Addressing Table

Device	Interface	MAC Address	Switch Interface
Router0	Gg0/0	0001.6458.2501	G0/1
	S0/0/0	N/A	N/A
Router1	G0/0	00E0.F7B1.8901	G0/1
	S0/0/0	N/A	N/A
10.10.10.2	Wireless	0060.2F84.4AB6	F0/2
10.10.10.3	Wireless	0060.4706.572B	F0/2
172.16.31.2	F0	000C.85CC.1DA7	F0/1
172.16.31.3	F0	0060.7036.2849	F0/2
172.16.31.4	G0	0002.1640.8D75	F0/3

Objectives

Part 1: Examine an ARP Request
Part 2: Examine a Switch MAC Address Table
Part 3: Examine the ARP Process in Remote Communications

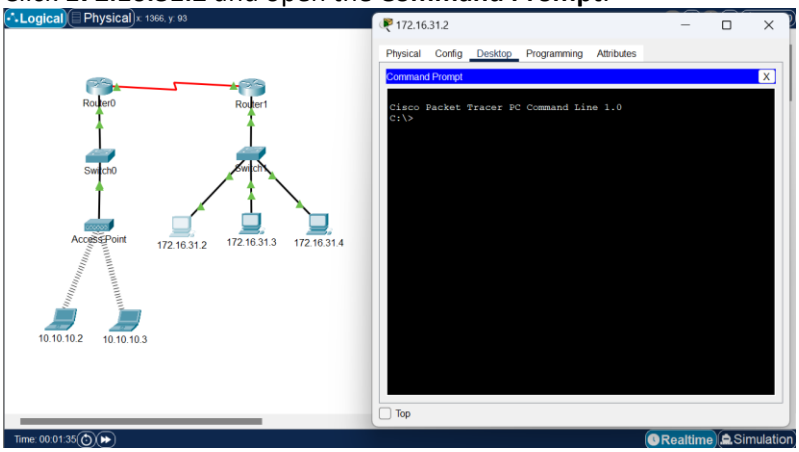
Background

This activity is optimized for viewing PDUs. The devices are already configured. You will gather PDU information in simulation mode and answer a series of questions about the data you collect.

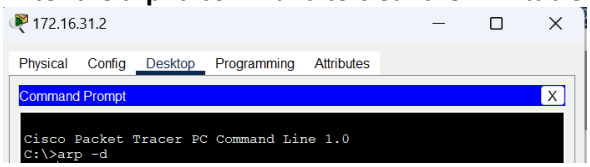
Part 1: Examine an ARP Request

Step 1: Generate ARP requests by pinging 172.16.31.3 from 172.16.31.2.

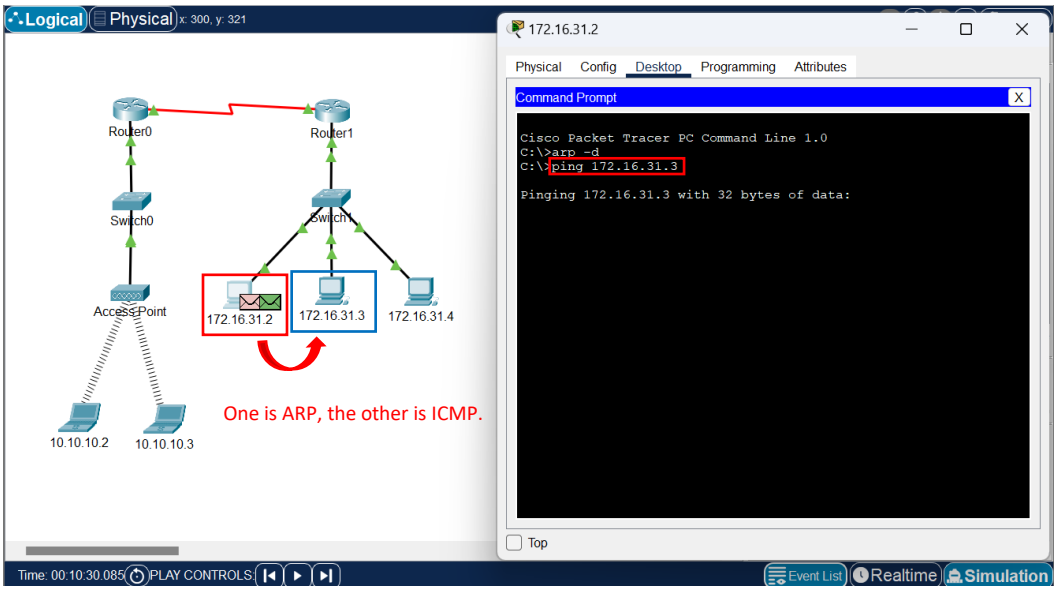
a. Click **172.16.31.2** and open the **Command Prompt**.



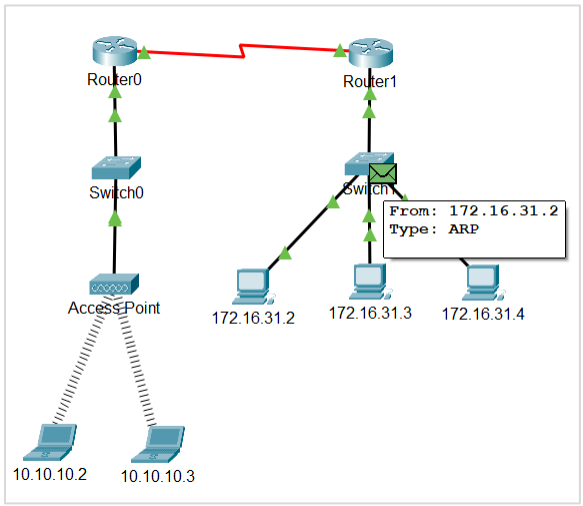
b. Enter the **arp -d** command to clear the ARP table.

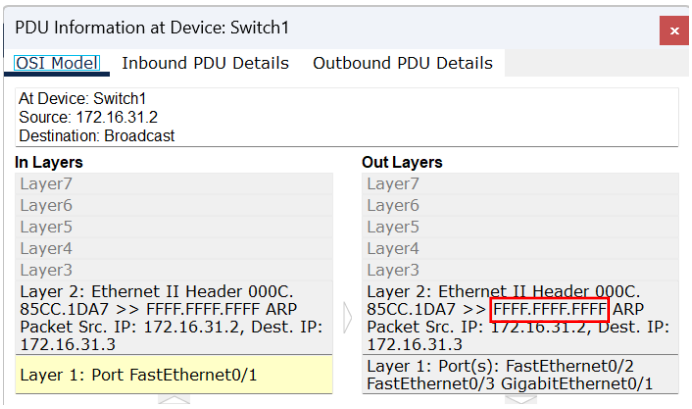


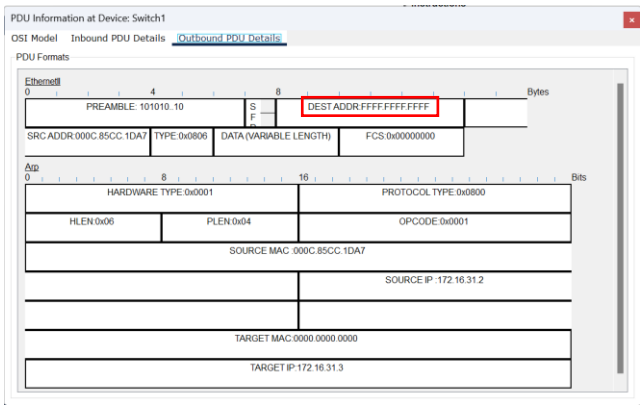
c. Enter **Simulation** mode and enter the command **ping 172.16.31.3**. Two PDUs will be generated. The **ping** command cannot complete the ICMP packet without knowing the MAC address of the destination. So the computer sends an ARP broadcast frame to find the MAC address of the destination.



d. Click **Capture/Forward** once. The ARP PDU moves **Switch1** while the ICMP PDU disappears, waiting for the ARP reply. Open the PDU and record the destination MAC address.







Is this address listed in the table above?

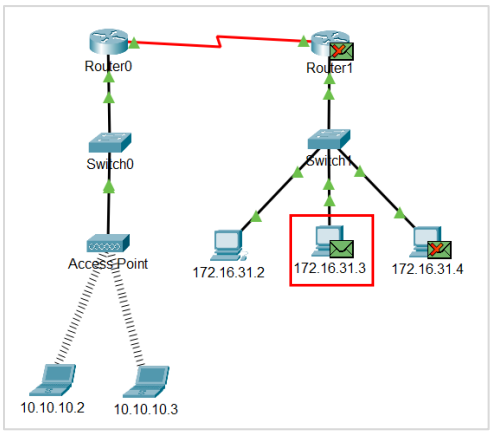
It's not because it's not a MAC address of any specific device. It's more of a broadcast address.

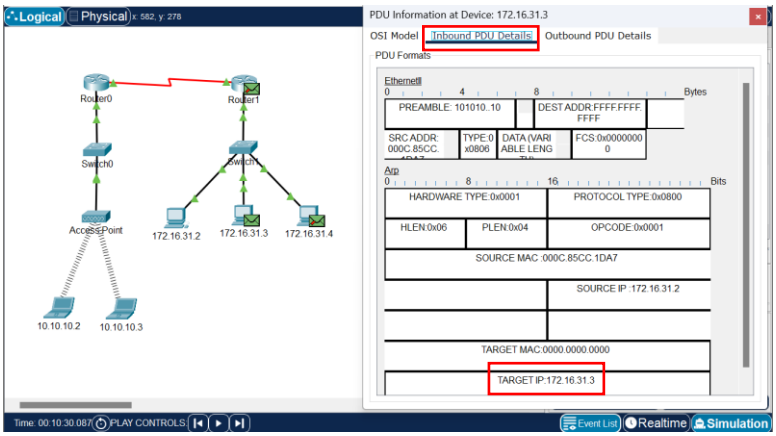
How many copies of the PDU did Switch1 make?

3 copies. One will go to Router1, one will go to the PC with the IP address of 172.16.31.3, and the remaining will go to the PC with the IP address of 172.16.31.4. (It will not go the PC with the IP address of 172.16.31.2 because Switch1 received the frame from that device.)

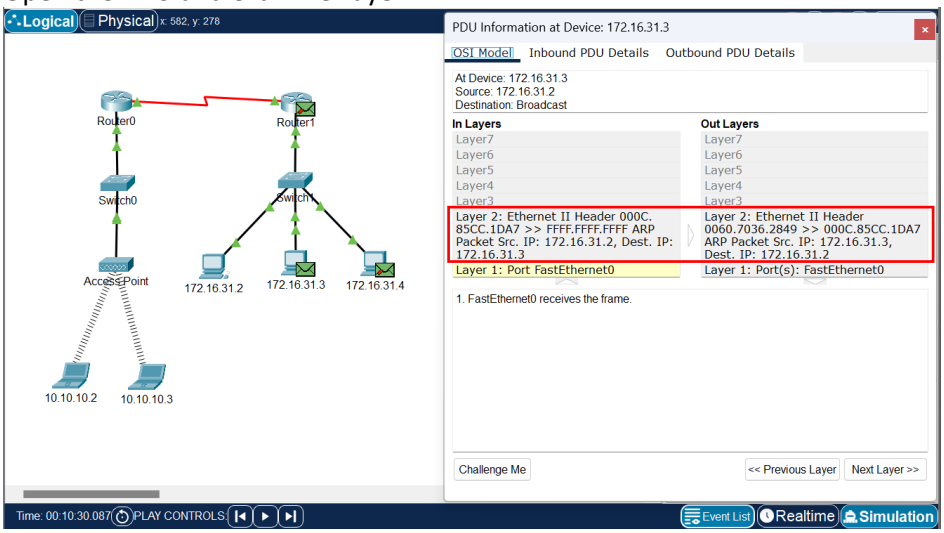
What is the IP address of the device that accepted the PDU?

The device that accepted the frame is the PC with an IP address of 172.16.31.3. This PC accepted the PDU because the PDU is destined for this device.





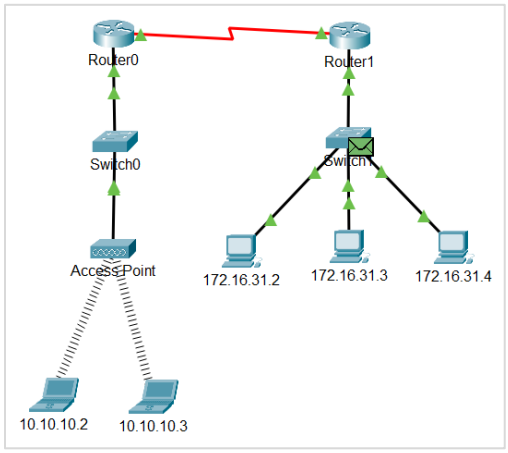
e. Open the PDU and examine Layer 2.

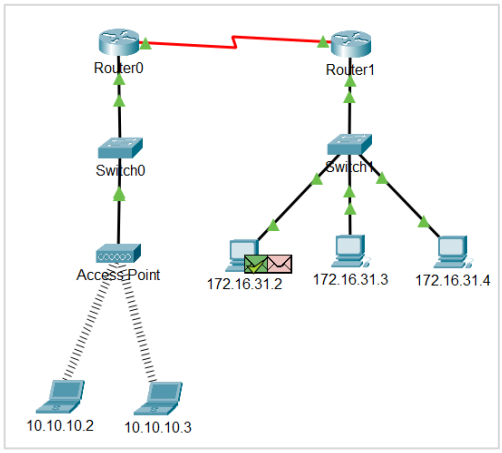


What happened to the source and destination MAC addresses?

The source MAC address is that of the 172.16.31.3 device (the original destination).
The destination MAC address is that of the 172.16.31.2 device (the original source).
This is because the 172.16.31.3 device will send back an ARP reply to the 172.16.31.2 device.

Click **Capture/Forward** until the PDU returns to **172.16.31.2**.



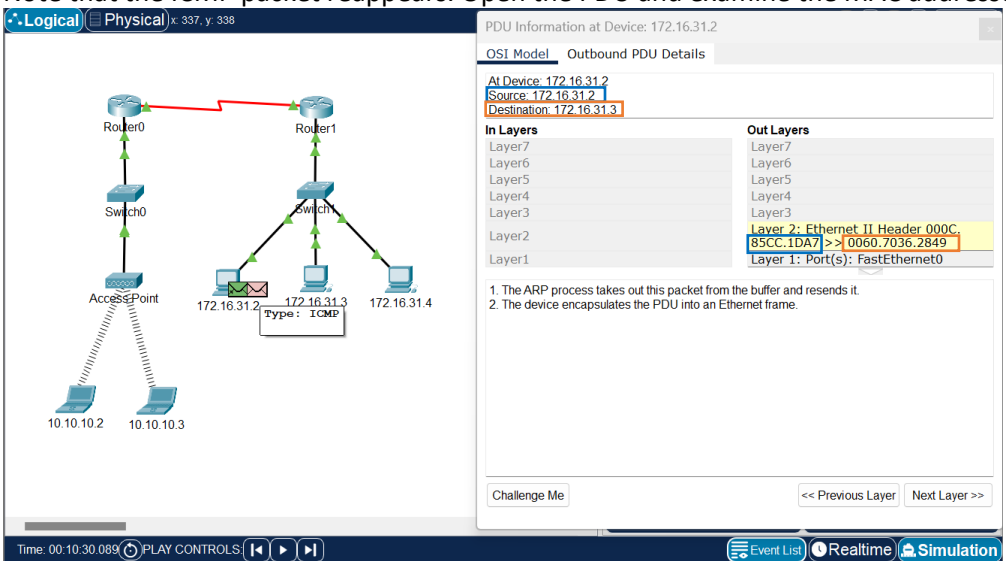


How many copies of the PDU did the switch make during the ARP reply?

Only one copy because this communication is a unicast communication.

Step 2: Examine the ARP table.

a. Note that the ICMP packet reappears. Open the PDU and examine the MAC addresses.

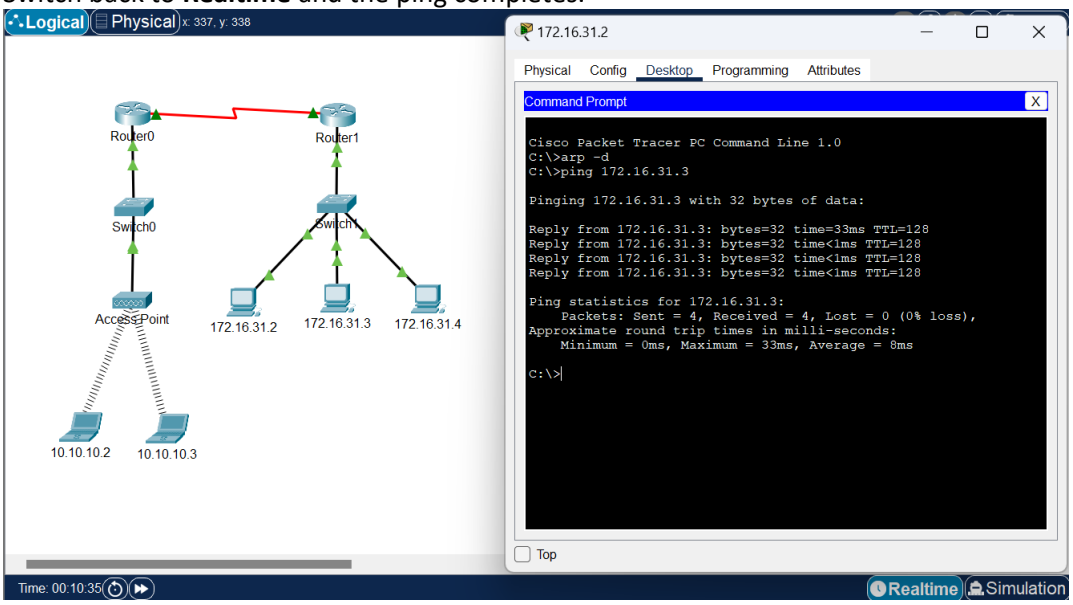


Do the MAC addresses of the source and destination align with their IP addresses?

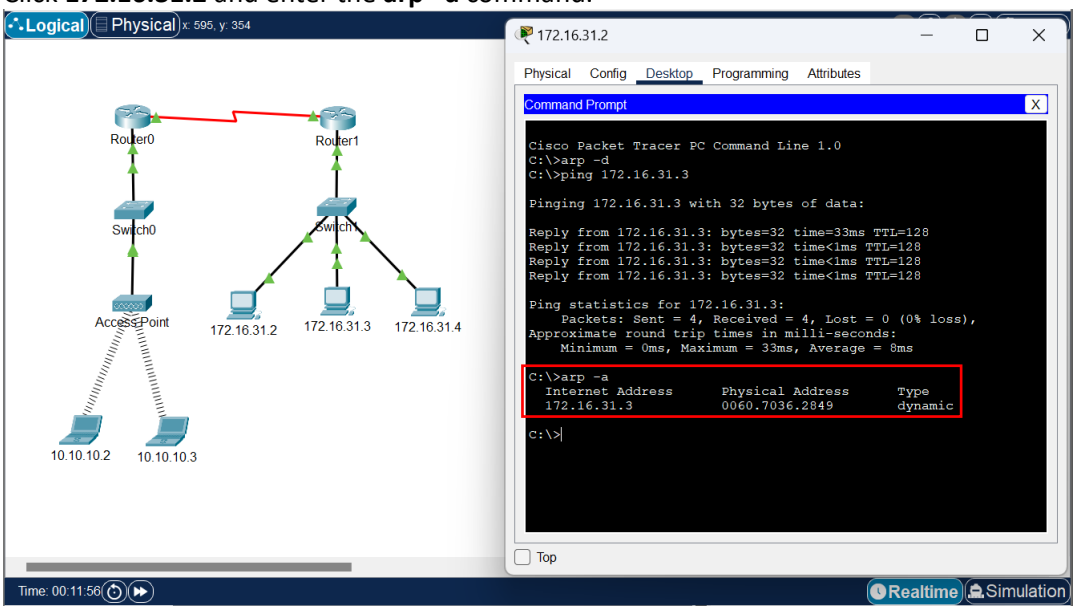
Yes.

Device	Interface	MAC Address	Switch Interface
172.16.31.2	F0	000C.85CC.1DA7	F0/1
172.16.31.3	F0	0060.7036.2849	F0/2

b. Switch back to **Realtime** and the ping completes.



c. Click **172.16.31.2** and enter the **arp –a** command.



To what IP address does the MAC address entry correspond?

172.16.31.3 (the destination IP address)

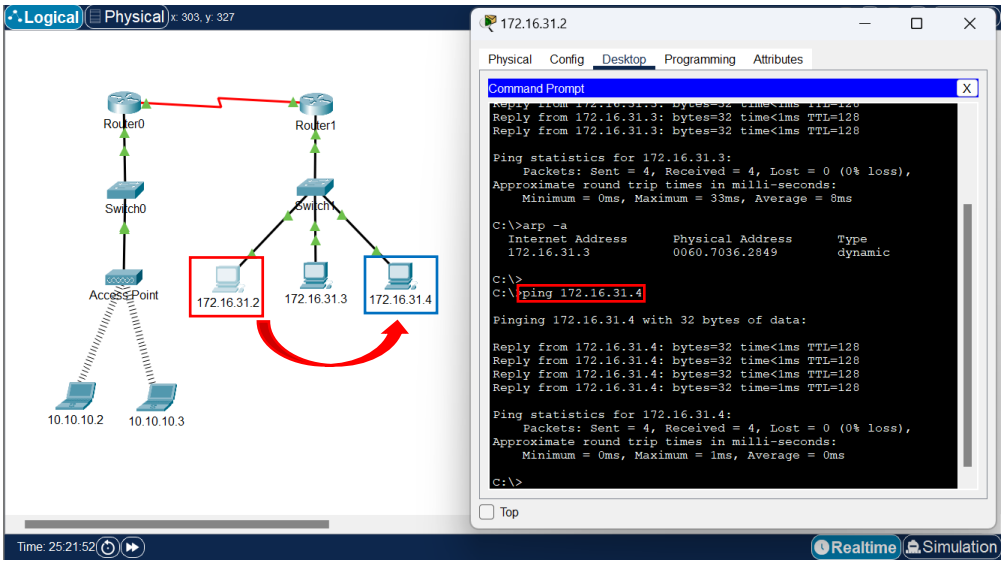
In general, when does an end device issue an ARP request?

Whenever a source device is unaware of its destination MAC address.

Part 2: Examine a Switch MAC Address Table

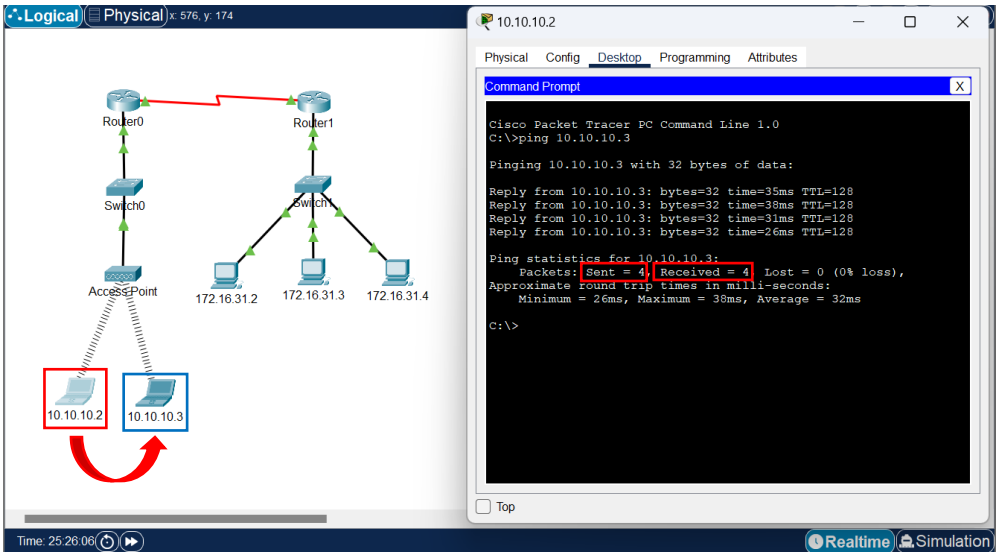
Step 1: Generate additional traffic to populate the switch MAC address table.

a. From **172.16.31.2**, enter the ping **172.16.31.4** command.



b. Click **10.10.10.2** and open the **Command Prompt**.

c. Enter the **ping 10.10.10.3** command.

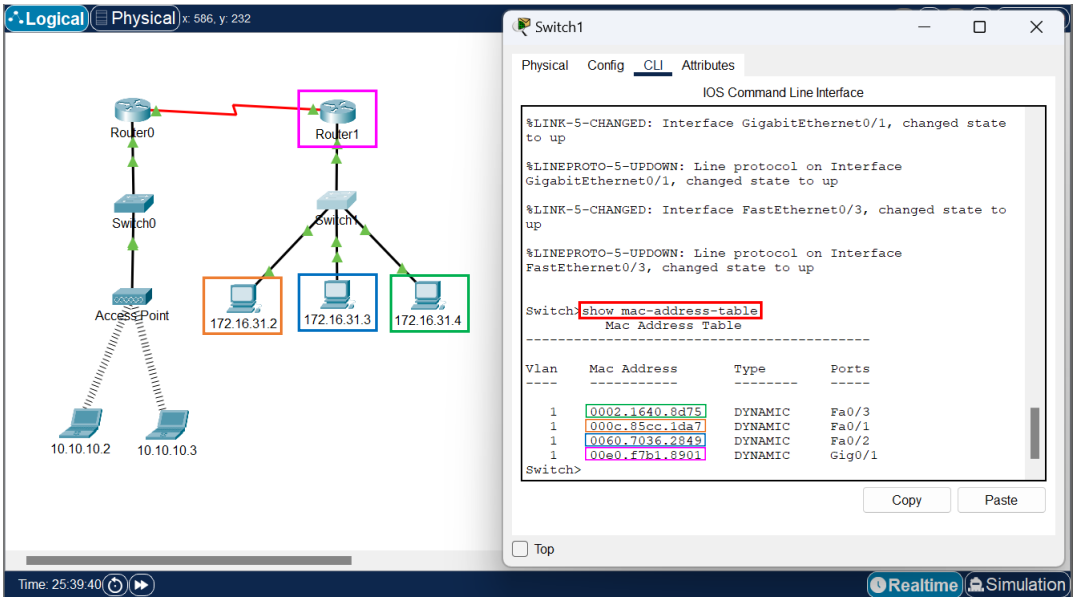


How many replies were sent and received?

Sent = 4, Received = 4.

Step 2: Examine the MAC address table on the switches.

a. Click **Switch1** and then the **CLI** tab. Enter the **show mac-address-table** command.

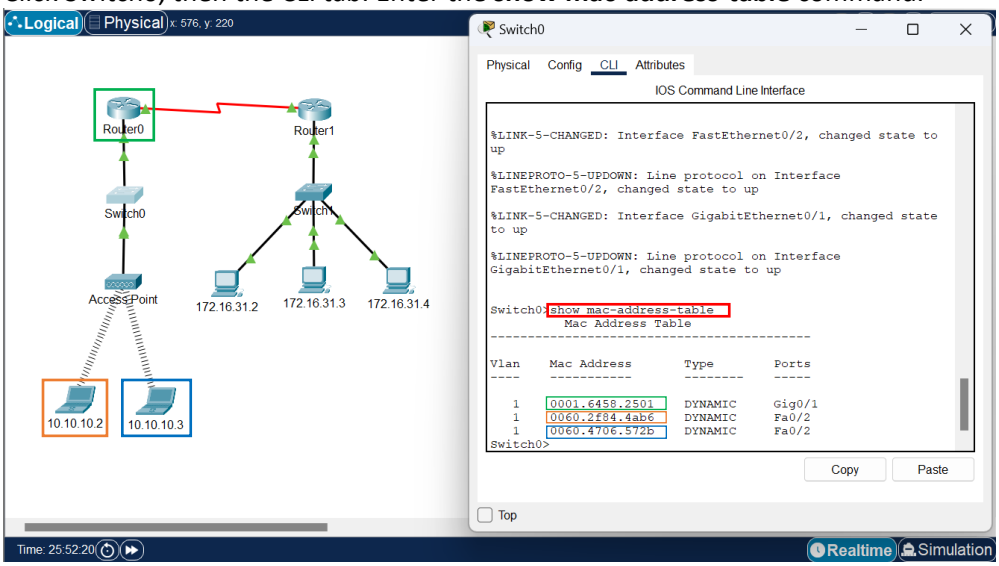


Do the entries correspond to those in the table above?

Yes.

Device	Interface	MAC Address	Switch Interface
Router0	Gg0/0	0001.6458.2501	G0/1
	S0/0/0	N/A	N/A
Router1	G0/0	00E0.F7B1.8901	G0/1
	S0/0/0	N/A	N/A
10.10.10.2	Wireless	0060.2F84.4AB6	F0/2
10.10.10.3	Wireless	0060.4706.572B	F0/2
172.16.31.2	F0	000C.85CC.1DA7	F0/1
172.16.31.3	F0	0060.7036.2849	F0/2
172.16.31.4	G0	0002.1640.8D75	F0/3

b. Click Switch0, then the CLI tab. Enter the **show mac-address-table** command.



Do the entries correspond to those in the table above?

Yes.

Device	Interface	MAC Address	Switch Interface
Router0	Gg0/0	0001.6458.2501	G0/1
	S0/0/0	N/A	N/A
Router1	G0/0	00E0.F7B1.8901	G0/1
	S0/0/0	N/A	N/A
10.10.10.2	Wireless	0060.2F84.4AB6	F0/2
10.10.10.3	Wireless	0060.4706.572B	F0/2
172.16.31.2	F0	000C.85CC.1DA7	F0/1
172.16.31.3	F0	0060.7036.2849	F0/2
172.16.31.4	G0	0002.1640.8D75	F0/3

Why are two MAC addresses associated with one port?

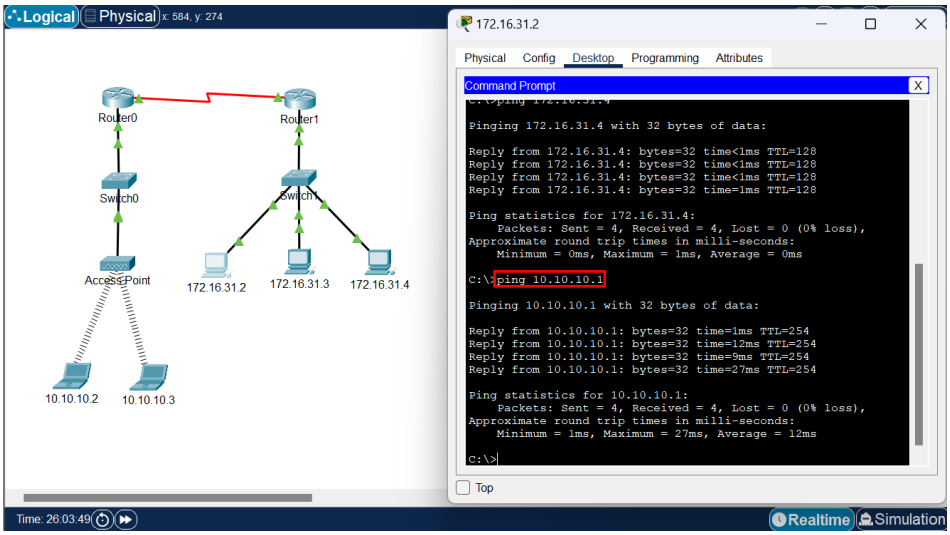
We can see that port F0/2 is associated with two MAC addresses. The 10.10.10.2 and 10.10.10.23 end devices are connected to the access point through a single port.

Part 3: Examine the ARP Process in Remote Communications

Step 1: Generate traffic to produce ARP traffic.

a. Click **172.16.31.2** and open the **Command Prompt**.

b. Enter the **ping 10.10.10.1** command.



c. Type **arp –a**.

```
C:\>arp -a
  Internet Address      Physical Address      Type
  172.16.31.1           00e0.f7b1.8901        dynamic
  172.16.31.4           0002.1640.8d75        dynamic
```

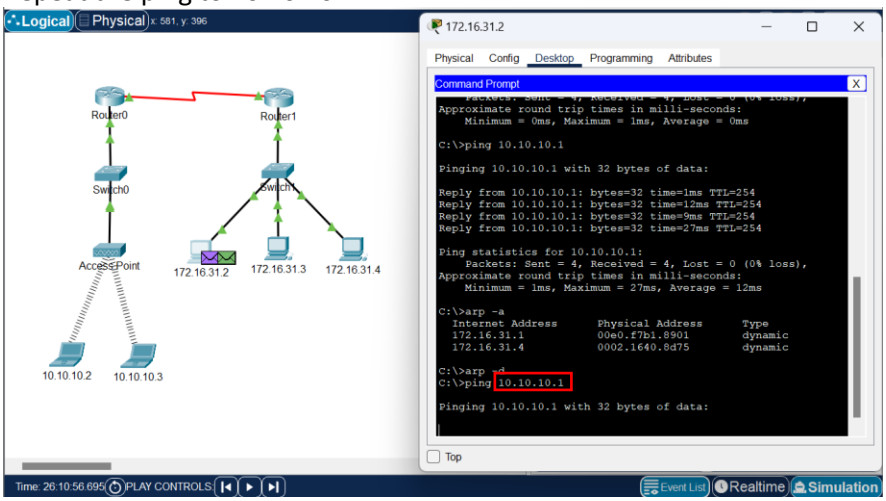
What is the IP address of the new ARP table entry?

172.16.31.1

d. Enter **arp -d** to clear the ARP table and switch to **Simulation** mode.

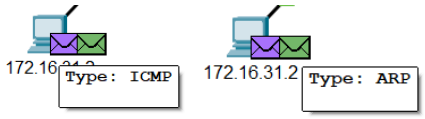
```
C:\>arp -d
```

e. Repeat the ping to 10.10.10.1.

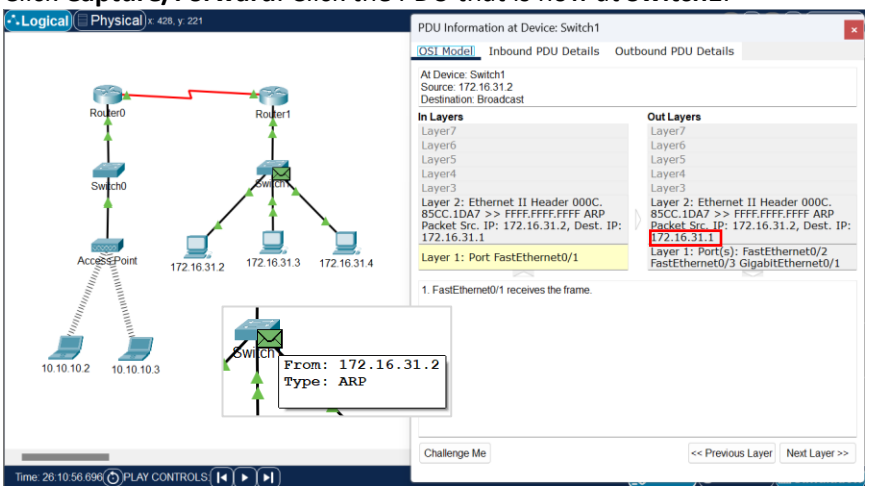


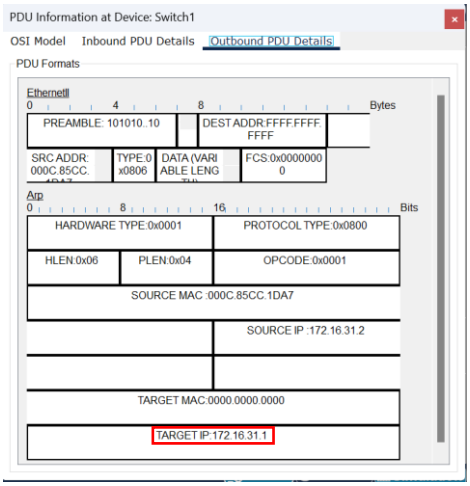
How many PDUs appear?

2



f. Click **Capture/Forward**. Click the PDU that is now at **Switch1**.





What is the target destination IP destination address of the ARP request?

172.16.31.1

g. The destination IP address is not 10.10.10.1.

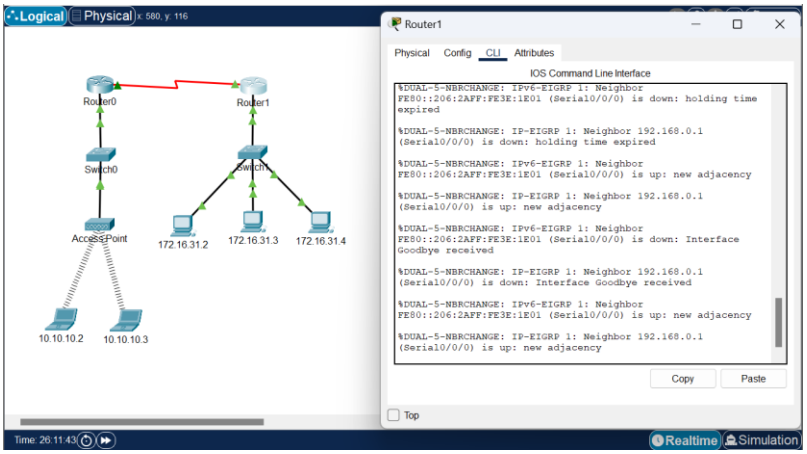
Why?

The 172.16.31.1 IP address actually belongs to our router interface. It is the gateway address of our router.

NOTE: If the receiving host is not on the same network, the source uses ARP process to determine a MAC address for the router interface to serve as the gateway.

Step 2: Examine the ARP table on Router1.

a. Switch to **Realtime** mode. Click **Router1** and then the **CLI** tab.



b. Enter privileged EXEC mode and then the **show mac-address-table** command.

```
Router>enable
Router#show mac-address-table
          Mac Address Table
-------------------------------------------

Vlan    Mac Address       Type        Ports
----    -----------       --------    -----
```

How many MAC addresses are in the table? Why?

None because the "show mac-address-table" command means something completely different for a router compared to a switch.

c. Enter the **show arp** command.

```
Router#show arp
Protocol  Address          Age (min)  Hardware Addr   Type   Interface
Internet  172.16.31.1            -   00E0.F7B1.8901  ARPA   GigabitEthernet0/0
Internet  172.16.31.2           14   000C.85CC.1DA7  ARPA   GigabitEthernet0/0
```

Is there an entry for **172.16.31.2**?

Yes.

What happens to the first ping in a situation where the router responds to the ARP request?

It will timeout.