CN-3530/CS 301 Assignment 2

1. Stop and Wait Protocol

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 the average **number of retransmissions** and **average throughput**.

Retransmission timeout (ms)	Average number of re-transmissions	Average throughput (Kilobytes per second)
5	5872.4	99.9402
10	746.6	109.4062
15	159.6	107.1428
20	220.8	98.899
25	107.2	89.79888
30	117	91.8602
40	102.6	92.5682
50	111.4	84.1894
75	80	78.7068
100	68.4	70.4848

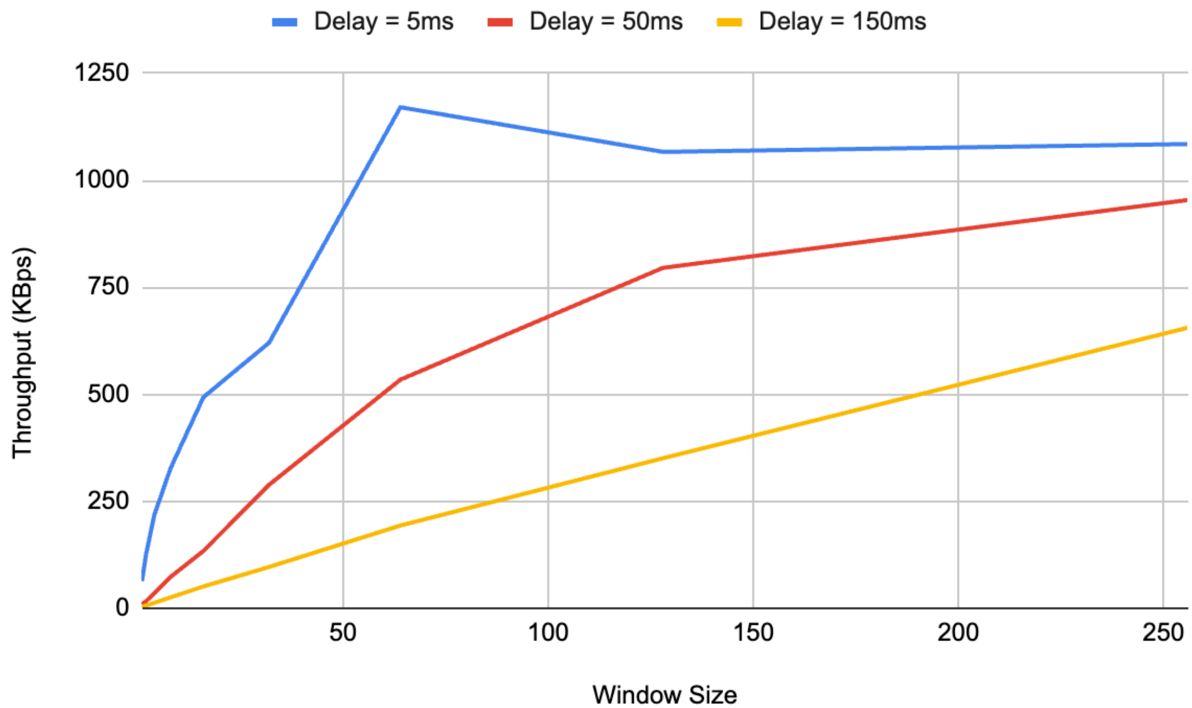
Question 2 – Discuss the impact of retransmission timeout value on number of retransmissions and throughput. Indicate the optimal timeout value from communication efficiency viewpoint (i.e., the timeout that minimizes the number of retransmissions and keeps the throughput as high as possible).

It can be seen that for very low timeout values, there are way too many retransmissions which is likely caused due to premature timeouts. Then at retransmission timeout = 15ms, I am getting the highest throughput, and also not a very high number of retransmissions. As we keep increasing timeout, the general trend is that the number of retransmissions decrease and so does the throughput. The retransmissions decrease because at high timeout values, only the packets/acks which are lost cause retransmission and a delayed ack is very unlikely to cause a retransmission. However, the time we wait for a timeout overshadows the time we spent for retransmissions leading to a low timeout. The timeout that minimizes the number of retransmissions and keeps the throughput as high as possible is 15ms.

2. Go back N Protocol

Question 1 – Experimentation with Go-Back-N. For each value of window size, run the experiments **5 times** and write down the **average throughput**.

	Average throughput (Kilobytes per second)		
Window Size	**Delay = 5ms**	**Delay = 50ms**	**Delay = 150ms**
1	63.06172	9.00946	3.143
2	125.3026	16.46083333	6.394
4	217.3134	34.9461	12.521
8	327.5858	73.315	25.3825
16	493.2448	133.8713333	50.843
32	620.568	288.532	96.46966667
64	1170.793	534.23	193.2703333
128	1066.4672	795.4663333	350.5766667
256	1084.8316	954.1663333	655.759



Question 2 – Discuss your results from Question 1.

Initially all the graphs are such that their values are increasing exponentially (multiplying almost by 2 every time), however they tend to converge and the possible reason for that may be that when the window size is very big, the bottleneck then becomes the underlying channel and not the propagation delay or the packet loss. Note that I have kept the values of timeouts as 2 * propagation delay + 5ms. The reason for this is that we know that RTT is 2 * propagation delay then we also usually keep some extra margin, since for Stop and Wait question, this was 5ms, I decided to keep this factor uniform and constant. Now, explaining the trend, the reason for the exponential growth is due to the fact that we are always doubling the window size, so by definition at the same time we are always sending double the packets, so the transmission rate is likely to almost double every single time. Also note that when propagation delay is low, the the RTT is also low, thus we transmission happens faster leading to a better throughput.

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