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EE3204

Lab Report

1. Collecting data

Running server: ./tcp\_ser4 data\_len port error\_rate

Running client: ./tcp\_client4 host data\_len port

data\_len is data length for each packet which is parameterize for both server and client side.

error\_rate is the percentage of error used to simulate packet losses. error\_rate ranges between 0 and 90.

For each given data\_len value, transmitted time, total number of bytes transmitted, data rate and number of errors are recored. In practice, for each given value of data\_len, client will send data for a number of times (for example, 20) and the average values of above metrics are calculated.

2. Results

Graphs of data rate (Kb/s) vs data length (Kb) are plotted below when error\_rate is 0, 10, 50 and 90.

Data rate vs data length when error\_rate = 0

Data rate vs data length when error\_rate = 10

Data rate vs data lenth when error\_rate = 50

Data rate vs data length when error\_rate = 90

From the above graphs, one can see that the data rate increases with the increasing of data length for zero error rate. In overall, data rate decreases when error rate increases. However, for high error rate, data rate no longer increases together with data length. Instead, there is a drop between 40Kb and 50Kb data length.

The chosen value of data length is 20Kb to 30Kb. In this range, data rate can achieves the highest rate (60000Kb/s) for zero error rate and still achieves a reasonable good enough rate for high error rate.

3. Interpretation of results

Denote B be bandwidth, RTT be the round-trip time for transmitting a packet and L be size of transmitted file.

For zero error rate,

Time to transmit a packet with length x is approximately Tp = x/B + RTT. So, the average throughput when alternatively transmitting between x and 2x data length is S = (x + 2x) / (x/B + RTT + 2x/B + RTT) = 1 / (1/B + 2RTT/3x). This explains why the data rate increases with the increasing of data length. However, for big x, the number of packets sent drops until the point when only 2 packets with length x and L-x are sent. The throughput in this case is S = L / (x/B + RTT + (L-x)/B + RTT) = 1 / (1/B + 2RTT/L). This explains why data rate becomes almost constant when data length is larger than a certain value.

For non zero rate,

In case of small data length, the throughput can be approximated as

S = (1 – p) / (1/B + 2RTT/3x). This explains the overall drop of data rate meanwhile still predicts an increasing of data rate vs data length. However, in case of large data length, the number of packets sent is no longer a main factor. Instead, the extra time spent for retransmitting a huge packet dominates the total time. That is why data rate drops when data length is 40Kb to 50Kb.