RELIABLE DATA TRANSFER PROTOCOLS
(Go Back N and Selective Repeat Protocols)

Go Back N Protocol (GBN)

For PACKET_GEN_RATE = 20 ,

The **Retransmission Ratio** observed is:

RANDOM_DROP_PROB / PACKET_LENGTH(B)	10^-3	10^-5	10^-7
256	2.048	2.025	1.938
1500	2.115	2.432	2.142

The **Average Round Trip Time (RTT)** observed is: (in milliseconds)

RANDOM_DROP_PROB / PACKET_LENGTH(B)	10^-3	10^-5	10^-7
256	1.244	3.175	2.256
1500	3.906	4.802	4.623

For PACKET_GEN_RATE = 300 ,

The **Retransmission Ratio** observed is:

RANDOM_DROP_PROB / PACKET_LENGTH(B)	**10^-3**	**10^-5**	**10^-7**
256	1.932	1.615	1.465
1500	1.625	1.982	2.091

The **Average Round Trip Time (RTT)** observed is: (in milliseconds)

RANDOM_DROP_PROB / PACKET_LENGTH(B)	**10^-3**	**10^-5**	**10^-7**
256	3.609	5.138	4.198
1500	5.744	6.545	5.276

Observations and Inferences:

1. When we increase the Packet length, both Retransmission ratio and RTT increased. This can be for all error rates and Generation rates. This is because, even though we transmit packet by packet at higher layer, at lower layers (link, physical) the data packets which are larger take larger transmission time. So, RTT for larger packets is higher.
2. When RTTs increase due to packet length, the Retransmission ratio also increases because the chances for time-outs increase.
3. Retransmission ratio and RTT are not so affected by Drop probability here because, the number of packets we took are quite small (10000) compared to the drop probabilities so packets are seldom dropped by the receiver.
4. When we increase the drop probabilities to at least 1~10%, we will be able to properly see the dependence of RTT and Retransmission ratio on drop Probability.
5. When we increased the Packet generation rate from 20 to 300, the retransmission ratios have all dropped. But the RTT times have increased significantly. This is because when the generation rate is high, at any instant, the window is likely to contain more packets. This makes the packets wait a longer time in the window. So RTT time increased. But the retransmission ratio decreased.

Selective Repeat Protocol (SR)

For PACKET_GEN_RATE = 20 ,

The **Retransmission Ratio** observed is:

RANDOM_DROP_PROB / PACKET_LENGTH(B)	10^-3	10^-5	10^-7
256	1.062	1.120	1.15
1500	1.035	1.045	1.138

The **Average Round Trip Time (RTT)** observed is: (in milliseconds)

RANDOM_DROP_PROB / PACKET_LENGTH(B)	10^-3	10^-5	10^-7
256	0.969	1.456	1.721
1500	1.665	3.071	1.013

For PACKET_GEN_RATE = 300 ,

The **Retransmission Ratio** observed is:

RANDOM_DROP_PROB / PACKET_LENGTH(B)	10^-3	10^-5	10^-7
256	1.082	1.027	1.082
1500	1.442	1.032	1.030

The **Average Round Trip Time (RTT)** observed is: (in milliseconds)

RANDOM_DROP_PROB / PACKET_LENGTH(B)	10^-3	10^-5	10^-7
256	0.613	0.687	7.538
1500	5.153	1.280	0.878

Observations and Inferences:

1. Similar to GBN, RTTs increased when we increase the packet length.
2. As a whole, when we compare the Retransmission ratio of GBN and SR, we can see that, for SR, Retransmission ratio is a lot lower.
3. This is probably because in SR, the receiver is able to accept packets out of order (as long as they are in the Receiver's window) as it uses a Buffer. This saves the need of transmitting again for the sender. So, the Retransmission ratios are very much lower in SR.
4. In most of the cases, RTT decreased as drop probability decreased. (As expected)

What I've learnt through this project:

1. I achieved a much clearer insight to the workings of the protocols (GBN and SR) than before.
2. I feel that experimenting various no of times by tweaking parameters and trying to infer those results has been very much useful.