Computer Communications and Networks (COMN) 2017/18, Semester 1

Assignment Part 1 Results Sheet

Forename and Surname:	Michael Michaelides
Matriculation Number:	s1447836

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	2146.8	21.0
10	1090.4	22.0
15	752.4	24.5
20	217.2	24.2
25	195.4	25.0
30	201.6	26.4
40	205.0	28.8
50	193.4	30.6
75	206.4	37.0
100	198.6	42.2

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).

If the timeout is too low, i.e. lower than the RTT which is 20ms in this case, then a lot of premature retransmissions occur as we can see above. The sender starts the timer when the packet is sent, but the reply needs at least RTT ms to arrive. Hence, if the timeout is less than that, then the sender will inevitably re-send datagrams whose ACKs are on the way back. This causes multiple unnecessary retransmissions and decreases the throughput due to the extra time taken.
On the other hand, if the timeout is too long - a lot longer than the RTT time - then in the case of a lost datagram the sender will wait too long for the timeout to occur before resending which causes decrease of throughput but keeps the retransmission rate low.
Thus, the ideal timeout value should be longer than RTT to avoid premature retransmissions but not too long to avoid waiting unnecessarily. Specifically, it is calculated as below:

Timeout = EstimatedRTT + 4 * VarianceRTT

where:

EstimatedRTT denotes an averaged measure of the RTTs accounting both for past and current RTTs. Specifically it is equal to: **0.875 * EstimatedRTT** (history of previous RTTs) **+ 0.125 * SampleRTT** (current sampled RTT of the ACK just received)

VarianceRTT denotes the spread around EstimatedRTT, i.e. the variance around the mean of the values. It is equal to **0.75 * VarianceRTT + 0.25 * |SampleRTT - EstimatedRTT|.**