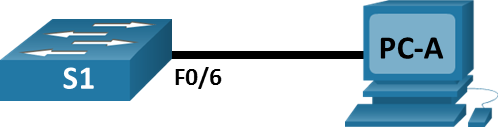
Lab - View Network Device MAC Addresses (Instructor Version)

**Instructor Note**: Red font color or gray highlights indicate text that appears in the instructor copy only.

# Topology



# Addressing Table

| Device | Interface | IP Address | Subnet Mask | Default Gateway |
| --- | --- | --- | --- | --- |
| S1 | VLAN 1 | 192.168.1.2 | 255.255.255.0 | N/A |
| PC-A | NIC | 192.168.1.3 | 255.255.255.0 | 192.168.1.1 |

# Objectives

Part 1: Configure Devices and Verify Connectivity

Part 2: Display, Describe, and Analyze Ethernet MAC Addresses

# Background / Scenario

Every device on an Ethernet LAN is identified by a Layer 2 MAC address. This address is assigned by the manufacturer and stored in the firmware of the NIC. This lab will explore and analyze the components that make up a MAC address, and how you can find this information on a switch and a PC.

You will cable the equipment as shown in the topology. You will configure the switch and PC to match the addressing table. You will verify your configurations by testing for network connectivity.

After the devices have been configured and network connectivity has been verified, you will use various commands to retrieve information from the devices to answer questions about your network equipment.

**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 the output produced might vary from what is shown in the labs.

**Note**: Make sure that the switches have been erased and have no startup configurations. If you are unsure, ask your instructor.

**Instructor Note**: Refer to the Instructor Lab Manual for the procedures to initialize and reload devices.

# Required Resources

* 1 Switch (Cisco 2960 with Cisco IOS Release 15.2(2) lanbasek9 image or comparable)
* 1 PC (Windows with a terminal emulation program, such as Tera Term)
* Console cable to configure the Cisco switch via the console ports
* Ethernet cables as shown in the topology

# Instructions

## Configure Devices and Verify Connectivity

In this part, you will set up the network topology and configure basic settings, such as the interface IP addresses and device name. For device name and address information, refer to the Topology and Addressing Table.

### Cable the network as shown in the topology.

* + - 1. Attach the devices shown in the topology and cable as necessary.
      2. Power on all the devices in the topology.

### Configure the IPv4 address for the PC.

* + - 1. Configure the IPv4 address, subnet mask, and default gateway address for PC-A.
      2. From the command prompt on PC-A, ping the switch address.

Open a Windows command prompt

#### Question:

Were the pings successful? Explain.

Type your answers here.

No. The switch has not been configured yet.

Close a Windows command prompt

### Configure basic settings for the switch.

In this step, you will configure the device name and the IP address, and disable DNS lookup on the switch.

* + - 1. Console into the switch and enter global configuration mode.

Open a configuration window.

Switch> **enable**

Switch# **configure terminal**

Enter configuration commands, one per line. End with CNTL/Z.

Switch(config)#

* + - 1. Assign a hostname to the switch based on the Addressing Table.

Switch(config)# **hostname S1**

* + - 1. Disable DNS lookup.

S1(config)# **no ip domain-lookup**

* + - 1. Configure and enable the SVI interface for VLAN 1.

S1(config)# **interface vlan 1**

S1(config-if)# **ip address 192.168.1.2 255.255.255.0**

S1(config-if)# **no shutdown**

S1(config-if)# **end**

\*Mar 1 00:07:59.048: %SYS-5-CONFIG\_I: Configured from console by console

Close a configuration window

### Verify network connectivity.

Open a Windows command prompt.

Ping the switch from PC-A.

#### Question:

Were the pings successful?

Type your answers here.

The pings should be successful.

Close a Windows command prompt.

## Display, Describe, and Analyze Ethernet MAC Addresses

Every device on an Ethernet LAN has a MAC address that is assigned by the manufacturer and stored in the firmware of the NIC. Ethernet MAC addresses are 48-bits long. They are displayed using six sets of hexadecimal digits that are usually separated by dashes, colons, or periods. The following example shows the same MAC address using the three different notation methods:

**00-05-9A-3C-78-00 00:05:9A:3C:78:00 0005.9A3C.7800**

**Note**: MAC addresses are also called physical addresses, hardware addresses, or Ethernet hardware addresses.

You will issue commands to display the MAC addresses on a PC and a switch, and analyze the properties of each one.

### Analyze the MAC address for the PC-A NIC.

Before you analyze the MAC address on PC-A, look at an example from a different PC NIC. You can issue the **ipconfig /all** command to view the MAC address of your NIC. An example screen output is shown below. When using the **ipconfig /all** command, notice that MAC addresses are referred to as physical addresses. Reading the MAC address from left to right, the first six hex digits refer to the vendor (manufacturer) of this device. These first six hex digits (3 bytes) are also known as the organizationally unique identifier (OUI). This 3-byte code is assigned to the vendor by the IEEE organization.

To find the manufacturer, use the keywords ***IEEE OUI standards*** to find an OUI lookup tool on the internet or navigate to <http://standards-oui.ieee.org/oui.txt> to find the registered OUI vendor codes. The last six digits are the NIC serial number assigned by the manufacturer.

* + - 1. Using the output from the **ipconfig /all** command, answer the following questions.

C:\> **ipconfig /all**

<output omitted>

Ethernet adapter Ethernet:

Connection-specific DNS Suffix . :

Description . . . . . . . . . . . : Intel(R) 82577LM Gigabit Network Connection

Physical Address. . . . . . . . . : 5C-26-0A-24-2A-60

DHCP Enabled. . . . . . . . . . . : Yes

Autoconfiguration Enabled . . . . : Yes

Link-local IPv6 Address . . . . . : fe80::b875:731b:3c7b:c0b1%10(Preferred)

IPv4 Address. . . . . . . . . . . : 192.168.1.147(Preferred)

Subnet Mask . . . . . . . . . . . : 255.255.255.0

Lease Obtained. . . . . . . . . . : Friday, September 6, 2019 11:08:36 AM

Lease Expires . . . . . . . . . . : Saturday, September 7, 2019 11:08:36 AM

Default Gateway . . . . . . . . . : 192.168.1.1

<output omitted>

#### Questions:

What is the OUI portion of the MAC address for this device? *Answer: 5C-26-0A*

Type your answers here.

5C-26-0A

What is the serial number portion of the MAC address for this device? *Answer: 24-2A-60*

Type your answers here.

24-2A-60

Using the example above, find the name of the vendor that manufactured this NIC. *Answer: Dell Inc.*

Type your answers here.

Dell Inc.

* + - 1. From the command prompt on PC-A, issue the **ipconfig /all** command and identify the OUI portion of the MAC address for the NIC of PC-A. *Answer: 00-0A-41*

Type your answers here.

Answers will vary based on manufacturer.

Identify the serial number portion of the MAC address for the NIC of PC-A. *Answer: EE-74-90*

Type your answers here.

Answers will vary based on manufacturer serial number code.

Identify the name of the vendor that manufactured the NIC of PC-A. *Answer: Cisco Systems, Inc*

Type your answers here.

Answers will vary based on manufacturer OUI.

### Analyze the MAC address for the S1 F0/6 interface.

You can use a variety of commands to display MAC addresses on the switch.

* + - 1. Console into S1 and use the **show interfaces vlan 1** command to find the MAC address information. A sample is shown below. Use output generated by your switch to answer the questions.

Open a configuration window

S1# **show interfaces vlan 1**

Vlan1 is up, line protocol is up

Hardware is EtherSVI, address is 001b.0c6d.8f40 (bia 001b.0c6d.8f40)

Internet address is 192.168.1.2/24

MTU 1500 bytes, BW 1000000 Kbit/sec, DLY 10 usec,

reliability 255/255, txload 1/255, rxload 1/255

Encapsulation ARPA, loopback not set

Keepalive not supported

ARP type: ARPA, ARP Timeout 04:00:00

Last input never, output 00:14:51, output hang never

Last clearing of "show interface" counters never

Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0

Queueing strategy: fifo

Output queue: 0/40 (size/max)

5 minute input rate 0 bits/sec, 0 packets/sec

5 minute output rate 0 bits/sec, 0 packets/sec

0 packets input, 0 bytes, 0 no buffer

Received 0 broadcasts (0 IP multicasts)

0 runts, 0 giants, 0 throttles

0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored

34 packets output, 11119 bytes, 0 underruns

0 output errors, 2 interface resets

0 unknown protocol drops

0 output buffer failures, 0 output buffers swapped out

#### Question:

What is the MAC address for VLAN 1 on S1? *Answer: 0009.7c45.4b5c*

Type your answers here.

Answers will vary based on the switch the student is using. Using the output from above, the answer would be **001b.0c6d.8f40**.

What is the MAC serial number for VLAN 1? *Answer: 45.4b.5c*

Type your answers here.

Answers will vary based on the switch the student is using. Using the output from above, the answer would be 6d-8f-40.

What is the OUI for VLAN 1? *Answer: 00.09.7c*

Type your answers here.

Answers will vary based on the switch the student is using. Using the output from above, the answer would be 00-1b-0c.

Based on this OUI, what is the name of the vendor? *Answer: Cisco Systems, Inc*

Type your answers here.

Cisco Systems

What does bia stand for? *Answer: Burned in address*

Type your answers here.

Burned in address.

Why does the output show the same MAC address twice? *Answer:*

Type your answers here.

The MAC address can be changed via a software command. The actual address (bia) will still be there. It is shown in the parenthesis.

* + - 1. Another way to display the MAC address on the switch is to use the **show arp** command. Use the **show arp** command to display MAC address information. This command maps the Layer 2 address to its corresponding Layer 3 address. A sample is shown below. Use output generated by your switch to answer the questions.

S1# **show arp**

Protocol Address Age (min) Hardware Addr Type Interface

Internet 192.168.1.2 - 001b.0c6d.8f40 ARPA Vlan1

Internet 192.168.1.3 0 5c26.0a24.2a60 ARPA Vlan1

What Layer 2 addresses are displayed on S1?

*Answer: 0009.7C45.4B5C and 000A.41EE.7490 (S1 and PC-A hardware/MAC addr)*

Type your answers here.

S1 VLAN 1 and PC-A MAC addresses. If the student also records the MAC addresses, their answers will vary.

What Layer 3 addresses are displayed on S1?

Answer: 192.168.1.2 and 192.168.1.3 (S1 and PC-A)

S1 and PC-A IP addresses

### View the MAC addresses on the switch.

Issue the **show mac address-table** command on S1. A sample is shown below. Use output generated by your switch to answer the questions.

**Instructor Note**: The **show mac address-table** command can vary based on the model switch you are using. For example, the syntax on some switches is **show mac-address-table.**

S1# **show** **mac address-table**

Mac Address Table

-------------------------------------------

Vlan Mac Address Type Ports

---- ----------- -------- -----

All 0100.0ccc.cccc STATIC CPU

All 0100.0ccc.cccd STATIC CPU

All 0180.c200.0000 STATIC CPU

All 0180.c200.0001 STATIC CPU

All 0180.c200.0002 STATIC CPU

All 0180.c200.0003 STATIC CPU

All 0180.c200.0004 STATIC CPU

All 0180.c200.0005 STATIC CPU

All 0180.c200.0006 STATIC CPU

All 0180.c200.0007 STATIC CPU

All 0180.c200.0008 STATIC CPU

All 0180.c200.0009 STATIC CPU

All 0180.c200.000a STATIC CPU

All 0180.c200.000b STATIC CPU

All 0180.c200.000c STATIC CPU

All 0180.c200.000d STATIC CPU

All 0180.c200.000e STATIC CPU

All 0180.c200.000f STATIC CPU

All 0180.c200.0010 STATIC CPU

All ffff.ffff.ffff STATIC CPU

1 5c26.0a24.2a60 DYNAMIC Fa0/6

Total Mac Addresses for this criterion: 21

#### Question:

Did the switch display the MAC address of PC-A? If you answered yes, what port was it on?

*Answer: NO, transparent mode?*

Type your answers here.

Yes. Port should be F0/6. Answers will vary for the MAC address. In the example above, the MAC address would be 5c26.0a24.2a60.

# Reflection Questions

* 1. Can you have broadcasts at the Layer 2 level? If so, what would the MAC address be?

Type your answers here.

You can have broadcasts at Layer 2. ARP will use broadcasts to find MAC address information. The broadcast address is FF.FF.FF.FF.FF.FF.

* 1. Why would you need to know the MAC address of a device?

Type your answers here.

There could be a variety of reasons. In a large network, it may be easier to pinpoint location and identity of a device by its MAC address instead of its IP address. The MAC OUI will list the manufacturer, which may help narrow down the search. Security measures can be applied at Layer 2, so knowledge of allowable MAC addresses is needed.

End of Document

# Device Config

# Switch S1

S1# **show run**

Building configuration...

Current configuration : 1335 bytes

!

version 15.2

no service pad

service timestamps debug datetime msec

service timestamps log datetime msec

no service password-encryption

!

hostname S1

!

boot-start-marker

boot-end-marker

!

no aaa new-model

system mtu routing 1500

!

no ip domain-lookup

!

spanning-tree mode pvst

spanning-tree extend system-id

!

vlan internal allocation policy ascending

!

interface FastEthernet0/1

!

interface FastEthernet0/2

!

interface FastEthernet0/3

!

interface FastEthernet0/4

!

interface FastEthernet0/5

!

interface FastEthernet0/6

!

interface FastEthernet0/7

!

interface FastEthernet0/8

!

interface FastEthernet0/9

!

interface FastEthernet0/10

!

interface FastEthernet0/11

!

interface FastEthernet0/12

!

interface FastEthernet0/13

!

interface FastEthernet0/14

!

interface FastEthernet0/15

!

interface FastEthernet0/16

!

interface FastEthernet0/17

!

interface FastEthernet0/18

!

interface FastEthernet0/19

!

interface FastEthernet0/20

!

interface FastEthernet0/21

!

interface FastEthernet0/22

!

interface FastEthernet0/23

!

interface FastEthernet0/24

!

interface GigabitEthernet0/1

!

interface GigabitEthernet0/2

!

interface Vlan1

ip address 192.168.1.2 255.255.255.0

!

ip http server

ip http secure-server

logging esm config

!

line con 0

line vty 5 15

!

end