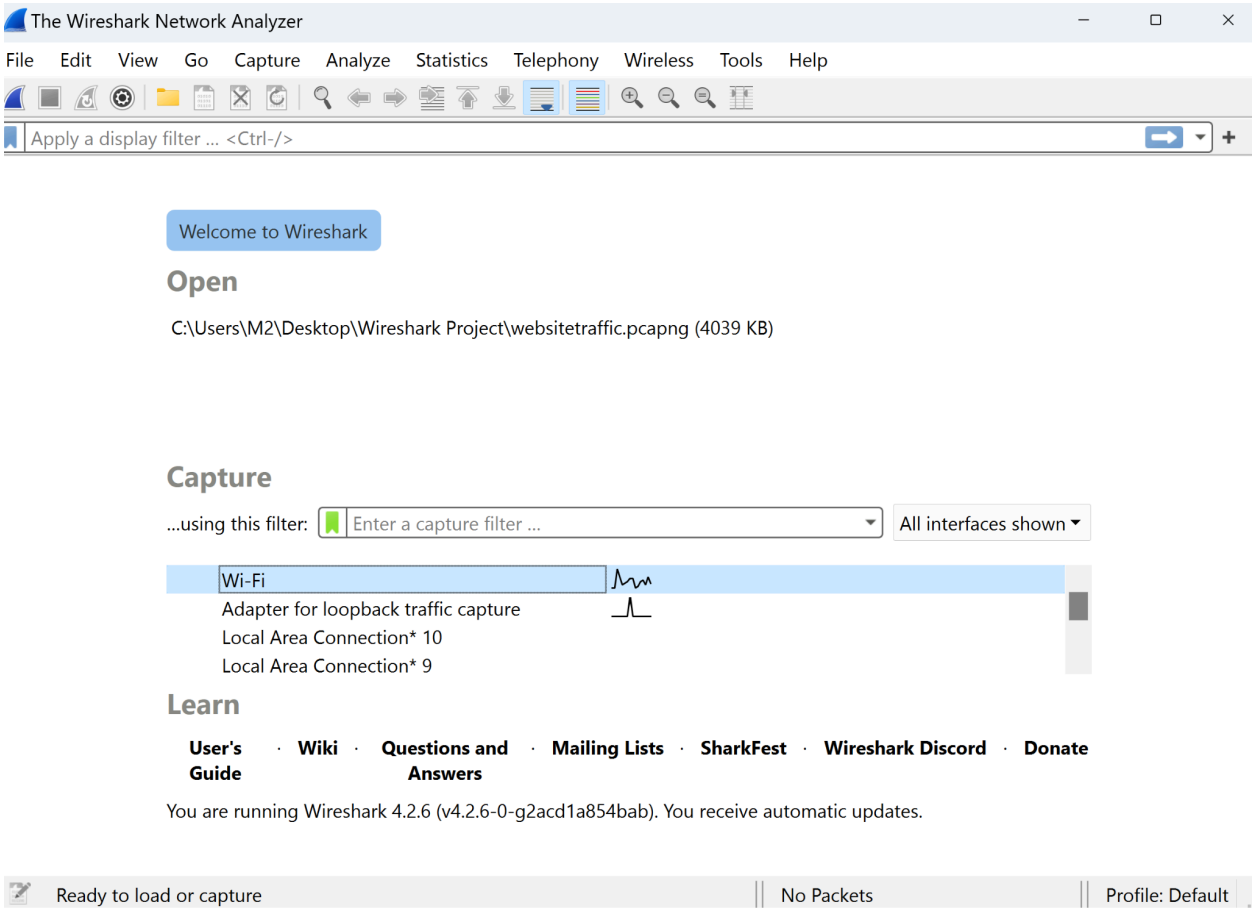
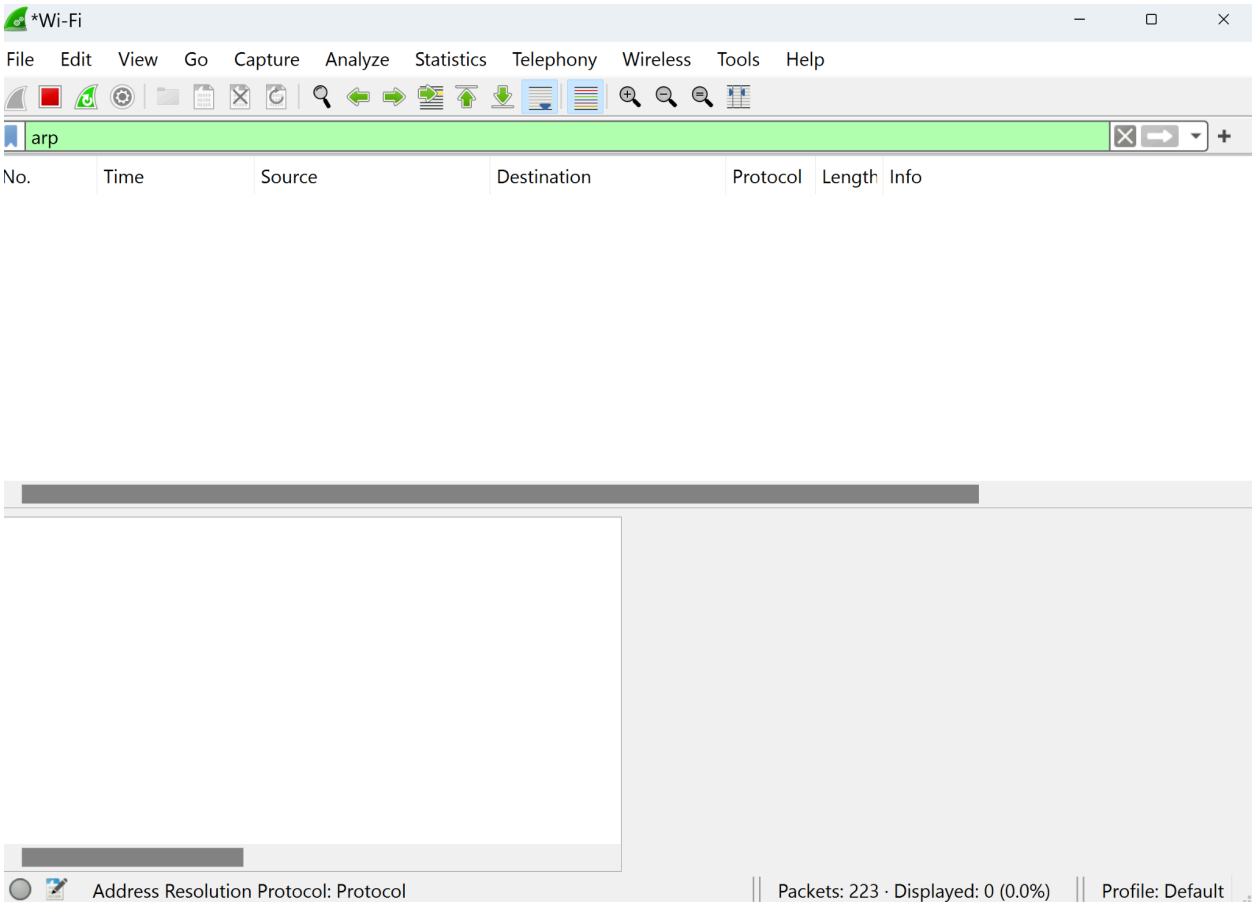
Using Nmap to Generate ARP Requests and Capturing Them with Wireshark by Matthew Miller 8/13/24

Step 1: Open Wireshark and Set Up for Capturing

1. **Launching Wireshark**: I opened Wireshark from my Start menu or desktop.
2. **Selecting a Network Interface**: Wireshark showed me a list of network interfaces, and I chose Wifi.



3. **Starting Capture**: I clicked the blue shark fin button to start capturing traffic on the selected interface.
4. **Filtering for ARP Traffic**: In the display filter bar at the top of Wireshark, I typed `arp` to filter only ARP traffic. This way, I could focus on ARP packets as they appeared.



Step 2: Use Nmap to Generate ARP Requests

1. **Opening Command Prompt**: I opened the Command Prompt on my Windows machine by pressing `Win + R`, typing `cmd`, and pressing `Enter`.

2. **Using Nmap for Scanning**: To generate ARP requests, I used Nmap to scan my local network. This scan sent ARP requests to identify live hosts on the network.

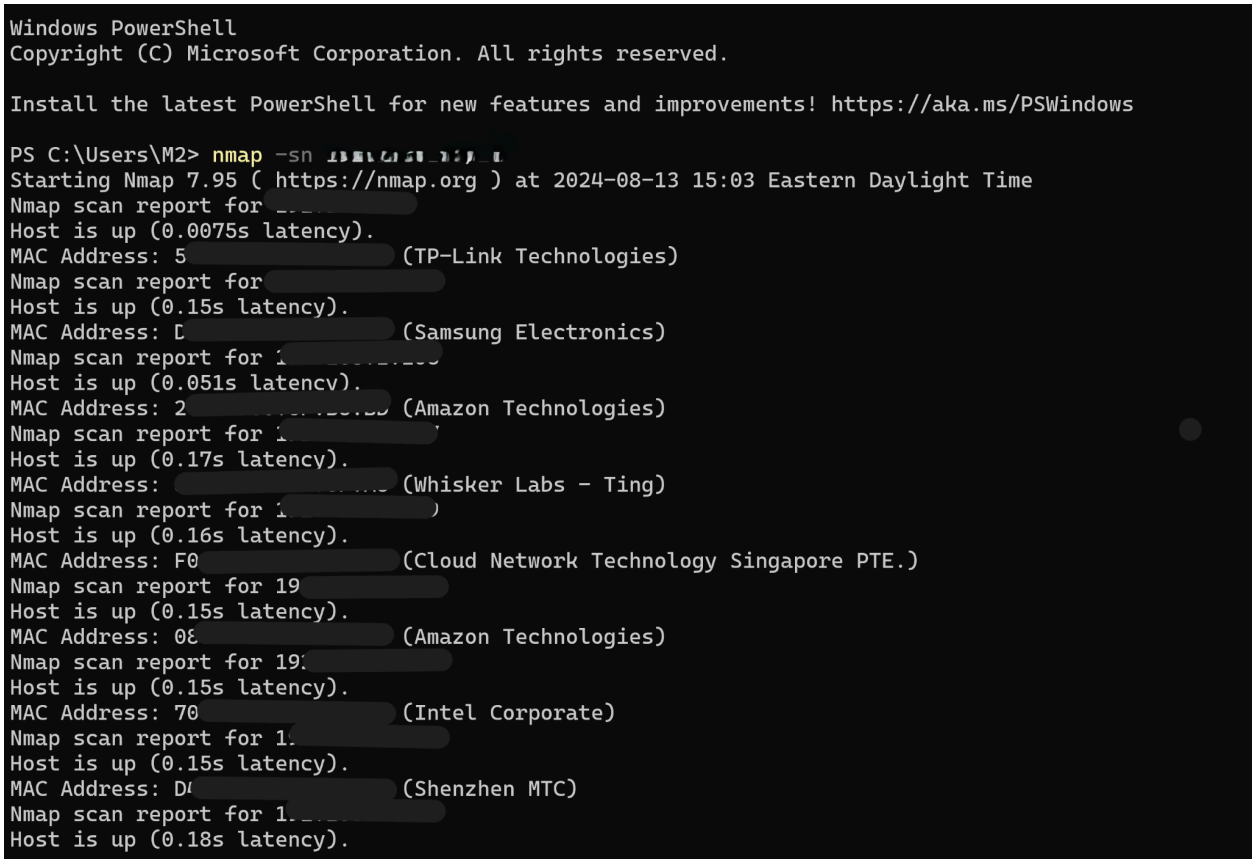
Basic ARP Scan: I ran the following command:
`nmap -sn [my_network]/24`

- I replaced `[my_network]` with my local network range.

Explanation:

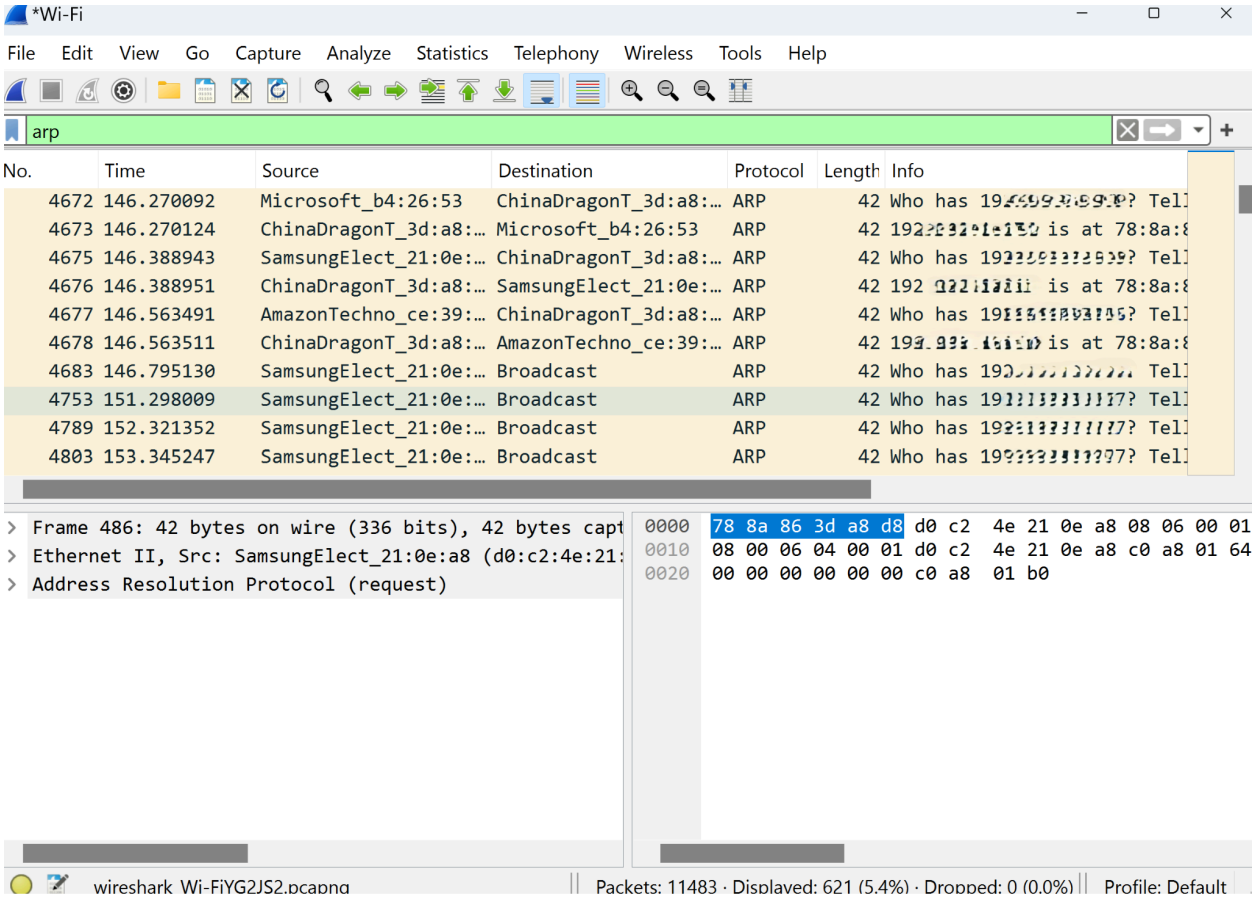
- `nmap`: This is the command to invoke Nmap.
- `-sn`: This option tells Nmap to perform a "ping scan," which sends ARP requests without conducting a full port scan.
- `[my_network]/24`: This specifies the range of IP addresses on my local network. The `/24` subnet mask means I'm scanning all 256 addresses in a typical home network range.

3. **Running the Scan**: After typing the command, I pressed `Enter`, and Nmap started scanning the network, generating ARP requests in the process.

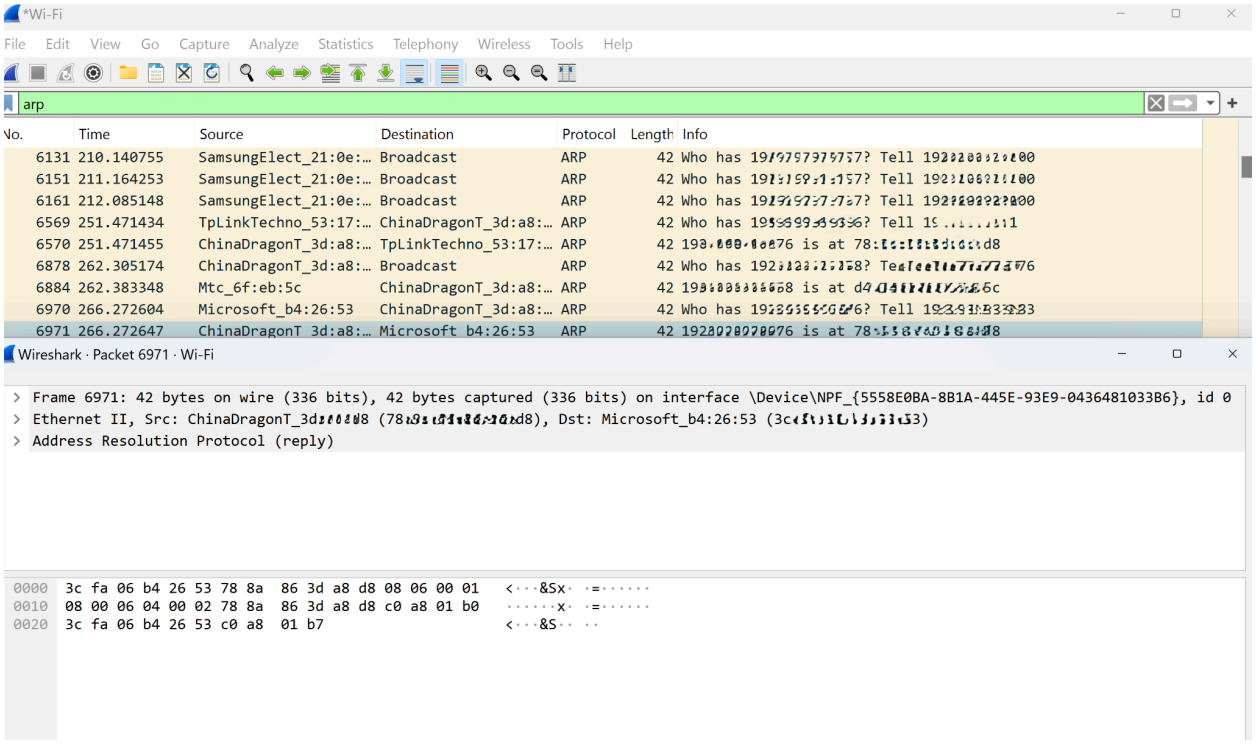


Step 3: Capture ARP Requests in Wireshark

1. **Checking Wireshark for ARP Traffic**: I switched back to Wireshark and saw ARP requests appearing in real-time as a result of the Nmap scan.



2. **Inspecting the ARP Packets**:
    - I clicked on an ARP packet in the list to highlight it.
    - The packet details pane showed me the ARP request and reply information.
    - I could see who was asking for which IP address and the MAC address involved.



Step 4: Stop the Capture and Save the Data

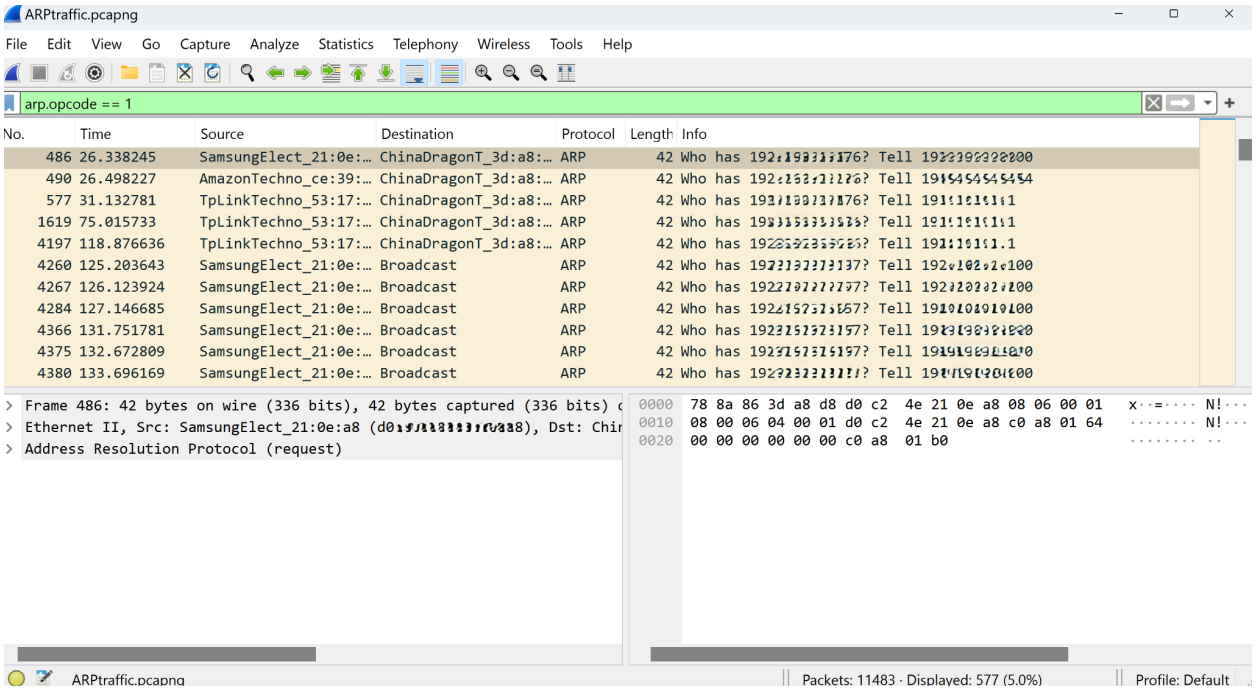
1. **Stopping Capture**: Once I had captured enough ARP requests, I clicked the red square button to stop the capture.
2. **Saving the Capture**:
    - I went to `File` > `Save As` and chose a location and filename to save my capture file.
    - I saved the file with a `.pcapng` extension.

Step 5: Further Analysis of ARP Packets

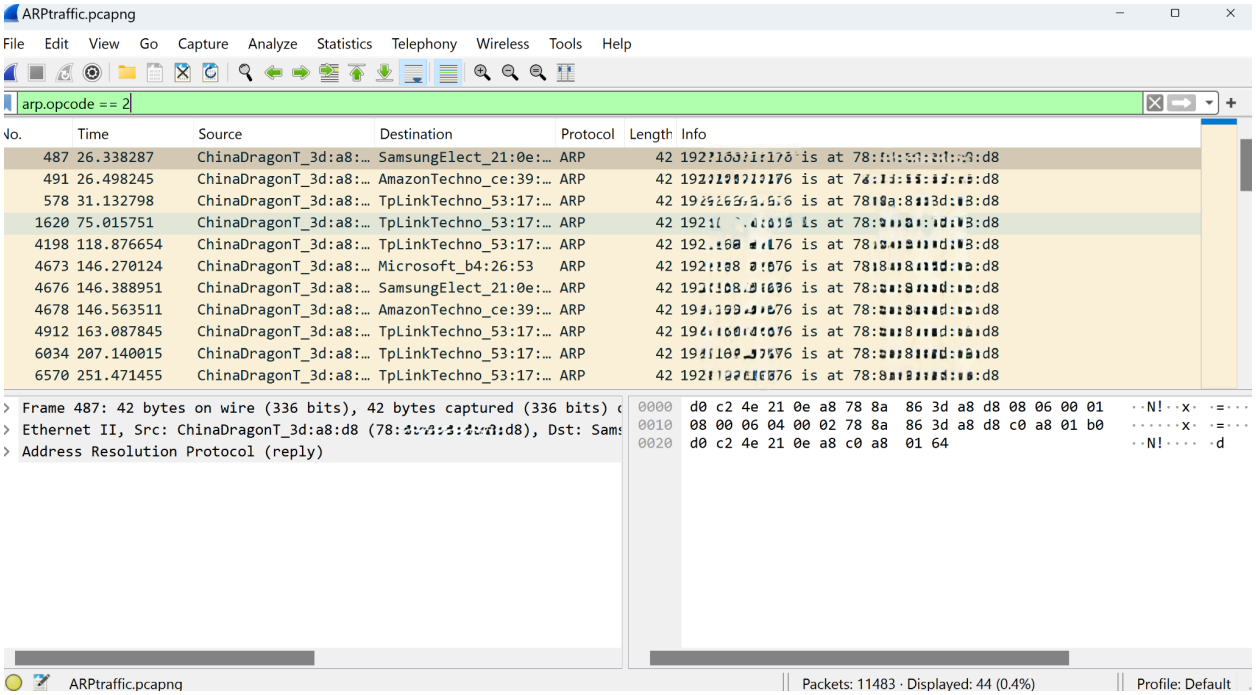
Here's how I did a deeper dive into the ARP packets I captured:

1. Filtering Specific ARP Packets

- **Filter for ARP Requests and Replies**:
    - If I want to isolate ARP requests, I use the filter `arp.opcode == 1`. This will show only the ARP requests where a device is asking "Who has this IP address?"

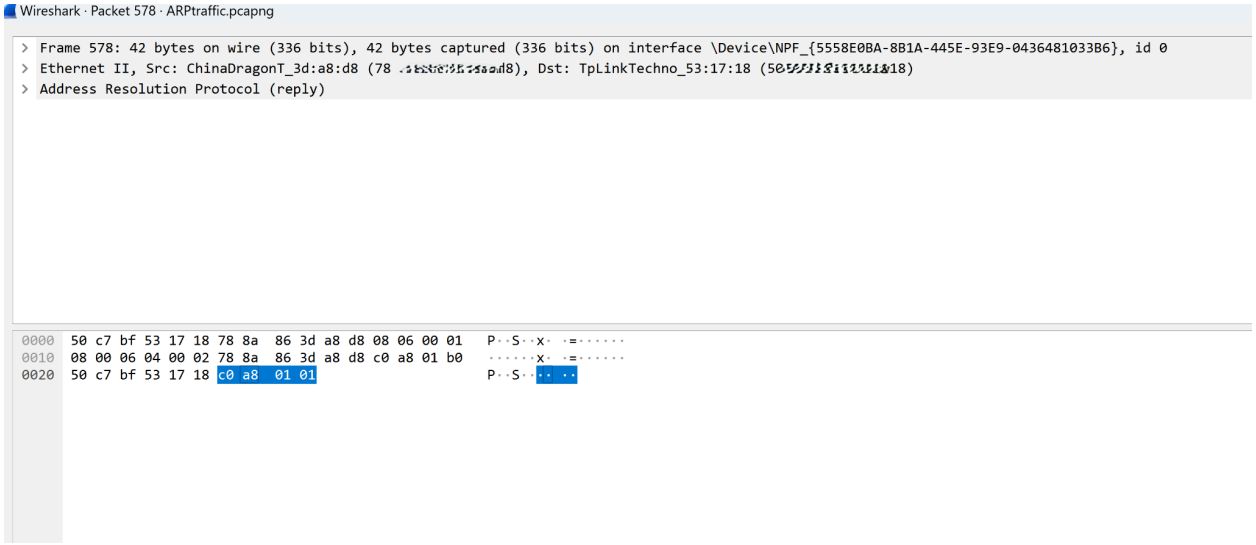


- To filter for ARP replies, I use `arp.opcode == 2`. This filter shows only the replies where a device responds, "I have this IP address."
- I enter these filters in the display filter bar at the top of Wireshark and press `Enter`.



2. Inspecting the ARP Packet Details

- Packet List Pane:
    - In the top pane, I see a list of captured packets. I double click on any ARP packet to highlight it. The details of this packet will appear in the middle pane.
- Packet Details Pane:
    - In the middle pane, I see a breakdown of the selected packet. This is where I can inspect the ARP details:



I clicked on an ARP reply packet (Packet 578). The packet has a length of 42 bytes and was captured on the interface with the identifier `\Device\NPF_{5558E0BA-8B1A-445E-93E9-0436481033B6}`.

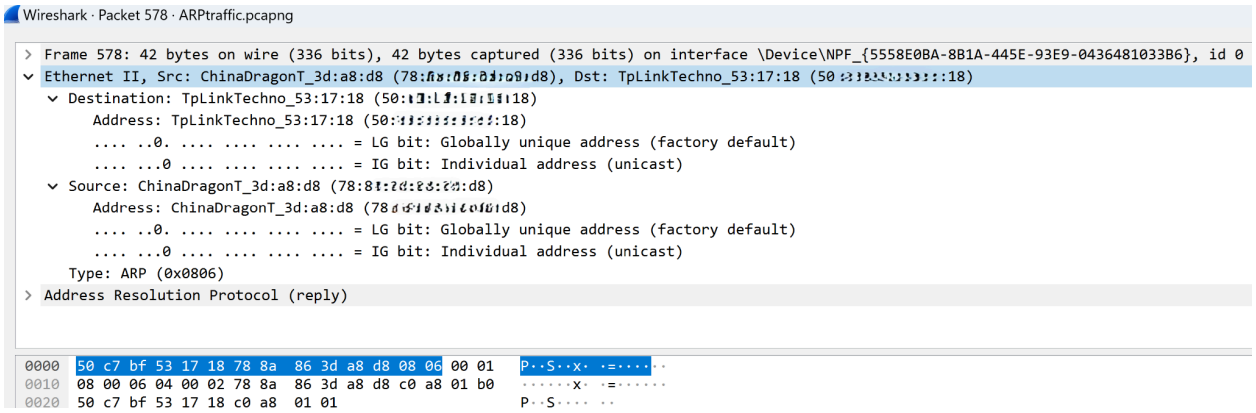
The packet's source MAC address is `78**********d8`, identified as "ChinaDragonT_3d:a8

", and the destination MAC address is `50:*******:18`, identified as "TpLinkTechno_53:17:18". The protocol used here is the Address Resolution Protocol (ARP), specifically an ARP reply.

The hex dump shows the structure of the packet, with the ARP protocol fields visible in the payload.

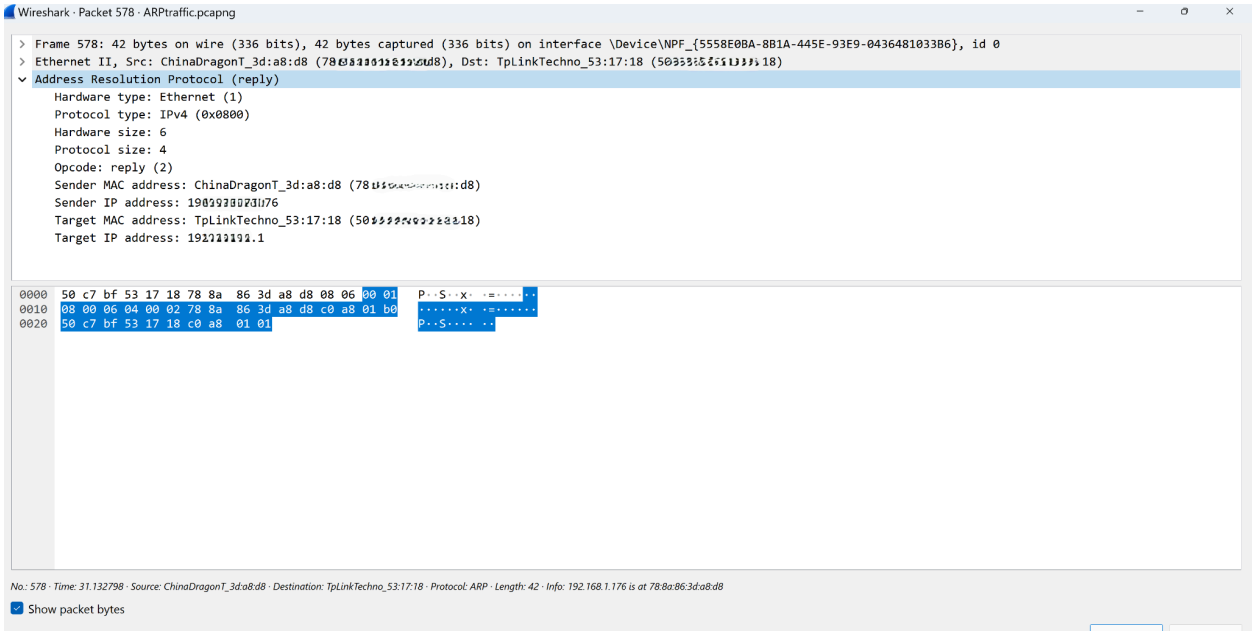
Inspect Ethernet Frame Details:

- Click on the "Ethernet II" line to expand it.
- Review the source and destination MAC addresses to confirm the devices involved.



Analyze ARP Packet Content:

- Expand the "Address Resolution Protocol (reply)" section.
- Verify the ARP operation type (in this case, it should be "Reply").
- Examine the sender and target IP addresses within the ARP payload to understand the IP mapping involved in this exchange.

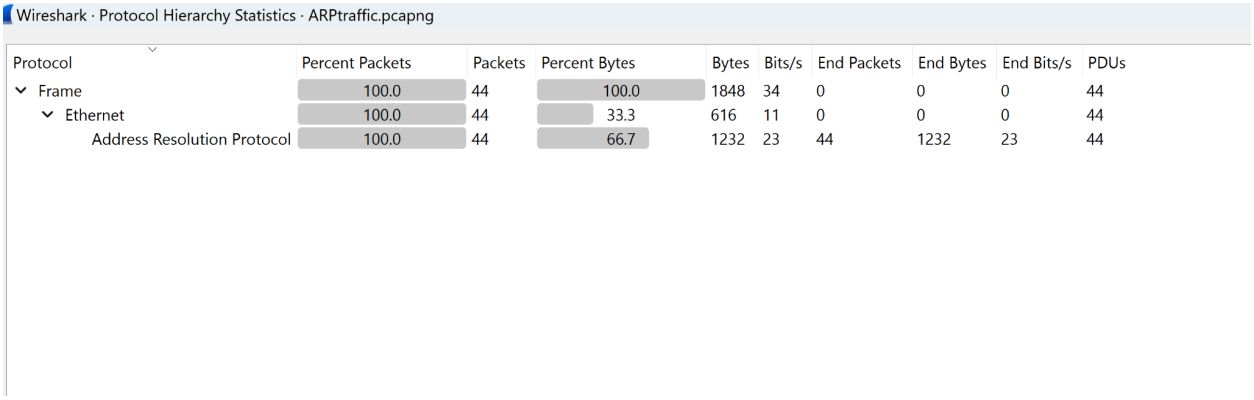


Cross-Referencing with Network Data

- **Identify Relationships**: I can cross-reference ARP packets with other captured data. For example, I can identify if the MAC address revealed in the ARP reply is consistent with what I see in other types of traffic from that IP.
- **Look for Anomalies**: I examine if there are unusual ARP requests, such as frequent or unexpected requests from unknown devices, which could indicate suspicious activity like ARP spoofing or a rogue device on the network.

Generate Reports: Wireshark also allows me to generate summary reports or statistics:

- I can go to `Statistics` > `Protocol Hierarchy` to get an overview of the ARP traffic compared to other protocols.


Wireshark · Protocol Hierarchy Statistics · ARPtraffic.pcapng

Protocol	Percent Packets	Packets	Percent Bytes	Bytes	Bits/s	End Packets	End Bytes	End Bits/s	PDUs
Frame	100.0	44	100.0	1848	34	0	0	0	44
Ethernet	100.0	44	33.3	616	11	0	0	0	44
Address Resolution Protocol	100.0	44	66.7	1232	23	44	1232	23	44

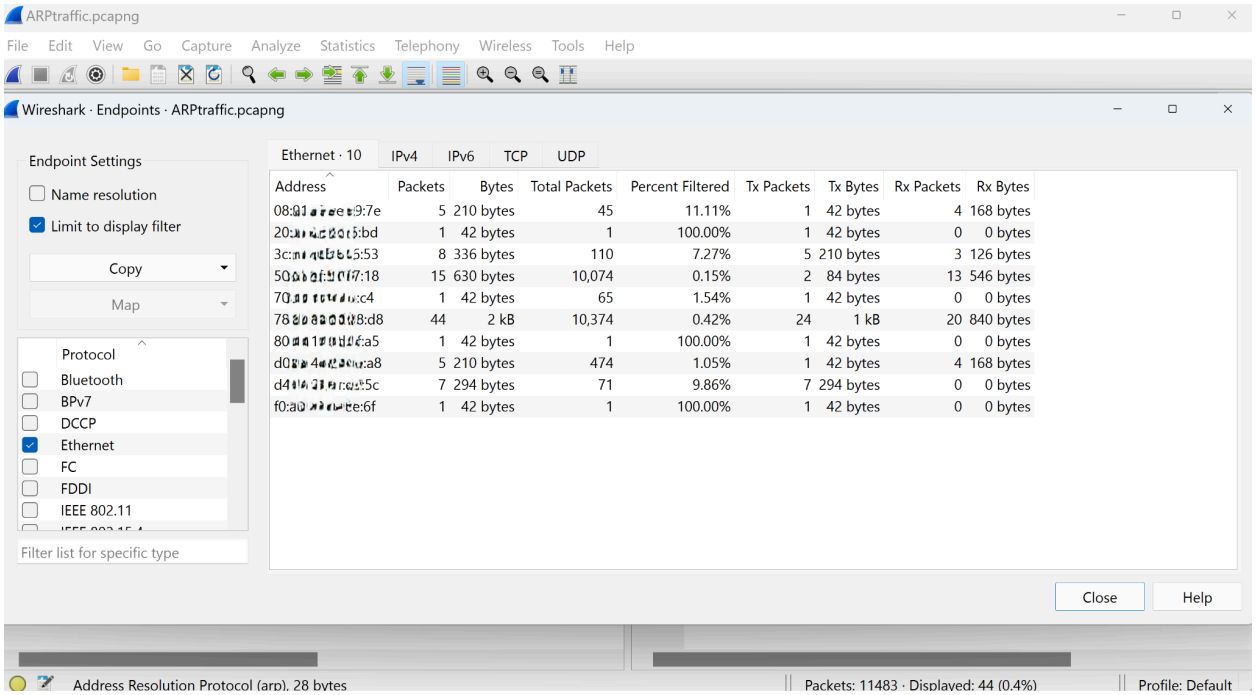
Total Packets Captured:

- **44 Packets** were captured during this session, all of which fall under the Ethernet protocol.

Breakdown by Protocol:

- **Ethernet (100%)**:
  - All 44 packets (100% of the captured traffic) are Ethernet frames. This indicates that all traffic in this capture was sent over Ethernet, which is the most common link-layer protocol.
- **Address Resolution Protocol (ARP)**:
  - Within the Ethernet frames, all 44 packets (100% of the Ethernet traffic) are ARP packets. This means the entire capture consists of ARP traffic, which is used for resolving IP addresses to MAC addresses within a local network.
- **Bytes and Bandwidth**:
  - **Total Bytes**: The total amount of data captured is 1,848 bytes, with 1,232 bytes belonging to ARP (66.7% of total bytes) and 616 bytes to Ethernet (33.3% of total bytes).
  - **Bits/s**: The data transfer rate for ARP traffic is 23 bits per second, indicating the bandwidth consumption of ARP traffic within this capture.

- Using `Statistics` > `Endpoints`, I can view a list of IP addresses and MAC addresses, providing a broader picture of the devices involved in the ARP communication.



This section provides an analysis of the endpoints involved in the ARP traffic captured in the `ARPtraffic.pcapng` file. The analysis focuses on the Ethernet layer, detailing the packet and byte distribution across different MAC addresses (endpoints) within the network.

Key Observations:

1. **Total Packets and Bytes**:
    - The capture includes a total of **44 packets** with a combined size of approximately **2 kB** of data.
2. **Endpoints (MAC Addresses)**:
    - **08:*******:7e**:
        - **Packets**: 5
        - **Bytes**: 210 bytes
        - **Total Packets**: 45 (11.11% of the filtered packets)
        - **Tx Packets**: 1
        - **Rx Packets**: 4
        - **Description**: This MAC address exchanged a small amount of data, transmitting 42 bytes and receiving 168 bytes.
    - **3c:*******:53**:
        - **Packets**: 8

        - **Bytes**: 336 bytes
        - **Total Packets**: 110 (7.27% of the filtered packets)
        - **Tx Packets**: 5
        - **Rx Packets**: 3
        - **Description**: This endpoint transmitted and received a moderate amount of data, indicating it was actively involved in ARP exchanges.
    - **50:*******:18**:
        - **Packets**: 15
        - **Bytes**: 630 bytes
        - **Total Packets**: 10,074 (0.15% of the filtered packets)
        - **Tx Packets**: 2
        - **Rx Packets**: 13
        - **Description**: This MAC address was a significant participant in the ARP communication, with a higher count of received packets (546 bytes).
    - **78*******:a8**
      :
        - **Packets**: 44
        - **Bytes**: 2 kB
        - **Total Packets**: 10,374 (0.42% of the filtered packets)
        - **Tx Packets**: 24
        - **Rx Packets**: 20
        - **Description**: This endpoint is the primary communicator in the ARP traffic, responsible for the bulk of the data exchange.
3. **Endpoints with Single Packet Transmission**:
    - **20:******:b5**
      , **70:*******:55**
      , **80:*******:5f**
      , **f0:*******:6f**: These addresses each transmitted a single packet with 42 bytes, indicating minimal interaction in the ARP communication.

Notes: tx means transmission, rx means receive

Summary:

The ARP traffic captured in this session involves multiple endpoints, with a few key addresses being more active in transmitting and receiving data. The endpoint **78:******:a8**

stands out as the most active participant, responsible for a substantial portion of the data exchange, likely acting as a central node or router in the network. The presence of multiple endpoints with minimal packet exchange suggests either sporadic ARP requests/replies or the potential involvement of devices briefly connected to the network.

Conclusion

By following these steps, I successfully used Nmap to generate ARP requests and captured them using Wireshark and analyzed the packets. This exercise demonstrates my understanding of basic network scanning and packet analysis techniques.