Packet Tracer - Compare Layer 2 and Layer 3 Devices

Objectives

Part 1: Compare Layer 2 and Layer 3 Switches

Part 2: Compare a Layer 3 Switch and a Router

Background / Scenario

In this activity, you will use various commands to examine three different switching topologies and compare the similarities and differences between the 2960 and 3650 switches. You will also compare the routing table of a 4321 router with that of a 3650 switch.

Note: Search the internet for more details about the *WS-C3650-24PS-L Layer 3 switch* and the *ISR 4321/K9* router.

Instructions

Part 1: Compare Layer 2 and Layer 3 Switches

Step 1: Explore the Physical Workspace.

a. In the Physical Workspace, click the **Home City** image. Click the **Corporate Office** image. Click the **Main Wiring Closet** image.

b. In the Rack, locate the devices **D1** and **ASw-1**. Examine the physical aspects of **D1** and **ASw-1**. If you need to examine the devices more closely, click the device and select the Physical tab.

Questions:

Each individual switch has how many physical switchports?

26 ports are on the 2960. Four SFP-compatible modular ports and 24 fixed ports make up the 3650.

How many Fast Ethernet and Gigabit Ethernet switchports does each switch have?

24 Fast Ethernet and 2 Gigabit Ethernet switchports are available on the 2960. 24 fixed and 4 modular Gigabit Ethernet ports are available on the 3650.

List the transmission speed of the Fast Ethernet and Gigabit Ethernet switchports on each switch.

The Gigabit Ethernet switchports can support rates of up to 1000 mbps, while the Fast Ethernet switchports offer speeds of 10/100 mbps.

Are either of the two switches modular in design?

Yes, the 3650.

Step 2: In the CLI tab

a. The switchports of a 3650 switch can be configured as Layer 3 interfaces by entering the **no switchport** command in interface configuration mode. This allows technicians to assign an IP address and subnet mask to the switchport in the same way that they are configured on a router interface.

Questions:

What is the difference between a Layer 2 switch and a Layer 3 switch?

L2 (MAC) addresses are used as the basis for a Layer 2 switch's forwarding decisions. On Layer 3 switches, switchports can be set up as IP-based interfaces. Like a router, the switches can also be set up with routing protocols.

What is the difference between a switch's physical interface and the VLAN interface?

The physical interface of a switch is used for connecting end devices to the network. The switch is assigned an IP address so that it can be managed remotely via a switched virtual interface (SVI or VLAN).

At which layers do 2960 and 3650 switches operate?

The 2960 functions at Layer 2, whereas the 3650 functions at Layers 2 and 3.

b. Navigate to the CLI tab for both devices. Issue the **show run** command to examine the configurations of the **D1** and **ASw-1** switches.

Question:
Do you notice any differences between them?

The 2960 contains largely Fast Ethernet ports and two Gigabit Ethernet ports that are meant for uplinks between switches, whereas D1's ports are all Gigabit Ethernet. Additionally, the D1's ports are given several names. The stack-module-port format is used by the D1. Switch port G1/1/1 and G1/1/2 on D1 are configured using the no switchport command and display an IP address and mask. The ip routing command has also enabled IP routing on D1.

c. Try to display the routing table on D1 and ASw-1 using the **show ip route** command.

Question:
Why do you think the command does not work on **ASw-1** but works on **D1**?

It may serve as a Layer 2 switch and, at the same time, route packets and make forwarding decisions based on Layer 3 information (IP addresses), which is something that conventional switches cannot do. This is how it works on D1. Since ASw-1 is a Layer 2 switch, it lacks a routing table.

Part 2: Compare a Layer 3 Switch and a Router

In the past, switches and routers have been separate and distinct devices. The term switch was set aside for hardware devices that function at Layer 2. Routers, on the other hand, are devices that make forwarding decisions based on Layer 3 information. They use routing protocols to share routing information and to communicate with other routers. Layer 3 switches, such as the 3650, can be configured to forward Layer 3 packets. Entering the **ip routing** command in global configuration mode allows Layer 3 switches to be configured with routing protocols, which gives them some of the capabilities of a router. Although similar in some ways, Layer 3 switches are different from routers in many other aspects.

Step 1: Compare D1 and R1

a. Open the Physical tab on D1 and R1.

Question:
Do you notice any similarities between the two? Do you notice any differences between the two?

Both of them have Gigabit Ethernet interfaces, console ports, and USB connections. Modularity in R1 and D1 allows for the addition of additional interfaces. Compared to D1, R1 only has Ethernet ports, while R1 has serial and asynchronous interfaces. R1 can use a variety of connection types depending on the modules being used, and D1 can use copper- or fiber-based Ethernet depending on the modules that are present. More Gigabit Ethernet ports are available on D1 than R1.

b. In the CLI tab, issue the **show run** command and examine the configurations of R1 and D1.

Questions:
What differences do you see between the two?

Despite being on distinct interfaces, R1 and D1 both have the same IP addresses configured on them.

Which command allows configuration of D1 with an IP address on one of its physical interfaces?

The no switchport command.

c. Use the **show ip route** command on both devices.

Question:

Do you see any similarities or differences between the two tables?

Except for the router, which has a L code for local, the codes are identical. This link has been set up on R1's physical interface. This code is missing from the switch routing table. The routing tables of both devices show the same networks.

Step 2: Compare R2 and D2

a. Now, analyze the routing table of R2 and D2. Click both devices in the Rack. In the CLI tab, issue the **show ip route** command.

Questions:

What is present now that was not present in the configuration of R1 and D1?

Both of them have OSPF set up, and they are exchanging network information.

Which network is in the routing table of D2 that was learned from R2?

The 1.1.1.0/24 network was learned from R2.

b. Click the **Back Level** icon (Alt + Left) to leave the Main Wiring Closet. Verify that each topology has full connectivity by completing the following tests:

Ping from **PC1** to **PC2**

Ping from **PC3** to **PC4**

Ping from **PC5** to **PC6** and **PC7**

In all three examples, each PC is on a different network.

Note: You may need to move the PCs to see them.

Questions:

Which device is used to provide communication between networks?

Router or multilayer switch.

Why were we able to ping across networks without there being a router?

If a multilayer switch is setup with an IP address and has IP routing turned on, it can route between networks. If you intend to use OSPF or other routing protocols on the switch, IP routing must also be enabled. For the switch's physical interface to receive an IP address and subnet mask, the no switchport command must be enabled on the interface.

Bonus question: We say that routers are Layer 3 devices and conventional (non-Layer 3) switches are Layer 2 devices. However, we can assign an IP address to a management (SVI) interface of a Layer 2 switch. How is this possible if switches are Layer 2 devices?

An embedded server that may be accessed through Layer 3 is present in managed Layer 2 switches like the Cisco Catalyst 2960. The switch can be remotely operated and set by the server by allowing Telnet, SSH, or HTTP access from anywhere on the network. It helps to think of this functionality as distinct from the Layer 2 data forwarding capability of the switch.

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