OPNET Based Simulation and Performance Analysis of GRP Routing Protocol

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Abstract— Mobile Ad-Hoc network (MANET) is a network of mobile nodes that can communicate with each other without using any centralized control or fixed infrastructure .This paper using OPNET simulation tool for the performance of GRP routing protocol simulation, build a small scale the complexity of the mobile Ad-Hoc network model, the GRP routing algorithm, the average GRP traffic sent and received in packet and bit per second form, delay, Delay and no. of packets create, copied and destroyed in scenario for the simulation analysis and performances. The simulation result of the research has practical reference value for further study.

Keywords— MANET, GRP, OPNET, IEEE802.11, IEEE802.11b

I. INTRODUCTION

MANET (Mobile Ad Hoc Network) is a network of mobile devices that communicates through wireless links without the use of any existing network infrastructure or centralized administration [1,9].
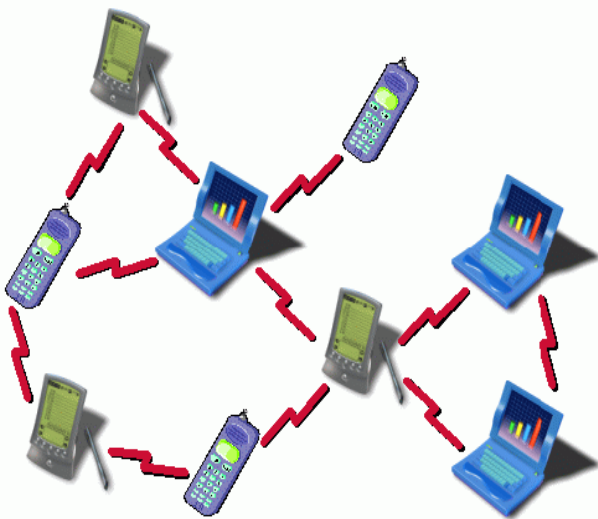

Fig. 1 Ad Hoc Network

It is composed by group of stations that communicate wirelessly with each other to form a network. Two of the most important factors that characterize MANETs are the routing protocol and the wireless technology employed by the stations that confirm it. Routing Protocols in computer network research has been a research hot spot and difficult, so does MANET network. The routing protocols which are suitable for the fixed network previously are no longer suitable for MANET network because of the particular characteristics of MANET network; therefore we have no choice but to design a suitable one according to the characteristics of the MANET network [2,9].

The IEEE 802.11 standard was created for wireless Area Network which had data rate of up to 2Mbps with the bandwidth of 20 MHz and band of 2.4GHz or a unlicensed 5 GHz Band. But 802.11b standard (MANET) after 802.11a enhances the data rate up to 11Mbps at the same band of 2.4GHz. [3] It uses CSMA/CA access method which helps in avoiding collision with sensing the routing path. It works over extension of DSSS (Direct-sequence spread spectrum). It mainly use Complementary code keying (CCK). In this paper OPNET simulation tool is used for the performance of GRP Ad- hoc routing protocol which simulate the number of packet destroyed, number of packet copied, number of packet created, network delay, routing traffic received and traffic sent[9,10]

II. THE GRP PROTOCOL

GRP (Gathering based routing protocol) protocol is source initialized protocol in MANET routing protocol in which all

the routing path is created by source node in Mobile Ad-hoc network. In this protocol, source node collects all the information about the route to the destination. In this procedure, source node sends a destination Query toward the destination through network. It works like AODV and DSR using RREQS (Reverse Request Query by Source). In it, when destination Query reached to the destination, destination sends a packet called Network Information Gathering (NIG) which approach through network. When NIG packet reached at a router, router gives it all the information about the network and its resources. There are many nodes called Effective Outgoing Links (EIL) where NIG packet does not riches, routers send this information to these EILs. At last NIG reaches at source node and source node get all the information [4, 5].

A. Advantages of GRP

In GRP does not require maintained of routing tables or route construction prior to or during the forwarding process. Moreover GRP offers a number of advantages over convention ad hoc routing strategies. The forwarding process also allowed a packet to adopt to change in the topology by selecting the next best choice if an intermediate node used by previous packets becomes unavailable. These approaches do not require table maintains other than immediate neighbor nor dissemination of topology information even without the need for route construction [6]. Routes can be altered node by node and packet by packet simply by considering additional Quality -of- Services (QoS) parameters relating to the next-hop neighbours, such as delay or available bandwidth [7].

B. Disadvantages of GRP

One of the major disadvantages of GRP is complexity and overhead required for a distributed location database service. However, The over- head of the location service cannot be entirely apportioned as the routing overhead if location-aware nodes and location-centric data become an integral part of pervasive computing and mobile sensor networks used for control and monitoring of applications. For example, location-aware capabilities provide facilities for uncast and multicast messaging into specific user-defined geographic areas [8]

III. SIMULATION PARAMETER & MODEL

Network consist of N mobile nodes randomly distributed in X *Y rectangular area, through wireless communication link. In this paper the simulation of performance of nodes under various Gathering based routing protocol is analyzed through process model, Network model and node model [10].

A. Experimental Model

In this paper we proposed a location based network consisting of three models by using mobile nodes which are based on

GRP Protocol as shown in fig 2,fig 3and fig 4. These models are created with help of OPNET MODELER 14.5.
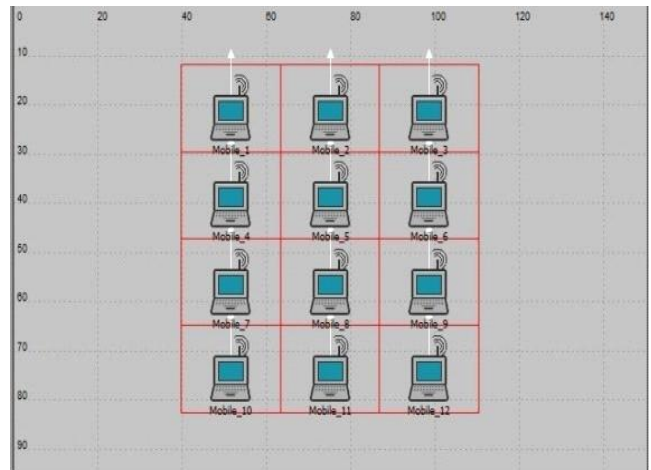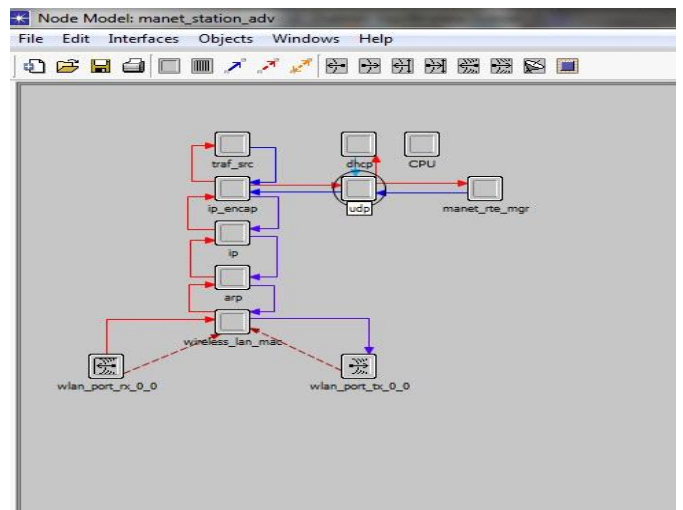

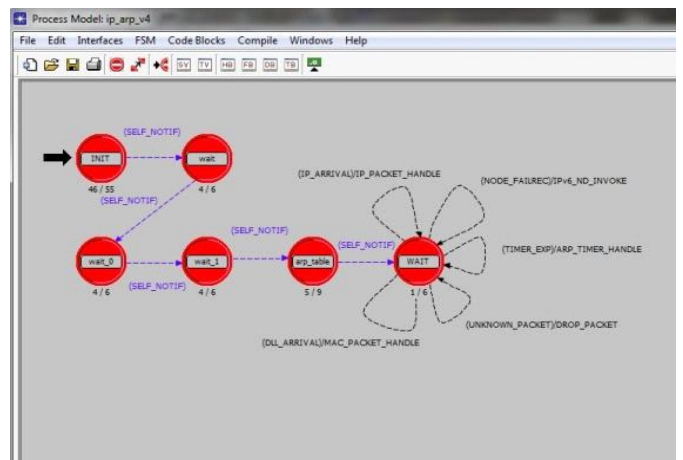Fig.2 Network model using mobile node

Fig 3 Node Model

Fig 4 Process Model

The simulation parameters are shown in the table below.

Parameter	Value
Transmitter Range	100 m
Data Rate	11 MBPS
Simulation Time	1 Hour
Number Of nodes	12
Environment Size	100 x 100 m
Traffic Type	Constant Bit Rate
Seed	128
Values per statistic	100
Update Interval	500000 events
Simulation Kernel	Based on Kernel-type preference
Trajectory Information	Random Wave point
Area of movement	Within Network
Speed	5(m/s)
Altitude	10 m

IV. SIMULATIONS, ANALYSIS AND DISCUSSION

A. Packet Delivery Ratio

In MANET using GRP protocol, Fig 5 shows the simulation of no of packets created in node centric. There are 12231 packets are created through GRP, 12231 packets created through ip-diagram, 3500 created through WLAN control, 12363 are created through wlan-mac,3500 unformatted packets are created and 12363 packets are created through SAR Segments. The total no of packets created in all node centric are 56188.
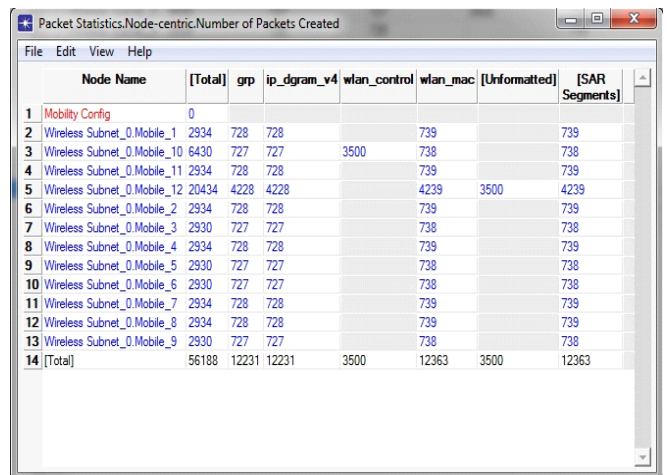

Fig 5 No of Packets Created

Fig 6 shows the simulation of number of packets copied in node centric. There are 100789 packets copied through GRP, 100789 packets copied through ip-diagram, 35000 copied through WLAN control, 127130 are copied through wlan-mac, 7000 unformatted packets are copied and 222455 packets are copied through SAR Segments. The total no of packets copied in all node centric are 593163.
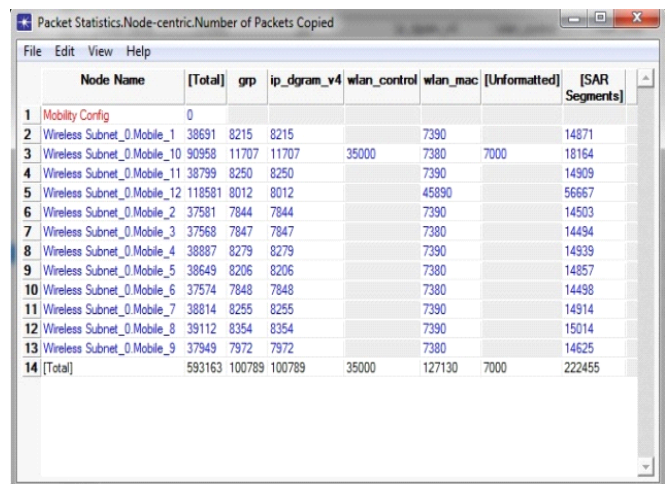

Fig 6 No of Packets Copied

Fig 7 shows the simulation of no of packets destroyed in node centric. There are 113020 packets destroyed through GRP, 113020 packets destroyed through ip-diagram,38500 destroyed through WLAN control , 139493 are destroyed through wlan-mac,7000 unformatted packets are destroyed and 139493 packets are destroyed through SAR Segments. The total no of packets destroyed in all node centric are 550526.

Fig 7 No of Packets Destroyed

Fig 8 shows the End-to-End Delay in Ad-hoc Network using GRP Protocol, here X-axis shows time in minutes where as Y-axis shows the delay in nano seconds
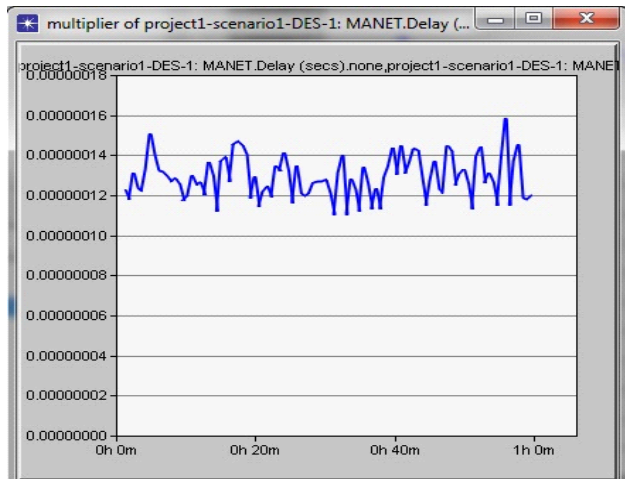

Fig 8 End –to-End Delay

Fig 9 shows the delay element in form of GRP routing traffic where the time to leave expiry in bits per second are 0 and the traffic received and traffic sent are shown in red and green respectively.
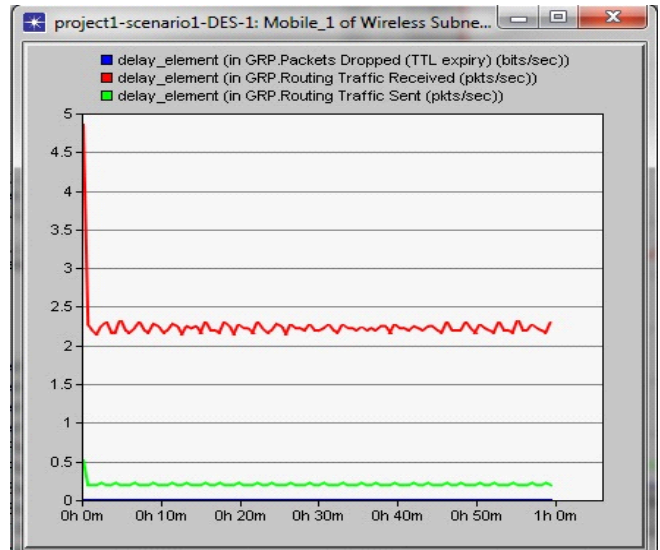

Fig 9 Routing Traffic in Packet Form

Fig 10 shows the constant shift in GRP Routing traffic and constant shift in MANET traffic.GRP routing traffic is in packets per second where as total traffic received in bits per second. The traffic sent in MANET is shows in bits per second and packets per second.
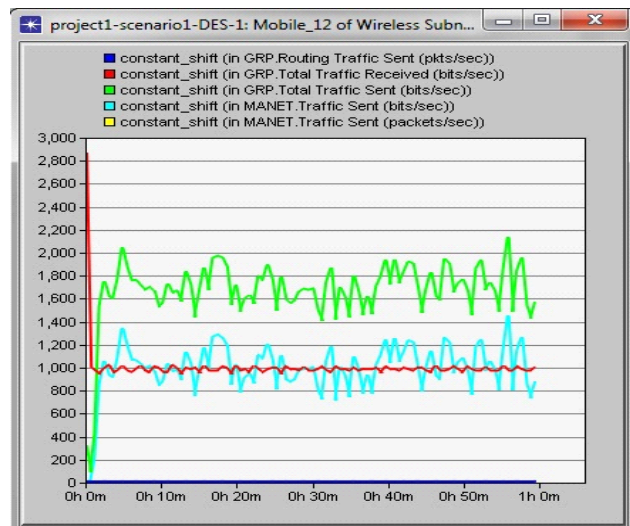

Fig 10 Comparison of GRP & MANET Traffic

Fig 11 shows GRP no of hops per route and GRP routing traffic sent and received in bit per second and packet per second..
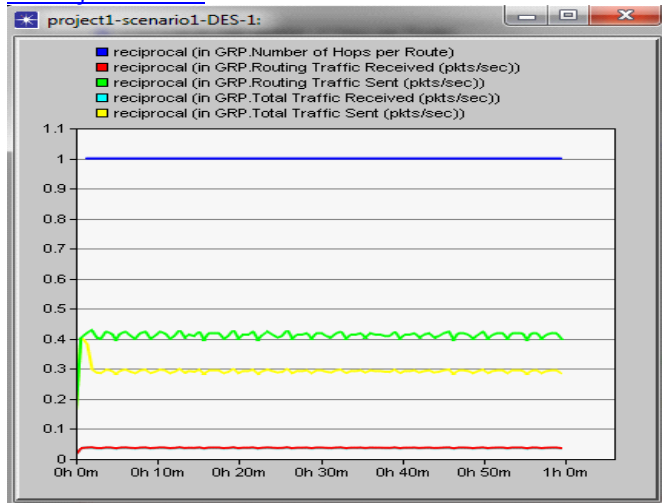
Fig 11 Hops per Route & GRP Traffic (pkts/sec)

V. CONCLUSION

In this paper, we analyze the performance of mobile Ad-hoc network in GRP routing protocol. The simulation results shows GRP protocol has better performance in the term of delay, total traffic sent and received, routing traffic sent and received in packet and bit form, packet copy, packet destroyed, packet created. The same result also holds good for other networking applications. On the basis of this simulation we can deploy the network in all over the world with efficiently and provide the platform for location based security because security is the primary concern for any ad-hoc network.

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