrf member DATA
 Ip address 204.1.6.1 255.255.255.0
!
```

```
Interface Loopback 204
 Vrf member DATA
 Ip address 204.1.7.1 255.255.255.0
!
route-map RC permit 10
  match interface loopback201 loopback202 loopback203 loopback204
!
Router ospf 1
  Vrf DATA
  Redistribute direct route-map RC
```

Task 5

Verify IP Connectivity by pinging 204.1.4.1 network from R1 & 202.1.4.1 from R1.

R1

```
Show ip route vrf DATA
!
Ping 204.1.4.1 vrf DATA
```

R4

```
Show ip route vrf DATA
!
Ping 202.1.4.1 vrf DATA
```

Task 6

Summarize the 202.1.X.0 and the 204.1.X.0 networks on the appropriate routers.

R2

```
Router ospf 1
 Vrf DATA
  Summary-address 202.1.4.0 255.255.252.0
```

R4

```
Router ospf 1
  Vrf DATA
  Summary-address 204.1.4.0 255.255.252.0
```

Task 7

Verify IP Connectivity by pinging 202.1.4.1 network from R1. Also, verify that the routes are getting summarized.

R1
Show ip route vrf DATA ! Ping 202.1.4.1 vrf DATA
R3
Show ip route vrf DATA ! Ping 202.1.4.1 vrf DATA

Task 8
Configure Area 10 as a Totally Stubby area.

R1

Router ospf 1
  Vrf DATA
  Area 10 stub

R2

Router ospf 1
  Vrf DATA
  Area 10 stub no-summary

Task 9
Verify IP Connectivity by pinging 202.1.4.1 network from R1. Also, verify that Inter-Area & External Routes are not getting sent to R1.

R1
Show ip route vrf DATA ! Ping 202.1.4.1 vrf DATA

Task 10
Configure Area 20 as a NSSA-Totally Stubby Area.

R3

Router ospf 1
  Vrf DATA
  Area 20 nssa no-summary

R4

Router ospf 1
  Vrf DATA
  Area 20 nssa

Task 11

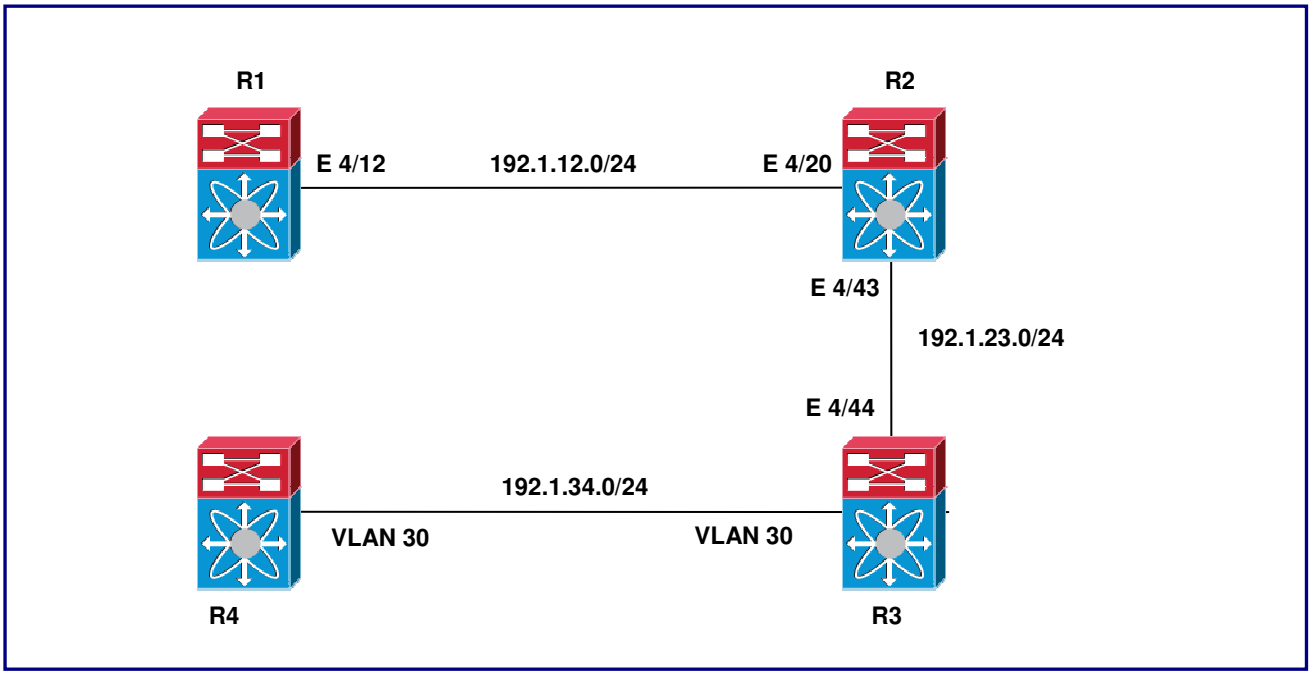
Verify IP Connectivity by pinging 202.1.4.1 network from R4. Also, verify that Inter-Area & External Routes from the backbone are not getting sent to R4.

R2
Show ip route vrf DATA
R4
Show ip route vrf DATA ! Ping 202.1.4.1 vrf DATA

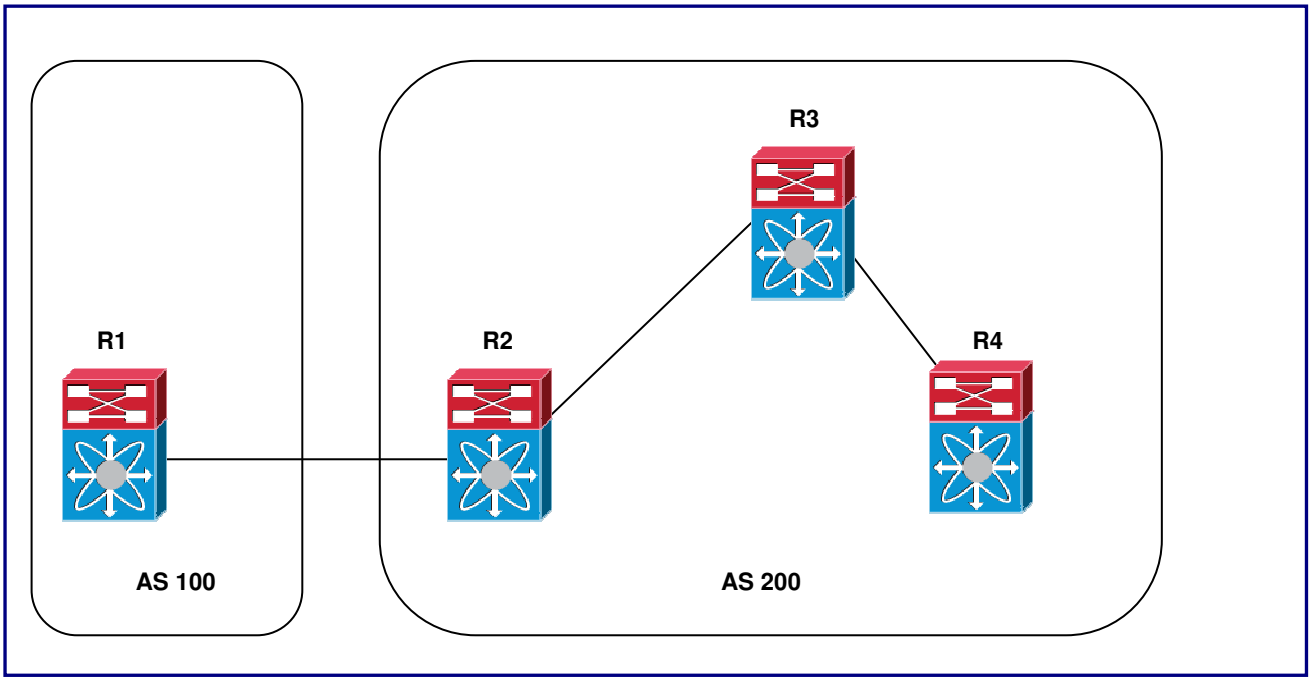
Note: Don't save during the Labs. Reload the routers. It should reload with just the IP Configuration saved during Lab 3.

Lab 7 – Configuring BGP on Nexus 5K & 7K

(Builds on Lab 1)



BGP Logical Topology



Task 1
Enable the BGP & OSPF features on all 4 Devices.

R1
Feature bgp Feature ospf
R2
Feature bgp Feature ospf
R3
Feature bgp Feature ospf
R4
Feature bgp Feature ospf

Task 2
Configure BGP between R1 & R2 based on the BGP Logical Topology. Advertise the Loopback 0 Interfaces under BGP.

R1

router bgp 100
  vrf DATA
  address-family ipv4 unicast
  network 1.0.0.0/8
  neighbor 192.1.12.2
  remote-as 200

R2

router bgp 200
  vrf DATA
  address-family ipv4 unicast
  network 2.0.0.0/8
  neighbor 192.1.12.1
  remote-as 100

Task 3
Verify IP Connectivity by pinging 2.2.2.2 network from R1 & 2.2.2.2 from R1.

R1

Show ip route vrf DATA
!
Ping 2.2.2.2 source 1.1.1.1 vrf DATA

R2

Show ip route vrf DATA
!
Ping 1.1.1.1 source 2.2.2.2 vrf DATA

Task 4

Secure the BGP relationship between R1 & R2. Use Cciedc01 as the key.

R1

```
router bgp 100
  vrf DATA
    neighbor 192.1.12.2
      password Cciedc01
```

R1

```
router bgp 200
  vrf DATA
    neighbor 192.1.12.1
      password Cciedc01
```

Task 5

Configure Loopback 10 on R2, R3 & R4 using the 10.X.X.X/32 format. Configure OSPF as the IGP in AS 200. Enable OSPF in Area 0 on the internal links in Area 0 and the Loopback 10 networks. These will be used to setup the iBGP relationships.

R2

```
Router ospf 1
  Vrf DATA
    Router-id 22.22.22.22
!
Interface E 4/43
  Ip router ospf 1 area 0
!
Interface Loopback 10
```

```
  Vrf member DATA
    Ip address 10.2.2.2 255.255.255.255
     Ip router ospf 1 area 0
```

R3

```
Router ospf 1
  Vrf DATA
    Router-id 33.33.33.33
!
Interface E 4/44
  Ip router ospf 1 area 0
!
Interface VLAN 30
  Ip router ospf 1 area 0
!
Interface Loopback 10
 Vrf member DATA
  Ip address 10.3.3.3 255.255.255.255
  Ip router ospf 1 area 0
```

R4

```
Router ospf 1
  Vrf DATA
    Router-id 44.44.44.44
!
Interface VLAN 30
   Ip router ospf 1 area 0
!
Interface Loopback 10
 Vrf member DATA
  Ip address 10.4.4.4 255.255.255.255
  Ip router ospf 1 area 0
```

Task 6

Verify IP Connectivity by using the **Show ip route vrf DATA** command on R2, R3 & R4.

R2

```
Show ip route vrf DATA
```

R3

```
Show ip route vrf DATA
```

R4

```
Show ip route vrf DATA
```

Task 7

Configure an iBGP neighbor relationship between R2 & R3. Configure the neighbor relationship based on Lookback 10. Advertise Loopback 0 in BGP on R3. Change the Next-hop attribute on R2 towards R3.

R2

```
router bgp 200
  vrf DATA
    neighbor 10.3.3.3
      remote-as 200
      Update-source loopback 10
      address-family ipv4 unicast
        Next-hop-self
```

R3

```
router bgp 200
  vrf DATA
    address-family ipv4 unicast
      network 3.0.0.0/8
    neighbor 10.2.2.2
      remote-as 200
      Update-source loopback 10
```

Task 8

Verify reachability to the 1.0.0.0 network from 3.0.0.0.

R1

```
Show ip route vrf DATA
!
Ping 3.3.3.3 source 1.1.1.1 vrf DATA
```

R3

```
Show ip route vrf DATA
!
Ping 1.1.1.1 source 3.3.3.3 vrf DATA
```

Task 9

Configure an iBGP neighbor relationship between R3 & R4. Configure the neighbor relationship based on Lookback 10. Advertise Loopback 0 in BGP on R4. Configure R3 as a Route Reflector for R2 & R4.

R3

```
Router BGP 200
 Vrf DATA
   Neighbor 10.4.4.4
     remote-as 200
     Update-source loopback 10
     Address-family ipv4 unicast
        Route-reflector-client
    Neighbor 10.2.2.2
     Address-family ipv4 unicast
        Route-reflector-client
```

R4

```
Router BGP 200
 Vrf DATA
   Address-family ipv4 unicast
     Network 4.0.0.0/8
   Neighbor 10.3.3.3
     remote-as 200
     Update-source loopback 10
```

Task 11

Verify reachability to the 1.0.0.0 network from 4.0.0.0.

R1

```
Show ip route vrf DATA
!
Ping 4.4.4.4 source 1.1.1.1 vrf DATA
```

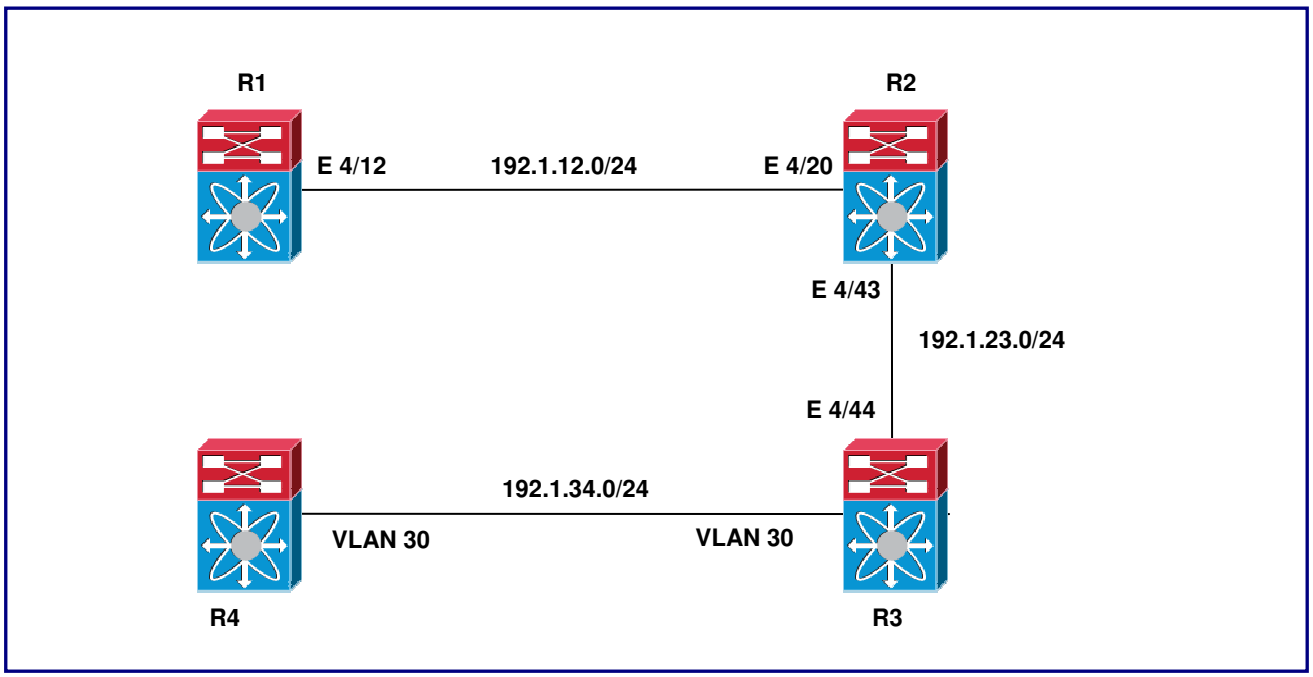
R4

```
Show ip route vrf DATA
!
Ping 1.1.1.1 source 4.4.4.4 vrf DATA
```

Note: Don't save during the Labs. Reload the routers. It should reload with just the IP Configuration saved during Lab 3.

Lab 8 – Configuring PIM Sparse Mode on Nexus 5K & 7K - Static RP

(Builds on Lab 3)



Task 1

Enable the EIGRP & PIM feature on all 4 Devices.

R1 Feature eigrp Feature PIM
R2 Feature eigrp Feature PIM
R3 Feature eigrp Feature PIM
R4 Feature eigrp Feature PIM

Task 2

Configure EIGRP on R1, R2, R3 & R4 in AS 100. Enable the Loopbacks under EIGRP 100. Use NEXUS as the Instance Name. Set the EIGRP Router ID based on XX.XX.XX.XX, where X is the Router #.

R1

```
Router EIGRP NEXUS
  address-family ipv4 unicast
  vrf DATA
    autonomous-system 100
!
Interface E 4/12
 Ip router eigrp NEXUS
!
Interface Loopback 0
 Ip router eigrp NEXUS
```

R2

```
Router EIGRP NEXUS
  address-family ipv4 unicast
  vrf DATA
    autonomous-system 100
!
Interface E 4/20
 Ip router eigrp NEXUS
!
Interface E 4/43
 Ip router eigrp NEXUS
!
Interface Loopback 0
 Ip router eigrp NEXUS
```

R3

```
Router EIGRP NEXUS
  address-family ipv4 unicast
  vrf DATA
    autonomous-system 100
!
Interface E 4/44
 Ip router eigrp NEXUS
!
Interface VLAN 30
```

```
 Ip router eigrp NEXUS
!
Interface Loopback 0
 Ip router eigrp NEXUS
```

R4

```
Router EIGRP NEXUS
  address-family ipv4 unicast
  vrf DATA
    autonomous-system 100
!
Interface VLAN 30
 Ip router eigrp NEXUS
!
Interface Loopback 0
 Ip router eigrp NEXUS
```

Task 3

Verify IP Connectivity by pinging 4.4.4.4 network from R1 & 1.1.1.1 from R4.

R1

```
Show ip route vrf DATA
!
Ping 4.4.4.4 vrf DATA
```

R4

```
Show ip route vrf DATA
!
Ping 1.1.1.1 vrf DATA
```

Task 4

Configure R1 to be the RP for Multicast groups 224.1.1.0/24, and R4 to be the RP for the groups 224.4.4.0/24. These two RPs should use their Loopback 0 interface for this purpose.

R1

```
Vrf context DATA
 Ip pim rp-address 1.1.1.1 group-list 224.1.1.0/24
 Ip pim rp-address 4.4.4.4 group-list 224.4.4.0/24
!
Interface Loopback0
 Ip pim sparse-mode
```

```
!
Interface E 4/12
 Ip pim sparse-mode
```

R2

```
Vrf context DATA
 Ip pim rp-address 1.1.1.1 group-list 224.1.1.0/24
 Ip pim rp-address 4.4.4.4 group-list 224.4.4.0/24
!
Interface Loopback0
 Ip pim sparse-mode
!
Interface E 4/20
 Ip pim sparse-mode
!
Interface E 4/43
 Ip pim sparse-mode
```

R3

```
Vrf context DATA
 Ip pim rp-address 1.1.1.1 group-list 224.1.1.0/24
 Ip pim rp-address 4.4.4.4 group-list 224.4.4.0/24
!
Interface Loopback0
 Ip pim sparse-mode
!
Interface E 4/44
 Ip pim sparse-mode
!
Interface VLAN 30
 Ip pim sparse-mode
```

R4

```
Vrf context DATA
 Ip pim rp-address 1.1.1.1 group-list 224.1.1.0/24
 Ip pim rp-address 4.4.4.4 group-list 224.4.4.0/24
!
Interface Loopback0
 Ip pim sparse-mode
!
Interface VLAN 30
 Ip pim sparse-mode
```

Task 6

Verify the configuration by using the **Show ip pim rp vrf DATA** command.

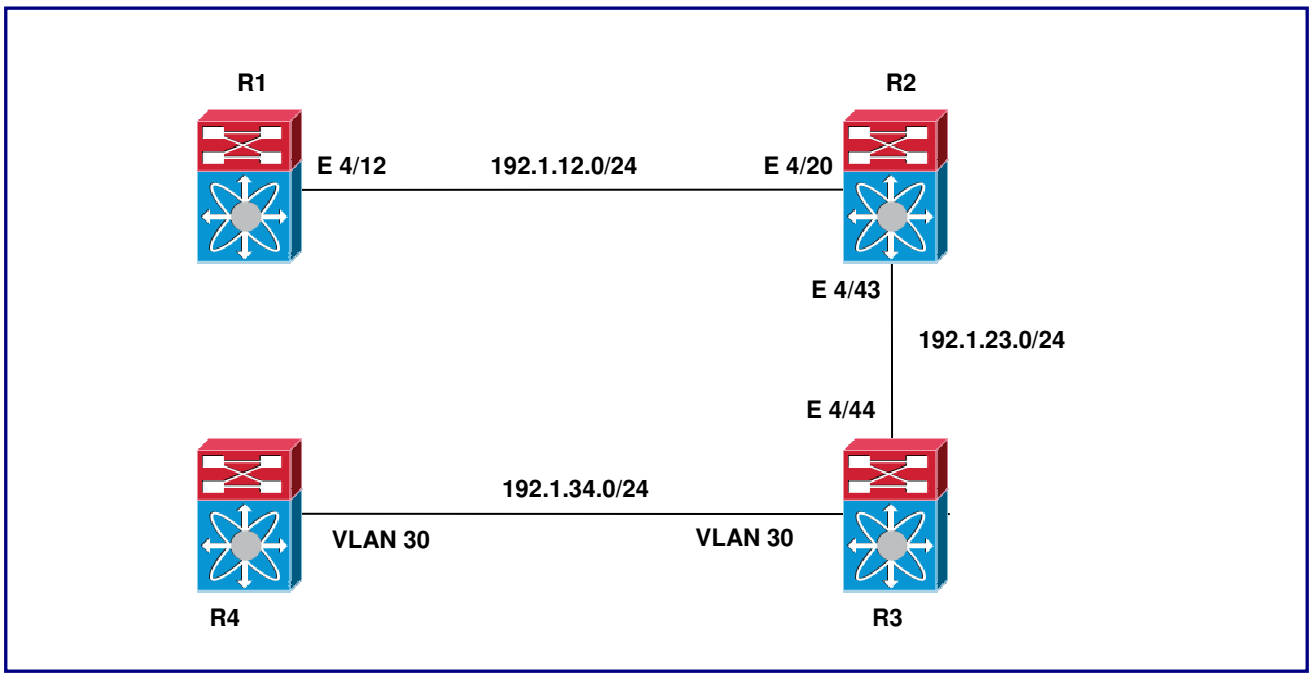
RX

Show ip pim rp vrf DATA
!
PIM RP Status Information for VRF "DATA"
BSR disabled
Auto-RP disabled
BSR RP Candidate policy: None
BSR RP policy: None
Auto-RP Announce policy: None
Auto-RP Discovery policy: None

RP: 1.1.1.1, (0), uptime: 00:00:12, expires: never,
priority: 0, **RP-source: (local),** group ranges:
224.1.1.0/24
RP: **4.4.4.4***, (0), uptime: 00:00:12, expires: never,
priority: 0, **RP-source: (local),** group ranges:
224.4.4.0/24

Lab 9 – Configuring PIM Sparse Mode on Nexus 5K & 7K - Auto RP

(Builds on Lab 8)



Task 1

We will be configuring Auto-RP. Get rid of the Static RP configurations on all the routers.

R1 Vrf context DATA no Ip pim rp-address 1.1.1.1 group-list 224.1.1.0/24 no Ip pim rp-address 4.4.4.4 group-list 224.4.4.0/24
R2 Vrf context DATA no Ip pim rp-address 1.1.1.1 group-list 224.1.1.0/24 no Ip pim rp-address 4.4.4.4 group-list 224.4.4.0/24
R3 Vrf context DATA no Ip pim rp-address 1.1.1.1 group-list 224.1.1.0/24 no Ip pim rp-address 4.4.4.4 group-list 224.4.4.0/24

R4

```
Vrf context DATA
 no Ip pim rp-address 1.1.1.1 group-list 224.1.1.0/24
 no Ip pim rp-address 4.4.4.4 group-list 224.4.4.0/24
```

Task 2

Verify that there no RP's configured on the Router using the **Show ip pim rp vrf DATA** command.

RX

```
Show ip pim rp vrf DATA
!
PIM RP Status Information for VRF "DATA"
BSR disabled
Auto-RP disabled
BSR RP Candidate policy: None
BSR RP policy: None
Auto-RP Announce policy: None
Auto-RP Discovery policy: None
```

Task 3

We will be configuring R2 as the RP as an RP-Candidate as well as the Mapping Agent. R3 should also be configured as a RP-Candidate. Use Loopback 0 as the RP-Address. R3 should be selected as the preferred RP. R2 & R3 should be RP's for all Multicast Groups.

R1

```
Vrf context DATA
  Ip pim auto-rp listen forward
```

R2

```
Vrf context DATA
  Ip pim auto-rp listen forward
  Ip pim auto-rp rp-candidate loopback0 group-list 224.0.0.0/4
  Ip pim auto-rp mapping-agent loopback0
```

R3

```
Vrf context DATA
  Ip pim auto-rp listen forward
  Ip pim auto-rp rp-candidate loopback0 group-list 224.0.0.0/4
```

R4

```
Vrf context DATA
  Ip pim auto-rp listen forward
```

Task 4

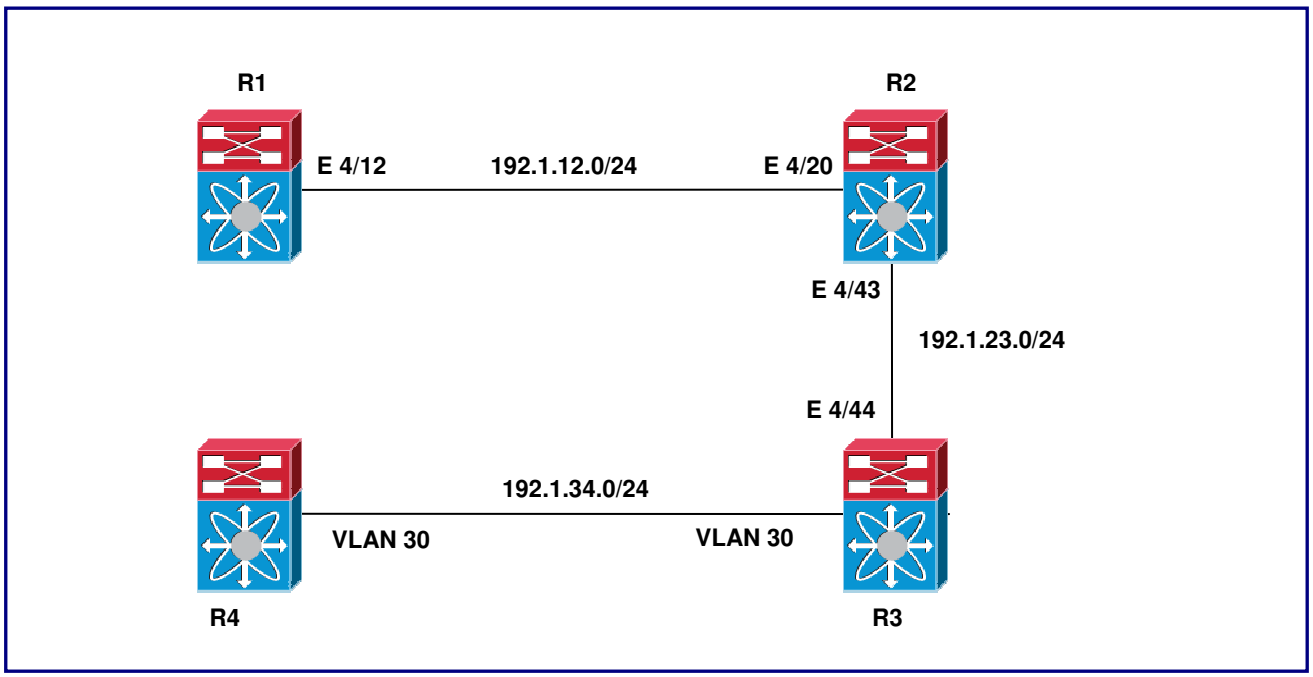
Verify the configuration by using the **Show ip pim rp vrf DATA** command.

RX

```
Show ip pim rp vrf DATA
!
PIM RP Status Information for VRF "DATA"
BSR disabled
Auto-RP RPA: 2.2.2.2, uptime: 00:02:36, expires: 00:02:12
BSR RP Candidate policy: None
BSR RP policy: None
Auto-RP Announce policy: None
Auto-RP Discovery policy: None

RP: 2.2.2.2, (0), uptime: 00:02:36, expires: 00:02:12,
  priority: 0, RP-source: 2.2.2.2 (A), group ranges:
      224.0.0.0/4
RP: 3.3.3.3, (0), uptime: 00:02:36, expires: 00:02:12,
  priority: 0, RP-source: 2.2.2.2 (A), group ranges:
      224.0.0.0/4
```

Lab 10 – Configuring PIM Sparse Mode on Nexus 5K & 7K - BSR

(Builds on Lab 9)



Task 1

We will be configuring BSR. Get rid of the Auto-RP configurations on all the routers.

R1 Vrf context DATA   No Ip pim auto-rp listen forward

R2
 	
Vrf context DATA
  No Ip pim auto-rp listen forward
  No Ip pim auto-rp rp-candidate loopback0 group-list 224.0.0.0/4
  No Ip pim auto-rp mapping-agent loopback0

R3
 	
Vrf context DATA
  No Ip pim auto-rp listen forward
  No Ip pim auto-rp rp-candidate loopback0 group-list 224.0.0.0/4

R4

```
Vrf context DATA
  No Ip pim auto-rp listen forward
```

Task 2

We will be configuring R2 as the BSR-candidate as well as a BSR RP-Candidate. R3 should also be configured as a BSR RP-Candidate. Use Loopback 0 as the RP-Address. R2 should be selected as the preferred RP. R2 & R3 should be RP's for all Multicast Groups.

R1

```
Vrf context DATA
  Ip pim bsr listen
```

R2

```
Vrf context DATA
  ip pim bsr bsr-candidate loopback0
  ip pim bsr rp-candidate loopback0 group-list 224.0.0.0/4 priority 0
```

R3

```
Vrf context DATA
  ip pim bsr rp-candidate loopback0 group-list 224.0.0.0/4 priority 100
```

R4

```
Vrf context DATA
  Ip pim bsr listen
```

Task 3

Verify the configuration by using the **Show ip pim rp vrf DATA** command.

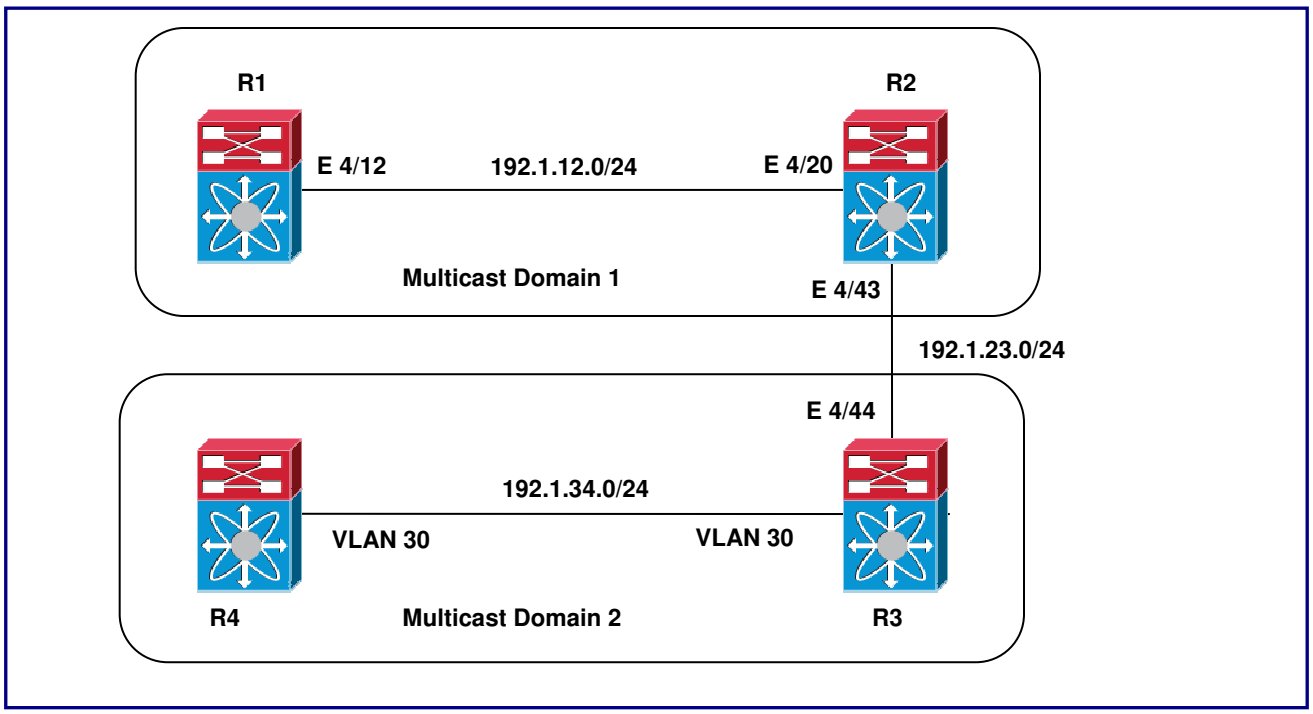
RX

```
Show ip pim rp vrf DATA
!
PIM RP Status Information for VRF "DATA"
BSR listen-only mode
BSR: 2.2.2.2, uptime: 00:04:19, expires: 00:01:16,
     priority: 64, hash-length: 30
Auto-RP disabled
BSR RP Candidate policy: None
BSR RP policy: None
Auto-RP Announce policy: None
```

```
Auto-RP Discovery policy: None

RP: 2.2.2.2, (0), uptime: 00:03:32, expires: 00:01:36,
  priority: 0, RP-source: 2.2.2.2 (B), group ranges:
      224.0.0.0/4
RP: 3.3.3.3, (0), uptime: 00:00:53, expires: 00:01:36,
  priority: 100, RP-source: 2.2.2.2 (B), group ranges:
      224.0.0.0/4
```

Lab 11 – Configuring PIM Sparse Mode on Nexus 5K & 7K - MSDP

(Builds on Lab 9)



Task 1

We will be configuring MSDP to Domain 1 to Domain 2. R2 will be the BSR Candidate as well as the bsr rp-candidate for Domain1. R3 will be the BSR Candidate as well as the bsr rp-candidate for Domain2. Let's get rid of PIM from the link between R2 & R3. Also, configure R3 also as a BSR Candidate. No configuration changes are required on R1 & R4.

R2

```
Interface E 4/43
 No ip pim sparse-mode
```

R3

```
Interface E 4/44
 No ip pim sparse-mode
!
Vrf context DATA
  ip pim bsr bsr-candidate loopback0
  ip pim bsr rp-candidate loopback0 group-list 224.0.0.0/4 priority 0
```

Task 2

Configure a MSDP Peering between R2 & R3 using Loopback 0 as the source address.

R2

```
Feature MSDP
!
Vrf context DATA
  ip msdp peer 3.3.3.3 connect-source loopback 0
```

R3

```
Feature MSDP
!
Vrf context DATA
  ip msdp peer 2.2.2.2 connect-source loopback 0
```

Task 3

Verify the configuration by using the **Show ip msdp summary vrf DATA** command.

R2

```
MSDP Peer Status Summary for VRF "DATA"
```

Local ASN: 0, originator-id: 0.0.0.0

Number of configured peers: 1
Number of established peers: 1
Number of shutdown peers: 0

Peer Address	Peer ASN	Connection State	Uptime/ Downtime	Last msg Received	(S,G)s Received
3.3.3.3	0	**Established**	00:02:28	00:00:33	0

R3

MSDP Peer Status Summary for VRF "DATA"
Local ASN: 0, originator-id: 0.0.0.0

Number of configured peers: 1
Number of established peers: 1
Number of shutdown peers: 0

Peer Address	Peer ASN	Connection State	Uptime/ Downtime	Last msg Received	(S,G)s Received
2.2.2.2	0	**Established**	00:01:15	00:00:18	0

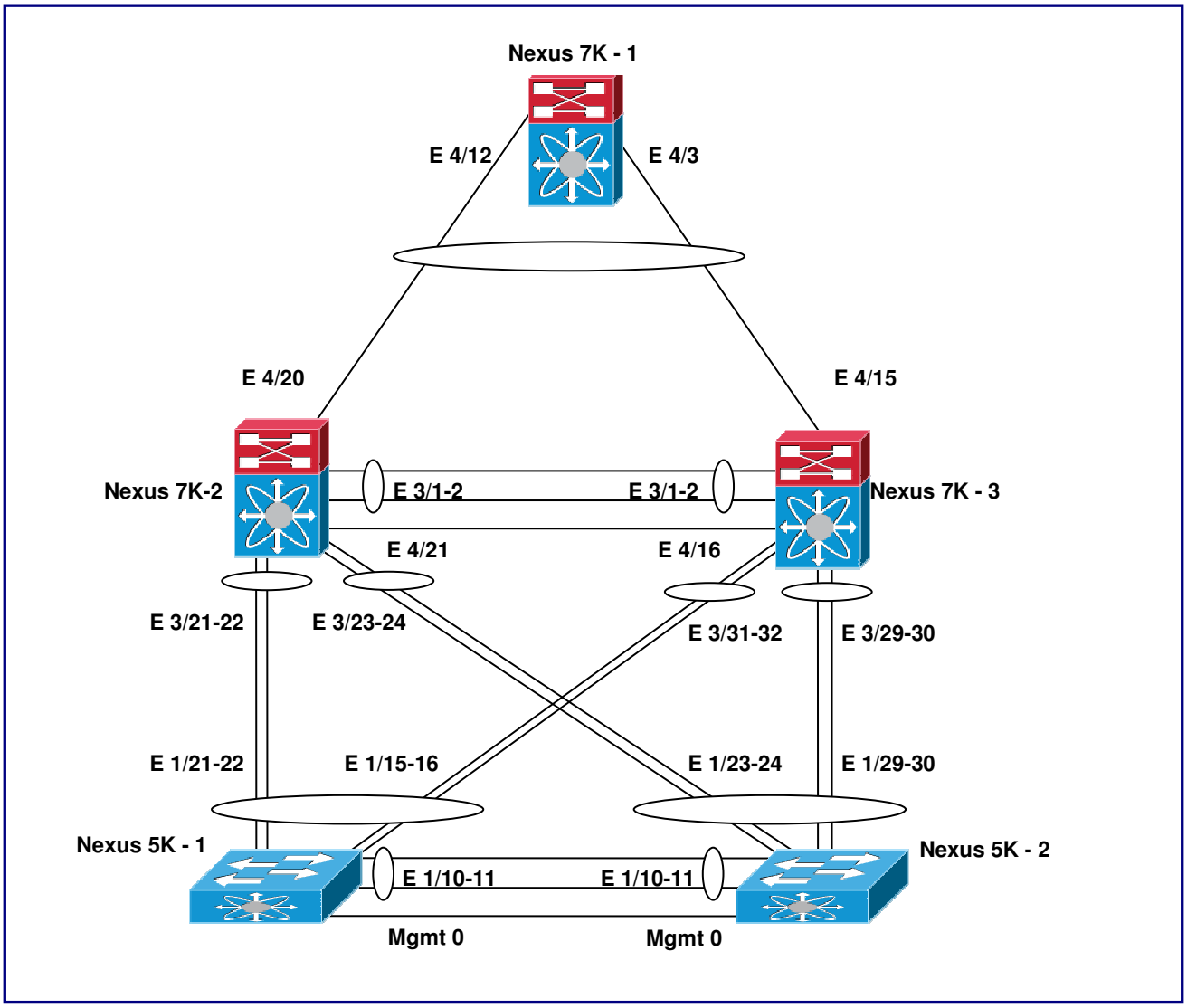
Cisco Nexus Switch Configuration

Authored By:

Khawar Butt
Penta CCIE # 12353
CCDE # 20110020

Module 5 – Configuring Advanced vPCs, FEX & FHRP Protocols

Lab 1- Configuring vPC on Nexus 7K Switches



Task 1

Connect to 7K1. Configure the admin username with a password of Cciedc01. Configure it with a hostname of 7K1.

7K-1

Configure the password on the setup wizard as : **Cciedc01**
!
!
Hostname 7K1

Task 2
Configure 2 VDCs on 7K1 using the following information:

- VDC 2: Name : **7K2** ID: **2**
  - Interfaces : E 3/1-2, E 3/21-24, E 4/20-21, E 4/24
- VDC 3: Name : **7K3** ID: **3**
  - Interfaces : E 3/17-18, E 3/29-30, E 4/15-16

7K-1

```
vdc 7K2 id 2
  allocate interface E 3/1-2, E 3/21-24
  allocate interface E 4/20-21, E 4/24
!
vdc 7K3 id 3
  allocate interface E 3/17-18, E 3/29-32
  allocate interface E 4/15-16
```

Note : When you allocate interfaces to VDCs, they are allocated based on Port-groups. Press **Yes** when prompted to allocate all members of the port-group.

Task 3
Verify the Creation of the VDCs by using the sh run vdc and sh vdc membership commands.

7K-1

Show run VDC
(Displays the configuration commands for the VDCs)
!
Show VDC membership
(Displays the ports that are members of the VDCs, including the ones that were not specified by you in the command)

Task 4
Configure alias for switching to VDC 7K2 and VDC 7K3 from the default VDC as VDC2 & VDC3 respectively.

7K-1

```
cli alias name VDC2 switchto vdc 7K2
cli alias name VDC3 switchto vdc 7K3
```

Task 5

Switch to 7K2 using the appropriate alias you created. Configure the password for the admin account as Cciedc01. Configure a alias for the **Switchback** command as SB. Switchback to the default VDC. Use the alias that you created to switchback.

7K-1 VDC2
7K-2 Configure the password on the setup wizard as : **Cciedc01** ! ! cli alias name SB switchback ! SB

Task 6

Switch to 7K3 using the appropriate alias you created. Configure the password for the admin account as Cciedc01. Configure a alias for the **Switchback** command as SB. Switchback to the default VDC. Use the alias that you created to switchback.

7K-1 VDC3
7K-3 Configure the password on the setup wizard as : **Cciedc01** ! ! cli alias name SB switchback ! SB

Task 7

Configure the prompt to only display the current VDC.

7K-1 no vdc combined-hostname

Task 8

We will be configuring a vPC to 7K1 to 7K2 & 7K3 based on the above diagram. Enable the vPC & LACP features on 7K2 & 7K3.

7K-2 Feature vpc Feature lacp
7K-3 Feature vpc Feature lacp

Task 9

Configure the parameters for the vPC Peer keepalive link based on the following:

- **7K2**
  - VRF Name: **PKL-23**
  - Interface: **4/21**
  - IP Address: **10.1.23.2/24**
- **7K3**
  - VRF Name: **PKL-23**
  - Interface: **4/16**
  - IP Address: **10.1.23.3/24**

7K-2 vrf context PKL-23 ! Interface E 4/21 vrf member PKL-23 ip address 10.1.23.2/24 no shut
7K-3 vrf context PKL-23 ! Interface E 4/16 vrf member PKL-23 ip address 10.1.23.3/24 no shut

Task 10

Configure a vPC Domain between 7K2 & 7K3. Use **23** as the Domain ID. Use the Interfaces and VRFs from the previous step to configure the vPC Peer Keepalive link. Make 7K3 as the Primary vPC device.

7K-2

```
vpc domain 23
  peer-keepalive destination 10.1.23.3 source 10.1.23.2 vrf PKL-23
```

7K-3

```
vpc domain 23
  role priority 300
  peer-keepalive destination 10.1.23.2 source 10.1.23.3 vrf PKL-23
```

Task 11

Configure the Port-channel port type as Network. This will enable the Bridge Assurance Fault tolerance feature. Use this port channel as the vPC Peer Link. Use the following parameters:

- **7K2**
  - Port-Channel #: **23**
  - Interfaces: **3/1-2**
  - Port Type: **Network**
- **7K3**
  - Port-Channel #: **23**
  - Interface: **3/17-18**
  - Port Type: **Network**

7K-2

```
Interface E 3/1-2
 channel-group 23 mode active
 no shut
!
Interface port-channel 23
 spanning-tree port type network
 switch mode trunk
 vpc peer-link
```

7K-3

```
int e 3/17-18
 channel-group 23 mode active
 no shut
!
```

```
Interface port-channel 23
 switch mode trunk
 spanning-tree port type network
 vpc peer-link
```

Task 12

Verify the status of the vPC Port Channel. Also, make sure the vPC Peer keepalive link is up. Use the **Show VPC** command to verify it.

7K-2

Show VPC

```
vPC domain id                     : 23
Peer status                       : peer adjacency formed ok
vPC keep-alive status             : peer is alive
Configuration consistency status : success
.
.
.
.
vPC  Peer-Link status
---------------------------------------------------
id    Port   Status Active vlans
--     -----  -------- -------------------------------
1     Po23   up     1
```

7K-3

Show VPC

```
vPC domain id                     : 23
Peer status                       : peer adjacency formed ok
vPC keep-alive status             : peer is alive
Configuration consistency status : success
.
.
.
.
vPC  Peer-Link status
---------------------------------------------------
id    Port   Status Active vlans
--     -----  -------- -------------------------------
1     Po23   up     1
```

Task 13

Configure a port-channel from 7K2 & 7K3 towards 7K1 using vPC. Configure it as a L2 Trunk Port Channel. Use 12 as the Port-channel ID. Use E 4/20 on 7K2 & E 4/15 on 7K3 as the vPC member ports.

7K-2

```
Interface E 4/20
 switchport
 channel-group 12 mode active
 no shut
!
Interface port-channel 12
 switchport mode trunk
 vpc 23
```

7K3

```
Interface E 4/15
 switchport
 channel-group 12 mode active
 no shut
!
Interface port-channel 12
 switchport mode trunk
 vpc 23
```

Task 14

Enable the LACP feature on 7K1. Configure a normal Port-Channel on 7K1. Configure it as a L2 Trunk Port Channel. Use 23 as the Port-channel ID. Use E 4/3 & E 4/12 on 7K1 as the member ports.

7K-1

```
feature lacp
!
Interface E 4/3 ,  E 4/12
 switchport
 channel-group 23 mode active
 no shut
!
Interface port-channel 23
 switchport mode trunk
```

Task 15

Verify the status of the Port Channel on 7K1. Use the normal **Show port-channel summary** command to verify it.

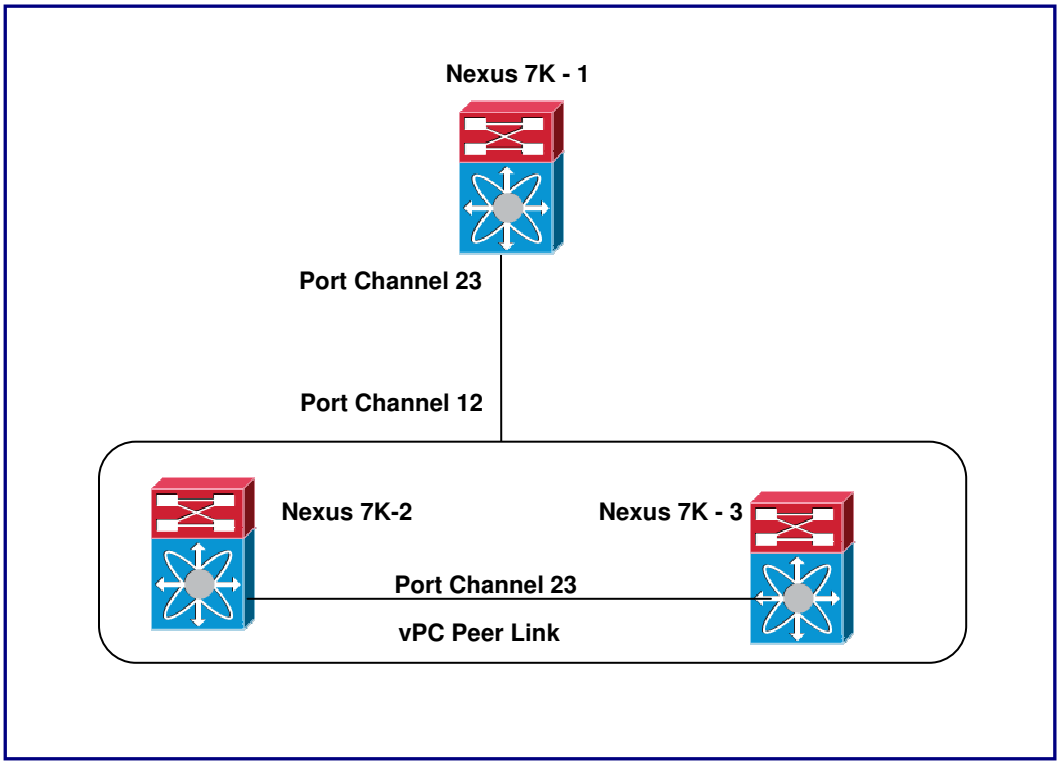
7K-1

show port-channel summary

P - Up in Port-channel (member)
S - Switched
U - Up (Port-Channel)
.
.
.

Group	Port-Channel	Type	Protocol	Member Ports	
23	Po23**(SU)**	Eth	LACP	Eth4/3(P)	Eth4/12**(P)**

Note: In this setup, 7K-2 & 7K-3 are seen as one logical switch by 7K1. The following is the logical diagram.



Lab 2 – Configuring vPC with Nexus 5K Switches

(Builds on Lab 1)

Task 1

Configure a port-channel from 7K2 & 7K3 towards 5K1 using vPC. Configure it as a L2 Trunk Port Channel. Use 523 as the Port-channel ID. Use E 3/21-22 Ports on 7K2 & E 3/31-32 Ports on 7K3 as the vPC member ports.

7K-2

```
Interface E 3/21 - 22
 channel-group 523 mode active
 no shut
!
Interface port-channel 523
 switchport mode trunk
 vpc 523
```

7K-3

```
Interface E 3/31 - 32
 channel-group 523 mode active
 no shut
!
Interface port-channel 523
 switchport mode trunk
 vpc 523
```

Task 2

Enable the LACP feature on 5K1. Configure a normal Port-Channel on 5K1. Configure it as a L2 Trunk Port Channel. Use 523 as the Port-channel ID. Use E 1/15-16 & E 1/21-22 on 5K1 as the member ports.

5K-1

```
feature lacp
!
Interface E 1/15-16 ,  E 1/21-22
 switchport
 channel-group 523 mode active
 no shut
```

```
!
int port-channel 523
 switchport mode trunk
```

Task 3

Verify the status of the Port Channel on 5K1. Use the normal **Show port-channel summary** command to verify it.

5K-1

show port-channel summary

```
P - Up in Port-channel (member)
S - Switched
U - Up (Port-Channel)
.
.
.
Group   Port-          Type    Protocol Member Ports
        Channel
523     Po523(SU)   Eth    LACP     Eth1/15(P)   Eth1/16(P)   Eth1/21(P)   Eth1/22(P)
```

Task 4

Configure a port-channel from 7K2 & 7K3 towards 5K2 using vPC. Configure it as a L2 Trunk Port Channel. Use 524 as the Port-channel ID. Use E 3/23-24 Ports on 7K2 & E 3/29-30 Ports on 7K3 as the vPC member ports.

7K-2

```
Interface E 3/23 - 24
 channel-group 524 mode active
 no shut
!
Interface port-channel 524
 switchport mode trunk
 vpc 524
```

7K-3

```
Interface E 3/29 - 30
 channel-group 524 mode active
 no shut
!
Interface port-channel 524
 switchport mode trunk
```

```
vpc 524
```

Task 5

Enable the LACP feature on 5K2. Configure a normal Port-Channel on 5K2. Configure it as a L2 Trunk Port Channel. Use 524 as the Port-channel ID. Use E 1/23-24 & E 1/29-30 on 5K2 as the member ports.

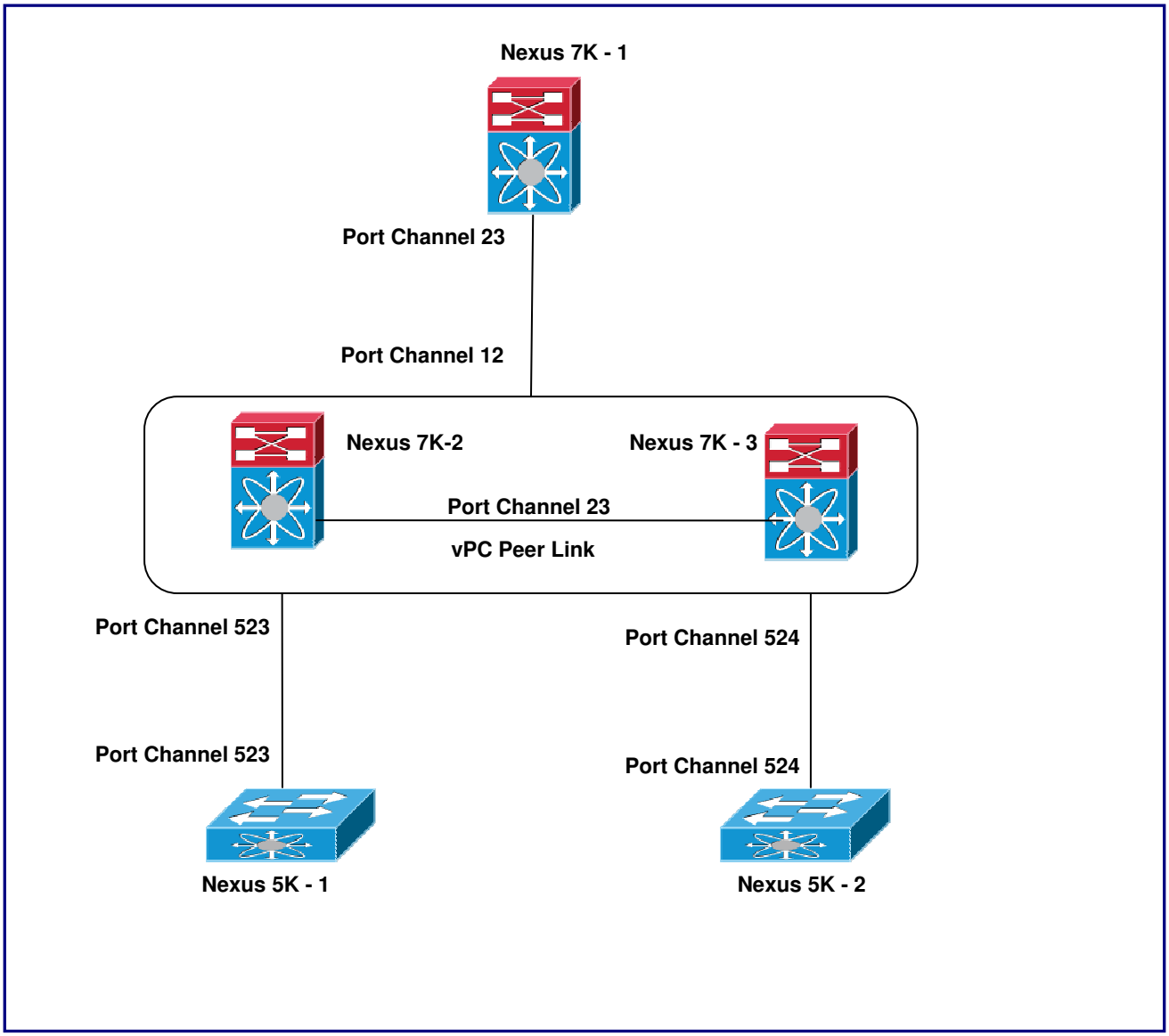
```
5K-2

feature lacp
!
Interface E 1/23-24 ,  E 1/29-30
 switchport
 channel-group 524 mode active
 no shut
!
Interface port-channel 524
 switchport mode trunk
```

Task 6

Verify the status of the Port Channel on 5K2. Use the normal **Show port-channel summary** command to verify it.

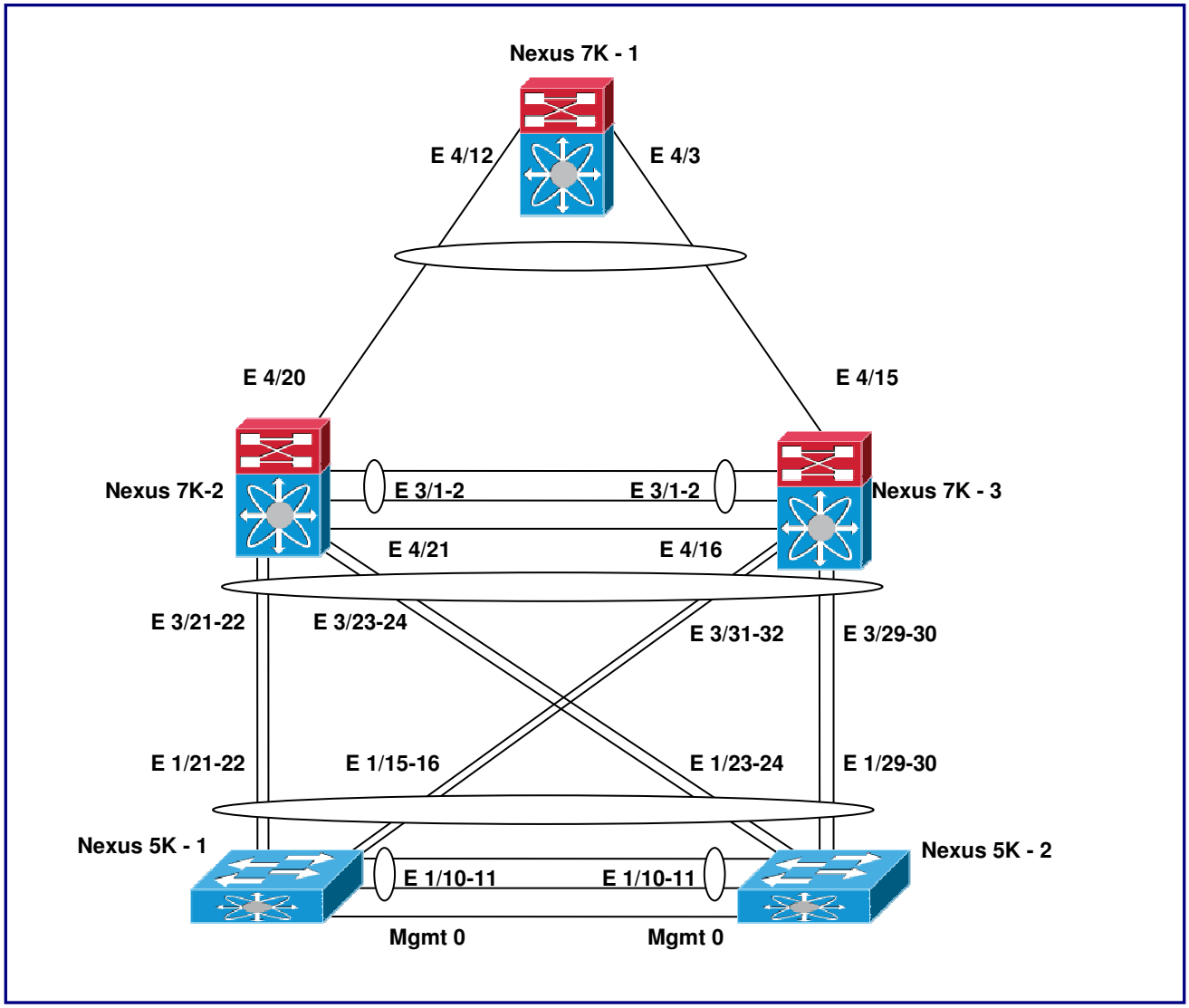
```
5K-2

show port-channel summary

P - Up in Port-channel (member)
S - Switched
U - Up (Port-Channel)
.
.
.
Group   Port-          Type    Protocol Member Ports
        Channel
524     Po524(SU)   Eth    LACP     Eth1/23(P)   Eth1/24(P)   Eth1/29(P)   Eth1/30(P)
```

Note: In this setup, 7K-2 & 7K-3 are seen as one logical switch by the 5K devices. The following is the logical diagram.



Lab 3 – Configuring vPC between Nexus 5K switches to setup a Back-to-Back vPC

(Builds on Lab 2)



Task 1

We will be configuring a vPC configuration between 5K1 to 5K2 based on the above diagram. Enable the vPC feature on 5K1 & 5K2.

5K-1

Feature vpc

Feature lacp
5K-2 Feature vpc Feature lacp

Task 2
Configure the parameters for the vPC Peer keepalive link based on the following:

- **5K1**
  - Interface: **Mgmt 0**
  - IP Address: **10.1.112.1/24**
- **5K2**
  - Interface: **Mgmt 0**
  - IP Address: **10.1.112.2/24**

5K-1 Interface mgmt 0 ip address 10.1.112.1/24 no shut
5K-2 Interface mgmt 0 ip address 10.1.112.2/24 no shut

Task 3
Configure a vPC Domain between 5K1 & 5K2. Use **12** as the Domain ID. Use the Interfaces from the previous step to configure the vPC Peer Keepalive link. Make 5K1 as the Primary vPC device.

5K-1 vpc domain 12 peer-keepalive destination 10.1.112.2 role priority 300
5K-2 vpc domain 12 peer-keepalive destination 10.1.112.1

Task 4

Configure the Port-channel port type as Network. This will enable the Bridge Assurance Fault tolerance feature. Use this port channel as the vPC Peer Link. Use the following parameters:

- **5K-1**
  - Port-Channel #: **12**
  - Interfaces: **1/10-11**
  - Port Type: **Network**
- **5K-2**
  - Port-Channel #: **12**
  - Interface: **1/10-11**
  - Port Type: **Network**

5K-1

```
Interface E 1/10-11
 channel-group 12 mode active
 no shut
!
Interface port-channel 12
 spanning-tree port type network
 switch mode trunk
 vpc peer-link
```

5K-2

```
Interface E 1/10-11
 channel-group 12 mode active
 no shut
!
Interface port-channel 12
 switch mode trunk
 spanning-tree port type network
 vpc peer-link
```

Task 5

Verify the status of the vPC Port Channel. Also, make sure the vPC Peer keepalive link is up. Use the **Show VPC** command to verify it.

5K-1

Show VPC

```
vPC domain id                     : 12
```

Peer status : **peer adjacency formed ok**
vPC keep-alive status : **peer is alive**
Configuration consistency status : **success**
.
.
.
.
vPC Peer-Link status
---
id Port Status Active vlans
-- ---- ------ ---
1 **Po12 up** 1

5K-2

Show VPC

vPC domain id : 12
Peer status : peer adjacency formed ok
vPC keep-alive status : peer is alive
Configuration consistency status : success
.
.
.
.
vPC Peer-Link status
---
id Port Status Active vlans
-- ---- ------ ---
1 Po12 up 1

Task 6

Disable the old vPC based port-channel (523) on the 7K devices (7K2 & 7K3). Create a new vPC port-channel (75) using ports E 3/21-24 as member ports on 7K-2. Use ports E 3/29-32 on 7K-3. Use VPC id of 75 for this port-channel.

7K-2

```
no Interface port-channel 523
!
Interface E 3/21 - 24
 channel-group 75 mode active
!
Interface port-channel 75
 vpc 75
```

7K-3

```
no Interface port-channel 523

Interface E 3/29 - 32
 channel-group 75 mode active
!
Interface port-channel 75
 vpc 75
```

Task 7

Disable the old vPC based port-channels (723-724) on the 5K devices (5K1 & 5K2). Create a new vPC port-channel (75) using ports E 1/21-22 , E 1/15-16 as member ports on 5K-1. Use ports E 1/23-24, E 1/29-30 on 5K-2. Use VPC id of 75 for this port-channel.

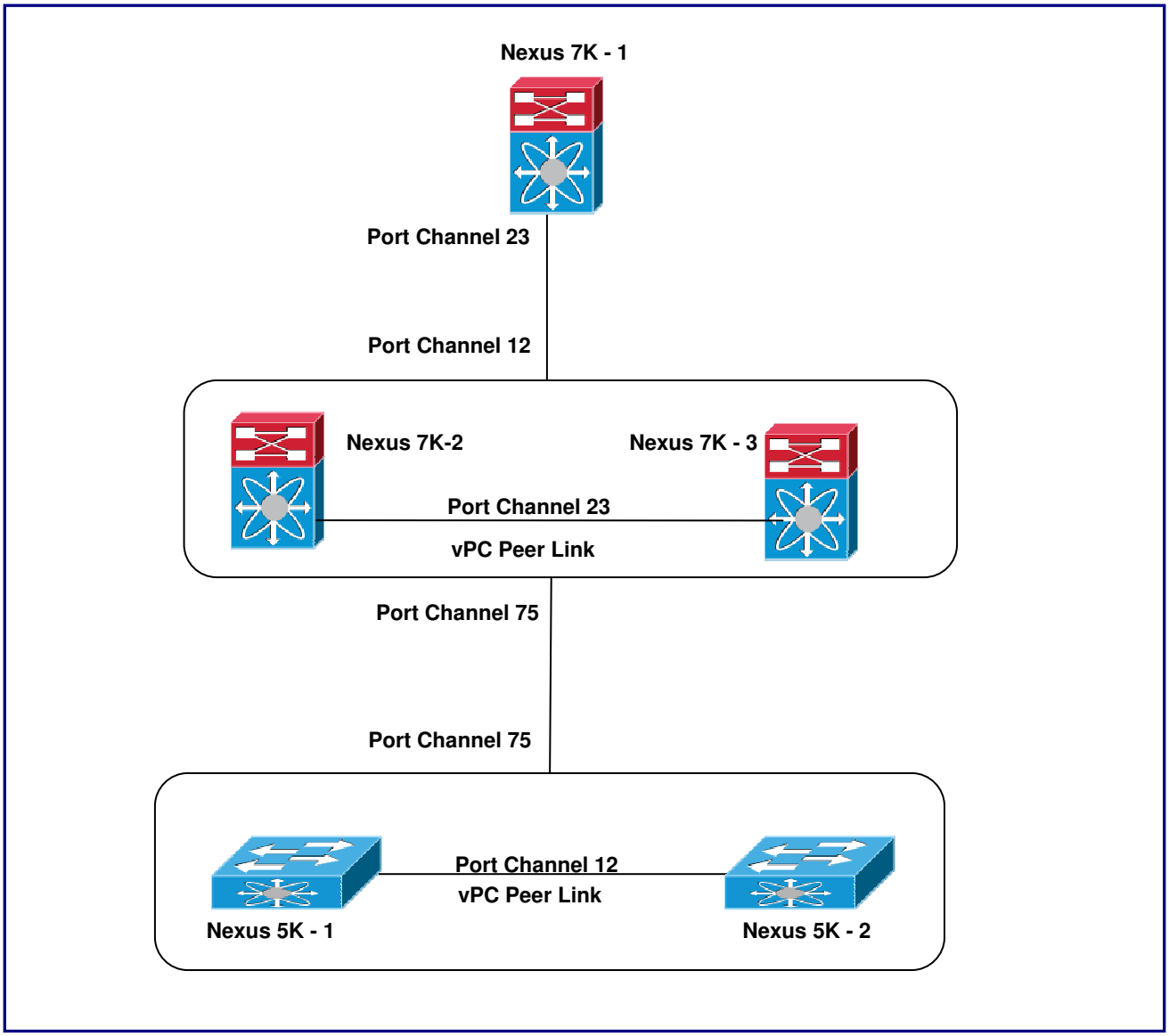
5K-1

```
no Interface port-channel 524
!
Interface E 1/21 - 22 , e 1/15 - 16
 channel-group 75 mode active
!
Interface port-channel 75
 vpc 75
```

5K-2

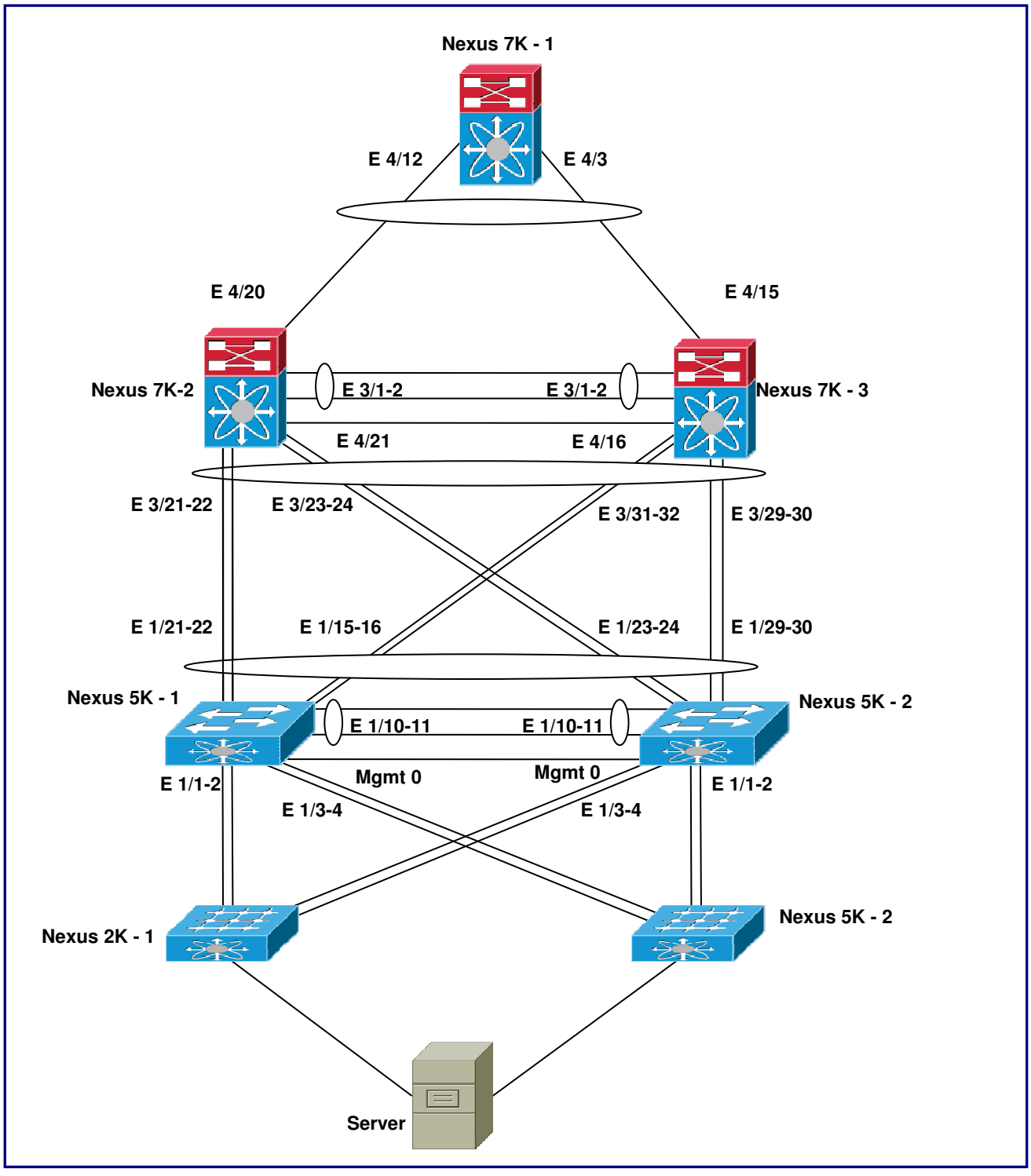
```
No Interface port-channel 524
!
Interface E 1/23 - 24 , e 1/29 -30
 channel-group 75 mode active
!
Interface port-channel 75
 vpc 75
```

Note: In this setup, 7K-2 & 7K-3 are seen as one logical switch by the 5K devices and vice versa. The following is the logical diagram.



Lab 4 – Configuring FEX - Using Static Pinning

(Builds on Lab 3)



Task 1

We will be connecting the Nexus 2K switches as Fabric Extensions for the Nexus 5K switches. Enable the FEX feature on 5K-1.

5K-1

```
Feature fex
```

Task 2

We will configure Ports E 1/1 & E 1/2 as FEX ports from 5K-1 towards 2K-1. Use 101 as the FEX Identifier.

5K-1

```
Interface E 1/1-2
 switchport mode fex
 fex associate 101
```

Task 3

Use the **Show Fex** command to verify the port status. It will initially show the ports as connected before going to online.

5K-1

Show Fex

```
  FEX         FEX             FEX          FEX
Number    Description       State         Model                 Serial
------------------------------------------------------------------------------------
101         FEX0101         Online       N2K-C2232PP-10GE   SSI162200CH
---       --------          Discovered   N2K-C2232PP-10GE   SSI16210D25
```

Task 4

By default, only 1 of the links is used. You can use the **Show Fex** command to verify this.

5K-1

Show Fex detail

```
FEX: 101 Description: FEX0101   state: Online
  FEX version: 5.1(3)N2(1c) [Switch version: 5.1(3)N2(1c)]
  FEX Interim version: 5.1(3)N2(1c)
  Switch Interim version: 5.1(3)N2(1c)
  Extender Serial: SSI162200CH
  Extender Model: N2K-C2232PP-10GE,  Part No: 73-12533-05
  Card Id: 82, Mac Addr: 0c:d9:96:08:1d:42, Num Macs: 64
  Module Sw Gen: 12594  [Switch Sw Gen: 21]
  post level: complete
  pinning-mode: static    Max-links: 1
.
.
.
```

Task 5

Change the number of Links for Fex to 2 to load share the traffic over the 2 links. It will equally share the physical ports based on the number of links connecting the 5K to the 2K switches.

5K-1

```
fex 101
 pinning max-links 2
```

Task 6

Verify the use of both links based on the **Show Fex detail** command.

5K-1

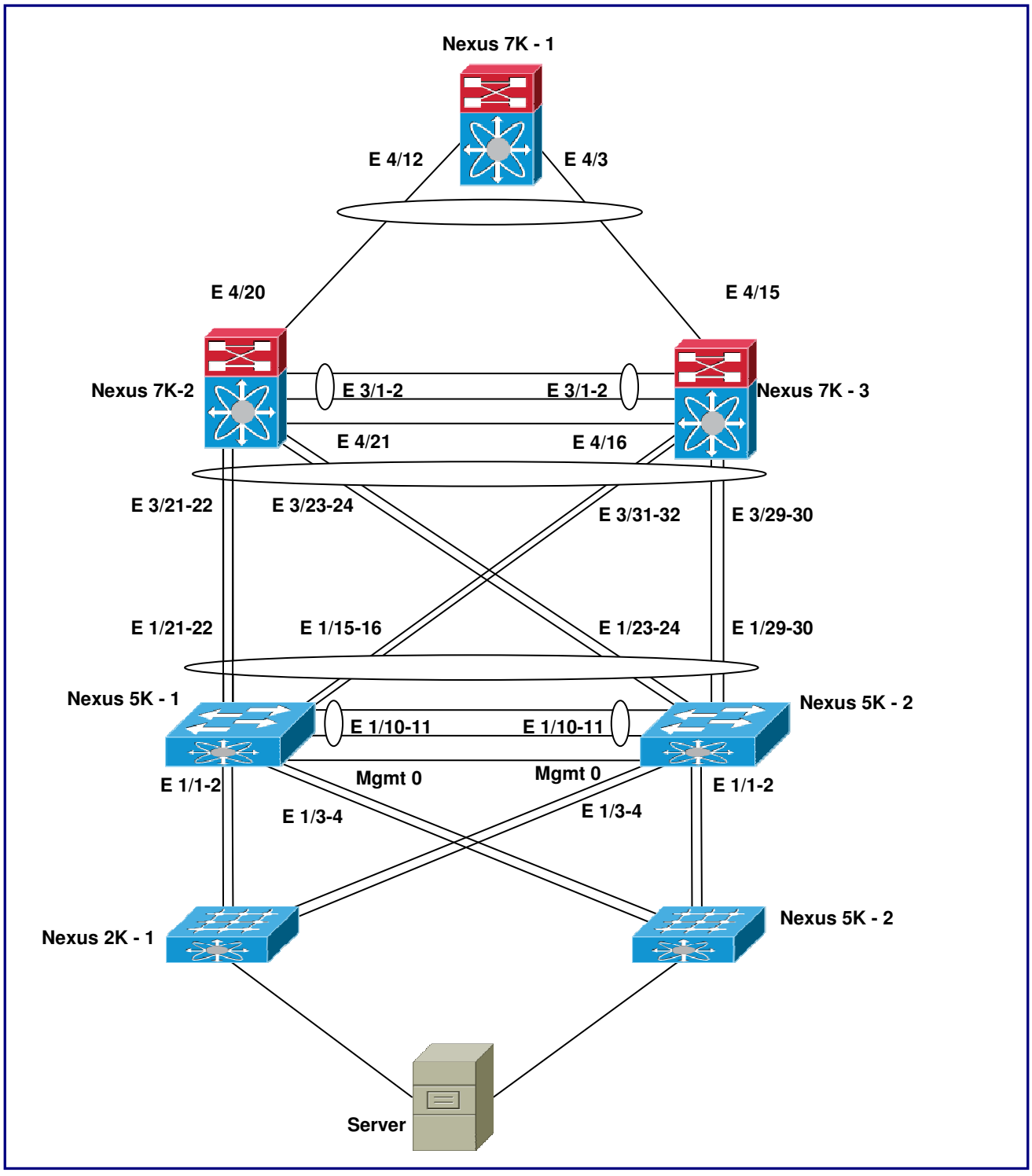
Show Fex detail

```
FEX: 101 Description: FEX0101   state: Online
  FEX version: 5.1(3)N2(1c) [Switch version: 5.1(3)N2(1c)]
  FEX Interim version: 5.1(3)N2(1c)
  Switch Interim version: 5.1(3)N2(1c)
  Extender Serial: SSI162200CH
```

```
  Extender Model: N2K-C2232PP-10GE,  Part No: 73-12533-05
  Card Id: 82, Mac Addr: 0c:d9:96:08:1d:42, Num Macs: 64
  Module Sw Gen: 12594  [Switch Sw Gen: 21]
  post level: complete
  pinning-mode: static    Max-links: 2
.
.
.
```

Lab 5 – Configuring FEX - Using Port Channels

(Builds on Lab 4)



Task 1

We will be connecting the Nexus 2K switches as Fabric Extensions for the Nexus 5K switches. Enable the FEX feature on 5K-2.

5K-2

```
Feature fex
```

Task 2

We will configure Ports E 1/1 & E 1/2 as FEX ports from 5K-2 towards 2K-1. We will be using Port Channels to take advantage of Dynamic Pinning and Load Balancing. Use 102 as the FEX Identifier. Use 102 as the Port Channel ID.

5K-2

```
Interface E 1/1-2
 channel-group 102 mode on
!
Interface port-channel 102
 switchport mode fex-fabric
 fex associate 102
```

Task 3

Use the **Show Fex** command to verify if the port is online. It will take a couple of minutes to come online.

5K-2

```
  FEX         FEX               FEX          FEX
Number    Description       State        Model                 Serial
------------------------------------------------------------------------------
102         FEX0102         Online       N2K-C2232PP-10GE   SSI16210D
```

Task 4

You can use the show fex detail command to verify that the Port-channel is being used to connect to the 2K2 Fex.

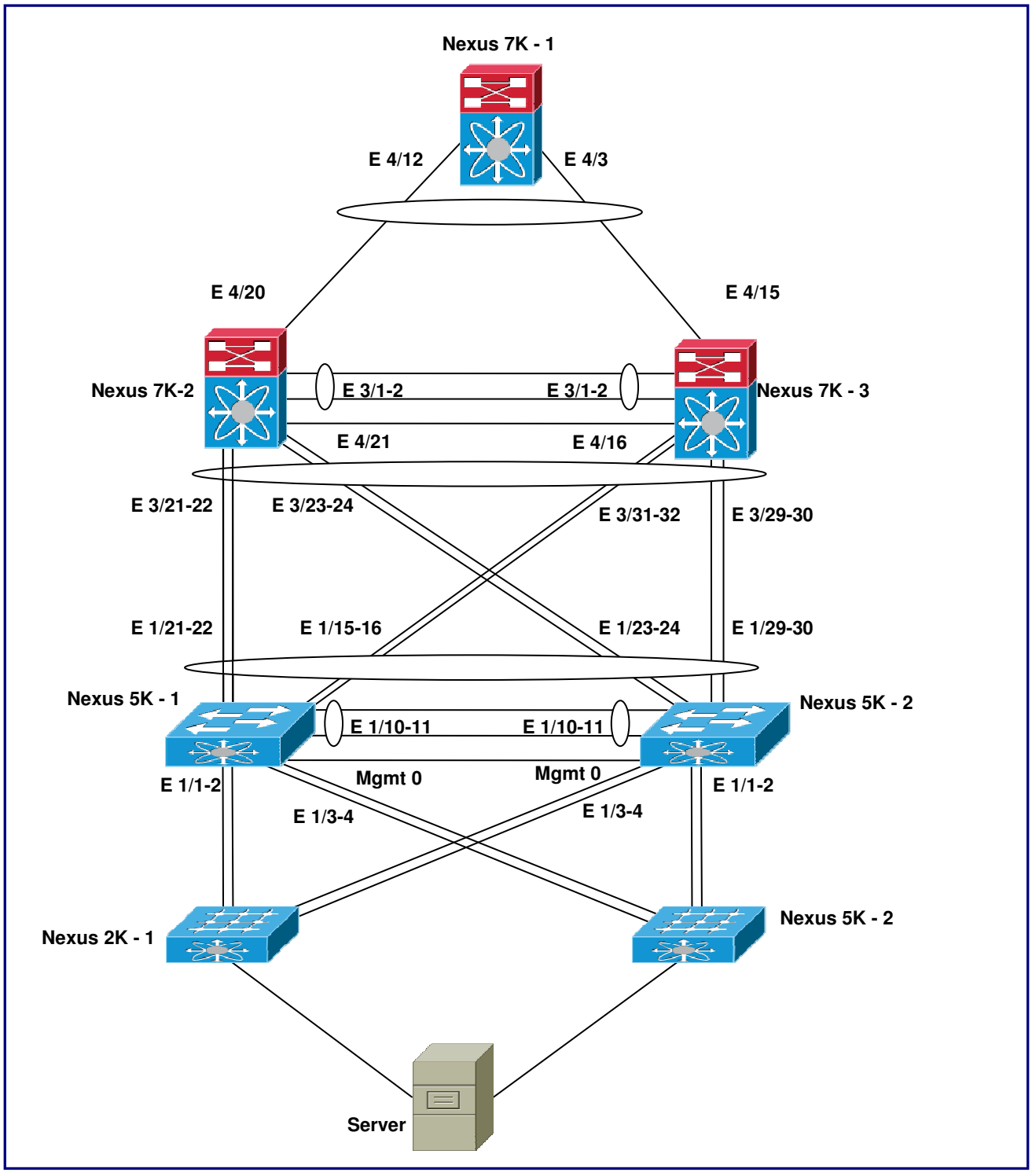
5K-2

show fex detail

```
FEX: 102 Description: FEX0102   state: Online
  FEX version: 5.1(3)N2(1c) [Switch version: 5.1(3)N2(1c)]
  FEX Interim version: 5.1(3)N2(1c)
  Switch Interim version: 5.1(3)N2(1c)
  Extender Serial: SSI16210D25
  Extender Model: N2K-C2232PP-10GE,  Part No: 73-12533-05
  Card Id: 82, Mac Addr: 0c:d9:96:08:27:02, Num Macs: 64
  Module Sw Gen: 12594  [Switch Sw Gen: 21]
  post level: complete
 pinning-mode: static    Max-links: 1
  Fabric port for control traffic: Eth1/1
  FCoE Admin: false
  FCoE Oper: true
  FCoE FEX AA Configured: false
  Fabric interface state:
    Po101 - Interface Up. State: Active
    Eth1/1 - Interface Up. State: Active
    Eth1/2 - Interface Up. State: Active
.
.
.
```

Lab 6 – Configuring FEX - Using vPC

(Builds on Lab 5)



Pre-requisite Configuration:

We will be configuring the Nexus 2K switches to see the Nexus 5K switches as one logical switch using vPCs. We have already configured a vPC Peer Keepalive Link and Port-Channel between 5K-1 & 5K-2 in Lab3. We are using a Domain-id of 12.

Task 1

Re-Configure Ports E 1/1-2 on 5K-1 to be part of an Port-Channel. This port channel will be used to connect the 5K devices to 2K1. Use Port-channel ID as 501. Use 101 as the FEX ID. Use a vPC ID of 10 for the Port Channel. Also, configure the cross-links E 1/3-4 on 5K-2 as a port channel to connect to 2K1 to the 5K switches. Use the same ID's as you did on 5K1.

5K-1

```
Interface E 1/1-2
 No switchport mode fex-fabric
 No Fex associate 101
!
Interface E 1/1-2
 channel-group 501 mode on
!
Interface port-channel 501
 switchport mode fex-fabric
 fex associate 101
 vpc 10
```

5K-2

```
Interface E 1/3-4
 channel-group 501 mode on
!
Interface port-channel 501
 switchport mode fex-fabric
 fex associate 101
 vpc 10
```

Task 2

Use the **Show Fex** command to verify if the ports are online on both the 5K switches. It will take a couple of minutes to come online.

5K-1

Show Fex

```
  FEX         FEX               FEX         FEX
Number    Description       State       Model                 Serial
------------------------------------------------------------------------------------
101         FEX0101        Online      N2K-C2232PP-10GE   SSI162200CH
```

5K-2

Show fex

```
  FEX         F EX              FEX         FEX
Number    Description       State       Model                 Serial
------------------------------------------------------------------------------------
101         FEX0101        Online      N2K-C2232PP-10GE   SSI162200CH
```

Task 3

Re-Configure Ports E 1/1-2 on 5K-2 to be part of an Port-Channel 502. This port channel will be used to connect the 5K devices to 2K2. Use Port-channel ID as 502. Use 102 as the FEX ID. Use a vPC ID of 20 for the Port Channel. Also, configure the cross-links E 1/3-4 on 5K-1 as a port channel to connect to 2K2 to the 5K switches. Use the same ID's as you did on 5K2.

5K-2

```
Interface E 1/1-2
 No channel-group 102 mode on
!
No interface port-channel 102
!
Interface E/1-2
 channel-group 502 mode on
int port-channel 502
 switchport mode fex-fabric
 fex associate 102
 vpc 20
```

5K-1

```
Interface E 1/3-4
```

```
 channel-group 502 mode on
!
Interface port-channel 502
 switchport mode fex-fabric
 fex associate 102
 vpc 20
```

Task 4

Use the **Show Fex** command to verify if the ports are online on both the 5K switches. It will take a couple of minutes to come online.

5K-1

Show Fex

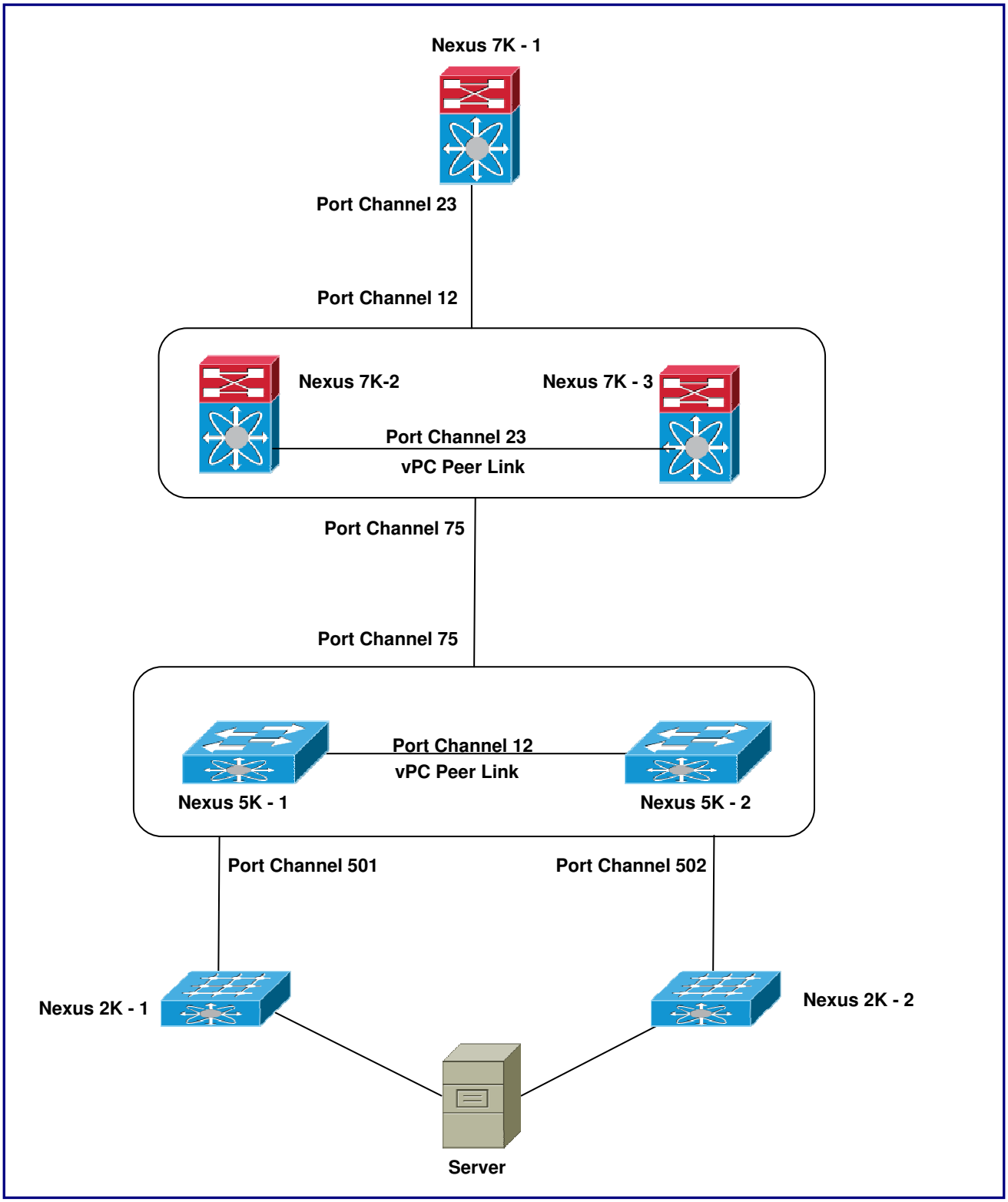
FEX Number	FEX Description	FEX State	FEX Model	Serial
102	FEX0102	Online	N2K-C2232PP-10GE	SSI16210D25

5K-2

Show fex

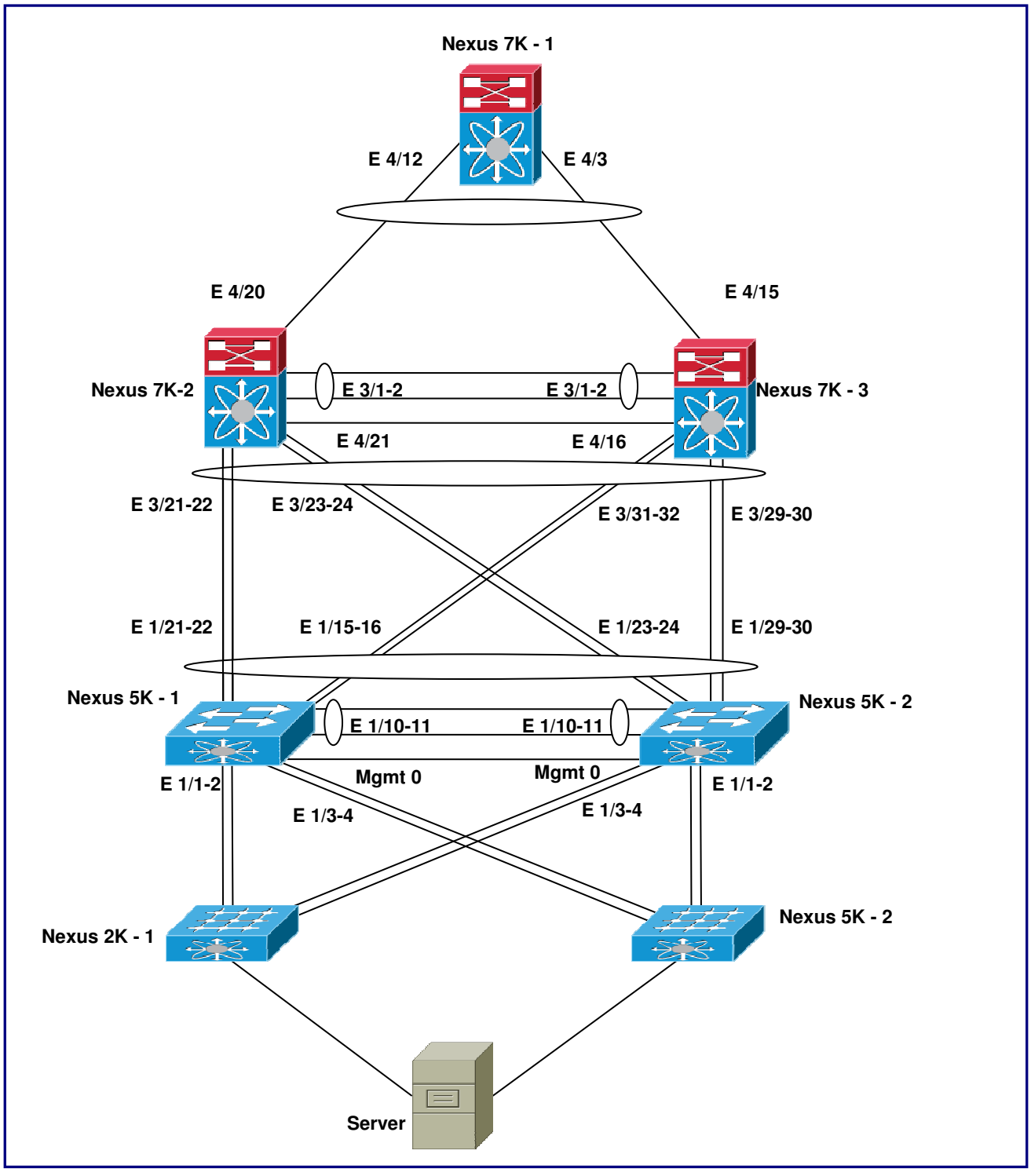
FEX Number	FEX Description	FEX State	FEX Model	Serial
102	FEX0102	Online	N2K-C2232PP-10GE	SSI16210D25

Note: In this setup, 5K-1 & 5K-2 are seen as one logical switch by the 2K devices. The following is the logical diagram of the entire topology.



Lab 7 – Configuring Enhanced vPC to Connect the Server with Redundancy

(Builds on Lab 5)



Task 1

To allow the Server to configure NIC Teaming/Trunking so that it has complete redundancy, we need to setup the Ports facing the Server as Edge Trunks. This type of complete redundancy upto the server level is known as Enhanced vPC. Configure the ports connected the FEX 2K1 towards the server as Spanning-tree port type **Edge trunk** on any 5K.

5K-1

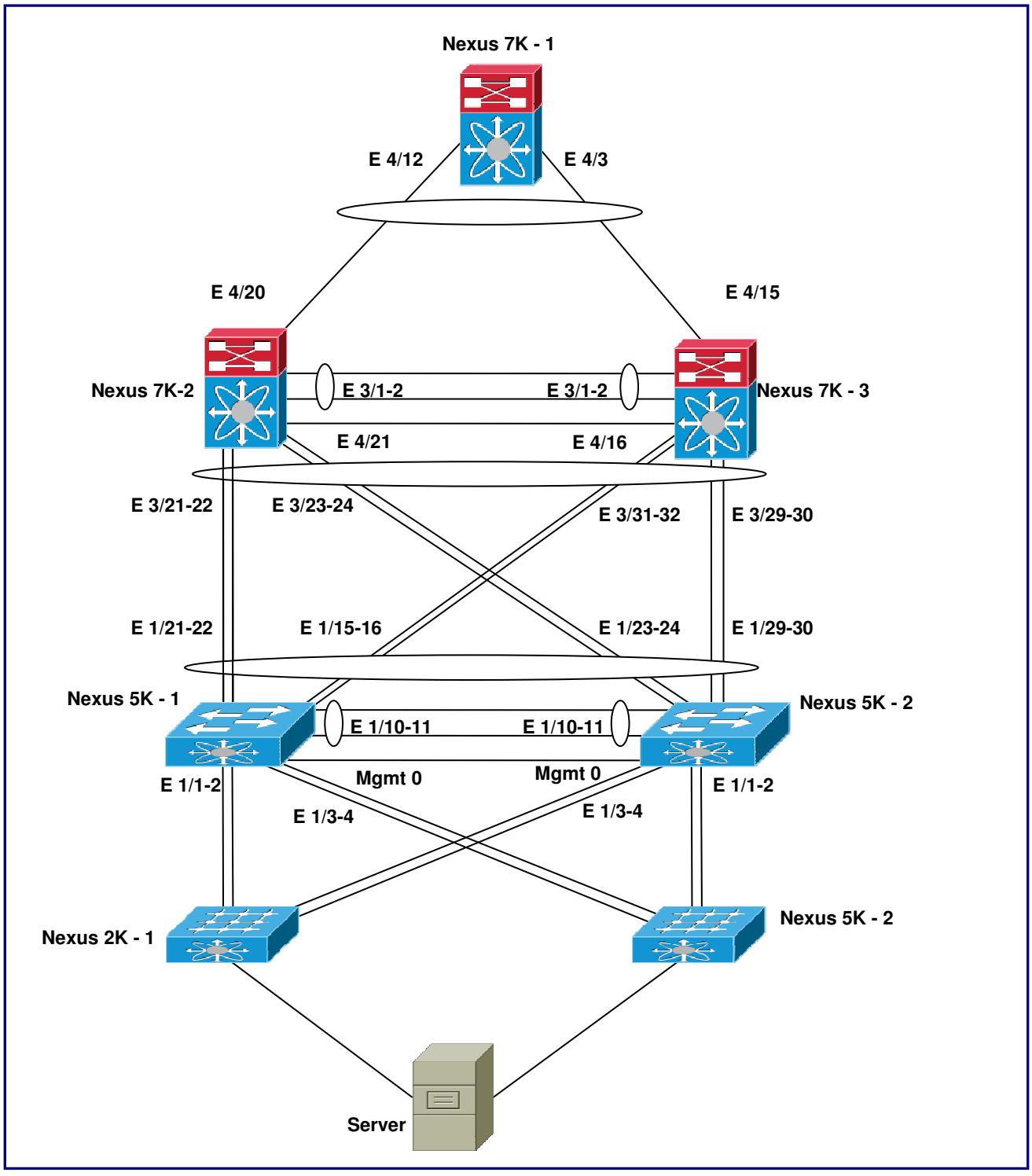
```
Interface E 101/1/20 , E 102/1/21
 spanning-tree port type edge trunk
```

Task 2

Server side will configure NIC Teaming for the 2 ports connecting into the 2 Nexus 2K switches.

Lab 8 – Configuring FCoE on the Nexus Switch to Connect to Storage Network

(Builds on Lab 5)



Task 1

Enable the FCoE Feature on both the Nexus 5K switches. Configure the FEX Links 101 for FCoE on 5K-1. Configure FEX Link 102 for FCoE on 5K-2.

5K-1

```
feature fcoe
!
Fex 101
 Fcoe
```

5K-2

```
feature fcoe
!
Fex 102
 Fcoe
```

Task 2

Configure VFC ports ports towards the server on 5K1 & 5K2. Configure VFC 101 on 5K-1. The server is connected to E 101/1/20. Configure the swithcport mode as F. Configure VFC 102 on 5K-2. The server is connected to E 102/1/21. Configure the swithcport mode as F.

5K-1

```
Interface vfc 101
 bind interface E 101/1/20
 switchport mode F
```

5K-2

```
Interface vfc 102
 bind interface E 102/1/21
 switchport mode F
```

Task 3

Configure VSAN 100 on 5K1 and attach it to VFC 101. Configure VSAN 200 on 5K2 and attach it to VFC 102.

5K-1 vsan database vsan 100 vsan Interface vfc 101
5K-2 vsan database vsan 200 vsan 200 Interface vfc 102

Task 4

Configure VLAN 100 & 200 as FCoE VSAN on 5K1 & 5K2.

5K-1 vlan 100 fcoe vsan 100
5K-2 vlan 200 fcoe vsan 200

Task 5

Verify that the FCoE VLANs are operational by using the **show vlan fcoe** command on both the 5K Switches.

5K-1

sh vlan fcoe

Original VLAN ID	Translated VSAN ID	Association State
100	100	**Operational**

5K-2

Original VLAN ID	Translated VSAN ID	Association State
200	200	**Operational**

Task 6

Once you are done configuring the FCoE VSAN, bring the VFC interfaces up on both switches.

5K-1

```
Interface vfc 101
  no shut
```

5K-2

```
Interface vfc 102
  no shut
```

Task 7

Configure the E 101/1/20 port on 5K1 as a trunk and allow the fcoe vlan 100 and data vlan on it. Configure the E 102/1/21 port on 5K1 as a trunk and allow the fcoe vlan 200 and data vlan on it.

5K-1

```
Interface e 101/1/20
 switchport mode trunk
 switchport trunk allowed vlan 100
```

5K-2

```
Interface E 102/1/21
 switchport mode trunk
 switchport trunk allowed vlan 200
```

Task 8

Verify that the VSANs are up on the VFC Interface.

5K-2

```
vfc102 is trunking (Not all VSANs UP on the trunk)
    Bound interface is Ethernet102/1/21
    Hardware is Ethernet
    Port WWN is 20:65:00:2a:6a:6d:90:3f
    Admin port mode is F, trunk mode is on
    snmp link state traps are enabled
    Port mode is TF
    Port vsan is 200
    Trunk vsans (admin allowed and active) (1,200)
    Trunk vsans (up)                      (200)
    Trunk vsans (isolated)                ()
    Trunk vsans (initializing)            (1)
    1 minute input rate 0 bits/sec, 0 bytes/sec, 0 frames/sec
    1 minute output rate 0 bits/sec, 0 bytes/sec, 0 frames/sec
      1586 frames input, 290244 bytes
        0 discards, 0 errors
      23 frames output, 2440 bytes
        0 discards, 0 errors
    last clearing of "show interface" counters never
    Interface last changed at Tue Jan 13 05:18:43 2009
```

Task 9

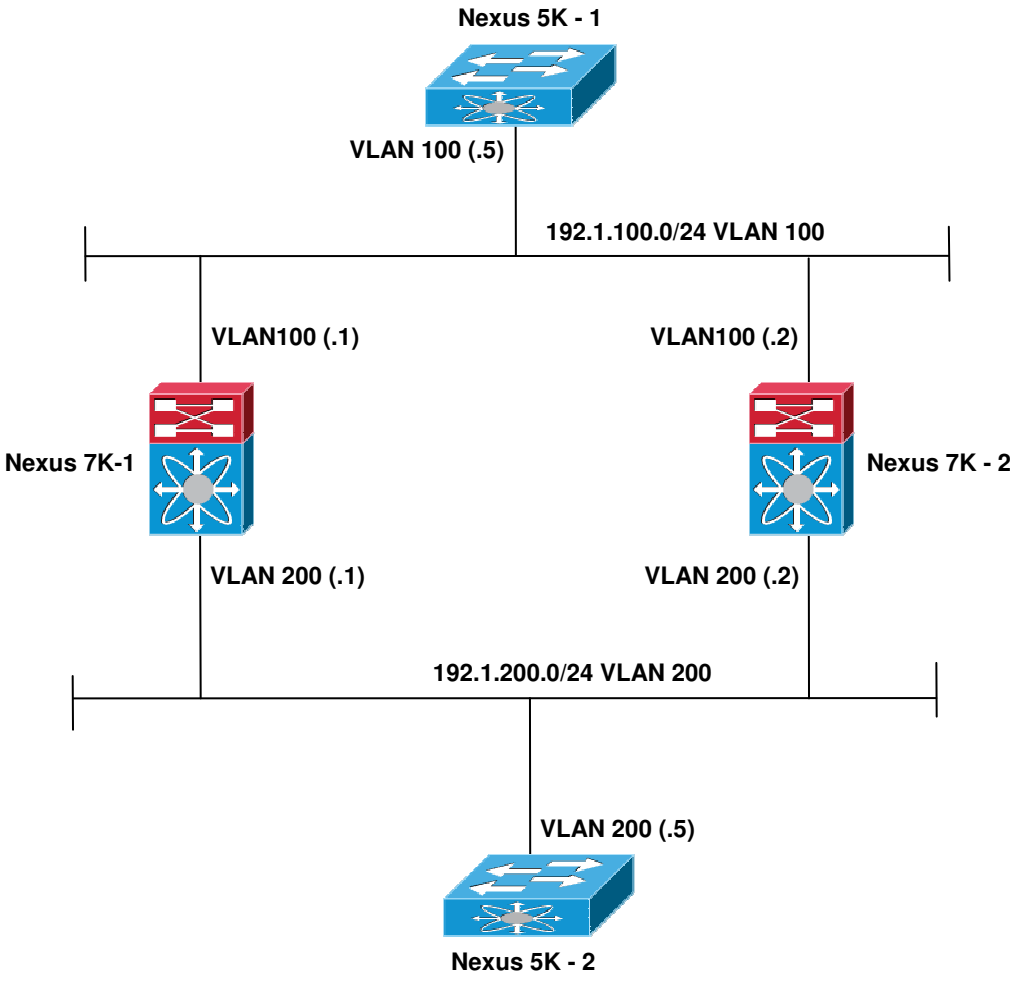
Also verify the flogi entry is in the FLOGI Database by using the **sh flogi database** command.

5K-2

show flogi database

```
--------------------------------------------------------------------------------------------------------
INTERFACE    VSAN    FCID        PORT NAME                 NODE NAME
--------------------------------------------------------------------------------------------------------
vfc102         200     0xb00000  20:00:a4:4c:11:13:56:d3 10:00:a4:4c:11:13:56:d3

Total number of flogi = 1.
```

Lab 9- Configuring HSRP on Nexus 7K Devices



Task 1

Connect to 7K1. Configure the admin username with a password of Cciedc01. Configure it with a hostname of 7K1.

7K-1

Configure the password on the setup wizard as : **Cciedc01**

!

!

Hostname 7K1

Task 2

Configure a VDC on 7K1 using the following information:

- VDC 1: Name : **7K1** ID: **1**
  - Interfaces : E 3/2, E 3/13, E 3/15, E 4/12, E 4/43
- VDC 2: Name : **7K2** ID: **2**
  - Interfaces : E 3/4, E 3/29, E 3/31, E 4/20, E 4/44

7K1

```
vdc 7K1 id 1
  allocate interface E 3/2 , 4/12 , 4/43 , 3/13 , 3/15
!
vdc 7K2 id 2
  allocate interface E 3/4, E 3/29, E 3/31, E 4/20, E 4/44
```

Note : When you allocate interfaces to VDCs, they are allocated based on Port-groups. Press **Yes** when prompted to allocate all members of the port-group.

Task 3

Verify the Creation of the VDCs by using the sh run vdc and sh vdc membership commands.

7K1

Show run VDC
(Displays the configuration commands for the VDCs)
!
Show VDC membership
(Displays the ports that are members of the VDCs, including the ones that were not specified by you in the command)

Task 4

Configure alias for switching to VDC 7K2 and VDC 7K3 from the default VDC as VDC2 & VDC3 respectively.

7K1

```
cli alias name N2 switchto vdc 7K2
```

Task 5

Switch to 7K2 using the appropriate alias you created. Configure the password for the admin account as Cciedc01. Configure a alias for the **Switchback** command as SB. Switchback to the default VDC. Use the alias that you created to switchback.

7K1

N2

7K2

Configure the password on the setup wizard as : **Cciedc01**
!
!
cli alias name SB switchback
!
SB

Task 6

Configure the prompt to only display the current VDC.

7K-1

no vdc combined-hostname

Task 7

Configure 2 VLANs (100 & 200) on 7K1 & 7K2. Assign the ports to these VLANS based on the following table:

- 7K1:
  - VLAN 100 : E 3/13
  - VLAN 200 : E 3/15
- 7K2:
  - VLAN 100 : E 3/31
  - VLAN 200 : E 3/29

7K1

Vlan100
Vlan 200
!
Interface E 3/13
 Switchport mode access
 Switchport access vlan 100
 No shut

```
!
Interface E 3/15
Switchport mode access
 Switchport access vlan 200
 No shut
```

7K2

```
Vlan 100
Vlan 200
!
Interface E 3/31
 Switchport mode access
 Switchport access vlan 100
 No shut
!
Interface E 3/29
Switchport mode access
 Switchport access vlan 200
 No shut
```

Task 8

Configure a VRF with a name of DATA on both 7K1 & 7K2. Create 2 VLAN interfaces on the 2 Nexus 7K Devices using the following table:

- **7K1**
  - Interface: **VLAN 100** VRF Name: **DATA** IP Address: **192.1.100.1/24**
  - Interface: **VLAN 200** VRF Name: **DATA** IP Address: **192.1.200.1/24**
- **7K2**
  - Interface: **VLAN 100** VRF Name: **DATA** IP Address: **192.1.100.2/24**
  - Interface: **VLAN 200** VRF Name: **DATA** IP Address: **192.1.200.2/24**

7K1

```
Feature interface-vlan
!
vrf context DATA
!
Interface VLAN 100
 Vrf member DATA
 Ip address 192.1.100.1 255.255.255.0
 No shut
!
Interface VLAN 200
```

```
 Vrf member DATA
 Ip address 192.1.200.1 255.255.255.0
 No shut
```

7K2

```
Feature interface-vlan
!
vrf context DATA
!
Interface VLAN 100
 Vrf member DATA
 Ip address 192.1.100.2 255.255.255.0
 No shut
!
Interface VLAN 200
 Vrf member DATA
 Ip address 192.1.200.2 255.255.255.0
 No shut
```

Task 9

Configure N5K1 ports E 1/13 & 1/15 in VLAN 100. Configure a VRF with a name of DATA. Configure a VLAN Interface for VLAN 100 with an IP Address of 192.1.100.5/24.

5K1

```
Feature interface-vlan
!
Vrf context DATA
!
Vlan 100
!
Interface E 1/13 , E 1/15
 Switchport mode access
 Switchport access vlan 100
!
Interface vlan 100
 Vrf member DATA
 Ip address 192.1.100.5 255.255.255.0
 No shut
```

Task 10

Configure N5K2 ports E 1/13 & 1/29 in VLAN 200. Configure a VRF with a name of DATA. Configure a VLAN Interface for VLAN 200 with an IP Address of 192.1.200.5/24.

5K2

```
Feature interface-vlan
!
Vrf context DATA
!
Vlan 200
!
Interface E 1/13 , E 1/29
 Switchport mode access
 Switchport access vlan 200
!
Interface vlan 200
 Vrf member DATA
 Ip address 192.1.200.5 255.255.255.0
 No shut
```

Task 11

Configure HSRP on VLAN 100 between N7K1 & N7K2. Use .12 as the Virtual IP Address. N7K1 should try to become the Active Router. Point a default gateway on N5K1 towards the Virtual IP. Use 100 as the Standby Group Number.

7K1

```
Feature HSRP
!
Interface VLAN 100
 Hsrp 100
   Ip 192.1.100.12
   Priority 200
   Preempt
```

7K2

```
Feature HSRP
!
Interface VLAN 100
 Hsrp 100
   Ip 192.1.100.12
```

5K1

```
Vrf context DATA
  Ip route 0.0.0.0/0 192.1.100.12
```

Task 12

Configure HSRP on VLAN 200 between N7K1 & N7K2. Use .12 as the Virtual IP Address. N7K1 should try to become the Active Router. Point a default gateway on N5K2 towards the Virtual IP. Use 200 as the Standby Group Number.

7K1

```
Interface VLAN 200
 Hsrp 200
   Ip 192.1.200.12
   Priority 200
   Preempt
```

7K2

```
Interface VLAN 200
 Hsrp 200
   Ip 192.1.200.12
```

5K2

```
Vrf context DATA
  Ip route 0.0.0.0/0 192.1.200.12
```

Task 13

Verify the HSRP Status on 7K1 & 7K2 using the **Show HSRP** command.

7K1

Show hsrp
!
Vlan100 - Group 100 (HSRP-V1) (IPv4)
  Local state is Active, priority 200 (Cfged 200), may preempt
...
  Virtual IP address is **192.1.100.12** (Cfged)
  Active router is **local**
  Standby router is 192.1.100.2 , priority 100 expires in 4.770000 sec(s)

Vlan200 - Group 200 (HSRP-V1) (IPv4)
  Local state is Active, priority 200 (Cfged 200), may preempt
  ...
Virtual IP address is **192.1.200.12** (Cfged)
  Active router is **local**
  Standby router is **192.1.200.2** , priority 100 expires in 4.428000 sec(s)
...

7K2

Show hsrp
!
Vlan100 - Group 100 (HSRP-V1) (IPv4)
  Local state is Standby, priority 100 (Cfged 100)
..
 Virtual IP address is **192.1.100.12** (Cfged)
  Active router is **192.1.100.1**, priority 200 expires in 3.074000 sec(s)
  Standby router is **local**

Vlan200 - Group 200 (HSRP-V1) (IPv4)
  Local state is Standby, priority 100 (Cfged 100)
...
  Virtual IP address is **192.1.200.12** (Cfged)
  Active router is **192.1.200.1**, priority 200 expires in 1.883000 sec(s)
  Standby router is **local**

Task 14

Secure HSRP using MD5 authentication between the peers. Use a Key of 1 and a key string of Cciedc01. Use it for both HSRP groups.

7K1

```
Key chain NEXUS
  Key 1
    Key-string Cciedc01
!
Int vlan 100
 Hsrp version 2
 Hsrp 100
    Authentication md5 key-chain NEXUS
!
Int vlan 200
 Hsrp version 2
 Hsrp 200
    Authentication md5 key-chain NEXUS
```

7K1

```
Key chain NEXUS
  Key 1
    Key-string Cciedc01
!
Int vlan 100
 Hsrp version 2
 Hsrp 100
    Authentication md5 key-chain NEXUS
!
Int vlan 200
 Hsrp version 2
 Hsrp 200
    Authentication md5 key-chain NEXUS
```

Task 15

Verify the HSRP Status on 7K1 & 7K2 using the **Show HSRP** command.

7K1

Show hsrp
!
Vlan100 - Group 100 (**HSRP-V2**) (IPv4)
  Local state is Active, priority 200 (Cfged 200), may preempt
...
  Virtual IP address is 192.1.100.12 (Cfged)
  Active router is local
  Standby router is 192.1.100.2 , priority 100 expires in 4.297000 sec(s)
  Authentication MD5, key-chain NEXUS

Vlan200 - Group 200 (**HSRP-V2**) (IPv4)
  Local state is Active, priority 200 (Cfged 200), may preempt
...
  Virtual IP address is 192.1.200.12 (Cfged)
  Active router is local
  Standby router is 192.1.200.2 , priority 100 expires in 7.746000 sec(s)
  Authentication MD5, key-chain NEXUS

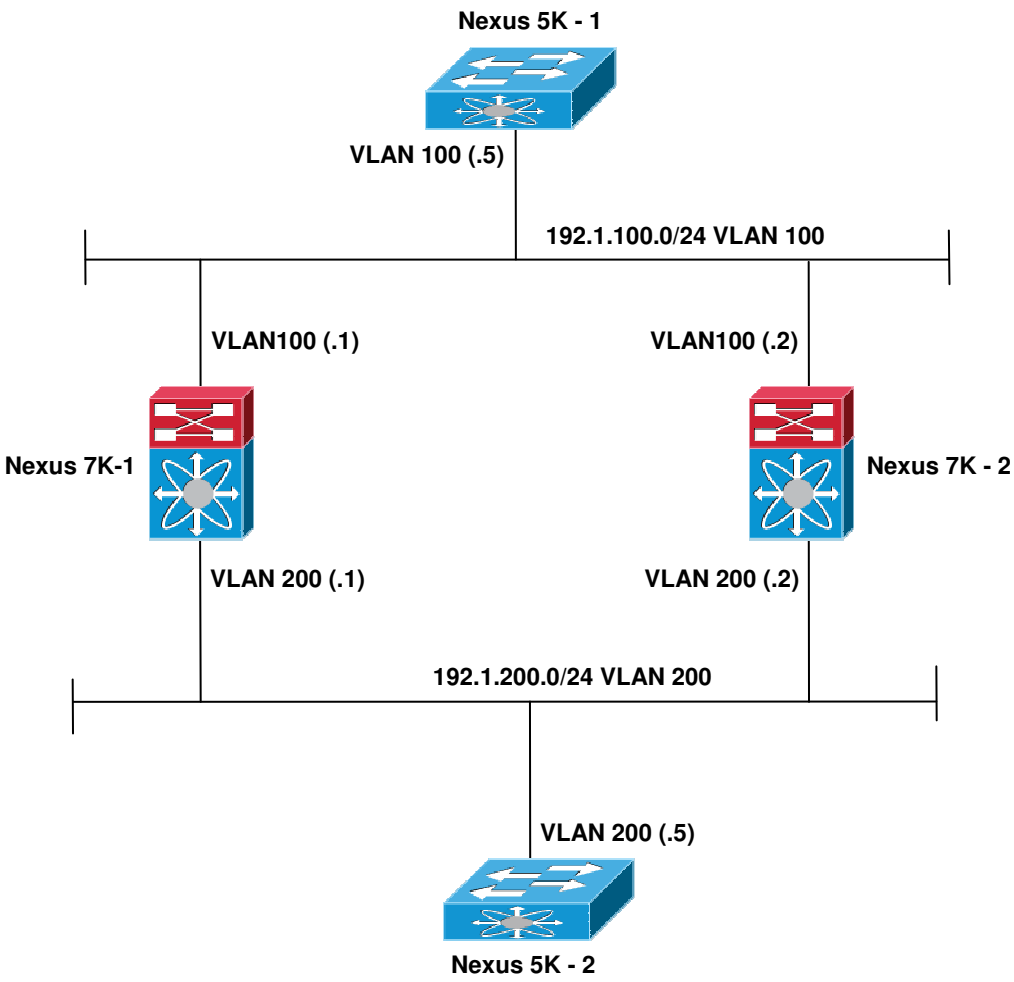
7K2

Show hsrp
!
Vlan100 - Group 100 (**HSRP-V2**) (IPv4)
  Local state is Standby, priority 100 (Cfged 100)
...
  Virtual IP address is 192.1.100.12 (Cfged)
  Active router is 192.1.100.1, priority 200 expires in 3.607000 sec(s)
  Standby router is local
  Authentication MD5, key-chain NEXUS

Vlan200 - Group 200 (**HSRP-V2**) (IPv4)
  Local state is Standby, priority 100 (Cfged 100)
...
  Virtual IP address is 192.1.200.12 (Cfged)
  Active router is 192.1.200.1, priority 200 expires in 7.437000 sec(s)
  Standby router is local
  Authentication MD5, key-chain NEXUS
 ...

Lab 10- Configuring VRRP on Nexus 7K Devices

(Builds on Lab 9)



Task 1

Disable HSRP and enable VRRP on N7K1 & N7K2. Configure VRRP on VLAN 100 between N7K1 & N7K2. Use .12 as the Virtual IP Address. N7K1 should try to become the Active Router. Use 100 as the Group number.

7K1

No Feature HSRP

```
Feature VRRP
!
Interface VLAN 100
 Vrrp 100
   Address 192.1.100.12
   Priority 200
   Preempt
   No shut
```

7K2

```
No Feature HSRP
Feature VRRP
!
Interface VLAN 100
 Vrrp 100
   Address 192.1.100.12
   No shut
```

Task 2

Configure VRRP on VLAN 200 between N7K1 & N7K2. Use .12 as the Virtual IP Address. N7K1 should try to become the Active Router. Use 200 as the Group Number.

7K1

```
Interface VLAN 200
 Vrrp 200
   Address 192.1.200.12
   Priority 200
   Preempt
   No shut
```

7K2

```
Interface VLAN 200
 Vrrp 200
   Address 192.1.200.12
   No shut
```

Task 3

Verify the VRRP Status on 7K1 & 7K2 using the **Show VRRP detail** command.

7K1

Show vrrp detail
!

Vlan100 - **Group 100** (IPV4)
    State is **Master**
    Virtual IP address is **192.1.100.12**
…
    Master router is Local

Vlan200 - **Group 200** (IPV4)
    State is **Master**
    Virtual IP address is **192.1.200.12**
…
    Master router is Local…

7K2

Show vrrp detail
!
Vlan100 - **Group 100** (IPV4)
    State is **Backup**
    Virtual IP address is **192.1.100.12**
    Priority 100, Configured 100
…
    Master router is 192.1.100.1

Vlan200 - **Group 200** (IPV4)
    State is **Backup**
    Virtual IP address is **192.1.200.12**
    Priority 100, Configured 100
…
    Master router is 192.1.200.1

Task 4

Secure HSRP using authentication between the peers. Use a key string of Cciedc01. Use it for both VRRP groups.

7K1 Int vlan 100 Vrrp 100 Authentication text Cciedc01 ! Int vlan 200 Vrrp 200 Authentication text Cciedc01
7K1 Int vlan 100 Vrrp 100 Authentication text Cciedc01 ! Int vlan 200 Vrrp 200 Authentication text Cciedc01

Task 5

Verify the VRRP authentication Status on 7K1 & 7K2 using the **Show vrrp detail** command.

7K1

Show Vrrp detail
!
Vlan100 - **Group 100** (IPV4)
    State is **Master**
    Virtual IP address is 192.1.100.12
…
    Authentication text "Cciedc01"
    Virtual MAC address is 0000.5e00.0164
    Master router is Local

Vlan200 - **Group 200** (IPV4)
    State is **Master**
    Virtual IP address is 192.1.200.12
…
    Authentication text "Cciedc01"
    Virtual MAC address is 0000.5e00.01c8
    Master router is Local

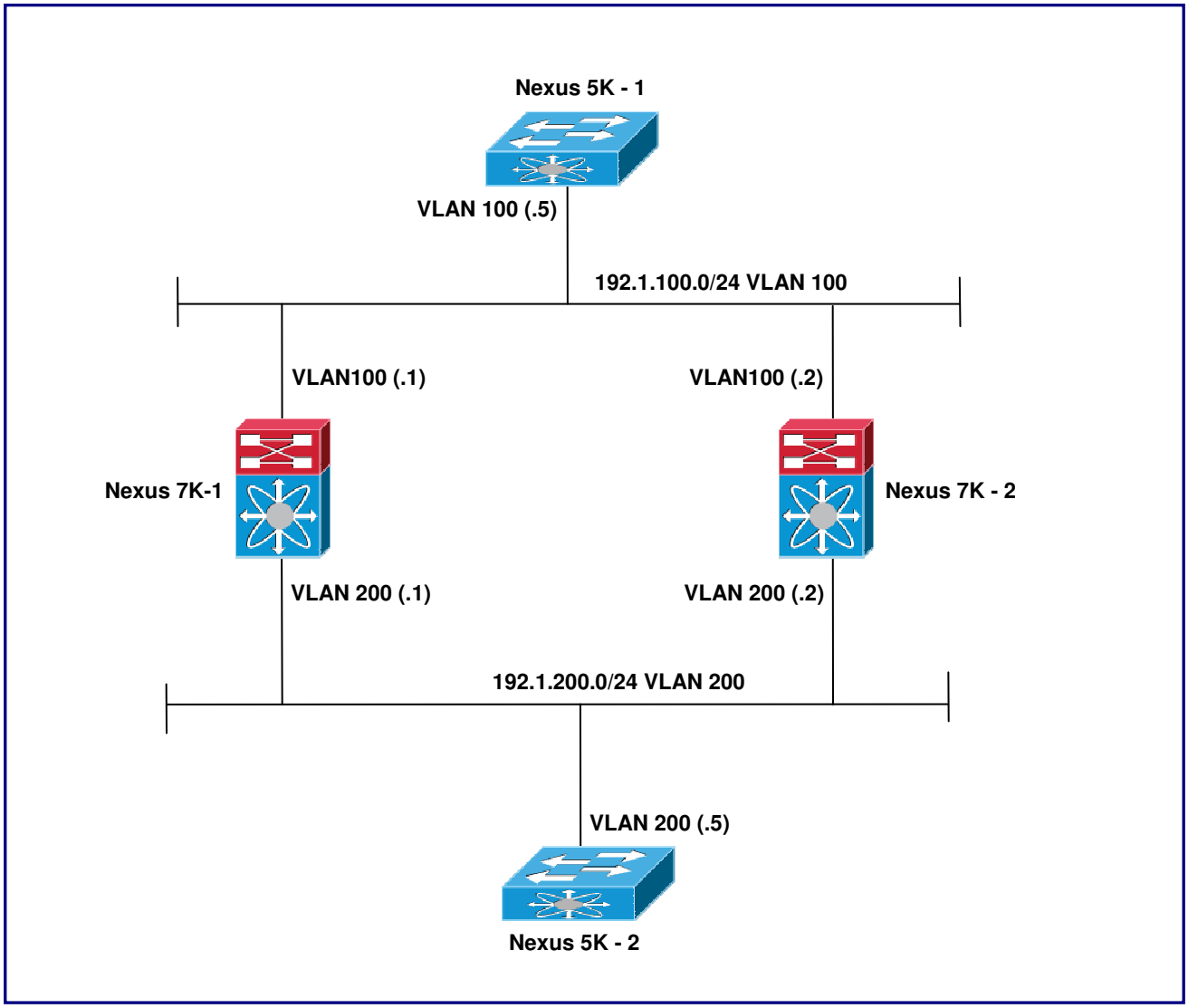
7K2

Show Vrrp detail
!
Vlan100 - **Group 100** (IPV4)
    State is **Backup**
    Virtual IP address is 192.1.100.12
…
    Authentication text "Cciedc01"
    Virtual MAC address is 0000.5e00.0164
    Master router is 192.1.100.1

Vlan200 - **Group 200** (IPV4)
    State is **Backup**
    Virtual IP address is 192.1.200.12
…
    Authentication text "Cciedc01"
    Virtual MAC address is 0000.5e00.01c8
    Master router is 192.1.200.1
 …

Lab 11- Configuring GLBP on Nexus 7K Devices

(Builds on Lab 10)



Task 1

Disable VRRP and enable GLBP on N7K1 & N7K2. Configure GLBP on VLAN 100 between N7K1 & N7K2. Use .12 as the Virtual IP Address. N7K1 should try to become the Active Router. Use 100 as the Group number.

7K1

No Feature VRRP

```
Feature GLBP
!
Interface VLAN 100
 GLBP 100
   Ip 192.1.100.12
   Priority 200
   Preempt
```

7K2

```
No Feature VRRP
Feature GLBP
!
Interface VLAN 100
 GLBP 100
   Ip 192.1.100.12
```

Task 2

Configure GLBP on VLAN 200 between N7K1 & N7K2. Use .12 as the Virtual IP Address. N7K1 should try to become the Active Router. Use 200 as the Group Number.

7K1

```
Interface VLAN 200
 GLBP 200
   Ip 192.1.200.12
   Priority 200
   Preempt
```

7K2

```
Interface VLAN 200
 GLBP 200
   Ip 192.1.200.12
```

Task 3

Verify the GLBP Status on 7K1 & 7K2 using the **Show GLBP** command.

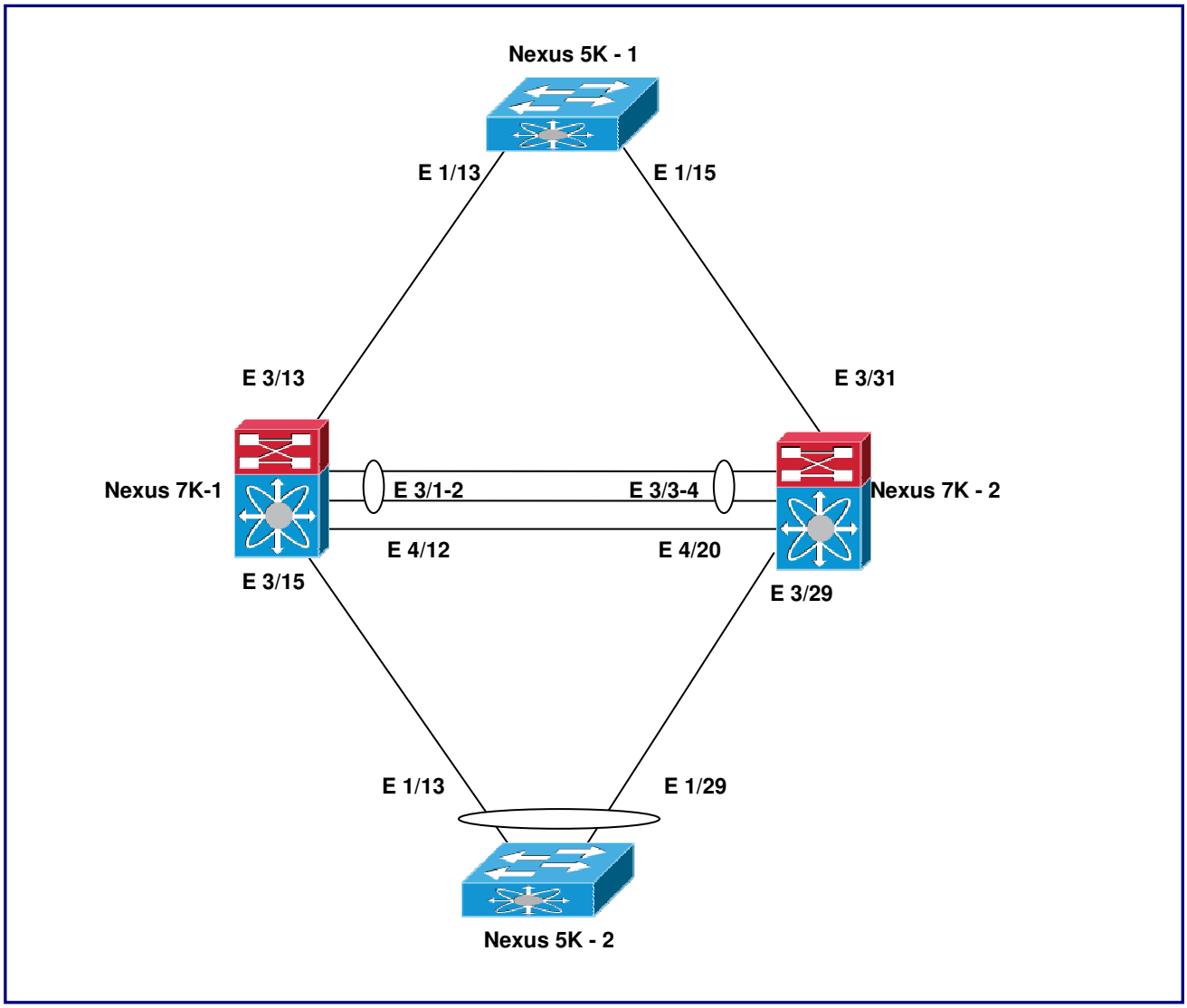
7K1

Show GLBP
!
Vlan100 - **Group 100**
  State is **Active**
    4 state change(s), last state change(s) 00:01:03
  Virtual IP address is **192.1.100.12**
...
  Active is local
  Standby is 192.1.100.2, priority 100 (expires in 8.398 sec)
..
  Load balancing: round-robin
  Group members:
    0018.BAD8.29D1 (192.1.100.1) local
    0018.BAD8.29D2 (192.1.100.2)

Vlan200 - **Group 200**
  State is **Active**
    4 state change(s), last state change(s) 00:00:36
  Virtual IP address is **192.1.200.12**
...
  Active is local
  Standby is 192.1.200.2, priority 100 (expires in 8.838 sec)
...
  Load balancing: round-robin
  Group members:
    0018.BAD8.29D1 (192.1.200.1) local
    0018.BAD8.29D2 (192.1.200.2)
...

Lab 12 - Configuring HSRP with vPC on the Nexus 7K Devices

Physical Setup



Task 1

Connect to 7K1. Configure the admin username with a password of Cciedc01. Configure it with a hostname of 7K1.

7K-1

Configure the password on the setup wizard as : **Cciedc01**

!

```
!
Hostname 7K1
```

Task 2

Configure a VDC on 7K1 using the following information:

- VDC 1: Name : **7K1** ID: **1**
  - Interfaces : E 3/1-2, E 3/13, E 3/15, E 4/12, E 4/43
- VDC 2: Name : **7K2** ID: **2**
  - Interfaces : E 3/3-4, E 3/29, E 3/31, E 4/20, E 4/44

7K1

```
vdc 7K1 id 1
  allocate interface E 3/1-2 , 4/12 , 4/43 , 3/13 , 3/15
!
vdc 7K2 id 2
  allocate interface E 3/3-4, E 3/29, E 3/31, E 4/20, E 4/44
```

Note : When you allocate interfaces to VDCs, they are allocated based on Port-groups. Press **Yes** when prompted to allocate all members of the port-group.

Task 3

Verify the Creation of the VDCs by using the sh run vdc and sh vdc membership commands.

7K1

```
Show run VDC
```
(Displays the configuration commands for the VDCs)
```
!
Show VDC membership
```
(Displays the ports that are members of the VDCs, including the ones that were not specified by you in the command)

Task 4

Configure alias for switching to VDC 7K2 and VDC 7K3 from the default VDC as VDC2 & VDC3 respectively.

7K1

```
cli alias name N2 switchto vdc 7K2
```

Task 5

Switch to 7K2 using the appropriate alias you created. Configure the password for the admin account as Cciedc01. Configure a alias for the **Switchback** command as SB. Switchback to the default VDC. Use the alias that you created to switchback.

7K1 N2
7K2 Configure the password on the setup wizard as : **Cciedc01** ! ! cli alias name SB switchback ! SB

Task 6

Configure the prompt to only display the current VDC.

7K-1 no vdc combined-hostname

Task 7

Configure a VLAN100 on 7K1 & 7K2. Assign the ports to these VLANS based on the following table:

- 7K1:
  - VLAN 100 : E 3/13
- 7K2:
  - VLAN 100 : E 3/31

7K1 Vlan100 ! Interface E 3/13 Switchport mode access Switchport access vlan 100 No shut
7K2 Vlan 100

```
!
Interface E 3/31
 Switchport mode access
 Switchport access vlan 100
 No shut
```

Task 8

We will be configuring a vPC to 5K2 to 7K1 & 7K2 based on the above diagram. Enable the vPC & LACP features on 7K1 & 7K2.

7K1

```
Feature vpc
Feature lacp
```

7K2

```
Feature vpc
Feature lacp
```

Task 9

Configure the parameters for the vPC Peer keepalive link based on the following:

- **7K1**
  - VRF Name: **PKL-12**
  - Interface: **4/12**
  - IP Address: **10.1.12.1/24**
- **7K2**
  - VRF Name: **PKL-12**
  - Interface: **4/20**
  - IP Address: **10.1.12.2/24**

7K1

```
vrf context PKL-12
!
Interface E 4/12
 vrf member PKL-12
 ip address 10.1.12.1/24
 no shut
```

7K2

```
vrf context PKL-12
!
```

```
Interface E 4/20
 vrf member PKL-12
 ip address 10.1.12.2/24
 no shut
```

Task 10

Configure a vPC Domain between 7K1 & 7K2. Use **12** as the Domain ID. Use the Interfaces and VRFs from the previous step to configure the vPC Peer Keepalive link. Make 7K1 as the Primary vPC device.

7K1

```
vpc domain 12
  role priority 300
  peer-keepalive destination 10.1.12.2 source 10.1.12.1 vrf PKL-12
```

7K2

```
vpc domain 12
  peer-keepalive destination 10.1.12.1 source 10.1.12.2 vrf PKL-12
```

Task 11

Configure the Port-channel port type as Network. This will enable the Bridge Assurance Fault tolerance feature. Use this port channel as the vPC Peer Link. Use the following parameters:

- **7K1**
  - Port-Channel #: **12**
  - Interfaces: **3/1-2**
  - Port Type: **Network**
- **7K2**
  - Port-Channel #: **12**
  - Interface: **3/3-4**
  - Port Type: **Network**

7K1

```
Interface E 3/1-2
 channel-group 12 mode active
 no shut
!
Interface port-channel 12
 spanning-tree port type network
 switch mode trunk
 vpc peer-link
```

7K2

```
int e 3/3-4
 channel-group 12 mode active
 no shut
!
Interface port-channel 12
 switch mode trunk
 spanning-tree port type network
 vpc peer-link
```

Task 12

Verify the status of the vPC Port Channel. Also, make sure the vPC Peer keepalive link is up. Use the **Show VPC** command to verify it.

7K1

Show VPC

```
vPC domain id                     : 12
Peer status                       : peer adjacency formed ok
vPC keep-alive status             : peer is alive
Configuration consistency status  : success
...
vPC role                          : primary
..
Peer Gateway                      : Disabled
...
vPC Peer-link status
---------------------------------------------------------------------
id   Port   Status Active vlans
--   ----   ------ --------------------------------------------------
1    Po12   up     1,100
```

7K2

Show VPC

```
vPC domain id                     : 12
Peer status                       : peer adjacency formed ok
vPC keep-alive status             : peer is alive
Configuration consistency status  : success
...
vPC role                          : secondary
..
Peer Gateway                      : Disabled
...
vPC Peer-link status
---------------------------------------------------------------------
id   Port   Status Active vlans
--   ----   ------ --------------------------------------------------
1    Po12   up     1,100
```

Task 13

Configure a port-channel from 7K1 & 7K2 towards 5K2 using vPC. Configure it as a L2 Trunk Port Channel. Use 12 as the Port-channel ID. Use E 3/15 on 7K1 & E 3/29 on 7K2 as the vPC member ports.

7K1

```
Interface E 3/15
 switchport
 channel-group 200 mode active
 no shut
!
Interface port-channel 200
 switchport mode trunk
 vpc 12
```

7K2

```
Interface E 3/29
 switchport
 channel-group 200 mode active
 no shut
!
Interface port-channel 200
 switchport mode trunk
 vpc 12
```

Task 14

Enable the LACP feature on 5K2. Configure a normal Port-Channel on 5K2. Configure it as a L2 Trunk Port Channel. Use 200 as the Port-channel ID. Use E 1/13 & E 1/29 on 5K2 as the member ports.

5K2

```
feature lacp
!
Interface E 1/13 ,  E 1/29
 channel-group 200 mode active
 no shut
!
Interface port-channel 200
 switchport mode trunk
```

Task 15

Verify the status of the Port Channel on 5K2. Use the normal **Show port-channel summary** command to verify it.

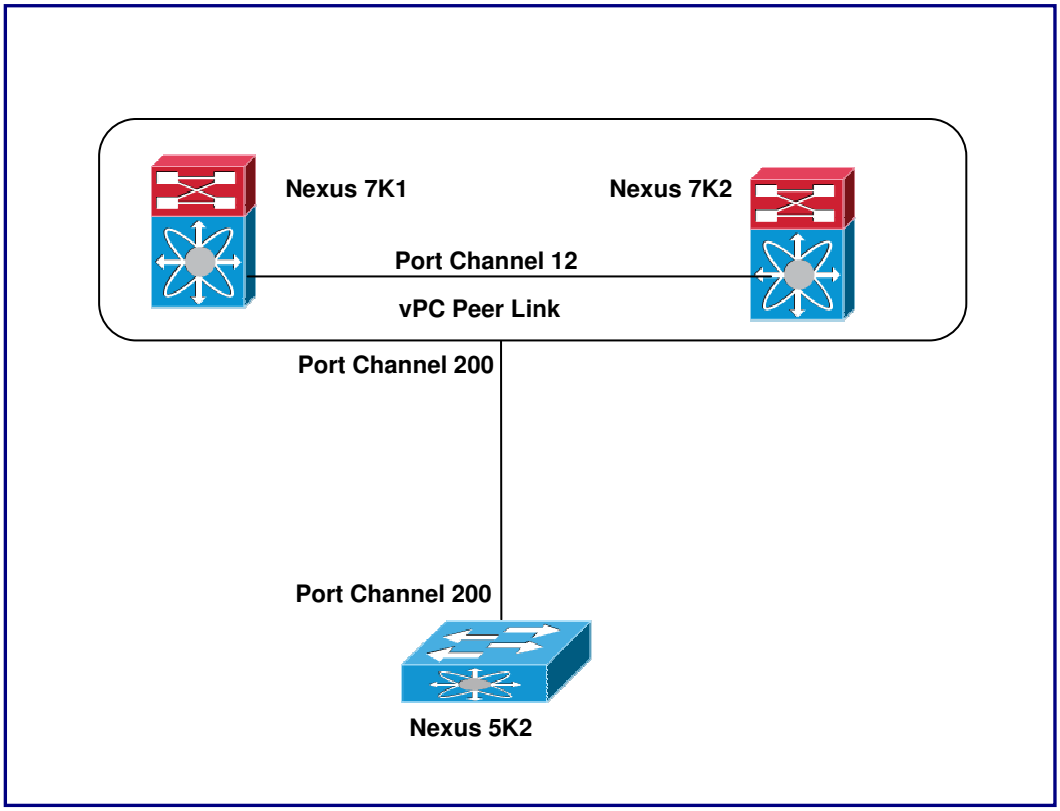
5K2

show port-channel summary

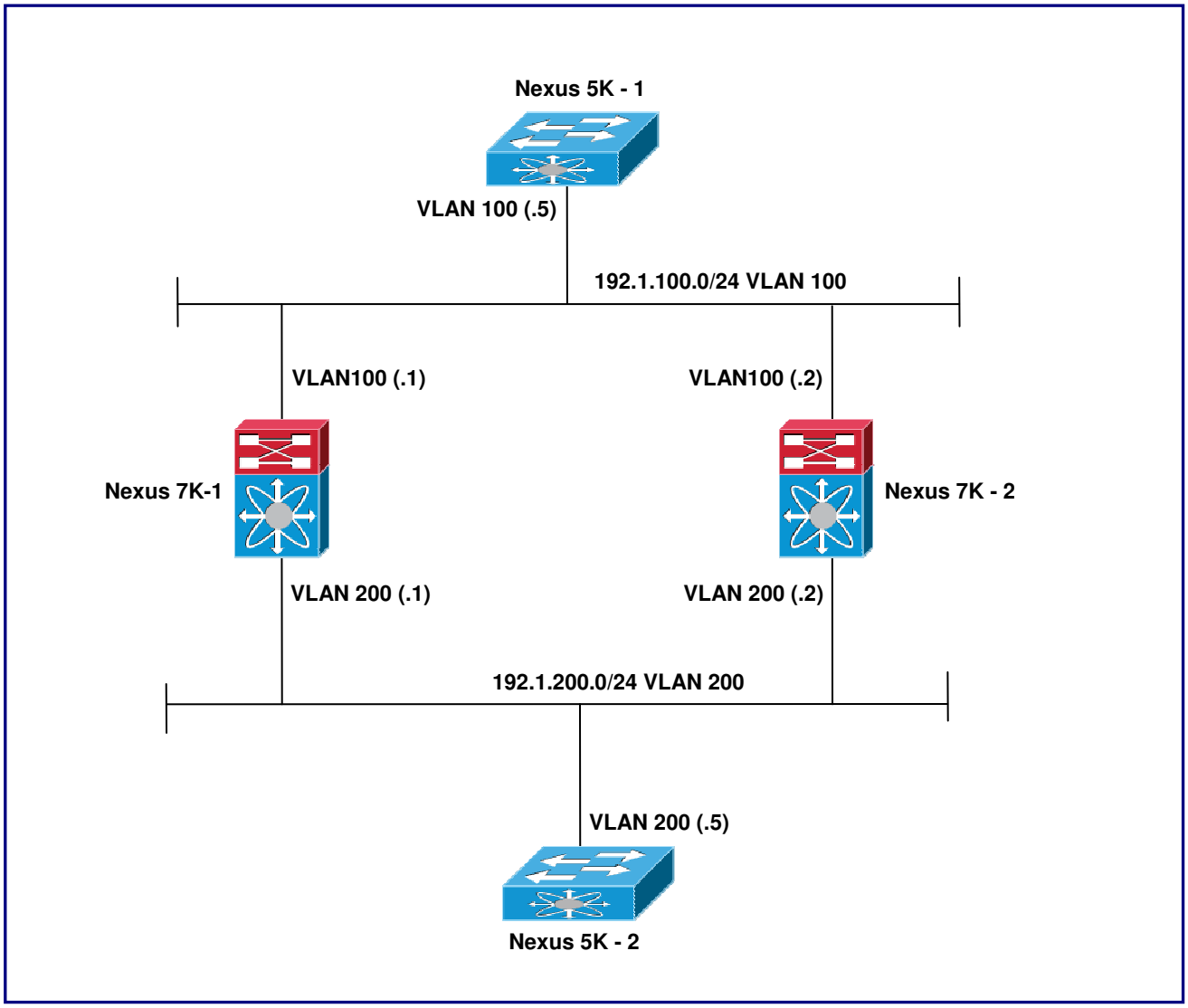
P - Up in Port-channel (member)
S - Switched
U - Up (Port-Channel)
.
.
.

Group	Port-Channel	Type	Protocol	Member Ports
200	**Po200(SU)**	Eth	LACP	**Eth1/13(P)** **Eth1/29(P)**

Note: In this setup, 7K-1 & 7K-2 are seen as one logical switch by 5K2. The following is the logical diagram.



Logical Setup



Task 16

Configure a VRF with a name of DATA on both 7K1 & 7K2. Create 2 VLAN interfaces on the 2 Nexus 7K Devices using the following table:

- **7K1**
  - Interface: **VLAN 100** VRF Name: **DATA** IP Address: **192.1.100.1/24**
  - Interface: **VLAN 200** VRF Name: **DATA** IP Address: **192.1.200.1/24**
- **7K2**
  - Interface: **VLAN 100** VRF Name: **DATA** IP Address: **192.1.100.2/24**
  - Interface: **VLAN 200** VRF Name: **DATA** IP Address: **192.1.200.2/24**

7K1

```
Feature interface-vlan
!
vrf context DATA
!
Interface VLAN 100
 Vrf member DATA
 Ip address 192.1.100.1 255.255.255.0
 No shut
!
Interface VLAN 200
 Vrf member DATA
 Ip address 192.1.200.1 255.255.255.0
 No shut
```

7K2

```
Feature interface-vlan
!
vrf context DATA
!
Interface VLAN 100
 Vrf member DATA
 Ip address 192.1.100.2 255.255.255.0
 No shut
!
Interface VLAN 200
 Vrf member DATA
 Ip address 192.1.200.2 255.255.255.0
 No shut
```

Task 17

Configure N5K1 ports E 1/13 & 1/15 in VLAN 100. Configure a VRF with a name of DATA. Configure a VLAN Interface for VLAN 100 with an IP Address of 192.1.100.5/24.

5K1

```
Feature interface-vlan
!
Vrf context DATA
!
Vlan 100
```

```
!
Interface E 1/13 , E 1/15
 Switchport mode access
 Switchport access vlan 100
!
Interface vlan 100
 Vrf member DATA
 Ip address 192.1.100.5 255.255.255.0
 No shut
```

Task 18

Configure a VRF with a name of DATA. Configure a VLAN Interface for VLAN 200 with an IP Address of 192.1.200.5/24.

5K2

```
Feature interface-vlan
!
Vrf context DATA
!
Vlan 200
!
Interface vlan 200
 Vrf member DATA
 Ip address 192.1.200.5 255.255.255.0
 No shut
```

Task 19

Configure HSRP on VLAN 100 between N7K1 & N7K2. Use .12 as the Virtual IP Address. N7K1 should try to become the Active Router. Point a default gateway on N5K1 towards the Virtual IP. Use 100 as the Standby Group Number.

7K1

```
Feature HSRP
!
Interface VLAN 100
 Hsrp 100
   Ip 192.1.100.12
   Priority 200
   Preempt
```

7K2

```
Feature HSRP
```

! Interface VLAN 100 Hsrp 100 Ip 192.1.100.12
5K1 Vrf context DATA Ip route 0.0.0.0/0 192.1.100.12

Task 20

Configure HSRP on VLAN 200 between N7K1 & N7K2. Use .12 as the Virtual IP Address. N7K1 should try to become the Active Router. Point a default gateway on N5K2 towards the Virtual IP. Use 200 as the Standby Group Number.

7K1 Interface VLAN 200 Hsrp 200 Ip 192.1.200.12 Priority 200 Preempt
7K2 Interface VLAN 200 Hsrp 200 Ip 192.1.200.12
5K2 Vrf context DATA Ip route 0.0.0.0/0 192.1.200.12

Task 21

Verify the HSRP Status on 7K1 & 7K2 using the **Show HSRP** command.

7K1

```
Show hsrp
!
Vlan100 - Group 100 (HSRP-V1) (IPv4)
  Local state is Active, priority 200 (Cfged 200), may preempt
...
  Virtual IP address is 192.1.100.12 (Cfged)
  Active router is local
  Standby router is 192.1.100.2 , priority 100 expires in 4.770000 sec(s)
-----------------------------------------------
Vlan200 - Group 200 (HSRP-V1) (IPv4)
  Local state is Active, priority 200 (Cfged 200), may preempt
  ...
Virtual IP address is 192.1.200.12 (Cfged)
  Active router is local
  Standby router is 192.1.200.2 , priority 100 expires in 4.428000 sec(s)
...
```

7K2

```
Show hsrp
!
Vlan100 - Group 100 (HSRP-V1) (IPv4)
  Local state is Standby, priority 100 (Cfged 100)
..
 Virtual IP address is 192.1.100.12 (Cfged)
  Active router is 192.1.100.1, priority 200 expires in 3.074000 sec(s)
  Standby router is local
-----------------------------------------------
Vlan200 - Group 200 (HSRP-V1) (IPv4)
  Local state is Standby, priority 100 (Cfged 100)
...
  Virtual IP address is 192.1.200.12 (Cfged)
  Active router is 192.1.200.1, priority 200 expires in 1.883000 sec(s)
  Standby router is local
```

Task 22

Configure the vPC on 7K1 & 7K2 with the peer-gateway feature. This feature allows the Nexus to forward packets destined to the MAC-Address of its peer. This is used in case Load balancers or application servers are using the fast-

path functionality that causes nodes to send traffic to a specified MAC-Address rather than the HSRP virtual MAC Address.

7K1

```
Vpc domain 12
 Peer-gateway
```

7K2

```
Vpc domain 12
 Peer-gateway
```

Task 23

Verify the vPC Status on 7K1 & 7K2 using the **Show vpc** command.

7K1

```
Show vpc
!
vPC domain id                     : 12
Peer status                       : peer adjacency formed ok
vPC keep-alive status             : peer is alive
Configuration consistency status  : success
..
vPC role                          : primary
Number of vPCs configured         : 1
Peer Gateway                      : Enabled

vPC Peer-link status
---------------------------------------------------------------------
id   Port   Status Active vlans
--   ----   ------ --------------------------------------------------
1    Po12   up     1,100,200

vPC status
----------------------------------------------------------------------
id   Port      Status Consistency Reason                Active vlans
--   ----      ------ ----------- ------                ------------
12   Po200     up     success     success               1,100,200
```

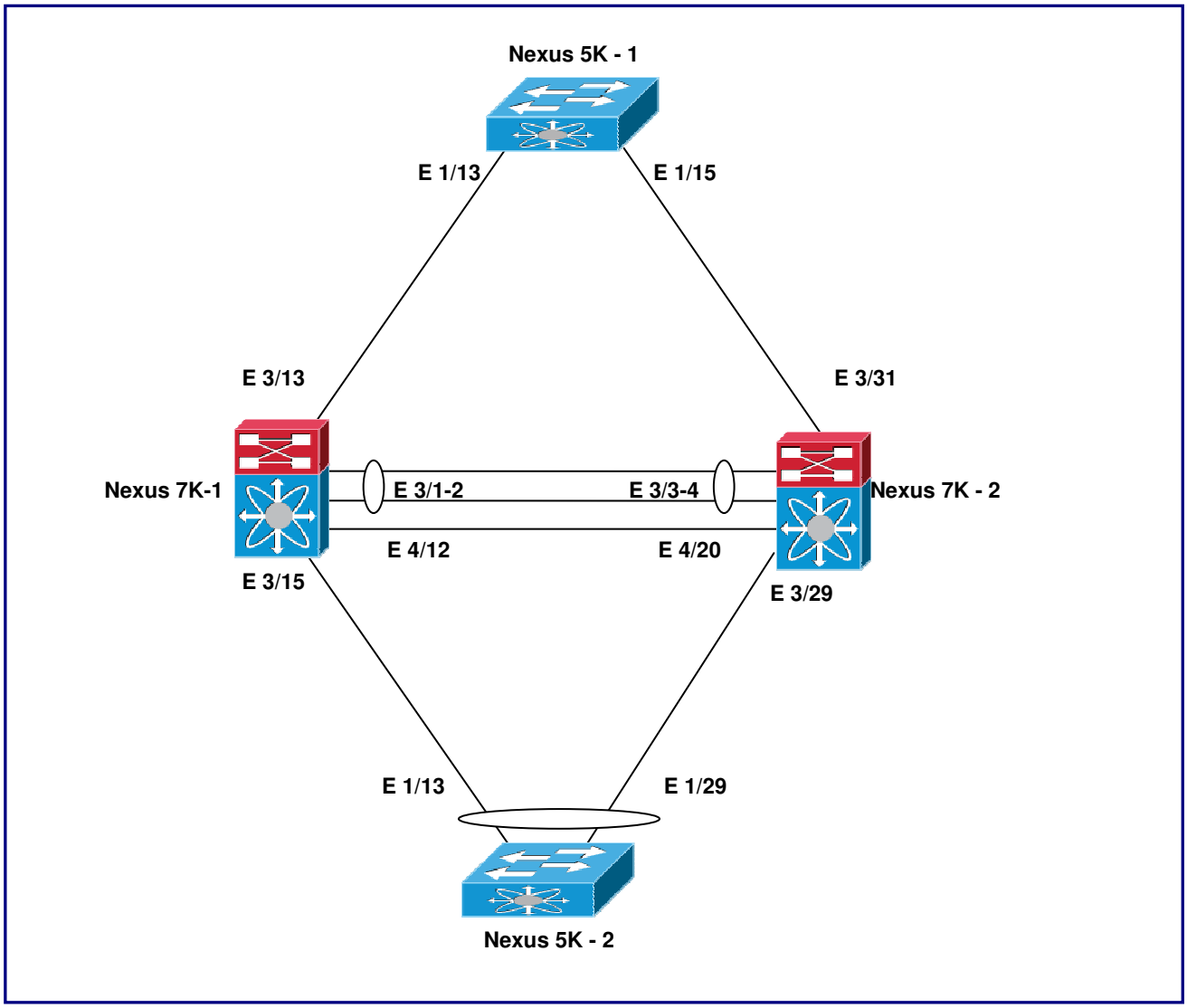
7K2

```
Show vpc
!
vPC domain id                     : 12
```

```
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                   : Enabled
...
vPC Peer-link status
---------------------------------------------------------------------
id   Port   Status Active vlans
--   ----   ------ --------------------------------------------------
1    Po12   up     1,100,200

vPC status
----------------------------------------------------------------------
id   Port      Status Consistency Reason                Active vlans
--   ----      ------ ----------- ------                ------------
12   Po200     up     success     success               1,100,200
```

Lab 13 - Configuring STP with vPC on the Nexus 7K Devices

Physical Setup



Task 1

Connect to 7K1. Configure the admin username with a password of Cciedc01. Configure it with a hostname of 7K1.

7K-1

Configure the password on the setup wizard as : **Cciedc01**

!

!
Hostname 7K1

Task 2
Configure a VDC on 7K1 using the following information:

- VDC 1: Name : **7K1** ID: **1**
  - Interfaces : E 3/1-2, E 3/13, E 3/15, E 4/12, E 4/43
- VDC 2: Name : **7K2** ID: **2**
  - Interfaces : E 3/3-4, E 3/29, E 3/31, E 4/20, E 4/44

7K1

vdc 7K1 id 1
  limit-resource module-type m1 f1
  allocate interface E 3/1-2 , E 4/12 , E 4/43 , E 3/13 , E 3/15
!
vdc 7K2 id 2
  limit-resource module-type m1 f1
  allocate interface E 3/3-4, E 3/29, E 3/31, E 4/20, E 4/44

Note : When you allocate interfaces to VDCs, they are allocated based on Port-groups. Press **Yes** when prompted to allocate all members of the port-group.

Task 3
Verify the Creation of the VDCs by using the sh run vdc and sh vdc membership commands.

7K1

Show run VDC
(Displays the configuration commands for the VDCs)
!
Show VDC membership
(Displays the ports that are members of the VDCs, including the ones that were not specified by you in the command)

Task 4
Configure alias for switching to VDC 7K2 and VDC 7K3 from the default VDC as VDC2 & VDC3 respectively.

7K1

cli alias name N2 switchto vdc 7K2

Task 5
Switch to 7K2 using the appropriate alias you created. Configure the password for the admin account as Cciedc01. Configure a alias for the **Switchback** command as SB. Switchback to the default VDC. Use the alias that you created to switchback.

7K1 N2
7K2 Configure the password on the setup wizard as : **Cciedc01** ! ! cli alias name SB switchback ! SB

Task 6
Configure the prompt to only display the current VDC.

7K-1 no vdc combined-hostname

Task 7
We will be configuring a vPC to 5K2 to 7K1 & 7K2 based on the above diagram. Enable the vPC & LACP features on 7K1 & 7K2.

7K1 Feature vpc Feature lacp
7K2 Feature vpc Feature lacp

Task 8
Configure the parameters for the vPC Peer keepalive link based on the following:

- **7K1**

- VRF Name: **PKL-12**
- Interface: **4/12**
- IP Address: **10.1.12.1/24**

- **7K2**
  - VRF Name: **PKL-12**
  - Interface: **4/20**
  - IP Address: **10.1.12.2/24**

7K1

```
vrf context PKL-12
!
Interface E 4/12
 vrf member PKL-12
 ip address 10.1.12.1/24
 no shut
```

7K2

```
vrf context PKL-12
!
Interface E 4/20
 vrf member PKL-12
 ip address 10.1.12.2/24
 no shut
```

Task 9

Configure a vPC Domain between 7K1 & 7K2. Use **12** as the Domain ID. Use the Interfaces and VRFs from the previous step to configure the vPC Peer Keepalive link. Make 7K1 as the Primary vPC device.

7K1

```
vpc domain 12
  role priority 300
  peer-keepalive destination 10.1.12.2 source 10.1.12.1 vrf PKL-12
```

7K2

```
vpc domain 12
  peer-keepalive destination 10.1.12.1 source 10.1.12.2 vrf PKL-12
```

Task 10

Configure the Port-channel port type as Network. This will enable the Bridge Assurance Fault tolerance feature. Use this port channel as the vPC Peer Link. Use the following parameters:

- **7K1**
  - Port-Channel #: **12**
  - Interfaces: **3/1-2**
  - Port Type: **Network**
- **7K2**
  - Port-Channel #: **12**
  - Interface: **3/3-4**
  - Port Type: **Network**

7K1

```
Interface E 3/1-2
 channel-group 12 mode active
 no shut
!
Interface port-channel 12
 spanning-tree port type network
 switch mode trunk
 vpc peer-link
```

7K2

```
int e 3/3-4
 channel-group 12 mode active
 no shut
!
Interface port-channel 12
 switch mode trunk
 spanning-tree port type network
 vpc peer-link
```

Task 11

Verify the status of the vPC Port Channel. Also, make sure the vPC Peer keepalive link is up. Use the **Show VPC** command to verify it.

7K1

Show VPC

```
vPC domain id                     : 12
Peer status                       : peer adjacency formed ok
vPC keep-alive status             : peer is alive
Configuration consistency status  : success
...
vPC role                          : primary
..
Peer Gateway                      : Disabled
...
vPC Peer-link status
---------------------------------------------------------------------
id   Port   Status Active vlans
--   ----   ------ --------------------------------------------------
1    Po12   up     1
```

7K2

Show VPC

```
vPC domain id                     : 12
Peer status                       : peer adjacency formed ok
vPC keep-alive status             : peer is alive
Configuration consistency status  : success
...
vPC role                          : secondary
..
Peer Gateway                      : Disabled
...
vPC Peer-link status
---------------------------------------------------------------------
id   Port   Status Active vlans
--   ----   ------ --------------------------------------------------
1    Po12   up     1
```

Task 12

Configure a port-channel from 7K1 & 7K2 towards 5K2 using vPC. Configure it as a L2 Trunk Port Channel. Use 12 as the Port-channel ID. Use E 3/15 on 7K1 & E 3/29 on 7K2 as the vPC member ports.

7K1

```
Interface E 3/15
 switchport
 channel-group 200 mode active
 no shut
!
Interface port-channel 200
 switchport mode trunk
 vpc 12
```

7K2

```
Interface E 3/29
 switchport
 channel-group 200 mode active
 no shut
!
Interface port-channel 200
 switchport mode trunk
 vpc 12
```

Task 13

Enable the LACP feature on 5K2. Configure a normal Port-Channel on 5K2. Configure it as a L2 Trunk Port Channel. Use 200 as the Port-channel ID. Use E 1/13 & E 1/29 on 5K2 as the member ports.

5K2

```
feature lacp
!
Interface E 1/13 ,  E 1/29
 channel-group 200 mode active
 no shut
!
Interface port-channel 200
 switchport mode trunk
```

Task 14

Verify the status of the Port Channel on 5K2. Use the normal **Show port-channel summary** command to verify it.

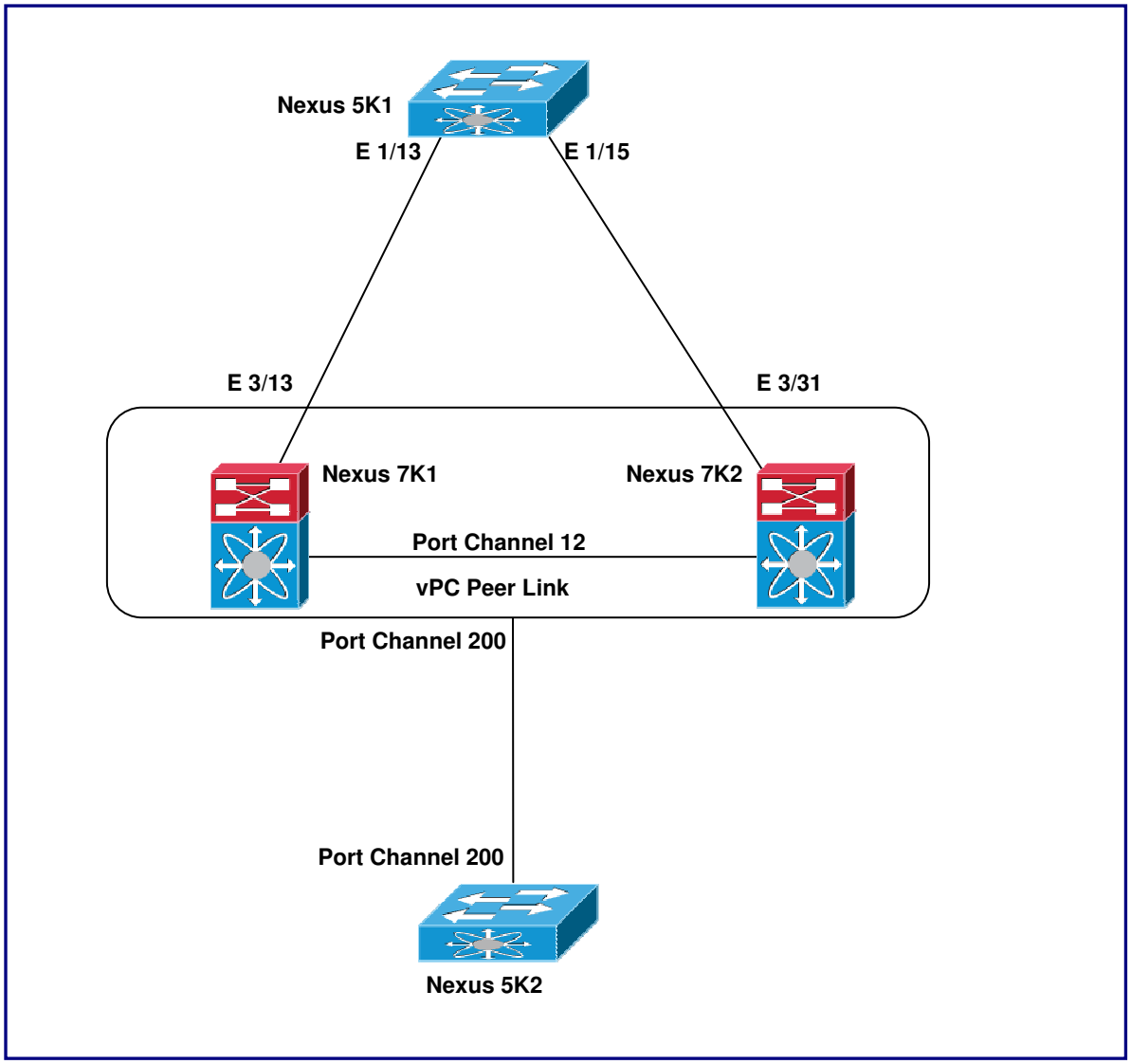
5K2

show port-channel summary

P - Up in Port-channel (member)
S - Switched
U - Up (Port-Channel)
.
.
.

Group	Port-Channel	Type	Protocol	Member Ports	
200	**Po200(SU)**	Eth	LACP	**Eth1/13(P)**	**Eth1/29(P**)

Note: In this setup, 7K-1 & 7K-2 are seen as one logical switch by 5K2. The following is the logical diagram.



Task 15

Configure trunks from Nexus 5K1 towards 7K1 & 7K2. 5K1 sees them as 2 separate switches unlike 5K2 which sees them as 1 switch due to the vPC configuration.

5K1 Interface E 1/13 , E 1/15 switchport mode trunk
7K1 Interface E 3/13 switchport mode trunk
7K2 Interface E 3/31 switchport mode trunk

Task 16

Verify the Spanning Tree configuration by using the show span vlan 1. At this time, all traffic from 5K1 towards the Aggregation (7K1 7K2) will use the 5K1-7K1 link as the other link will be blocked for all VLANs assuming 7K1 has a lower Bridge ID.

5K1

Show spanning-tree vlan1

```
VLAN0001
  Spanning tree enabled protocol rstp
  Root ID    Priority    32769
             Address     0018.bad8.29d1
             Cost        2
             Port        141 (Ethernet1/13)
             Hello Time  2  sec  Max Age 20 sec  Forward Delay 15 sec
....
Interface        Role    Sts      Cost     Prio.Nbr   Type
---------------- ----      ---      --------- --------     --------------------------------
....
Eth1/13          Root FWD      2        128.141  P2p
Eth1/15          Altn  BLK      2        128.143  P2p
```

5K2

Show spanning-tree vlan1

```
VLAN0001
  Spanning tree enabled protocol rstp
  Root ID    Priority    32769
             Address     0018.bad8.29d1
             Cost        1
             Port        4295 (port-channel200)
             Hello Time  2  sec  Max Age 20 sec  Forward Delay 15 sec
...
Interface        Role    Sts Cost      Prio.Nbr Type
---------------- ---- --- --------- -------- --------------------------------
Po200            Root FWD 1         128.4295 P2p
```

Task 17

Configure the Peer-switch feature for the vPC domain 12. Set the Bridge Priority on both switches as 8192.

7K1 spanning-tree vlan 1 priority 8192 ! vpc domain 12 peer-switch
7K2 spanning-tree vlan 1 priority 8192 ! vpc domain 12 peer-switch

Task 18

Verify the Change in the bridge ID by using the show spanning-tree command.

5K1

```
Show spanning-tree
!
VLAN0001
  Spanning tree enabled protocol rstp
  Root ID    Priority    8193
             Address     0023.04ee.be0c
             Cost        2
             Port        141 (Ethernet1/13)
             Hello Time  2  sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority    32769  (priority 32768 sys-id-ext 1)
             Address     547f.eef2.3bfc
             Hello Time  2  sec  Max Age 20 sec  Forward Delay 15 sec

Interface        Role   Sts     Cost      Prio.Nbr Type
---------------- ----   ---     --------- -------- --------------------------------
Eth1/13          Root   FWD     2         128.141  P2p
Eth1/15          Altn   BLK     2         128.143  P2p
```

5K2

```
Show spanning-tree vlan1 detail
!
VLAN0001
  Spanning tree enabled protocol rstp
  Root ID    Priority    8193
             Address     0023.04ee.be0c
             Cost        1
             Port        4295 (port-channel200)
             Hello Time  2  sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority    32769  (priority 32768 sys-id-ext 1)
             Address     547f.ee4c.30fc
             Hello Time  2  sec  Max Age 20 sec  Forward Delay 15 sec

Interface        Role   Sts     Cost      Prio.Nbr  Type
---------------- ----   ---     --------- --------  --------------------------------
Po200            Root   FWD     1         128.4295  P2p
```

Task 19
Configure 2 VLANs (100 & 200) on all 4 Switches.

5K1 vlan 100 vlan 200
5K2 vlan 100 vlan 200
7K1 vlan 100 vlan 200
7K2 vlan 100 vlan 200

Task 20
Configure the root priority for all vlans on N7K1 and N7K2 as 8192.

7K1 spanning-tree vlan 1,100,200 priority 8192
7K2 spanning-tree vlan 1,100,200 priority 8192

Task 21
Configure pseudo-information to load share VLAN 100 & VLAN 200. 7K1 should be preferred for VLAN 100 & 7K2 should be preferred for VLAN 200. Set the parameters based on the following:

- **7K1**
  - VLAN **100** : Root Priority: **4096** Designated Priority : **8192**
  - VLAN **200** : Root Priority: **4096** Designated Priority : **12288**
- **7K2**
  - VLAN **100** : Root Priority: **4096** Designated Priority : **12288**
  - VLAN **200** : Root Priority: **4096** Designated Priority : **8192**

7K1

```
Spanning-tree pseudo-information
 Vlan 100,200 root priority 4096
 Vlan 100 designated priority 8192
 Vlan 200 designated priority 12288
```

7K2

```
Spanning-tree pseudo-information
 Vlan 100,200 root priority 4096
 Vlan 100 designated priority 12288
 Vlan 200 designated priority 8192
```

Task 22

Verify the Change in the bridge ID by using the show span vlan command for VLAN 100 & 200 on N5K1.

5K1

```
Show spanning-tree vlan 100
!
VLAN0100
  Spanning tree enabled protocol rstp
  Root ID    Priority    4196
             Address     0023.04ee.be0c
             Cost        2
             Port        141 (Ethernet1/13)
             Hello Time  2  sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority    32868  (priority 32768 sys-id-ext 100)
             Address     547f.eef2.3bfc
             Hello Time  2  sec  Max Age 20 sec  Forward Delay 15 sec

Interface        Role  Sts    Cost      Prio.Nbr  Type
---------------- ----  ---    --------- --------  --------------------------------
Eth1/13          Root  FWD  2         128.141   P2p
Eth1/15          Altn  BLK  2         128.143   P2p
==========================================================
 Show spanning-tree vlan 200
!
VLAN0200
  Spanning tree enabled protocol rstp
  Root ID    Priority    4296
             Address     0023.04ee.be0c
             Cost        2
             Port        143 (Ethernet1/15)
```

```
          Hello Time  2  sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority    32968  (priority 32768 sys-id-ext 200)
          Address     547f.eef2.3bfc
          Hello Time  2  sec  Max Age 20 sec  Forward Delay 15 sec

Interface        Role    Sts    Cost      Prio.Nbr  Type
---------------- ----    ---    --------- --------  --------------------------------
Eth1/13          Altn    BLK    2         128.141   P2p
Eth1/15          Root    FWD    2         128.143   P2p
```

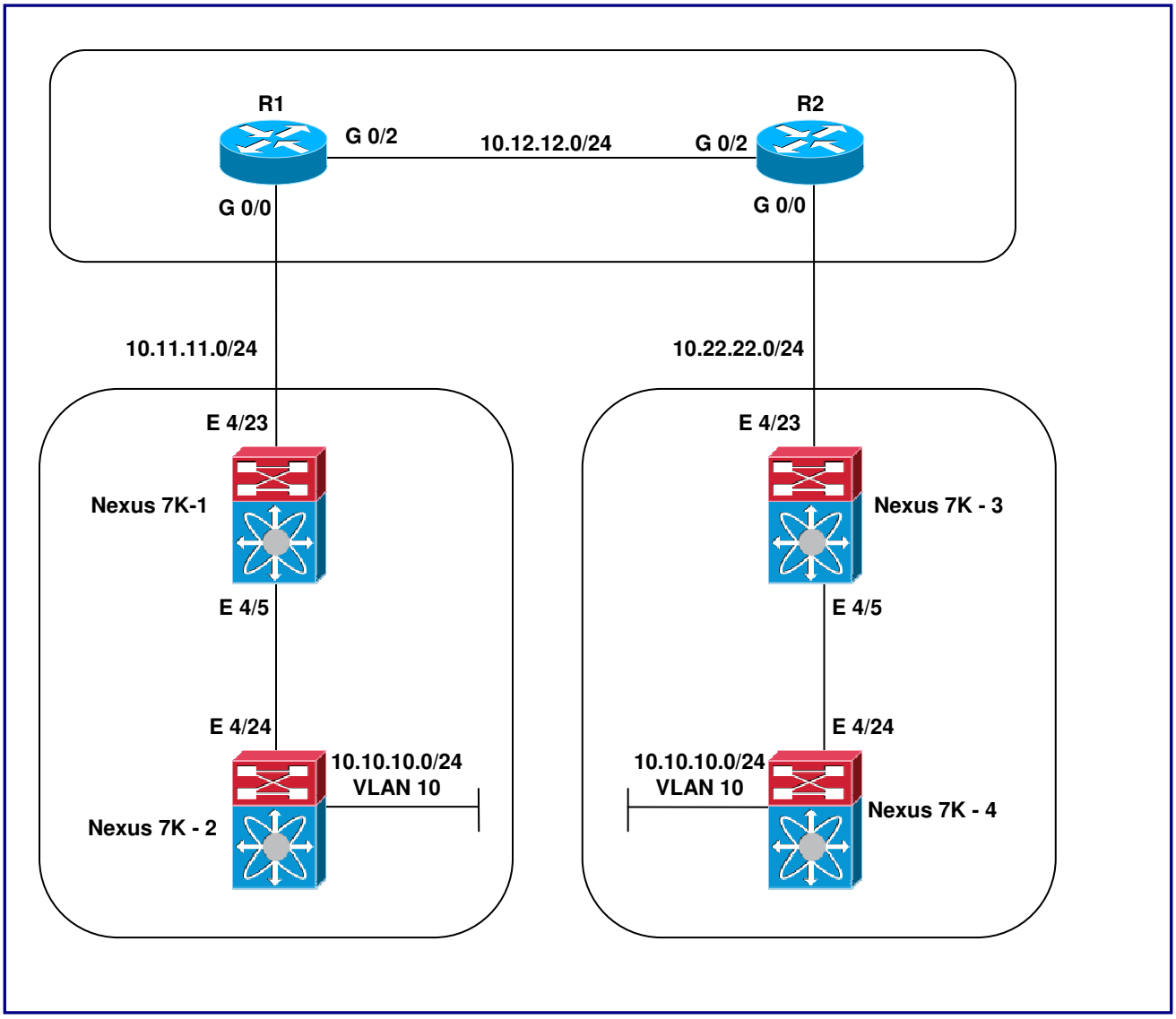
Cisco Nexus Switch Configuration

Authored By:

Khawar Butt
Penta CCIE # 12353
CCDE # 20110020

Module 6 – Advanced Topics - OTV & Fabric Path

Lab 1- Configuring OTV - Multicast-based



Task 1

Connect to 7K1. Configure the admin username with a password of Cciedc01. Configure it with a hostname of 7K1.

7K-1

Configure the password on the setup wizard as : **Cciedc01**

!

!

Hostname 7K1

Task 2
Configure a VDCs on 7K1 using the following information:

- VDC 2: Name : **7K2** ID: **2**
  - Interfaces : E 4/24

7K-1

```
vdc 7K2 id 2
  allocate interface E 4/24
!
```

Note : When you allocate interfaces to VDCs, they are allocated based on Port-groups. Press **Yes** when prompted to allocate all members of the port-group.

Task 3
Connect to 7K3. Configure the admin username with a password of Cciedc01. Configure it with a hostname of 7K3.

7K-3

Configure the password on the setup wizard as : **Cciedc01**
!
!
Hostname 7K3

Task 4
Configure a VDCs on 7K3 using the following information:

- VDC 2: Name : **7K4** ID: **2**
  - Interfaces : E 4/24

7K-3

```
vdc 7K4 id 2
  allocate interface E 4/24
!
```

Note : When you allocate interfaces to VDCs, they are allocated based on Port-groups. Press **Yes** when prompted to allocate all members of the port-group.

Task 5

Configure VLAN 10 on all 4 Nexus Switches (7K1 - 7K4). Configure the Trunk links between 7K1-7K2 & 7K3-7K4. Configure VLAN 10 SVI's on 7K2 & 7K4. Assign them IP based on the following:

- **7K2**
  - Interface VLAN **10** : Address: **10.10.10.2/24**
- **7K4**
  - Interface VLAN **10** : Address: **10.10.10.4/24**

7K-1

```
VLAN 10
!
Interface Ethernet4/5
  switchport
  switchport mode trunk
  no shutdown
```

7K-2

```
Feature interface-vlan
!
VLAN 10
!
Interface Ethernet4/24
  switchport
  switchport mode trunk
  no shutdown
!
Interface VLAN 10
 Ip address 10.10.10.2/24
 No shut
```

7K-3

```
VLAN 10
!
Interface Ethernet4/5
  switchport
  switchport mode trunk
  no shutdown
```

7K-4

```
Feature interface-vlan
!
```

```
VLAN 10
!
Interface Ethernet4/24
  switchport
  switchport mode trunk
  no shutdown
!
Interface VLAN 10
 Ip address 10.10.10.4/24
 No shut
```

Task 6

Configure IP connectivity from 7K1 to 7K3. Run OSPF as the routing protocol in Area 0. Configure 7K1, R1, R2 & 7K3 based on the following:

- **7K1**
  - Interface Loopback0 : **10.1.1.1/32**
  - Interface E 4/23 : **10.11.11.1/24**
- **R1**
  - Interface Loopback0 : **1.1.1.1/32**
  - Interface G 0/0 : **10.11.11.11/24**
  - Interface G 0/2 : **10.12.12.11/24**
- **R2**
  - Interface Loopback0 : **2.2.2.2/32**
  - Interface G 0/0 : **10.22.22.22/24**
  - Interface G 0/2 : **10.12.12.22/24**
- **7K3**
  - Interface Loopback0 : **10.3.3.3/32**
    Interface E 4/23 : **10.22.22.3/24**

7K-1

```
feature ospf
!
router ospf 1
  router-id 10.1.1.1
!
interface Loopback0
  ip address 10.1.1.1/32
  ip router ospf 1 area 0
!
interface E 4/23
  ip address 10.11.11.1/24
  ip router ospf 1 area 0
```

no shutdown
R1 Interface Loopback0 ip address 1.1.1.1 255.255.255.255 ! interface G 0/0 ip address 10.11.11.11 255.255.255.0 no shut ! interface G 0/2 ip address 10.12.12.11 255.255.255.0 no shut ! Router ospf 1 router-id 11.11.11.11 network 1.1.1.1 0.0.0.0 area 0 network 10.11.11.0 0.0.0.255 area 0 network 10.12.12.0 0.0.0.255 area 0
R2 Interface Loopback0 ip address 2.2.2.2 255.255.255.255 ! Interface G 0/0 ip address 10.22.22.22 255.255.255.0 no shut ! Interface G 0/2 ip address 10.12.12.22 255.255.255.0 no shut ! Router ospf 1 router-id 22.22.22.22 network 2.2.2.2 0.0.0.0 area 0 network 10.22.22.0 0.0.0.255 area 0 network 10.12.12.0 0.0.0.255 area 0
7K-3 feature ospf ! Router ospf 1 router-id 10.3.3.3 !

```
Interface loopback0
  ip address 10.3.3.3/32
  ip router ospf 1 area 0
!
Interface E 4/23
  ip address 10.22.22.3/24
  ip router ospf 1 area 0
  no shutdown
```

Task 7

Make sure that the OSPF neighbor relationships are up using the **Show IP OSPF neighbor** command.

7K-1

```
Show ip OSPF neighbor
!
OSPF Process ID 1 VRF default
 Total number of neighbors: 1
 Neighbor ID     Pri   State            Up Time    Address         Interface
 11.11.11.11       1   FULL/DR          01:22:20   10.11.11.11     Eth4/23
```

7K-3

```
Show ip OSPF neighbor
!
OSPF Process ID 1 VRF default
 Total number of neighbors: 1
 Neighbor ID     Pri   State            Up Time    Address         Interface
 22.22.22.22       1   FULL/DR          01:16:36   10.22.22.12     Eth4/23
```

Task 8

Configure PIM Sparse Mode on R1 & R2. Run PIM Sparse-Mode on all interfaces. Configure IGMPv3 on the Nexus facing Interfaces. Set R1 as the RP. Set the MTU size to 9216.

R1

```
ip multicast-routing
!
Interface Loopback0
 ip pim sparse-mode
!
Interface G 0/0
 mtu 9216
```

```
 ip pim sparse-mode
 ip igmp version 3
!
Interface G 0/2
 ip pim sparse-mode
!
ip pim rp-address 1.1.1.1
```

R2

```
ip multicast-routing
!
Interface Loopback0
 ip pim sparse-mode
!
Interface G 0/0
 mtu 9216
 ip pim sparse-mode
 ip igmp version 3
!
interface G 0/2
 ip pim sparse-mode
!
ip pim rp-address 1.1.1.1
```

Task 9

Configure OTV to connect 7K1 & 7K3 using the following:

- **7K1**
  - Site VLAN : **99**
  - Site ID : **0.0.1**
  - Join Interface : **E 4/23**
  - Multicast Control Group : **239.1.1.1**
  - Multicast Data Group : **232.1.1.0/28**
  - Extend VLAN(s) : **10**
  - IGMP v3 : **E 4/23**
  - MTU : **E 4/23 - 9216**
- **7K3**
  - Site VLAN : **99**
  - Site ID : **0.0.2**
  - Join Interface : **E 4/23**
  - Multicast Control Group : **239.1.1.1**
  - Multicast Data Group : **232.1.1.0/28**
  - Extend VLAN(s) : **10**
  - IGMP v3 : **E 4/23**
  - MTU : **E 4/23 - 9216**

7K1

```
VLAN 99
!
feature otv
!
otv site-vlan 99
otv site-identifier 0.0.1
!
interface Overlay1
  otv join-interface E 4/23
  otv control-group 239.1.1.1
  otv data-group 232.1.1.0/28
  otv extend-vlan 10
  no shutdown
!
interface E 4/23
  mtu 9216
  ip igmp version 3
```

7K3

```
VLAN 99
```

```
!
feature otv
!
otv site-vlan 99
otv site-identifier 0.0.2
!
interface Overlay1
  otv join-interface E 4/23
  otv control-group 239.1.1.1
  otv data-group 232.1.1.0/28
  otv extend-vlan 10
  no shutdown
!
interface E 4/23
  mtu 9216
  ip igmp version 3
```

Task 10

Verify the OTV status by using the **show OTV** command.

7K-1

```
show otv
!
OTV Overlay Information
Site Identifier 0000.0000.0001

Overlay interface Overlay1

 VPN name              : Overlay1
 VPN state             : UP
 Extended vlans        : 10 (Total:1)
 Control group         : 239.1.1.1
 Data group range(s)   : 232.1.1.0/28
 Broadcast group       : 239.1.1.1
 Join interface(s)     : Eth4/23 (10.11.11.1)
 Site vlan             : 99 (up)
 AED-Capable           : Yes
 Capability            : Multicast-Reachable
```

7K-3

```
show otv
!
OTV Overlay Information
```

Site Identifier **0000.0000.0002**

Overlay interface Overlay1

VPN name : Overlay1
VPN state : **UP**
Extended vlans : **10** (Total:1)
Control group : 239.1.1.1
Data group range(s) : 232.1.1.0/28
Broadcast group : 239.1.1.1
Join interface(s) : Eth4/23 (10.22.22.3)
Site vlan : **99 (up)**
AED-Capable : **Yes**
Capability : **Multicast-Reachable**

Task 11

Verify the OTV Unicast MAC Routing Table by using the **Show otv route** command.

7K-1

Show otv route
!
OTV Unicast MAC Routing Table For Overlay1

VLAN	MAC-Address	Metric	Uptime	Owner	Next-hop(s)
10	**0018.bad8.29d2**	42	00:01:27	overlay	**7K3**
10	**0024.986d.2442**	1	00:01:02	site	**Ethernet4/5**

7K-3

Show otv route
!
OTV Unicast MAC Routing Table For Overlay1

VLAN	MAC-Address	Metric	Uptime	Owner	Next-hop(s)
10	**0018.bad8.29d2**	1	00:01:59	site	**Ethernet4/5**
10	**0024.986d.2442**	42	00:01:34	overlay	**7K1**

Task 12

Verify connectivity by ping 10.10.10.4 from 7K2 (10.10.10.2)

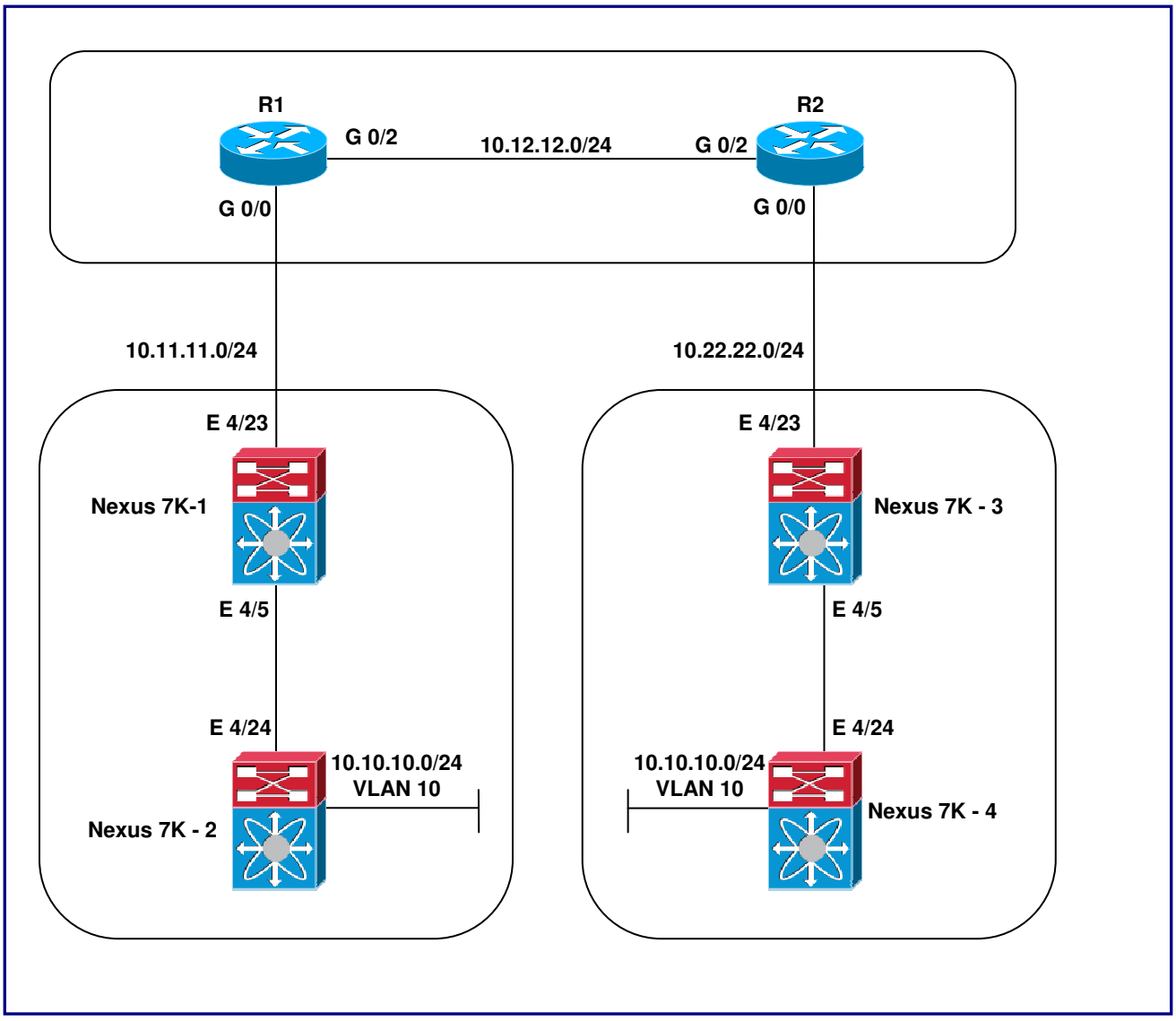
7K-2

Ping 10.10.10.4 source 10.10.10.2

```
!
PING 10.10.10.4 (10.10.10.4) from 10.10.10.2: 56 data bytes
64 bytes from 10.10.10.4: icmp_seq=0 ttl=254 time=2.009 ms
64 bytes from 10.10.10.4: icmp_seq=1 ttl=254 time=1.275 ms
64 bytes from 10.10.10.4: icmp_seq=2 ttl=254 time=1.221 ms
64 bytes from 10.10.10.4: icmp_seq=3 ttl=254 time=1.225 ms
64 bytes from 10.10.10.4: icmp_seq=4 ttl=254 time=1.221 ms
```

Lab 2- Configuring OTV - Unicast-Based

(Builds on Lab 1)



Task 1

Disable OTV on 7K1 & 7K3 so all the OTV Configuration is erased.

7K1 No feature otv
7K3

```
No feature otv
```

Task 2

Configure OTV to connect 7K1 & 7K3 using the following:

- **7K1**
  - Site VLAN : **99**
  - Site ID : **0.0.1**
  - Join Interface : **E 4/23**
  - Unicast-based Adjacency : **7K1 (10.11.11.1)**
  - Extend VLAN(s) : **10**
  - IGMP v3 : **E 4/23**
  - MTU : **E 4/23 - 9216**
- **7K3**
  - Site VLAN : **99**
  - Site ID : **0.0.2**
  - Join Interface : **E 4/23**
  - Unicast-based Adjacency : **7K1 (10.11.11.1)**
  - Extend VLAN(s) : **10**
  - IGMP v3 : **E 4/23**
  - MTU : **E 4/23 - 9216**

7K1

```
VLAN 99
!
feature otv
!
otv site-vlan 99
otv site-identifier 0.0.1
!
interface Overlay1
  otv join-interface E 4/23
  otv adjacency-server unicast-only
  otv extend-vlan 10
  no shutdown
!
Interface E 4/23
  mtu 9216
  no shutdown
```

7K3

```
VLAN 99
!
```

```
feature otv
!
otv site-vlan 99
otv site-identifier 0.0.2
!
interface Overlay1
  otv join-interface E 4/23
  otv adjacency-server unicast-only
  otv use-adjacency-server 10.11.11.1 unicast-only
  otv extend-vlan 10
  no shutdown
!
interface E 4/23
  mtu 9216
  ip igmp version 3
```

Task 3

Verify the OTV status by using the **show OTV** command.

7K-1

```
show otv
!
OTV Overlay Information
Site Identifier 0000.0000.0001

Overlay interface Overlay1

 VPN name             : Overlay1
 VPN state            : UP
 Extended vlans       : 10 (Total:1)
 Join interface(s)    : Eth4/23 (10.11.11.1)
 Site vlan            : 99 (up)
 AED-Capable          : Yes
 Capability           : Unicast-Only
 Is Adjacency Server  : Yes
 Adjacency Server(s)  : [None] / [None]
```

7K-3

```
show otv
!
OTV Overlay Information
Site Identifier 0000.0000.0002
```

Overlay interface Overlay1

VPN name : Overlay1
VPN state : **UP**
Extended vlans : **10 (Total:1)**
Join interface(s) : **Eth4/23 (10.22.22.3)**
Site vlan : **99 (up)**
AED-Capable : **Yes**
Capability : **Unicast-Only**
Is Adjacency Server : **Yes**
Adjacency Server(s) : **10.11.11.1 / [None]**

Task 4

Verify the OTV ISIS adjacency using the **show otv isis adjacency** command.

7K-1

Show otv isis adjacency
!
TV-IS-IS process: default VPN: **Overlay1**
OTV-IS-IS adjacency database:

System ID	SNPA	Level	State	Hold Time	Interface	Site-ID
7K3	0018.bad8.29d1	1	**UP**	00:01:01	**Overlay1**	**0000.0000.0002**

7K-3

Show otv route
!
OTV-IS-IS process: default VPN: **Overlay1**
OTV-IS-IS adjacency database:

System ID	SNPA	Level	State	Hold Time	Interface	Site-ID
7K1	0024.986d.2441	1	**UP**	00:01:01	**Overlay1**	**0000.0000.0001**

Task 5

Verify the OTV Unicast MAC Routing Table by using the **Show otv route** command.

7K-1

Show otv route
!
OTV Unicast MAC Routing Table For Overlay1

VLAN	MAC-Address	Metric	Uptime	Owner	Next-hop(s)

10	**0018.bad8.29d2**	42	00:01:27	overlay	**7K3**
10	**0024.986d.2442**	1	00:01:02	site	**Ethernet4/5**

7K-3

Show otv route
!
OTV Unicast MAC Routing Table For Overlay1

VLAN	MAC-Address	Metric	Uptime	Owner	Next-hop(s)
10	**0018.bad8.29d2**	1	00:01:59	site	**Ethernet4/5**
10	**0024.986d.2442**	42	00:01:34	overlay	**7K1**

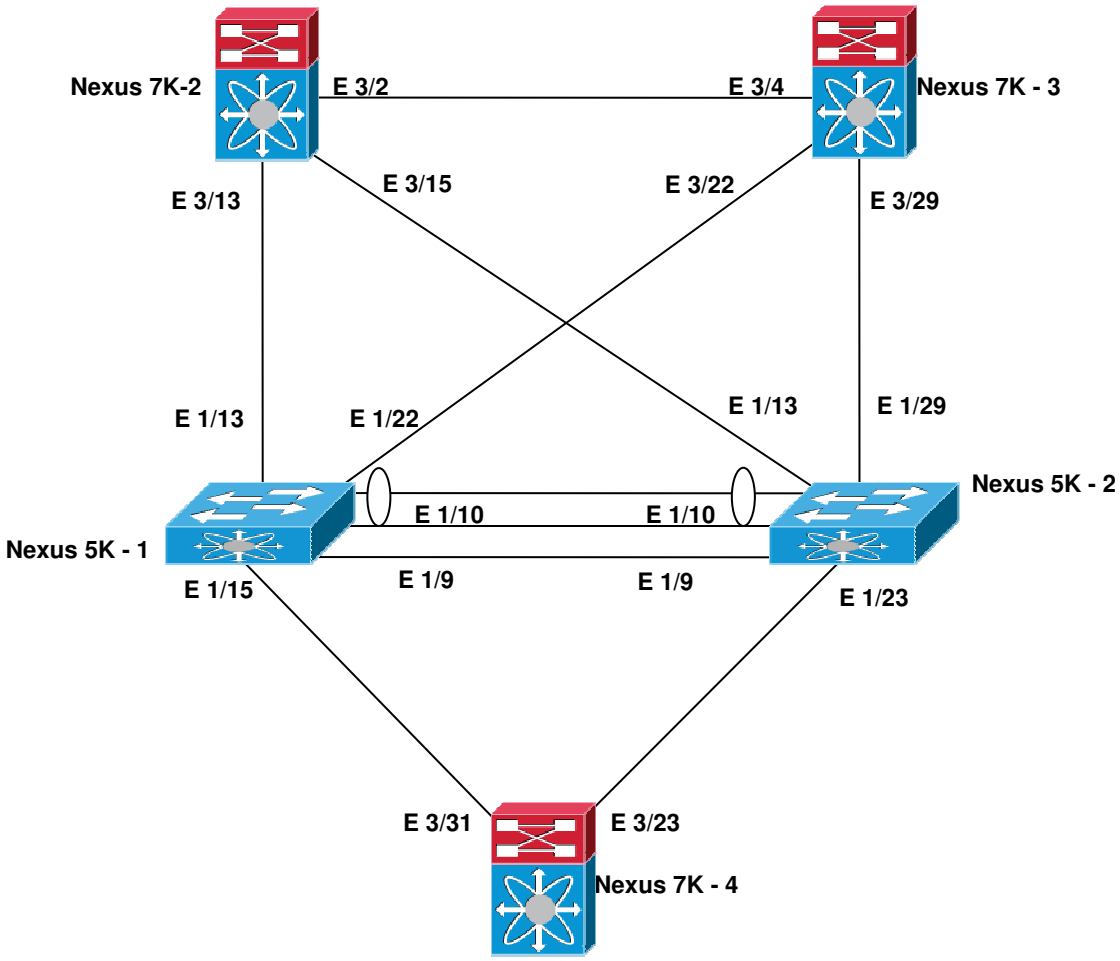
Task 6

Verify connectivity by ping 10.10.10.4 from 7K2 (10.10.10.2)

7K-2

Ping 10.10.10.4 source 10.10.10.2
!
PING 10.10.10.4 (10.10.10.4) from 10.10.10.2: 56 data bytes
64 bytes from 10.10.10.4: icmp_seq=0 ttl=254 time=2.009 ms
64 bytes from 10.10.10.4: icmp_seq=1 ttl=254 time=1.275 ms
64 bytes from 10.10.10.4: icmp_seq=2 ttl=254 time=1.221 ms
64 bytes from 10.10.10.4: icmp_seq=3 ttl=254 time=1.225 ms
64 bytes from 10.10.10.4: icmp_seq=4 ttl=254 time=1.221 ms

Lab 3- Configuring Fabricpath on the Nexus Switches



Task 1

Configure 3 VDCs on 7K1 using the following information:

- VDC 2: Name : **7K2** ID: **2**
  - Interfaces : E 3/1-2, E 3/13 - 16, E 4/20-21, E 4/24
- VDC 3: Name : **7K3** ID: **3**
  - Interfaces : E 3/17-18, E 3/29-30, E 4/15-16

- VDC 4: Name : **7K3** ID: **3**
  - Interfaces : E 3/17-18, E 3/29-30, E 4/15-16

7K-1

```
vdc 7K2 id 2
  limit-resource module-type m1 f1
  allocate interface E 3/1-2, E 3/13-16, E 4/24
!
vdc 7K3 id 3
  limit-resource module-type m1 f1
  allocate interface E 3/3-4, E 3/21-22, E 3/29-30, E 4/44
!
vdc 7K4 id 4
  limit-resource module-type m1 f1
  allocate interface E 3/23-24, E 3/31-32, E 4/48
```

Note : When you allocate interfaces to VDCs, they are allocated based on Port-groups. Press **Yes** when prompted to allocate all members of the port-group.

Task 2

Install the fabricpath feature-set license on 7K1, 5K1 & 5K2. Enable the Fabricpath feature-set on 7K2, 7K3, 5K1 & 5K2.

7K-1

```
install feature-set fabricpath
```

7K-2

```
feature-set fabricpath
```

7K-3

```
feature-set fabricpath
```

5K-1

```
install feature-set fabricpath
feature-set fabricpath
```

5K-2

```
install feature-set fabricpath
feature-set fabricpath
```

Task 3

Configure Fabricpath switch ID's and Fabricpath links based on the following table:

- **7K2**
  - Switch-id : 72
  - E 3/2 , E 3/13, E 3/15
- **7K3**
  - Switch-id : 73
  - E 3/4 , E 3/22, E 3/29
- **5K1**
  - Switch-id : 51
  - E 1/13 , E 1/22
- **5K1**
  - Switch-id : 52
  - E 1/13 , E 1/29

7K-2 Fabricpath switch-id 72 ! Interface E 3/2 , E 3/13 , E 3/15 switchport mode fabricpath no shut
7K-3 Fabricpath switch-id 73 ! Interface E 3/4 , E 3/22 , E 3/29 switchport mode fabricpath no shut
5K1 Fabricpath switch-id 51 ! Interface E 1/13 , E 1/22 switchport mode fabricpath no shut
5K2 Fabricpath switch-id 52 ! Interface E 1/13 , E 1/29 switchport mode fabricpath

```
no shut
```

Task 4

Verify the Fabricpath configuration and communications using the **Show fabricpath switch-id** command.

7K-2

```
show fabricpath switch-id
!
                    FABRICPATH SWITCH-ID TABLE
Legend: '*' - this system
        '[E]' - local Emulated Switch-id
        '[A]' - local Anycast Switch-id
Total Switch-ids: 4
================================================================
SWITCH-ID      SYSTEM-ID       FLAGS       STATE       STATIC  EMULATED/
                                                               ANYCAST
--------------+--------------------+-----------+---------------+---------+---------------
   51          547f.eef2.3bfc      Primary     Confirmed     Yes       No
   52          547f.ee4c.30fc      Primary     Confirmed     Yes       No
*  72          0018.bad8.29d2      Primary     Confirmed     Yes       No
   73          0018.bad8.29d3      Primary     Confirmed     Yes       No
```

Task 5

Verify that the ISIS neighbor adjacencies are established by using the **show fabricpath isis adjacency** command.

7K-2

```
Fabricpath  IS-IS domain: default Fabricpath IS-IS adjacency database:

System ID   SNPA          Level  State  Hold Time  Interface
7K3         N/A           1      UP     00:00:31   Ethernet3/2
5K1         N/A           1      UP     00:00:29   Ethernet3/13
5K2         N/A           1      UP     00:00:32   Ethernet3/15
```

Task 6

Configure a trunk interface connecting 5K1-7K4. **Do not configure the link between 5K2 & 7K4 yet. It will be used in the next lab.**

5K-1

```
Interface E 1/15
 switchport mode trunk
```

7K-4

```
Interface E 3/31
 switchport
 switchport mode trunk
 no shut
```

Task 7

Verify the trunk status using the **Show interface trunk** command.

Note : The Trunks between the 7K2, 7K3, 5K1 & 5K2 are Fabricpath based whereas the one towards 7K4 is a normal trunk.

7K-2

```
Show interface trunk
!
--------------------------------------------------------------------------------
Port          Native  Status        Port
              Vlan                  Channel
--------------------------------------------------------------------------------
Eth3/2        1       fabricpath    --
Eth3/13       1       fabricpath    --
Eth3/15       1       fabricpath    --
```

5K1

```
--------------------------------------------------------------------------------
Port          Native  Status        Port
              Vlan                  Channel
--------------------------------------------------------------------------------
Eth1/13       1       fabricpath    --
Eth1/15       1       trunking      --
Eth1/22       1       fabricpath    --
```

Task 8

Configure a VLAN 100 on all switches (7K2, 7K3, 7K4, 5K1 & 5K2). Configure it as a fabricpath VLAN on 7K2, 7K3, 5K1 & 5K2. Set 5K1 & 5K2 as Root bridges for VLAN 100.

7K-2 vlan 100 mode fabricpath
7K-3 vlan 100 mode fabricpath
5K-1 vlan 100 mode fabricpath ! spanning-tree vlan 100 priority 0
5K-2 vlan 100 mode fabricpath ! spanning-tree vlan 100 priority 0

Task 9

Verify the status of the VLAN using the Show VLAN command

Note : The VLAN-Mode for VLAN 100 is Fabricpath.

5K-1

show VLAN

```
VLAN Name                           Status    Ports
---- -------------------------------- --------- -------------------------------
1    default                         active    Eth1/1, Eth1/2, Eth1/3, Eth1/4
....
100  VLAN0100                        active    Eth1/13, Eth1/15, Eth1/22

VLAN Type  Vlan-mode
---- ----- ----------
1    enet  CE
100  enet  FABRICPATH
```

Task 10

Verify the status of Spanning-tree on 5K-1.

Note : 5K-1 is the Spanning-tree root bridge for VLAN 100.

5K-1

show spanning-tree vlan 100

```
VLAN0100
  Spanning tree enabled protocol rstp
  Root ID    Priority    100
             Address     c84c.75fa.600a
             This bridge is the root
             Hello Time  2  sec  Max Age 20 sec  Forward Delay 15 sec
.......

Interface        Role  Sts     Cost      Prio.Nbr  Type
---------------- ----  ------  --------- --------- --------------------------------
Eth1/15          Desg  FWD     2         128.143   P2p
```

Task 11

Verify the Fabric Routes to reach switches using Fabricpath ISIS using the **show fabricpath route** command.

5K-1

show fabricpath route

```
FabricPath Unicast Route Table
'a/b/c' denotes ftag/switch-id/subswitch-id
'[x/y]' denotes [admin distance/metric]
ftag 0 is local ftag
subswitch-id 0 is default subswitch-id


FabricPath Unicast Route Table for Topology-Default

0/51/0, number of next-hops: 0
       via ---- , [60/0], 0 day/s 01:44:33, local
1/52/0, number of next-hops: 2
       via Eth1/13, [115/80], 0 day/s 00:24:34, isis_fabricpath-default
       via Eth1/22, [115/80], 0 day/s 01:25:46, isis_fabricpath-default
1/73/0, number of next-hops: 1
       via Eth1/22, [115/40], 0 day/s 01:26:08, isis_fabricpath-default
1/72/0, number of next-hops: 1
       via Eth1/13, [115/40], 0 day/s 00:24:34, isis_fabricpath-default
```

Task 12

Enable the Interface-VLAN feature on the 7K3 and 7K4 switches. Configure a SVI on 7K3 with an IP Address of 192.1.100.3/24. Configure a SVI on 7K4 with an IP Addressof 192.1.100.4/24.

7K-3

```
feature interface-vlan
!
int vlan100
 ip address 192.1.100.3/24
 no shut
```

7K-4

```
feature interface-vlan
!
int vlan100
```

```
ip address 192.1.100.4/24
no shut
```

Task 13

Verify the Connectivity between the SVI's on 7K3 & 7K4 by pinging 192.1.100.3 from 7K4.

7K-3

```
Ping 192.1.100.4 source 192.1.100.3
```

7K-4

```
Ping 192.1.100.3 source 192.1.100.4
```

Task 14

Verify the contents of the Mac Address table on 5K-1 & 7K-3 using the **Show mac address-table dynamic vlan 100.**

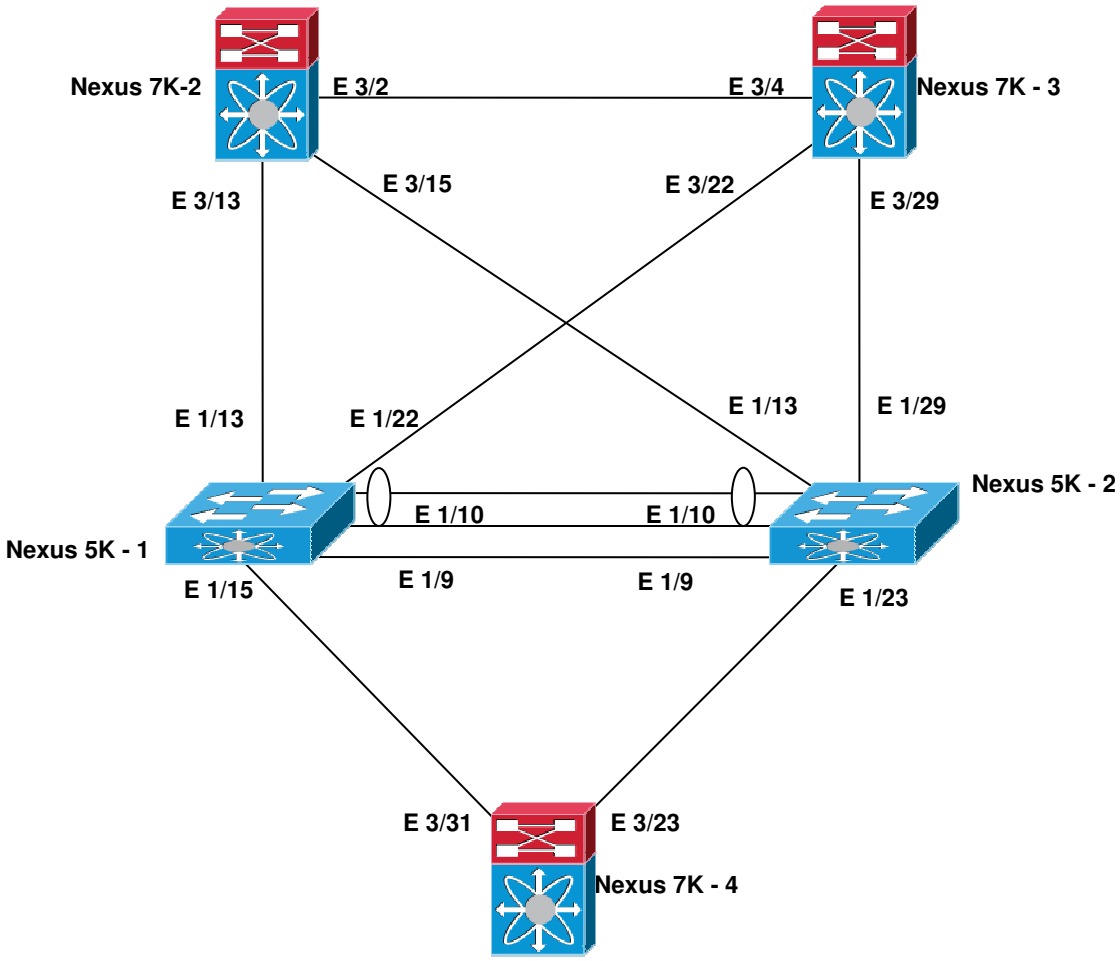
7K-3

```
Legend:
        * - primary entry, G - Gateway MAC, (R) - Routed MAC, O - Overlay MAC
        age - seconds since last seen,+ - primary entry using vPC Peer-Link,
        (T) - True, (F) - False

   VLAN     MAC Address      Type         age    Secure NTFY Ports/SWID.SSID.LID
---------+--------------------+-----------+---------+------+-------------+----------------------
  100     0018.bad8.29d4   dynamic      90       F         F         51.0.0
```

5K-1

```
Legend:
        * - primary entry, G - Gateway MAC, (R) - Routed MAC, O - Overlay MAC
        age - seconds since last seen,+ - primary entry using vPC Peer-Link


   VLAN     MAC Address      Type         age    Secure NTFY Ports/SWID.SSID.LID
---------+--------------------+-----------+---------+------+-------------+----------------------
  100     0018.bad8.29d3   dynamic      150      F         F         73.0.1054
```

Lab 4- Configuring Fabricpath with vPC+



Task 1

We will be configuring a vPC configuration using a SVI between 5K1 to 5K2 based on the above diagram. Enable the appropriate features on 5K1 & 5K2.

5K-1

Feature vpc
Feature lacp

Feature interface-vlan
5K-2 Feature vpc Feature lacp Feature interface-vlan

Task 2

Configure the parameters for the vPC Peer keepalive link based on the following:

- **5K1**
  - VRF: **VPC-PL**
  - Interface: **VLAN 55**
  - IP Address: **10.1.55.1/24**
  - Interface: E 1/9
- **5K2**
  - VRF: **VPC-PL**
  - Interface: **VLAN 55**
  - IP Address: **10.1.55.2/24**
  - Interface: E 1/9

5K-1 vrf context VPC-PL ! vlan 55 ! Interface E 1/9 switchport access vlan 55 ! Interface Vlan55 no shutdown vrf member VPC-PL ip address 10.1.55.1/24
5K-2 vrf context VPC-PL ! vlan 55 ! Interface E 1/9 switchport access vlan 55 !

```
Interface Vlan55
  no shutdown
  vrf member VPC-PL
  ip address 10.1.55.2/24
```

Task 3

Configure vPC+ between 5K1 & 5K2 based on the following:

- **5K1**
  - Peer Keepalive Address : **10.1.55.2**
  - Domain ID: **55**
  - Fabric Switch-id: **55**
  - Primary : **Yes**
  - Interface PortChannel : **55 (Using E 1/10 as the Physical Interface)**
  - Port Channel Mode : **Fabricpath**
  - vPC Link : **Port Channel 55**
- **5K2**
  - Peer Keepalive Address : **10.1.55.1**
  - Domain ID: **55**
  - Fabric Switch-id: **55**
  - Primary : **Yes**
  - Interface PortChannel : **55 (Using E 1/10 as the Physical Interface)**
  - Port Channel Mode : **Fabricpath**
  - vPC Link : **Port Channel 55**

5K-1

```
vpc domain 55
  role priority 300
  peer-keepalive destination 10.1.55.2 source 10.1.55.1 vrf VPC-PL
  fabricpath switch-id 55
!
Interface E 1/10
 channel-group 55 mode active
!
Interface port-channel 55
 switch mode fabricpath
 vpc peer-link
```

5K-2

```
vpc domain 55
  peer-keepalive destination 10.1.55.1 source 10.1.55.2 vrf VPC-PL
  fabricpath switch-id 55
!
```

```
Interface E 1/10
 channel-group 55 mode active
!
Interface port-channel 55
 switch mode fabricpath
 vpc peer-link
```

Task 4

Verify the confguration of the vPC+ using the **show vpc** command.

Note : vPC+ Switch ID is identical & the Peer being reachable thru fabricpath.

5K-1

```
show vpc
!
..
vPC domain id                     : 55
vPC+ switch id                    : 55
Peer status                       : peer adjacency formed ok
vPC keep-alive status             : peer is alive
vPC fabricpath status             : peer is reachable through fabricpath
Configuration consistency status  : success
Per-vlan consistency status       : success
Type-2 consistency status         : success
vPC role                          : primary
.....
vPC Peer-link status
---------------------------------------------------------------------
id   Port   Status   Active vlans
--   ----   --------  -------------------------------------------------
1    Po55   up       100
```

5K-2

```
...
vPC domain id                     : 55
vPC+ switch id                    : 55
Peer status                       : peer adjacency formed ok
vPC keep-alive status             : peer is alive
vPC fabricpath status             : peer is reachable through fabricpath
Configuration consistency status  : success
Per-vlan consistency status       : success
Type-2 consistency status         : success
vPC role                          : primary
.....
vPC Peer-link status
---------------------------------------------------------------------
id   Port   Status   Active vlans
--   ----   --------  -------------------------------------------------
1    Po55   up       100
```

Task 5

Configure a Port Channel from the 5K1 and 5k2 towards 7K4 using the appropriate ports based on the Diagram.

7K-4

```
Interface E 3/23
  channel-group 100 mode active
  no shutdown
!
Interface E 3/31
  No swtichport mode trunk
  channel-group 100 mode active
  no shutdown
!
Interface Port-channel 100
 switchport mode trunk
 no shut
```

5K-1

```
Interface E 1/15
  channel-group 100 mode active
!
interface port-channel100
  switchport mode trunk
  vpc 55
```

5K2

```
Interface E 1/23
  channel-group 100 mode active
!
interface port-channel100
  switchport mode trunk
  vpc 55
```

Task 6

Verify the Port-channel confguration of the vPC+ using the **show vpc** command.

5K-1

```
show vpc
!
..
```

vPC domain id : **55**
vPC+ switch id : 55
Peer status : **peer adjacency formed ok**
vPC keep-alive status : **peer is alive**
vPC fabricpath status : **peer is reachable through fabricpath**
Configuration consistency status : success
Per-vlan consistency status : success
Type-2 consistency status : success
vPC role : **primary**
.....
vPC Peer-link status

id	Port	Status	Active vlans
1	**Po55**	**up**	100

vPC status

id	Port	Status	Consistency	Reason	Active vlans	vPC+ Attrib
55	**Po100**	up	success	success	100	DF: Partial, **FP MAC: 55.0.0**

5K-2

show vpc
!
..
vPC domain id : **55**
vPC+ switch id : 55
Peer status : **peer adjacency formed ok**
vPC keep-alive status : **peer is alive**
vPC fabricpath status : **peer is reachable through fabricpath**
Configuration consistency status : success
Per-vlan consistency status : success
Type-2 consistency status : success
vPC role : **primary**
.....
vPC Peer-link status

id	Port	Status	Active vlans
1	**Po55**	**up**	100

```
vPC status
----------------------------------------------------------------------------
id     Port        Status Consistency Reason     Active vlans  vPC+ Attrib
--     ----------  ------ --------------- ------   ---------------- ---------------
55     Po100       up     success     success      100           DF: Partial,
                                                                  FP MAC:
                                                                  55.0.0
```

Task 7

Verify the Spanning-tree configuration for VLAN 100 on 7K4 using the **show spanning-tree vlan 100** command.

```
5K-1

Spanning tree enabled protocol rstp
  Root ID    Priority    100
             Address     c84c.75fa.600a
             Cost        1
             Port        4195 (port-channel100)
             Hello Time  2  sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority    32868  (priority 32768 sys-id-ext 100)
             Address     0018.bad8.29d4
             Hello Time  2  sec  Max Age 20 sec  Forward Delay 15 sec

Interface        Role  Sts     Cost    Prio.Nbr    Type
---------------- ------ ------- --------- -----------   --------------------------------
Po100            Root FWD     1       128.4195    P2p
```

Task 8

Verify the addition of the Fabric Switch ID for the vPC+ setup using the **show fabricpath switch-id** command.

Note : The Switch-ID are duplicated for 5K1 & 5K2. They are seen as emulated.

5K-1

Show fabricpath switch-id

FABRICPATH SWITCH-ID TABLE

Legend: '*' - this system

SWITCH-ID	SYSTEM-ID	FLAGS	STATE	STATIC	EMULATED
*51	547f.eef2.3bfc	Primary	Confirmed	Yes	No
52	547f.ee4c.30fc	Primary	Confirmed	Yes	No
55	547f.eef2.3bfc	Primary	Confirmed	No	**Yes**
55	547f.ee4c.30fc	Primary	Confirmed	No	**Yes**
73	0018.bad8.29d3	Primary	Confirmed	Yes	No
1323	0018.bad8.29d2	Primary	Confirmed	No	No

Task 13

Verify the Connectivity between the SVI's on 7K3 & 7K4 by pinging 192.1.100.3 from 7K4.

7K-3

Ping 192.1.100.4 source 192.1.100.3

7K-4

Ping 192.1.100.3 source 192.1.100.4

Task 14

Verify the contents of the Mac Address table on 5K-1 & 5K-2 using the **Show mac address-table dynamic vlan 100.**

5K-1

Legend:
* - primary entry, G - Gateway MAC, (R) - Routed MAC, O - Overlay MAC
age - seconds since last seen,+ - primary entry using vPC Peer-Link,
(T) - True, (F) - False

VLAN	MAC Address	Type	age	Secure	NTFY	Ports/SWID.SSID.LID
100	**0018.bad8.29d3**	dynamic	10	F	F	**73**.0.1054
100	**0018.bad8.29d4**	dynamic	10	F	F	**Po100**

5K-2

Legend:
* - primary entry, G - Gateway MAC, (R) - Routed MAC, O - Overlay MAC
age - seconds since last seen,+ - primary entry using vPC Peer-Link

VLAN	MAC Address	Type	age	Secure	NTFY	Ports/SWID.SSID.LID
100	**0018.bad8.29d3**	dynamic	0	F	F	**73**.0.1054
100	**0018.bad8.29d4**	dynamic	0	F	F	**Po100**