

Assignment 1

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Part 1: Client-server socket program in C.

Instructions to run the C Program:

1. cd Socket_Programming
2. make clean
3. make
4. ./server
5. open new shell for client program, cd to Socket_Programming
6. ./client
7. Enter file name to transfer
8. After file transfer client closes socket and server waits for next connection.

- I have done the following assignment for linux environment.
- There are 2 folders in Socket_Programming folder which contains server and client c++ code files are present along with Makefile, Document and object files. There are 2 folders named Shared_drive and Client_drive.
- Shared_drive contains 3 sample files and Client_drive is empty. I have used file.txt.
- The Server transfers file from Shared_drive to Client_drive and this can be observed in wireshark.

Part 2: Wireshark trace

File used: file.txt in Shared_drive

- a. How many TCP connections are made?
One connection is made. As server and client ports remain the same throughout the program.

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000000	127.0.0.1	127.0.0.1	TCP	68	49579 → 9999 [SYN] Seq=0 Win=65535 Len=0 MSS=16344 WS=64 TSval=996755306 TSecr=0 SACK_PERM=1
2	0.000087000	127.0.0.1	127.0.0.1	TCP	68	9999 → 49579 [SYN, ACK] Seq=0 Ack=1 Win=65535 Len=0 MSS=16344 WS=64 TSval=996755306 TSecr=996755306 SACK...
3	0.000102000	127.0.0.1	127.0.0.1	TCP	56	49579 → 9999 [ACK] Seq=1 Ack=1 Win=408256 Len=0 TSval=996755306 TSecr=996755306
4	0.000114000	127.0.0.1	127.0.0.1	TCP	56	[TCP Window Update] 9999 → 49579 [ACK] Seq=1 Ack=1 Win=408256 Len=0 TSval=996755306 TSecr=996755306
5	28.6375480...	127.0.0.1	127.0.0.1	TCP	65	49579 → 9999 [PSH, ACK] Seq=1 Ack=1 Win=408256 Len=9 TSval=996783832 TSecr=996755306
6	28.6375850...	127.0.0.1	127.0.0.1	TCP	56	9999 → 49579 [ACK] Seq=1 Ack=10 Win=408256 Len=0 TSval=996783832 TSecr=996783832
7	28.6378630...	127.0.0.1	127.0.0.1	TCP	60	9999 → 49579 [PSH, ACK] Seq=1 Ack=10 Win=408256 Len=4 TSval=996783832 TSecr=996783832
8	28.6378960...	127.0.0.1	127.0.0.1	TCP	56	49579 → 9999 [ACK] Seq=10 Ack=5 Win=408256 Len=0 TSval=996783832 TSecr=996783832
9	28.6380030...	127.0.0.1	127.0.0.1	TCP	156	9999 → 49579 [PSH, ACK] Seq=5 Ack=10 Win=408256 Len=100 TSval=996783832 TSecr=996783832
10	28.6380390...	127.0.0.1	127.0.0.1	TCP	56	49579 → 9999 [ACK] Seq=10 Ack=105 Win=408192 Len=0 TSval=996783832 TSecr=996783832
11	28.6380600...	127.0.0.1	127.0.0.1	TCP	256	9999 → 49579 [PSH, ACK] Seq=105 Ack=10 Win=408256 Len=200 TSval=996783832 TSecr=996783832
12	28.6380700...	127.0.0.1	127.0.0.1	TCP	56	49579 → 9999 [ACK] Seq=10 Ack=305 Win=407936 Len=0 TSval=996783832 TSecr=996783832
13	28.6380820...	127.0.0.1	127.0.0.1	TCP	256	9999 → 49579 [PSH, ACK] Seq=305 Ack=10 Win=408256 Len=200 TSval=996783832 TSecr=996783832
14	28.6380910...	127.0.0.1	127.0.0.1	TCP	56	49579 → 9999 [ACK] Seq=10 Ack=505 Win=407744 Len=0 TSval=996783832 TSecr=996783832
15	28.6381370...	127.0.0.1	127.0.0.1	TCP	256	9999 → 49579 [PSH, ACK] Seq=505 Ack=10 Win=408256 Len=200 TSval=996783832 TSecr=996783832
16	28.6381520...	127.0.0.1	127.0.0.1	TCP	56	49579 → 9999 [ACK] Seq=10 Ack=705 Win=407552 Len=0 TSval=996783832 TSecr=996783832
17	28.6381630...	127.0.0.1	127.0.0.1	TCP	118	9999 → 49579 [PSH, ACK] Seq=705 Ack=10 Win=408256 Len=62 TSval=996783832 TSecr=996783832
18	28.6381720...	127.0.0.1	127.0.0.1	TCP	56	49579 → 9999 [ACK] Seq=10 Ack=767 Win=407488 Len=0 TSval=996783832 TSecr=996783832
19	28.6382570...	127.0.0.1	127.0.0.1	TCP	56	9999 → 49579 [FIN, ACK] Seq=767 Ack=10 Win=408256 Len=0 TSval=996783832 TSecr=996783832
20	28.6382870...	127.0.0.1	127.0.0.1	TCP	56	49579 → 9999 [ACK] Seq=10 Ack=768 Win=407488 Len=0 TSval=996783832 TSecr=996783832
21	28.6406980...	127.0.0.1	127.0.0.1	TCP	56	49579 → 9999 [FIN, ACK] Seq=10 Ack=768 Win=407488 Len=0 TSval=996783834 TSecr=996783832
22	28.6407830...	127.0.0.1	127.0.0.1	TCP	56	9999 → 49579 [ACK] Seq=768 Ack=11 Win=408256 Len=0 TSval=996783834 TSecr=996783834

▶ Frame 17: 118 bytes on wire (944 bits), 118 bytes captured (944 bits) on interface lo0, id 0
 ▶ Null/Loopback
 ▶ Internet Protocol Version 4, Src: 127.0.0.1, Dst: 127.0.0.1
 ▶ Transmission Control Protocol, Src Port: 9999, Dst Port: 49579, Seq: 705, Ack: 10, Len: 62
 ▶ Data (62 bytes)

0000 02 00 00 00 45 00 00 72 00 00 40 00 40 06 00 00 ... E...r...@...
 wireshark_lo0_20200908142626_PodOZL.pcapng

Packets: 22 · Displayed: 22 (100.0%) · Dropped: 0 (0.0%) · Profile: Default

b. What is the port number of the server and what is that of the client?

Client Port No. : 49579

Server Port No. : 9999 (Chosen by us in C program)

c. How many packets are exchanged between client and server?

From the Wireshark trace, we can see that in total, 22 packets are transferred between the client and server.

d. How much time is needed to download the file?

We can see that file transmission starts at 9th packet and the data transfer ends at 17th packet.

Hence, taking the 9th packet as the reference time, we get 17th packet gets transferred in 0.000160000 seconds.

Now Considering(Assumption) the download time to be time after client sends file name to the server the download starts after 5th packet till 17th packet, so download time would be 0.000615000 seconds.

Frame 9: 156 bytes on wire (1248 bits), 156 bytes captured (1248 bits) on interface lo0, id 0

- Null/Loopback
- Internet Protocol Version 4, Src: 127.0.0.1, Dst: 127.0.0.1
- Transmission Control Protocol, Src Port: 9999, Dst Port: 49579, Seq: 5, Ack: 10, Len: 100
- Data (100 bytes)

0000 02 00 00 00 45 00 00 98 00 00 40 00 40 06 00 00E....@...
0010 7f 00 00 01 7f 00 00 01 27 0f c1 ab 07 1b c9 8f*.....
0020 c2 d6 65 a8 08 18 eb fe 8c 00 00 01 01 08 0ae.....
0030 3b 69 b6 d8 3b 69 b6 d8 54 68 69 73 20 69 73 20 ;i..ji.. This is
0040 61 20 74 65 78 74 20 66 69 6c 65 2e 0a 54 68 69 a text file. Thi
0050 73 20 69 73 20 61 20 74 65 78 74 20 66 69 6c 65 s is a text file
0060 2e 0a 54 68 69 73 20 69 73 20 61 20 74 65 78 74 . This is a text
0070 20 66 69 6c 65 2e 0a 54 68 69 73 20 69 73 20 61 file. This is a
0080 20 74 65 78 74 20 66 69 6c 65 2e 0a 54 68 69 73 text file. This
0090 20 69 73 20 61 20 74 65 78 74 20 66 is a text f

No.: 9 · Time: 28.638003000 · Source: 127.0.0.1 · Destination: 127.0.0.1 · Protocol: TCP · Length: 156 · Info: 9999 → 49579 [PSH, ACK] Seq=5 Ack=10 Win=408256 Len=100 TSval=996783832 TSecr=996783832

Help Close

Apply a display filter ... <32/>

Name Resolution Preferences... Address: 127.0.0.1 Name: Cancel OK

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000000	127.0.0.1	127.0.0.1	TCP	68	49579 → 9999 [SYN] Seq=0 Win=65535 Len=0 MSS=16344 WS=64 TSval=996755306 TSecr=0 SACK_PERM=1
2	0.000007000	127.0.0.1	127.0.0.1	TCP	68	9999 → 49579 [SYN, ACK] Seq=0 Ack=1 Win=65535 Len=0 MSS=16344 WS=64 TSval=996755306 TSecr=996755306 SACK=0
3	0.000102000	127.0.0.1	127.0.0.1	TCP	56	49579 → 9999 [ACK] Seq=1 Ack=1 Win=408256 Len=0 TSval=996755306 TSecr=996755306
4	0.000114000	127.0.0.1	127.0.0.1	TCP	56	[TCP Window Update] 9999 → 49579 [ACK] Seq=1 Ack=1 Win=408256 Len=0 TSval=996755306 TSecr=996755306
5	28.637548000	127.0.0.1	127.0.0.1	TCP	65	49579 → 9999 [PSH, ACK] Seq=1 Ack=1 Win=408256 Len=9 TSval=996783832 TSecr=996755306
6	28.637585000	127.0.0.1	127.0.0.1	TCP	56	9999 → 49579 [ACK] Seq=1 Ack=10 Win=408256 Len=0 TSval=996783832 TSecr=996783832
7	28.637863000	127.0.0.1	127.0.0.1	TCP	60	9999 → 49579 [PSH, ACK] Seq=1 Ack=10 Win=408256 Len=4 TSval=996783832 TSecr=996783832
8	28.637896000	127.0.0.1	127.0.0.1	TCP	56	49579 → 9999 [ACK] Seq=10 Ack=5 Win=408256 Len=0 TSval=996783832 TSecr=996783832
9	0.000000000	127.0.0.1	127.0.0.1	TCP	156	9999 → 49579 [PSH, ACK] Seq=5 Ack=10 Win=408256 Len=100 TSval=996783832 TSecr=996783832
10	0.000036000	127.0.0.1	127.0.0.1	TCP	56	49579 → 9999 [ACK] Seq=10 Ack=105 Win=408192 Len=0 TSval=996783832 TSecr=996783832
11	0.000057000	127.0.0.1	127.0.0.1	TCP	256	9999 → 49579 [PSH, ACK] Seq=105 Ack=10 Win=408256 Len=200 TSval=996783832 TSecr=996783832
12	0.000067000	127.0.0.1	127.0.0.1	TCP	56	49579 → 9999 [ACK] Seq=10 Ack=305 Win=407936 Len=0 TSval=996783832 TSecr=996783832
13	0.000079000	127.0.0.1	127.0.0.1	TCP	256	9999 → 49579 [PSH, ACK] Seq=305 Ack=10 Win=408256 Len=200 TSval=996783832 TSecr=996783832
14	0.000088000	127.0.0.1	127.0.0.1	TCP	56	49579 → 9999 [ACK] Seq=10 Ack=505 Win=407744 Len=0 TSval=996783832 TSecr=996783832
15	0.000134000	127.0.0.1	127.0.0.1	TCP	256	9999 → 49579 [PSH, ACK] Seq=505 Ack=10 Win=408256 Len=200 TSval=996783832 TSecr=996783832
16	0.000149000	127.0.0.1	127.0.0.1	TCP	56	49579 → 9999 [ACK] Seq=10 Ack=705 Win=407552 Len=0 TSval=996783832 TSecr=996783832
17	0.000160000	127.0.0.1	127.0.0.1	TCP	118	9999 → 49579 [PSH, ACK] Seq=705 Ack=10 Win=408256 Len=62 TSval=996783832 TSecr=996783832
18	0.000169000	127.0.0.1	127.0.0.1	TCP	56	49579 → 9999 [ACK] Seq=10 Ack=767 Win=407488 Len=0 TSval=996783832 TSecr=996783832
19	0.000254000	127.0.0.1	127.0.0.1	TCP	56	9999 → 49579 [FIN, ACK] Seq=767 Ack=10 Win=408256 Len=0 TSval=996783832 TSecr=996783832
20	0.000284000	127.0.0.1	127.0.0.1	TCP	56	49579 → 9999 [ACK] Seq=10 Ack=768 Win=407488 Len=0 TSval=996783832 TSecr=996783832
21	0.002695000	127.0.0.1	127.0.0.1	TCP	56	49579 → 9999 [FIN, ACK] Seq=10 Ack=768 Win=407488 Len=0 TSval=996783834 TSecr=996783832
22	0.002788000	127.0.0.1	127.0.0.1	TCP	56	9999 → 49579 [ACK] Seq=768 Ack=11 Win=408256 Len=0 TSval=996783834 TSecr=996783834

Frame 9: 156 bytes on wire (1248 bits), 156 bytes captured (1248 bits) on interface lo0, id 0

- Null/Loopback
- Internet Protocol Version 4, Src: 127.0.0.1, Dst: 127.0.0.1
- Transmission Control Protocol, Src Port: 9999, Dst Port: 49579, Seq: 5, Ack: 10, Len: 100
- Data (100 bytes)

0010 7f 00 00 01 7f 00 00 01 27 0f c1 ab 07 1b c9 8f*.....

Transmission Control Protocol (tcp), 32 bytes

Packets: 22 · Displayed: 22 (100.0%) · Dropped: 0 (0.0%)

Profile: Default