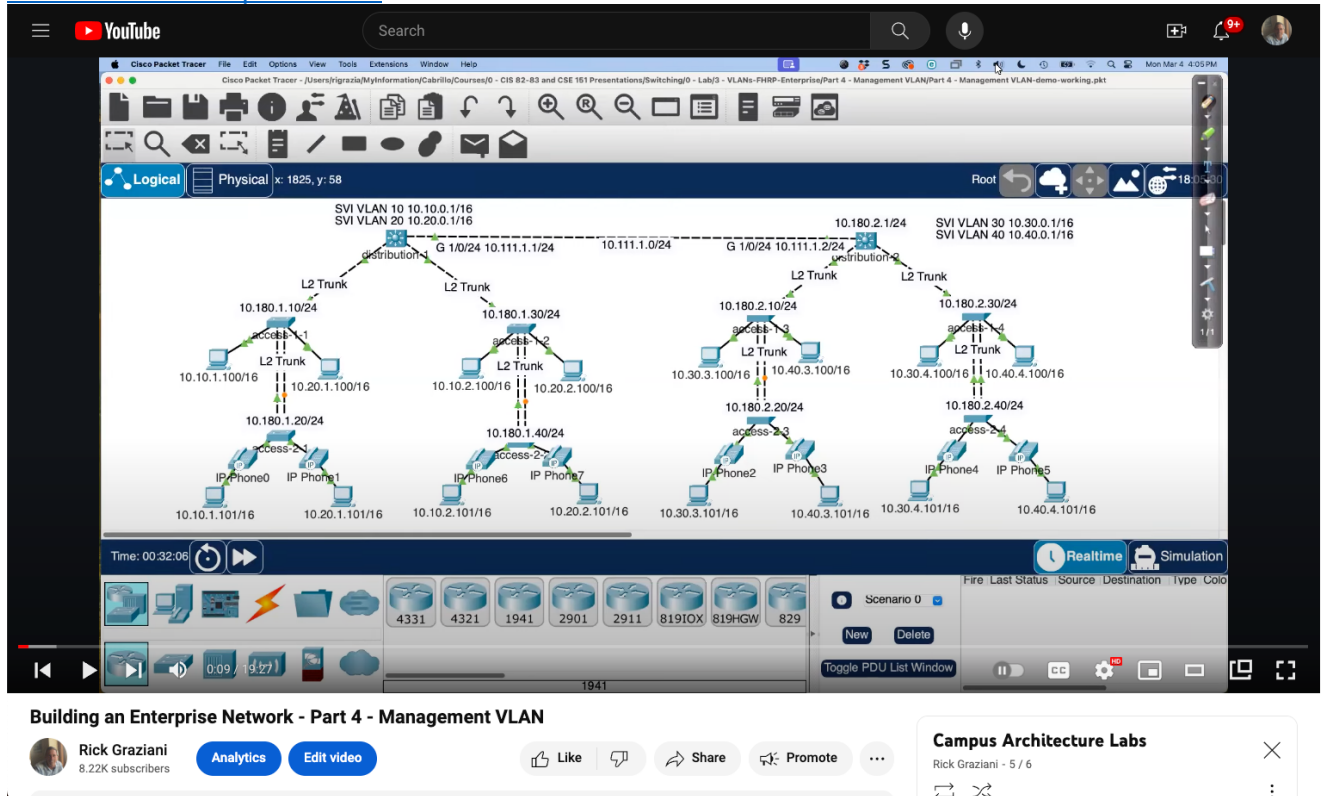# Building an Enterprise Network
Part 4: Management VLAN

Refer to the following YouTube Video:
https://www.youtube.com/watch?v=sVXv7fqkHiE&list=PLMLm7-g0V0kdkzbfJS-naBrLMQNDubT8p&index=6

Topology from Previous Lab

Begin by using the topology you completed in the previous lab

Inter-Connecting Distribution Switches

Since we have not yet created and configured connectivity between the distribution switches, there is no reachability between devices in columns 1 and 2 with devices in columns 3 and 4.

There is more than one way configure our network to forward data within the same VLAN (IP network) or between VLANs (different IP networks). Using our campus architecture model and best practices

we will add a link between the two distribution switches and treat this link as a separate layer 3 network.

We will begin by connecting an Ethernet cross-over cable on the GigabitEthernet 1/0/24 ports between distribution-1 and distribution-2 switches.

Since these are layer 3 switches, we will make both of these "routed ports" on a separate IPv4 network 10.111.1.0/24.

Note: We could use a /30 or /31 if we need to conserve our IPv4 address space. At the same time, we should be transitioning to IPv6.

Configure Distribution-1 Routed Port

```
distribution-1(config)# interface g 1/0/24
distribution-1(config-if)# no switchport access vlan 255
distribution-1(config-if)# no switchport
distribution-1(config-if)# ip address 10.111.1.1 255.255.255.0
distribution-1(config-if)# no shutdown
distribution-1(config-if)# exit
distribution-1(config)#
```

Configure Distribution-2 Routed Port

```
distribution-2(config)# interface g 1/0/24
distribution-2(config-if)# no switchport access vlan 255
distribution-2(config-if)# no switchport
distribution-2(config-if)# ip address 10.111.1.2 255.255.255.0
distribution-2(config-if)# no shutdown
distribution-2(config-if)# exit
distribution-2(config)#
```

Verify Routed Port

The routed port can be used by using the show interface <interface> switchport command. The switchport shows as "Disabled", which indicates that this port is no longer a layer 2 switch port, but is not a layer 3 routed port. "Enabled" would indicate that the port is a layer 2 switch port.

```
distribution-1# show interface g 1/0/24 switchport
Name: Gig1/0/24
Switchport: Disabled

distribution-1#
```

Configure Static Routes to Remote Networks

Distribution-1 switch has IPv4 addresses associated with its SVIs on VLAN 10 (10.10.0.1/16) VLAN 20 (10.20.0.1/16), along with the IPv4 address configured on the routed port g 1/0/24, which makes it directly connected to the following networks:
- 10.10.0.0/16
- 10.20.0.0.16
- 10.111.1.0/24

However, distribution-1 does not know about remote networks via distribution-2. Therefore, we will configure two static routes, one to each of the following remote networks via the next-hop IPv4 address of distribution-2, 10.111.1.2:
- 10.30.0.0/16
- 10.40.0.0.16

```
distribution-1(config)# ip route 10.30.0.0 255.255.0.0 10.111.1.2
distribution-1(config)# ip route 10.40.0.0 255.255.0.0 10.111.1.2
```

Distribution-2 switch has IPv4 addresses associated with its SVIs on VLAN 30 (10.30.0.1/16) VLAN 40 (10.40.0.1/16), along with the IPv4 address configured on the routed port g 1/0/24, which makes it directly connected to the following networks:
- 10.30.0.0/16
- 10.40.0.0.16
- 10.111.1.0/24

However, distribution-2 does not know about remote networks via distribution-1. Therefore, we will configure two static routes, one to each of the following remote networks via the next-hop IPv4 address of distribution-1, 10.111.1.1:
- 10.10.0.0/16
- 10.20.0.0.16

```
distribution-2(config)# ip route 10.10.0.0 255.255.0.0 10.111.1.1
distribution-2(config)# ip route 10.20.0.0 255.255.0.0 10.111.1.1
```

Distribution Switch Routing Tables

We can verify the directly connected networks and the static routes we just configured by examining the routing tables of each distribution switch.

Distribution-1 Routing Table

```
distribution-1# show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

     10.0.0.0/8 is variably subnetted, 5 subnets, 2 masks
C       10.10.0.0/16 is directly connected, Vlan10
C       10.20.0.0/16 is directly connected, Vlan20
S       10.30.0.0/16 [1/0] via 10.111.1.2
S       10.40.0.0/16 [1/0] via 10.111.1.2
C       10.111.1.0/24 is directly connected, GigabitEthernet1/0/24

distribution-1#
```

Distribution-2 Routing Table

```
distribution-2# show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

     10.0.0.0/8 is variably subnetted, 5 subnets, 2 masks
S       10.10.0.0/16 [1/0] via 10.111.1.1
S       10.20.0.0/16 [1/0] via 10.111.1.1
C       10.30.0.0/16 is directly connected, Vlan30
C       10.40.0.0/16 is directly connected, Vlan40
C       10.111.1.0/24 is directly connected, GigabitEthernet1/0/24

distribution-2#
```

Verify Connectivity Between All IP Networks, VLANS

From PC with the IPv4 address 10.10.1.100/16 verify connectivity to devices on 10.30.0.0/16 and 10.40.0.0/16 networks via the two distribution switches.

Note: It is normal that the first one or two pings time out due to the ARP protocol used by this device or other devices.

```
C:\> ping 10.30.3.100

Pinging 10.30.3.100 with 32 bytes of data:

Reply from 10.30.3.100: bytes=32 time<1ms TTL=126
Reply from 10.30.3.100: bytes=32 time<1ms TTL=126
Reply from 10.30.3.100: bytes=32 time<1ms TTL=126
Reply from 10.30.3.100: bytes=32 time<1ms TTL=126

Ping statistics for 10.30.3.100:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\> ping 10.40.4.100

Pinging 10.40.4.100 with 32 bytes of data:

Request timed out.
Reply from 10.40.4.100: bytes=32 time=22ms TTL=126
Reply from 10.40.4.100: bytes=32 time<1ms TTL=126
Reply from 10.40.4.100: bytes=32 time<1ms TTL=126

Ping statistics for 10.40.4.100:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 22ms, Average = 7ms

C:\>
```

Management VLANs

The management VLAN is used to remotely access the layer 2 and layer 3 switches using a separate VLAN 180 associated with 10.180.0.0/16. The management VLAN

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Distribution-1 switch and access switches connected to distribution-1 will be on the management VLAN 180 that is associated with the IPv4 network 10.180.1.0/24. The distribution-1 switch will have the IPv4 address 10.180.1.1/24.

Distribution-2 switch and access switches connected to distribution-2 will be on the management VLAN 180 that is associated with the IPv4 network 10.180.2.0/24. The distribution-1 switch will have the IPv4 address 10.180.2.1/24.

Note: Both management VLANs on separate IPv4 networks are both VLAN 180. This is fine because they are separated by the network between distribution-1 and distribution 2 switches. We kept the same VLAN number for simplicity but some network policies will have you use different VLAN numbers.

Configure Management VLAN on Distribution-1

```
distribution-1(config)# interface vlan 180
distribution-1(config-if)# ip address 10.180.1.1 255.255.255.0
distribution-1(config-if)# no shutdown
distribution-1(config-if)# exit

%LINK-5-CHANGED: Interface Vlan180, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan180, changed state to up

distribution-1(config)#
```

Configure Management VLAN on Distribution-2

```
distribution-2(config)# interface vlan 180
distribution-2(config-if)# ip address 10.180.2.1 255.255.255.0
distribution-2(config-if)# no shutdown
distribution-2(config-if)# exit

%LINK-5-CHANGED: Interface Vlan180, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan180, changed state to up

distribution-2(config)#
```

Configure Management VLAN on Access Layer Switches

The default gateway is required on access switches, so these switches, when remotely accessed and acting as a "computer" or "server" can forward packets to a layer 3 device (distribution switch) when telnet/ssh client is on another network.

For access switches, include the distribution layer switch as its default gateway.

```
access-1-1(config)# interface vlan 180
```

```
access-1-1(config-if)# ip address 10.180.1.10 255.255.255.0
access-1-1(config-if)# no shutdown
access-1-1(config-if)# exit

%LINK-5-CHANGED: Interface Vlan180, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan180, changed state to up

access-1-1(config-if)# ip default-gateway 10.180.1.1
access-1-1(config)#
```

The access switches will use the distribution-1 switch IPv4 address as its default gateway.
- Distribution-1: 10.180.1.1/24
- Access-1-1: 10.180.1.10/24, default gateway: 10.180.1.1
- Access-2-1: 10.180.1.20/24, default gateway: 10.180.1.1
- Access-1-2: 10.180.1.30/24, default gateway: 10.180.1.1
- Access-2-2: 10.180.1.40/24, default gateway: 10.180.1.1

The access switches will use the distribution-1 switch IPv4 address as its default gateway.
- Distribution-2: 10.180.2.1/24
- Access-1-3: 10.180.2.10/24, default gateway: 10.180.2.1
- Access-2-3: 10.180.2.20/24, default gateway: 10.180.2.1
- Access-1-4: 10.180.2.30/24, default gateway: 10.180.2.1
- Access-2-4: 10.180.2.40/24, default gateway: 10.180.2.1

For all column 1 and 2 switches, makes distribution-1 the default gateway for the management VLAN.

```
access-1-1(config-if)# ip default-gateway 10.180.1.1
```

For all column 3 and 4 switches, makes distribution-2 the default gateway for the management VLAN.

```
access-1-3(config-if)# ip default-gateway 10.180.2.1
```

Configure static route on distribution-1 to reach Management VLAN on distribution-2

```
distribution-1(config)# ip route 10.180.2.0 255.255.255.0 10.111.1.2
```

Configure static route on distribution-2 to reach Management VLAN on distribution-2

```
distribution-2(config)# ip route 10.180.1.0 255.255.255.0 10.111.1.1
```