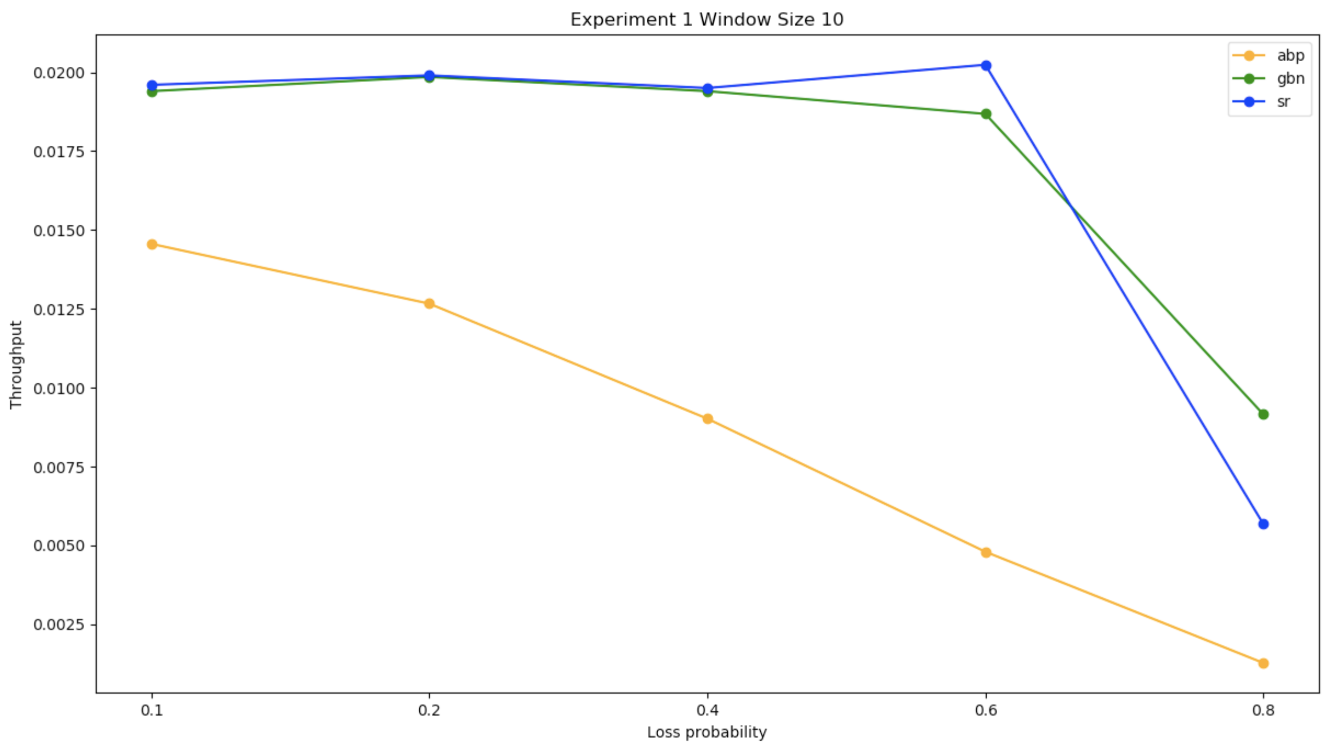
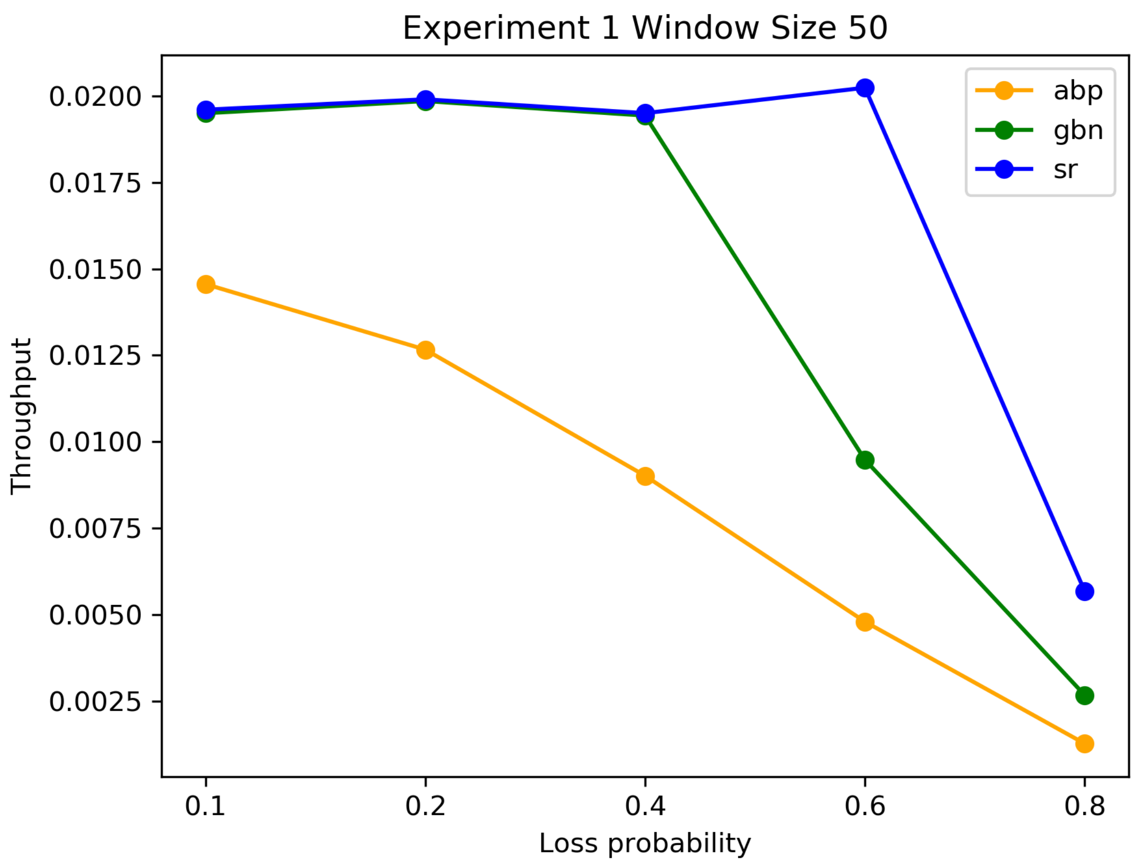
Experiment 1:

We obtain the graph as mentioned below for window size 10. The graph shows the variation in throughput with change in loss probability.



The graph for window size 50 is shown below:



We observe from the graph that the throughput is around 0.02 for both Go Back N and Selective Repeat protocols for loss probabilities ranging from 0.2 to 0.4. At 0.6, it decreases drastically for GBN for window size 50 and decreases slightly for window size 10. On the other hand, for selective repeat it remains the same at around 0.02. This shows that selective repeat is more robust for change in loss probabilities and window sizes compared to go back n. Also, for larger window size of 50, selective repeat performs better when compared to go back N on channels which are less reliable and gives better throughput for loss probabilities of 0.6 and 0.8.

We also notice that the Alternating Bit Protocol performs the worst among the three protocols and has the lowest throughput for loss probabilities ranging from 0.1 to 0.8. The main reason being that alternating bit protocol is a stop and wait protocol. It sends a new packet to the receiver once it receives acknowledgment for the older packet or there is a timeout. This directly leads to a lower throughput since time taken for 10 packets to reach from A to receiver B is 10 RTTs. In Go back N and selective repeat, the sender sends packets which lie within the window size even though it might not have received acknowledgment from the previous packet. This explains the higher throughput for Go Back N and Selective Repeat compared to Alternating Bit Protocol.

Also, the reason for a drastic decrease in throughput for loss probability 0.8 from 0.6 is mainly due to the fact that there is a lot of packet loss in the channel and it takes a lot more packets to be sent from sender A to make sure that packets are delivered to B and are not lost in the medium. This leads to a decrease in overall throughput.

Example simulation results for selective repeat protocol is given below:

Input:
Enter the number of messages to simulate: 1000
Enter packet loss probability [enter 0.0 for no loss]:0.6
Enter packet corruption probability [0.0 for no corruption]:0.2
Enter average time between messages from sender's layer5 [> 0.0]:50
Enter TRACE:2

Output:

Simulation Results:
Protocol: Selective Repeat
1000 of packets sent from the Application Layer of Sender A
9191 of packets sent from the Transport Layer of Sender A
3815 packets received at the Transport layer
998 packets received at the Application layer
Total time: 49321.230469 time units
Throughput = 0.020235 packets/time units

Example simulation results for Go back n protocol:

Input:
window size 10, timeout 10.0
Enter the number of messages to simulate: 1000
Enter packet loss probability [enter 0.0 for no loss]:0.1
Enter packet corruption probability [0.0 for no corruption]:0.2
Enter average time between messages from sender's layer5 [> 0.0]:50
Enter TRACE:2

Simulation Results:
Protocol: Go-Back-N
1000 of packets sent from the Application Layer of Sender A
2628 of packets sent from the Transport Layer of Sender A
2375 packets received at the Transport layer
999 packets received at the Application layer
Total time: 50696.601562 time units
Throughput = 0.019705 packets/time units

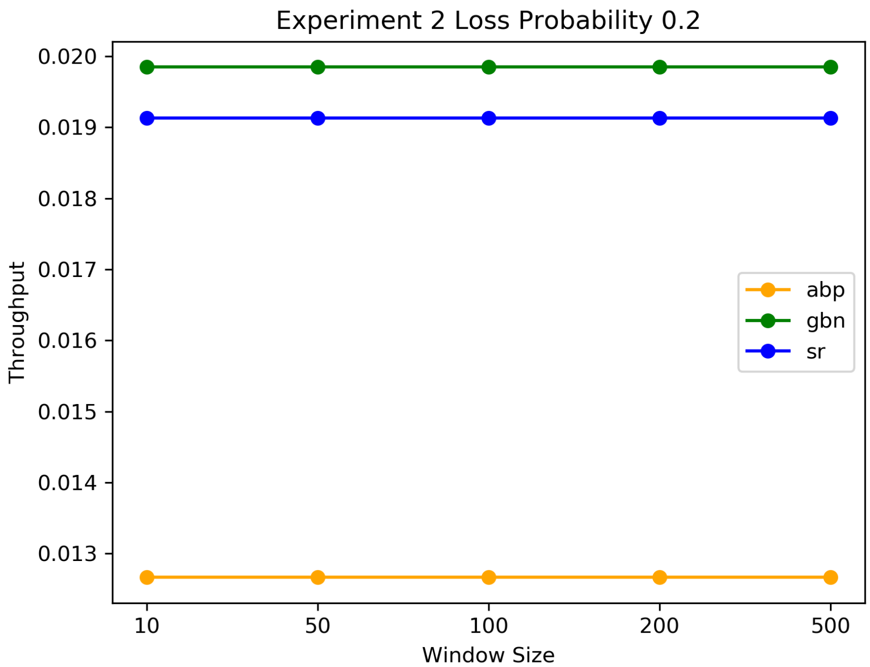
Example simulation results for Alternating Bit protocol:

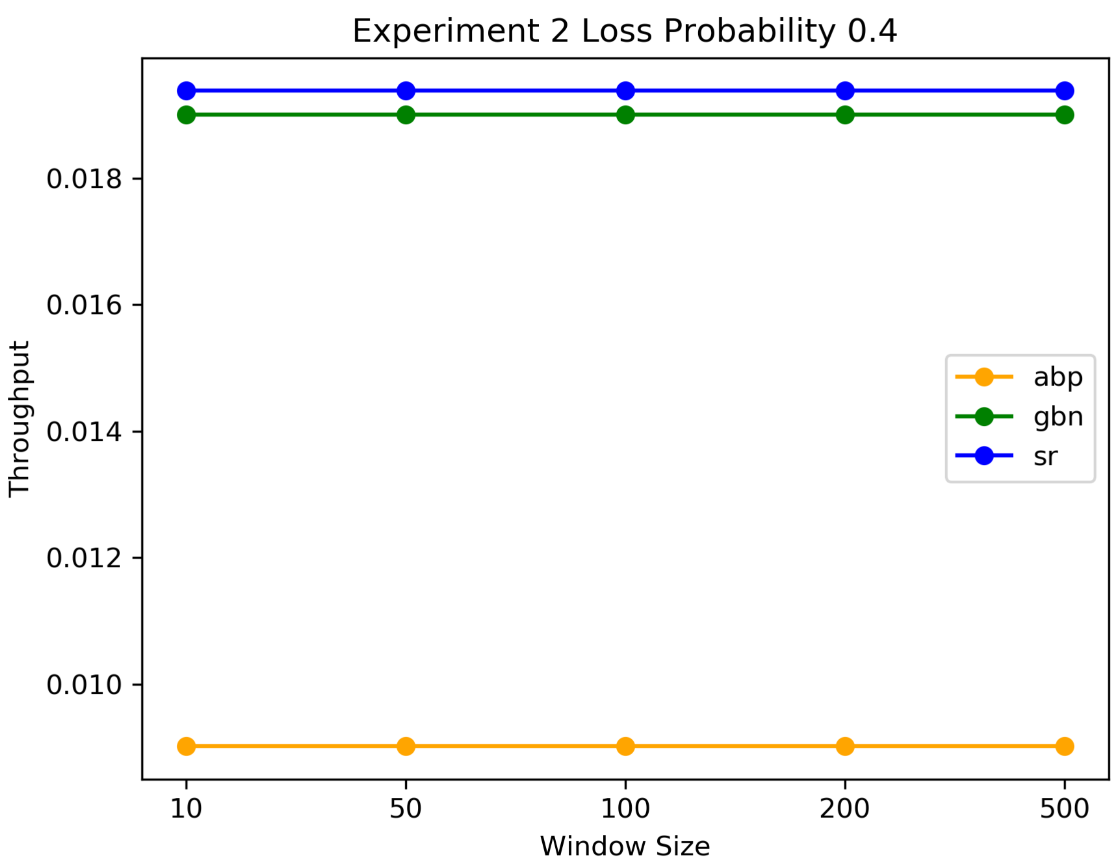
Input:
Enter the number of messages to simulate: 1000
Enter packet loss probability [enter 0.0 for no loss]:0.1
Enter packet corruption probability [0.0 for no corruption]:0.2
Enter average time between messages from sender's layer5 [> 0.0]:50
Enter TRACE:2

Output:
Simulation Results:
Protocol: Alternating Bit Protocol
484 of packets sent from the Application Layer of Sender A
917 of packets sent from the Transport Layer of Sender A
1245 packets received at the Transport layer
381 packets received at the Application layer
Total time: 51098.773438 time units
Throughput = 0.007456 packets/time units

Experiment 2:

We obtain the graphs as shown below:


Experiment 2 Loss Probability 0.2
0.020
0.019
0.018
0.017
0.016
0.015
0.014
0.013
Throughput
abp
gbn
sr
10
50
100
200
500
Window Size


Experiment 2 Loss Probability 0.4
0.018
0.016
0.014
0.012
0.010
Throughput
abp
gbn
sr
10
50
100
200
500
Window Size

We observe that for loss probability of 0.2 and 0.4, the throughput remains the same with selective repeat and go back n protocols having similar throughputs lying between 0.019 and 0.02. The alternating bit protocol has a much lower throughput of around 0.12 for loss probablity 0.2 and 0.09 for loss probability of 0.4.

This makes sense and is expected as for loss probabilties of 0.2 and 0.4 which are considered low, the change in window size will not impact the throughput much since the packets are coming to A at the rate of 1 packet every 50 timeunits. Now, the medium has sufficient bandwidth to transfer the packets at a rate such that the window is underutilized for higher windows since the medium is transferring packets at a speed which is higher than the rate at which packets are being received at A.

I feel that if the mean time of 50 between messages arrivals at A is reduced to a very low value (say) 5, then we will observe a benefit of using very big window sizes like 100 to 500.