



Vidyavardhini's College of Engineering & Technology

Department of Artificial Intelligence and Data Science

EXPERIMENT 09

Aim: Detect ARP spoofing using nmap and/or open source tool ARPWATCH and wireshark

Objectives:

- To understand ARP spoofing.
- To understand ARPWATCH and use it to detect ARP spoofing.

Theory:

1. Nmap (Network Mapper):

While Nmap isn't specifically designed for ARP spoofing detection, it can be used indirectly. Nmap can perform a quick network scan to identify active devices and their MAC addresses. You can then compare this information with the ARP table on your machine (using `arp -a` on Linux/macOS) to identify any discrepancies.

For example, if Nmap identifies a device with a specific IP address but the ARP table shows a different MAC address associated with that IP, it might indicate ARP spoofing. However, this method can be unreliable as legitimate network configurations can also cause MAC address changes.

2. Arpwatch:

Arpwatch is a dedicated tool for monitoring ARP activity on your network. It keeps track of learned MAC addresses for IPs and monitors for any changes. Here's how it helps detect ARP spoofing:

Database: Arpwatch maintains a database of learned IP/MAC mappings.

Monitoring: It continuously monitors ARP packets on the network.

Alerting: If Arpwatch detects an unsolicited ARP reply (attacker trying to modify the ARP table) or a change in the MAC address associated with a known IP, it raises an alert in the system logs.

3. Wireshark:

Wireshark is a powerful network packet analyzer. While not solely for ARP spoofing detection, it can be used for in-depth analysis of network traffic. Here's how it helps:

Packet Capture: Wireshark can capture live network traffic.

Filtering: You can filter captured packets to focus specifically on ARP traffic.

Analysis: By examining ARP packets, you can identify inconsistencies. For instance, if you see multiple ARP replies for the same IP address with different MAC addresses, it might indicate ARP spoofing.



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Implementation :

Using nmap

`nmap` is primarily a network scanning tool, but it can be used to detect ARP spoofing by checking for duplicate IP addresses or multiple MAC addresses associated with a single IP.

1. Scan the Network:

Use `nmap` to scan your network and identify all live hosts.

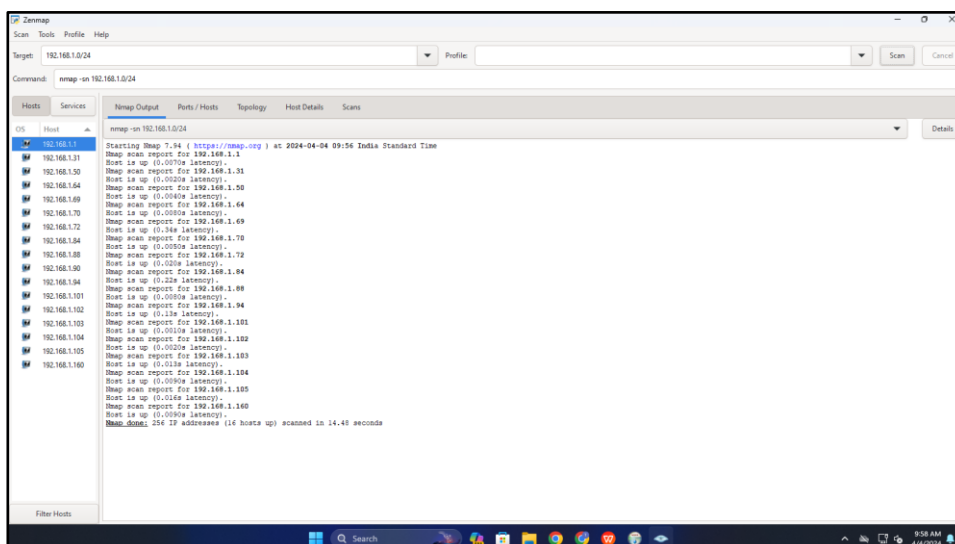
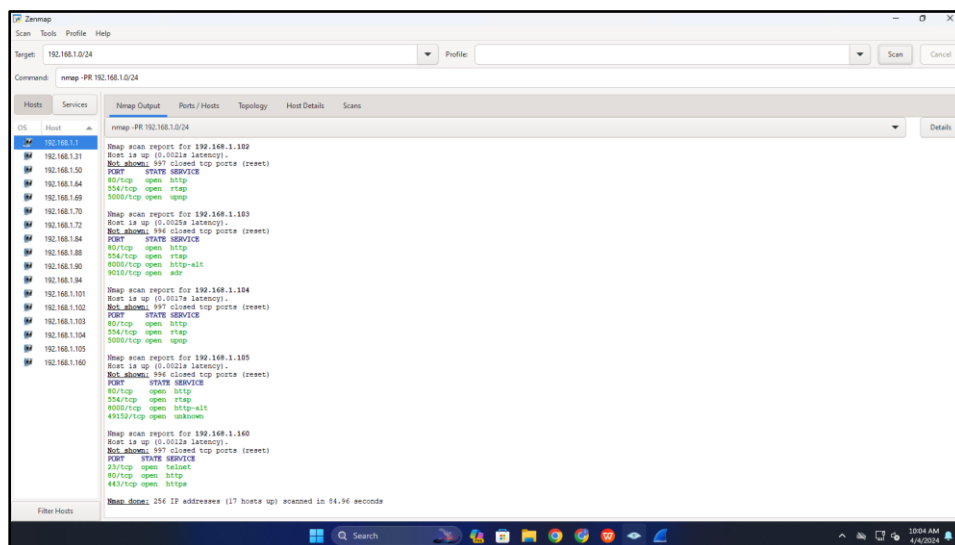
```
nmap -sn 192.168.1.0/24
```

2. Check for Duplicate IPs:

Look for multiple MAC addresses associated with a single IP, which could indicate an ARP spoofing attack.

```
nmap -PR 192.168.1.0/24
```

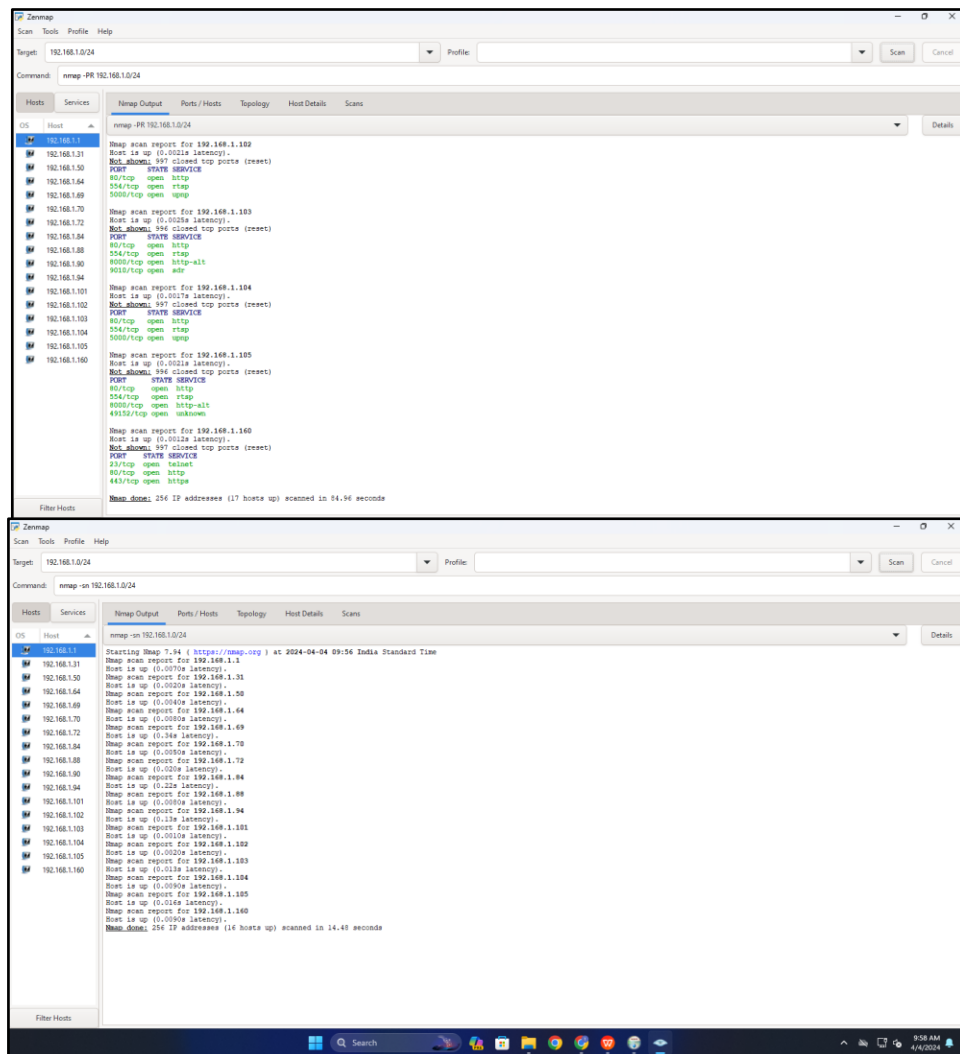
Output:





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• Using Wireshark

`Wireshark` is a powerful network protocol analyzer that can be used to capture and analyze network traffic, making it suitable for detecting ARP spoofing attacks.

1. Capture Traffic:

Start capturing traffic on the network interface where you suspect ARP spoofing is happening. In Wireshark, select the appropriate network interface and start the capture.

2. Filter ARP Packets:

Use Wireshark's display filters to only show ARP packets.

3. Analyze ARP Requests and Replies:

Look for inconsistencies in ARP requests and replies. In a typical ARP spoofing attack, you might see:

- ARP replies for ARP requests that were never sent.
- Multiple ARP replies for the same IP address with different MAC addresses.
- ARP requests and replies with suspicious or unexpected information.



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Pay close attention to the source and destination MAC addresses, as well as the IP addresses involved in ARP requests and replies.

Output:

```
> Frame 104736: 60 bytes on wire (480 bits), 60 bytes captured (480 bits) on interface \Device\NPF_{C58B7346-C62F-4D52-9079-C25510E6591}, id 0
  Ethernet II, Src: Hewlett-Packard (3c:52:82:09:be:c2), Dst: Broadcast (ff:ff:ff:ff:ff:ff)
    Destination: Broadcast (ff:ff:ff:ff:ff:ff)
      Address: Broadcast (ff:ff:ff:ff:ff:ff)
        ....1..... = LO bit: Locally administered address (this is NOT the factory default)
        ....1..... = IG bit: Group address (multicast/broadcast)
      Source: Hewlett-Packard (3c:52:82:09:be:c2)
        Address: Hewlett-Packard (3c:52:82:09:be:c2)
          ....0..... = LG bit: Globally unique address (factory default)
          ....0..... = IG bit: Individual address (unicast)
        Type: ARP (0x0806)
        Padding: 00000000000000000000000000000000
      Address Resolution Protocol (request)
        Hardware type: Ethernet (1)
        Protocol type: IPv4 (0x0800)
        Hardware size: 6
        Protocol size: 4
        Opcode: Request (1)
        Sender MAC address: Hewlett-Packard (3c:52:82:09:be:c2)
        Sender IP address: 192.168.12.241
        Target MAC address: 00:00:00:00:00:00 (00:00:00:00:00:00)
        Target IP address: 192.168.12.13
        [Duplicate IP address detected for 192.168.12.241 (3c:52:82:09:be:c2) - also in use by 48:9e:bd:9f:ef:8c (frame 57189)]

0000 ff ff ff ff ff 3c 52 82 09 be c2 00 06 00 01 .....<R>.....
0010 00 00 00 00 01 3c 52 82 09 be c2 c8 a8 bc f1 .....<R>.....
0020 00 00 00 00 00 c8 a8 bc f1 00 00 00 00 00 00 .....<R>.....
0030 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....<R>.....
```

```
File Edit View Go Capture Analysis Statistics Help
Filter: Duplicate address detected
No. Time Source Destination Protocol Length Info
1173. 1809.45321 Hewlett-Packard (3c:52:82:09:be:c2) Broadcast ARP 60 who has 192.168.12.1427 Tell 192.168.12.241 (duplicate use of 192.168.12.241 detected)
1174. 1811.90767 Hewlett-Packard (3c:52:82:09:be:c2) Broadcast ARP 60 who has 192.168.12.1427 Tell 192.168.12.241 (duplicate use of 192.168.12.241 detected)
1174. 1812.55571 Hewlett-Packard (3c:52:82:09:be:c2) Broadcast ARP 60 who has 192.168.12.1427 Tell 192.168.12.241 (duplicate use of 192.168.12.241 detected)
1174. 1813.56993 Hewlett-Packard (3c:52:82:09:be:c2) Broadcast ARP 60 who has 192.168.12.1427 Tell 192.168.12.241 (duplicate use of 192.168.12.241 detected)
1175. 1815.51589 Hewlett-Packard (3c:52:82:09:be:c2) Broadcast ARP 60 who has 192.168.12.1427 Tell 192.168.12.241 (duplicate use of 192.168.12.241 detected)
1176. 1816.55838 Hewlett-Packard (3c:52:82:09:be:c2) Broadcast ARP 60 who has 192.168.12.1427 Tell 192.168.12.241 (duplicate use of 192.168.12.241 detected)
1176. 1817.56289 Hewlett-Packard (3c:52:82:09:be:c2) Broadcast ARP 60 who has 192.168.12.1427 Tell 192.168.12.241 (duplicate use of 192.168.12.241 detected)
1176. 1821.51486 Hewlett-Packard (3c:52:82:09:be:c2) Broadcast ARP 60 who has 192.168.12.1427 Tell 192.168.12.241 (duplicate use of 192.168.12.241 detected)
1176. 1824.55917 Hewlett-Packard (3c:52:82:09:be:c2) Broadcast ARP 60 who has 192.168.12.1427 Tell 192.168.12.241 (duplicate use of 192.168.12.241 detected)
1180. 1825.56298 Hewlett-Packard (3c:52:82:09:be:c2) Broadcast ARP 60 who has 192.168.12.1427 Tell 192.168.12.241 (duplicate use of 192.168.12.241 detected)
1232. 1889.45667 Hewlett-Packard (3c:52:82:09:be:c2) Broadcast ARP 60 who has 192.168.12.1447 Tell 192.168.12.241 (duplicate use of 192.168.12.241 detected)
1233. 1890.45642 Hewlett-Packard (3c:52:82:09:be:c2) Broadcast ARP 60 who has 192.168.12.1447 Tell 192.168.12.241 (duplicate use of 192.168.12.241 detected)
1234. 1891.45645 Hewlett-Packard (3c:52:82:09:be:c2) Broadcast ARP 60 who has 192.168.12.1447 Tell 192.168.12.241 (duplicate use of 192.168.12.241 detected)
1238. 1892.45602 Hewlett-Packard (3c:52:82:09:be:c2) Broadcast ARP 60 who has 192.168.12.1447 Tell 192.168.12.241 (duplicate use of 192.168.12.241 detected)
1241. 1896.47897 Hewlett-Packard (3c:52:82:09:be:c2) Broadcast ARP 60 who has 192.168.12.1447 Tell 192.168.12.241 (duplicate use of 192.168.12.241 detected)
1241. 1897.47872 Hewlett-Packard (3c:52:82:09:be:c2) Broadcast ARP 60 who has 192.168.12.1447 Tell 192.168.12.241 (duplicate use of 192.168.12.241 detected)
1242. 1898.47854 Hewlett-Packard (3c:52:82:09:be:c2) Broadcast ARP 60 who has 192.168.12.1447 Tell 192.168.12.241 (duplicate use of 192.168.12.241 detected)
1246. 1184.48522 Hewlett-Packard (3c:52:82:09:be:c2) Broadcast ARP 60 who has 192.168.12.1447 Tell 192.168.12.241 (duplicate use of 192.168.12.241 detected)
1246. 1189.46928 Hewlett-Packard (3c:52:82:09:be:c2) Broadcast ARP 60 who has 192.168.12.1447 Tell 192.168.12.241 (duplicate use of 192.168.12.241 detected)
1250. 1188.46901 Hewlett-Packard (3c:52:82:09:be:c2) Broadcast ARP 60 who has 192.168.12.1447 Tell 192.168.12.241 (duplicate use of 192.168.12.241 detected)
1282. 1148.46159 Hewlett-Packard (3c:52:82:09:be:c2) Broadcast ARP 60 who has 192.168.12.2117 Tell 192.168.12.241 (duplicate use of 192.168.12.241 detected)
1285. 1150.71924 Hewlett-Packard (3c:52:82:09:be:c2) Broadcast ARP 60 who has 192.168.12.2117 Tell 192.168.12.241 (duplicate use of 192.168.12.241 detected)
1285. 1151.57151 Hewlett-Packard (3c:52:82:09:be:c2) Broadcast ARP 60 who has 192.168.12.2117 Tell 192.168.12.241 (duplicate use of 192.168.12.241 detected)
1285. 1152.56788 Hewlett-Packard (3c:52:82:09:be:c2) Broadcast ARP 60 who has 192.168.12.2117 Tell 192.168.12.241 (duplicate use of 192.168.12.241 detected)
1287. 1154.72587 Hewlett-Packard (3c:52:82:09:be:c2) Broadcast ARP 60 who has 192.168.12.2117 Tell 192.168.12.241 (duplicate use of 192.168.12.241 detected)
1287. 1155.57229 Hewlett-Packard (3c:52:82:09:be:c2) Broadcast ARP 60 who has 192.168.12.2117 Tell 192.168.12.241 (duplicate use of 192.168.12.241 detected)
1288. 1156.57229 Hewlett-Packard (3c:52:82:09:be:c2) Broadcast ARP 60 who has 192.168.12.2117 Tell 192.168.12.241 (duplicate use of 192.168.12.241 detected)
> Frame 128883: 60 bytes on wire (480 bits), 60 bytes captured (480 bits) on interface \Device\NPF_{C58B7346-C62F-4D52-9079-C25510E6591}, id 0
  Ethernet II, Src: Hewlett-Packard (3c:52:82:09:be:c2), Dst: Broadcast (ff:ff:ff:ff:ff:ff)
    Destination: Broadcast (ff:ff:ff:ff:ff:ff)
      Address: Broadcast (ff:ff:ff:ff:ff:ff)
        ....1..... = LO bit: Locally administered address (this is NOT the factory default)
        ....1..... = IG bit: Group address (multicast/broadcast)
      Source: Hewlett-Packard (3c:52:82:09:be:c2)
        Address: Hewlett-Packard (3c:52:82:09:be:c2)
          ....0..... = LG bit: Globally unique address (factory default)
          ....0..... = IG bit: Individual address (unicast)
        Type: ARP (0x0806)
        Padding: 00000000000000000000000000000000
      Address Resolution Protocol (request)
        Hardware type: Ethernet (1)
        Protocol type: IPv4 (0x0800)
        Hardware size: 6
        Protocol size: 4
        Opcode: Request (1)
        Sender MAC address: Hewlett-Packard (3c:52:82:09:be:c2)
        Sender IP address: 192.168.12.241
        Target MAC address: 00:00:00:00:00:00 (00:00:00:00:00:00)
        Target IP address: 192.168.12.13
        [Duplicate IP address detected for 192.168.12.241 (3c:52:82:09:be:c2) - also in use by 48:9e:bd:9f:ef:8c (frame 57189)]

0000 ff ff ff ff ff 3c 52 82 09 be c2 00 06 00 01 .....<R>.....
0010 00 00 00 00 01 3c 52 82 09 be c2 c8 a8 bc f1 .....<R>.....
0020 00 00 00 00 00 c8 a8 bc f1 00 00 00 00 00 00 .....<R>.....
0030 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....<R>.....
```

Conclusion:

In conclusion, ARP spoofing poses a significant security threat by allowing attackers to intercept network traffic. Utilizing tools like Nmap, ARPWATCH, and Wireshark can aid in detecting such attacks. Nmap provides a quick network scan to identify discrepancies in IP-MAC mappings, ARPWATCH continuously monitors ARP activity for any anomalies, and Wireshark allows for in-depth analysis of ARP packets for inconsistencies. By combining these tools and techniques, network administrators can enhance their ability to identify and mitigate ARP spoofing attacks, bolstering overall network security.