

# Computer Communications and Networks (COMN)

## 2020/21, 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	2575	59.17
10	1546	62.72
15	286	51.46
20	207	54.95
25	135	54.40
30	149	50.82
40	123	52.15
50	101	50.87
75	128	36.02
100	96	36.13

**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).

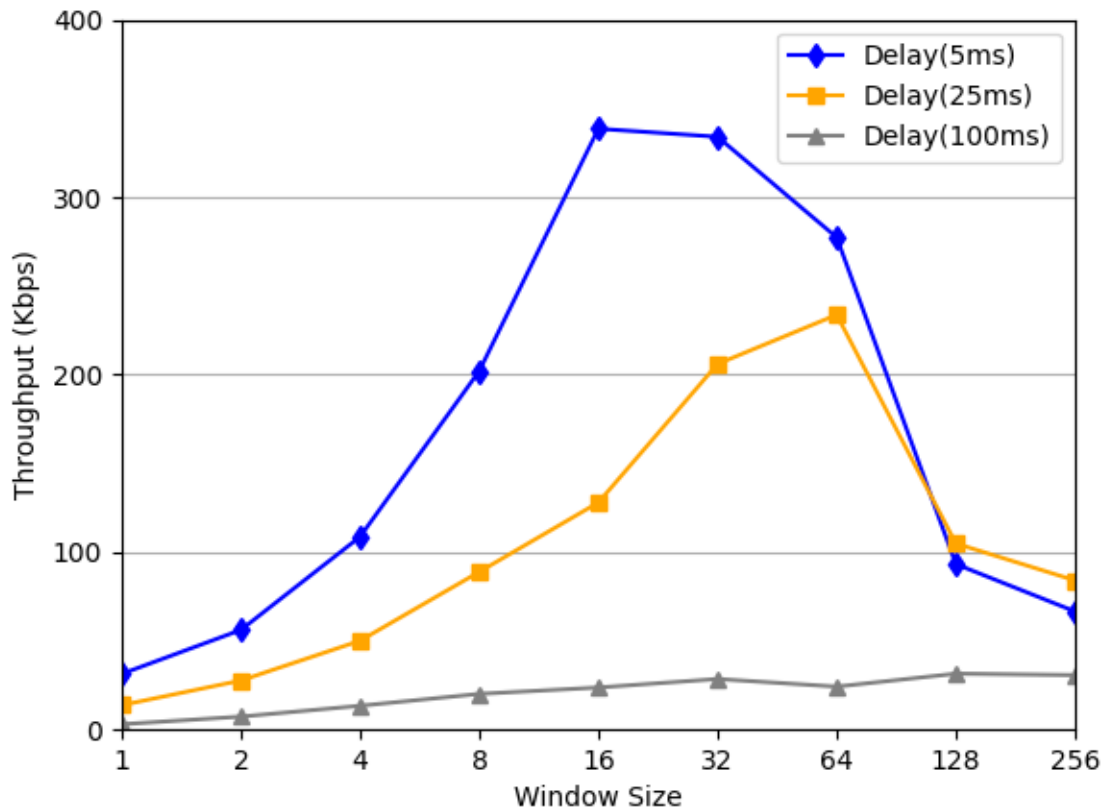
From the data above, it can be seen that, the average number of retransmissions keeps decreasing as the retransmission timeout is increased, however that is not the case with throughput. A maximum throughput of 62.72 Kb/s was observed with a retransmission timeout of 10ms whereas with 100ms where the lowest number of retransmissions were observed, the throughput was only 36.13 Kb/s. Looking at the data, it can be observed that the best results can probably be seen with a retransmission timeout of 25ms.

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

Window Size	Average throughput (Kilobytes per second)		
	Delay = 5ms	Delay = 25ms	Delay = 100ms
1	31.36	13.75	3
2	56.15	27.63	7.3
4	108.64	50.05	13.4
8	202	88.84	20.1
16	338.52	127.94	23.7
32	334	205.97	28.5
64	277.32	233.7	24.2
128	93.23	104.85	31.5
256	66.56	84.04	30.7

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



**Question 4** – Discuss your results from Question 3.

I used 25ms Retry timeout for 5ms delay, 60ms Retry timeout for 25ms delay, and 200ms retry timeout for 100ms delay. The reason 60ms and 200ms were chosen as timeouts is because we need to have a timeout larger than the delay of sending a packet and receiving an ACK for it.

As can be observed, an increase in delay is met with a decrease in throughput. There is a significant difference between the peaks of the line graphs of delay 5ms and those of delay 25ms whereas those of 100ms delay stay at similar values of throughput.

As can be seen, for delay of 5ms and for a delay of 25ms, bell shaped curves are obtained with the throughput maximizing roughly around the middle of the x-axis. For a delay of 5ms, the throughput is maximum for a window size of 16 with the second largest throughput for a window size of 32. Whereas, for a delay of 25ms, the peak is achieved with a window size of 64.

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

Average throughput (Kilobytes per second)	
Window Size	Delay = 25ms
1	14.8
2	29.6
4	45.3
8	81.2
16	137.8
32	215.2

**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.

It was observed that the results for Selective Repeat ARQ were slightly faster than Go Back-N. This is very intuitive since Go Back-N retransmits an entire window, whereas Selective Repeat fixes the re-sending of out-of-order packets that have already been sent and received by the Receiver. For example, if packets 1,2,3,4 are to be sent to the Receiver in Selective Repeat and only 3 and 4 are received , then the Sender only retransmits packets 1 and 2 given that packets 3 and 4 are already ACKed. In Go Back N, however, the Sender would retransmit all the 4 packets in the window.

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

Window Size (KB)	Average throughput (Kilobytes per second)
	Delay = 25ms
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.