

Part A Report:

The analysis_pcap_tcp program is used for calculating the number of flows, transactions, throughput loss rate empirical throughput from a pcapfile. I created a packet from existing TCP packet using only the data that is required for the analysis. The packet format created by me includes source port, destination port, syn, ack, fin flags, source ip address, destination ip address, sequence number, acknowledgement number windows size. The program creates three separate lists based on number of flows which makes the analysis easier. After that I check for the handshakes done and calculate number of flows. The program also prints the sequence number, acknowledgement numbers and window size for each flow. Then we calculate the loss rate using the retransmitted packets. The program also calculates the average RTT and calculates the theoretical throughput using the formula.

2 a.

For 43498

Transaction No: 1

Seq no: 705669103 Ack No: 1921750144 Window Size: 49152

Seq no: 1921750144 Ack No: 705669127 Window Size: 49152

Transaction No: 2

Seq no: 705669127 Ack No: 1921750144 Window Size: 49152

Seq no: 1921750144 Ack No: 705670575 Window Size: 49152

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For 43500

Transaction No: 1

Seq no: 3636173852 Ack No: 2335809728 Window Size: 49152

Seq no: 2335809728 Ack No: 3636173876 Window Size: 49152

Transaction No: 2

Seq no: 3636173876 Ack No: 2335809728 Window Size: 49152

Seq no: 2335809728 Ack No: 3636175324 Window Size: 49152

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For 43502

Transaction No: 1

Seq no: 2558634630 Ack No: 3429921723 Window Size: 49152

Seq no: 3429921723 Ack No: 2558634654 Window Size: 49152

Transaction No: 2

Seq no: 2558634654 Ack No: 3429921723 Window Size: 49152

Seq no: 3429921723 Ack No: 2558636102 Window Size: 49152

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The above values denote the sequence number, acknowledgement number and windows size for first two transactions. The sequence number is available in the data packet and acknowledgement number is calculated using the length of payload plus the sequence number. The windows size of the packet is available in the packet, but it is scaled. We need to multiply the relative window size with the multiplication factor as in the packet.

2 b

Throughput for flow 1: 5.38694715301 Mbps

Throughput for flow 2: 1.32322721879 Mbps

Throughput for flow 3: 1.52217235871 Mbps

The above values are the theoretical throughput for the three flows. I have taken in consideration both the header and data for throughput calculation. The values are in megabytes per second.

2 c

Lossrate for flow 1 : 0.000430169199885

Lossrate for flow 2 : 0.01330502477

Lossrate for flow 3 : 0.0

The loss rate is calculated by the number of packets that are received divided total number of packets. For calculating the packet not received I consider the packets that get retransmitted and divide by the total packets sent uniquely. This basically considering all retransmitted packets as the packets not received in first pass and then dividing them by all the packets sent.

2 d

Average Rtt for Flow 1: 0.0735193747896

Average Rtt for Flow 2: 0.167622576541

Average Rtt for Flow 3: 0.0731117840652

For average Rtt calculation I am checking the presence of acknowledgement number in the list which calculated by adding the sequence number plus the data payload. If the acknowledgement is present, then I am calculating the Rtt and appending it to the list for each flow and then averaging it.

For empirical throughput calculation we use the formula discussed in class which basically depended on RTT, loss rate and MSS value. There is huge difference between the empirical and the theoretical

throughput. This may be due to the not considering the out of order packets and some anomaly in calculation of loss rate and average RT.