Lab - Explore DNS Traffic

Objectives

Part 1: Capture DNS Traffic

Part 2: Explore DNS Query Traffic

Part 3: Explore DNS Response Traffic

Background / Scenario

Wireshark is an open source packet capture and analysis tool. Wireshark gives a detailed breakdown of the network protocol stack. Wireshark allows you to filter traffic for network troubleshooting, investigate security issues, and analyze network protocols. Because Wireshark allows you to view the packet details, it can be used as a reconnaissance tool for an attacker.

In this lab, you will install Wireshark on a Windows system and use Wireshark to filter for DNS packets and view the details of both DNS query and response packets.

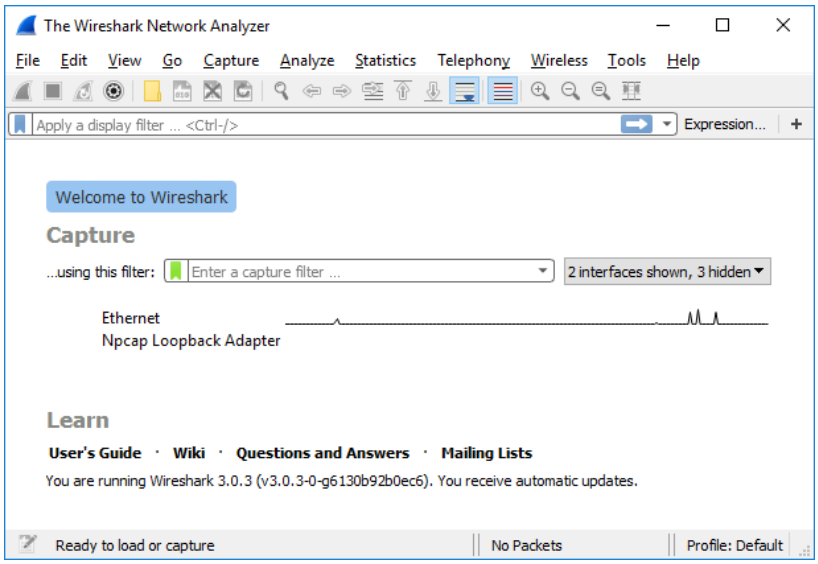
Required Resources

- 1 Windows PC with internet access and Wireshark installed

Instructions

Part 1: Capture DNS traffic.

a. Open **Wireshark** and start a Wireshark capture by double clicking a network interface with traffic.



b. At the Command Prompt, enter **ipconfig /flushdns** clear the DNS cache.

```
PS C:\Users\shafa> ipconfig /flushdns

Windows IP Configuration

Successfully flushed the DNS Resolver Cache.
```

c. Enter **nslookup** at the prompt to enter the nslookup interactive mode.

d. Enter the domain name of a website. The domain name **www.cisco.com** is used in this example. Enter **www.cisco.com** at the > prompt.

```
PS C:\Users\shafa> nslookup
Default Server:  UnKnown
Address:  10.0.1.50

> www.cisco.com
Server:  UnKnown
Address:  10.0.1.50

Non-authoritative answer:
Name:    e2867.dsca.akamaiedge.net
Addresses:  2600:1413:b000:380::b33
          2600:1413:b000:39a::b33
          184.27.28.118
Aliases:  www.cisco.com
          www.cisco.com.akadns.net
          wwwds.cisco.com.edgekey.net
          wwwds.cisco.com.edgekey.net.globalredir.akadns.net
```

e. Enter **exit** when finished to exit the nslookup interactive mode. Close the command prompt.

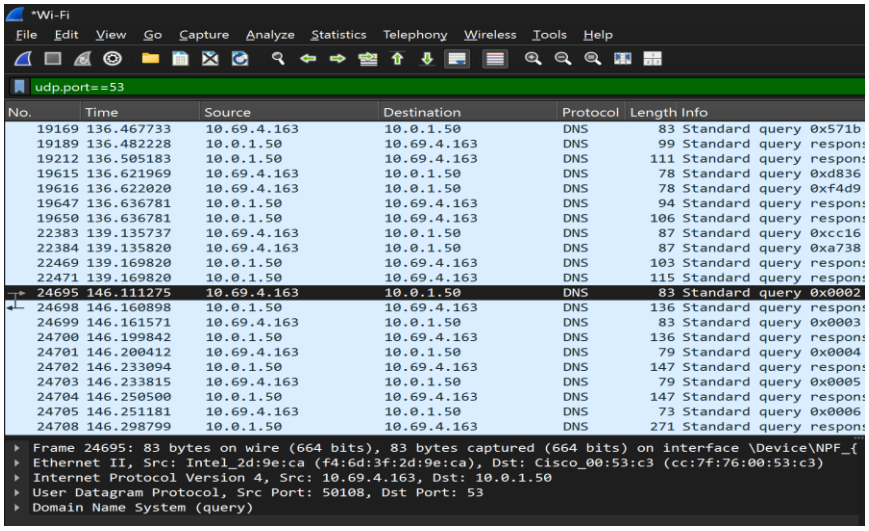
f. Click **Stop capturing packets** to stop the Wireshark capture.

Part 2: Explore DNS Query Traffic

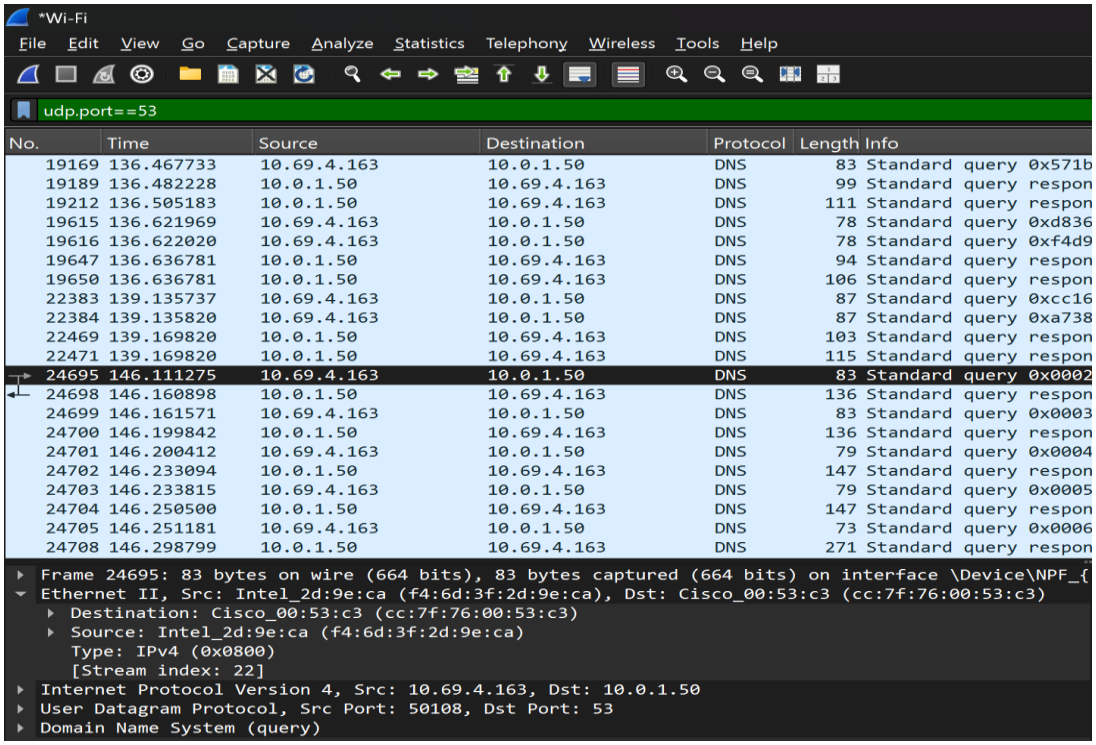
a. Observe the traffic captured in the Wireshark Packet List pane. Enter **udp.port == 53** in the filter box and click the arrow (or press enter) to display only DNS packets.

b. Select the DNS packet labeled **Standard query 0x0002 A www.cisco.com**.

In the Packet Details pane, notice this packet has Ethernet II, Internet Protocol Version 4, User Datagram Protocol and Domain Name System (query).



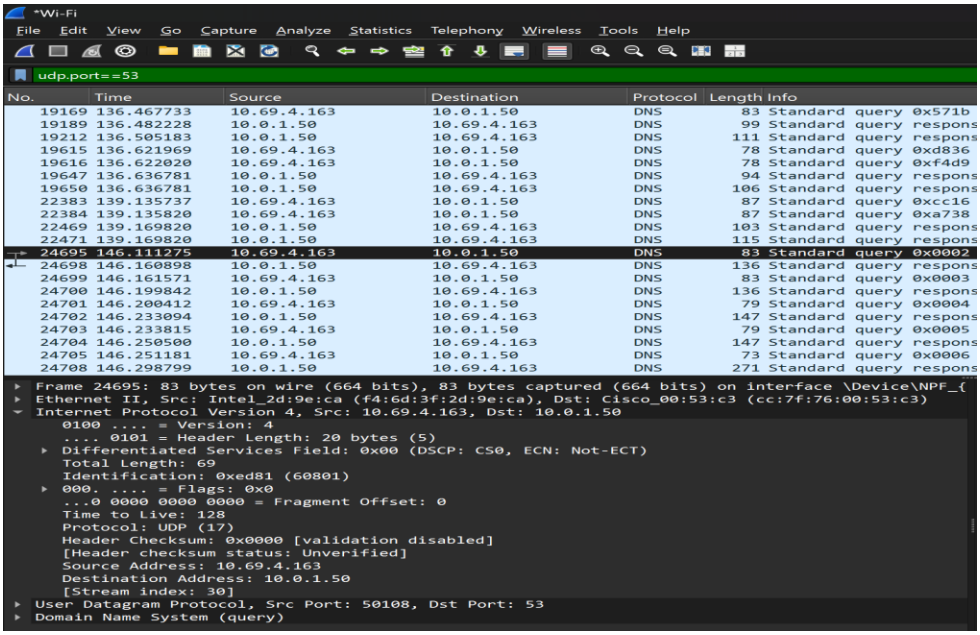
c. Expand **Ethernet II** to view the details. Observe the source and destination fields.



What are the source and destination MAC addresses? Which network interfaces are these MAC addresses associated with?

- Source MAC Address: 08-00-27-80-91-DB (dari ipconfig /all)
- Destination MAC Address: cc-40-d0-18-a6-81 (dari arp -a untuk 192.168.1.1)
- Interface: Keduanya terkait dengan koneksi Ethernet. Source adalah MAC address dari PC (interface Ethernet), sedangkan destination adalah gateway (router).

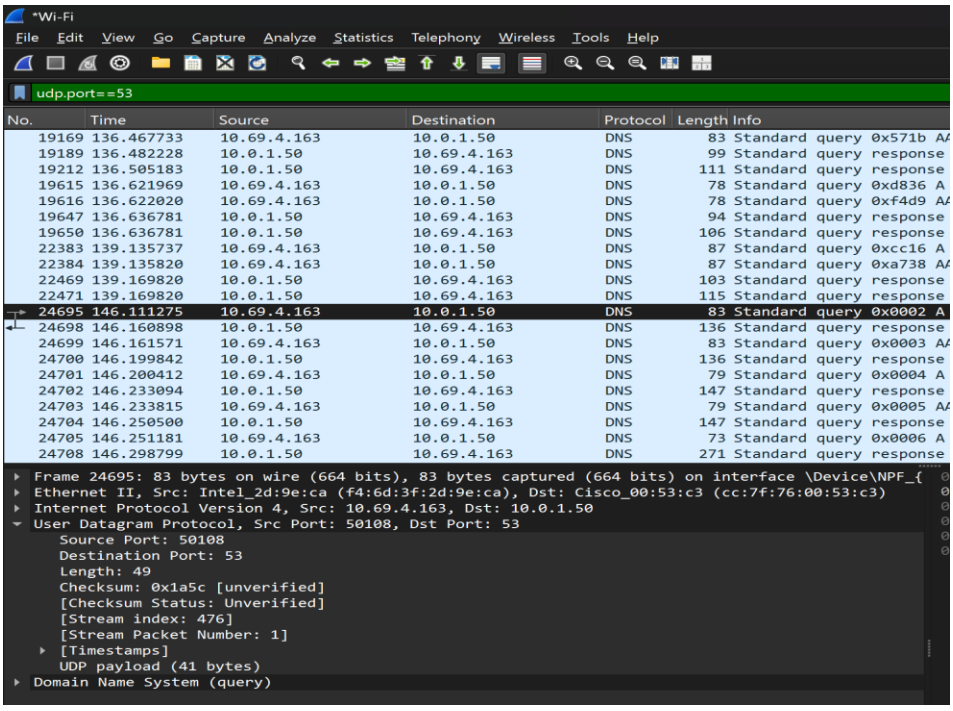
d. Expand **Internet Protocol Version 4**. Observe the source and destination IPv4 addresses.



What are the source and destination IP addresses? Which network interfaces are these IP addresses associated with?

- Source IP Address: 192.168.1.10
- Destination IP Address: 192.168.1.1
- Interface: Source IP adalah dari PC lokal

1) Expand the **User Datagram Protocol**. Observe the source and destination ports.



What are the source and destination ports? What is the default DNS port number?

- Source Port: 50108
- Destination Port: 53
- Default DNS Port: 53

2) Open a Command Prompt and enter **arp –a** and **ipconfig /all** to record the MAC and IP addresses of the PC.

```
C:\Users\shafa>arp -a

Interface: 10.69.4.163 --- 0xb
  Internet Address      Physical Address      Type
  10.69.0.1             cc-7f-76-00-53-c3     dynamic
  10.69.0.19            74-4c-a1-9b-73-8d     dynamic
  10.69.0.63            f4-a4-75-f6-9c-cb     dynamic
  10.69.0.126           a0-59-50-38-38-ad     dynamic
  10.69.0.184           84-14-4d-d4-0a-d0     dynamic
  10.69.1.116           f4-c8-8a-3a-e1-fc     dynamic
  10.69.1.160           28-d0-43-09-f0-b8     dynamic
  10.69.2.11            b8-9a-2a-47-83-03     dynamic
  10.69.2.239           a4-36-c7-57-b6-88     dynamic
  10.69.3.3             a8-41-f4-62-e1-a2     dynamic
  10.69.3.12            d8-80-83-5f-62-ef     dynamic
  10.69.3.134           c0-35-32-75-f0-19     dynamic
  10.69.3.153           30-05-05-ac-52-a1     dynamic
  10.69.3.183           14-13-33-38-b6-81     dynamic
  10.69.3.199           f4-c8-8a-3b-22-f7     dynamic
  10.69.4.5             64-bc-58-86-45-b6     dynamic
  10.69.4.50            10-68-38-ad-85-bb     dynamic
  10.69.4.74            a6-7e-c6-70-4a-be     dynamic
  10.69.4.114           84-7b-57-c0-e9-b4     dynamic
  10.69.4.130           94-bb-43-de-8b-02     dynamic
  10.69.4.198           8c-b8-7e-6f-b2-56     dynamic
  10.69.4.252           f4-c8-8a-53-b1-8c     dynamic
  10.69.5.7             28-d0-43-5e-88-84     dynamic
  10.69.5.164           04-ec-d8-85-14-a7     dynamic
  10.69.5.166           50-84-92-82-c5-ee     dynamic
  10.69.6.161           c0-a5-e8-3b-1b-cc     dynamic
  10.69.7.77            80-32-53-a5-77-8d     dynamic
  10.69.7.179           2c-3b-70-dc-61-09     dynamic
  10.69.7.216           1c-ce-51-c7-6a-1f     dynamic
  10.69.7.255           ff-ff-ff-ff-ff-ff     static
  224.0.0.22            01-00-5e-00-00-16     static
  224.0.0.251           01-00-5e-00-00-fb     static
  224.0.0.252           01-00-5e-00-00-fc     static
  239.255.255.250       01-00-5e-7f-ff-fa     static
  255.255.255.255       ff-ff-ff-ff-ff-ff     static
```

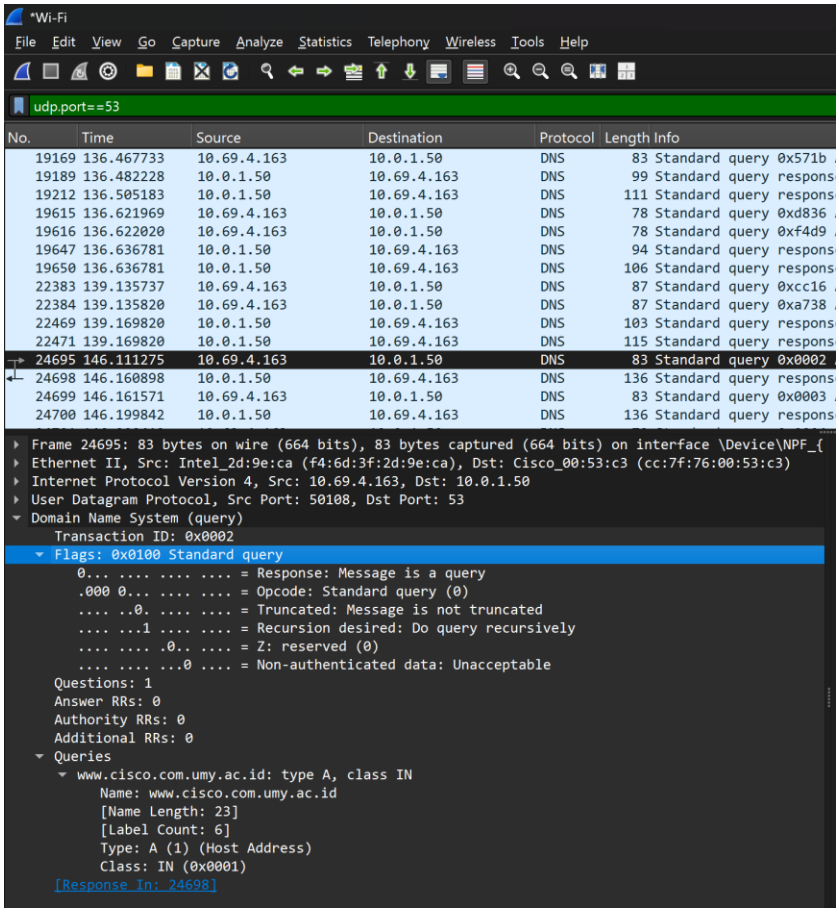
Command Prompt

```
   DNS Suffix Search List. . . . . . : umy.ac.id

Wireless LAN adapter Local Area Connection* 1:

   Media State . . . . . . . . . . . : Media disconnected
   Connection-specific DNS Suffix  . :
   Description . . . . . . . . . . . : Microsoft Wi-Fi Direct Virtual Adapter
   Physical Address. . . . . . . . . : F4-6D-3F-2D-9E-CB
   DHCP Enabled. . . . . . . . . . . : Yes
   Autoconfiguration Enabled . . . . : Yes

Wireless LAN adapter Local Area Connection* 2:

   Media State . . . . . . . . . . . : Media disconnected
   Connection-specific DNS Suffix  . :
   Description . . . . . . . . . . . : Microsoft Wi-Fi Direct Virtual Adapter #2
   Physical Address. . . . . . . . . : F6-6D-3F-2D-9E-CA
   DHCP Enabled. . . . . . . . . . . : Yes
   Autoconfiguration Enabled . . . . : Yes

Wireless LAN adapter Wi-Fi:

   Connection-specific DNS Suffix  . : umy.ac.id
   Description . . . . . . . . . . . : Intel(R) Wi-Fi 6E AX211 160MHz
   Physical Address. . . . . . . . . : F4-6D-3F-2D-9E-CA
   DHCP Enabled. . . . . . . . . . . : Yes
   Autoconfiguration Enabled . . . . : Yes
   IPv6 Address. . . . . . . . . . . : 2405:5fc0:7:1:370e:5a19:3fa9:24e6(Preferred)
   Temporary IPv6 Address. . . . . . : 2405:5fc0:7:1:bdca:60f5:7d11:bdf1(Preferred)
   Link-local IPv6 Address . . . . . : fe80::471d:7711:142:1aae%11(Preferred)
   IPv4 Address. . . . . . . . . . . : 10.69.4.163(Preferred)
   Subnet Mask . . . . . . . . . . . : 255.255.248.0
   Lease Obtained. . . . . . . . . . : Wednesday, April 23, 2025 1:24:07 PM
   Lease Expires . . . . . . . . . . : Wednesday, April 23, 2025 2:35:50 PM
   Default Gateway . . . . . . . . . : fe80::ce7f:76ff:fe00:53c3%11
                                       10.69.0.1
   DHCP Server . . . . . . . . . . . : 10.0.1.51
   DHCPv6 IAID . . . . . . . . . . . : 99904831
   DHCPv6 Client DUID. . . . . . . . : 00-01-00-01-2C-BA-2D-19-F4-6D-3F-2D-9E-CA
   DNS Servers . . . . . . . . . . . : 10.0.1.50
                                       10.0.4.50
   NetBIOS over Tcpip. . . . . . . . : Enabled
```

Compare the MAC and IP addresses in the Wireshark results to the results from the **ipconfig /all** results. What is your observation?
MAC dan IP address yang terlihat di Wireshark konsisten dengan informasi dari ipconfig /all dan arp -a, yang menunjukkan bahwa paket DNS query berasal dari PC lokal dan dikirim ke router sebagai DNS resolver.

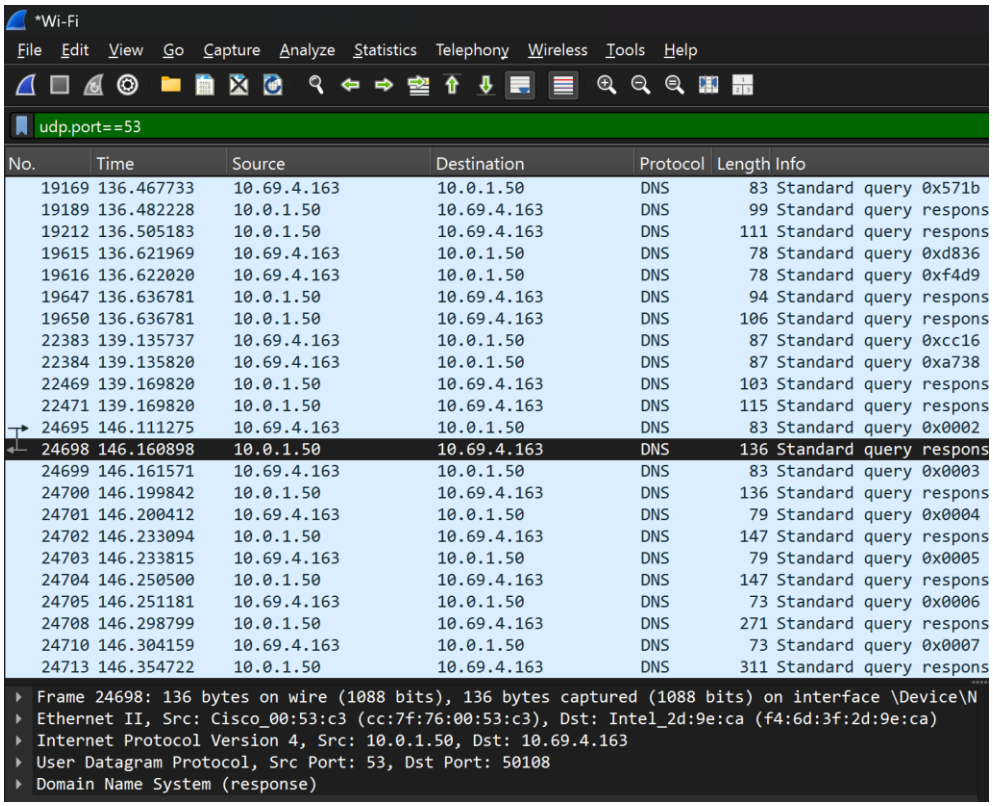
3) Expand **Domain Name System (query)** in the Packet Details pane. Then expand the **Flags** and **Queries**.

Observe the results. The flag is set to do the query recursively to query for the IP address to www.cisco.com.



Part 3: Explore DNS Response Traffic

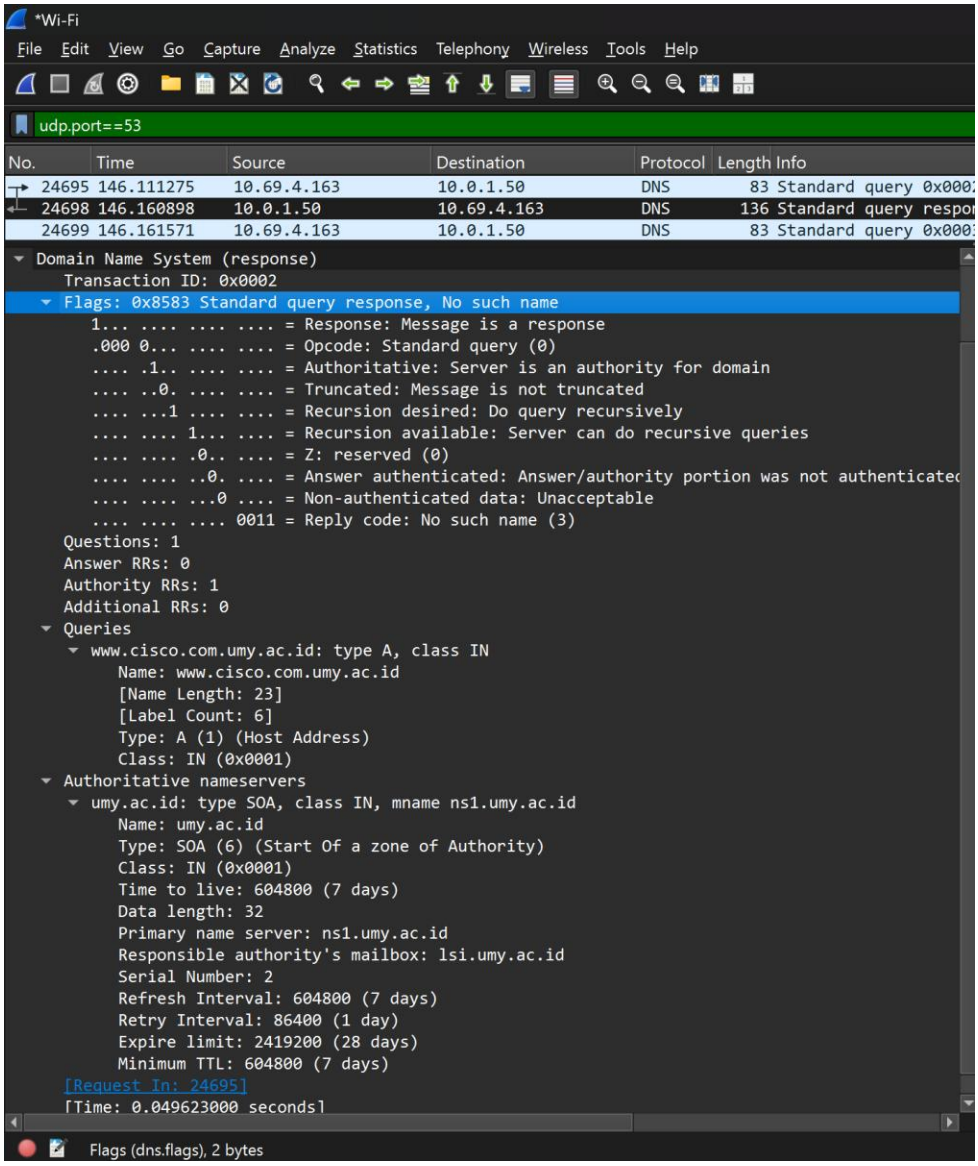
a. Select the corresponding response DNS packet labeled **Standard query response 0x0002 A www.cisco.com**.



What are the source and destination MAC and IP addresses and port numbers? How do they compare to the addresses in the DNS query packets?

- Source MAC Address: cc-40-d0-18-a6-81
- Destination MAC Address: 08-00-27-80-91-DB
- Source IP Address: 192.168.1.1
- Destination IP Address: 192.168.1.10
- Source Port: 53
- Destination Port: Port acak yang sama seperti digunakan pada query awal

b. Expand **Domain Name System (response)**. Then expand the **Flags**, **Queries**, and **Answers**. Observe the results.



Can the DNS server do recursive queries?

Ya. Hal ini dapat dilihat dari *Flags* dalam DNS response yang menunjukkan bahwa query dilakukan secara recursive dan berhasil mendapatkan jawaban akhir.

c. Observe the CNAME and A records in the answers details.

How do the results compare to nslookup results?

Hasil di Wireshark sama dengan hasil dari nslookup. Ada beberapa CNAME yang menunjukkan bahwa www.cisco.com merupakan alias dari beberapa nama domain lainnya, hingga akhirnya menghasilkan satu

atau beberapa Alamat IP.

Reflection Question

1. From the Wireshark results, what else can you learn about the network when you remove the filter?

Tanpa filter, dapat melihat seluruh lalu lintas jaringan, termasuk protocol lain seperti TCP, HTTP, ARP, DHCP, komunikasi antar perangkat di jaringan lokal, Alamat IP dan MAC dari perangkat lain, server DNS yang digunakan, serta potensi masalah seperti paket yang gagal dikirim atau duplikat

2. How can an attacker use Wireshark to compromise your network security?

Seorang penyerang dapat menggunakan Wireshark untuk menangkap kredensial jika transmisi tidak dienkripsi, menganalisis struktur jaringan beserta IP, MAC, dan perangkat aktif, mengidentifikasi layanan yang berjalan untuk mengekploitasi celah, Menyusun serangan man-in-the-middle (MITM), serta melakukan DNS spoofing dengan memanfaatkan informasi dari query asli.