Project 1 (Analysis Report)
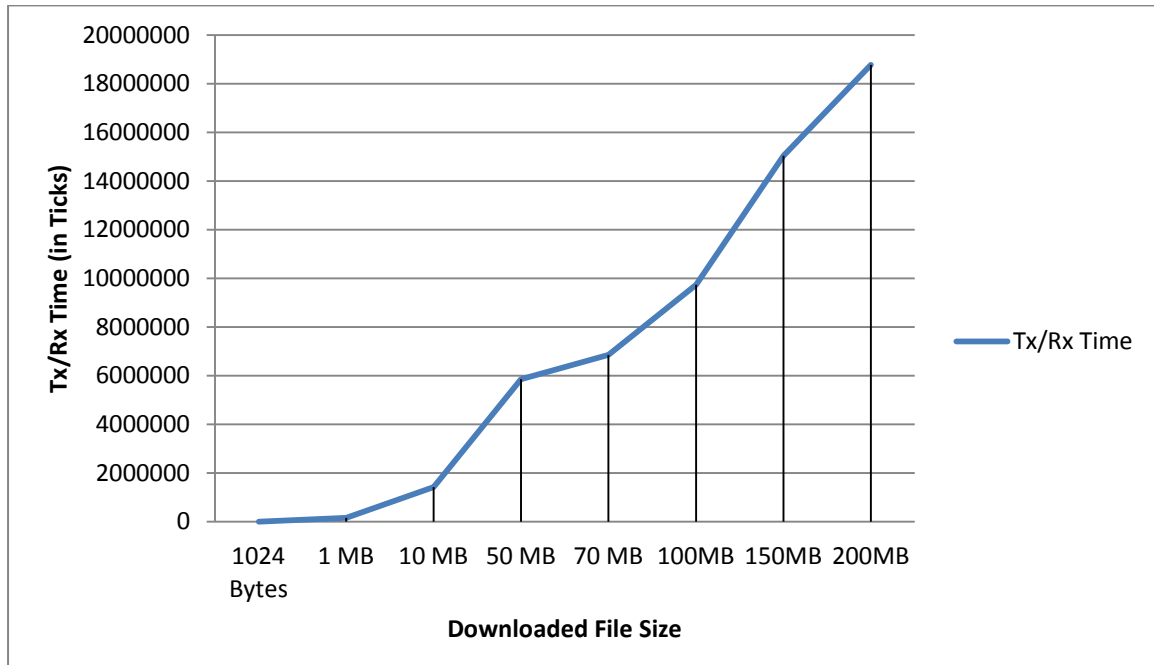
4.1 Data Rate vs. File Size:

Chart between transfer time and File size (between two peers without any other network
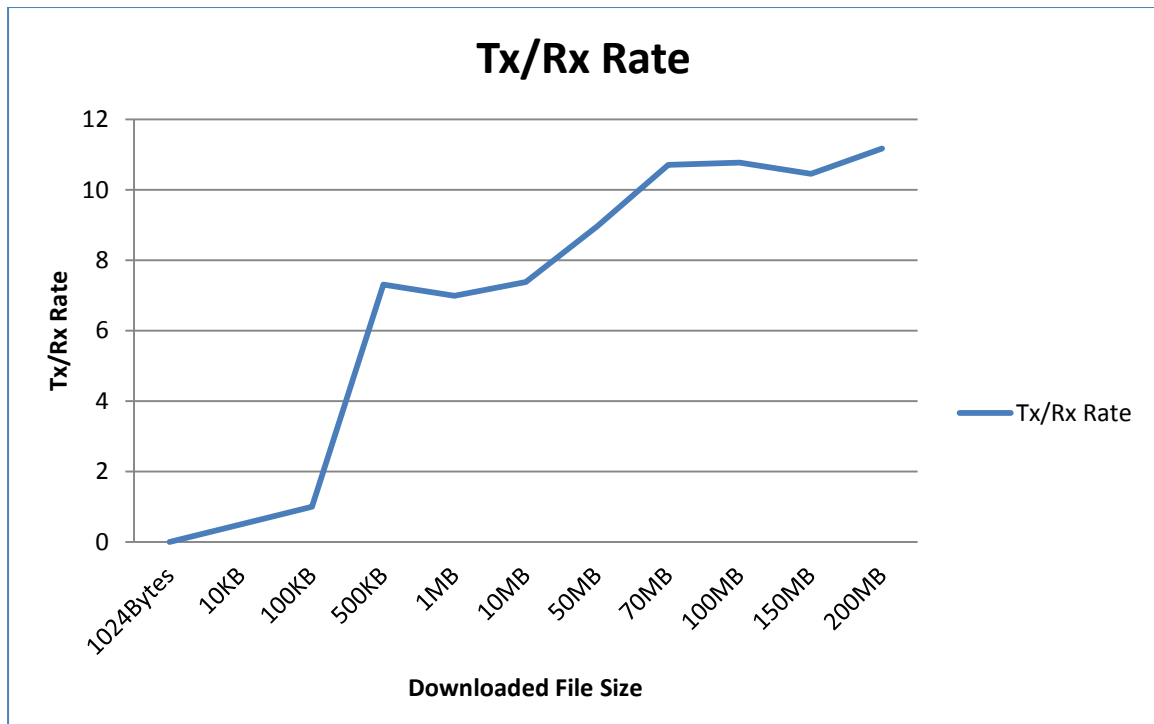

Chart between transfer rate and File size (between two peers without any other network

Analysis :

- TCP follows the slow start procedure for avoiding congestion in network. I t initially starts its segment size(MSS- Maximum Segment Size)from 1 and reaches up to some threshold value with exponential increase rate and after the threshold it increases linearly.

Expected Behaviour of Above Experiment:

- Initially a small file may take more time to download as it takes some time to reach peak value of transfer rate and hence average transfer rate of that transaction decreases.
- But as the file size increases, the transfer rate abruptly increases up to its threshold and adjust it s speed to some peak average speed (if network is not congested, other it may have more fluctuations in transfer rate before it comes to some average peak rate).
- After that transfer rate is expected to increase almost linearly.

Experimental Data Analysis :

- Initially average transfer rate for 10K and 100K packet is observed very low(0.5 and 1.0 bytes/ticks respectively). And the for 500K packet, data rate surges rapidly (to 7.31bytes/ticks).
- After that data rate increases linearly as with the increase in file size (6.31 bytes/ticks to 11.17 bytes/ticks) .
- Small fluctuations in data rate can be observed as a adjustment in TCP transfer rate with network conditions.
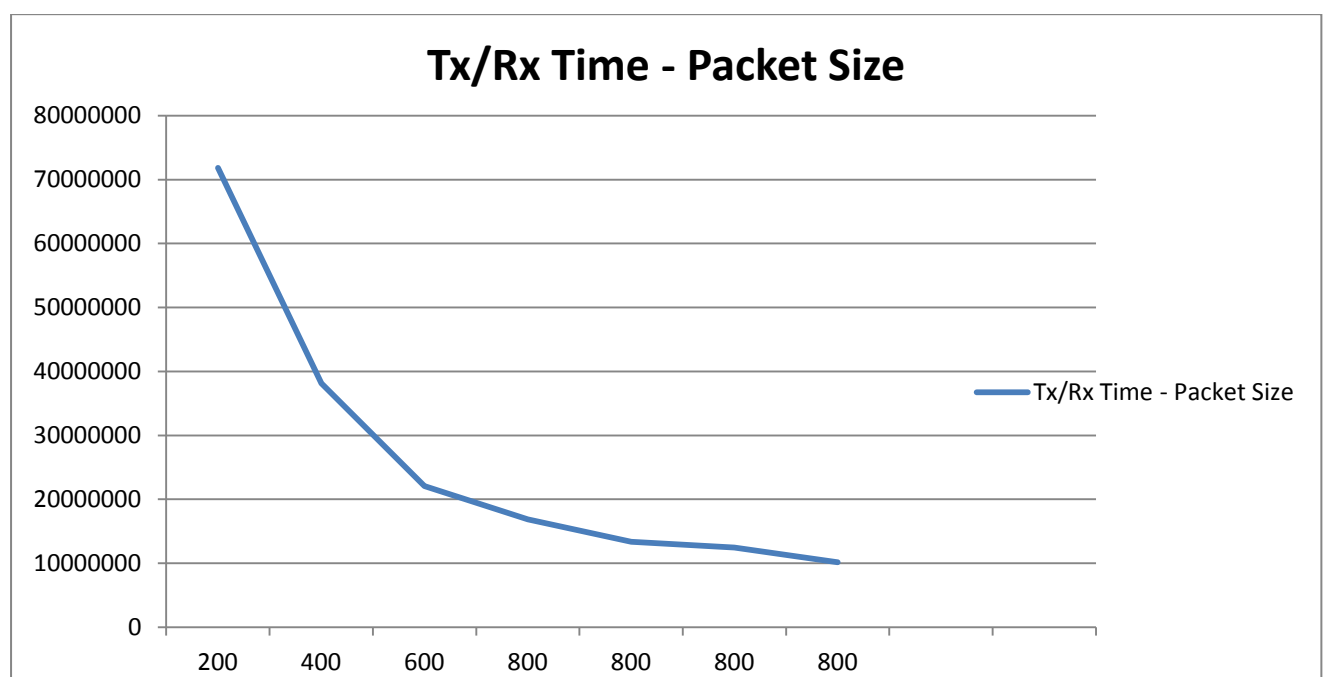-

4.2 Data Rates vs. Packet Size:

Chart between transfer Time (in ticks) and Packet Size (in Bytes) for file transfer of size = 150MB
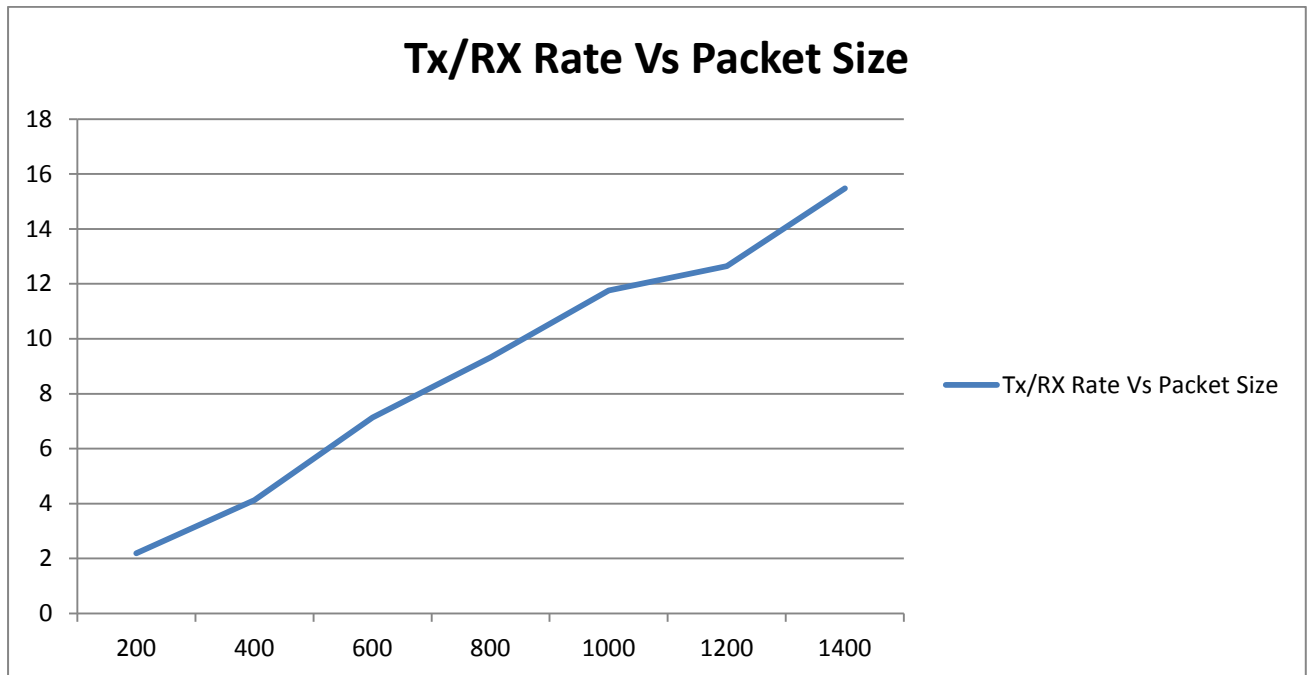
Tx/RX Rate Vs Packet Size

Chart between transfer Rate and Packet Size (in Bytes) for single file transfer of size = 150MB

Analysis :
- TCP is connection oriented protocol i.e first it establishes a connection a reserves the bandwidth for data transfer. No other application can use the same data channel for packet transfer. TCP has the concept of in-flight packet size i.e. it uses some fixed size(maximum segment size) packet to transfer data on network. TCP tries to set MSS such that it can fit into single link layer packet(MTU - Maximum Transferrable Unit).

Expected Behaviour of Above Experiment:
- Transfer Rate should increase with the increase in packet size up to MSS(assuming very less congestion in network).

Experimental Data Analysis :
- Initially a small packet size takes quite long time to transfer the file to destination.
- With the increase in packet size, the transfer time decreases considerably.
- Transfer rate increase almost linearly with the increase in packet size.
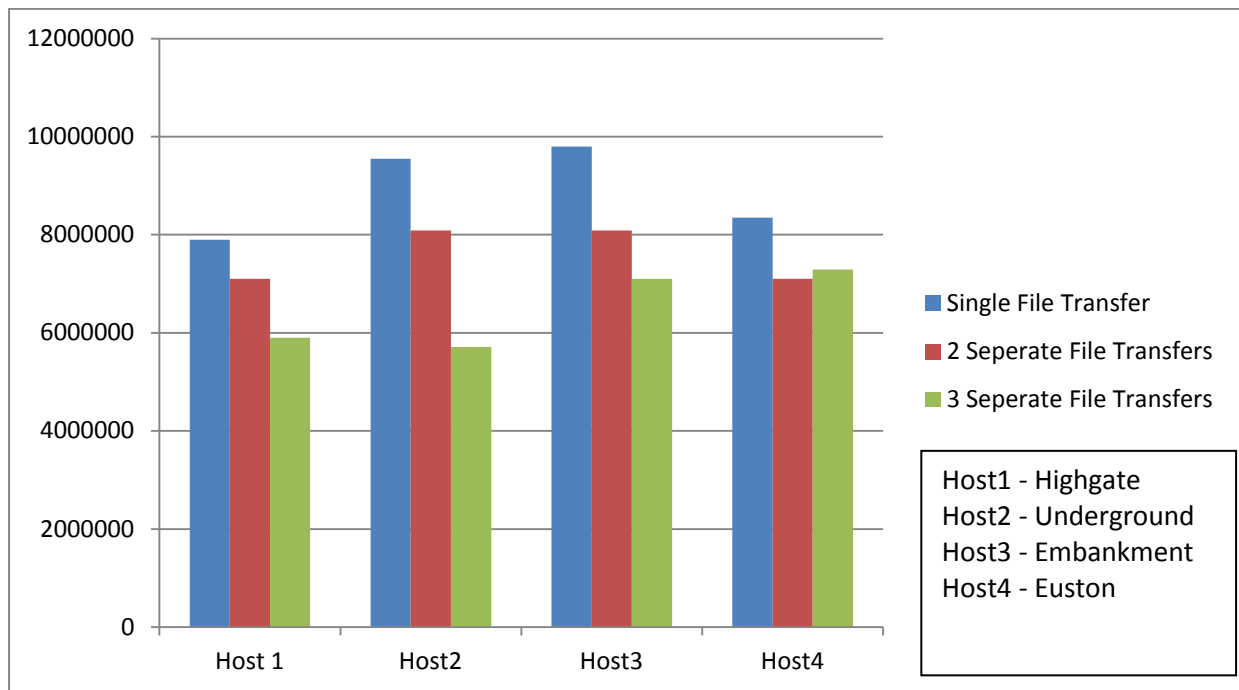
4.3 Data Rates vs. Load Variation:

Chart for comparison of Transfer Time(in ticks) Vs Load (file size = 70MB, Tx = 1000 Bytes)

Analysis :
- TCP does the congestion avoidance and congestion control in network with slow start and fast recovery. Earlier TCP versions follow AIMD but it affects the peak transfer rate of network but the TCP versions(TCP Reno) improves slow start and recovery considerably.

Expected Behaviour of Above Experiment:
- Transfer Rate should decrease with the increase in network load.
- Also sometime, abrupt decrease of some Tx rate of other connections may give chance to other connections to recover data rate.

Experimental Data Analysis :
- Different host varies the single file transfer rate assuming other network traffic for different hosts.
- For 2 separate file transfers, there is fall in transfer rate of almost all hosts but it varies for different hosts.
- With 3 separate file transfers, there is further fall in transfer rate of hosts but some slows hosts gets chance to recover their Tx rate(host4).

4.4 Data Rates vs. Host Number Variation:

Chart for comparison of Transfer Time(in ticks) Vs # of Hosts(file size = 150MB, Tx = 1000
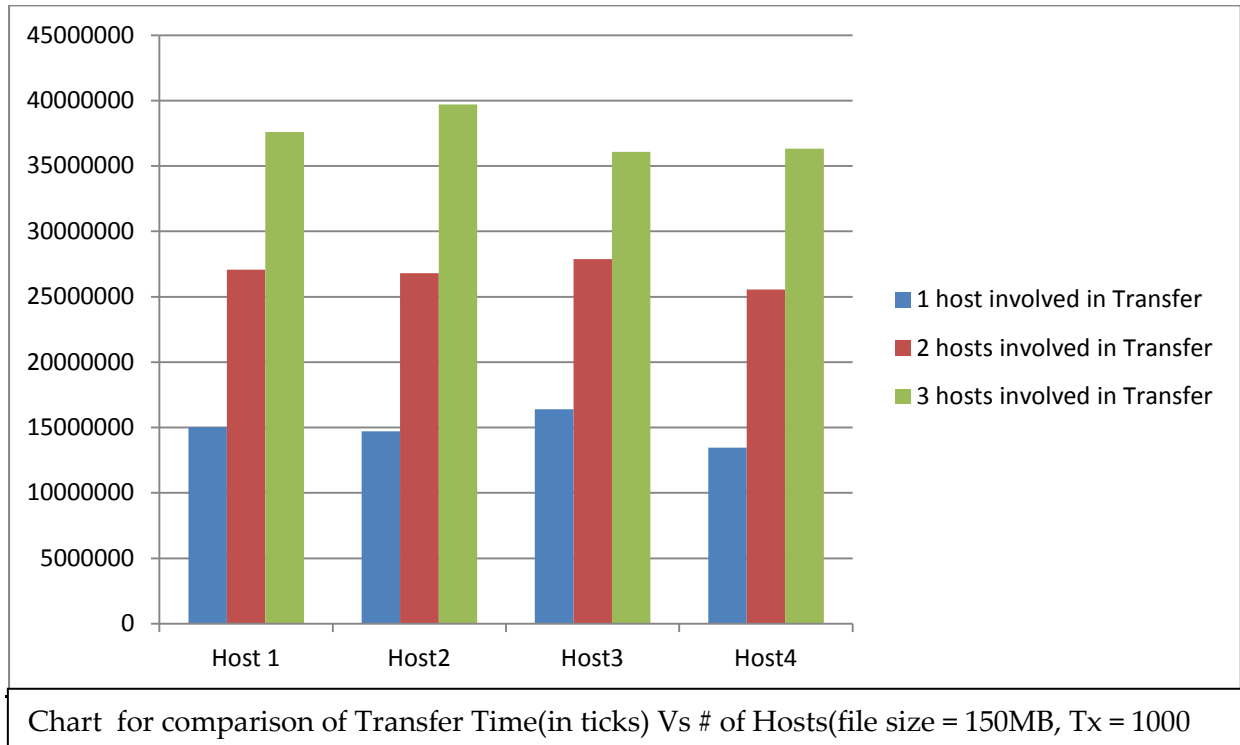
Analysis :
- TCP establishes separate channel for each host involved in connection and these channels don't interfere with each other i.e. TCP can carry data transfer on parallel channels between source and destination.

Expected Behaviour of Above Experiment:
- Transfer rate should increase with the involvement of more number of hosts involved in connections.
- But if the number of host involved are too much (beyond some limit that can introduce considerable traffic in link) , it may affect the transfer rates of others.
- The transfer rate is not always increases multiplicatively with the numbers of hosts involved in transfer.

Experimental Data Analysis :
- For each host, data rate increases with the increase in number of hosts involved in transfer.
- Increase in data rate of some hosts is observed to deviate from each other considering network congestion of some host.