

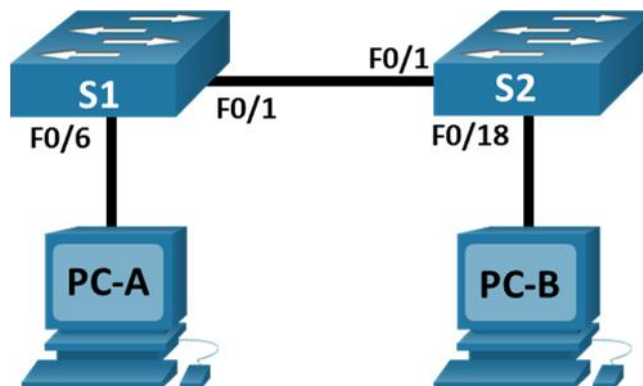
Lab 7.3.7 - View the Switch MAC Address Table



This lab has been updated for use on NETLAB+.

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Topology



Addressing Table

| Device | Interface | IP Address | Subnet Mask |
|--------|-----------|--------------|---------------|
| S1 | VLAN 1 | 192.168.1.11 | 255.255.255.0 |
| S2 | VLAN 1 | 192.168.1.12 | 255.255.255.0 |
| PC-A | NIC | 192.168.1.1 | 255.255.255.0 |
| PC-B | NIC | 192.168.1.2 | 255.255.255.0 |

Objectives

Part 1: Setup and Configure the Network

Part 2: Examine the Switch MAC Address Table

Background / Scenario

The purpose of a Layer 2 LAN switch is to deliver Ethernet frames to host devices on the local network. The switch records host MAC addresses that are visible on the network, and maps those MAC addresses to its own Ethernet switch ports. This process is called building the MAC address table. When a switch receives a frame from a PC, it examines the frame's source and destination MAC addresses. The source MAC address is recorded and mapped to the switch port from which it arrived. Then the destination MAC address is looked up in the MAC address table. If the destination MAC address is a known address, then the frame is forwarded out of the corresponding switch port associated with that MAC address. If the MAC address is unknown, then the frame is broadcasted out of all switch ports, except the one from which it came. It is important to observe and understand the function of a switch and how it delivers data on the network. The way a switch operates has implications for network administrators whose job it is to ensure secure and consistent network communication.

Switches are used to interconnect and deliver information to computers on local area networks. Switches deliver Ethernet frames to host devices identified by network interface card MAC addresses.

In Part 1, you will configure the PCs and Cisco 2960 switches. In Part 2, you will ping various devices and observe how the two switches build their MAC address tables.

Note: The switches used are Cisco Catalyst 2960s with Cisco IOS Release 15.2(2) (lanbasek9 image). Other switches and Cisco IOS versions can be used. Depending on the model and Cisco IOS version, the commands available and output produced might vary from what is shown in the labs.

Instructions

Part 1: Setup and Configure the Network

Step 1: Configure PC hosts.

Step 2: Configure basic settings for each switch.

- Configure device name as shown in the topology.
- Configure IP address as listed in Addressing Table.
- Assign **cisco** as the console and vty passwords.
- Assign **class** as the privileged EXEC password.

Part 2: Examine the Switch MAC Address Table

A switch learns MAC addresses and builds the MAC address table, as network devices initiate communication on the network.

Step 1: Record network device MAC addresses.

- Open a command prompt on PC-A and PC-B and type **ipconfig /all**.

What are the Ethernet adapter physical addresses?

PC-A MAC Address:

Type your answers here.

00-50-56-82-FA-9D

PC-B MAC Address:

Type your answers here.

00-50-56-82-FA-9E

- Click on switch S1 and S2 to access their Console ports and type the **show interface F0/1** command on each switch.

On the second line of command output, what is the hardware addresses (or burned-in address [bia])?

S1 Fast Ethernet 0/1 MAC Address:

Type your answers here.

000a.b853.5801

S2 Fast Ethernet 0/1 MAC Address:

Type your answers here.

000a.b81d.d781

Step 2: Display the switch MAC address table.

Access switch S2 and view the MAC address table, both before and after running network communication tests with ping.

- Click on switch S2 and enter privileged EXEC mode.
- In privileged EXEC mode, type the **show mac address-table** command and press Enter.

```
S2# show mac address-table
```

Even though there has been no network communication initiated across the network (i.e., no use of ping), it is possible that the switch has learned MAC addresses from its connection to the PC and the other switch.

Are there any MAC addresses recorded in the MAC address table?

Type your answers here.

Yes, when I pinged the switches, the MAC addresses were recorded.

What MAC addresses are recorded in the table? To which switch ports are they mapped and to which devices do they belong? Ignore MAC addresses that are mapped to the CPU.

MAC address that the switch learns are recorded in the table. Some of the ones currently in the table are S1 F0/1's MAC address and PC-A's MAC.

If you had not previously recorded MAC addresses of network devices in Step 1, how could you tell which devices the MAC addresses belong to, using only the output from the **show mac address-table** command? Does it work in all scenarios?

The command shows the port where the MAC addresses was learned. If two switches are connected, then multiple addresses will be shown.

Step 3: Clear the S2 MAC address table and display the MAC address table again.

- In privileged EXEC mode, type the **clear mac address-table dynamic** command and press Enter.

```
S2# clear mac address-table dynamic
```
- Quickly type the **show mac address-table** command again.

Does the MAC address table have any addresses in it for VLAN 1? Are there other MAC addresses listed?

Type your answers here.

No, but the MAC for S1 F0/1 is still shown.

Wait 10 seconds, type the **show mac address-table** command, and press Enter. Are there new addresses in the MAC address table?

Type your answers here.

Yes

Step 4: From PC-B, ping the devices on the network and observe the switch MAC address table.

- From PC-B, open a command prompt and type **arp -a**.

Not including multicast or broadcast addresses, how many device IP-to-MAC address pairs have been learned by ARP?

Type your answers here. 1

- b. From the PC-B command prompt, ping PC-A, S1, and S2.

Did all devices have successful replies? If not, check your cabling and IP configurations.

Type your answers here.

Yes

- c. Access switch S2, enter the **show mac address-table** command.

Has the switch added additional MAC addresses to the MAC address table? If so, which addresses and devices?

Type your answers here.

PC-A's MAC address had been added.

From PC-B, open a command prompt and retype **arp -a**.

Does the PC-B ARP cache have additional entries for all network devices that were sent pings?

Type your answers here.

PC-A's MAC was already in the table, but S1 and S2's MACs were added.

Reflection Question

On Ethernet networks, data is delivered to devices by their MAC addresses. For this to happen, switches and PCs dynamically build ARP caches and MAC address tables. With only a few computers on the network this process seems fairly easy. What might be some of the challenges on larger networks?

Type your answers here.

On any network, a device can be spoofed since ARP and switch MAC address tables do not match the IP address to a MAC address. Many ARP broadcasts can cause delay on networks with minimal bandwidth.

Router and Switch Interface Summary Table

| Router / Switch Model | Ethernet Interface #1 | Ethernet Interface #2 | Serial Interface #1 | Serial Interface #2 |
|-----------------------|-----------------------------|-----------------------------|-----------------------|-----------------------|
| 1800 | Fast Ethernet 0/0 (F0/0) | Fast Ethernet 0/1 (F0/1) | Serial 0/0/0 (S0/0/0) | Serial 0/0/1 (S0/0/1) |
| 1900 | Gigabit Ethernet 0/0 (G0/0) | Gigabit Ethernet 0/1 (G0/1) | Serial 0/0/0 (S0/0/0) | Serial 0/0/1 (S0/0/1) |
| 2801 | Fast Ethernet 0/0 (F0/0) | Fast Ethernet 0/1 (F0/1) | Serial 0/1/0 (S0/1/0) | Serial 0/1/1 (S0/1/1) |
| 2811 | Fast Ethernet 0/0 (F0/0) | Fast Ethernet 0/1 (F0/1) | Serial 0/0/0 (S0/0/0) | Serial 0/0/1 (S0/0/1) |
| 2900 | Gigabit Ethernet 0/0 (G0/0) | Gigabit Ethernet 0/1 (G0/1) | Serial 0/0/0 (S0/0/0) | Serial 0/0/1 (S0/0/1) |

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| Router / Switch Model | Ethernet Interface #1 | Ethernet Interface #2 | Serial Interface #1 | Serial Interface #2 |
|--------------------------|------------------------------------|------------------------------------|-----------------------|-----------------------|
| 2960 | Fast Ethernet 0/1 (F0/1) | Fast Ethernet 0/2 (F0/2) | n/a | n/a |
| 3560 | Fast Ethernet 0/1 (F0/1) | Fast Ethernet 0/2 (F0/2) | n/a | n/a |
| 3650 | Gigabit Ethernet 1/0/1 (G1/0/1) | Gigabit Ethernet 1/0/2 (G1/0/2) | n/a | n/a |
| 4221 | Gigabit Ethernet 0/0/0 (G0/0/0) | Gigabit Ethernet 0/0/1 (G0/0/1) | Serial 0/1/0 (S0/1/0) | Serial 0/1/1 (S0/1/1) |
| 4300 | Gigabit Ethernet 0/0/0 (G0/0/0) | Gigabit Ethernet 0/0/1 (G0/0/1) | Serial 0/1/0 (S0/1/0) | Serial 0/1/1 (S0/1/1) |

Note: To find out how the router is configured, look at the interfaces to identify the type of router and how many interfaces the router has. There is no way to effectively list all the combinations of configurations for each router class. This table includes identifiers for the possible combinations of Ethernet and Serial interfaces in the device. The table does not include any other type of interface, even though a specific router may contain one. An example of this might be an ISDN BRI interface. The string in parenthesis is the legal abbreviation that can be used in Cisco IOS commands to represent the interface.