Computer Communications and Networks (COMN) 2021/22, Semester 2

Assignment 2 Results Sheet

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Question 1 – Number of retransmissions and throughput with different retransmission timeout values with stop-and-wait protocol. For each value of retransmission timeout, run the experiments for **5 times** and write down **average number of retransmissions** and **average throughput**.

Retransmission timeout (ms)	Average number of re-transmissions	Average throughput (Kilobytes per second)
5	1094.20	26.29
10	619.80	46.96
15	99.00	60.85
20	101.80	59.58
25	101.40	59.48
30	101.80	54.21
40	91.60	55.42
50	100.60	47.69
75	106.40	40.16
100	104.00	35.92

Question 2 – Discuss the impact of retransmission timeout value on the number of retransmissions and throughput. Indicate the optimal timeout value from a communication efficiency viewpoint (i.e., the timeout that minimizes the number of retransmissions while ensuring a high throughput).

From the table, there was a massive decrease in the average number of re-transmissions with a steady increase in average throughput as the timeout values increased 5 to 10 and 10 to15ms. Given that the delay value, RTT for testing the stop and wait protocol was 10ms (5ms one-way propagation delay), for a very small timeout value like 5ms, it recorded the highest average number of retransmissions (1094.20) and the lowest average throughput (26.29 Kbps) because this 5ms timeout was lesser than the set RTT (10ms), so there were a lot of premature timeouts and/or loss of acks hence re-transmitting a lot of packets.
For timeout values larger the set RTT, though there was a decrease in the number of packet re-transmission, the average throughput was relatively small because it could have taken longer to identify and re-transmit lost packets thus increasing transfer time which affected the overall throughput. The optimal timeout value was 15ms because it has a low average number of retransmissions of 99.00 and the highest average throughput of 60.85Kbps among the other timeouts.

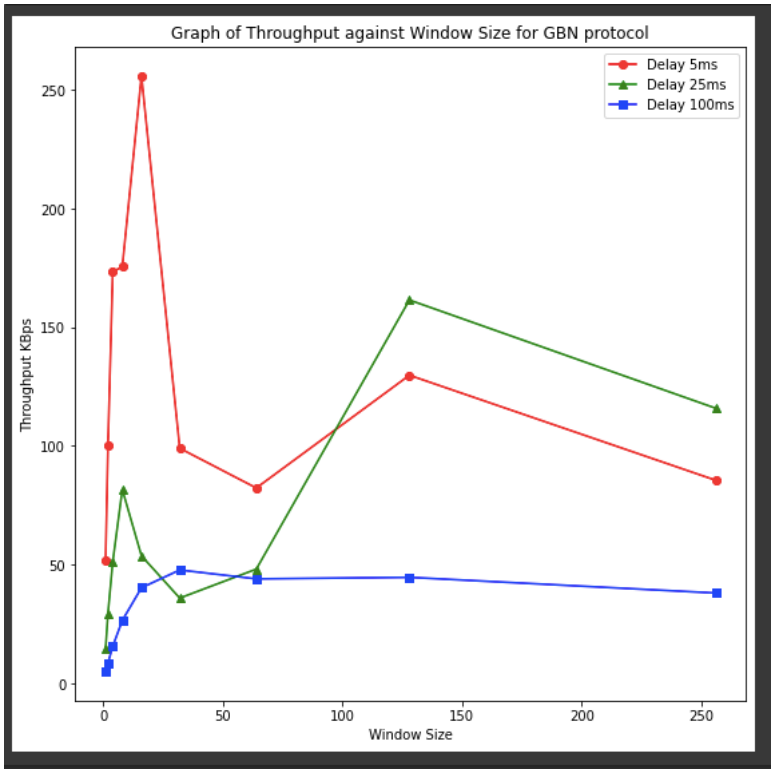
Question 3 – Experimentation with Go-Back-N. For each value of window size, run the experiments for **5 times** and write down **average throughput**.

For 25ms and 100ms one-way propagation delays, I chose a timeout that is two times the RTT (i.e for 25ms, the RTT will 50ms, so timeout is 100ms). Choosing a timeout less than 2*RTT would lead to too many retransmissions due to premature timeouts or loss of acks from sender and choosing very large timeouts would lead to large delays and inefficiency.

Window-sizes and average throughput for different 1-way propagation delays

Window-size	5ms 1-way propagation delay (15ms timeout)	25ms 1-way propagation delay (100ms timeout)	100ms 1-way propagation delay (400ms timeout)
1	51.60	14.53	5.25
2	100.15	29.38	8.50
4	173.43	51.17	15.59
8	175.49	81.61	26.48
16	255.88	53.69	40.23
32	99.00	35.88	47.72
64	82.27	48.08	43.98
128	129.78	161.47	44.63
256	85.54	115.88	38.02

Create a graph as shown below using the results from the above table:



Question 4 – Discuss your results from Question 3.

For the 5ms delay, there was a sharp increase in throughput as the window size increased from 1 to 16 followed by a sharp decrease in throughput as window increased from 16 to 32 then a steady decrease from 32 to 64 then a steady increase from 64 to 128 and lastly a steady decrease in throughput from 128 to 256.

For the 25ms delay, there was also a sharp increase in throughput as the window size increased from 1 to 8 followed by a steady decrease from 8 to 32, then gradual increase in throughput from 32 to 64 and then the throughput increased massively from 64 to 128 followed by a gradual decrease from 128 to 256.

For the 100ms delay, there was a steady increase in throughput as window sizes increased from 1 to 32 then followed by 32 to 256.

From the graph, after a certain window size (128), there is a decrease in throughput for all the delays, but it was much faster in 5ms and 25ms and slower in 100ms delay.

Question 5 – Experimentation with Selective Repeat. For each value of window size, run the experiments for **5 times** and write down **average throughput**.

Window-sizes and average throughput for different 1-way propagation delays

Window-size	25ms (1-way propagation delay) throughput
1	
2	
4	
8	
16	
32	

Question 6 - Compare the throughput obtained when using "Selective Repeat" with the corresponding results you got from the "Go Back N" experiment and explain the reasons behind any differences.

Question 7 – Experimentation with *iperf*. For each value of window size, run the experiments for **5 times** and write down **average throughput**.

Window-size	25ms 1-way propagation delay
1	
2	
4	
8	
16	
32	

Question 8 - Compare the throughput obtained when using "Selective Repeat" and "Go Back N" with the corresponding results you got from the *iperf* experiment and explain the reasons behind any differences.