PROJECT REPORT-FCOMM

(Group No-26)

Simulate a cluster based network in NS2/NS3 using underwater RF channel model

Submitted by:

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Objective:-

Simulate a cluster based network in NS2/NS3 using underwater RF channel model.

Procedure:-

- First we assume a square field consisting of a network cluster under the sea bed. Initially, we assume the field dimension to be 100*100.
- We assume n number of nodes inside the field in such a way that n belongs to {4, 9, 16, 25}. These collection of nodes is called a cluster.
- We assign a cluster head to one amongst all the nodes. The node which is at minimum distance from the base station is chosen as the cluster head.
- All these nodes have are assigned various attributes such as node position(symmetric distribution in 100x100 space), data rate (varied in the range belonging to {0.1Mbps, 0.5Mbps, 1Mbps, 11Mbps}), initial energy({ child nodes are assigned 1J of energy and cluster head is assigned sufficient energy to survive till the end of the life of network}).
- We assume that there is base station at the top of the square field exactly above the middle point of the cluster.
- Data by child nodes will be first communicated to cluster head and then to base station
- Links are established between nodes and cluster head and data is sent over those links from nodes to cluster head using TDMA protocol. We measure the network life for different number of nodes keeping the data rate constant. For this we calculate the energy consumed for each transmission and reduce the energy of the nodes after each transmission
- For each set of nodes we also measure the network life varying the data rate. In this case the number of nodes is constant.
- We also find the network life by increasing the dimensions of the field to 200*200 and keeping the previous parameters.
- We then study the network life for by varying the different parameters.

Observation:

Table-1.1 Network life for a given distance against number of nodes

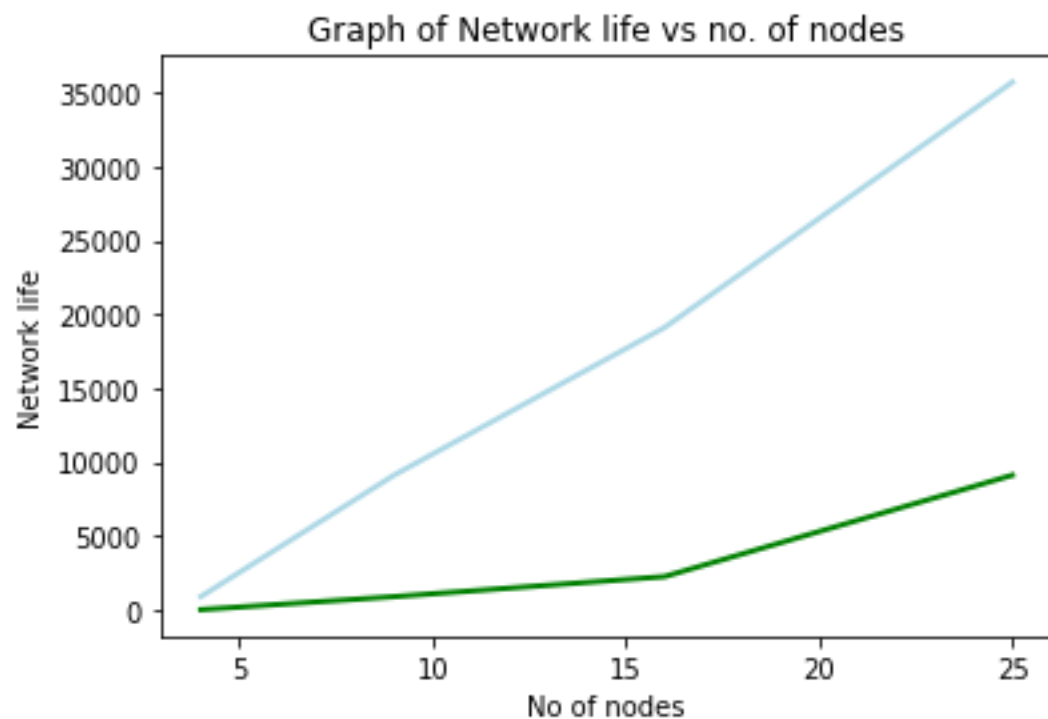| Number of Nodes	Network life for d = 100	Network life for d = 200
4	910	31
9	9121	910
16	19102	2265
25	35691	9121

Fig-1.1 Variation of network life with number of nodes where blue line indicates d=100 and green line indicates d=200

Table-1.2 Network life when number of node (N) and data rate are varied:

	0.1Mbps	0.5Mbps	1Mbps	11Mbps
N=4	100017	20004	10002	910
N=9	954538	213674	98565	9121
N=16	1716443	428751	210094	19102
N=25	43578304	840223	424353	35691

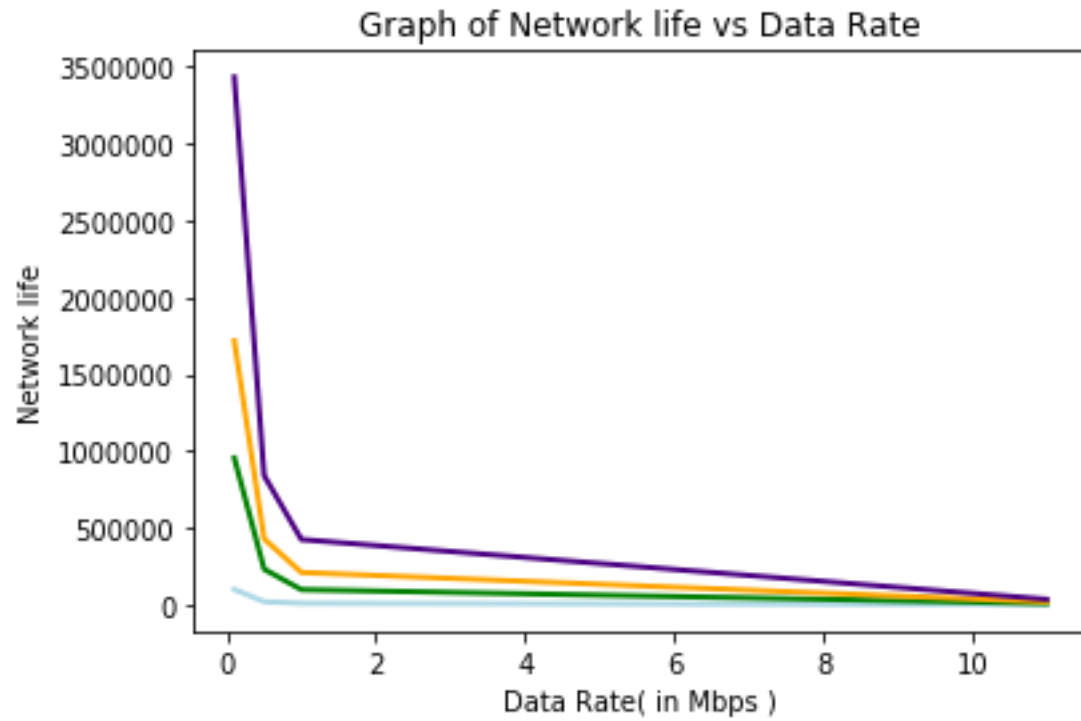**Fig-1.2 Variation of network life with data rate where** indigo line indicates N=25, orange line indicates N=16, green line indicates N=9 **and** blue line indicates N=4

Table-1.3 Network life for a 2-cluster network for different data rates(K)

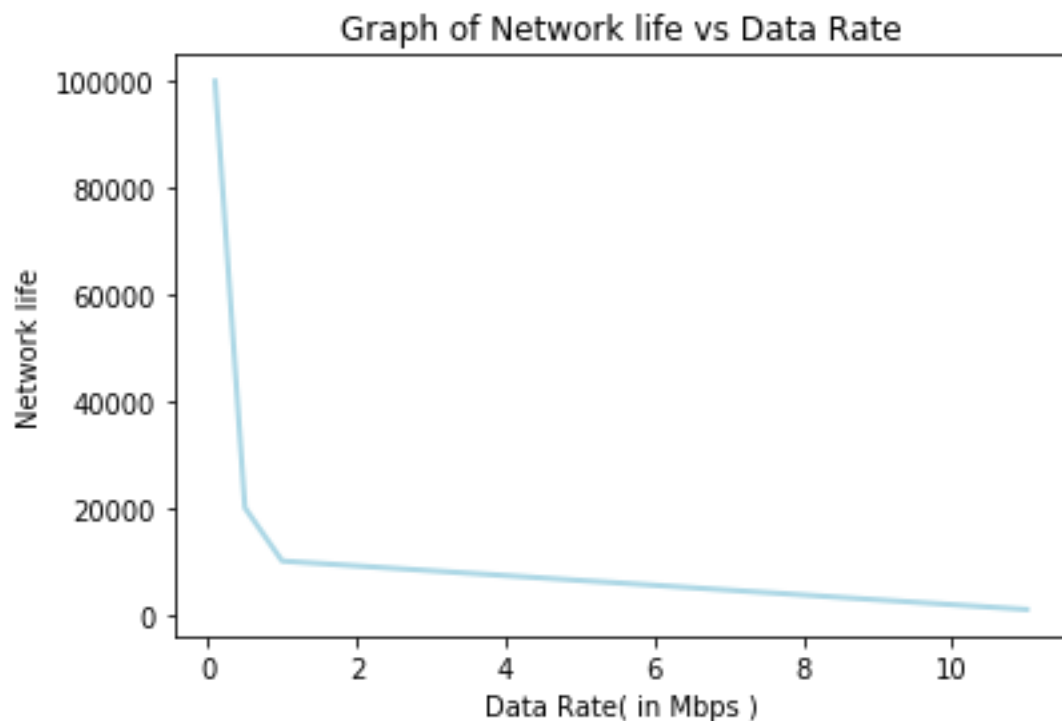| Data Rate(in Mbps)	Network Life
K=0.1	100017
K=0.5	20004
K=1	10002
K=11	910

Fig-1.3 Variation of network life with data rate for 2-cluster network where blue line indicates N=4

Inference:

From the above set of study and observations, it can be seen that on increasing the number of nodes in the cluster, the individual energy consumed by each node becomes less and thus the network life increases exponentially. Also, when the overall perimeter of the cluster network increases, the network life decreases because the distance between the nodes increases, which in turn takes more energy to transfer the data. Also the network life decreases exponentially when the data rate increases.