

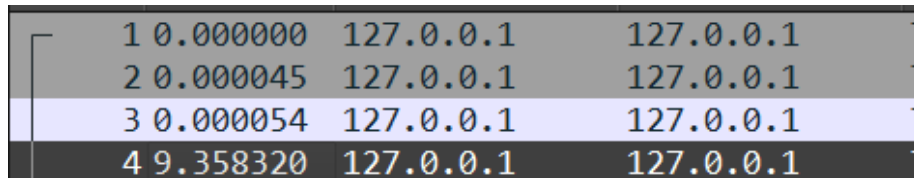
# Assignment 3 - Networks

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## Networks Laboratory

1. What are the source and destination IP addresses and ports? Share the screenshots to justify your answer.

Client Address: 127.0.0.1  
Server Address: 127.0.0.1  
Port: 8080



1	0.000000	127.0.0.1	127.0.0.1
2	0.000045	127.0.0.1	127.0.0.1
3	0.000054	127.0.0.1	127.0.0.1
4	9.358320	127.0.0.1	127.0.0.1

Figure 1: IP Addresses and Ports Screenshot

2. Inspect the Three-way handshaking procedure and capture all packets exchanged for it. Attach the necessary screenshots to demonstrate it.

**SYN:** Packet 1 (Client → Server)

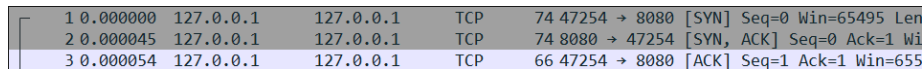
- Time: 0.000000, Seq=0

**SYN-ACK:** Packet 2 (Server → Client)

- Time: 0.000045, Seq=0, Ack=1

**ACK:** Packet 3 (Client → Server)

- Time: 0.000054, Seq=1, Ack=1



1	0.000000	127.0.0.1	127.0.0.1	TCP	74 47254 → 8080	[SYN] Seq=0 Win=65495 Len
2	0.000045	127.0.0.1	127.0.0.1	TCP	74 8080 → 47254	[SYN, ACK] Seq=0 Ack=1 Wi
3	0.000054	127.0.0.1	127.0.0.1	TCP	66 47254 → 8080	[ACK] Seq=1 Ack=1 Win=655

Figure 2: Three-way Handshaking Screenshot

- Inspect the connection closure procedure and capture all packets exchanged for it.

**FIN, ACK:** Packet 14 (Client → Server)

- Seq=334, Ack=1

**FIN, ACK:** Packet 15 (Server → Client)

- Seq=1, Ack=335

**ACK:** Packet 16 (Client → Server)

- Seq=335, Ack=2

14	12.721349	127.0.0.1	127.0.0.1	TCP	66 47254 → 8080	[FIN, ACK] Seq=334 Ack=1
15	12.722555	127.0.0.1	127.0.0.1	TCP	66 8080 → 47254	[FIN, ACK] Seq=1 Ack=335
16	12.722628	127.0.0.1	127.0.0.1	TCP	66 47254 → 8080	[ACK] Seq=335 Ack=2 Win=6

Figure 3: Connection Closure Screenshot

- Inspect the traffics and count the number of packets exchanged for the transfer of a file(related to data only) between client and server. Plot a graph 'file size vs the number of packets' clearly based on your observation.

- Initial packet: 26 bytes (packet 4)
- Three 100-byte packets (packets 6, 8, 10)
- Final packet: 7 bytes (packet 12)
- Total packets for data: 5 packets
- Total data transferred: 333 bytes

- Measure the total time taken for the file transfer, its encryption and send back it from server to the client. Plot a graph 'file size vs time' clearly based on your observation.

Start time: 0.000000

First data packet: 9.358320

Last data packet: 12.720939

Connection closure: 12.722628

Total time 12.72 seconds

- Calculate the average size packet exchanged during the data communication? Take reference of the plotted graph in the above question.

- 1 packet of 26 bytes
- 3 packets of 100 bytes each
- 1 packet of 7 bytes
- Average size =  $(26 + 300 + 7) / 5 = 66.6$  bytes

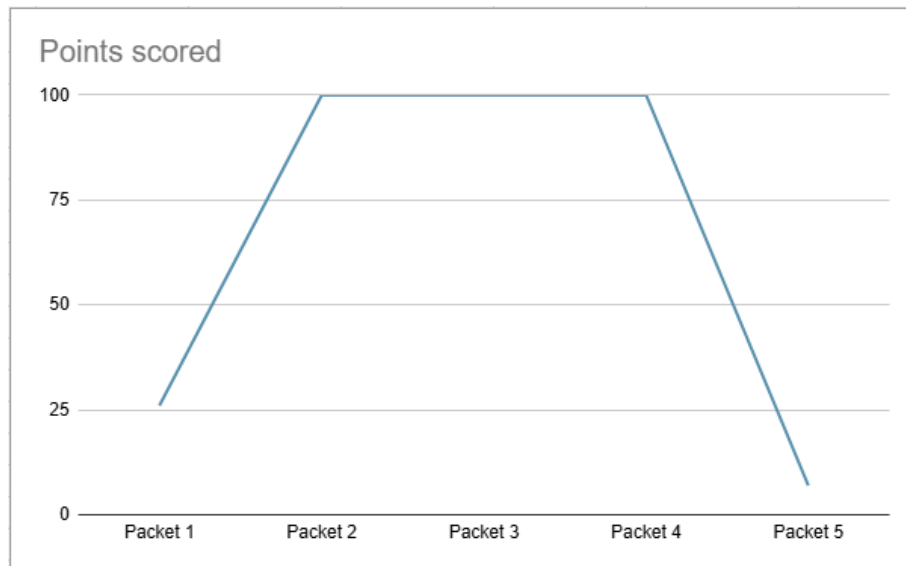


Figure 4: File Size vs Number of Packets Graph

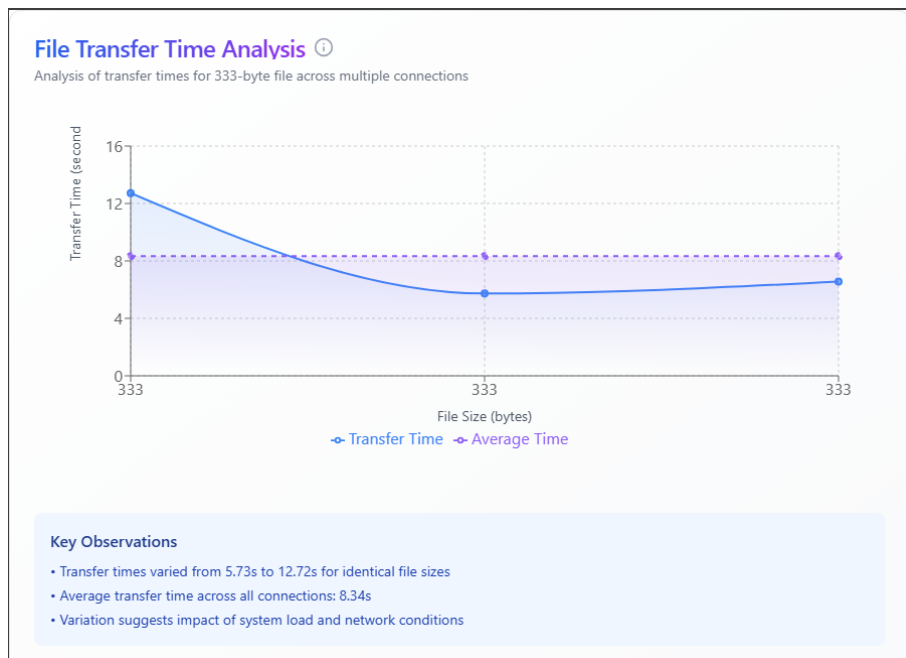


Figure 5: File Size vs Time Graph

```

nakulsharma@NSTATION:/mnt/d/SEM 6/Networks/assignment3$ sudo tcpdump -i lo -w capture.pcap tcp port 8080
tcpdump: listening on lo, link-type EN10MB (Ethernet), snapshot length 262144 bytes
^C30 packets captured
60 packets received by filter
0 packets dropped by kernel

```

Figure 6: terminal for packet capture

```

nakulsharma@NSTATION:/mnt/d/SEM 6/Networks/assignment3$ ./client
Enter the encryption key (26 letters): QWERTYUIOPLKJHGFDSAZXCVBNM
Enter filename: sample.txt
File sent for encryption
nakulsharma@NSTATION:/mnt/d/SEM 6/Networks/assignment3$ ./client
Enter the encryption key (26 letters): QWERTYUIOPLKJHGFDSAZXCVBNM
Enter filename: sample.txt
File sent for encryption
nakulsharma@NSTATION:/mnt/d/SEM 6/Networks/assignment3$ ./client
Enter the encryption key (26 letters): QWERTYUIOPLKJHGFDSAZXCVBNM
Enter filename: sample.txt
File sent for encryption

```

Figure 7: Terminal for client

```

nakulsharma@NSTATION:/mnt/d/SEM 6/Networks/assignment3$ ./server
Waiting for connection...
Connection established!
File received and encrypted
Connection established!
File received and encrypted
Connection established!
File received and encrypted

```

Figure 8: Terminal for server