

Assignment 2: UDP Sockets Submission:

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Link of the pcap file: [UDP_packets](#)

1) Capture all packets exchanged between the client and server during execution. Show the screenshots.

The screenshot displays a Wireshark packet capture of 24 UDP packets. The packet list table is as follows:

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	127.0.0.1	127.0.0.1	UDP	51	55339 → 5000 Len=19
2	0.001466	127.0.0.1	127.0.0.1	UDP	37	5000 → 55339 Len=5
3	0.002086	127.0.0.1	127.0.0.1	UDP	37	55339 → 5000 Len=5
4	0.002150	127.0.0.1	127.0.0.1	UDP	37	5000 → 55339 Len=5
5	0.002187	127.0.0.1	127.0.0.1	UDP	37	55339 → 5000 Len=5
6	0.002218	127.0.0.1	127.0.0.1	UDP	37	5000 → 55339 Len=5
7	0.002249	127.0.0.1	127.0.0.1	UDP	37	55339 → 5000 Len=5
8	0.002292	127.0.0.1	127.0.0.1	UDP	42	5000 → 55339 Len=10
9	0.002329	127.0.0.1	127.0.0.1	UDP	37	55339 → 5000 Len=5
10	0.002365	127.0.0.1	127.0.0.1	UDP	37	5000 → 55339 Len=5
11	0.002401	127.0.0.1	127.0.0.1	UDP	37	55339 → 5000 Len=5
12	0.002427	127.0.0.1	127.0.0.1	UDP	41	5000 → 55339 Len=9
13	0.002467	127.0.0.1	127.0.0.1	UDP	37	55339 → 5000 Len=5
14	0.002498	127.0.0.1	127.0.0.1	UDP	44	5000 → 55339 Len=12
15	0.002532	127.0.0.1	127.0.0.1	UDP	37	55339 → 5000 Len=5
16	0.002559	127.0.0.1	127.0.0.1	UDP	43	5000 → 55339 Len=11
17	0.002590	127.0.0.1	127.0.0.1	UDP	37	55339 → 5000 Len=5
18	0.002619	127.0.0.1	127.0.0.1	UDP	39	5000 → 55339 Len=7
19	0.002651	127.0.0.1	127.0.0.1	UDP	37	55339 → 5000 Len=5
20	0.002683	127.0.0.1	127.0.0.1	UDP	40	5000 → 55339 Len=8
21	0.002739	127.0.0.1	127.0.0.1	UDP	38	55339 → 5000 Len=6
22	0.002769	127.0.0.1	127.0.0.1	UDP	42	5000 → 55339 Len=10
23	0.002804	127.0.0.1	127.0.0.1	UDP	38	55339 → 5000 Len=6
24	0.002838	127.0.0.1	127.0.0.1	UDP	38	5000 → 55339 Len=6

The details pane for the selected packet (No. 1) shows:

- Frame 1: 51 bytes on wire (408 bits), 51 bytes captured (408 bits) on interface lo0, id 0
- Null/Loopback
- Internet Protocol Version 4, Src: 127.0.0.1, Dst: 127.0.0.1
- User Datagram Protocol, Src Port: 55339, Dst Port: 5000
- Data (19 bytes)

The hex and ASCII data for the data field is:

```
0000 02 00 00 00 45 00 00 2f 3e ff 00 00 40 11 00 00
0010 7f 00 00 01 7f 00 00 01 d8 2b 13 88 00 1b fe 2e
0020 32 32 43 53 33 30 30 31 37 5f 46 69 6c 65 32 2e
0030 74 78 74
```

2) What protocol is used for communication?

- UDP (User Datagram Protocol)

3) What are the source and destination IP addresses and ports?

- Source (client):
 - Address: **127.0.0.1**
 - Port: **55339**
- Destination (server):
 - Address: **127.0.0.1**
 - Port: **5000**

4) What is the size (in bytes) of the FILENAME request sent by the client?

The image shows a Wireshark packet capture of a client request. The packet list on the left shows 20 packets. Packet 1 is the first packet, and packet 20 is the last packet. The packet details pane on the right shows the following information:

- Frame 1: 51 bytes on wire (408 bits), 51 bytes captured (408 bits) on interface lo0, id 0
- Null/Loopback
- Internet Protocol Version 4, Src: 127.0.0.1, Dst: 127.0.0.1
- User Datagram Protocol, Src Port: 55339, Dst Port: 5000
- Source Port: 55339
- Destination Port: 5000
- Length: 27
- Checksum: 0xfe2e [unverified]
- [Checksum Status: Unverified]
- [Stream Index: 0]
- [Stream Packet Number: 1]
- [Timestamps]
- UDP payload (19 bytes)
- Data (19 bytes)**
- Data: 323243533303031375f46696c65322e747874
- [Length: 19]

The packet bytes pane on the right shows the raw data of the packet. The first 19 bytes are highlighted in blue, corresponding to the data field. The data is: 32 32 43 53 33 30 30 31 37 5f 46 69 6c 65 32 2e 74 78 74. This is the ASCII representation of the filename '22CS30017_File2.txt'.

- The filename requested by client was '22CS30017_File2.txt' => Size = **19 bytes**

5) What is the size of the server's response for HELLO and the first word (*WORD*)

The image shows a Wireshark packet capture of a server response. The packet list on the left shows 20 packets. Packet 1 is the first packet, and packet 20 is the last packet. The packet details pane on the right shows the following information:

- Frame 2: 37 bytes on wire (296 bits), 37 bytes captured (296 bits) on interface lo0, id 0
- Null/Loopback
- Internet Protocol Version 4, Src: 127.0.0.1, Dst: 127.0.0.1
- User Datagram Protocol, Src Port: 5000, Dst Port: 55339
- Source Port: 5000
- Destination Port: 55339
- Length: 13
- Checksum: 0xfe20 [unverified]
- [Checksum Status: Unverified]
- [Stream Index: 0]
- [Stream Packet Number: 2]
- [Timestamps]
- UDP payload (5 bytes)
- Data (5 bytes)**
- Data: 48454c4c4f
- [Length: 5]

The packet bytes pane on the right shows the raw data of the packet. The first 5 bytes are highlighted in blue, corresponding to the data field. The data is: 48 45 4c 4c 4f. This is the ASCII representation of the word 'HELLO'.

- size of the server's response for HELLO : **5 bytes**

Wireshark packet capture showing a list of UDP packets. The selected packet (No. 4) is a UDP packet from 127.0.0.1 to 127.0.0.1, port 5000 to 55339. The payload is 5 bytes long, with hex data 4c 69 6e 65 31, which corresponds to the ASCII string "Line1".

- size of the server's response for first word : **5 bytes** [the word was: *Line1*]

6) Inspect the payload of packets where the words are transmitted. Show the UDP payloads of those packets.

Wireshark packet capture showing a list of UDP packets. The selected packet (No. 21) is a UDP packet from 127.0.0.1 to 127.0.0.1, port 55339 to 5000. The payload is 6 bytes long, with hex data 57 4f 52 44 31 30, which corresponds to the ASCII string "Word10".

We can see the payload of the packet when 'Word10' was transmitted to the server.

7) Measure the total time taken for the file transfer from start to finish.

Total Time = Timestamp of Last Packet - Timestamp of First Packet

=> total time for the file transfer = timestamp of the last word(FINISH) - timestamp of first word(HELLO)
= 0.002838 - 0.001466 (s)
= **0.001372 seconds = 1.372 ms**

- *Note: we may also consider the start time as the timestamp of the FILENAME packet.*
As the may call it the start of file transfer in that case,
Total time for file transfer is 0.002838 seconds = **2.838 ms**

8) What is the average size of each packet during the communication?

- Compute the average size:
 - Average Packet Size = Total Size of Packets / Number of Packets

Total size of packets = (sum of all the values in the length column)

= 51 + 37 + 37 + 37 + 37 + 37 + 37 + 42 + 37 + 37 + 37 + 41 + 37 + 44 + 37 + 43 + 37 + 39 + 37 + 40
+ 38 + 42 + 38 + 38
= 937 bytes

Number of packets = 24

=> Average packet size = 937/24 bytes = 39.04 ~ **39 bytes**

Terminal

```
~/Doc/6/CN/LAB/LA2 main ?1 > make all                                05:17:00 pm
gcc -Wall -o wordserver wordserver.c
gcc -Wall -o wordclient wordclient.c
~/Doc/6/CN/LAB/LA2 main ?3 > make rsv                               05:17:02 pm
gcc -Wall -o wordserver wordserver.c
./wordserver
Server is running on port 5000 ...
Received filename: 22CS30017_File2.txt
==> File transfer complete.
~/Doc/6/CN/LAB/LA2 main ?4 > [ ]                                   12s 05:17:21 pm

~/Doc/6/CN/LAB/LA2 main ?1 > make rcl                                05:16:55 pm
gcc -Wall -o wordclient wordclient.c
./wordclient
Enter the filename to request: 22CS30017_File2.txt
+++ Receiving file from server...
+++ Received word 0: HELLO
+++ Received word 1: Line1
+++ Received word 2: LiNe2
+++ Received word 3: Chandransh
+++ Received word 4: Singh
+++ Received word 5: 22CS30017
+++ Received word 6: Assignment_2
+++ Received word 7: UDP_sockets
+++ Received word 8: CS39006
+++ Received word 9: Networks
+++ Received word 10: Laboratory
==> File transfer complete.
==> File saved as received_22CS30017_File2.txt
~/Doc/6/CN/LAB/LA2 main ?4 > [ ]                                   9s 05:17:21 pm
```