CN-3530/CS 301 Assignment 2

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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	344.75	181.296375
10	159.5	186.942295
15	129.25	158.3249
20	123	152.990275
25	123.25	129.7263
30	125.25	123.5693
40	127.67	108.4307
50	128	95.30910633
75	124	70.75103
100	125	65.2042548

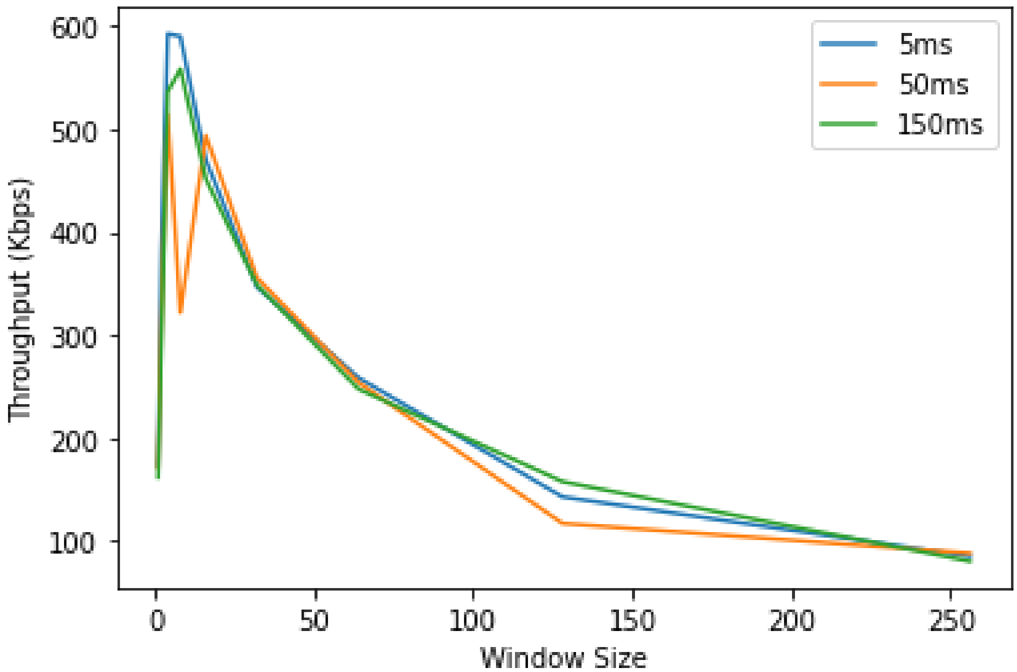
Question 2 – Discuss the impact of retransmission timeout value on number of retransmissions and throughput. Indicate the optimal timeout value from communication efficiency viewpoint (i.e., the timeout that minimizes the number of retransmissions and keeps the throughput as high as possible).

For very low timeout value(5ms), often timeout occurs even when the packet was not actually dropped and the acknowledgment was merely delayed, so we do not attain the maximum throughput possible, Also, the number of re-transmissions is high due to extra unneeded retransmits due to timeout before ack is received. **At 10ms timeout, we reach the maximum throughput among these timeout values**. There are lesser unneeded timeouts compared to 5ms case. But, as timeout value increases more, we start waiting longer times to resent dropped packets, so throughput starts going down. After a certain timeout value(15ms), increasing timeout value stops affecting number of re-transmissions, since there are almost no unneeded re-transmissions and only for the dropped packets, So, the re-transmissions become almost constant, And we now only increase the time after which we resend the packet, so throughput starts decreasing.

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**. [timeout was set to 5ms for all trials]

	Average throughput (Kilobytes per second)		
Window Size	**Delay = 5ms**	**Delay = 50ms**	**Delay = 150ms**
1	173.3783835	171.66968	162.15869
2	379.33367	316.3486545	287.670644
4	592.2119047	514.31068	536.0403442
8	589.749664	321.963705	558.11961
16	470.018242	493.5172309	451.3535267
32	346.7947613	355.8466455	348.891574
64	258.595544	254.0657	247.638815
128	143.1834857	117.43198	157.936383
256	85.53032077	88.393545	80.70564



Question 2 – Discuss your results from Question 1.

Quite obviously, as the propagation delay increases, the throughput decreases. Now, let us analyse the throughput vs window size for the 5 ms delay case (Other columns are pretty similar).

When the window is very small (window_size = 1), it is essentially just stop and wait and throughput is not very good as the network is not utilized properly. As the window increases, the network is utilized more and more, So, the throughput increases. But, as the windows size increases further (after 4-8), since we are resending the entire window in case of timeout, the resending becomes too costly, particularly in the extreme 256 window size, so the throughput again suffers.