CS 315: Computer Networks Lab
Spring 2024-25, IIT Dharwad
Assignment-6

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UDP, Socket Programming & SMTP
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Lab Instructions

Introduction

Part 0: Paste a screenshot of your system IP address, using `ipconfig` (on Windows) or `ifconfig` (on Mac and Linux), and fill out this Google form to submit the details of your system. The same system must be used to attempt all exercises of this lab.

```
user@sysad-HP-Elite-Tower-600-G9-Desktop-PC:~$ ifconfig
eno1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 10.240.118.97  netmask 255.255.248.0  broadcast 10.240.119.255
        inet6 fe80::1d6b:1bfb:2bd6:ef0d  prefixlen 64  scopeid 0x20<link>
        ether e0:73:e7:0a:99:9a  txqueuelen 1000  (Ethernet)
        RX packets 1428020  bytes 560023912 (560.0 MB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 150004  bytes 30720298 (30.7 MB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
        device interrupt 19  memory 0x80900000-80920000

lo: flags=73<UP,LOOPBACK,RUNNING>  mtu 65536
        inet 127.0.0.1  netmask 255.0.0.0
        inet6 ::1  prefixlen 128  scopeid 0x10<host>
        loop  txqueuelen 1000  (Local Loopback)
        RX packets 206884  bytes 182116195 (182.1 MB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 206884  bytes 182116195 (182.1 MB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

wlp0s20f3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 10.200.179.190  netmask 255.255.248.0  broadcast 10.200.183.255
        inet6 fe80::ddaf:17f1:5c70:a58  prefixlen 64  scopeid 0x20<link>
        ether b0:dc:ef:fb:f1:e4  txqueuelen 1000  (Ethernet)
        RX packets 128853  bytes 101627104 (101.6 MB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 98195  bytes 17730638 (17.7 MB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
```

Part-1: Wireshark UDP

Do the following:

1. Start Wireshark
2. Flush DNS cache in terminal
3. Use nslookup on www.woodenstreet.com domain
4. Stop the Wireshark.

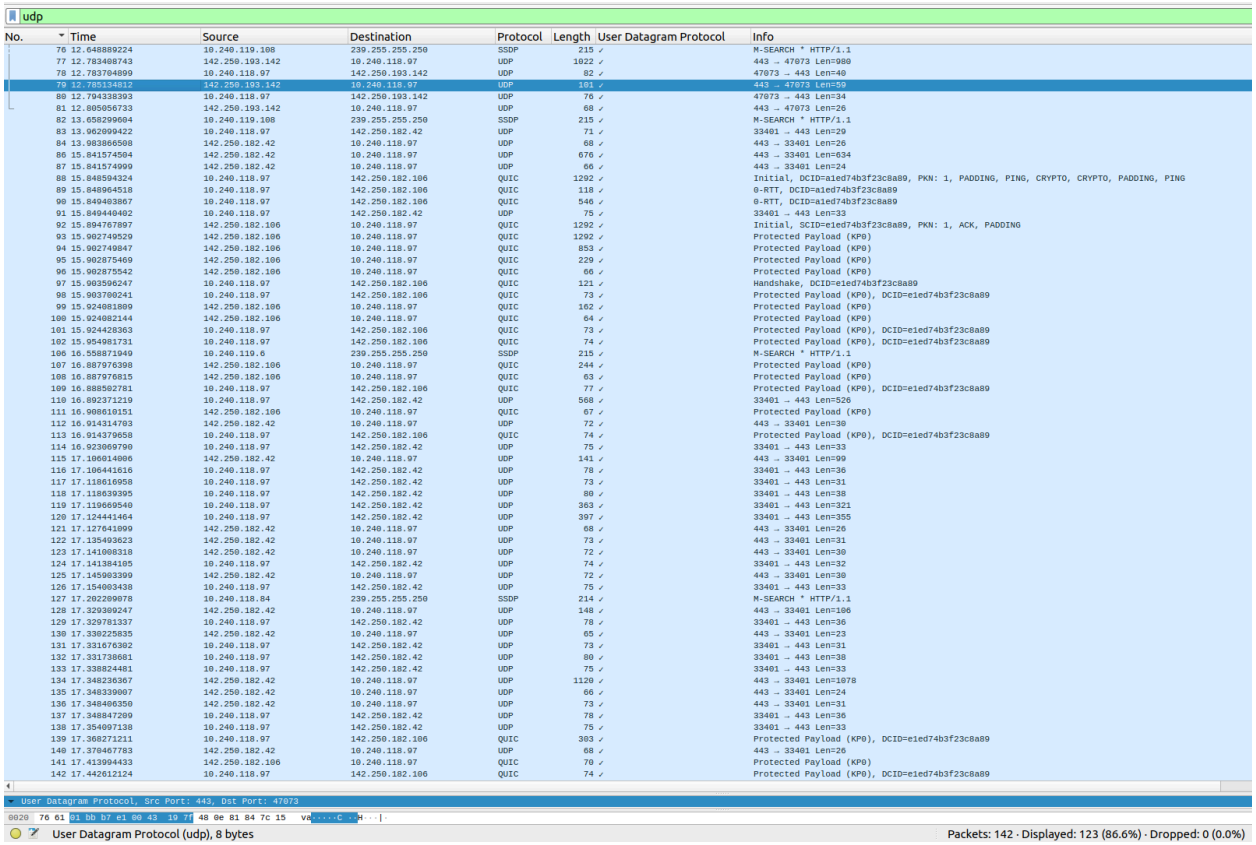
Answer the following questions:

1. **List the different protocols you observe in the trace that use the UDP in the transport layer.**
   Hint: Select any packet you observe using UDP from the packet listing window then select Apply as Column

We don't need to go into any more details about `nslookup` or DNS, as we're just interested in getting a few UDP segments into Wireshark. Pick the first UDP segment for the above hostname (by applying DNS in the filter) and expand the UDP fields in the details window.

udp

No.	Time	Source	Destination	Protocol	Length	User Datagram Protocol
1	0.000000000	10.240.118.74	239.255.255.250	SSDP	215	✓
2	0.313529114	10.240.118.106	224.0.0.251	MDNS	170	✓
3	0.314590356	10.240.118.109	224.0.0.251	MDNS	145	✓
5	0.522327517	10.240.118.92	224.0.0.251	MDNS	169	✓
6	0.523424701	10.240.119.89	224.0.0.251	MDNS	145	✓
7	0.790176991	10.240.118.72	239.255.255.250	SSDP	215	✓
9	1.006377532	10.240.118.74	239.255.255.250	SSDP	215	✓
10	1.167787706	10.240.118.97	142.250.193.142	UDP	495	✓
11	1.189783958	142.250.193.142	10.240.118.97	UDP	75	✓
12	1.202312600	10.240.118.97	142.250.193.142	UDP	76	✓
13	1.487412696	142.250.193.142	10.240.118.97	UDP	1292	✓
14	1.487413038	142.250.193.142	10.240.118.97	UDP	910	✓
15	1.487413108	142.250.193.142	10.240.118.97	UDP	98	✓
16	1.488078560	10.240.118.97	142.250.193.142	UDP	82	✓
17	1.488497919	142.250.193.142	10.240.118.97	UDP	65	✓
18	1.498610386	10.240.118.97	142.250.193.142	UDP	76	✓
19	1.509708725	142.250.193.142	10.240.118.97	UDP	68	✓
20	1.798111275	10.240.118.72	239.255.255.250	SSDP	215	✓
21	2.013768848	10.240.118.74	239.255.255.250	SSDP	215	✓
22	2.164602372	142.250.193.142	10.240.118.97	UDP	79	✓
23	2.170035413	10.240.118.97	142.250.193.142	UDP	76	✓
28	2.805929746	10.240.118.72	239.255.255.250	SSDP	215	✓
29	3.022654127	10.240.118.74	239.255.255.250	SSDP	215	✓
30	3.887082801	10.250.200.3	10.240.119.83	DNS	281	✓
31	4.165553651	10.240.118.215	224.0.0.251	MDNS	276	✓
32	4.165784346	fe80::a249:784c:895b:5d0e	ff02::fb	MDNS	296	✓
33	4.166458179	10.240.118.215	224.0.0.251	MDNS	93	✓
34	4.166458543	fe80::a249:784c:895b:5d0e	ff02::fb	MDNS	113	✓
35	4.416776228	10.240.118.215	224.0.0.251	MDNS	93	✓
36	4.416776681	fe80::a249:784c:895b:5d0e	ff02::fb	MDNS	113	✓
37	4.455745613	10.250.200.3	10.240.119.46	DNS	281	✓
39	4.668844870	10.240.118.215	224.0.0.251	MDNS	93	✓
40	4.668937637	fe80::a249:784c:895b:5d0e	ff02::fb	MDNS	113	✓
41	4.921573406	10.240.118.215	224.0.0.251	MDNS	341	✓
42	4.921573737	fe80::a249:784c:895b:5d0e	ff02::fb	MDNS	361	✓
43	4.921844675	10.240.118.215	224.0.0.251	MDNS	277	✓
44	4.922087730	fe80::a249:784c:895b:5d0e	ff02::fb	MDNS	297	✓
45	5.561485664	10.240.118.97	10.250.200.3	DNS	80	✓
46	5.561833546	10.250.200.3	10.240.118.97	DNS	164	✓
48	6.562288425	10.240.118.20	239.255.255.250	SSDP	215	✓
49	7.569819684	10.240.118.20	239.255.255.250	SSDP	215	✓
51	7.921892891	142.250.193.142	10.240.118.97	UDP	142	✓
52	7.930927597	10.240.118.97	142.250.193.142	UDP	76	✓
55	8.578195593	10.240.118.20	239.255.255.250	SSDP	215	✓
56	8.588420994	10.240.118.20	224.0.0.251	MDNS	82	✓
57	9.586480669	10.240.118.20	239.255.255.250	SSDP	215	✓
58	9.593615174	10.240.118.20	224.0.0.251	MDNS	82	✓
60	10.634416391	10.240.119.108	239.255.255.250	SSDP	215	✓
61	11.601545077	10.240.118.20	224.0.0.251	MDNS	82	✓
62	11.640763530	10.240.119.108	239.255.255.250	SSDP	215	✓
65	12.302953649	10.240.118.40	224.0.0.251	MDNS	285	✓
66	12.303905427	10.240.119.56	224.0.0.251	MDNS	145	✓
67	12.304433320	fe80::87a7:b342:6617:d67d	ff02::fb	MDNS	247	✓
68	12.305324819	fe80::97e2:21c:a3a3:86b2	ff02::fb	MDNS	149	✓
69	12.417576306	142.250.193.142	10.240.118.97	UDP	78	✓
70	12.417911323	142.250.193.142	10.240.118.97	UDP	238	✓
71	12.424585782	10.240.118.97	142.250.193.142	UDP	76	✓
72	12.425005629	10.240.118.97	142.250.193.142	UDP	779	✓
73	12.446859238	142.250.193.142	10.240.118.97	UDP	75	✓
74	12.458347329	10.240.118.97	142.250.193.142	UDP	76	✓
76	12.648889224	10.240.119.108	239.255.255.250	SSDP	215	✓
77	12.783408743	142.250.193.142	10.240.118.97	UDP	1022	✓
78	12.783704899	10.240.118.97	142.250.193.142	UDP	82	✓

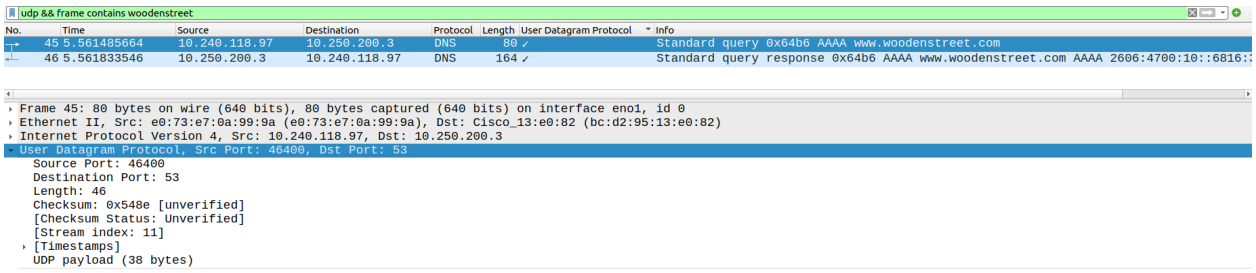


- SSDP
- MDNS
- UDP
- DNS
- QUIC

2. **State the total number of fields you observe in the UDP and list them. State the size of each of those fields.**

<u>UDP Fields and Their Sizes:</u>

- **Source Port**: The port number on the sending side.
- **Destination Port**: The port number on the receiving side.
- **Length**: Total size of the UDP packet
- **Checksum**: A checksum to verify the integrity of the UDP packet.
- **UDP Payload:**Data that has been sent to the server or received from the server



The exact sizes of each field may vary, but typically:

- **Source Port**: 2 bytes
- **Destination Port**: 2 bytes
- **Length**: 2 bytes
- **Checksum**: 2 bytes
- The total size of the UDP header is usually 8 bytes.
- UDP Payload which will vary depending on the size of the data we have received.

3. **What does the Length field signify in the UDP?**

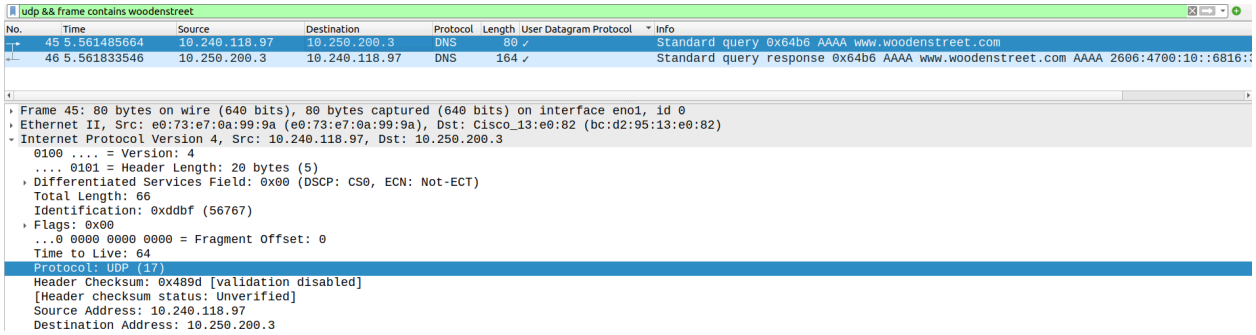
   The Length field in the UDP header specifies the length of the entire UDP packet, which includes both the header and the data (payload). The minimum length is 8 bytes (for the header), and it increases as more data is added to the packet.

4. **What is the maximum number of bytes that can be included in a UDP payload?**

The maximum size of the UDP payload can be calculated by subtracting the size of the UDP header from the maximum size of an IP packet.

- The maximum size of an IP packet is typically 65,535 bytes (for IPv4).
- The UDP header is 8 bytes.
- Thus, the maximum number of bytes that can be included in a UDP payload is:- 65,535−8=**65,527 bytes**

5. **What is the protocol number for UDP? Give your answer in decimal notation. To answer this question, you'll need to look into the Protocol field of the IP datagram containing this UDP segment.**



In the **IP header**, the **Protocol field** specifies the protocol used in the transport layer.

- The protocol number for UDP is **17** in decimal notation.

Part-2: Socket Programming

```
tejaswinich17@TEJASWINICHIDURALA:/mnt/c/Users/HP/Downloads/PART2$ python3 220010012_server.py
Server listening on 0.0.0.0:12345...
Connected by ('127.0.0.1', 50288)
File received successfully. Extracting required lines...
Extracted lines:
                ALICE'S ADVENTURES IN WONDERLAND

                        Lewis Carroll

               THE MILLENNIUM FULCRUM EDITION 3.0




                            CHAPTER I

hers would, in the after-time, be herself a grown woman; and how
she would keep, through all her riper years, the simple and
loving heart of her childhood:  and how she would gather about
her other little children, and make THEIR eyes bright and eager
with many a strange tale, perhaps even with the dream of
Wonderland of long ago:  and how she would feel with all their
simple sorrows, and find a pleasure in all their simple joys,
remembering her own child-life, and the happy summer days.

                            THE END

Sent extracted lines to client.
```

```
tejaswinich17@TEJASWINICHIDURALA:/mnt/c/Users/HP/Downloads/PART2$ python3 220010012_client.py
Connected to server.
File sent. Waiting for server response...

Received from server:

                ALICE'S ADVENTURES IN WONDERLAND

                        Lewis Carroll

               THE MILLENNIUM FULCRUM EDITION 3.0




                            CHAPTER I

hers would, in the after-time, be herself a grown woman; and how
she would keep, through all her riper years, the simple and
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with many a strange tale, perhaps even with the dream of
Wonderland of long ago:  and how she would feel with all their
simple sorrows, and find a pleasure in all their simple joys,
remembering her own child-life, and the happy summer days.

                            THE END
```

Part-3: Socket Programming: SMTP

```
user@sysad-HP-Elite-Tower-600-G9-Desktop-PC:~/Downloads/PART3$ python3 220010012_client.py
Enter Email Destination: 220010012@iitdh.ac.in
Enter Subject: CN_ass6
Enter Message: Hello!!
220 smtp.gmail.com ESMTP d9443c01a7336-21f3687c820sm68270295ad.173 - gsmtp

250 smtp.gmail.com at your service

/home/user/Downloads/PART3/220010012_client.py:38: DeprecationWarning: ssl.wrap_socket() is deprecated, use SSLContext.wrap_socket()
  sslClientSocket = ssl.wrap_socket(clientSocket)  # Wrap the socket to use SSL/TLS
b'334 VXNlcm5hbWU6\r\n'
b'334 UGFzc3dvcmQ6\r\n'
b'235 2.7.0 Accepted\r\n'
250 2.1.0 OK d9443c01a7336-21f3687c820sm68270295ad.173 - gsmtp

250 2.1.5 OK d9443c01a7336-21f3687c820sm68270295ad.173 - gsmtp

354 Go ahead d9443c01a7336-21f3687c820sm68270295ad.173 - gsmtp

250 2.0.0 OK  1739162777 d9443c01a7336-21f3687c820sm68270295ad.173 - gsmtp

221 2.0.0 closing connection d9443c01a7336-21f3687c820sm68270295ad.173 - gsmtp
```