NETWORKS LAB 7

JEREMIAH THOMAS

106119055 | CSE - A

Question:-

Implement a simple MAC protocol. The network architecture consists of one sink node which receives the packets transmitted by source nodes. The source nodes are all within one-hop communication range of the sink node. The only reason for unsuccessful transmission is due to collision among multiple packets sent by multiple source nodes. The source nodes generate and transmit data as follows:

1. A data packet is generated every T seconds and has to be delivered to the sink before the next packet is generated.
2. In order to increase the chance of successful transmission, each node transmits X copies of each packet at random instants before the next packet is generated.
3. The source node picks X random instants of time within the interval [0, T] (i.e. the interval between the time the current packet is generated to the time the next packet will be generated), and transmits the data packet at each of the X instants of time.

Simulation:

The desired network configuration is as follows:

- 25 source nodes, one sink node
- Simulation Time: 100 s
- Packet size: 128 bits (including a header)
- Packet generation interval (T): 0.02 s

(Default values can be used for other parameters)

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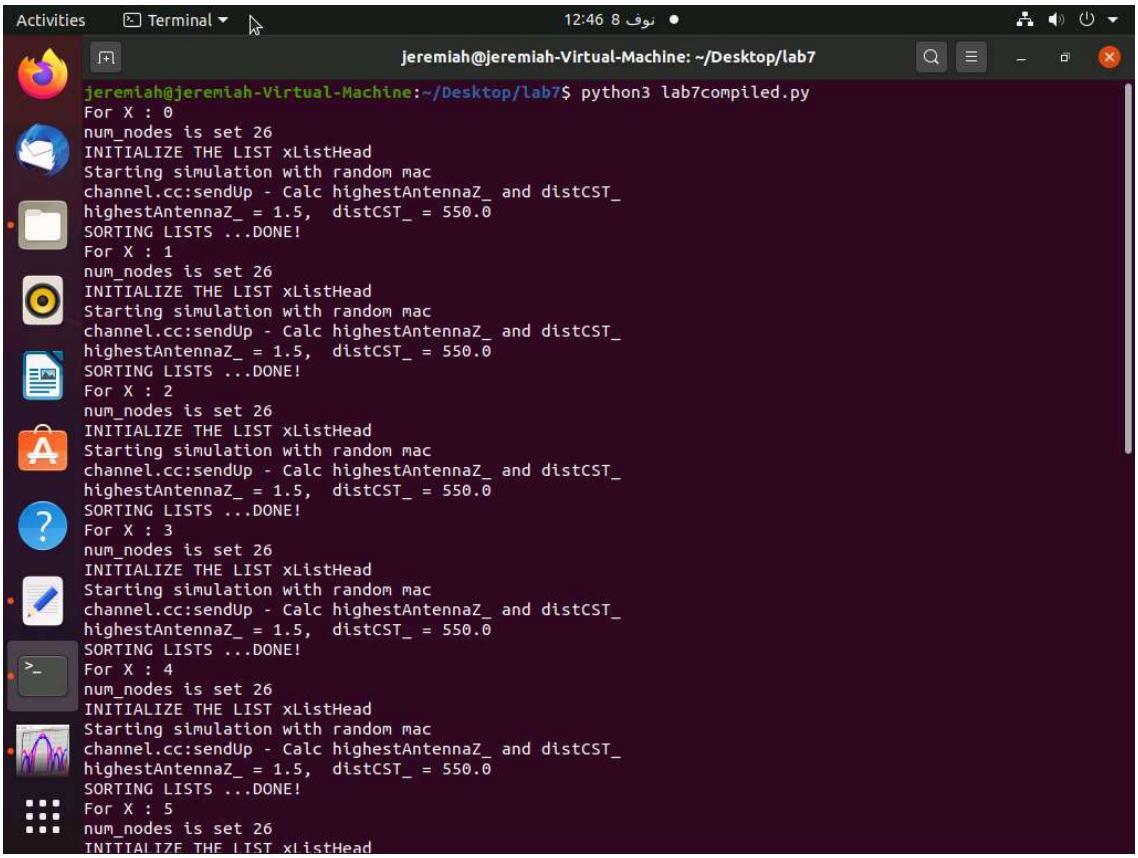
Let each source node transmit X copies of each packet. If at least one of the X copies of a packet is received by the sink, we say the packet is successfully delivered. If, out of the X transmissions, the same packet is delivered successfully more than once, only one packet is considered to be successfully delivered. The average delivery probability P is defined to be the ratio of the total number of successfully delivered packets to the total number of packets generated by source nodes for the duration of the simulation.
Perform simulations for X = 1,...,10 transmissions. Plot P against X. The range of X is [1, 10] and the range of P on the y-axis is [Plowest, Phighest] in Xgraph.

Answer:-

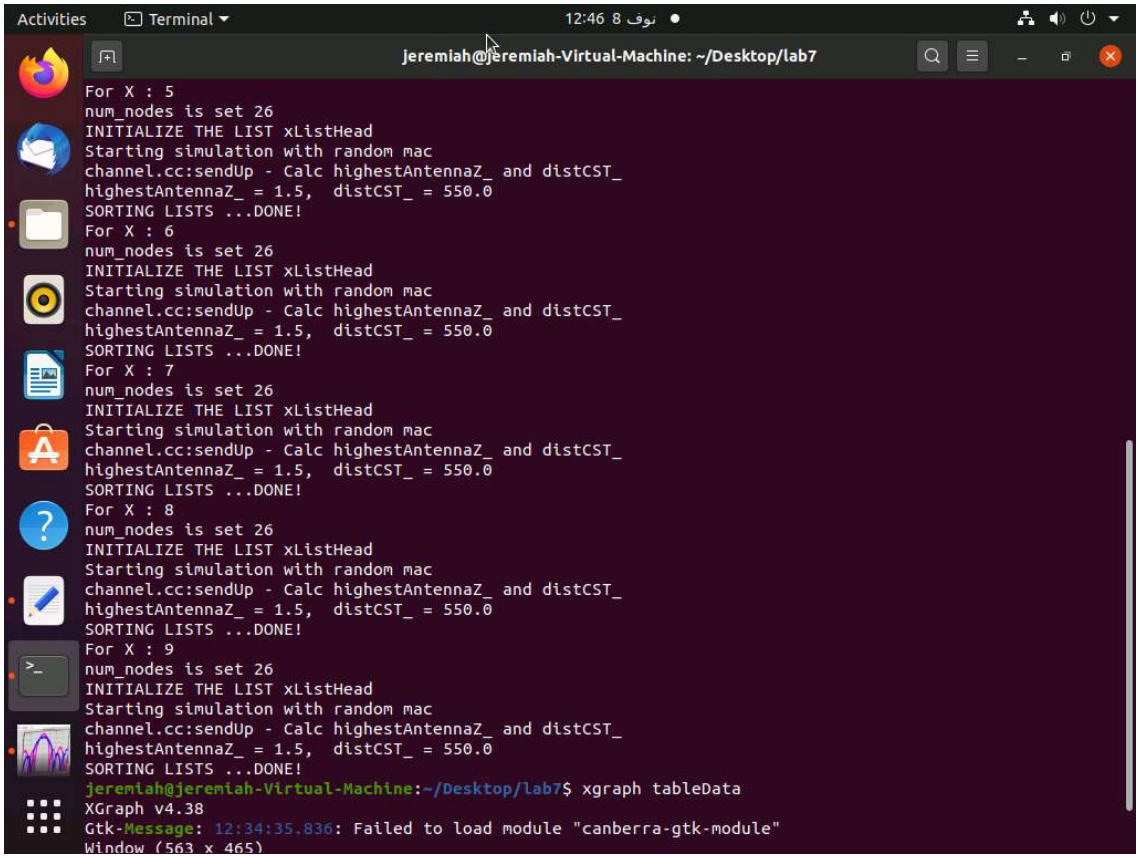
Do note:-

- Kindly find all the codes in the zip folder as requested
- Do cd into the right directory while running the programs.
- It is preferred to run the programs on a Linux environment.
- Also, **lab7compiled.py** is convenient one stop solution that runs the 10 different renditions for varying Xs at once.
- Run lab7compiled.py and then use the xgraph command on tableData.

Terminal:-

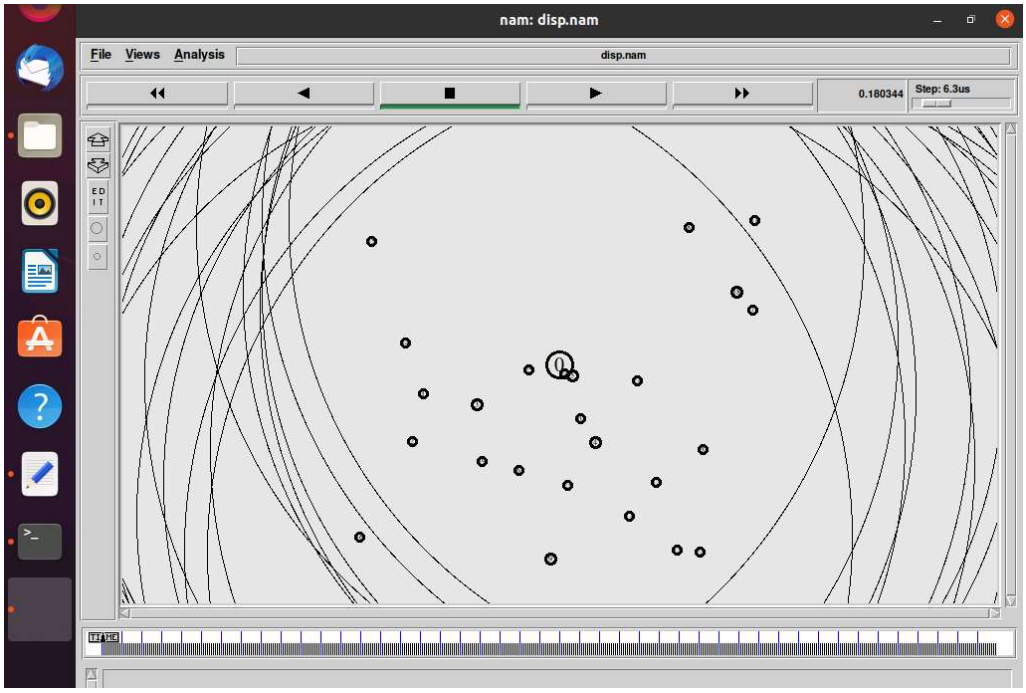


(DO SCROLL DOWN)

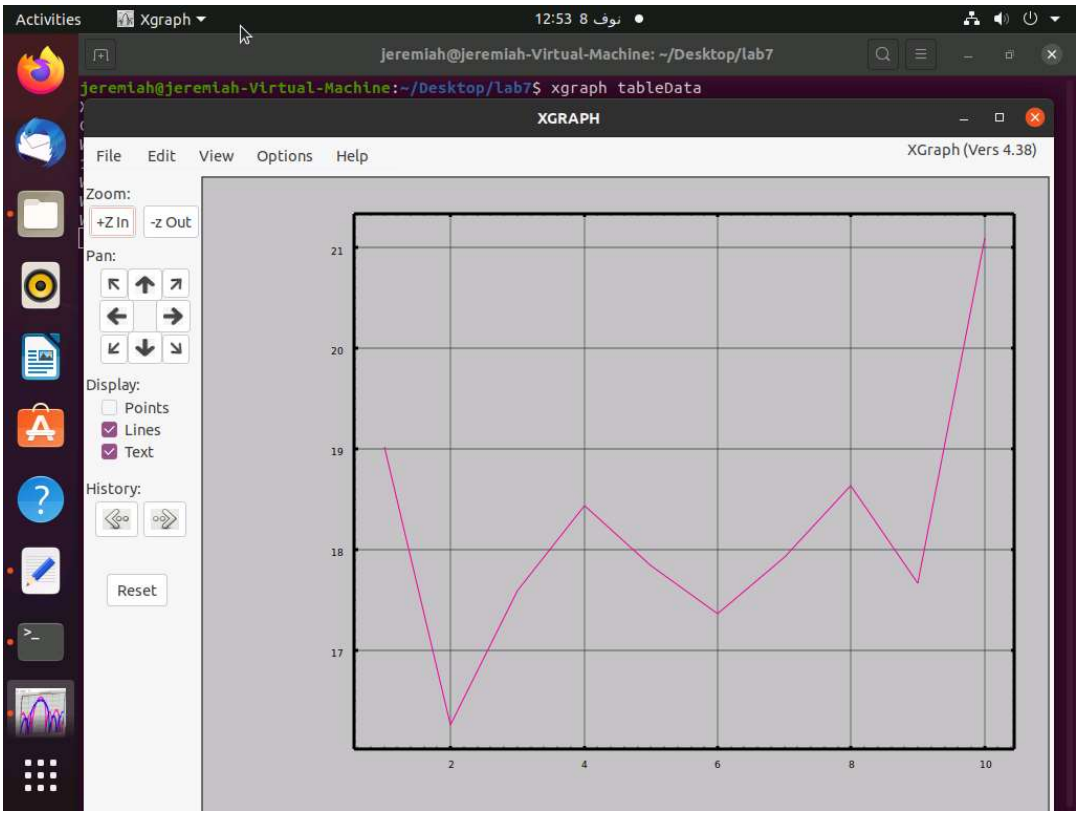


A sample snippet of a simulation:-

When X=10:-



Graph:-



Analysis:-

- There is a drop from X=1 to X=2, owing to the fact that collisions would happen and the no of transmissions are less, leading to a reduced chance of the message being reached. The rather abnormal high at X=1 could be attributed to this being the first case executed.

- From X=3 to X=9, there is an irregular rise and fall of probability. However, that being said, there is a general increase in probability owing to the fact that the X factor/ Retransmission increases. Thus, because of an increased retransmission factor, here, in this stage, channel capacity is being attained.

- At X=10, there is a steep rise which could be attributed to the fact that this might be the maximum channel capacity, following which the probability will approximate to the uniform distribution.

THANK YOU!