

VxLEARN Networks

Networking & Cybersecurity Track
Simulated Employment Program

Lab Report: Identify MAC and IP Addresses

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1. Objective

This lab focuses on examining the movement of PDUs (Protocol Data Units) across a network. You will analyze MAC and IP addressing inside Ethernet frames and IP packets during local and remote communications. Packet Tracer's Simulation Mode will be used to track the path of packets across devices.

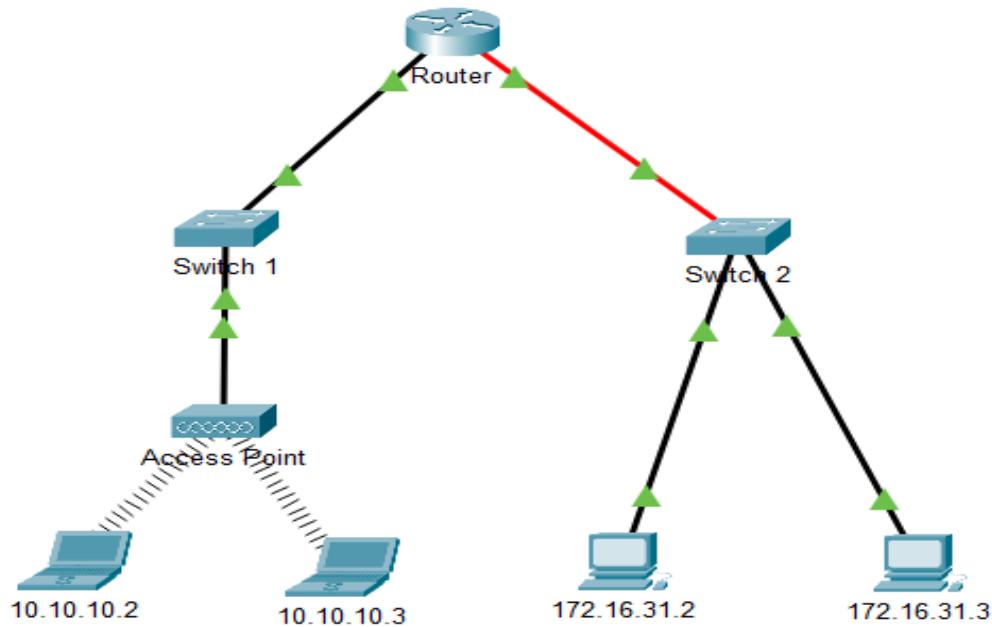
2. Background

Computers communicate across networks by encapsulating data with Layer 2 MAC addresses and Layer 3 IP addresses.

When devices communicate on the same local network, only MAC addresses change hop-to-hop.

When communicating across different networks, a router is required.

This router changes the MAC addresses as the packet moves between networks while the source and destination IP addresses remain the same.

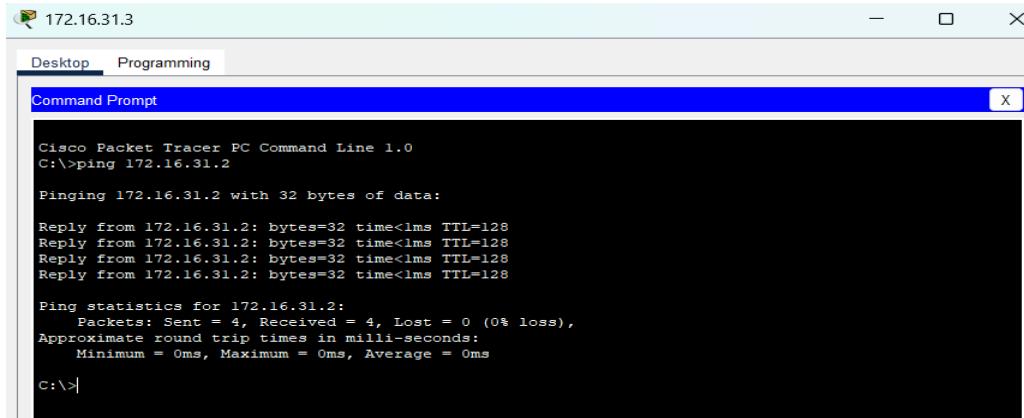


3. Part 1 – Local Network Communication

Goal: Observe how devices communicate within the same subnet without needing a default gateway.

1. On PC 172.16.31.3, run:

```
ping 172.16.31.2
```



A screenshot of the Cisco Packet Tracer Command Line interface. The window title is "172.16.31.3". Inside, a "Command Prompt" window shows the output of a ping command. The output indicates four successful replies from the target host at 172.16.31.2. Below the ping results, statistics are displayed: 4 packets sent, 4 received, 0 lost (0% loss). Approximate round trip times are shown as 0ms for minimum, maximum, and average. The command prompt ends with "C:\>".

```
Cisco Packet Tracer PC Command Line 1.0
C:>ping 172.16.31.2

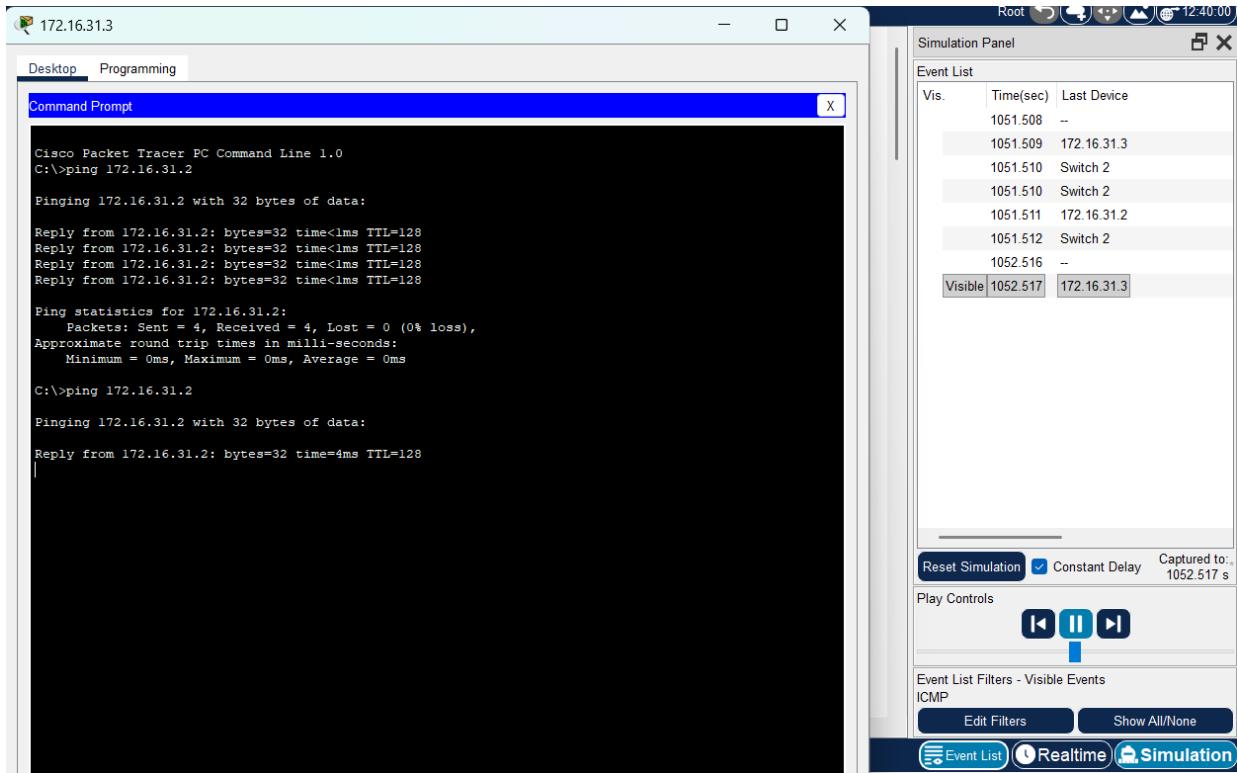
Pinging 172.16.31.2 with 32 bytes of data:

Reply from 172.16.31.2: bytes=32 time<1ms TTL=128

Ping statistics for 172.16.31.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:>|
```

2. Switch to Simulation Mode and repeat the ping.

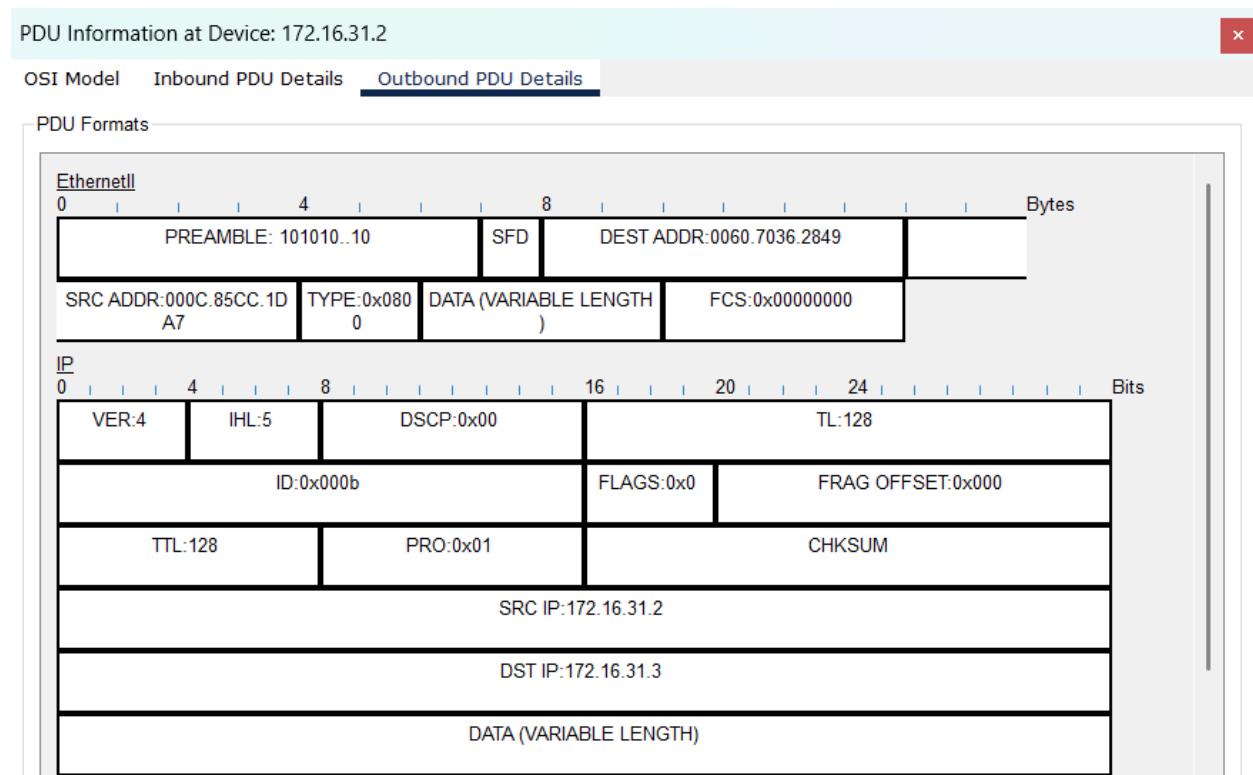


3. Click the PDU Envelope to inspect addressing.



Captured Address Information – First Hop

At Device	Source MAC	Destination MAC	Source IP	Destination IP
172.16.31.3	00E0.7036.2849	000C.85CC.1DA7	172.16.31.3	172.16.31.2



PDU at PC

Question (Local Communication):

How did the addressing differ in the outbound PDU and why?

Answer:

The MAC addresses changed, but the IP addresses remained the same.

This is because Layer 2 MAC addresses change per hop, while the Layer 3 IP addresses remain end-to-end.

4. Part 2 – Remote Network Communication

Goal: Observe communication across different networks, requiring a router.

1. On PC 172.16.31.3, enter:

```
ping 10.10.10.2
```



172.16.31.3

```
C:\>ping 10.10.10.2

Pinging 10.10.10.2 with 32 bytes of data:

Request timed out.
Reply from 10.10.10.2: bytes=32 time=14ms TTL=127
Reply from 10.10.10.2: bytes=32 time=55ms TTL=127
Reply from 10.10.10.2: bytes=32 time=44ms TTL=127

Ping statistics for 10.10.10.2:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 14ms, Maximum = 55ms, Average = 37ms

C:\>
```

2. Switch to Simulation Mode and examine the PDU again.

At Device	Source MAC	Destination MAC	Source IP	Destination IP
172.16.31.3	0060.7036.2849	00D0.BA8E.741A	172.16.31.3	10.10.10.2

PDU Information at Device: 172.16.31.3

OSI Model Inbound PDU Details

PDU Formats

EthernetII

PREAMBLE: 101010..10		SF D	DEST ADDR:0060.7036.2849	9	Bytes
SRC ADDR:00D0.BA8E.741A	TYPE:0x0800	DATA (VARIABLE LENGTH)	FCS:0x00000000		

IP

VER:4	IHL:5	DSCP:0x00	TL:128		
ID:0x0005		FLAGS: 0x0	FRAG OFFSET:0x000		
TTL:127	PRO:0x01	CHKSUM			
SRC IP:10.10.10.2					
DST IP:172.16.31.3					
DATA (VARIABLE LENGTH)					

ICMP

TYPE:0x00	CODE:0x00	CHECKSUM			
-----------	-----------	----------	--	--	--

Simulation Panel

Event List

Vis.	Time(sec)	Last Device
0.000	--	
0.001	172.16.31.3	
0.002	Switch 2	
0.003	Router	
0.004	Switch 1	
0.005	Access Point	
0.005	Access Point	
0.008	--	
0.009	10.10.10.2	
0.010	Access Point	
0.010	--	
0.011	Access Point	
0.011	Access Point	
0.011	Switch 1	
0.012	Router	
Visible	0.013	Switch 2

Reset Simulation Constant Delay Captured to: 0.013 s

Play Controls

Event List Filters - Visible Events ICMP

Edit Filters Show All/None

Event List Realtime Simulation

PC PDU

Question:

What device owns the destination MAC address?

Answer:

The destination MAC belongs to the Router's LAN Interface it is acting as the default gateway.

Important Observation (NAT Not Used Here):

- MAC addresses change at every hop
- IP addresses stay the same end-to-end

5. Reflection Questions

Question	Answer
1. What types of cables were used?	Ethernet copper straight-through cables.
2. Did cables affect PDU handling?	No. cables only carry signals.
3. Did the Access Point modify PDUs?	No. it forwards frames without changing addressing.
4. Was addressing changed by the AP?	No. MAC forwarding only changed at router hops.
5. Highest OSI Layer used by Access Point?	Layer 2 (Data Link)
6. OSI layer of cables and AP?	Layer 1 (cables) and Layer 2 (AP)
7. Which appears first in PDU: source or destination MAC?	Source MAC appears first.
8. Meaning of red X vs green ✓ ?	Green ✓ = successful hop, Red X = drop or incomplete path.
9. Where did MAC change between 172 and 10 networks?	At the router during inter-network forwarding.
10. Which device uses MACs starting 00D0.BA?	The Router interfaces .
11. Who owns other MACs?	PCs and Switch ports.
12. Did IP addresses change?	No. IP addresses remained constant end-to-end.
13. What happens in ping replies?	Source and destination IP addresses swap roles .
14. Why does router have two IP networks?	To route between different network segments.
15. Which networks are connected?	172.16.31.0/24 and 10.10.10.0/24

6. Conclusion

This lab demonstrated how MAC addresses change per hop, while IP addresses remain constant end-to-end, and how routers enable communication between different networks. Simulation mode allowed direct observation of packet header details, reinforcing understanding of Layer 2 and Layer 3 communication.

7. Sign-Off

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