CS3205: Assignment 2: Go Back-N and Selective repeat protocol

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Go Back N Protocol:

1. **PART 1**: Packet Generation Rate = 20, Buffer Size = 10, Window Size = 3

Packet Length	Error Probability	Average RTT in Nanoseconds	Retransmission Ratio
256	10^{-3}	525225.685	1
256	10^{-5}	483840.1575	1.0075
256	10^{-7}	551209.707	1.011905
1500	10^{-3}	1268784.7735	1.0754
1500	10^{-5}	574978.70648	1.00248
1500	10^{-7}	693539.388	1.0559

2. **PART 2**: Packet Generation rate = 20, Buffer Size = 50, Window Size = 10

Packet Length	Error Probability	Average RTT in Nanoseconds	Retransmission Ratio
256	10^{-3}	1208621.3034	1.089
256	10^{-5}	1016162.1575	1
256	10^{-7}	948845.545	1.00025
1500	10^{-7}	907582.14	1.0175
1500	10^{-5}	951584.152	1.0075
1500	10^{-3}	1239330.2775	1

Observations Made:

1. For a larger packet size, the average round trip times increase significantly. This behaviour is expected.

2. Increasing the buffer size, in general causes an improvement in the transmission rates. This is evidenced by the fact that the rate of output messages on the terminal window is considerably higher.
3. A lower error probability results in almost 0 packet loss, which reduces the RTT rates significantly.
4. If a host that is further away is used, transmitting data between sockets takes more time, resulting in a larger average RTT value. The above tests were performed locally on my machine.
5. Some instances of the transmission test resulted in termination due to repeated retransmission of the same packets. This could be attributed to delay in thread creation by the program, or due to cluttering of packets at the socket.
6. Increasing the error probability to large values such as 0.1 or 0.3 cause the program to exit early, due to repeated retransmission failure.

Selective Repeat Protocol

1. **PART 1**: Packert generation Rate = 20, Buffer size = 10, Window Size = 3

Maximum Packet Length	Error Probability	Average RTT in Nanoseconds	Retransmission Ratio
256	10^{-3}	503762.445	1
256	10^{-5}	544022.48	1.015
256	10^{-7}	518869.297	1.015
1500	10^{-3}	502851.9	1
1500	10^{-5}	509842.717	1.0075
1500	10^{-7}	517345.51	1

2. **PART 2**: Packet Generation Rate = 300, Buffer Size = 100, Window Size = 3

Maximum Packet Length	Error Probability	Average RTT in Nanoseconds	Retransmission Ratio
256	10^{-3}	746567.625	1.0025
256	10^{-5}	900756.263	1.02
256	10^{-7}	918257.518	1.0125
1500	10^{-3}	818390.415	1.03
1500	10^{-5}	658324.48	1.005
1500	10^{-7}	905879	1.01

Observations Made:

1. Selective repeat performs considerably better than GBN for a large packet size.
2. Due to random fluctuations in the packet size, Selective Repeat tends to have an unpredictable trend in terms of the average RTT.
3. However, a general trend we notice is that a larger window size leads to a reduction in the average trip time.
4. Selective repeat with a larger window size performs better than the GoBack-N algorithm due to repetition of only selected packets.
5. If the packet loss rate is too large, the resend limit is reached much quicker and the program terminates.

Useful Takeaways from the Assignment

I learnt the nuances of concurrent programming by means of this useful exercise. I was able to explore and understand the challenges faced in data transmission, while appreciating the various mechanisms used in error recovery of data as well. Unfortunately I started slightly late and could not complete on time, but I definitely felt that time spent herein was worth it.