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Scalability With Ring Topology in QoS Analysis of Mobile Ad-Hoc Network

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ABSTRACT

Wireless ad-hoc networking is core technology in modern communication system. Difference in terms of scalability by varying number of nodes (7 & 15) and ring topology is studied by using Network Simulator-2 (NS-2) software for QoS service analysis of MANET. To analyze the effect of scalability on QoS analysis, we are using Xgraph to show parameter's difference graphs. The parameters taken for the comparison are number of packets transmitted, number of packets lost, total bytes transferred, bit rate, bit rate with delay and packet loss rate. We have tried to conclude relation between distance from coordinator, throughput and packet loss.

Key words: MANET, QoS

1. QUALITY OF SERVICE (QOS) [1,2,3,4]

The overall effect of performance in terms of service that determines the degree of user satisfaction is QoS. The QoS metrics can be defined in terms of certain parameters; such as bandwidth requirement in service functioning, delay occurred in signal transmission and reception, packet loss probability during transmission and reception and delay variance (gitter).[5] There are certain issues and difficulties faced in these ad-hoc networks due to which there is need to consider certain QoS provisions in the networks. These issues and difficulties that affects the QoS provisions in the network are: unpredictable link properties in physical layer and MAC layer, continuous node mobility, bandwidth constraints in signal transmission, limited processing and storing capabilities of the device, limited battery life, hidden terminal problem, exposed terminal problem, route maintenance and security[6]. QoS provisions do not rely on to extinct overhead problem but it tends to keep it as low as possible. QoS and overhead are interlinked and work on expense of each other. In short we can say that QoS and overhead are synonym to each other.

2. RING TOPOLOGY

For different number of nodes keeping all other parameters constant and using ring topology, the various QoS parameters i.e. number of packets transmitted, number of packets lost, total bytes transmitted, bit rate, bit rate with delay and packet lost rate are studied. The various parameters used during simulation are shown in table 1.

Table 1: Parameters used in simulation

Parameter	Value
Number of Nodes	7,15
Topography Dimension	50m*50m
Traffic Type	CBR
Radio Propagation Model	Two ray ground model
MAC Type	802.15.4.Mac Layer
Packet Size	70
Mobility Model	Random Way Point
Antenna Type	Omni directional
Protocol	AODV

Here the basic parameters of the proposed work are presented respective to the simulation environment. The system is implemented on Ubuntu Environment with NS2 simulator.

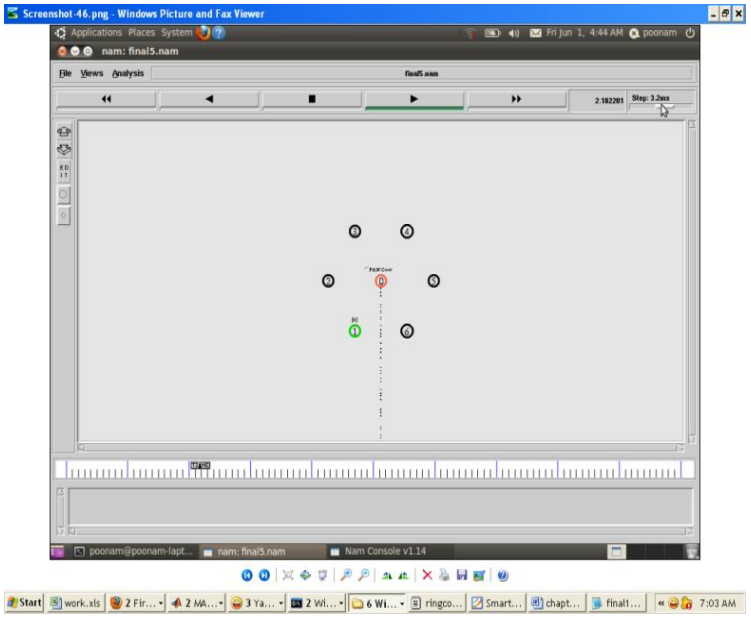

Figure 1: Simulation 1 (Ring Topology/7 Nodes)

Figure 1 shows network has about 7 nodes. The center node is the PAN coordinator. It will control the communication over the network. the center node is the main receiver node and the communication is performed by different nodes over the time. For the current instance communication is performed by node 1 shown in Green color. Because of controlling the communication of multiple nodes the coordinator is having the heavy traffic over it because of this it gives the packet loss shown by drak black line coming downward.

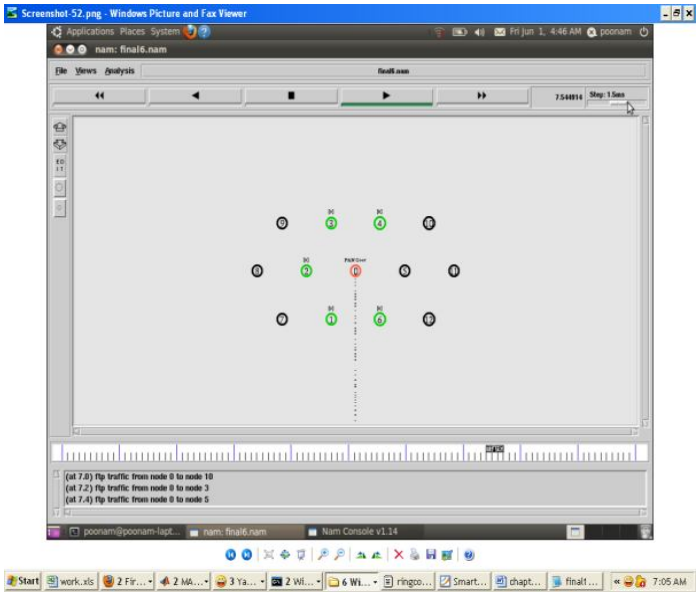

Figure 2: Simulation 2 (Ring Topology/15 Nodes)

Figure 2 shows Network has about 15 nodes. The nodes are arrange in a ring. Two rings are established to cover all the nodes. The center node shown in red color is the PAN coordinator. All nodes of a ring are at equal distance from the coordinator. Communication is being performed in from different nodes over the network to the coordinator node. For the current instance the communication is shown between the coordinator and node 10,3 and 5. Because of that much parallel work, the PAN coordinator is under heavy load and gives the packet loss over the network. The dark line coming downward is showing the packet loss during the communication over the network

3. COMPARATIVE ANALYSIS

We have taken 2 different Scenarios that are different in terms of Number of nodes in ring topology, all other parameters are identical. The particular work is showing the difference in terms of scalability. Here we are increasing the distance of nodes from a centralized PAN Coordinator. The particular scenarios will analyze the security as well as role of centralized PAN coordinator. As the PAN is small area network because of this more number of nodes reduces the gap between nodes. To analyze the effect of scalability we are using Xgraph to show the difference graph. The parameters taken for the comparison are number of packets transmitted, number of packets lost, total bytes transferred, bit rate, bit rate with delay and packet loss rate.

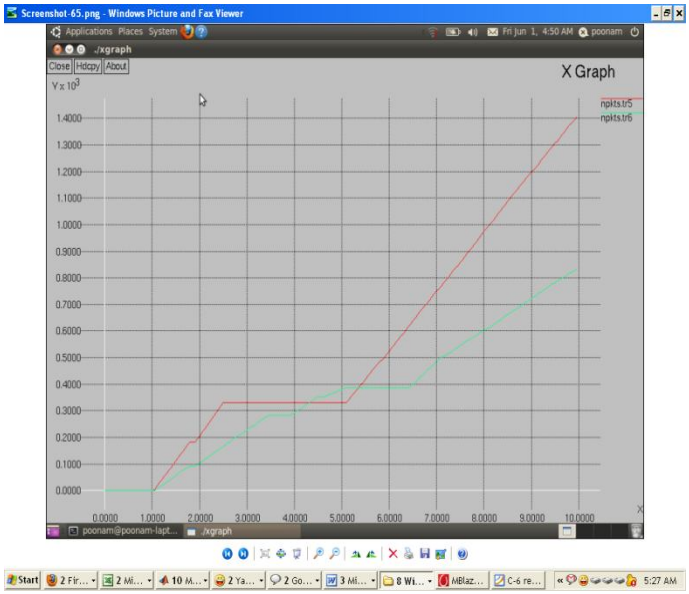

Figure 3: Comparison Packet Transmitted (Ring Topology)

Figure 3 shows the simulation is been performed for 10 seconds. The x-axis here represents the time and y axis represents the packet transmitted over the network. The red line here represents the minimum number of nodes in network i.e. 7 nodes. And the green line shows the maximum number of nodes in the network i.e. 15. We can observe that as the distance from the PAN coordinator increases the throughput over the network decreases. As we know smart dust are the tiny particles that have very less energy to communicate. They can give better results if the nodes are at less distance from PAN coordinator. So we can conclude as the nearer the distance from PAN coordinator, more effective the network is.

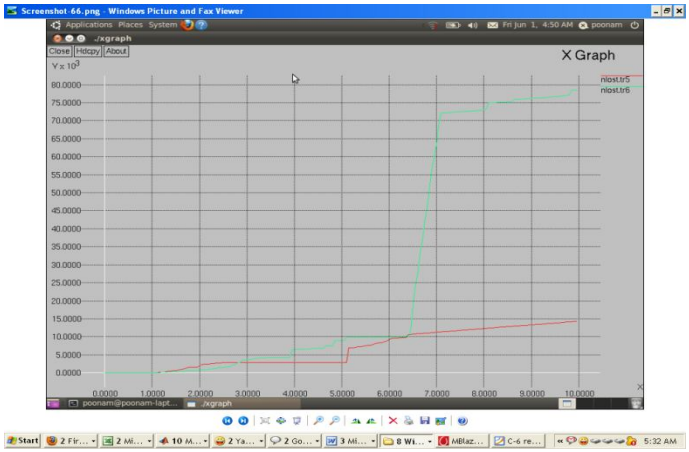

Figure 4: Comparison Packet loss (Ring Topology)

From figure 4 it is concluded that simulation is been performed for 10 seconds. We can observe that as the distance from the PAN coordinator increases the data loss over the network increases. As we know smart dust are the tiny particles that have very less energy to communicate. They can give better results if the nodes are at less distance from PAN coordinator. So we can conclude as the larger the distance from PAN coordinator, more packet loss in network.

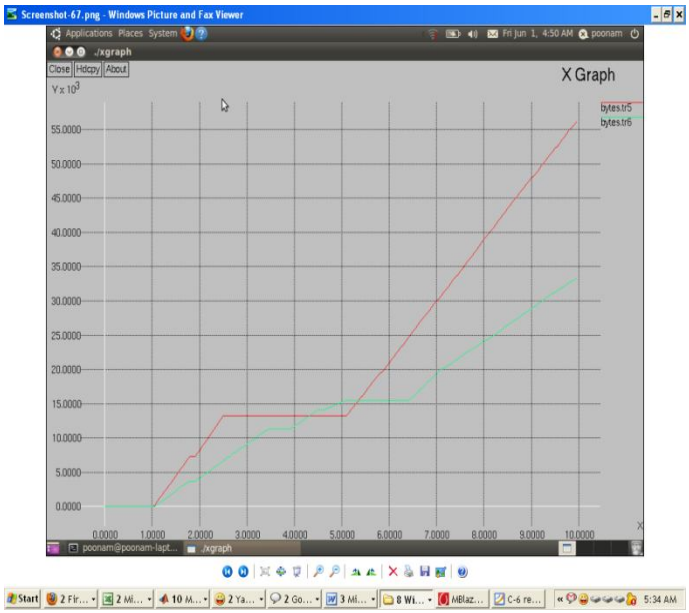

Figure 5: Comparison bytes Transmitted (Ring Topology)

From figure 5, we can observe that simulation is been performed for 10 seconds. We can observe that as the distance from the PAN coordinator increases the bytes communication over the network decreases. As we know smart dust are the tiny particles that have very less energy to communicate. They can give better results if the nodes are at less distance from PAN coordinator. So we can conclude as the nearer the distance from PAN coordinator, more effective the network is.

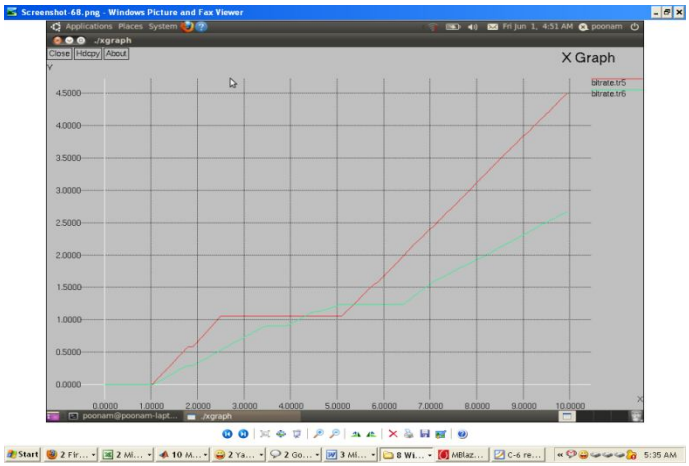

Figure 6: Comparison Bit rate (Ring Topology)

From the figure6, we can observe that the simulation is been performed for 10 seconds. We can observe that as the distance from the PAN coordinator increases the bitrate over the network decreases. As we know smart dust are the tiny particles that have very less energy to communicate. They can give better results if the nodes are at less distance from PAN coordinator. The bit rate is higher if the nodes are closer to the coordinator.

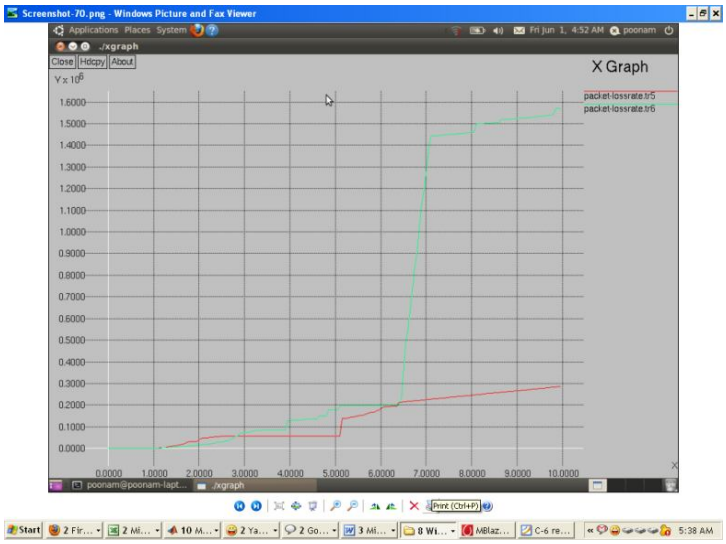

Figure 7: Comparison Packet loss rate (Ring Topology)

From the figure7, we can observe that the simulation is been performed for 10 seconds. We can observe that as the distance from the PAN coordinator increases the packet-loss rate over the network also increases. As we know smart dust are the tiny particles that have very less energy to communicate. They can give better results if the nodes are at less distance from PAN coordinator. As the distance of nodes increases from the coordinator the loss rate will be increased.

4. CONCLUSION

We have taken a centralized coordinator and place all nodes in the ring form surrounding the coordinator. The coordinator is the main controller and the receiver node for the network. From the results we can conclude as the distance from the coordinator will be increased the throughput will be decreased and the packet loss will be increased.

Table 2: Concluded results of QoS parameters

	7 Nodes	15 Nodes
Packet Transmitted	High	Low
Packet Lost	Low	High
Bit Rate	High	Low
Packet Loss Rate	Low	High

As the distance from the coordinator is less the total packet transmission will be improved. As the distance of nodes from the coordinator is increased the packet loss will be increased on coordinator node. The distance from the coordinator will affect the bit rate, higher the distance lower the bit rate. The packet loss rate will increase as the number of nodes in the network will be increased.

REFERENCES:

[1] D.P. Agarwal and Q-A. Zeng, Introduction to Wireless and Mobile Systems, Brooks/Cole, 2003.

[2] Jun-Zhao Sun, Mobile Ad Hoc Networking: an Essential Technology for Pervasive Computing, International Conferences on Info-tech and Info-net, Beijing 29 Oct. – 1 Nov., 2001, Proceedings, ICII 2001, Volume 3, pp.: 316 – 321.

[3] IETF Working Group: Mobile Adhoc Networks (manet). http://www.ietf.org/html.charters/manet-charter.html.

[4] P. M. Ruiz, A. F. Gomez-Skarmeta, Approximating optimal multicast trees in wireless multihop networks, Computers and Communications, 2005. ISCC 2005. Proceedings. 10th IEEE Symposium on, 27-30 June 2005, pp.: 686 – 691.

[5] Z.-Y. Demetrios, A Glance at Quality of Services in Mobile Ad-Hoc Networks, http://www.cs.ucr.edu/~csyiazti/cs260.html, November 19, 2001.

[6] H.Xiao, K.Chua, W.Seah and A.Lo, A Flexible Quality of Service Model for Mobile Ad-hoc Networks, Proceedings of Vehicular Technology Conference (VTC), Tokyo, Japan, May 2000, pp.: 445-449.

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