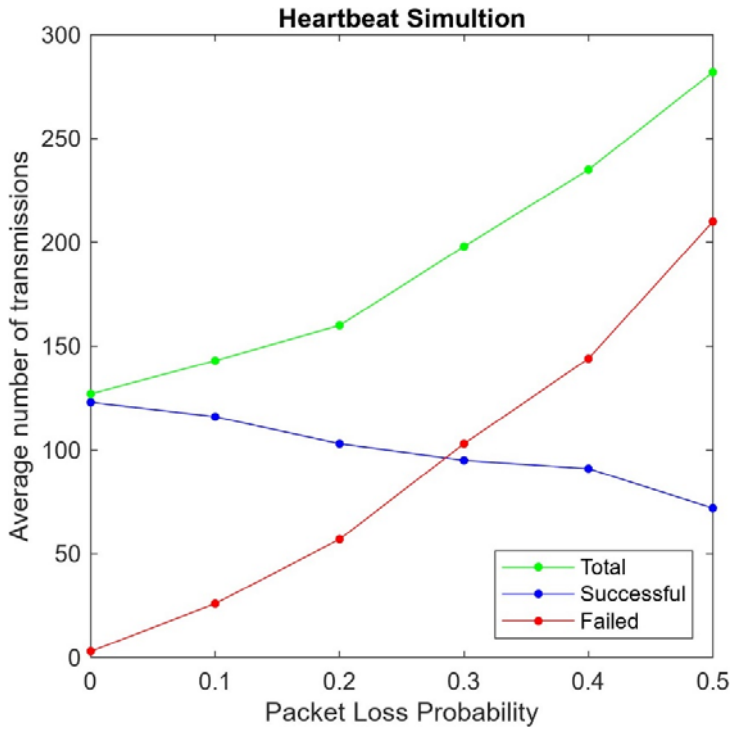
Project Title: Heartbeat

Instructions on how to run the program:

1. Export the c file proj_hb.c to willow server. This can be done using winSCP.
2. Compile the file using the command, “csim64.gcc proj_hb.c –o proj_hb”.
3. Run the executable file using the command, “./proj_hb”.
4. There is a user prompt to enter the value of packet loss probability.
5. Enter any value provided in the options to get the simulation results.
6. The program must be run 5 times using the command in (3) to get the results for all 5 probabilities.
7. If any value other than 0.1, 0.2, 0.3, 0.4, 0.5 are given, then the program ends without transmitting any messages so the number of transmissions will be zero.
8. The summary of the simulation is stored in the output file sim.out. It can be viewed using the command “cat sim.out”.

Results:

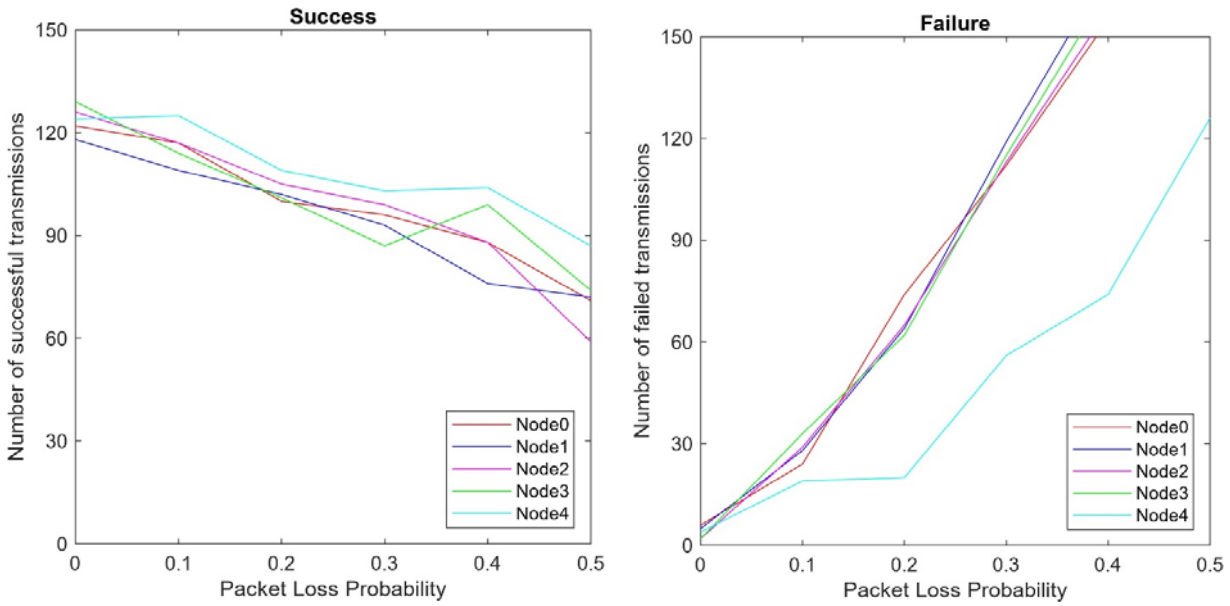


Graph 1. Graph illustrating the effect of packet loss probability on the average number of transmissions

From the graph 1, it can be observed that, as the packet loss probability increases, the average number of successful transmissions decreases and the average number of failed transmissions increases.

The total number of transmissions also increase with increase in packet loss probability. This is because, every time a hello or hello_ack packet is lost and the source node does not receive any hello_ack from the destination node within the timeout period. So, it retransmits the hello packet again once. These retransmissions cause the total number of messages in the network to increase.

When the packet loss probability is 0, few number of failures can be observed. This is not due to messages getting lost in the communication channel. But due to the simulation clock exceeding the given simulation time of the project. So, in this case, hello packets were sent within the simulation time but the simulation clock exceeded the simulation time before receiving the hello_ack.



Graph 2 (left), 3 (right). Graphs illustrating the trends of successful (left) and failed (right) transmissions in each node in the network

From both the graphs, it can be observed that node4 has the highest amount of successful transmissions out of all 5 nodes. So, the number of failed transmissions in node 4 is comparatively low.

In case of node3, in graph 2, as the packet loss probability increased from 0.3 to 0.4, the number of successful transmissions also increased. This is in contrast to the observations in graph 1. So, at node level, several factors like the total number of transmissions, inter-arrival time (exponential(5.0)) used in the generation of packets, random number generator also need to be considered while comparing the effects of packet loss probabilities on the number of successful/failed transmissions.

For packet loss probability 0.3, total number of transmissions of node 3 = 202

Successful number of transmissions of node 3 = 87

Ratio_0.3 = 87/202 = 0.43

For packet loss probability 0.4, total number of transmissions of node 3 = 263

Successful number of transmissions of node 3 = 99

Ratio_0.4 = 99/263 = 0.37

Ratio_0.3 > Ratio_0.4

So the initial observation that “as packet loss probability increases, number of successful transmissions decrease” holds true.