**Steps to Follow:**

1. Run the command '$make' to see tcpserver binary in server folder and tcpclient binary in client folder.
2. To run server side program use the command '$./tcpserver <portno>'. <portno> should be replaced with the desired port to be used.
3. To run the client side program use the command '$./tcpclient <serverip> <serverport> <filename>'. Replace <serverip> with the IP address of the server machine,<serverport> with port number on which the server side program is being run and <filename> with the file you want to send.
4. Sample input is provided in the client folder.
5. Sample output will be produced in the server folder.

**Working of Code:**

Client Side:

1. The client establishes a connection with the server.
2. The client sends filename along with file size.
3. The client reads the file 1KB at a time into buffer and sends it to the server using TCP protocol.
4. The client computes the MD5_checksum and stores and waits for server to send the file MD5_checksum and checks for match.

Server Side:

1. Server establishes a connection with client and uses the same buffer size as that of the client.
2. From the file name and size received the server creates a file with the same name and finds the no of chunks in which the client sends data.
3. In recv special flag MSG_WAITALL is used to read from the stream only if the buffer capacity is full.
4. Once the file is read the MD5_checksum is computed and sent to the client.

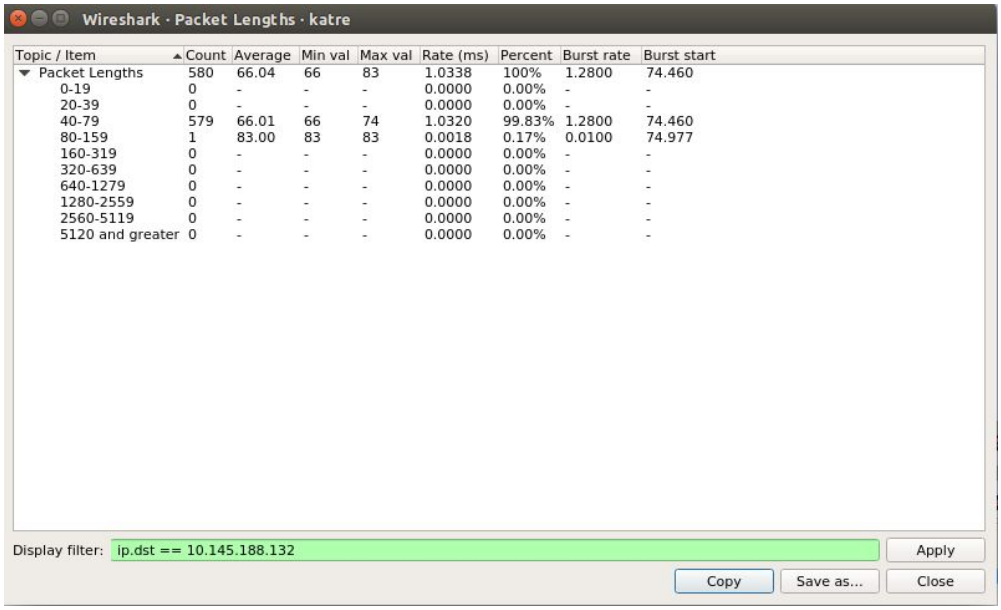
**Observations:**

TCP case:

**WIRESHARK ON SERVER SIDE**

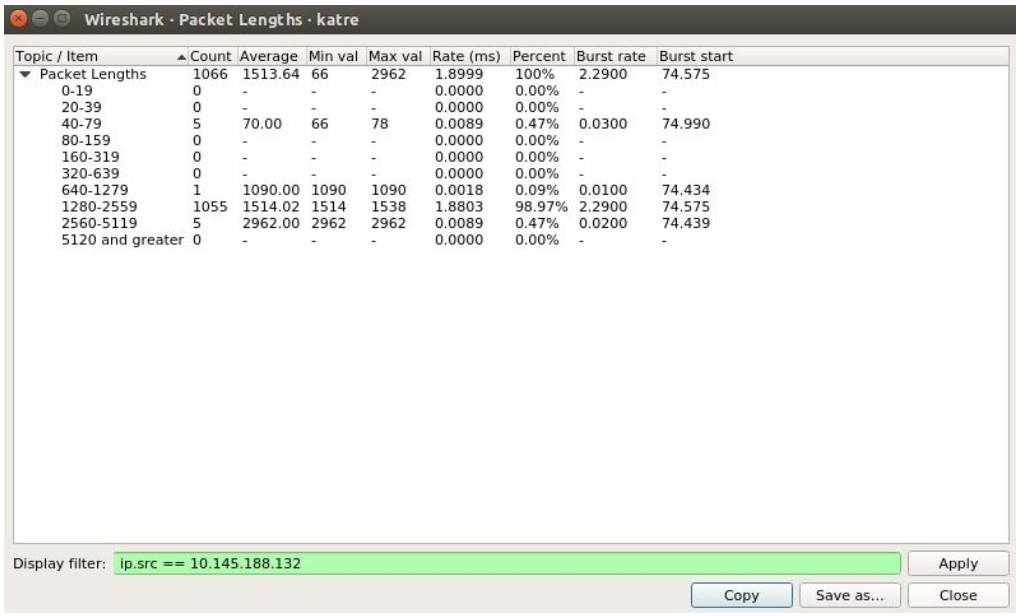
1 retransmission of packet is observed for the pdf file provided in the client folder. The packet size distribution is shown below. The file is distributed into 1506 chunks for transferring.

Server to client packet lengths:




The above image shows all packet transfer between server and client.
Most of the packet length lies in the region of 1280-2559 as the buffer size used in 1024 Bytes.

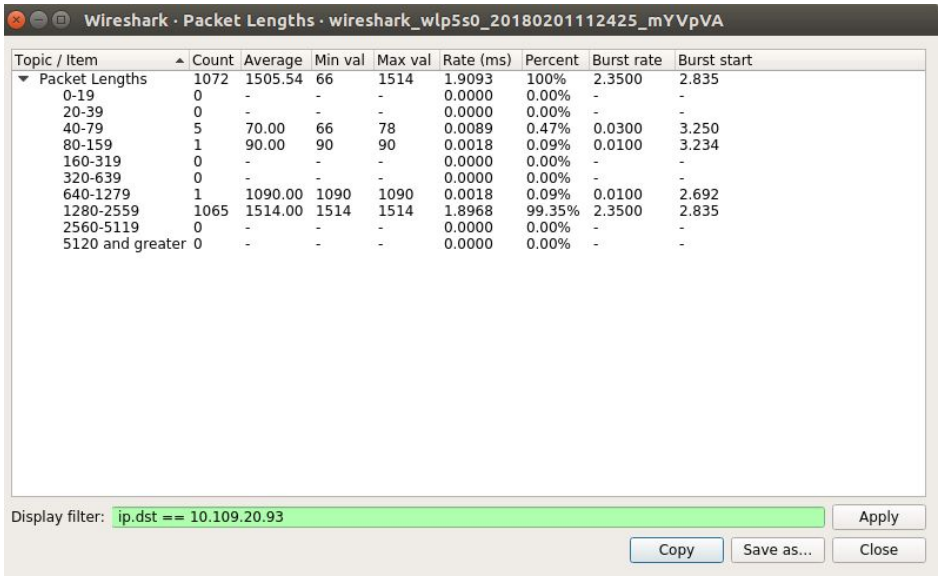
The below image shows the packets sent from client to server.



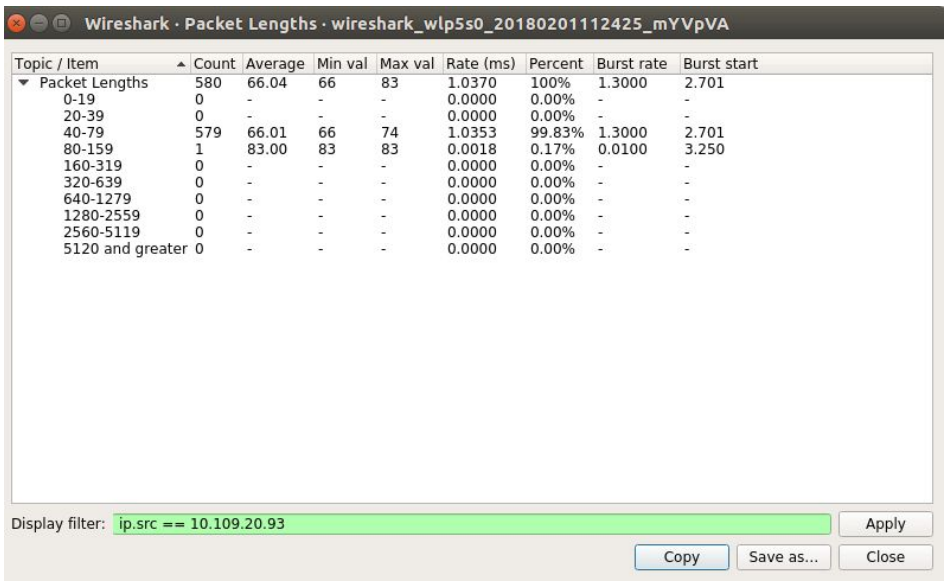

It can be seen clearly that sent packets mostly lie in the 1280-2259 region the 40-79 region packets are mostly handshake packets.

## WIRESHARK ON CLIENT

Client to server packet lengths:




Server to client packet lengths:




TIME TO RECEIVE Measured on server side: 0.543062584
TIME TO RECEIVE Measured on client side: 3.251414490 -2.692290817 = 0.559123673