

CS39006: NETWORKS LABORATORY

ASSIGNMENT – 2

REPORT

UDP Sockets

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22CS10058

PART A: SOCKET PROGRAMMING

OUTPUT:

```
22CS10058_File1.txt  ...  22CS10058_client.txt  C wordclient.c
1 HELLO
2 READ
3 MESSAGE
4 FROM
5 FILE1
6 FINISH
7

rishabh@rishabh-Dell-G15-5520: ~/Desktop/Networks/Assign...
rishabh@rishabh-Dell-G15-5520:~/Desktop/Networks/Assignment2$ ./server
Server Running .....

Received request from client to fetch 22CS10058_File0.txt

File requested by client is not found
rishabh@rishabh-Dell-G15-5520:~/Desktop/Networks/Assignment2$

rishabh@rishabh-Dell-G15-5520:~/Desktop/Networks/Assignme...
rishabh@rishabh-Dell-G15-5520:~/Desktop/Networks/Assignment2$ ./client
Client Running .....

Sending request to fetch file: 22CS10058_File0.txt

NOTFOUND 22CS10058_File0.txt
rishabh@rishabh-Dell-G15-5520:~/Desktop/Networks/Assignment2$
```

```
22CS10058_File1.txt  ...  22CS10058_client.txt  C wordclient.c
1 HELLO
2 READ
3 MESSAGE
4 FROM
5 FILE1
6 FINISH
7

rishabh@rishabh-Dell-G15-5520: ~/Desktop/Networks/Assign...
rishabh@rishabh-Dell-G15-5520:~/Desktop/Networks/Assignment2$ ./server
Server Running .....

Received request from client to fetch 22CS10058_File1.txt

Starting to send file content to client

Finished sending file content to client
rishabh@rishabh-Dell-G15-5520:~/Desktop/Networks/Assignment2$

rishabh@rishabh-Dell-G15-5520:~/Desktop/Networks/Assignme...
rishabh@rishabh-Dell-G15-5520:~/Desktop/Networks/Assignment2$ ./client
Client Running .....

Sending request to fetch file: 22CS10058_File1.txt

Starting to receive file content from server

Finished receiving file content from server
rishabh@rishabh-Dell-G15-5520:~/Desktop/Networks/Assignment2$
```

```
22CS10058_File2.txt  ...  22CS10058_client.txt  C wordclient.c
1 HELLO
2 READ
3 MESSAGE
4 FROM
5 FILE2
6 FINISH
7

rishabh@rishabh-Dell-G15-5520: ~/Desktop/Networks/Assign...
rishabh@rishabh-Dell-G15-5520:~/Desktop/Networks/Assignment2$ ./server
Server Running .....

Received request from client to fetch 22CS10058_File2.txt

Starting to send file content to client

Finished sending file content to client
rishabh@rishabh-Dell-G15-5520:~/Desktop/Networks/Assignment2$

rishabh@rishabh-Dell-G15-5520:~/Desktop/Networks/Assignme...
rishabh@rishabh-Dell-G15-5520:~/Desktop/Networks/Assignment2$ ./client
Client Running .....

Sending request to fetch file: 22CS10058_File2.txt

Starting to receive file content from server

Finished receiving file content from server
rishabh@rishabh-Dell-G15-5520:~/Desktop/Networks/Assignment2$
```

```
22CS10058_File3.txt  ...  22CS10058_client.txt  C wordclient.c
1 HELLO
2 READ
3 MESSAGE
4 FROM
5 FILE3
6 FINISH
7

rishabh@rishabh-Dell-G15-5520: ~/Desktop/Networks/Assign...
rishabh@rishabh-Dell-G15-5520:~/Desktop/Networks/Assignment2$ ./server
Server Running .....

Received request from client to fetch 22CS10058_File3.txt

Starting to send file content to client

Finished sending file content to client
rishabh@rishabh-Dell-G15-5520:~/Desktop/Networks/Assignment2$

rishabh@rishabh-Dell-G15-5520:~/Desktop/Networks/Assignme...
rishabh@rishabh-Dell-G15-5520:~/Desktop/Networks/Assignment2$ ./client
Client Running .....

Sending request to fetch file: 22CS10058_File3.txt

Starting to receive file content from server

Finished receiving file content from server
rishabh@rishabh-Dell-G15-5520:~/Desktop/Networks/Assignment2$
```

PART B: WIRESHARK ANALYSIS

[Note: This part of the assignment was done using the File2. Content of file – “Hello Read Message from File2 Finish”]

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

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000000	127.0.0.1	127.0.0.1	UDP	1042	52710 → 5000 Len=1000
2	0.000071823	127.0.0.1	127.0.0.1	UDP	1042	5000 → 52710 Len=1000
3	0.000081399	127.0.0.1	127.0.0.1	UDP	1042	5000 → 52710 Len=1000
4	0.000085029	127.0.0.1	127.0.0.1	UDP	1042	5000 → 52710 Len=1000
5	0.000090505	127.0.0.1	127.0.0.1	UDP	1042	5000 → 52710 Len=1000
6	0.000093949	127.0.0.1	127.0.0.1	UDP	1042	5000 → 52710 Len=1000
7	0.000096733	127.0.0.1	127.0.0.1	UDP	1042	5000 → 52710 Len=1000

- 2) What protocol is used for communication - UDP
- 3) What are the source and destination IP addresses and ports?

File name (Client to Server):

Source – 127.0.0.1#52710

Destination – 127.0.0.1#5000

File content (Server to Client):

Source – 127.0.0.1#5000

Destination – 127.0.0.1#52710

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

Size of the request – 1042 bytes

- 5) What is the size of the server’s response for HELLO and the first word (WORD1)?

Size of the response of each message - 1042 bytes

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

- a) HELLO Message –

2	0.000071823	127.0.0.1	127.0.0.1	UDP	1042	5000 → 52710 Len=1000
3	0.000081399	127.0.0.1	127.0.0.1	UDP	1042	5000 → 52710 Len=1000
4	0.000085029	127.0.0.1	127.0.0.1	UDP	1042	5000 → 52710 Len=1000
5	0.000090505	127.0.0.1	127.0.0.1	UDP	1042	5000 → 52710 Len=1000
6	0.000093949	127.0.0.1	127.0.0.1	UDP	1042	5000 → 52710 Len=1000
7	0.000096733	127.0.0.1	127.0.0.1	UDP	1042	5000 → 52710 Len=1000

▼ Data (1000 bytes)		
Data: 48454c4c4f9a0035385f46696c65332e7478740000000000000000fc7f0000ffffffff...		
[Length: 1000]		

0000	00 00 00 00 00 00 00 00 00 00 00 00 08 00 45 00	.....E
0010	04 04 9d 8c 40 00 40 11 9b 5a 7f 00 00 01 7f 00	...@.@.Z...
0020	00 01 13 88 cd e6 03 f0 02 04 48 45 4c 4c 4f 0a	...HELLO
0030	00 35 38 5f 46 69 6c 65 33 2e 74 78 74 00 00 00	..58_File 3.txt...
0040	00 00 00 00 00 00 00 00 fc 7f 00 00 ff ff ff 00 00	.....
0050	00 00 08 4c 6c 25 ee 79 00 00 08 69 6c 25 ee 79	...L%.y ...il%.y
0060	00 00 f0 0a 70 25 ee 79 00 00 12 6c 6c 25 ee 79	...p%.y ...ll%.y

b) WORD1 Message –

2	0.000071823	127.0.0.1	127.0.0.1	UDP	1042 5000 → 52710 Len=1000
3	0.000081399	127.0.0.1	127.0.0.1	UDP	1042 5000 → 52710 Len=1000
4	0.000085029	127.0.0.1	127.0.0.1	UDP	1042 5000 → 52710 Len=1000
5	0.000090505	127.0.0.1	127.0.0.1	UDP	1042 5000 → 52710 Len=1000
6	0.000093949	127.0.0.1	127.0.0.1	UDP	1042 5000 → 52710 Len=1000
7	0.000096733	127.0.0.1	127.0.0.1	UDP	1042 5000 → 52710 Len=1000

Checksum: 0x0204 [unverified]					
[Checksum Status: Unverified]					
[Stream index: 0]					
[Timestamp: 0]					

0020	00 01 13 88 cd e6 03 f0	02 04 52 45 41 44 0a 00	.....	..READ..
0030	00 35 38 5f 46 69 6c 65	33 2e 74 78 74 00 00 00	.....	..58_File 3.txt...
0040	00 00 00 00 00 00 fc 7f	00 00 ff ff ff ff 00 00	.....	.....
0050	00 00 08 4c 6c 25 ee 79	00 00 08 69 6c 25 ee 79	....Ll%.y	....il%.y
0060	00 00 f0 0a 70 25 ee 79	00 00 12 6c 6c 25 ee 79	....p%.y	....ll%.y
0070	00 00 00 00 00 00 00 00	00 00 90 65 6c 25 ee 79	.....	....el%.y

c) WORD2 Message –

2	0.000071823	127.0.0.1	127.0.0.1	UDP	1042 5000 → 52710 Len=1000
3	0.000081399	127.0.0.1	127.0.0.1	UDP	1042 5000 → 52710 Len=1000
4	0.000085029	127.0.0.1	127.0.0.1	UDP	1042 5000 → 52710 Len=1000
5	0.000090505	127.0.0.1	127.0.0.1	UDP	1042 5000 → 52710 Len=1000
6	0.000093949	127.0.0.1	127.0.0.1	UDP	1042 5000 → 52710 Len=1000
7	0.000096733	127.0.0.1	127.0.0.1	UDP	1042 5000 → 52710 Len=1000

Checksum: 0x0204 [unverified]					
[Checksum Status: Unverified]					
[Stream index: 0]					
[Timestamp: 0]					

0020	00 01 13 88 cd e6 03 f0	02 04 4d 45 53 53 41 47	.....	..MESSAG
0030	45 0a 00 5f 46 69 6c 65	33 2e 74 78 74 00 00 00	.....	..E.._File 3.txt...
0040	00 00 00 00 00 00 fc 7f	00 00 ff ff ff ff 00 00	.....	.....
0050	00 00 08 4c 6c 25 ee 79	00 00 08 69 6c 25 ee 79	....Ll%.y	....il%.y
0060	00 00 f0 0a 70 25 ee 79	00 00 12 6c 6c 25 ee 79	....p%.y	....ll%.y
0070	00 00 00 00 00 00 00 00	00 00 90 65 6c 25 ee 79	.....	....el%.y
0080	00 00 50 fa 6f 25 ee 79	00 00 d8 68 6c 25 ee 79	....P.o%.y	....hl%.y

d) WORD3 Message –

2	0.000071823	127.0.0.1	127.0.0.1	UDP	1042 5000 → 52710 Len=1000
3	0.000081399	127.0.0.1	127.0.0.1	UDP	1042 5000 → 52710 Len=1000
4	0.000085029	127.0.0.1	127.0.0.1	UDP	1042 5000 → 52710 Len=1000
5	0.000090505	127.0.0.1	127.0.0.1	UDP	1042 5000 → 52710 Len=1000
6	0.000093949	127.0.0.1	127.0.0.1	UDP	1042 5000 → 52710 Len=1000
7	0.000096733	127.0.0.1	127.0.0.1	UDP	1042 5000 → 52710 Len=1000

Checksum: 0x0204 [unverified]					
[Checksum Status: Unverified]					
[Stream index: 0]					
[Timestamp: 0]					

0020	00 01 13 88 cd e6 03 f0	02 04 46 52 4f 4d 0a 00	.....	..FROM..
0030	45 0a 00 5f 46 69 6c 65	33 2e 74 78 74 00 00 00	.....	..E.._File 3.txt...
0040	00 00 00 00 00 00 fc 7f	00 00 ff ff ff ff 00 00	.....	.....
0050	00 00 08 4c 6c 25 ee 79	00 00 08 69 6c 25 ee 79	....Ll%.y	....il%.y
0060	00 00 f0 0a 70 25 ee 79	00 00 12 6c 6c 25 ee 79	....p%.y	....ll%.y
0070	00 00 00 00 00 00 00 00	00 00 90 65 6c 25 ee 79	.....	....el%.y
0080	00 00 50 fa 6f 25 ee 79	00 00 d8 68 6c 25 ee 79	....P.o%.y	....hl%.y

e) WORD4 Message –

2	0.000071823	127.0.0.1	127.0.0.1	UDP	1042 5000 → 52710 Len=1000
3	0.000081399	127.0.0.1	127.0.0.1	UDP	1042 5000 → 52710 Len=1000
4	0.000085029	127.0.0.1	127.0.0.1	UDP	1042 5000 → 52710 Len=1000
5	0.000090505	127.0.0.1	127.0.0.1	UDP	1042 5000 → 52710 Len=1000
6	0.000093949	127.0.0.1	127.0.0.1	UDP	1042 5000 → 52710 Len=1000
7	0.000096733	127.0.0.1	127.0.0.1	UDP	1042 5000 → 52710 Len=1000

Checksum: 0x0204 [unverified]					
[Checksum Status: Unverified]					
[Stream index: 0]					
[Timestamp: 0]					

0020	00 01 13 88 cd e6 03 f0	02 04 46 49 4c 45 33 0a	.....	..FILE3..
0030	00 0a 00 5f 46 69 6c 65	33 2e 74 78 74 00 00 00	.....	.._File 3.txt...
0040	00 00 00 00 00 00 fc 7f	00 00 ff ff ff ff 00 00	.....	.....
0050	00 00 08 4c 6c 25 ee 79	00 00 08 69 6c 25 ee 79	....Ll%.y	....il%.y
0060	00 00 f0 0a 70 25 ee 79	00 00 12 6c 6c 25 ee 79	....p%.y	....ll%.y
0070	00 00 00 00 00 00 00 00	00 00 90 65 6c 25 ee 79	.....	....el%.y
0080	00 00 50 fa 6f 25 ee 79	00 00 d8 68 6c 25 ee 79	....P.o%.y	....hl%.y
0090	00 00 d4 31 6d 25 ee 79	00 00 18 02 00 00 00 00	....1m%.y	.....
00a0	00 00 0d 00 00 00 00 00	00 00 60 41 6c 25 ee 79	.....	..`AL%.y

f) FINISH Message –

2	0.000071823	127.0.0.1	127.0.0.1	UDP	1042	5000	→	52710	Len=1000
3	0.000081399	127.0.0.1	127.0.0.1	UDP	1042	5000	→	52710	Len=1000
4	0.000085029	127.0.0.1	127.0.0.1	UDP	1042	5000	→	52710	Len=1000
5	0.000090505	127.0.0.1	127.0.0.1	UDP	1042	5000	→	52710	Len=1000
6	0.000093949	127.0.0.1	127.0.0.1	UDP	1042	5000	→	52710	Len=1000
7	0.000096733	127.0.0.1	127.0.0.1	UDP	1042	5000	→	52710	Len=1000
Checksum: 0x0204 [unverified]									
[Checksum Status: Unverified]									
[Stream index: 0]									
[Timestamp: 0.000000000]									

0020	00 01 13 88 cd e6 03 f0	02 04 46 49 4e 49 53 48	FINISH				
0030	0a 00 00 5f 46 69 6c 65	33 2e 74 78 74 00 00 00	..._File	3.txt...					
0040	00 00 00 00 00 00 fc 7f	00 00 ff ff ff ff 00 00	.....					
0050	00 00 08 4c 6c 25 ee 79	00 00 08 69 6c 25 ee 79	...Ll%.y	...il%.y					
0060	00 00 f0 0a 70 25 ee 79	00 00 12 6c 6c 25 ee 79	...p%.y	...ll%.y					
0070	00 00 00 00 00 00 00 00	00 00 90 65 6c 25 ee 79	.....	...el%.y			
0080	00 00 50 fa 6f 25 ee 79	00 00 d8 68 6c 25 ee 79	..P.o%.y	...hl%.y					
0090	00 00 d4 31 6d 25 ee 79	00 00 18 02 00 00 00 00	...1m%.y	.....				
00a0	00 00 0d 00 00 00 00 00	00 00 60 41 6c 25 ee 79	.....	..`Al%.y			

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

The time taken for the total file transfer can be seen in the picture of captured packets. The first packet from the client to the server containing the file name was sent at $t = 0$, and the final message 'FINISH' from the server to the client was sent at $t = 0.096733$ ms. Hence,

$$\text{Total time taken} = \underline{\underline{0.096733 \text{ ms}}}$$

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

The size of data being sent by the server to the client or vice-versa is 1000 bytes every time. Additionally, the network adds 42 bytes of data to the packet to facilitate the transfer. Hence, a total of 1042 bytes is transferred through each packet. Therefore,

$$\text{Average size of each packet} = \underline{\underline{1042 \text{ bytes}}}$$