CSE 589 - MODERN NETWORKING CONCEPTS

Project Assignment – 3

REPORT

MAC Random Transmission Protocol Using NS-2

Team

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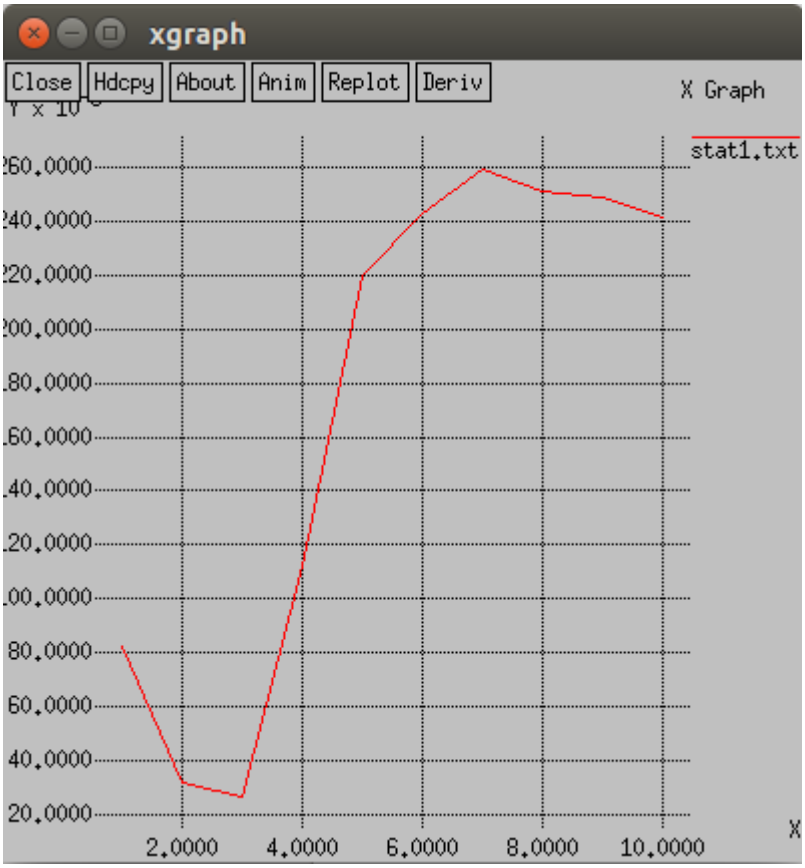
NS is a discrete simulator targeted at networking research. This tool is used to simulate different networks providing flexibility for the user to test his/her network among different combinations of protocols.

Network Environment (Setup):

1. There are 100 source nodes – within one-hop communication range of the sink node.
2. There is 1 sink node – receives the packets transmitted by the source nodes.
3. A data packet is generated every T seconds from the source nodes which are equipped only with a RF transmitter.
4. In order to increase the rate of successful transmission, the source nodes transmit X copies of each packet at Y random instants of time picked up within the interval [0, T] before the generation of the next packet. The value of X can range from 1 to 10 for this experiment.

Results :

Probability VS Value of X:



On X-axis : 1 unit = 1 unit

On Y-axis: 1 unit = 10^-3 unit

Simulation results explained :

The average delivery probability which is calculated as the ratio of number of packets successfully received by the sink node to the number of packets delivered by the source nodes on Y-axis versus the number of retransmissions on X-axis is plotted as shown above. As we can observe, the probability slightly decreases with the number of retransmissions until certain point (X = 4) and then tends to increase there-after. Below are the minimum and maximum probabilities obtained.

Minimum probability value: 0.02

Maximum probability value: 0.25

First of all, in this network, there is no chance of achieving value of probability as 1. This is because, there can be unsuccessful transmissions due to collision among multiple packets sent by multiple nodes. As the number of retransmissions increased till a threshold point, the number of collisions happen to increase at the sink node, there by leading to increase in unsuccessful transmissions. This led the delivery probability to decrease. But, after a certain threshold point (in our case X=4) we observed that as the retransmissions increase, the probability that one of the copies of packets sent by the source nodes are successfully received is increased due to the fact that a number of copies being sent is dominating the number of collisions that can happen.

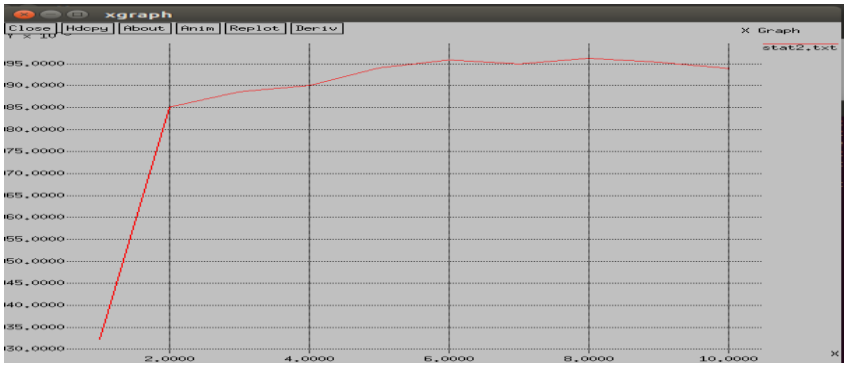
Observations :

1. As we reduce the number of source nodes in the network, the delivery probability is increased due to the fact that the number of collisions that can happen decreased as we decrease the number of nodes transmitting data.

Number of nodes = 10

Simulation time = 5sec

Observed results graph:



2. As we increase the number of sink nodes, the delivery probability has increased drastically due to the fact that a packet is said to successful if any one of the sink nodes receive it.

Theoretical Analysis :

A network containing random source nodes and few sink nodes can be realized as shown in the figure 1. The Wireless Sensor Network nodes are all within one hop transmission range of the sink. As the source nodes are equipped only with a RF transmitter and no receiving unit, it is not possible for the sensor nodes to sense the channel for collision detection or receive any acknowledgements from the sink node.

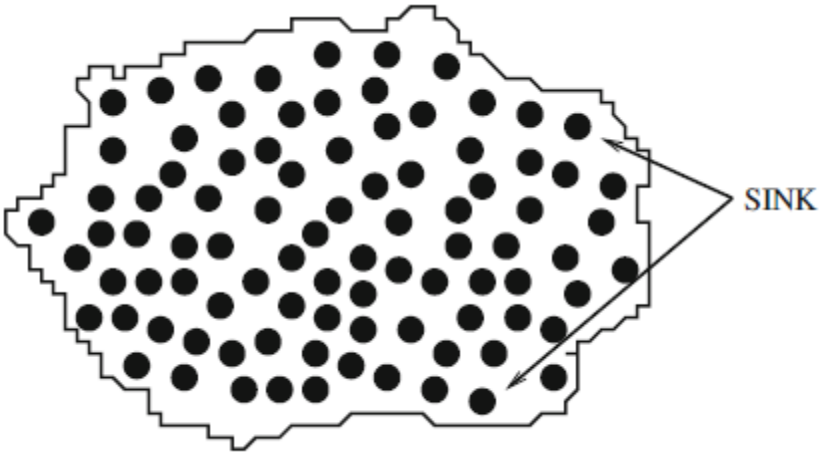


Figure 1

In a decentralized network containing 100 sources nodes and one sink node, a minimum probability of data being delivered between the source and sink nodes successfully is achieved by allowing each one of the source nodes to transmit each few optimal number of in every given interval of time. By controlling the rate of re-transmissions by an intelligent algorithm, we can increase the delivery probability.

References :

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