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Royal University of Bhutan
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Lab - Explore DNS Traffic

Submitted by:

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DIPLOMA IN COMPUTER SYSTEM AND NETWORK

JIGME NAMGYEL ENGINEERING COLLEGE

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DEWATHANG

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Background / Scenario

Wireshark is an opensource 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.

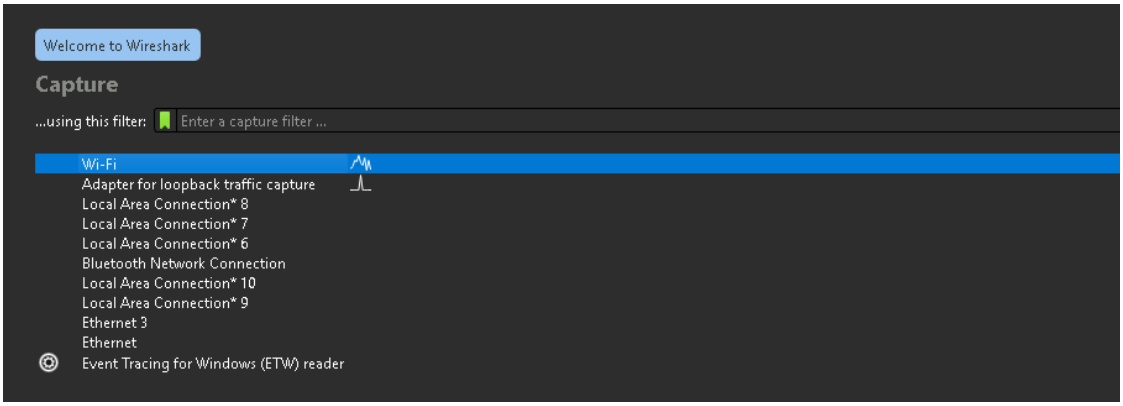
Required Resources

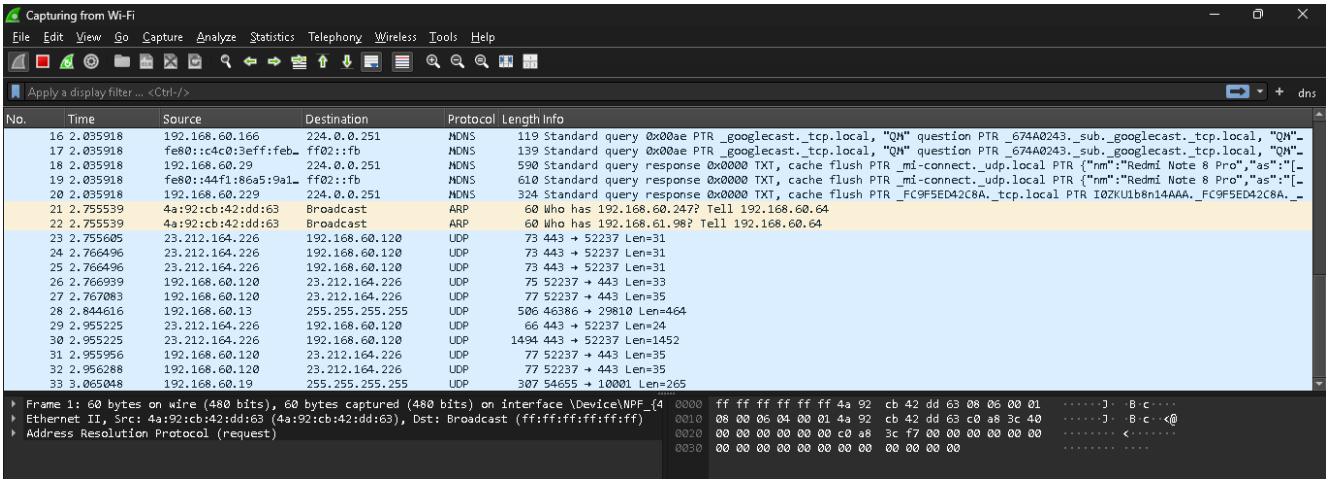
- 1 Windows PC with internet access and Wireshark installed

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.

```
Microsoft Windows [Version 10.0.26100.5074]
(c) Microsoft Corporation. All rights reserved.

C:\Users\DELL>ipconfig /flushdns

Windows IP Configuration

Successfully flushed the DNS Resolver Cache.

C:\Users\DELL>
```

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

```
C:\Users\DELL>nslookup
Default Server:  ns0.jnec.edu.bt
Address:  192.168.255.227
```

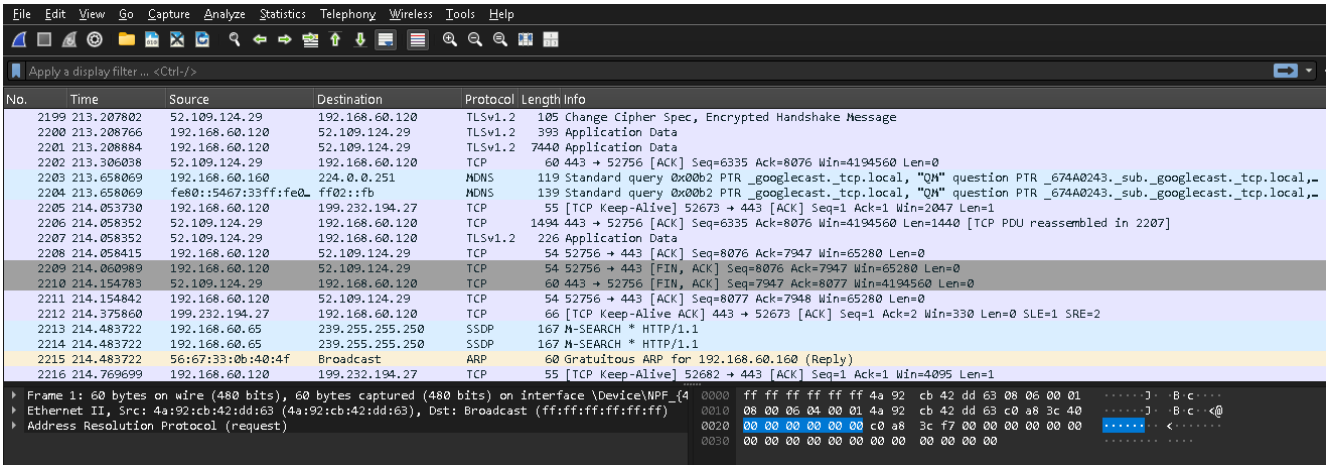
d. Enter the domain name of a website. The domain name www.cisco.com is used in this example. Enter www.cisco.com at the > prompt.

```
> www.cisco.com
Server:  ns0.jnec.edu.bt
Address:  192.168.255.227

Non-authoritative answer:
Name:    e2867.dsca.akamaiedge.net
Addresses:  2600:140f:7:48c::b33
          2600:140f:7:489::b33
          23.204.252.98
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.

```
> exit

C:\Users\DELL>
```

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



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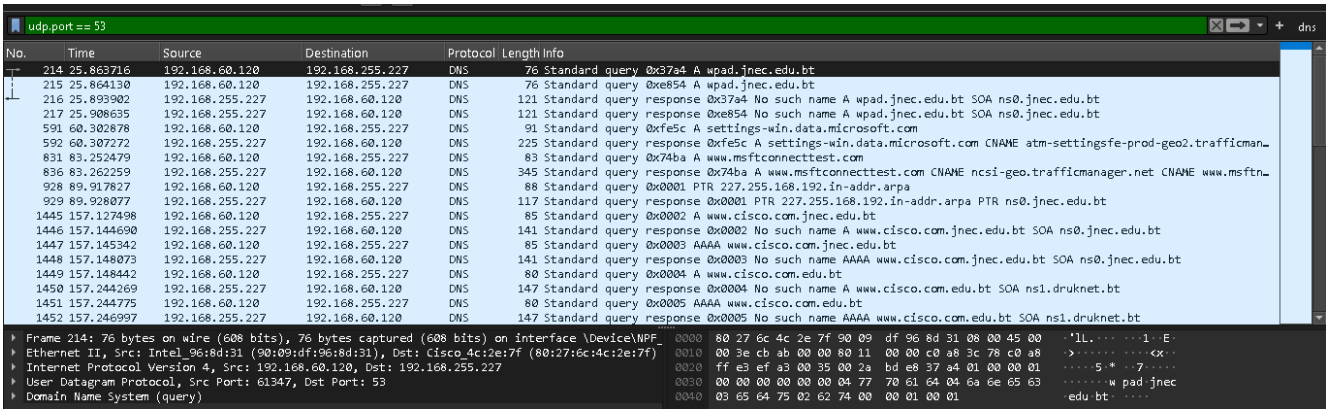
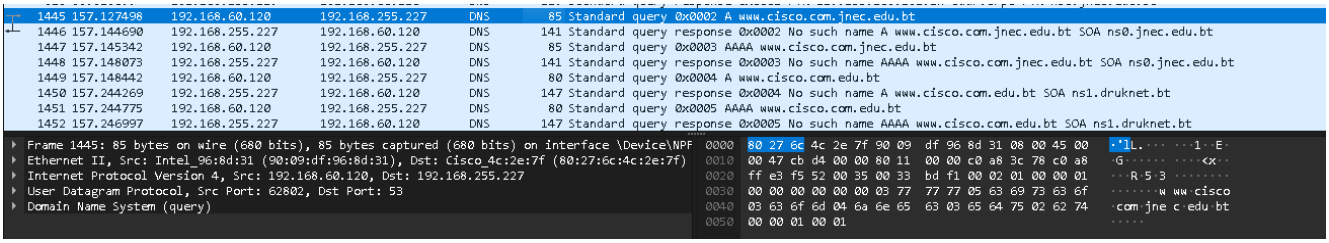
Part 2: Explore DNS Query Traffic

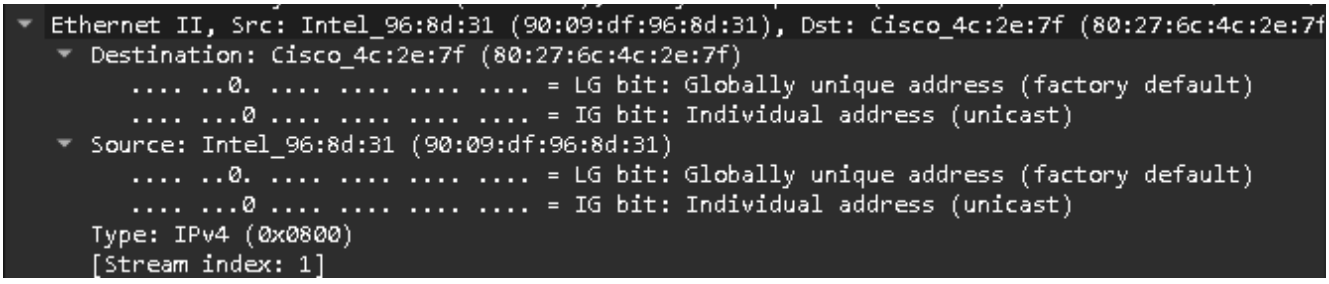
a. Observe the traffic captured in the Wireshark Packet List pane. Enter udp.port == 53 in the filter box and click the arrow (or press enter) to display only DNS packets.



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).

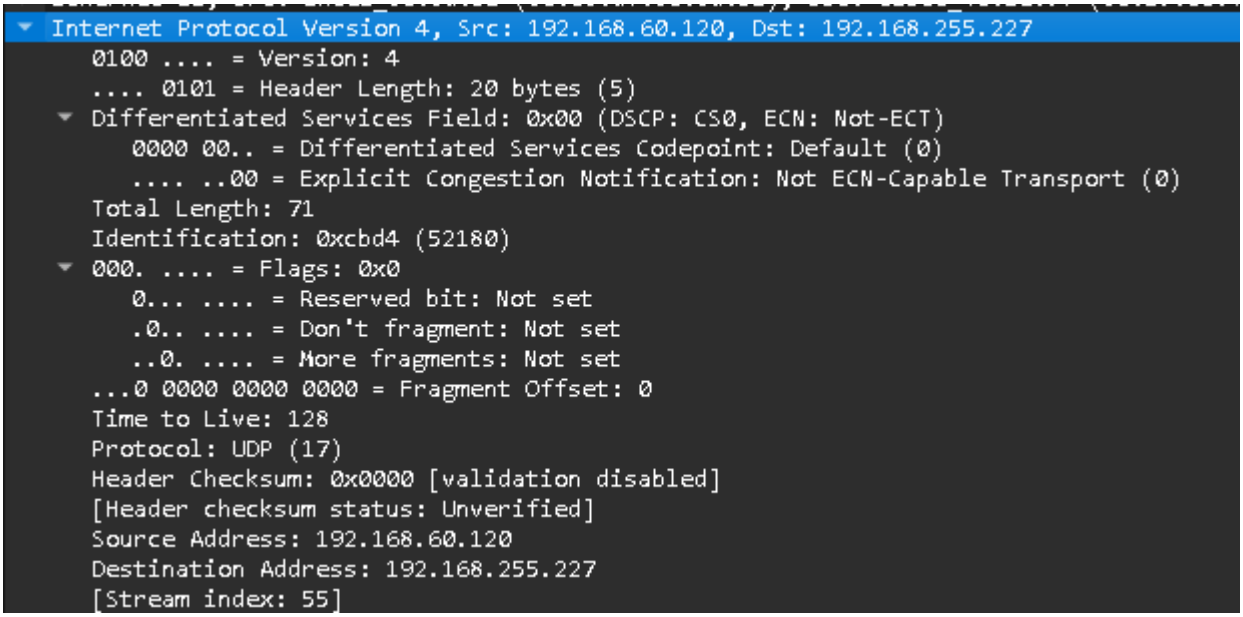


c. Expand Ethernet II to view the details. Observe the source and destination fields.



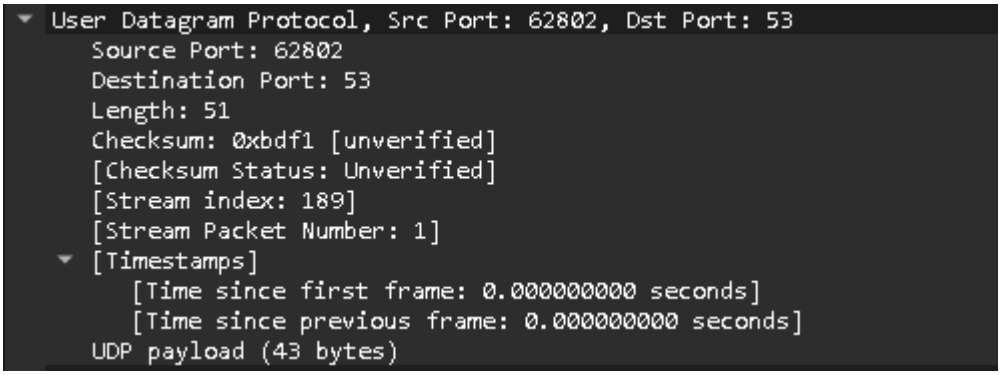
What are the source and destination MAC addresses? Which network interfaces are these MAC addresses associated with?
Ans: The source MAC address is associated with the NIC on the PC and the destination MAC address is associated with the default gateway. If there is a local DNS server, the destination MAC address would be the MAC address of the local DNS server.

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?
Ans: The source IP address is associated with the NIC on the PC and the destination IP address is associated with the DNS server.

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?

Ans: The source port number is 62802 and the destination port is 53, which is the default DNS port number.

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

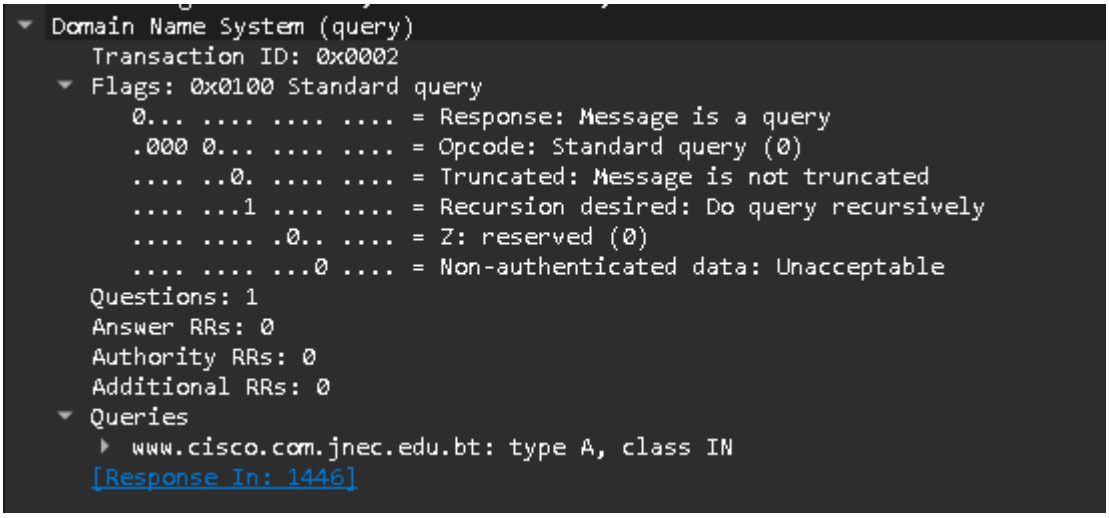
```
C:\Users\DELL>arp -a

Interface: 192.168.60.120 --- 0x7
  Internet Address      Physical Address      Type
  192.168.60.1          80-27-6c-4c-2e-7f     dynamic
  192.168.60.138        f8-54-f6-ef-de-2f     dynamic
  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
  255.255.255.255       ff-ff-ff-ff-ff-ff     static

Interface: 192.168.128.1 --- 0xd
  Internet Address      Physical Address      Type
  192.168.128.255       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

C:\Users\DELL>
```

```
C:\Users\DELL>ipconfig /all

Windows IP Configuration

   Host Name . . . . . . . . . . . . : DESKTOP-CTB9450
   Primary Dns Suffix  . . . . . . . :
   Node Type . . . . . . . . . . . . : Mixed
   IP Routing Enabled. . . . . . . . : No
   WINS Proxy Enabled. . . . . . . . : No
   DNS Suffix Search List. . . . . . : jnec.edu.bt

Ethernet adapter Ethernet 3:

   Connection-specific DNS Suffix  . :
   Description . . . . . . . . . . . : VirtualBox Host-Only Ethernet Adapter
   Physical Address. . . . . . . . . : 0A-00-27-00-00-0D
   DHCP Enabled. . . . . . . . . . . : No
   Autoconfiguration Enabled . . . . : Yes
   Link-local IPv6 Address . . . . . : fe80::7106:5771:1dfe:8f8f%13(Preferred)
   IPv4 Address. . . . . . . . . . . : 192.168.128.1(Preferred)
   Subnet Mask . . . . . . . . . . . : 255.255.255.0
   Default Gateway . . . . . . . . . :
   DHCPv6 IAID . . . . . . . . . . . : 906625063
   DHCPv6 Client DUID. . . . . . . . : 00-01-00-01-2E-0D-54-2F-4C-D7-17-79-7F-AA
   NetBIOS over Tcpip. . . . . . . . : Enabled

Wireless LAN adapter Local Area Connection* 9:

   Media State . . . . . . . . . . . : Media disconnected
   Connection-specific DNS Suffix  . :
   Description . . . . . . . . . . . : Microsoft Wi-Fi Direct Virtual Adapter
   Physical Address. . . . . . . . . : 90-09-DF-96-8D-32
   DHCP Enabled. . . . . . . . . . . : Yes
   Autoconfiguration Enabled . . . . : Yes
```

Compare the MAC and IP addresses in the Wireshark results to the results from the ipconfig /all results. What is your observation?

Ans: The IP and MAC addresses captured in the Wireshark results are the same as the addresses listed in arp – a and ipconfig /all command.

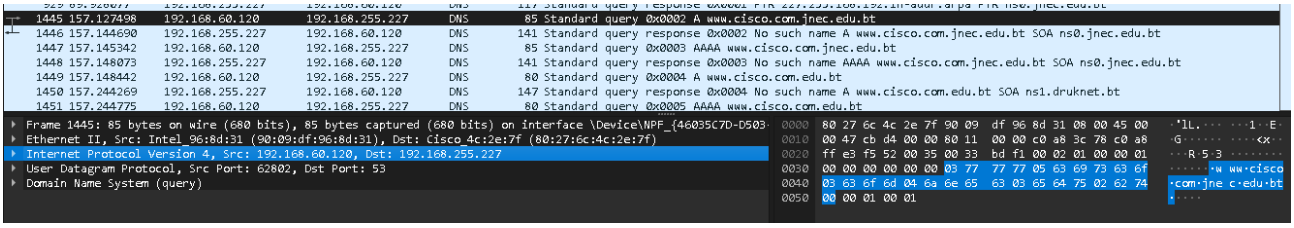
3) Expand Domain Name System (query) in the Packet Details pane. Then expand the Flags and Queries.



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

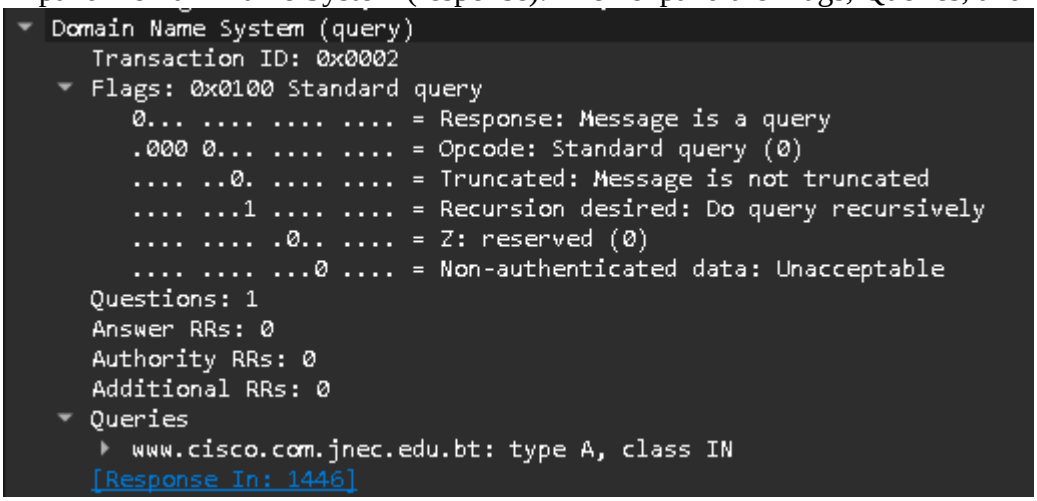
Part 3: Explore DNS Response Traffic

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?
Ans: The source IP, MAC address, and port number in the query packet are now destination addresses. The destination IP, MAC address, and port number in the query packet are now source addresses.

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



Observe the results.
Can the DNS server do recursive queries?
Ans: Yes, the DNS can handle recursive queries.

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c. Observe the CNAME and A records in the answers details.
How do the results compare to nslookup results?
Ans: The results in the Wireshark should be the same as the results from nslookup in the Command Prompt.

Reflection Question

1. From the Wireshark results, what else can you learn about the network when you remove the filter?
   Ans: Without the filters, the results display other packets, such as DHCP and ARP. From these packets and the information contained within these packets, you can learn about other devices and their functions within the LAN.

2. How can an attacker use Wireshark to compromise your network security?
   Ans: An attacker on the LAN can use Wireshark to observe the network traffic and can get sensitive information in the packet details if the traffic is not encrypted.