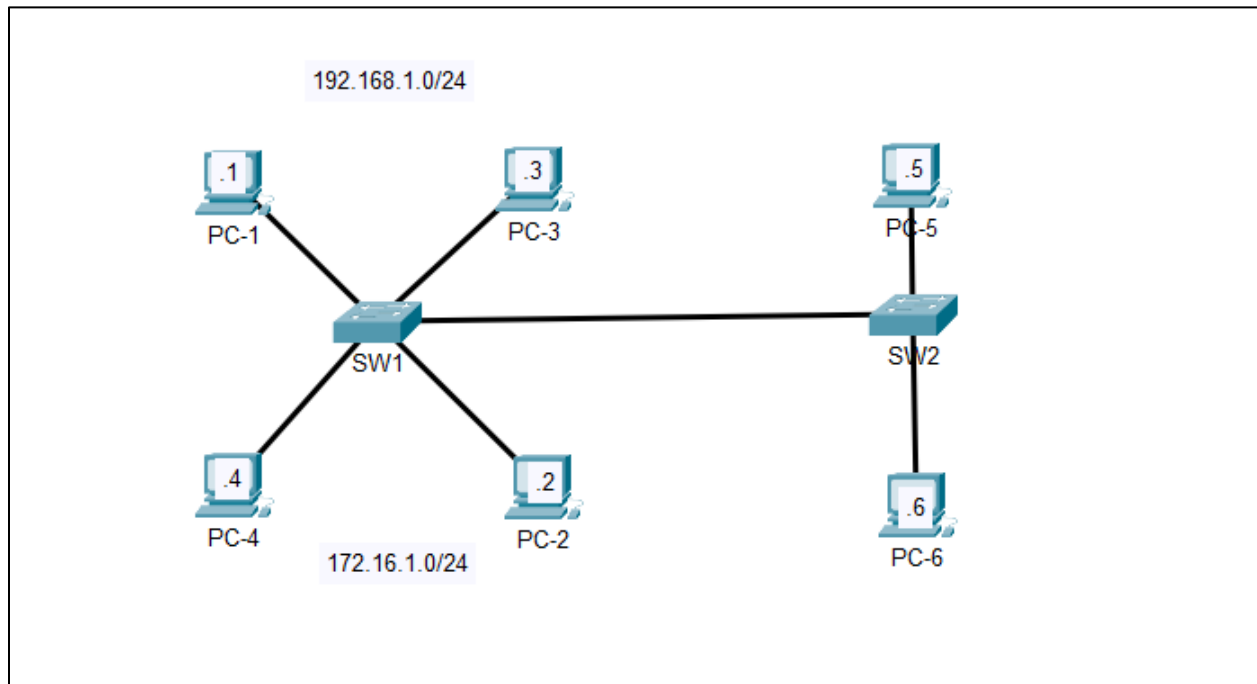


Lab - Trunks

Topology Overview

PC-1, PC-3, and PC-5 are on network 192.168.1.0/24. PC-2, PC-4, and PC-6 are on network 172.16.1.0/24.



- a. From PC-1, ping 192.168.1.255 and from PC-4, ping 172.16.1.255. PC-3 and PC-5 should respond to PC-1, PC-2 and PC-6 should respond to PC-4.

Observe

Reachability is confirmed.

- b. On SW1 and SW2, place the even-numbered PCs in VLAN 2 and the odd-numbered PCs in VLAN 3. Name VLAN 2 EVEN and VLAN 3 ODD. Press the up arrow and repeat step a.

```
SW(config)# vlan X
SW(config-vlan)# name X
```

Observe

The PCs connected to SW2 are no longer responding to the broadcast pings.

- c. On SW1 and SW2, observe the interface statuses.

Observe

On both switches, interface Fa0/7 is part of the default VLAN.

There's A Problem

There are ports assigned to both VLANs on both switches, and devices need to maintain reachability to other devices in their respective VLANs that are connected to the remote switch. The connection between the switches must therefore be able to carry traffic for multiple VLANs; however, an **access port can be assigned to only one VLAN**.

The Solution

The solution is called a **trunk port**. A trunk port can carry traffic for multiple VLANs, allowing traffic from both VLANs to be forwarded across the link to the other switch.

Question

- How would SW2 know which arriving traffic forwarded from SW1 belongs to which VLAN?

Engineer Insight

When switches are connected using trunks, they can mark frames with the VLAN they belong to. This is called **VLAN tagging**. The tag identifies the frame's VLAN using its VLAN ID. **802.1Q** is the protocol used to tag the frames. You can think of 802.1Q as the language the switches use to communicate this VLAN information.

An **access port**, on the other hand, forwards frames with no VLAN-related information attached. They are the ports that connect to end devices like a PC or printer which are **unaware of the VLAN assigned to their port**. *Figures 2 and 3* show packet captures of the broadcast frames forwarded out of access ports.

```
> Frame 1: Packet, 98 bytes on wire (784 bits), 98 bytes captured (784 bits)
> Ethernet II, Src: 52:54:00:46:ac:7b (52:54:00:46:ac:7b), Dst: Broadcast (ff:ff:ff:ff:ff:ff)
> Internet Protocol Version 4, Src: 192.168.1.1, Dst: 192.168.1.255
> Internet Control Message Protocol
```

Figure 2 – Frame Forwarded Out Access Port

```
> Frame 7: Packet, 98 bytes on wire (784 bits), 98 bytes captured (784 bits)
> Ethernet II, Src: 52:54:00:21:60:d0 (52:54:00:21:60:d0), Dst: Broadcast (ff:ff:ff:ff:ff:ff)
> Internet Protocol Version 4, Src: 172.16.1.1, Dst: 172.16.1.255
> Internet Control Message Protocol
```

Figure 3 – Frame Forwarded Out Access Port

- d. On SW1 and SW2, configure interface Fa0/7 as a trunk, then check the status of the interfaces.

```
SW(config)# interface fa0/7
SW(config-if)# switchport mode trunk
```

Note: Some switches require 802.1Q to be explicitly configured as the tagging protocol with the command `switchport trunk encapsulation dot1q`.

Observe

Instead of a numerical VLAN ID being displayed, the Vlan value for interface Fa0/7 is trunk.

```
SW1(config-if)#do sh int status
```

Port	Name	Status	Vlan	Duplex	Speed	Type
Fa0/1	PC-1	connected	1	a-full	a-100	10/100BaseTX
Fa0/2	PC-2	connected	1	a-full	a-100	10/100BaseTX
Fa0/3	PC-3	connected	1	a-full	a-100	10/100BaseTX
Fa0/4	PC-4	connected	1	a-full	a-100	10/100BaseTX
Fa0/5		notconnect	1	auto	auto	10/100BaseTX
Fa0/6		notconnect	1	auto	auto	10/100BaseTX
Fa0/7	SW2	connected	trunk	a-full	a-100	10/100BaseTX

Figure 4 – SW1 show interface status output

Engineer Insight

With trunking enabled, the switches can forward traffic for both VLANs between each other on interface Fa0/7. *Figures 5 and 6* display the VLAN 802.1Q tags applied to the broadcast frames. The actual packet captures were included with the lab download.

```
> Frame 1: Packet, 102 bytes on wire (816 bits), 102 bytes captured (816 bits)
> Ethernet II, Src: 52:54:00:46:ac:7b (52:54:00:46:ac:7b), Dst: Broadcast (ff:ff:ff:ff:ff:ff)
< 802.1Q Virtual LAN, PRI: 0, DEI: 0, ID: 3
    000. .... = Priority: Best Effort (default) (0)
    ...0 .... = DEI: Ineligible
    .... 0000 0000 0011 = ID: 3
    Type: IPv4 (0x0800)
> Internet Protocol Version 4, Src: 192.168.1.1, Dst: 192.168.1.255
> Internet Control Message Protocol
```

Figure 5 – Frame Forwarded Out Trunk Port

```
> Frame 14: Packet, 102 bytes on wire (816 bits), 102 bytes captured (816 bits)
> Ethernet II, Src: 52:54:00:21:60:d0 (52:54:00:21:60:d0), Dst: Broadcast (ff:ff:ff:ff:ff:ff)
< 802.1Q Virtual LAN, PRI: 0, DEI: 0, ID: 2
    000. .... = Priority: Best Effort (default) (0)
    ...0 .... = DEI: Ineligible
    .... 0000 0000 0010 = ID: 2
    Type: IPv4 (0x0800)
> Internet Protocol Version 4, Src: 172.16.1.1, Dst: 172.16.1.255
> Internet Control Message Protocol
```

Figure 6 – Frame Forwarded Out Trunk Port

- e. On SW1, issue the following command then view the MAC table.

```
SW1# show interfaces trunk
```

Observe

As a trunk, interface Fa0/7 appears in the output of the show interfaces trunk command. The MAC table lists Fa0/7 in all three VLANs. The MAC address 000d.bd6a.d207 belongs to the remote switch and appears once in each VLAN, resulting in the multiple entries you see.

```
SW1(config-if)#do sh int trunk
Port      Mode      Encapsulation  Status      Native vlan
Fa0/7     on         802.1q         trunking     1

Port      Vlans allowed on trunk
Fa0/7     1-1005

Port      Vlans allowed and active in management domain
Fa0/7     1,2,3

Port      Vlans in spanning tree forwarding state and not pruned
Fa0/7     1,2,3

SW1(config-if)#
```

Figure 7 – SW1 do show interface trunk output

```
SW1#show mac add
SW1#show mac address-table
      Mac Address Table
-----
Vlan    Mac Address      Type      Ports
----    -
1       000d.bd6a.d207    DYNAMIC   Fa0/7
2       000d.bd6a.d207    DYNAMIC   Fa0/7
2       5254.0021.60d0    DYNAMIC   Fa0/4
2       5254.0093.62c6    DYNAMIC   Fa0/2
2       5254.00aa.d77e    DYNAMIC   Fa0/7
3       000d.bd6a.d207    DYNAMIC   Fa0/7
3       5254.0046.ac7b    DYNAMIC   Fa0/1
3       5254.0062.65fb    DYNAMIC   Fa0/3
3       5254.0075.78ce    DYNAMIC   Fa0/7
SW1#
```

Figure 8 – SW1 show mac address-table output

The trunk allows a single connection between the switches to carry traffic for multiple VLANs while maintaining the separation between those VLANs.