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Implementation of Ad-hoc on Demand Distance Vector and Optimized Link State Routing Protocol for Mobile Ad-hoc Network with QoS

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Abstract: ***MANET stands for Mobile Adhoc Network in which two or more mobile nodes connects through a wireless links so that they can communicate with each other.In this paper we evaluate the performance of Proactive MANET protocol (OLSR), Reactive MANET Protocols (AODV) and Hybrid Routing Protocol (ZRP) in OPNET Modeler 14.5. For all these comparisons we will use the FTP traffic and IEEE 802.11 Standard to look the effects of the ad hoc network protocols***.

Keywords: MANET, FTP, OPNET, QOS, IEEE 802.11.

I. INTRODUCTION

A mobile adhoc network is formed without the central administration that consist of mobile nodes they can use a wireless interface to send a packet data. MANET nodes contain multiple applications and it require different level of data traffic to communicate with the other nodes. MANET does not contain fixed network topology since nodes are in true mobility irrespective of the direction which generates large complexity in routing traffic from source to destination.In the MANET theret are different categories of MANET routing protocols, Proactive, Reactive and Hybrid. Each category contains the different routing protocols developed according to some specific domain requirements.In this paper we evaluate the performance of the Proactive MANET protocol (OLSR), Reactive MANET Protocols (AODV) and Hybrid Routing Protocol (ZRP) in OPNET Modeler 14.5. For all these comparisons we will use the FTP traffic and IEEE 802.11 Standard to look the effects of the ad hoc network protocols. In our simulation we have wireless routing protocols carrying the FTP traffic.

1.1 MANET Application Example

The flexibility of MANETs makes them ideal candidates for a wide-range of array of applications. A common use of the MANETs is during the group communications in conferences. The key attributes is that make MANETs ideal candidates for such applications are their quick self-configuration and low cost of deployment.

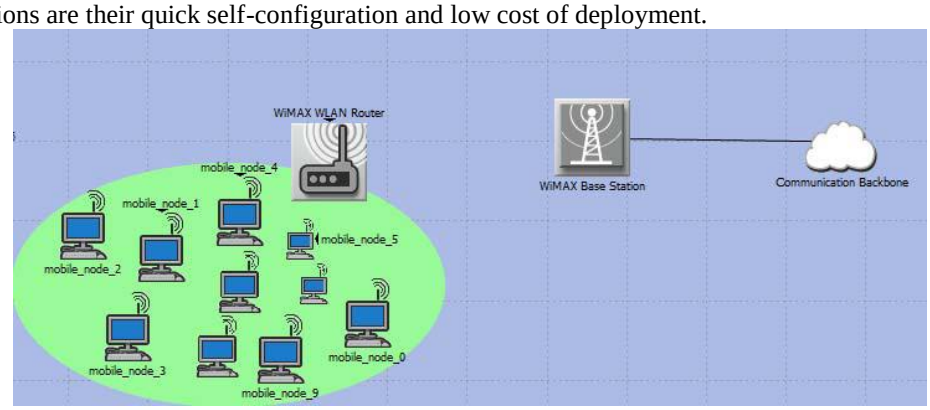

Fig.1 MANET deployment over WiMAX

This is used in case of a natural disaster, a radio link such as WiMAX radio link may be established to one area and then the MANET access network established to provide coverage addition to the areas that would otherwise be impossible to cover. In this situation, the nodes further away from the base station will rely on intermediate nodes for the communication. This provides an important communication network used in such situation. Figure 1 shows that the deployment of a MANET over a WiMAX backbone.

1.2 Routing in Mobile Ad hoc Network

Routing means to choose a appropriate path. Routing in MANET means to select a right and suitable path from source to destination. Routing protocols in mobile ad hoc network means that the mobile nodes will search for a path that can be connected to each other and share the data packets. In mobile ad hoc networks the routing is mostly done by the help of

routing tables. These tables are kept in the memory cache of these mobile nodes. When routing process is going on, it route the data packets in different mechanisms. The first is unicast, in which the source directly sends the data packets to the destination. The second is multicast, in which the source node sends data packet to the specified multiple nodes in the network. The third is broadcast; it which the source node sends messages to all the near and far nodes in the network.

II. IMPLEMENTATION AND RESULT

Different performance of the metrics are used in the evaluation of routing protocols. They represents the different characteristics of the overall network performance. In this report, we evaluate four metrics used in our comparisons to study their effect on the overall network performance. These metrics are routing overhead, packet delivery ratio, packet end-to-end delay and network throughput.

There are two types of statistics, Object statistics and Global statistics that can be collected in the OPNET. Global statistics are collected from the entire network while object statistics are from the individual nodes. In which when desired statistics are chosen, run the simulation to record the statistics. After running the simulation, the collected results are viewed and analysed. This is done by either the right clicking in the project editor workspace and choosing 'View Results' or by the clicking on 'DES', 'Results' then 'View Results'. A results browser then pops up as shown in Figure 2 below.

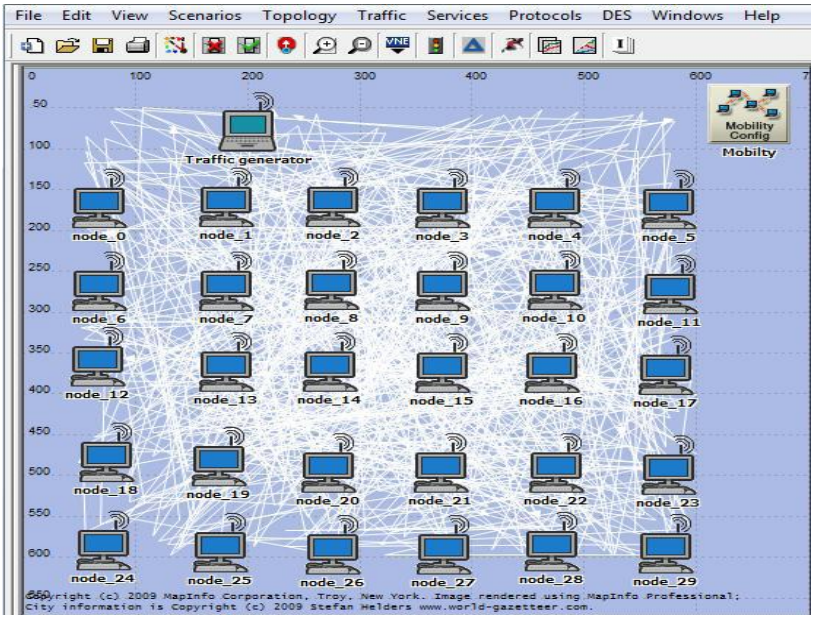

Fig.2 Simulation Setup

2.1 Simulation Procedure

There are six categories for the simulations. Each category contains the four simulations, one for each of the four ad hoc protocols under consideration namely AODV, OLSR, DSR and TORA.

Table. 1 simulation categories

CATEGORY	Number of Nodes	Node Speed (m/s)
1	5	10
2	5	28
3	20	10
4	20	28
5	50	10
6	50	28

2.2 Result

We discuss and analyse the results of our simulations. We start on our discussion by analysing the routing overhead of the network. We then analyse the packet delivery ratio, packet end-to-end delay and lastly the throughput of the network. We collected global statistics for the entire network and present the average values in this report. We were not able to collect statistics for TORA with higher traffic sources, i.e. 50 nodes. TORA performs a well with a gradual injection of traffic as it has a problem of counting to infinity. In our simulations, all the traffic sources were active at the original setup. This caused by the TORA to overrun the computer memory during the simulations.

2.2.1 Throughput

Figure 3 show the performance of the protocols in different scenarios. We observe that the OLSR by far outperforms all the other protocols in all the scenarios considered. As OLSR is proactive routing protocol, paths are readily available for traffic.

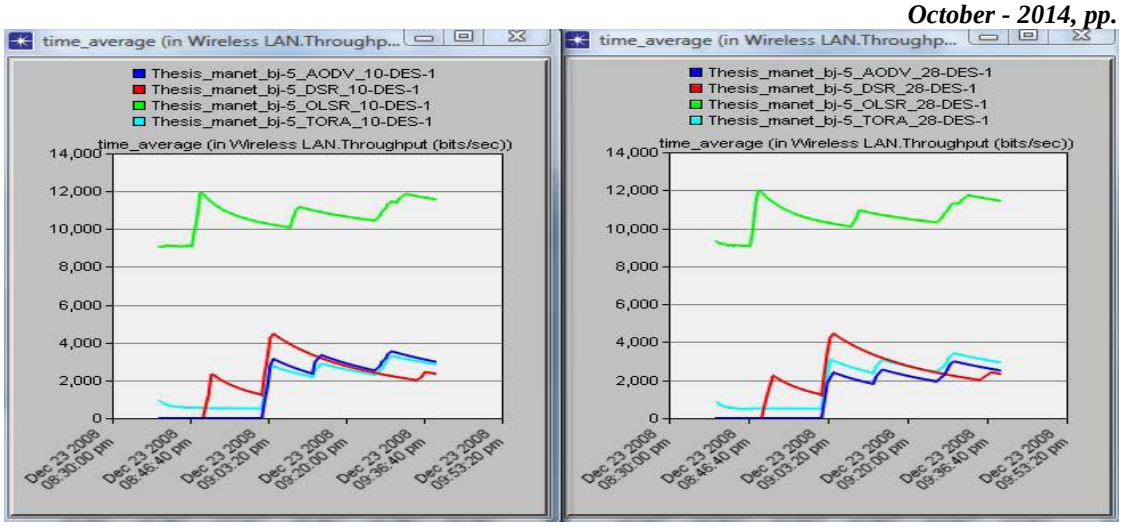

Fig. 3 Throughput – 5 sources at 10m/s and 28m/s

2.2.2 Number of traffic sources and mobility effects on TORA

For the comparison of the TORA's performance at various network conditions. In the scenario with five traffic sources, we observe that increasing the speed form 10 m/s to 28 m/s does not have an effect on the amount of routing overhead in TORA. On the other hand, with twenty traffic sources, we observe that routing overhead is lower at the higher speed of 28 m/s as compared to when the nodes are moving at 10 m/s. We can therefore conclude that in the networks with large traffic sources, TORA performs better at higher than at lower mobility.

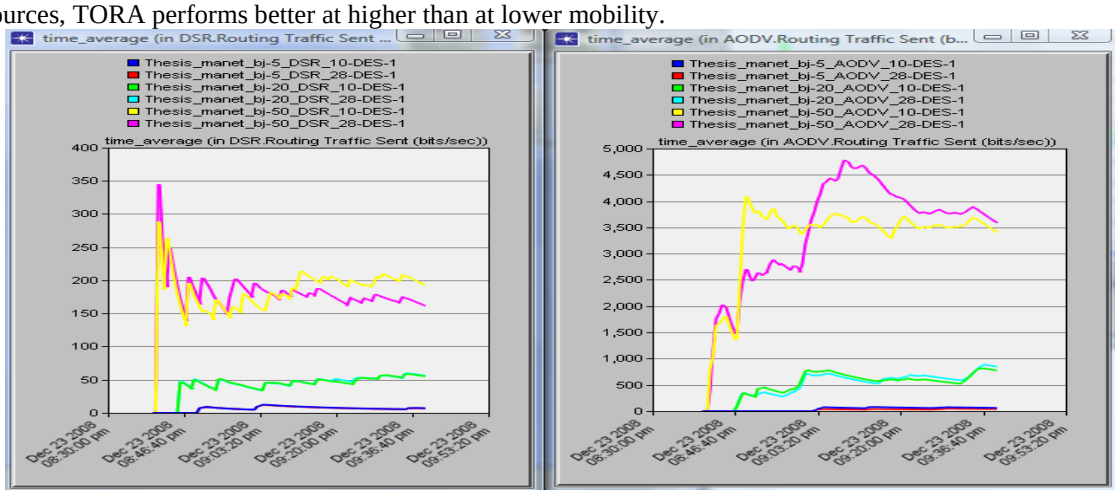

Fig. 7.2 Routing overhead in TORA and OLS

III. CONCLUSION

We have to evaluated the four different ad hoc routing protocols with respect to their routing overhead, packet delivery ratio, throughput and packet end-to-end delay. These performance metrics used in our evaluation represents two aspects of the performance in a network. Throughput, packet end-to-end delay and packet delivery ratio addresses the reliability of the protocols. We can used TCP (FTP) traffic with all the sources sending traffic to a common destination. Due to the use of the TCP, the packet delivery ratios for all the protocols in the scenarios considered was about 50%. This demonstrated the nonsuitability of using TCP with the current ad hoc routing protocols.

IV. FUTURE SCOPE

Future works will be evaluate the performance of existing ad hoc routing protocols and those protocols specifically designed in the IEEE 802.16 standard in Mobile WiMAX. Mobility in WiMAX is a feature that was developed as an addition to the original IEEE 802.16 standard for WiMAX; therefore, it would be good to provide all the necessary information to prospective users and hardware manufacturers about the pros and cons of the already developed standards in this area.

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