Analysis_Assignment2

I have read and understood the course academic integrity policy.

- **Brief description of the timeout scheme you used in your protocol implementation and why you chose that scheme.**

  The static timing scheme has been implemented, the timeout has been set to 11 time units as the average RTT of the simulation environment is 10 and the 1 time unit has been given to compensate any delayed packets based on heuristics to maximize throughput in ABT and SR.

  In GBN the timeout is set to 1.5RTT to ensure that not sending too many duplicate packets in case of ack delays.

- **Brief description (including references to the corresponding variables and data structures in your code) of how you implemented multiple software timers in SR using a single hardware timer.**

  Each individual timer has a timeout value of 11 time units, which is stored as number of remaining ticks initially in an array of timers with index corresponding to packet number.

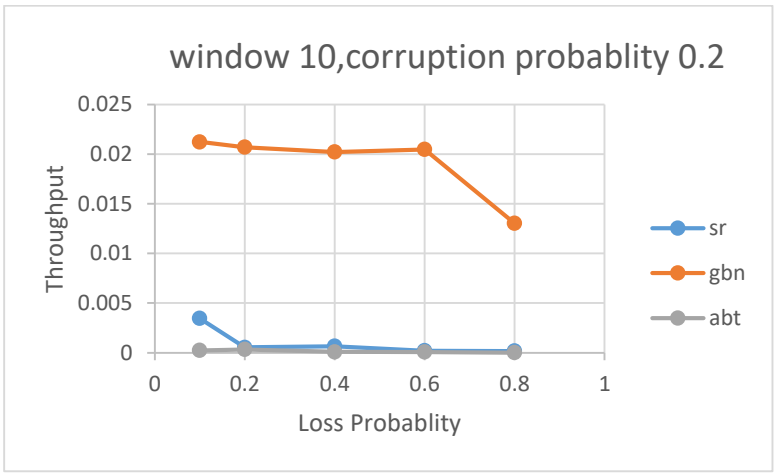
  At each tick the timer interrupt fires and decrements the remaining number of ticks of the corresponding timers of packets **lying in the sender window** by 1 and checks if any timer has expired and hasn't been acked by the sender. As the remaining ticks are immediately checked after decrementing its value the retransmission of unacked packet occurs at perfect timeout time of the corresponding timer (strictly enshured by use of remininig ticks== 0, inside if condition)

  The further decrement of the timers that don't meet the above conditions is simply stopped.

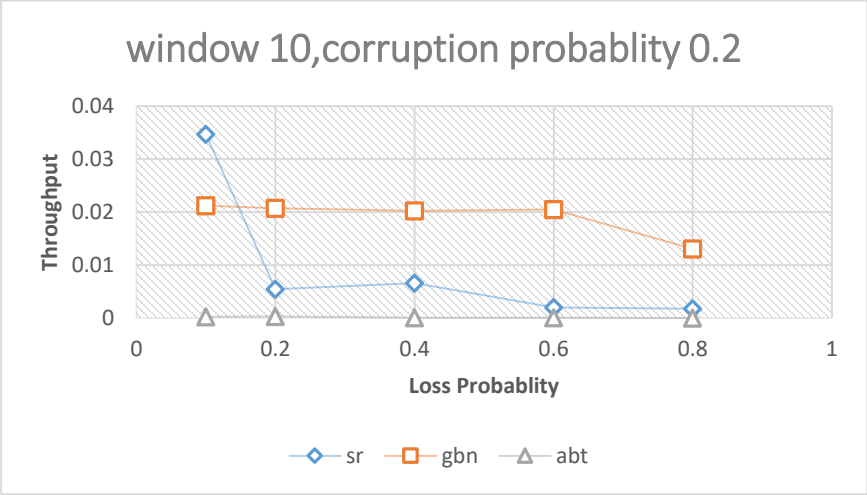
- **Experiment 1**

  With loss probabilities: {0.1, 0.2, 0.4, 0.6, 0.8}, compare the 3 protocols' throughputs at the application layer of receiver B. Use 2 window sizes: {10, 50} for the Go-Back-N version and the Selective-Repeat Version.
  Expected Graphs

  - .Window size: 10; X-axis: Loss probability; Y-axis: Throughput (ABT, GBN and SR) in one graph/plot.

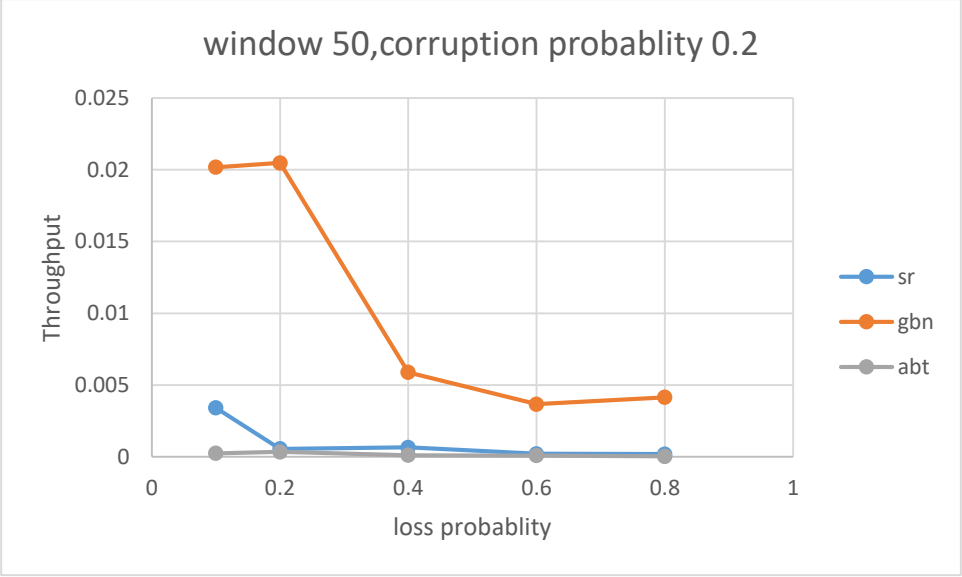


This graph is deviating too much from theory, as observed from low throughput of sr as compared to gbn. If sr is scaled by 10 we get the following graph.

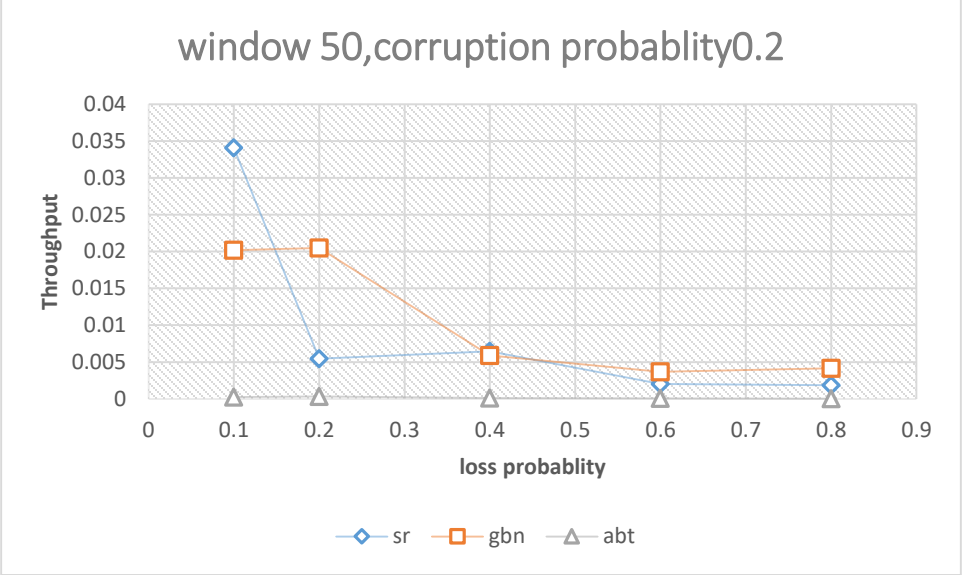


loss	sr	gbn	abt
0.1	0.03465	0.021237	0.000238
0.2	0.00546	0.0207	0.000341
0.4	0.00659	0.020222	0.0001
0.6	0.00199	0.020473	0.000081
0.8	0.00179	0.013031	0.00002

- Window size: 50; X-axis: Loss probability; Y-axis: Throughput (ABT, GBN and SR) in one graph/plot.



This graph is deviating too much from theory, as observed from low throughput of sr as compared to gbn. If sr is scaled by 10 we get the following graph.



loss	sr	gbn	abt
0.1	0.03409	0.020175	0.000238
0.2	0.00545	0.020478	0.000341
0.4	0.00644	0.005882	0.0001
0.6	0.00201	0.00366	0.000081
0.8	0.00183	0.004138	0.00002

Observations:

1. GBN performance is better in high loss probability when window size is small.

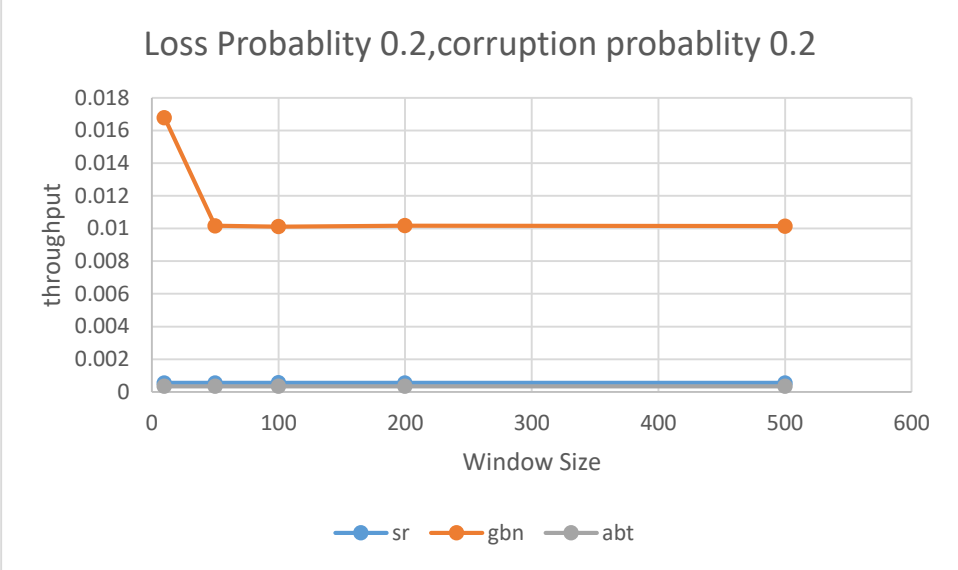
2. SR performs better in low loss probability when window size is small.

3. The throughput of abt is very low as expected.

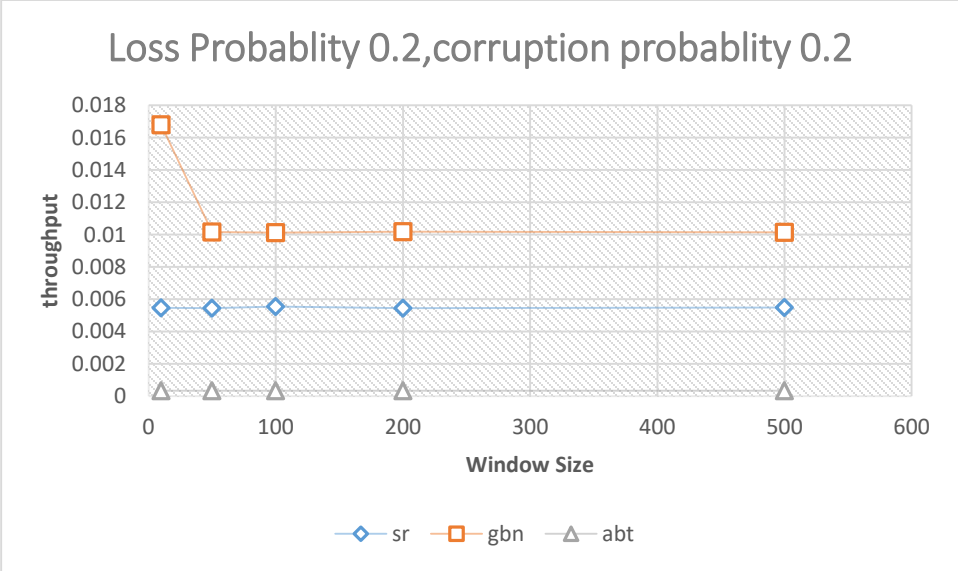
- **Experiment 2**

  With window sizes: {10, 50, 100, 200, 500} for GBN and SR, compare the 3 protocols' throughputs at the application layer of receiver B. Use 3 loss probabilities: {0.2, 0.5, 0.8} for all 3 protocols.
  Expected Graphs

  - Loss probability: 0.2; X-axis: Window size; Y-axis: Throughput (ABT, GBN and SR) in one graph/plot.

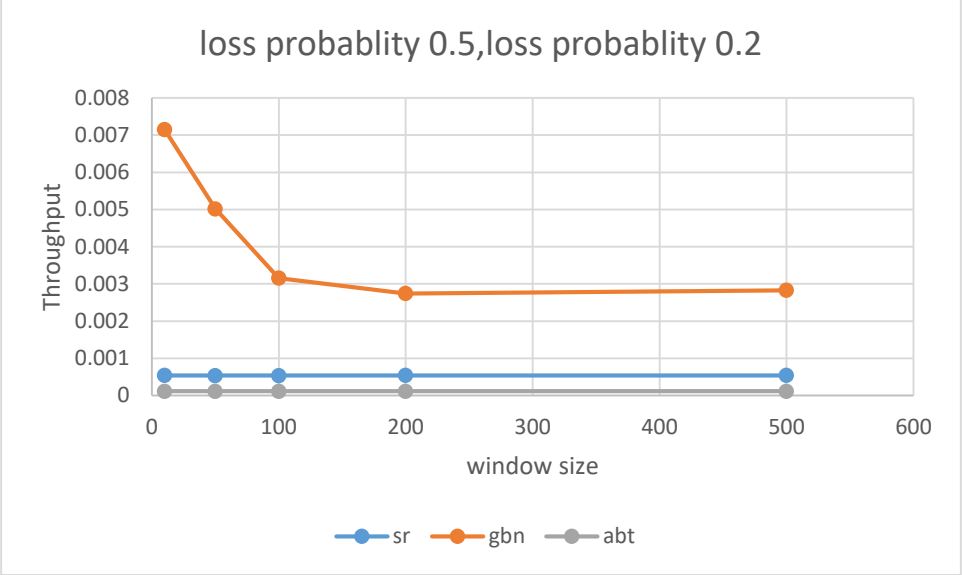


This graph is deviating too much from theory, as observed from low throughput of sr as compared to gbn. If sr is scaled by 10 we get the following graph.

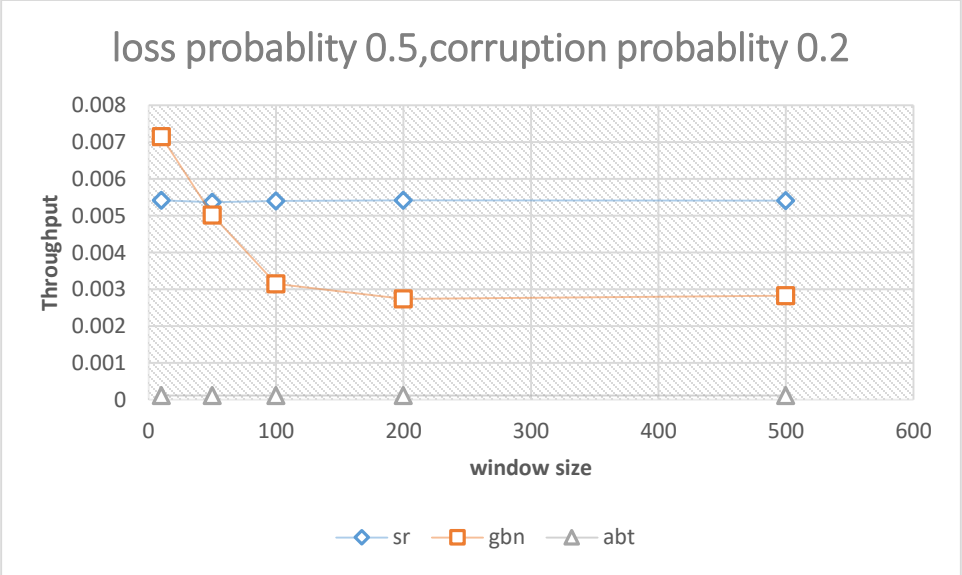


Window Size	sr	gbn	abt
10	0.00546	0.016795	0.000341
50	0.00545	0.01017	0.000341
100	0.00554	0.010124	0.000341
200	0.00545	0.010178	0.000341
500	0.00548	0.010146	0.000341

- Loss probability: 0.5; X-axis: Window size; Y-axis: Throughput (ABT, GBN and SR) in one graph/plot.

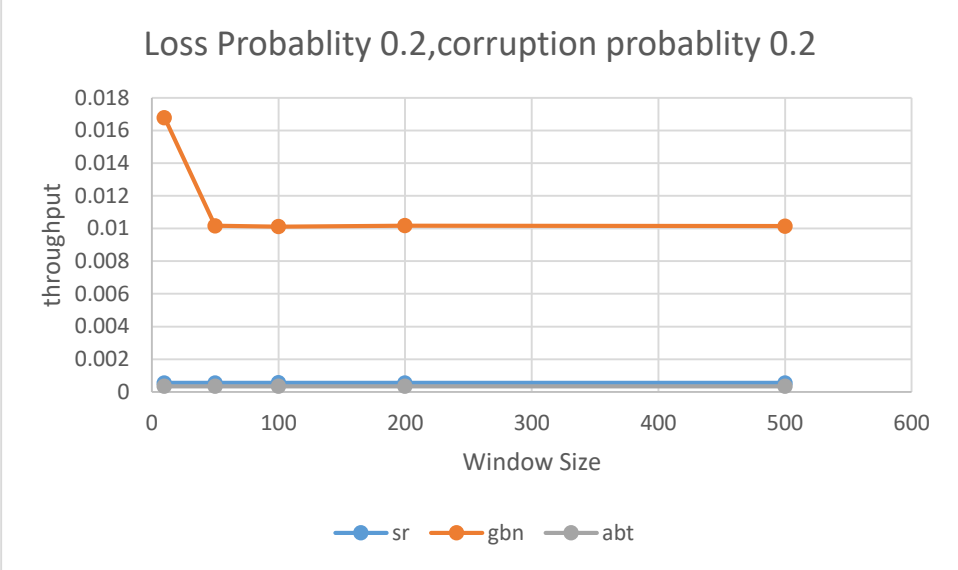


This graph is deviating too much from theory, as observed from low throughput of sr as compared to gbn. If sr is scaled by 10 we get the following graph.

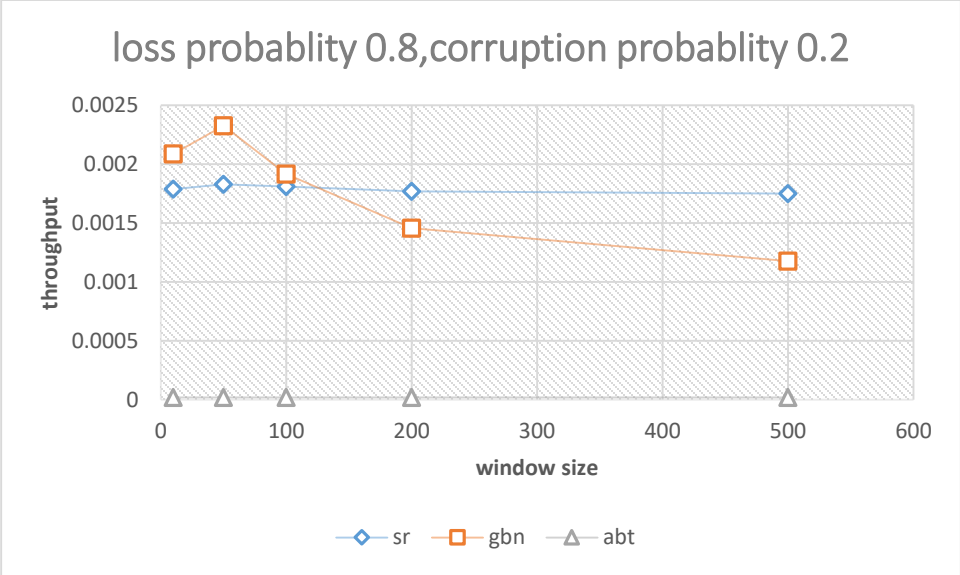


Window Size	sr	gbn	abt
10	0.00542	0.007151	0.000118
50	0.00537	0.00502	0.000118
100	0.0054	0.003156	0.000118
200	0.00542	0.002745	0.000118
500	0.00541	0.002828	0.000118

- Loss probability: 0.8; X-axis: Window size; Y-axis: Throughput (ABT, GBN and SR) in one graph/plot.



This graph is deviating too much from theory, as observed from low throughput of sr as compared to gbn. If sr is scaled by 10 we get the following graph.



Window Size	sr	gbn	abt
10	0.00179	0.002089	0.00002
50	0.00183	0.002327	0.00002
100	0.00181	0.001917	0.00002
200	0.00177	0.001457	0.00002
500	0.00175	0.001177	0.00002

Observations:

1. As the window size increases the performance of GBN goes down as compared to SR

2. GBN performance is better in high loss probability when window size is small.

3. ABT is low performance in all regions.

Conclusion

The performance of GBN dominates when window size is low and loss probability is high and the SR dominates in high loss probability region at higher window sizes, hence TCP adopts features from both GBN and SR to perform better in low and high loss probability regions while maintaining a high window size.