Course: Cloud and Network Security – C3 - 2025

Module: Network Standards, Models & Protocols

Week1 Assignment2 Class Exercise:

Using Wireshark To View Network Traffic

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Introduction

This report summarizes a two-part networking lab focused on how data packets travel across networks. Using ipconfig /all and Wireshark, ICMP packets were captured to compare local and remote communication. The first part examined pings within a LAN, showing how IP and MAC addresses enable direct host-to-host interaction. The second part explored pings to remote servers, highlighting how packets are routed through a gateway. The analysis illustrates the roles of Layer 2 and Layer 3 addressing and how ARP helps resolve MAC addresses, offering insight into how packet headers direct data to its destination.

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Answers To Questions

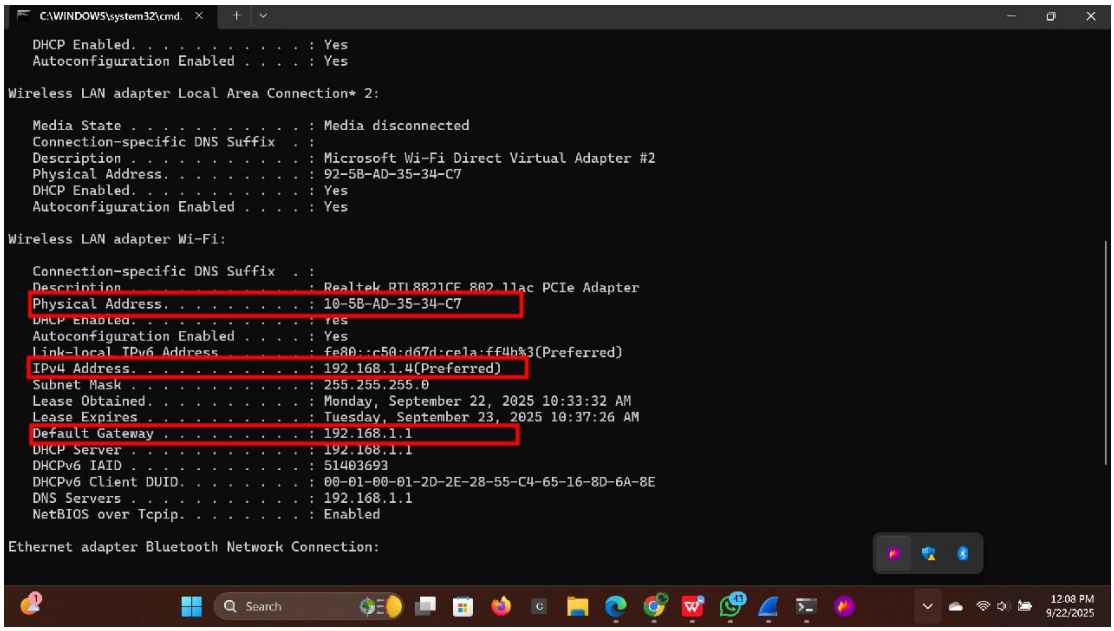
Part 1: Capture and Analyze Local ICMP Data in Wireshark

In Part 1 of this lab, you will ping another PC on the LAN and capture ICMP requests and replies in Wireshark. You will then analyze the IP and MAC addresses for the source and destination. This analysis should help to clarify how packet headers are used to transport data to their destination.

Step 1: Retrieve your PC interface addresses.

For this lab, you will need to retrieve your PC IP address and its network interface card (NIC) physical address, also called the MAC address.

a. In a command prompt window, enter ipconfig /all to the IP address of your PC interface, its description, and its MAC (physical) address.



MAC (Physical) Address: 10-5B-AD-35-34-C7

IP Address: 192.168.1.4

Default Gateway(Router): 192.161.1.1

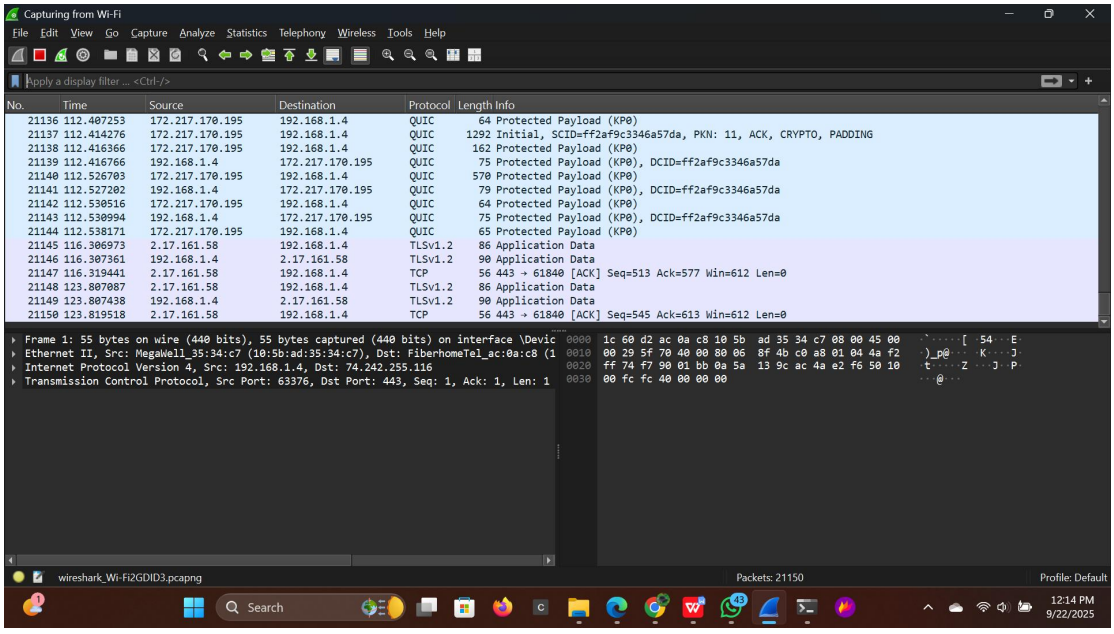
b. Ask a team member or team members for their PC IP address and provide your PC IP address to them. Do not proceed with your own MAC address at this time.

Step 2: Start Wireshark and begin capturing data.

a. Navigate to Wireshark. Double-click the desired interface to start the packet capture. Make sure the desired interface has traffic.

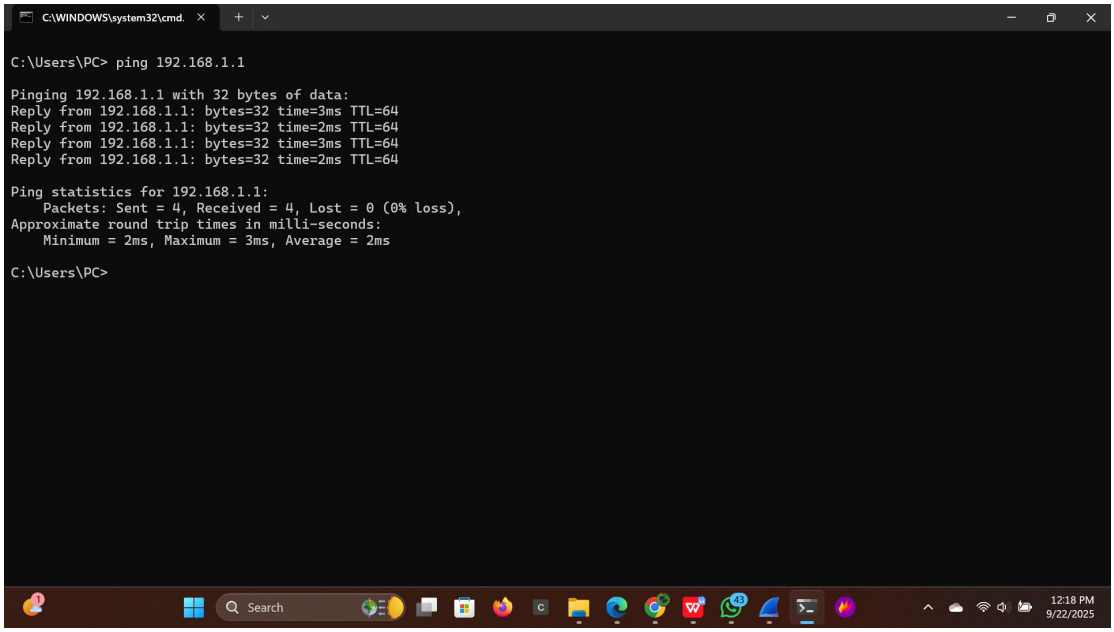
b. Information will start scrolling down the top section in Wireshark. The data lines will appear in different colors depending on the protocol.

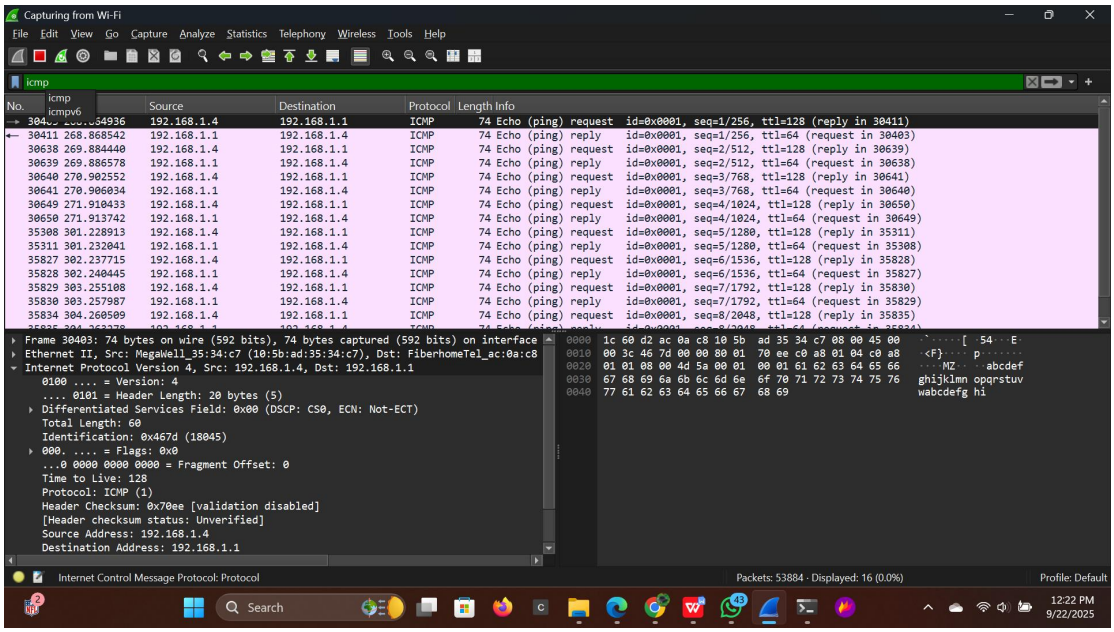
This information will scroll by very quickly depending on what communication is taking place between your PC and the LAN. We can apply a filter to make it easier to view and work with the data that is being captured by Wireshark.



For this lab, we are only interested in displaying ICMP PDU's. Type icmp in the Filter box at the top of Wireshark and then press Enter or click the Apply button. This will display only ICMP (ping) PDUs.

c. The filter causes all data in the top window to disappear, but you are still capturing traffic on the interface. Navigate to a command prompt window and ping the IP address that you received from your team member.





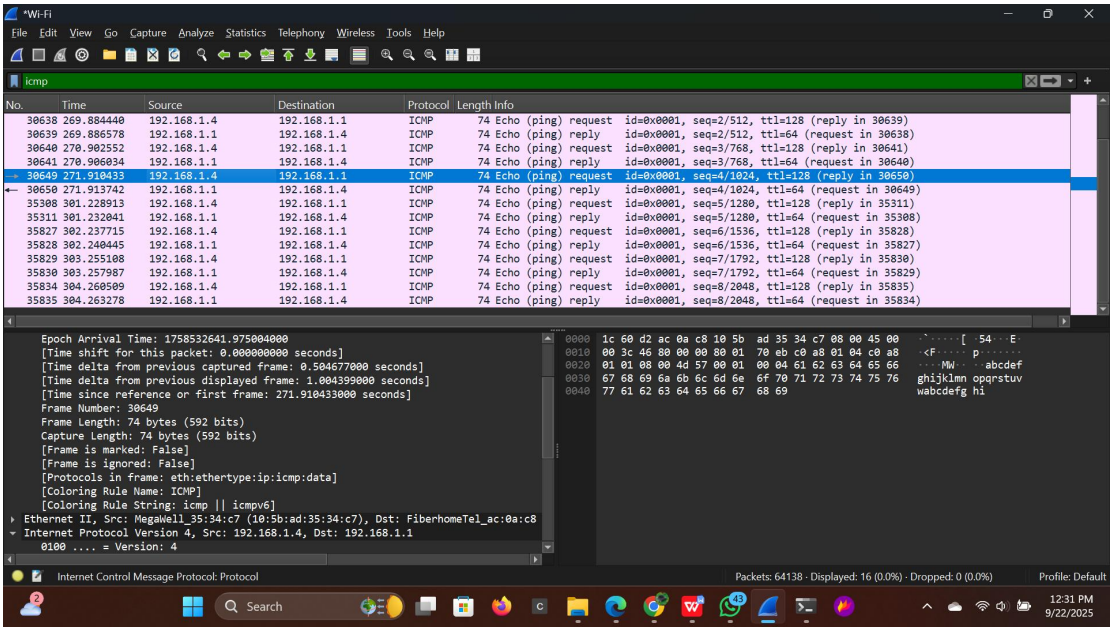
d. Stop capturing data by clicking the Stop Capture icon.

Step 3: Examine the captured data.

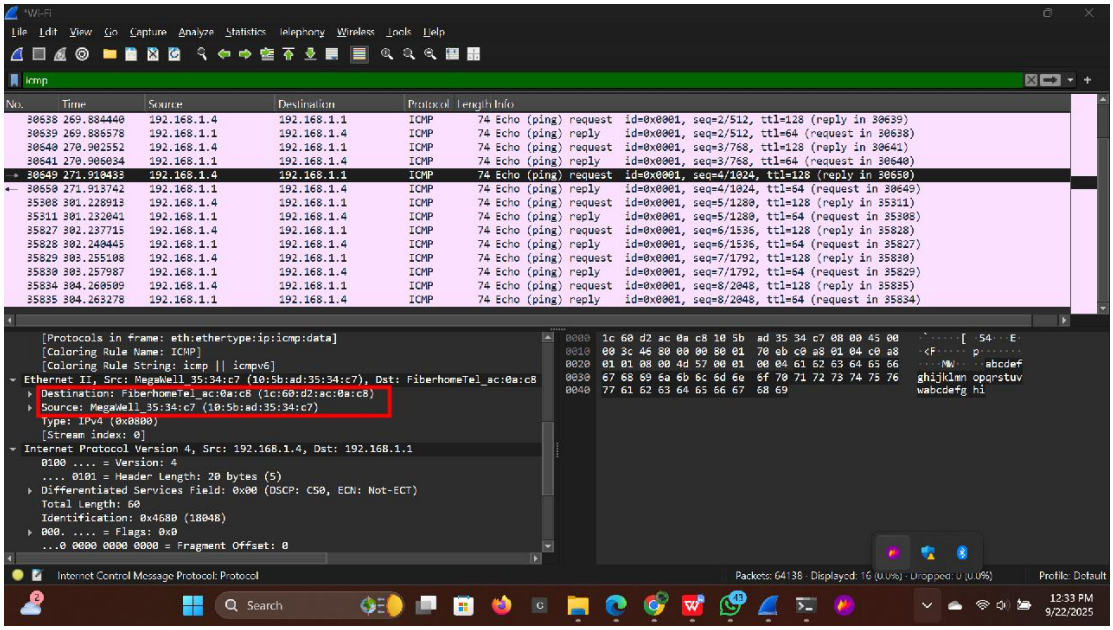
In Step 3, examine the data that was generated by the ping requests of your team member PC. Wireshark data is displayed in three sections: 1) the top section displays

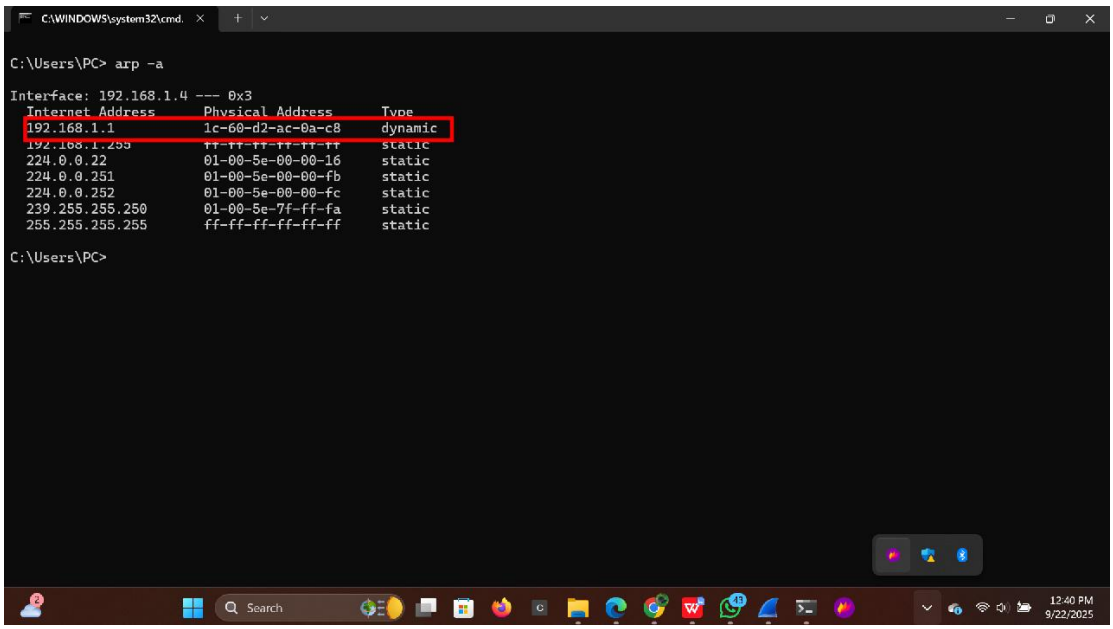
the list of PDU frames captured with a summary of IP packet information listed 2) the middle section lists PDU information for the frame selected in the top part of the screen and separates a captured PDU frame by its protocol layers, and 3) the bottom section displays the raw data of each layer. The raw data is displayed in both hexadecimal and decimal form.

a. Click the first ICMP request PDU frames in the top section of Wireshark. Notice that the **Source** column has your PC IP address, and the **Destination** column contains the IP address of the teammate PC that you pinged.

b. 

c. With this PDU frame still selected in the top section, navigate to the middle section. Click the plus sign to the left of the Ethernet II row to view the destination and source MAC addresses.





Does the source MAC address match your PC interface?

Yes, The source MAC address in Wireshark matches my MAC (Physical) Address which is 10-5B-AD-35-34-C7

Does the destination MAC address in Wireshark match your team member MAC address?

Yes, The destination MAC address(1c-60-d2-ac-0a-c8

) in Wireshark matches my router IP address since I pinged my default gateway(192.168.1.1) instead.

How is the MAC address of the pinged PC obtained by your PC?

My PC obtains the MAC address of the default gateway using the Address Resolution Protocol (ARP). i.e arp -a command

Part 2: Capture and Analyze Remote ICMP Data in Wireshark

In Part 2, you will ping remote hosts (hosts not on the LAN) and examine the generated data from those pings. You will then determine what is different about the data from the first experiment in Part 1.

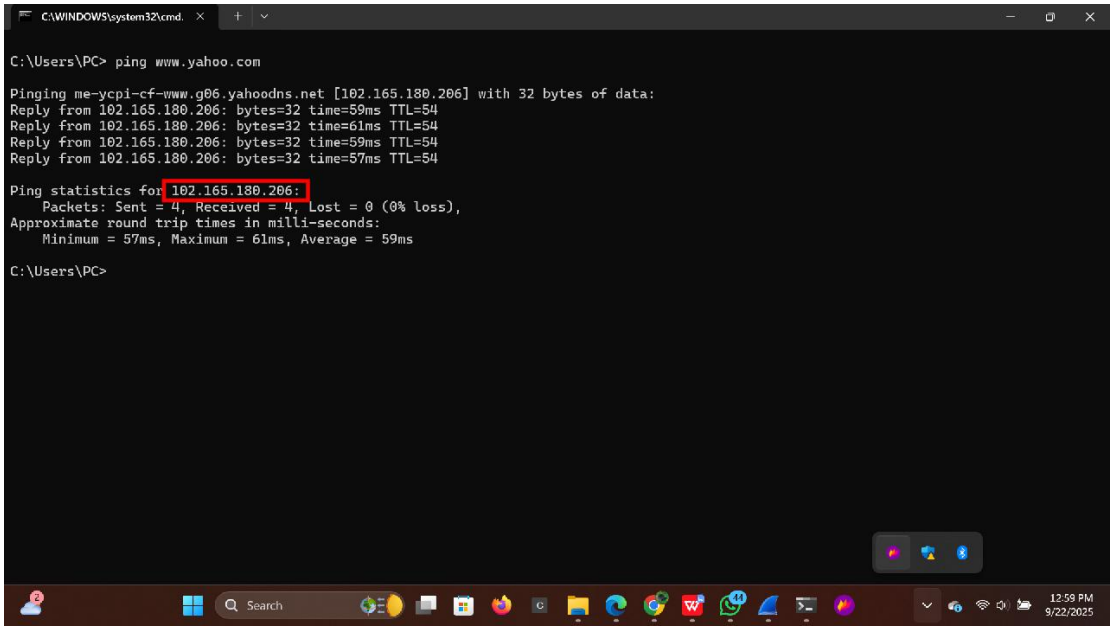
Step 1: Start capturing data on the interface.

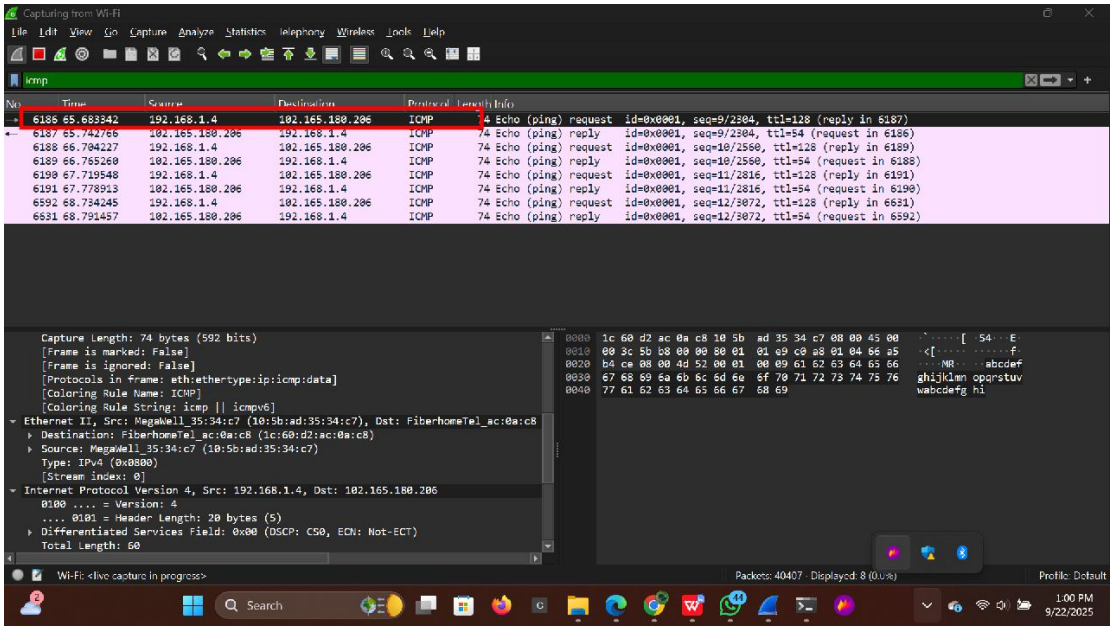
a. Start the data capture again.

b. A window prompt will ask to save the previously captured data before starting another capture. It is not necessary to save the data. Click Continue without Saving.

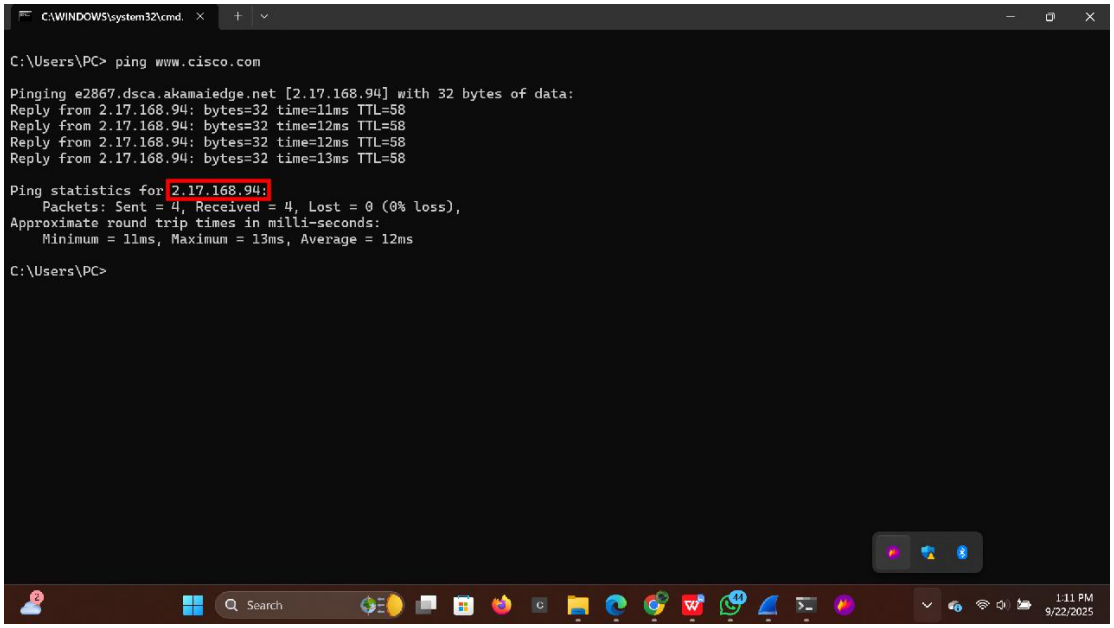
c. With the capture active, ping the following three website URLs from a Windows command prompt:

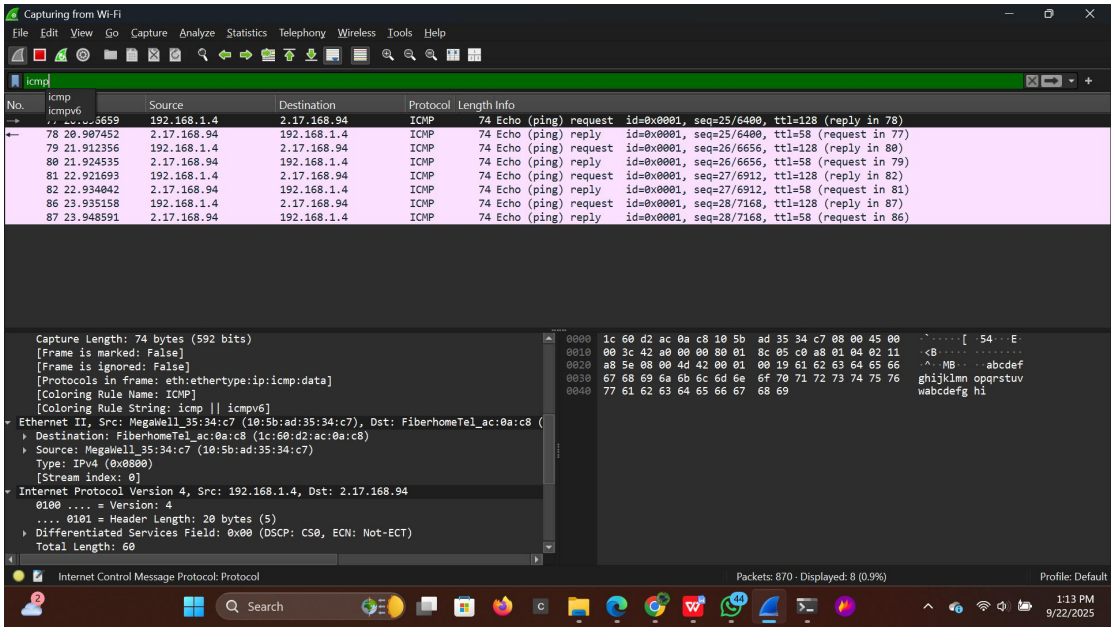
www.yahoo.com



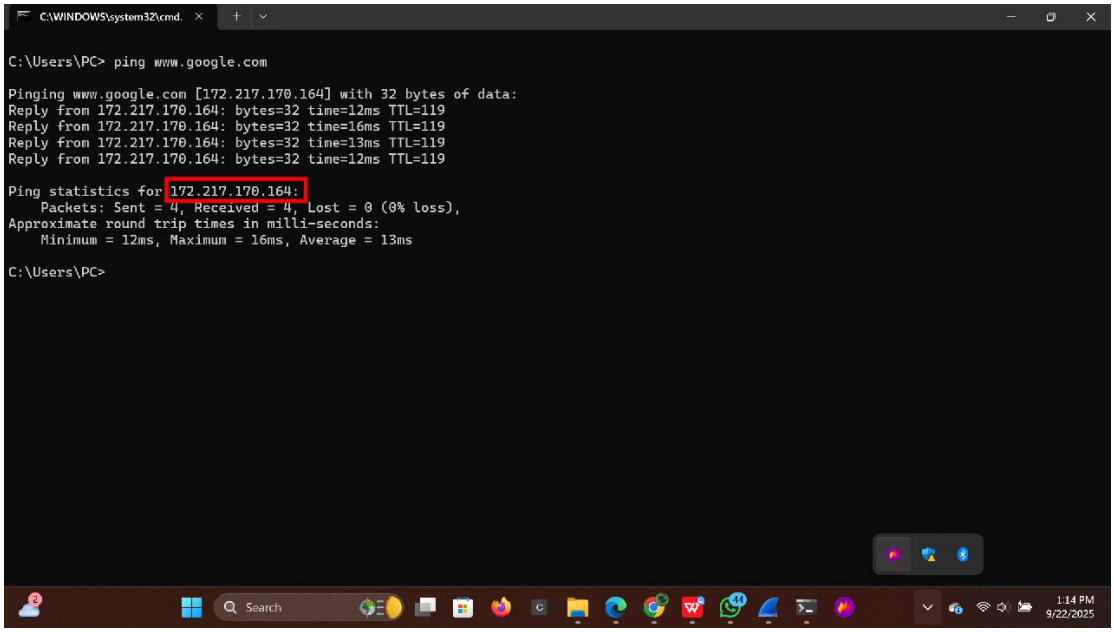


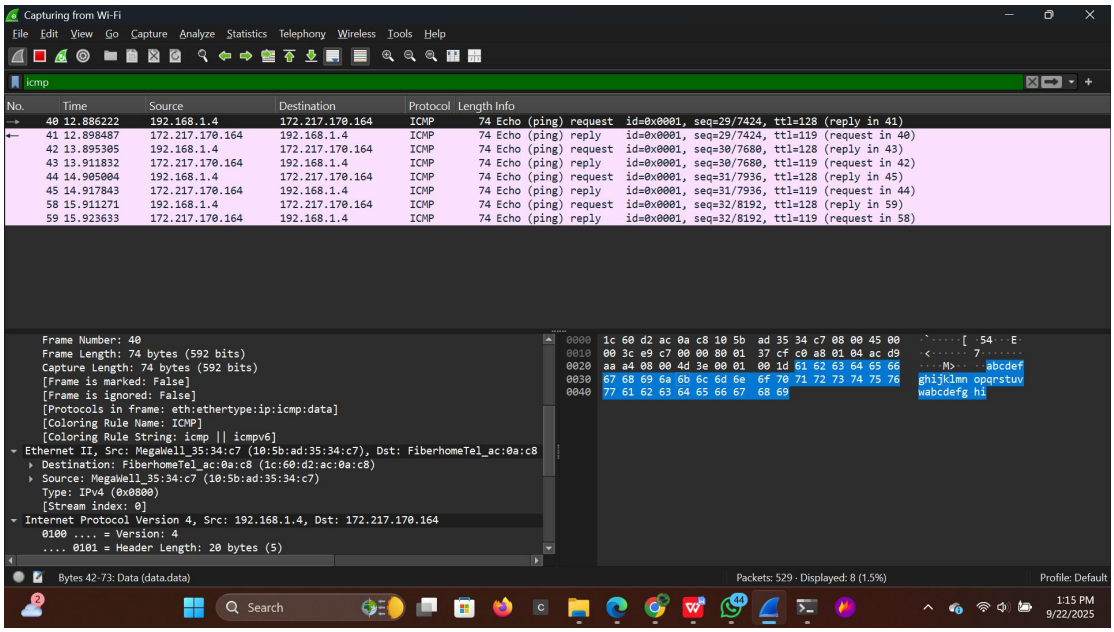
www.cisco.com





www.google.com





c. As soon as you begin pinging the URLs listed, notice that the Domain Name Server (DNS) translates the URL to an IP address. Note the IP addresses received for each URL.

d. You can stop capturing data by clicking the Stop Capture icon.

Step 2: Examining and analyzing the data from the remote hosts.

Review the captured data in Wireshark and examine the IP and MAC addresses of the three locations that you pinged. List the destination IP and MAC addresses for all three locations in the space provided.

IP address for www.yahoo.com:

102.165.180.206

MAC address for www.yahoo.com:

1c-60-d2-ac-0a-c8

IP address for www.cisco.com:

2.17.168.94

MAC address for www.cisco.com:

1c-60-d2-ac-0a-c8

IP address for www.google.com:

172.217.170.164

MAC address for www.google.com:

1c-60-d2-ac-0a-c8

What is significant about this information?

Even though websites like Yahoo, Cisco, and Google have different IP addresses, my computer sends data to the same MAC address i.e my router's. That's because my PC doesn't send data directly to those websites; it sends it to the default gateway (router), which then forwards the packets to the correct destination on the internet. So in Wireshark, the destination MAC address seen is that of my router, not the final server.

How does this information differ from the local ping information you received in Part 1?

This differs from a local ping because a local ping communicates directly with another device on the same network. My computer uses ARP to find the MAC address of that device and sends the packet straight to it. In contrast, with a remote ping, my computer can't access the MAC address of the distant server, so it sends the packet to the router's MAC address instead. The router then forwards it to the correct destination on the internet.

Reflection Question

Why does Wireshark show the actual MAC address of the local hosts, but not the actual MAC address for the remote hosts?

Wireshark shows actual MAC addresses for local hosts because LANs operate at Layer 2 of the OSI model, where MAC addresses are used for direct host-to-host communication. When you ping a local device, your PC uses ARP to find and store its MAC address, then sends the packet directly to it.

In contrast, when pinging a remote host like Google or Yahoo, your PC sends the packet to the default gateway's MAC address. The gateway forwards it to the destination. As the packet moves across the internet, MAC addresses change at each hop and are only relevant within each local network segment. That's why Wireshark only shows the MAC address of your router not the final destination.

Conclusion

This lab demonstrated how network protocols function across different layers to enable communication. Wireshark analysis showed that local pings include both source and destination MAC addresses, resolved via ARP within the same network segment. In contrast, remote pings display destination IPs but use the MAC address of the default gateway, confirming that external traffic is first routed through the gateway. This highlights the role of MAC addresses in local delivery and IP addresses in end-to-end communication across networks, offering key insight into how data travels through the Internet.