VLANs & Trunking

« Managing UCS C-Series Server Using CIMC | Port Channels »

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VLANs & Trunking

Objective

- Establish and verify IP reachability between your servers using multiple VLANs.

Task

- Disable the links between your 5Ks.
- Create VLANs 10 & 20 on your 5Ks and 7Ks.
- Configure 802.1Q trunk ports as follows:
  - Configure all links between the 5Ks and 7Ks as trunks except the disabled ports between the 5Ks.
  - Limit all trunk links so that they only carry traffic for VLANs 10 & 20.
- Configure access ports as follows:
  - Configure the link on your first 5K to the first server as an access port in VLAN 10.
  - Configure the link on your second 5K to the second server as an access port in VLAN 10.
  - Configure the link on your first 5K to the second server as an access port in VLAN 20.
  - Configure the link on your second 5K to the first server as an access port in VLAN 20.
- Configure IP addressing as follows:
  - Configure the servers' VLAN 10 interfaces with IP addressing 10.0.0.1**X**/24, where ***X*** is the server number.
  - Configure the servers' VLAN 20 interfaces with IP addressing 20.0.0.1**X**/24, where ***X*** is the server number.
  - Create Layer 3 SVIs for VLANs 10 & 20 on your 5Ks and 7Ks with IP addressing 10.0.0.**X**/24 and 20.0.0.**X**/24 respectively, where ***X*** is the device number.
- When complete your servers should have IP connectivity to each other and all SVIs for both VLANs 10 & 20.
- Verify what path the layer 2 traffic is following between your servers for both VLANs 10 & 20.

Configuration Click to *collapse*

N5K1:

```
feature interface-vlan
!
vlan 10,20
!
interface Ethernet1/1
  switchport
  switchport mode access
  switchport access vlan 10
  no shutdown
!
interface Ethernet1/2
  switchport
  switchport mode access
  switchport access vlan 20
  no shutdown
!
interface Ethernet1/3 - 4
  shutdown
!
interface Ethernet1/5 - 6
  switchport
  switchport mode trunk
  switchport trunk allowed vlan 10,20
  no shutdown
!
interface Vlan10
 ip address 10.0.0.51/24
 no shutdown
!
interface Vlan20
 ip address 20.0.0.51/24
 no shutdown
```

N5K2:

```
feature interface-vlan
!
vlan 10,20
!
interface Ethernet1/1
  switchport
  switchport mode access
  switchport access vlan 20
  no shutdown
!
interface Ethernet1/2
  switchport
  switchport mode access
  switchport access vlan 10
  no shutdown
!
interface Ethernet1/3 - 4
  shutdown
!
interface Ethernet1/5 - 6
  switchport
  switchport mode trunk
  switchport trunk allowed vlan 10,20
  no shutdown
!
```

```
interface Vlan10
 ip address 10.0.0.52/24
 no shutdown
!
interface Vlan20
 ip address 20.0.0.52/24
 no shutdown
```

N7K1:

```
feature interface-vlan
!
vlan 10,20
!
interface Ethernet1/1 - 4
  switchport
  switchport mode trunk
  switchport trunk allowed vlan 10,20
  no shutdown
!
interface Vlan10
 ip address 10.0.0.71/24
 no shutdown
!
interface Vlan20
 ip address 20.0.0.71/24
 no shutdown
```

N7K2:

```
feature interface-vlan
!
vlan 10,20
!
interface Ethernet1/1 - 4
  switchport
  switchport mode trunk
  switchport trunk allowed vlan 10,20
  no shutdown
!
interface Vlan10
 ip address 10.0.0.72/24
 no shutdown
!
interface Vlan20
 ip address 20.0.0.72/24
 no shutdown
```

Verification

A quick way to verify that all switches have created proper VLANs and are trunking them together is to check the Spanning-Tree Root Bridge ID for the VLAN. If correctly configured, all four switches should agree on the Root BID for both VLANs 10 & 20, as seen below.:

```
N5K1# show spanning-tree vlan 10 root

                                   Root  Hello Max Fwd
Vlan                 Root ID       Cost  Time  Age Dly  Root Port
---------------- ------------------- ------- ----- --- ---  ----------------
VLAN0010         32778 0026.980c.2142       2    2   20  15       Ethernet1/6


N5K2# show spanning-tree vlan 10 root

                                   Root  Hello Max Fwd
Vlan                 Root ID       Cost  Time  Age Dly  Root Port
---------------- ------------------- ------- ----- --- ---  ----------------
VLAN0010         32778 0026.980c.2142       2    2   20  15       Ethernet1/6

N7K1# show spanning-tree vlan 10 root

                                   Root  Hello Max Fwd
Vlan                 Root ID       Cost  Time  Age Dly  Root Port
---------------- ------------------- ------- ----- --- ---  ----------------
VLAN0010         32778 0026.980c.2142       2    2   20  15       Ethernet1/1

N7K2# show spanning-tree vlan 10 root

                                   Root  Hello Max Fwd
Vlan                 Root ID       Cost  Time  Age Dly  Root Port
---------------- ------------------- ------- ----- --- ---  ----------------
VLAN0010         32778 0026.980c.2142       0    2   20  15  This bridge is root
```

Since all STP variables are default (i.e. we didn't modify any of the STP configuration), the Root ID should be identical for all VLANs with the exception of the STP priority offset value, called the System-ID Extension.

```
N5K1# show spanning-tree vlan 20 root

                                   Root  Hello Max Fwd
Vlan                 Root ID       Cost  Time  Age Dly  Root Port
---------------- ------------------- ------- ----- --- ---  ----------------
VLAN0020         32788 0026.980c.2142       2    2   20  15       Ethernet1/6


N5K2# show spanning-tree vlan 20 root

                                   Root  Hello Max Fwd
Vlan                 Root ID       Cost  Time  Age Dly  Root Port
---------------- ------------------- ------- ----- --- ---  ----------------
VLAN0020         32788 0026.980c.2142       2    2   20  15       Ethernet1/6
```

```
N7K1# show spanning-tree vlan 20 root

                                        Root  Hello Max Fwd
Vlan                 Root ID            Cost  Time  Age Dly  Root Port
---------------- -------------------- ------- ----- --- ---  ----------------
VLAN0020         32788 0026.980c.2142       2    2   20  15       Ethernet1/1

N7K2# show spanning-tree vlan 20 root

                                        Root  Hello Max Fwd
Vlan                 Root ID            Cost  Time  Age Dly  Root Port
---------------- -------------------- ------- ----- --- ---  ----------------
VLAN0020         32788 0026.980c.2142       0    2   20  15  This bridge is root
```

To verify access ports, check that STP is forwarding the correct VLAN on the interface.

```
N5K1# show spanning-tree interface e1/1

Vlan             Role Sts Cost      Prio.Nbr Type
---------------- ---- --- --------- -------- --------------------------------
VLAN0010         Desg FWD 2         128.129  P2p

N5K1# show spanning-tree interface e1/2

Vlan             Role Sts Cost      Prio.Nbr Type
---------------- ---- --- --------- -------- --------------------------------
VLAN0020         Desg FWD 2         128.130  P2p

N5K2# show spanning-tree interface e1/1

Vlan             Role Sts Cost      Prio.Nbr Type
---------------- ---- --- --------- -------- --------------------------------
VLAN0020         Desg FWD 2         128.129  P2p

N5K2# show spanning-tree interface e1/2

Vlan             Role Sts Cost      Prio.Nbr Type
---------------- ---- --- --------- -------- --------------------------------
VLAN0010         Desg FWD 2         128.130  P2p
```

Reachability can be verified with pings, as seen below. The first dropping ping is due to the switch sending an ARP request to the server to resolve its MAC address to IP address.

```
N5K1# ping 10.0.0.11
PING 10.0.0.11 (10.0.0.11): 56 data bytes
36 bytes from 10.0.0.51: Destination Host Unreachable
Request 0 timed out
64 bytes from 10.0.0.11: icmp_seq=1 ttl=127 time=0.871 ms
64 bytes from 10.0.0.11: icmp_seq=2 ttl=127 time=0.665 ms
64 bytes from 10.0.0.11: icmp_seq=3 ttl=127 time=0.558 ms
64 bytes from 10.0.0.11: icmp_seq=4 ttl=127 time=0.595 ms

--- 10.0.0.11 ping statistics ---
5 packets transmitted, 4 packets received, 20.00% packet loss
round-trip min/avg/max = 0.558/0.672/0.871 ms
N5K1# ping 10.0.0.12
PING 10.0.0.12 (10.0.0.12): 56 data bytes
36 bytes from 10.0.0.51: Destination Host Unreachable
Request 0 timed out
64 bytes from 10.0.0.12: icmp_seq=1 ttl=127 time=0.9 ms
64 bytes from 10.0.0.12: icmp_seq=2 ttl=127 time=0.699 ms
64 bytes from 10.0.0.12: icmp_seq=3 ttl=127 time=0.529 ms
64 bytes from 10.0.0.12: icmp_seq=4 ttl=127 time=0.568 ms

--- 10.0.0.12 ping statistics ---
5 packets transmitted, 4 packets received, 20.00% packet loss
round-trip min/avg/max = 0.529/0.674/0.9 ms
N5K1# ping 20.0.0.11
PING 20.0.0.11 (20.0.0.11): 56 data bytes
36 bytes from 20.0.0.51: Destination Host Unreachable
Request 0 timed out
64 bytes from 20.0.0.11: icmp_seq=1 ttl=127 time=0.887 ms
64 bytes from 20.0.0.11: icmp_seq=2 ttl=127 time=0.674 ms
64 bytes from 20.0.0.11: icmp_seq=3 ttl=127 time=0.567 ms
64 bytes from 20.0.0.11: icmp_seq=4 ttl=127 time=0.583 ms

--- 20.0.0.11 ping statistics ---
5 packets transmitted, 4 packets received, 20.00% packet loss
round-trip min/avg/max = 0.567/0.677/0.887 ms
N5K1# ping 20.0.0.12
PING 20.0.0.12 (20.0.0.12): 56 data bytes
36 bytes from 20.0.0.51: Destination Host Unreachable
Request 0 timed out
64 bytes from 20.0.0.12: icmp_seq=1 ttl=127 time=0.922 ms
64 bytes from 20.0.0.12: icmp_seq=2 ttl=127 time=0.618 ms
64 bytes from 20.0.0.12: icmp_seq=3 ttl=127 time=0.523 ms
64 bytes from 20.0.0.12: icmp_seq=4 ttl=127 time=0.582 ms

--- 20.0.0.12 ping statistics ---
5 packets transmitted, 4 packets received, 20.00% packet loss
round-trip min/avg/max = 0.523/0.661/0.922 ms
```

Once data plane traffic has been exchanged between the servers, the switches should now know all MAC addresses in the control plane. In the below output the servers' MAC addresses are highlighted, while the rest represent the SVI interfaces of the switches.

By checking the MAC address table we can verify how traffic is being forwarded between the servers. In this case traffic in VLAN 10 from Server 1 to Server 2 is entering the access port on N5K1, switching out port E1/6 towards N7K2 (the STP Root Bridge), next switching out port E1/4 on N7K2 towards N5K2, and then then finally out port E1/2 on N5K2 towards the final destination.

```
N5K1# show mac address-table dynamic vlan 10
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
---------+-----------------+--------+---------+------+----+------------------
* 10       0000.0000.0010    dynamic   10         F    F  Eth1/1
* 10       0000.0000.0021    dynamic   10         F    F  Eth1/6
* 10       0026.980c.2142    dynamic   880        F    F  Eth1/6
* 10       00de.fb12.1a01    dynamic   880        F    F  Eth1/6
* 10       68bd.abd7.6042    dynamic   860        F    F  Eth1/6

N5K2# show mac address-table dynamic vlan 10
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
---------+-----------------+--------+---------+------+----+------------------
* 10       0000.0000.0010    dynamic   0          F    F  Eth1/6
* 10       0000.0000.0021    dynamic   0          F    F  Eth1/2
* 10       0026.980c.2142    dynamic   860        F    F  Eth1/6
* 10       00de.fb12.1a7c    dynamic   80         F    F  Eth1/6
* 10       68bd.abd7.6042    dynamic   870        F    F  Eth1/6

N7K1# show mac address-table dynamic vlan 10
 Note: MAC table entries displayed are getting read from software.
 Use the 'hardware-age' keyword to get information related to 'Age'

 Legend:
        * - primary entry, G - Gateway MAC, (R) - Routed MAC, O - Overlay MAC
        age - seconds since last seen,+ - primary entry using vPC Peer-Link, E - EVPN entry
        (T) - True, (F) - False ,  ~~~ - use 'hardware-age' keyword to retrieve age info
  VLAN/BD   MAC Address      Type      age     Secure NTFY Ports/SWID.SSID.LID
---------+-----------------+--------+---------+------+----+------------------
* 10       0000.0000.0010    dynamic     ~~~      F    F  Eth1/1
* 10       0000.0000.0021    dynamic     ~~~      F    F  Eth1/1
* 10       0026.980c.2142    dynamic     ~~~      F    F  Eth1/1
* 10       00de.fb12.1a01    dynamic     ~~~      F    F  Eth1/1
* 10       00de.fb12.1a7c    dynamic     ~~~      F    F  Eth1/1

N7K2# show mac address-table dynamic vlan 10
 Note: MAC table entries displayed are getting read from software.
 Use the 'hardware-age' keyword to get information related to 'Age'

 Legend:
        * - primary entry, G - Gateway MAC, (R) - Routed MAC, O - Overlay MAC
        age - seconds since last seen,+ - primary entry using vPC Peer-Link, E - EVPN entry
        (T) - True, (F) - False ,  ~~~ - use 'hardware-age' keyword to retrieve age info
  VLAN/BD   MAC Address      Type      age     Secure NTFY Ports/SWID.SSID.LID
---------+-----------------+--------+---------+------+----+------------------
* 10       0000.0000.0010    dynamic     ~~~      F    F  Eth1/3
* 10       0000.0000.0021    dynamic     ~~~      F    F  Eth1/4
* 10       00de.fb12.1a01    dynamic     ~~~      F    F  Eth1/4
* 10       00de.fb12.1a7c    dynamic     ~~~      F    F  Eth1/3
* 10       68bd.abd7.6042    dynamic     ~~~      F    F  Eth1/1
```

VLAN 20 follows the same traffic patterns as VLAN 10, as no STP options have been changed for either of the STP topologies.

```
N5K1# show mac address-table dynamic vlan 20
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
---------+-----------------+--------+---------+------+----+------------------
* 20       0000.0000.0011    dynamic   110        F    F  Eth1/6
* 20       0000.0000.0020    dynamic   80         F    F  Eth1/2
* 20       0026.980c.2142    dynamic   930        F    F  Eth1/6
* 20       00de.fb12.1a01    dynamic   930        F    F  Eth1/6
* 20       68bd.abd7.6042    dynamic   930        F    F  Eth1/6

N5K2# show mac address-table dynamic vlan 20
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
---------+-----------------+--------+---------+------+----+------------------
* 20       0000.0000.0011    dynamic   80         F    F  Eth1/1
* 20       0000.0000.0020    dynamic   390        F    F  Eth1/6
* 20       0026.980c.2142    dynamic   930        F    F  Eth1/6
* 20       00de.fb12.1a7c    dynamic   110        F    F  Eth1/6
* 20       68bd.abd7.6042    dynamic   930        F    F  Eth1/6

N7K1# show mac address-table dynamic vlan 20
 Note: MAC table entries displayed are getting read from software.
 Use the 'hardware-age' keyword to get information related to 'Age'

 Legend:
        * - primary entry, G - Gateway MAC, (R) - Routed MAC, O - Overlay MAC
        age - seconds since last seen,+ - primary entry using vPC Peer-Link, E - EVPN entry
        (T) - True, (F) - False ,  ~~~ - use 'hardware-age' keyword to retrieve age info
  VLAN/BD   MAC Address      Type      age     Secure NTFY Ports/SWID.SSID.LID
---------+-----------------+--------+---------+------+----+------------------
* 20       0000.0000.0011    dynamic     ~~~      F    F  Eth1/1
* 20       0000.0000.0020    dynamic     ~~~      F    F  Eth1/1
* 20       0026.980c.2142    dynamic     ~~~      F    F  Eth1/1
```

```
* 20       00de.fb12.1a01    dynamic     ~~~      F    F  Eth1/1
* 20       00de.fb12.1a7c    dynamic     ~~~      F    F  Eth1/1

N7K2# show mac address-table dynamic vlan 20
 Note: MAC table entries displayed are getting read from software.
 Use the 'hardware-age' keyword to get information related to 'Age'

 Legend:
        * - primary entry, G - Gateway MAC, (R) - Routed MAC, O - Overlay MAC
        age - seconds since last seen,+ - primary entry using vPC Peer-Link, E - EVPN entry
        (T) - True, (F) - False ,  ~~~ - use 'hardware-age' keyword to retrieve age info
   VLAN/BD   MAC Address      Type      age     Secure NTFY Ports/SWID.SSID.LID
---------+-----------------+--------+---------+------+----+------------------
* 20       0000.0000.0011    dynamic     ~~~      F    F  Eth1/4
* 20       0000.0000.0020    dynamic     ~~~      F    F  Eth1/3
* 20       00de.fb12.1a01    dynamic     ~~~      F    F  Eth1/4
* 20       00de.fb12.1a7c    dynamic     ~~~      F    F  Eth1/3
* 20       68bd.abd7.6042    dynamic     ~~~      F    F  Eth1/1
```

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