CSC 573 – Internet Protocols

Project 2 – Go-back-N automatic repeat request (ARQ)

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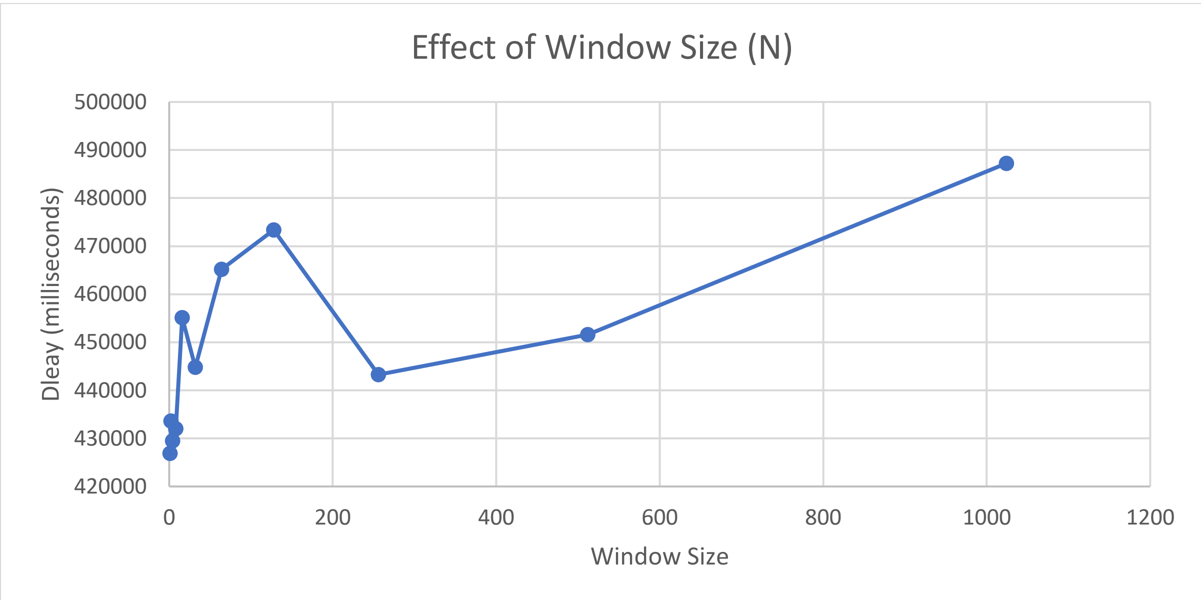
Task 1 – Effect of Window Size (N)

The readings for the calculation of delay against variation of the window size (N) is as presented in the table below –

Window Size	Reading 1	Reading 2	Reading 3	Reading 4	Reading 5	Average
1	424148	428253	441321	413478	427143	426868.6
2	439359	434100	431638	421573	441219	433577.8
4	415314	456271	423526	412535	439813	429491.8
8	427311	442124	412366	451243	427177	432044.2
16	445543	467608	452099	439181	471230	455132.2
32	425208	466674	438675	443249	450172	444795.6
64	434790	497044	451439	481536	461236	465209
128	511087	411815	481233	491349	471235	473343.8
256	437329	458864	423548	462472	433981	443238.8
512	440025	452132	447826	461874	456162	451603.8
1024	439500	620943	464028	434659	476970	487220

*Delays measured in milliseconds

The plot for the impact of window size on delay is as follows –



It can be seen from the graph that the delays increase with the increase in window size as larger window size leads to more retransmissions as we have more packets to retransmit in case a packet near the start of the window is lost. For e.g., if we have window size as 100 and the 1st packet is lost then we end up retransmitting the whole window of 100 packets. Likewise, we can end up retransmitting 200 packets in case the window size is 200.

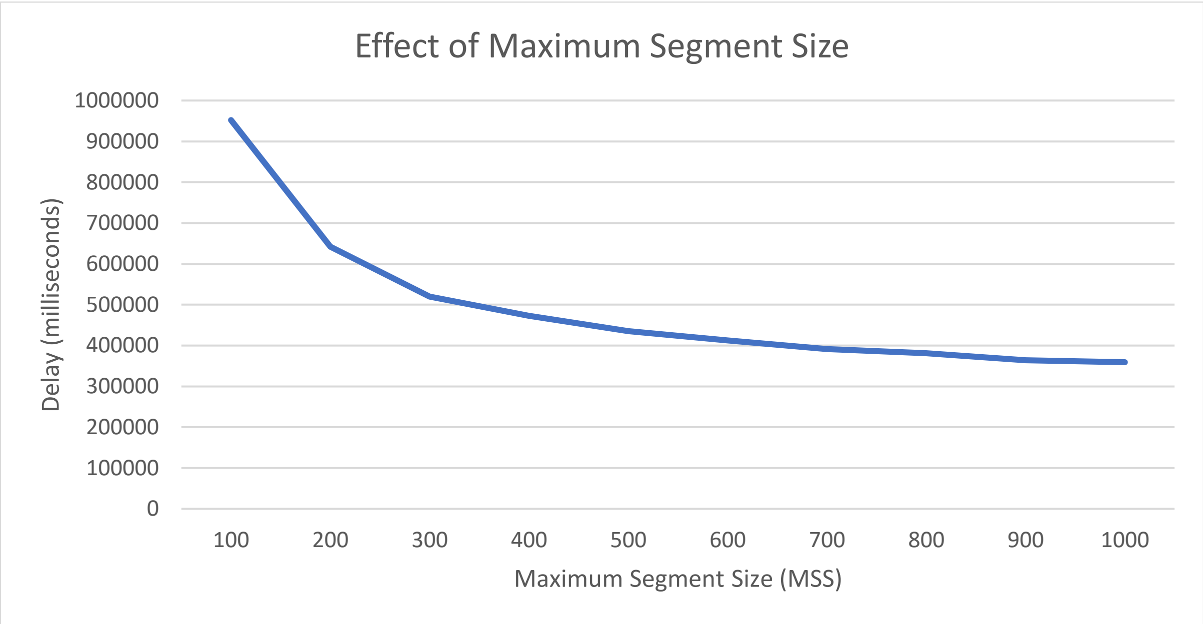
Task 2 – Effect of Maximum Segment Size (MSS)

The readings for the calculation of delay against variation of the maximum segment size (MSS) is as presented in the table below –

MSS	**Reading 1**	**Reading 2**	**Reading 3**	**Reading 4**	**Reading 5**	**Average**
100	956128	946049	955209	953901	949028	952063
200	607274	643274	669254	662212	628846	642172
300	514415	531235	510408	529849	512250	519631
400	470811	481011	463826	470038	478950	472927
500	452279	417280	430402	445270	432280	435502
600	410278	404264	420003	419485	410269	412860
700	400180	378179	397157	399420	381854	391358
800	391093	374076	374036	378320	388525	381210
900	365969	364035	358320	366100	364084	363702
1000	356948	353886	370873	358840	354980	359105

*Delays measured in milliseconds

The variation of the delay as per the readings can be seen in the plot shown below –



As shown in the graph the delay decreases as we increase the segment size because a large value of segment size results in smaller number of packets to be transferred from client to server. This in turn effectively lowers the number of retransmissions in case of packet loss.

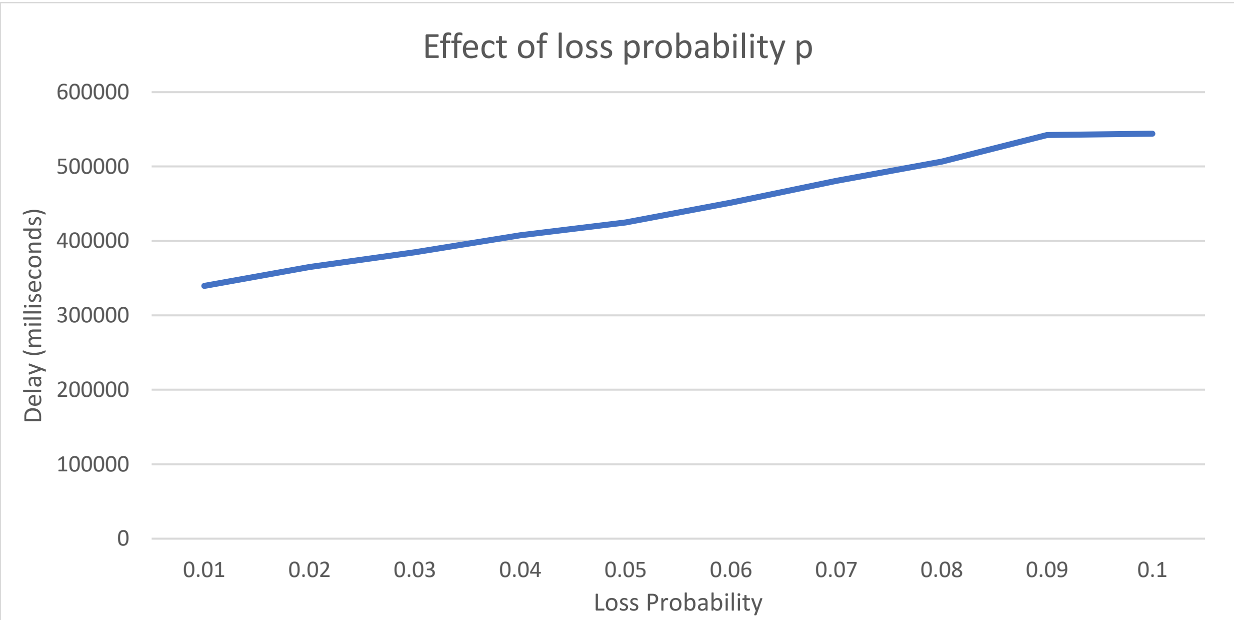
Task 3 – Effect of loss probability p

The readings for the calculation of delay against variation of the loss probability p is as presented in the table below –

Probability	**Reading 1**	**Reading 2**	**Reading 3**	**Reading 4**	**Reading 5**	**Average**
0.01	340641	329630	346519	342490	338920	339640
0.02	356501	378408	361431	358466	369469	364855
0.03	377464	384460	384489	389491	388650	384910.8
0.04	386460	405472	418513	413453	414768	407733.2
0.05	419554	407661	442560	426497	428762	425006.8
0.06	457488	447518	451535	448520	453075	451627.2
0.07	482561	483538	477457	481026	479200	480756.4
0.08	509632	502135	507599	510052	503800	506643.6
0.09	565586	543725	523648	535621	543087	542333.4
0.1	540554	551514	541020	531029	556723	544168

*Delays measured in milliseconds.

Further, a plot of the variation of delay across various loss probabilities is as follows –



The given results show a linear dependency between the delay and the loss probabilities which is expected since more number of packet losses will result in more re-transmissions and hence lead to a higher value of delay for the data transfer.