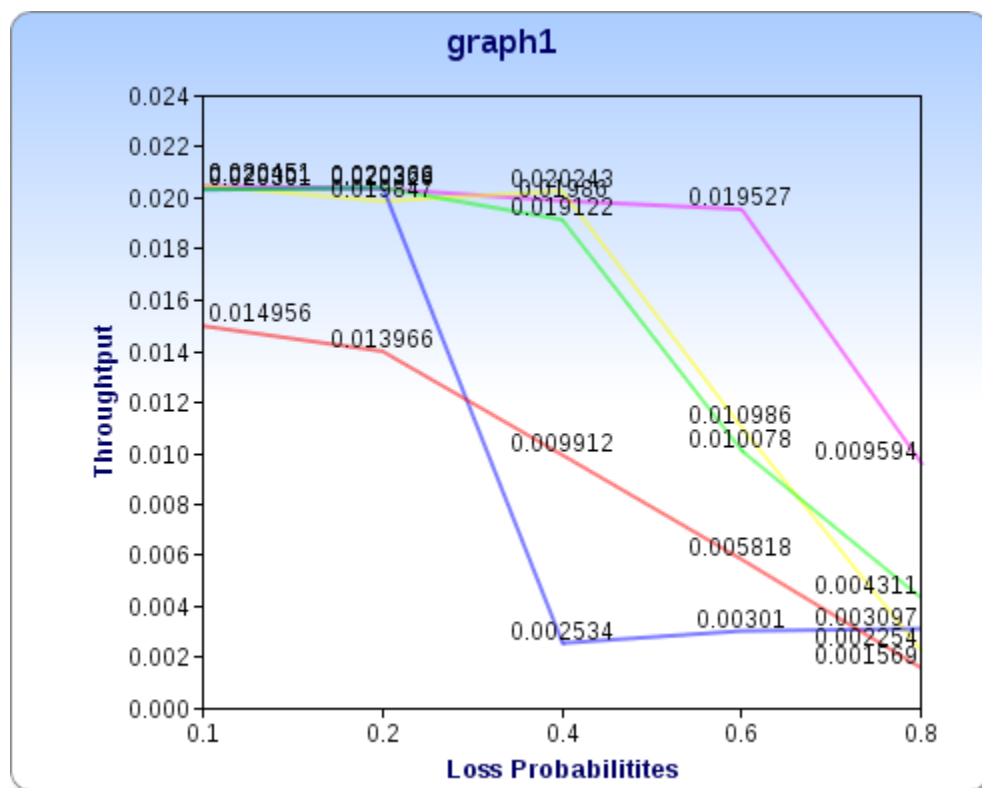


SECTION 4.2

EXPERIMENT 1

Loss Probabilities	ABT	GBN (W=10)	GBN (W=50)	SR (W=10)	SR (W=50)
0.1	0.014956	0.020301	0.020301	0.020451	0.020451
0.2	0.013966	0.020366	0.020366	0.019847	0.020328
0.4	0.009912	0.019122	0.002534	0.020243	0.019860
0.6	0.005818	0.010078	0.003010	0.010986	0.019527
0.8	0.001569	0.004311	0.003097	0.002254	0.009594



With the increase in the loss probability we see that the throughput decreases for every protocol as the losses induce more retransmissions and the loss of time and thus leading in the drop in the overall throughput.

ABT PROTOCOL

ABT : 0.1 LOSS

Protocol : Alternating Bit

1000 of Packets sent from Application Layer of Sender A

1590 of Packets sent from Transport Layer of Sender A

1437 of Packets received at Transport Layer of Receiver B

743 of Packets received at Application Layer of Receiver B

Total Time : 49680.179688 Time Units

Throughput = 0.014956 Packets /time units

ABT : 0.2 LOSS

Protocol : Alternating Bit

1000 of Packets sent from Application Layer of Sender A

1782 of Packets sent from Transport Layer of Sender A

1433 of Packets received at Transport Layer of Receiver B

689 of Packets received at Application Layer of Receiver B

Total Time : 49334.546875 Time Units

Throughput = 0.013966 Packets /time units

ABT : 0.4 LOSS

Protocol : Alternating Bit

1000 of Packets sent from Application Layer of Sender A

2335 of Packets sent from Transport Layer of Sender A

1412 of Packets received at Transport Layer of Receiver B

494 of Packets received at Application Layer of Receiver B

Total Time : 49837.507812 Time Units

Throughput = 0.009912 Packets /time units

ABT : 0.6 LOSS

Protocol : Alternating Bit

1000 of Packets sent from Application Layer of Sender A

2712 of Packets sent from Transport Layer of Sender A

1108 of Packets received at Transport Layer of Receiver B

285 of Packets received at Application Layer of Receiver B

Total Time : 48985.839844 Time Units

Throughput = 0.005818 Packets /time units

ABT : 0.8 LOSS

Protocol : Alternating Bit

1000 of Packets sent from Application Layer of Sender A

3209 of Packets sent from Transport Layer of Sender A

629 of Packets received at Transport Layer of Receiver B

79 of Packets received at Application Layer of Receiver B

Total Time : 50359.699219 Time Units

Throughput = 0.001569 Packets /time units

GBN PROTOCOL

WINDOW=10

GBN : 0.1 LOSS

Protocol : Go-Back N
1000 of Packets sent from Application Layer of Sender A
1949 of Packets sent from Transport Layer of Sender A
1777 of Packets received at Transport Layer of Receiver B
998 of Packets received at Application Layer of Receiver B
Total Time : 49159.992188 Time Units
Throughput = 0.020301 Packets /time units

GBN : 0.2 LOSS

Protocol : Go-Back N
1000 of Packets sent from Application Layer of Sender A
2986 of Packets sent from Transport Layer of Sender A
2389 of Packets received at Transport Layer of Receiver B
996 of Packets received at Application Layer of Receiver B
Total Time : 48905.929688 Time Units
Throughput = 0.020366 Packets /time units

GBN : 0.4 LOSS

Protocol : Go-Back N
1000 of Packets sent from Application Layer of Sender A
10387 of Packets sent from Transport Layer of Sender A
6269 of Packets received at Transport Layer of Receiver B
971 of Packets received at Application Layer of Receiver B
Total Time : 50779.628906 Time Units
Throughput = 0.019122 Packets /time units

GBN : 0.6 LOSS

Protocol : Go-Back N
1000 of Packets sent from Application Layer of Sender A
11412 of Packets sent from Transport Layer of Sender A
4612 of Packets received at Transport Layer of Receiver B
502 of Packets received at Application Layer of Receiver B
Total Time : 49813.636719 Time Units
Throughput = 0.010078 Packets /time units

GBN : 0.8 LOSS

Protocol : Go-Back N
1000 of Packets sent from Application Layer of Sender A
12404 of Packets sent from Transport Layer of Sender A
2443 of Packets received at Transport Layer of Receiver B
221 of Packets received at Application Layer of Receiver B
Total Time : 51268.691406 Time Units
Throughput = 0.004311 Packets /time units

WINDOW=50

GBN : 0.1 LOSS

1000 of Packets sent from Application Layer of Sender A
1949 of Packets sent from Transport Layer of Sender A
1777 of Packets received at Transport Layer of Receiver B
998 of Packets received at Application Layer of Receiver B
Total Time : 49159.992188 Time Units
Throughput = 0.020301 Packets /time units

GBN : 0.2 LOSS

Protocol : Go-Back N
1000 of Packets sent from Application Layer of Sender A
2986 of Packets sent from Transport Layer of Sender A
2389 of Packets received at Transport Layer of Receiver B
996 of Packets received at Application Layer of Receiver B
Total Time : 48905.929688 Time Units
Throughput = 0.020366 Packets /time units

GBN : 0.4 LOSS

Protocol : Go-Back N
1000 of Packets sent from Application Layer of Sender A
56597 of Packets sent from Transport Layer of Sender A
8702 of Packets received at Transport Layer of Receiver B
125 of Packets received at Application Layer of Receiver B
Total Time : 49330.167969 Time Units
Throughput = 0.002534 Packets /time units

GBN : 0.6 LOSS

Protocol : Go-Back N
1000 of Packets sent from Application Layer of Sender A
57120 of Packets sent from Transport Layer of Sender A
8879 of Packets received at Transport Layer of Receiver B
150 of Packets received at Application Layer of Receiver B
Total Time : 49826.582031 Time Units
Throughput = 0.003010 Packets /time units

GBN : 0.8 LOSS

Protocol : Go-Back N
1000 of Packets sent from Application Layer of Sender A
58944 of Packets sent from Transport Layer of Sender A
9060 of Packets received at Transport Layer of Receiver B
159 of Packets received at Application Layer of Receiver B

Total Time : 51335.406250 Time Units
Throughput = 0.003097 Packets /time units

SR PROTOCOL

WINDOW=10

SR : 0.1 LOSS

Protocol : Selective Repeat
1000 of Packets sent from Application Layer of Sender A
1923 of Packets sent from Transport Layer of Sender A
1737 of Packets received at Transport Layer of Receiver B
999 of Packets sent at Application Layer of Receiver B
Total Time : 48848.550781 Time Units
Throughput = 0.020451 Packets /time units

SR : 0.2 LOSS

Protocol : Selective Repeat
1000 of Packets sent from Application Layer of Sender A
2399 of Packets sent from Transport Layer of Sender A
1963 of Packets received at Transport Layer of Receiver B
999 of Packets sent at Application Layer of Receiver B
Total Time : 50335.031250 Time Units
Throughput = 0.019847 Packets /time units

SR : 0.4 LOSS

Protocol : Selective Repeat
1000 of Packets sent from Application Layer of Sender A
4470 of Packets sent from Transport Layer of Sender A
2703 of Packets received at Transport Layer of Receiver B
995 of Packets sent at Application Layer of Receiver B
Total Time : 49151.765625 Time Units
Throughput = 0.020243 Packets /time units

SR : 0.6 LOSS

Protocol : Selective Repeat
1000 of Packets sent from Application Layer of Sender A
5647 of Packets sent from Transport Layer of Sender A
2283 of Packets received at Transport Layer of Receiver B
555 of Packets sent at Application Layer of Receiver B
Total Time : 50520.597656 Time Units
Throughput = 0.010986 Packets /time units

SR : 0.8 LOSS

Protocol : Selective Repeat
1000 of Packets sent from Application Layer of Sender A
5062 of Packets sent from Transport Layer of Sender A
1012 of Packets received at Transport Layer of Receiver B
114 of Packets sent at Application Layer of Receiver B
Total Time : 50586.042969 Time Units
Throughput = 0.002254 Packets /time units

WINDOW=50

SR : 0.1 LOSS

Protocol : Selective Repeat
1000 of Packets sent from Application Layer of Sender A
1923 of Packets sent from Transport Layer of Sender A
1737 of Packets received at Transport Layer of Receiver B
999 of Packets sent at Application Layer of Receiver B
Total Time : 48848.550781 Time Units
Throughput = 0.020451 Packets /time units

SR : 0.2 LOSS

Protocol : Selective Repeat
1000 of Packets sent from Application Layer of Sender A
2376 of Packets sent from Transport Layer of Sender A
1934 of Packets received at Transport Layer of Receiver B
998 of Packets sent at Application Layer of Receiver B
Total Time : 49095.691406 Time Units
Throughput = 0.020328 Packets /time units

SR : 0.4 LOSS

Protocol : Selective Repeat
1000 of Packets sent from Application Layer of Sender A
4506 of Packets sent from Transport Layer of Sender A
2728 of Packets received at Transport Layer of Receiver B
999 of Packets sent at Application Layer of Receiver B
Total Time : 50300.984375 Time Units
Throughput = 0.019860 Packets /time units

SR : 0.6 LOSS

Protocol : Selective Repeat
1000 of Packets sent from Application Layer of Sender A
9784 of Packets sent from Transport Layer of Sender A
3939 of Packets received at Transport Layer of Receiver B
991 of Packets sent at Application Layer of Receiver B
Total Time : 50749.519531 Time Units
Throughput = 0.019527 Packets /time units

SR : 0.8 LOSS

Protocol : Selective Repeat

1000 of Packets sent from Application Layer of Sender A

19334 of Packets sent from Transport Layer of Sender A

3847 of Packets received at Transport Layer of Receiver B

486 of Packets sent at Application Layer of Receiver B

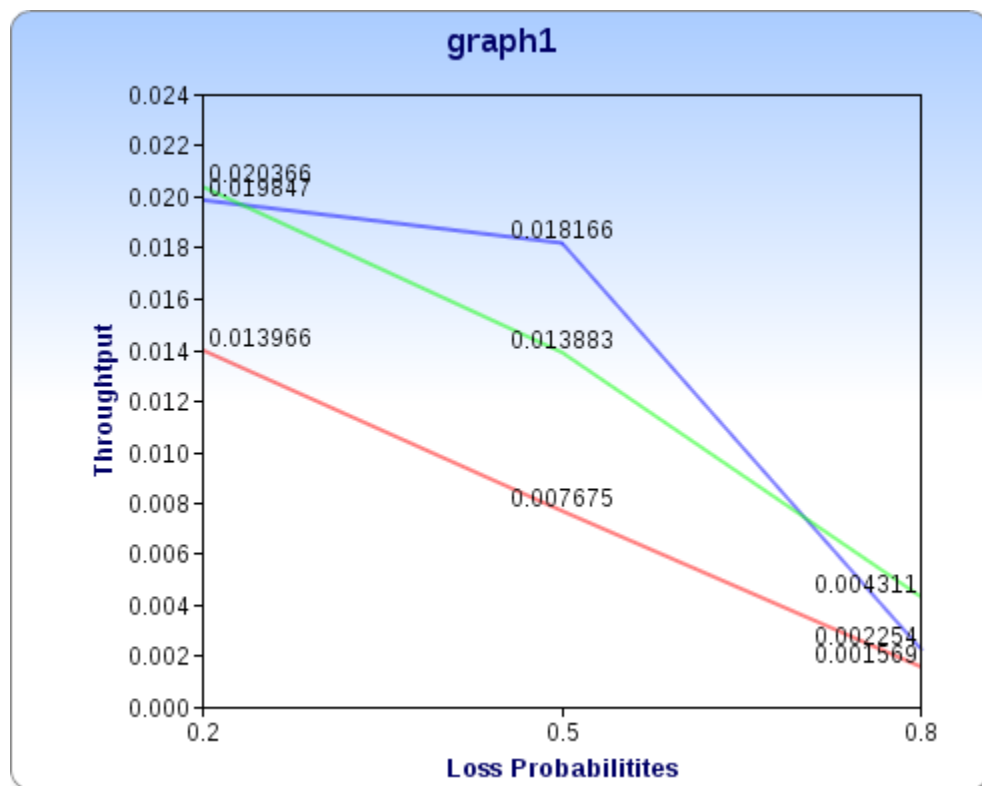
Total Time : 50659.257812 Time Units

Throughput = 0.009594 Packets /time units

EXPERIMENT 2

WINDOW=10

Loss Probabilities	ABT	GBN	SR
0.2	0.013966	0.020366	0.019847
0.5	0.007675	0.013883	0.018166
0.8	0.001569	0.004311	0.002254



For ABT Protocol the window size does not matter.
Both GBN and SR get affected in their throughput.

ABT : 0.2 LOSS

Protocol : Alternating Bit
1000 of Packets sent from Application Layer of Sender A
1782 of Packets sent from Transport Layer of Sender A
1433 of Packets received at Transport Layer of Receiver B
689 of Packets received at Application Layer of Receiver B
Total Time : 49334.546875 Time Units
Throughput = 0.013966 Packets /time units

ABT : 0.5 LOSS

Protocol : Alternating Bit
1000 of Packets sent from Application Layer of Sender A
2609 of Packets sent from Transport Layer of Sender A
1305 of Packets received at Transport Layer of Receiver B
387 of Packets received at Application Layer of Receiver B
Total Time : 50424.679688 Time Units
Throughput = 0.007675 Packets /time units

ABT : 0.8 LOSS

Protocol : Alternating Bit
1000 of Packets sent from Application Layer of Sender A
3209 of Packets sent from Transport Layer of Sender A
629 of Packets received at Transport Layer of Receiver B
79 of Packets received at Application Layer of Receiver B
Total Time : 50359.699219 Time Units
Throughput = 0.001569 Packets /time units

GBN : 0.2 LOSS

Protocol : Go-Back N
1000 of Packets sent from Application Layer of Sender A
2986 of Packets sent from Transport Layer of Sender A
2389 of Packets received at Transport Layer of Receiver B
996 of Packets received at Application Layer of Receiver B
Total Time : 48905.929688 Time Units
Throughput = 0.020366 Packets /time units

GBN : 0.5 LOSS

Protocol : Go-Back N
1000 of Packets sent from Application Layer of Sender A
10910 of Packets sent from Transport Layer of Sender A
5459 of Packets received at Transport Layer of Receiver B

689 of Packets received at Application Layer of Receiver B
Total Time : 49630.414062 Time Units
Throughput = 0.013883 Packets /time units
Simulator terminated at time 49630.414062
after sending 1000 msgs from layer5

GBN : 0.8 LOSS

Protocol : Go-Back N
1000 of Packets sent from Application Layer of Sender A
12404 of Packets sent from Transport Layer of Sender A
2443 of Packets received at Transport Layer of Receiver B
221 of Packets received at Application Layer of Receiver B
Total Time : 51268.691406 Time Units
Throughput = 0.004311 Packets /time units

SR : 0.2 LOSS

Protocol : Selective Repeat
1000 of Packets sent from Application Layer of Sender A
2399 of Packets sent from Transport Layer of Sender A
1963 of Packets received at Transport Layer of Receiver B
999 of Packets sent at Application Layer of Receiver B
Total Time : 50335.031250 Time Units
Throughput = 0.019847 Packets /time units

SR : 0.5 LOSS

Protocol : Selective Repeat
1000 of Packets sent from Application Layer of Sender A
5947 of Packets sent from Transport Layer of Sender A
2997 of Packets received at Transport Layer of Receiver B
900 of Packets sent at Application Layer of Receiver B
Total Time : 49543.441406 Time Units
Throughput = 0.018166 Packets /time units

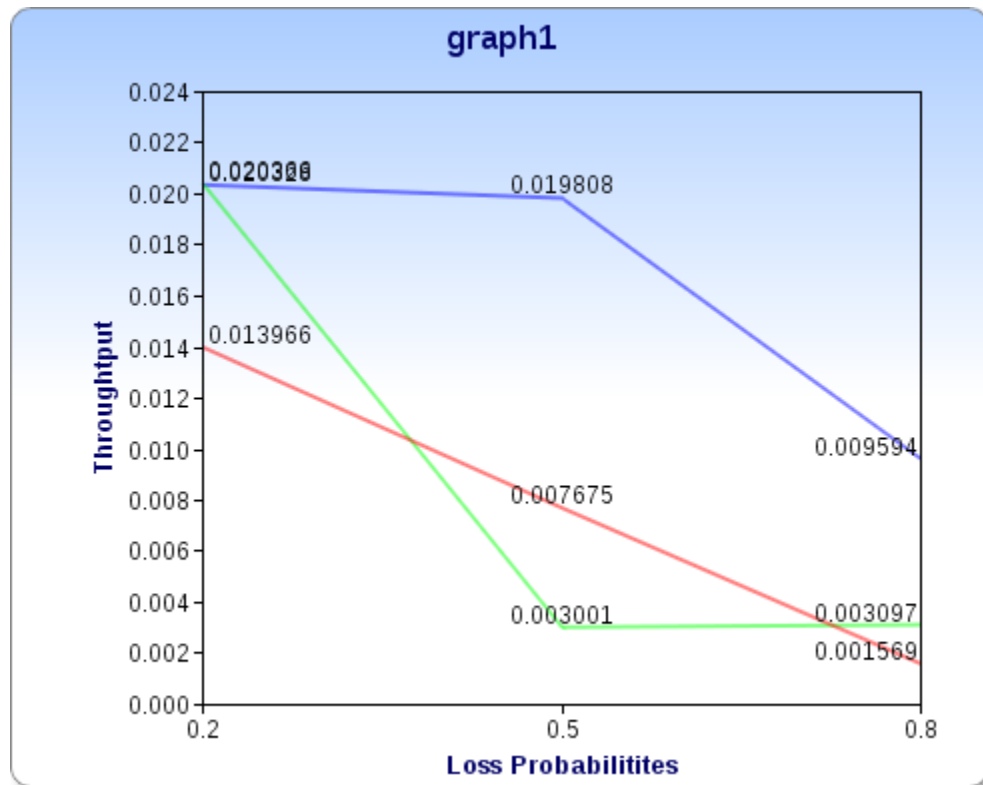
SR : 0.8 LOSS

Protocol : Selective Repeat
1000 of Packets sent from Application Layer of Sender A
5062 of Packets sent from Transport Layer of Sender A
1012 of Packets received at Transport Layer of Receiver B
114 of Packets sent at Application Layer of Receiver B
Total Time : 50586.042969 Time Units
Throughput = 0.002254 Packets /time units

WINDOW=50

Loss Probabilities	ABT	GBN	SR
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0.2	0.013966	0.020366	0.020328
0.5	0.007675	0.003001	0.019808
0.8	0.001569	0.003097	0.009594



GBN : 0.2 LOSS

Protocol : Go-Back N

1000 of Packets sent from Application Layer of Sender A

2986 of Packets sent from Transport Layer of Sender A

2389 of Packets received at Transport Layer of Receiver B

996 of Packets received at Application Layer of Receiver B

Total Time : 48905.929688 Time Units

Throughput = 0.020366 Packets /time units

GBN : 0.5 LOSS

Protocol : Go-Back N

1000 of Packets sent from Application Layer of Sender A

58299 of Packets sent from Transport Layer of Sender A

9030 of Packets received at Transport Layer of Receiver B

154 of Packets received at Application Layer of Receiver B

Total Time : 51309.468750 Time Units

Throughput = 0.003001 Packets /time units

GBN : 0.8 LOSS

Protocol : Go-Back N

1000 of Packets sent from Application Layer of Sender A
58944 of Packets sent from Transport Layer of Sender A
9060 of Packets received at Transport Layer of Receiver B
159 of Packets received at Application Layer of Receiver B
Total Time : 51335.406250 Time Units
Throughput = 0.003097 Packets /time units

SR : 0.2 LOSS

Protocol : Selective Repeat

1000 of Packets sent from Application Layer of Sender A
2376 of Packets sent from Transport Layer of Sender A
1934 of Packets received at Transport Layer of Receiver B
998 of Packets sent at Application Layer of Receiver B
Total Time : 49095.691406 Time Units
Throughput = 0.020328 Packets /time units

SR : 0.5 LOSS

Protocol : Selective Repeat

1000 of Packets sent from Application Layer of Sender A
6249 of Packets sent from Transport Layer of Sender A
3127 of Packets received at Transport Layer of Receiver B
999 of Packets sent at Application Layer of Receiver B
Total Time : 50434.753906 Time Units
Throughput = 0.019808 Packets /time units

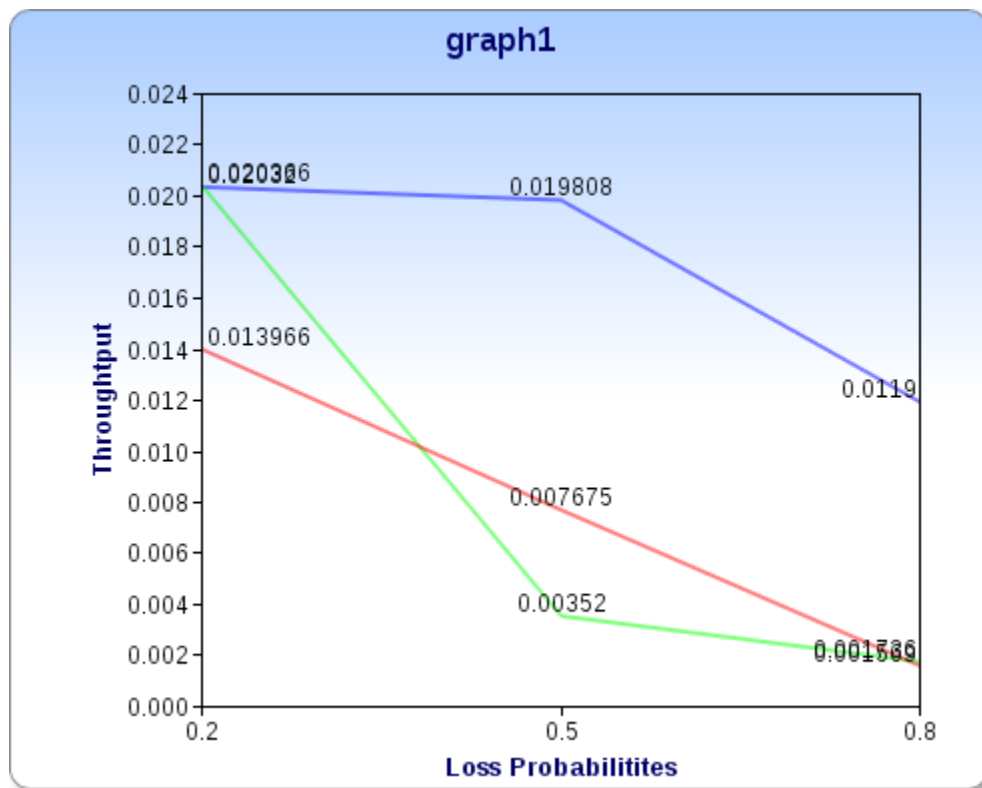
SR : 0.8 LOSS

Protocol : Selective Repeat

1000 of Packets sent from Application Layer of Sender A
19334 of Packets sent from Transport Layer of Sender A
3847 of Packets received at Transport Layer of Receiver B
486 of Packets sent at Application Layer of Receiver B
Total Time : 50659.257812 Time Units
Throughput = 0.009594 Packets /time units

WINDOW=100

Loss Probabilities	ABT	GBN	SR
0.2	0.013966	0.020366	0.02032
0.5	0.007675	0.003520	0.019808
0.8	0.001569	0.001736	0.011900



GBN : 0.2 LOSS

Protocol : Go-Back N

1000 of Packets sent from Application Layer of Sender A

2986 of Packets sent from Transport Layer of Sender A

2389 of Packets received at Transport Layer of Receiver B

996 of Packets received at Application Layer of Receiver B

Total Time : 48905.929688 Time Units

Throughput = 0.020366 Packets /time units

GBN : 0.5 LOSS

Protocol : Go-Back N

1000 of Packets sent from Application Layer of Sender A

108776 of Packets sent from Transport Layer of Sender A

8827 of Packets received at Transport Layer of Receiver B

177 of Packets received at Application Layer of Receiver B

Total Time : 50279.703125 Time Units

Throughput = 0.003520 Packets /time units

GBN : 0.8 LOSS

Protocol : Go-Back N
 1000 of Packets sent from Application Layer of Sender A
 115807 of Packets sent from Transport Layer of Sender A
 8971 of Packets received at Transport Layer of Receiver B
 88 of Packets received at Application Layer of Receiver B
 Total Time : 50696.894531 Time Units
 Throughput = 0.001736 Packets /time units

SR: 0.2 LOSS

Protocol : Selective Repeat
 1000 of Packets sent from Application Layer of Sender A
 2376 of Packets sent from Transport Layer of Sender A
 1934 of Packets received at Transport Layer of Receiver B
 998 of Packets sent at Application Layer of Receiver B
 Total Time : 49095.691406 Time Units
 Throughput = 0.020328 Packets /time units

SR: 0.5 LOSS

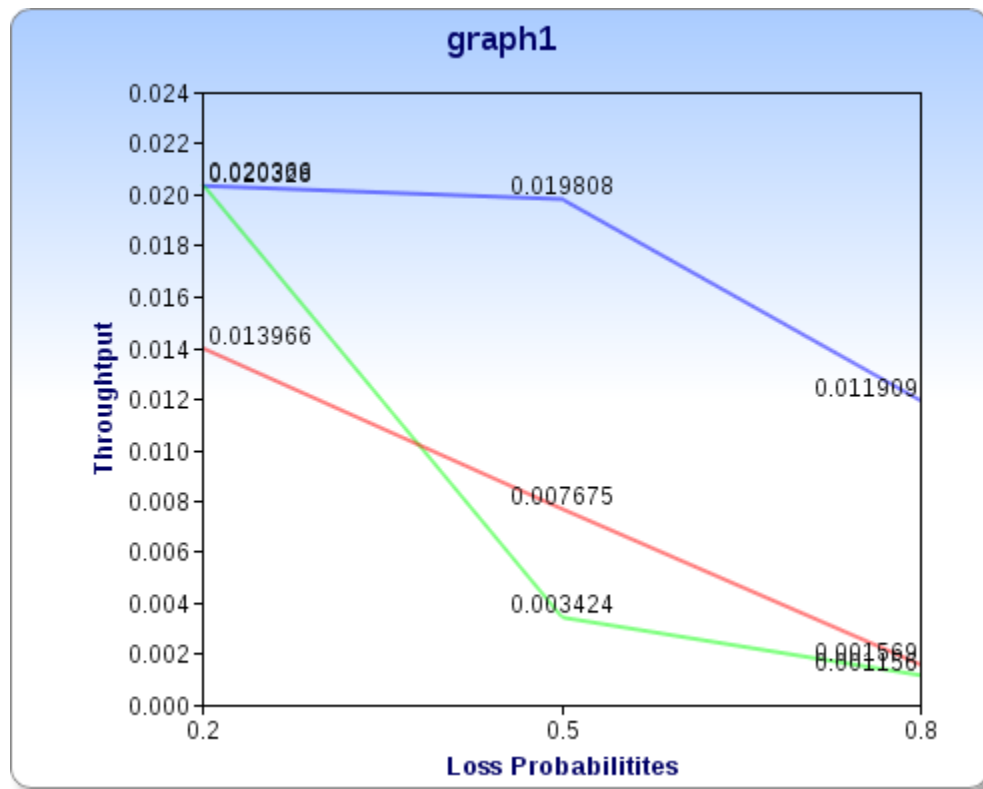
Protocol : Selective Repeat
 1000 of Packets sent from Application Layer of Sender A
 6249 of Packets sent from Transport Layer of Sender A
 3127 of Packets received at Transport Layer of Receiver B
 999 of Packets sent at Application Layer of Receiver B
 Total Time : 50434.753906 Time Units
 Throughput = 0.019808 Packets /time units

SR: 0.8 LOSS

Protocol : Selective Repeat
 1000 of Packets sent from Application Layer of Sender A
 53902 of Packets sent from Transport Layer of Sender A
 8082 of Packets received at Transport Layer of Receiver B
 588 of Packets sent at Application Layer of Receiver B
 Total Time : 49411.121094 Time Units
 Throughput = 0.011900 Packets /time units

WINDOW=200

Loss Probabilities	ABT	GBN	SR
0.2	0.013966	0.020366	0.020328
0.5	0.007675	0.003424	0.019808
0.8	0.001569	0.001156	0.011909



GBN : 0.2 LOSS

Protocol : Go-Back N

1000 of Packets sent from Application Layer of Sender A

2986 of Packets sent from Transport Layer of Sender A

2389 of Packets received at Transport Layer of Receiver B

996 of Packets received at Application Layer of Receiver B

Total Time : 48905.929688 Time Units

Throughput = 0.020366 Packets /time units

GBN: 0.5 LOSS

Protocol : Go-Back N

1000 of Packets sent from Application Layer of Sender A

200328 of Packets sent from Transport Layer of Sender A

8773 of Packets received at Transport Layer of Receiver B

171 of Packets received at Application Layer of Receiver B

Total Time : 49937.953125 Time Units

Throughput = 0.003424 Packets /time units

GBN: 0.8 LOSS

Protocol : Go-Back N
 1000 of Packets sent from Application Layer of Sender A
 218512 of Packets sent from Transport Layer of Sender A
 8858 of Packets received at Transport Layer of Receiver B
 58 of Packets received at Application Layer of Receiver B
 Total Time : 50165.925781 Time Units
 Throughput = 0.001156 Packets /time units

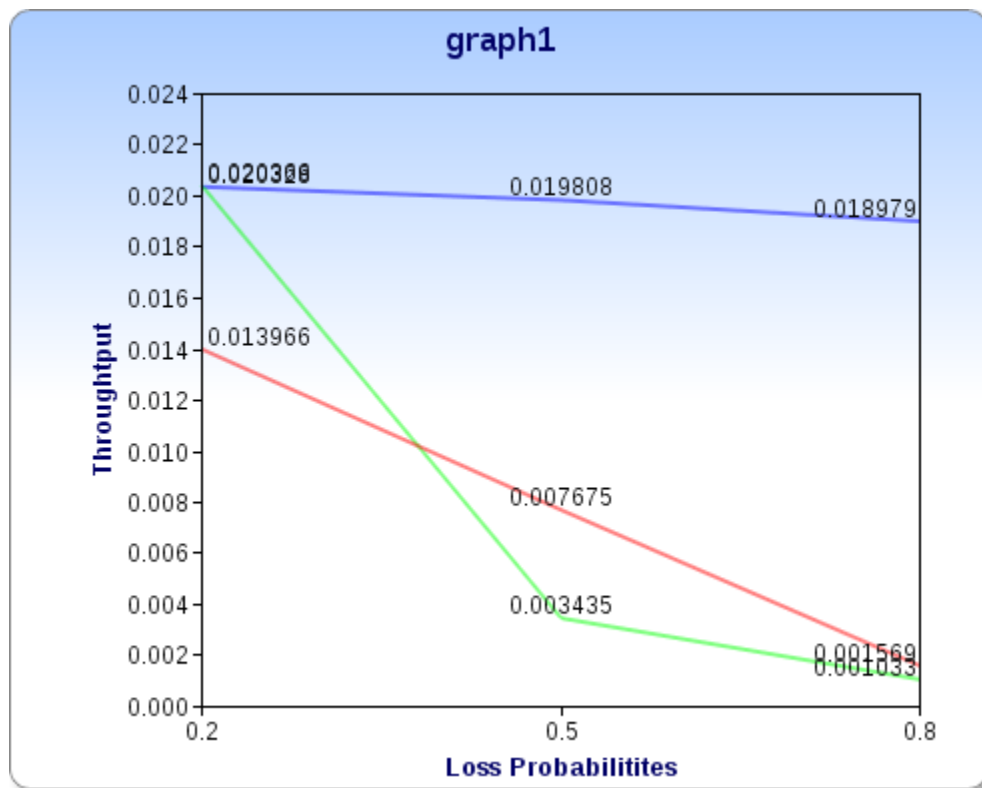
SR: 0.2 LOSS
 Protocol : Selective Repeat
 1000 of Packets sent from Application Layer of Sender A
 2376 of Packets sent from Transport Layer of Sender A
 1934 of Packets received at Transport Layer of Receiver B
 998 of Packets sent at Application Layer of Receiver B
 Total Time : 49095.691406 Time Units
 Throughput = 0.020328 Packets /time units

SR: 0.5 LOSS
 Protocol : Selective Repeat
 1000 of Packets sent from Application Layer of Sender A
 6249 of Packets sent from Transport Layer of Sender A
 3127 of Packets received at Transport Layer of Receiver B
 999 of Packets sent at Application Layer of Receiver B
 Total Time : 50434.753906 Time Units
 Throughput = 0.019808 Packets /time units

SR: 0.8 LOSS
 Protocol : Selective Repeat
 1000 of Packets sent from Application Layer of Sender A
 89291 of Packets sent from Transport Layer of Sender A
 8403 of Packets received at Transport Layer of Receiver B
 585 of Packets sent at Application Layer of Receiver B
 Total Time : 49121.359375 Time Units
 Throughput = 0.011909 Packets /time units

WINDOW=500

Loss Probabilities	ABT	GBN	SR
0.2	0.013966	0.020366	0.020328
0.5	0.007675	0.003435	0.019808
0.8	0.001569	0.001033	0.018979



GBN: 0.2 LOSS

Protocol : Go-Back N

1000 of Packets sent from Application Layer of Sender A

2986 of Packets sent from Transport Layer of Sender A

2389 of Packets received at Transport Layer of Receiver B

996 of Packets received at Application Layer of Receiver B

Total Time : 48905.929688 Time Units

Throughput = 0.020366 Packets /time units

GBN: 0.5 LOSS

Protocol : Go-Back N

1000 of Packets sent from Application Layer of Sender A

388827 of Packets sent from Transport Layer of Sender A

8743 of Packets received at Transport Layer of Receiver B

171 of Packets received at Application Layer of Receiver B

Total Time : 49774.929688 Time Units

Throughput = 0.003435 Packets /time units

GBN: 0.8 LOSS

Protocol : Go-Back N

1000 of Packets sent from Application Layer of Sender A

462981 of Packets sent from Transport Layer of Sender A

9068 of Packets received at Transport Layer of Receiver B

53 of Packets received at Application Layer of Receiver B

Total Time : 51290.968750 Time Units

Throughput = 0.001033 Packets /time units

SR: 0.2 LOSS

Protocol : Selective Repeat

1000 of Packets sent from Application Layer of Sender A

2376 of Packets sent from Transport Layer of Sender A

1934 of Packets received at Transport Layer of Receiver B

998 of Packets sent at Application Layer of Receiver B

Total Time : 49095.691406 Time Units

Throughput = 0.020328 Packets /time units

SR: 0.5 LOSS

Protocol : Selective Repeat

1000 of Packets sent from Application Layer of Sender A

6249 of Packets sent from Transport Layer of Sender A

3127 of Packets received at Transport Layer of Receiver B

999 of Packets sent at Application Layer of Receiver B

Total Time : 50434.753906 Time Units

Throughput = 0.019808 Packets /time units

SR: 0.8 LOSS

Protocol : Selective Repeat

1000 of Packets sent from Application Layer of Sender A

41012 of Packets sent from Transport Layer of Sender A

8163 of Packets received at Transport Layer of Receiver B

989 of Packets sent at Application Layer of Receiver B

Total Time : 52110.531250 Time Units

Throughput = 0.018979 Packets /time units

INFERENCE :

I expected the increase in the throughput by increase in the window size as more the more window more packets can be sent so the time taken would be less.

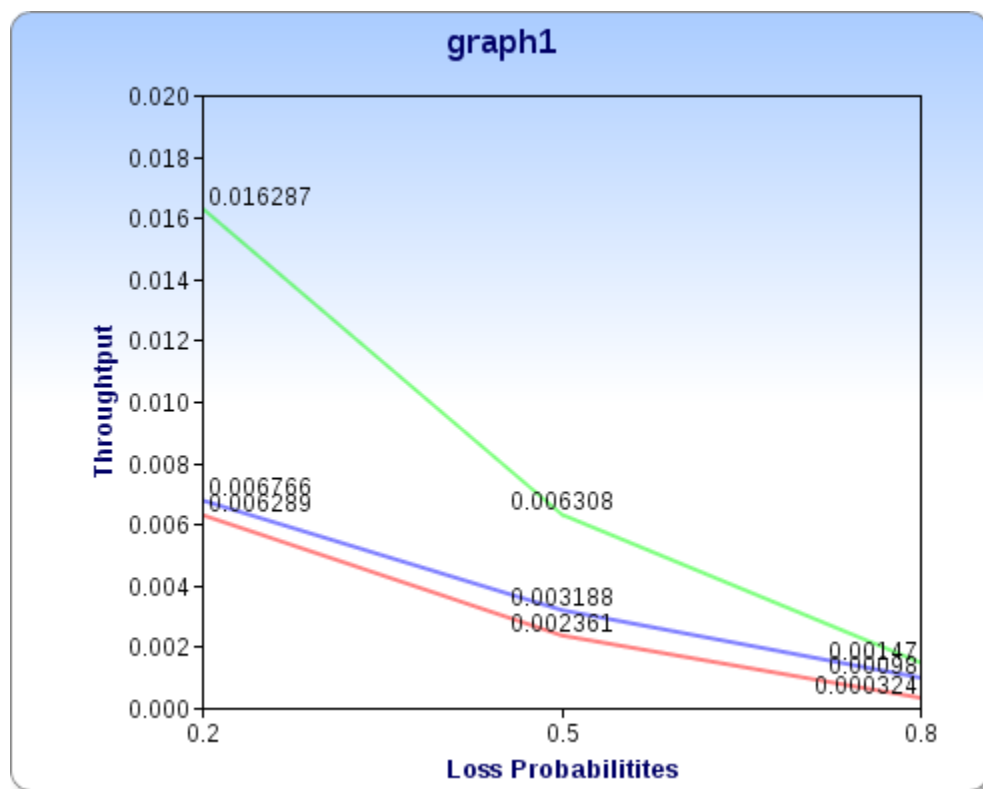
From the observatons GBN and SR both do not seem to get affected by the change in the window size as the throughput at size 10 is almost the same as at size 500 keeping the loss probability constant.

This may be due to the overhead caused by retransmitting all the packets in the window in case of GBN which leads to unnecessary congestion in the network. Also if the incoming packets do not reach the window size due to less rate then it might lead to all the window sizes behaving the same way.

Effect of increased timeout (40 to 100 for GBN and SR and 15 to 75 for ABT):

WINDOW 50

Loss Probabilities	ABT	GBN	SR
0.2	0.006289	0.016287	0.006766
0.5	0.002361	0.006308	0.003188
0.8	0.000324	0.001470	0.000980



We see that the throughput decreases with the increase in the timeout.

