

Computer Networks: Socket Programming Report

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File structure and working:

The submission contains four folders:

- server
 - Contains the server.c program file
- client
 - Contains the client.c program file
- shared_drive
 - Acts as the shared drive/folder between the client and the server
 - Contains sample.txt file for testing file transfer
- local_drive
 - Acts as the local drive to which the client fetches and downloads files

To run the programs, execute the commands:

- Run 'make'
- In one terminal, cd into the server directory, and in another terminal, cd into the client directory if running on the same machine
- Run ./server in the first terminal, and ./client 127.0.0.1 in the other. (Client takes the IP address of the server as an argument, localhost in this case)

The server will create and bind its socket and listen for clients connecting to it. At a given time, only one client can connect to the server.

The client will create and bind its socket and make a connection to the server. Once connected, it will prompt the user to enter a filename. The client will send the filename to the server. If the file is not found in the shared drive, the server sends the status to the client and again waits to receive the filename. The client shall prompt the user for the filename and communicate with the server unless the user provides a filename that is present in the shared drive.

Once the file has been located in the shared drive by the server, it begins the file transfer and sends the file content in streams of 1024 bytes to the client. The client receives the file content and writes it to a file in the local drive.

Once the file download is complete, the client closes its connection to the server and its execution terminates. The server continues to listen for other clients.

Question 2: Wireshark Trace

How many TCP connections are made

ONE connection: 1 TCP connection is made when the client connects to the server.
(refer image 1)

What is the port number of the server and what is that of the client

Port number of client (A): **47444**

Port number of server (B): **9001**

(refer image 1)

How many packets are exchanged between client and server

Total packets exchanged: **88**

Packets from client to server (A→B): **36**

Packets from server to client (B→A): **52**

(refer image 1)

How much time is needed to download the file

Time taken for file download (in seconds): **0.000566184**

Time when download started: **9.174098031 s** (refer image 2)

Time when download completed: **9.174664215 s** (refer image 3)

Ethernet · 1 IPv4 · 1 IPv6 · 1 TCP · 1 UDP · 1													
Address ▾	Port A	Address B	Port B	Packets	Bytes	Packets A → B	Bytes A → B	Packets B → A	Bytes B → A	Rel Start	Duration	Bits/s A → B	Bits/s B → A
127.0.0.1	47444	127.0.0.1	9001	88	55 k	36	2394	52	52 k	0.000000	9.1748	2087	46 k

☐ Name resolution
 ☐ Limit to display filter
 ☐ Absolute start time
 Conversation Types ▾
 Copy ▾ Follow Stream... Graph... Close Help

(Image 1)

File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

tcp.port in {15001}

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000000	127.0.0.1	127.0.0.1	TCP	74	47444 → 9001 [SYN] Seq=0 Win=65495 Len=0 MSS=65495 SACK_PERM=1
2	0.000028768	127.0.0.1	127.0.0.1	TCP	74	9001 → 47444 [SYN, ACK] Seq=0 Ack=1 Win=65483 Len=0 MSS=65495
3	0.000050556	127.0.0.1	127.0.0.1	TCP	66	47444 → 9001 [ACK] Seq=1 Ack=1 Win=65536 Len=0 TSval=988115636
4	9.173921675	127.0.0.1	127.0.0.1	TCP	76	47444 → 9001 [PSH, ACK] Seq=1 Ack=1 Win=65536 Len=10 TSval=98812481
5	9.173942431	127.0.0.1	127.0.0.1	TCP	66	9001 → 47444 [ACK] Seq=1 Ack=11 Win=64256 Len=0 TSval=98812481
6	9.174098031	127.0.0.1	127.0.0.1	TCP	1090	9001 → 47444 [PSH, ACK] Seq=1 Ack=11 Win=64256 Len=1024 TSval=98812481
7	9.174107612	127.0.0.1	127.0.0.1	TCP	66	47444 → 9001 [ACK] Seq=11 Ack=1025 Win=64512 Len=0 TSval=98812481
8	9.174127343	127.0.0.1	127.0.0.1	TCP	1090	9001 → 47444 [PSH, ACK] Seq=1025 Ack=11 Win=64256 Len=1024 TSval=98812481
9	9.174136573	127.0.0.1	127.0.0.1	TCP	66	47444 → 9001 [ACK] Seq=11 Ack=2049 Win=63872 Len=0 TSval=98812481
10	9.174151531	127.0.0.1	127.0.0.1	TCP	1090	9001 → 47444 [PSH, ACK] Seq=2049 Ack=11 Win=64256 Len=1024 TSval=98812481
11	9.174158224	127.0.0.1	127.0.0.1	TCP	66	47444 → 9001 [ACK] Seq=11 Ack=3073 Win=63360 Len=0 TSval=98812481
12	9.174171042	127.0.0.1	127.0.0.1	TCP	1090	9001 → 47444 [PSH, ACK] Seq=3073 Ack=11 Win=64256 Len=1024 TSval=98812481
13	9.174176641	127.0.0.1	127.0.0.1	TCP	66	47444 → 9001 [ACK] Seq=11 Ack=4097 Win=62848 Len=0 TSval=98812481
14	9.174191288	127.0.0.1	127.0.0.1	TCP	1090	9001 → 47444 [PSH, ACK] Seq=4097 Ack=11 Win=64256 Len=1024 TSval=98812481
15	9.174195661	127.0.0.1	127.0.0.1	TCP	66	47444 → 9001 [ACK] Seq=11 Ack=5121 Win=64384 Len=0 TSval=98812481
16	9.174207863	127.0.0.1	127.0.0.1	TCP	1090	9001 → 47444 [PSH, ACK] Seq=5121 Ack=11 Win=64256 Len=1024 TSval=98812481
17	9.174212408	127.0.0.1	127.0.0.1	TCP	66	47444 → 9001 [ACK] Seq=11 Ack=6145 Win=64384 Len=0 TSval=98812481

Frame 6: 1090 bytes on wire (8720 bits), 1090 bytes captured (8720 bits) on interface lo, id 0

Ethernet II, Src: 00:00:00:00:00:00 (00:00:00:00:00:00), Dst: 00:00:00:00:00:00 (00:00:00:00:00:00)

Internet Protocol Version 4, Src: 127.0.0.1, Dst: 127.0.0.1

Transmission Control Protocol, Src Port: 9001, Dst Port: 47444, Seq: 1, Ack: 11, Len: 1024

```

0000 00 00 00 00 00 00 00 00 00 00 00 00 08 00 45 00 .....E.
0010 04 34 90 cc 40 00 40 06 a7 f5 7f 00 00 01 7f 00  .4..@.@.....
0020 00 01 23 29 b9 54 55 27 4d 16 b2 66 6e 4f 80 18  .#).TU' M..fn0..
0030 01 f6 02 29 00 00 01 01 08 0a 3a e5 96 8c 3a e5  .).TU' M..fn0..
0040 96 8b 41 20 66 6c 6f 77 65 72 2c 20 73 6f 6d 65  .A flow er, some
0050 74 69 6d 65 73 20 6b 6e 6f 77 6e 20 61 73 20 61  times kn own as a
0060 20 62 6c 6f 6f 6d 20 6f 72 20 62 6c 6f 73 73 6f  bloom o r bloss
0070 6d 2c 20 69 73 20 74 68 65 20 72 65 70 72 6f 64  m, is th e reprod
0080 75 63 74 69 76 65 20 73 74 72 75 63 74 75 72 65  utive s tructure
0090 20 66 6f 75 6e 64 20 69 6e 20 66 6c 6f 77 65 72  found i n flower
00a0 69 6e 67 20 70 6c 61 6e 74 73 20 28 70 6c 61 6e  ing plan ts (plan

```

Transmission Control Protocol: Protocol

Packets: 93 · Displayed: 88 (94.6%) · Dropped: 0 (0.0%) · Profile: Default

(Image 2)

File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

tcp.port in {15001}

No.	Time	Source	Destination	Protocol	Length	Info
72	9.174582409	127.0.0.1	127.0.0.1	TCP	1514	9001 → 47444 [ACK] Seq=40961 Ack=11 Win=64256 Len=1448 TSval=98812481
73	9.174583453	127.0.0.1	127.0.0.1	TCP	66	47444 → 9001 [ACK] Seq=11 Ack=40961 Win=62592 Len=0 TSval=98812481
74	9.174590672	127.0.0.1	127.0.0.1	TCP	666	9001 → 47444 [PSH, ACK] Seq=42409 Ack=11 Win=64256 Len=600 TSval=98812481
75	9.174600890	127.0.0.1	127.0.0.1	TCP	1514	9001 → 47444 [ACK] Seq=43009 Ack=11 Win=64256 Len=1448 TSval=98812481
76	9.174602593	127.0.0.1	127.0.0.1	TCP	66	47444 → 9001 [ACK] Seq=11 Ack=43009 Win=61568 Len=0 TSval=98812481
77	9.174619315	127.0.0.1	127.0.0.1	TCP	666	9001 → 47444 [PSH, ACK] Seq=44457 Ack=11 Win=64256 Len=600 TSval=98812481
78	9.174626659	127.0.0.1	127.0.0.1	TCP	1514	9001 → 47444 [ACK] Seq=45057 Ack=11 Win=64256 Len=1448 TSval=98812481
79	9.174628834	127.0.0.1	127.0.0.1	TCP	66	47444 → 9001 [ACK] Seq=11 Ack=45057 Win=60544 Len=0 TSval=98812481
80	9.174635037	127.0.0.1	127.0.0.1	TCP	666	9001 → 47444 [PSH, ACK] Seq=46505 Ack=11 Win=64256 Len=600 TSval=98812481
81	9.174642178	127.0.0.1	127.0.0.1	TCP	1514	9001 → 47444 [ACK] Seq=47105 Ack=11 Win=64256 Len=1448 TSval=98812481
82	9.174644441	127.0.0.1	127.0.0.1	TCP	66	47444 → 9001 [ACK] Seq=11 Ack=47105 Win=59520 Len=0 TSval=98812481
83	9.174650402	127.0.0.1	127.0.0.1	TCP	666	9001 → 47444 [PSH, ACK] Seq=48553 Ack=11 Win=64256 Len=600 TSval=98812481
84	9.174658097	127.0.0.1	127.0.0.1	TCP	66	47444 → 9001 [ACK] Seq=11 Ack=49153 Win=58496 Len=0 TSval=98812481
85	9.174664215	127.0.0.1	127.0.0.1	TCP	281	9001 → 47444 [PSH, ACK] Seq=49153 Ack=11 Win=64256 Len=215 TSval=98812481
86	9.174672002	127.0.0.1	127.0.0.1	TCP	66	9001 → 47444 [FIN, ACK] Seq=49368 Ack=11 Win=64256 Len=0 TSval=98812481
87	9.174834950	127.0.0.1	127.0.0.1	TCP	66	47444 → 9001 [FIN, ACK] Seq=11 Ack=49369 Win=65536 Len=0 TSval=98812481
88	9.174849398	127.0.0.1	127.0.0.1	TCP	66	9001 → 47444 [ACK] Seq=49369 Ack=12 Win=64256 Len=0 TSval=98812481

TCP payload (215 bytes)

Data (215 bytes)

Data: 32302d313836342d392e0a45787465726e616c206c696e6b...

Length: 215

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0000 00 00 00 00 00 00 00 00 00 00 00 00 08 00 45 00 .....E.
0010 01 0b 90 fb 40 00 40 06 aa ef 7f 00 00 01 7f 00  .@.@.....
0020 00 01 23 29 b9 54 55 28 0d 16 b2 66 6e 4f 80 18  .#).TU( ...fn0..
0030 01 f6 fe ff 00 00 01 01 08 0a 3a e5 96 8c 3a e5  .).TU' M..fn0..
0040 96 8c 32 30 2d 31 38 36 34 2d 39 2e 0a 45 78 74  .20-186 4-9. Ext
0050 65 72 6e 61 6c 20 6c 69 6e 6b 73 0a 09 4c 6f 6f  ernal li nks-Lo
0060 6b 20 75 70 20 66 6c 6f 77 65 72 20 69 6e 20 57  k up flo wer in W
0070 69 6b 74 69 6f 6e 61 72 79 2c 20 74 68 65 20 66  ictionar y, the f
0080 72 65 65 20 64 69 63 74 69 6f 6e 61 72 79 2e 0a  ree dict ionary.
0090 09 57 69 6b 69 6d 65 64 69 61 20 43 6f 6d 6d 6f  .Wikimed ia Commo
00a0 6e 73 20 68 61 73 20 6d 65 64 69 61 20 72 65 6c  ns has m edia rel

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Transmission Control Protocol: Protocol

Packets: 93 · Displayed: 88 (94.6%) · Dropped: 0 (0.0%) · Profile: Default

(Image 3)