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.

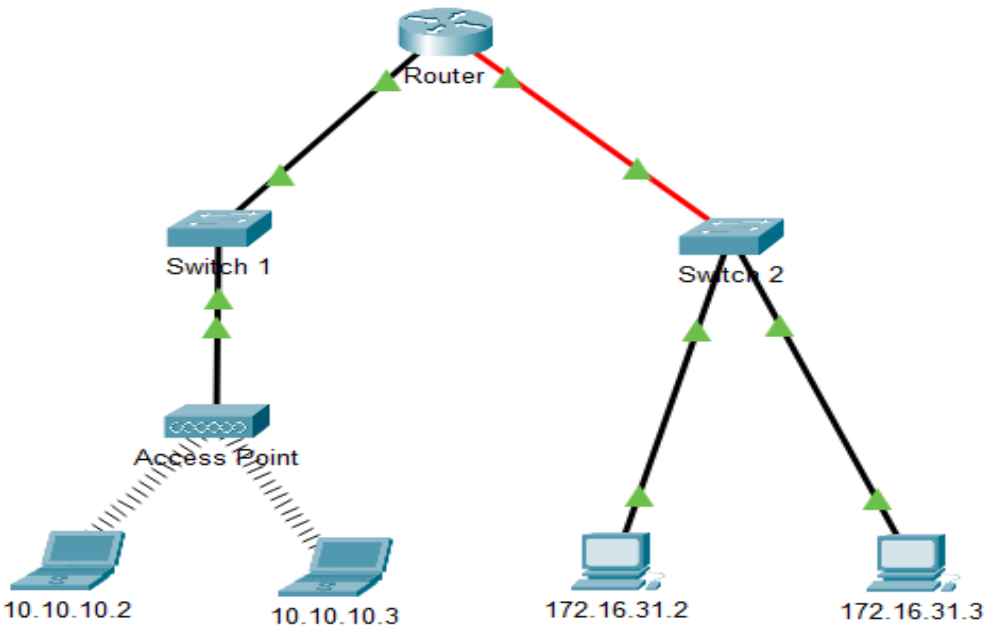
2. Background

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.

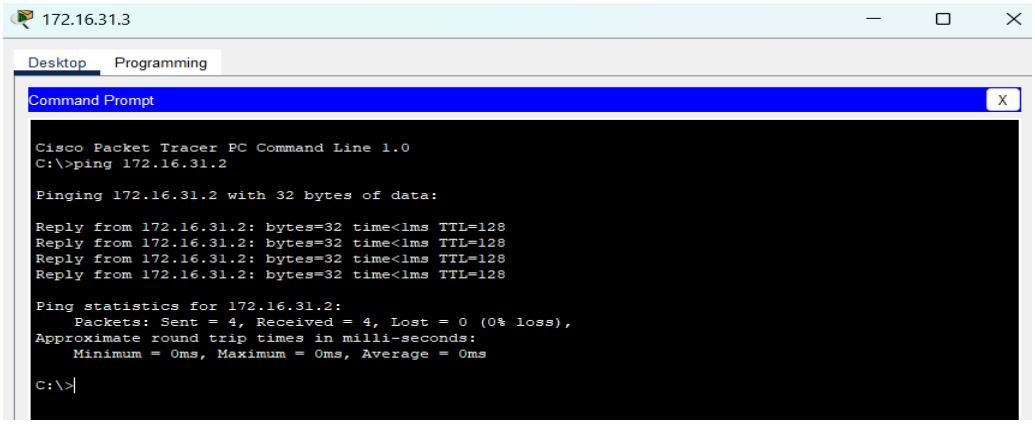


3. Part 1 – Local Network Communication

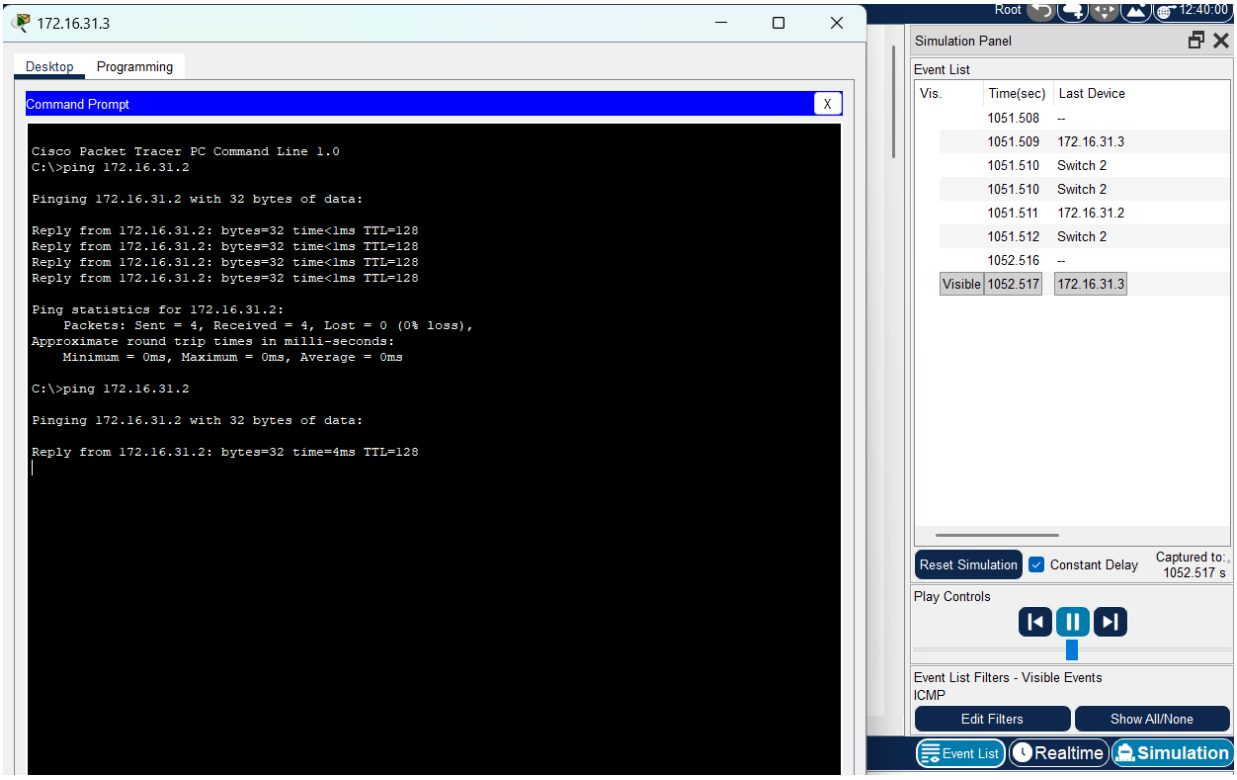
Goal: Observe how devices communicate within the same subnet without needing a default gateway.

1. On PC 172.16.31.3, run:

```
ping 172.16.31.2
```



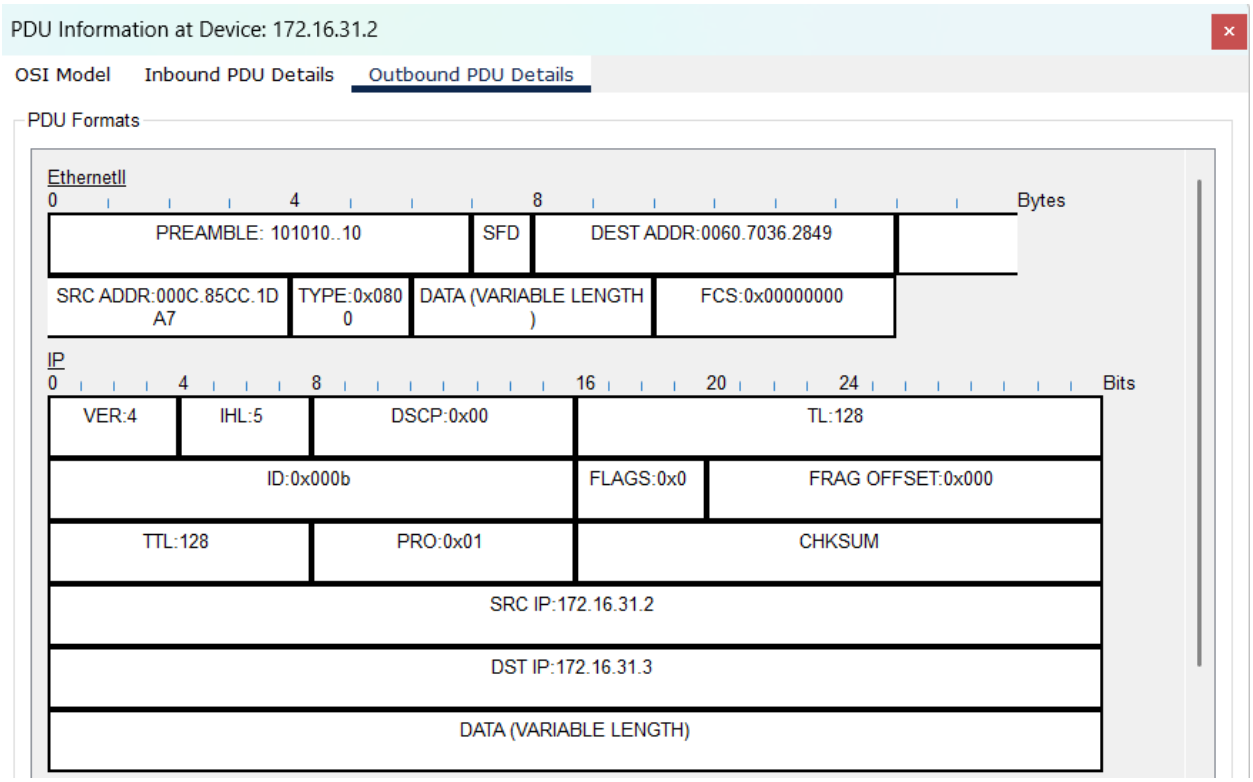
2. Switch to Simulation Mode and repeat the ping.



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	0060.7036.2849	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.

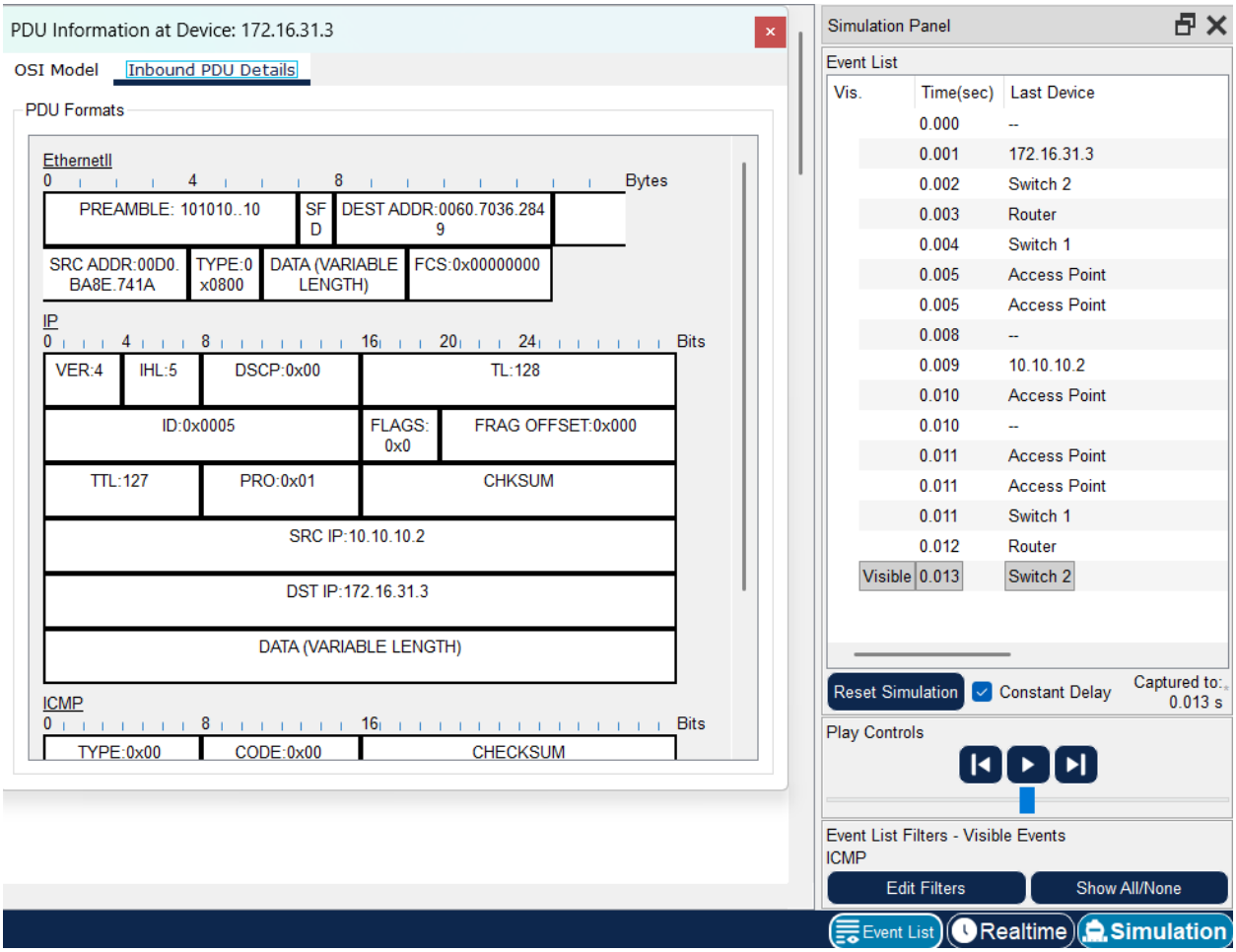
1. On PC 172.16.31.3, enter:

ping 10.10.10.2


```
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



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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