Indian Journal of Engineering

ANALYSIS

ISSN 2319 – 7757 EISSN 2319 –7765

Comparison of different mobility models based on routing protocols using BONNMOTION

Publication History
Received: 04 August 2015
Accepted: 21 August 2015
Published: 1 September 2015 (Special issue)

Citation
Gokulapriya K, Preethi GA, Chandrasekar C. Comparison of different mobility models based on routing protocols using BONNMOTION. *Indian Journal of Engineering*, 2015, 12(30), 238-246

COMPARISON OF DIFFERENT MOBILITY MODELS BASED ON ROUTING PROTOCOLS USING BONNMOTION

K. Gokulapriya	G.A.Preethi	C. Chandrasekar
M.Phil Research Scholar	Ph.D Research Scholar	Professor
Department of Computer science	Department of Computer science	Department of Computer science
Periyar University	Periyar University	Periyar University
Salem – 636011	Salem – 636011	Salem – 636011
gokulapriyamca2@gmail.com	preethi_ga2005@yahoo.com	ccsekar@gmail.com

Abstract

Mobile Ad-hoc Network is a continuously self configuring, infrastructure-less network of mobile devices connected without the need of any existing network infrastructure or centralized administration. Routing protocol is to efficiently construct a route between a pair of nodes with minimum routing overhead and bandwidth consumption. Mobility scenarios are generated for different mobility models like Manhattan Grid, Reference Point Group Mobility model, Gauss Markov mobility model using BONNMOTION 2.1a. The performance of the best mobility model is analyzed with the use of AODV, DSDV, DSR routing protocols. The simulation can be performed based on Tracegraph202. The metrics used for performance analysis are Throughput of sending packets, Throughput of sending bits Vs Minimal Simulation Jitter.

Keywords:- AODV, DSDV, DSR, Manhattan Grid, Reference Point Group Mobility Model, Gauss Markov, Bonnmotion-2.1a.

I INTRODUCTION

Mobile ad-hoc network (MANET) is a collection of wireless nodes that dynamically create a wireless network among them without any infrastructure or centralized administration. Since no fixed infrastructure or centralized administration is available, these networks are self-organized and end-to-end communication may require routing information via several intermediate nodes. Nodes can connect each other randomly and forming arbitrary topologies. Each node in MANET acts both as a host and as a router to forward messages for other nodes that are not within the same radio range. The primary challenge in building a Mobile Ad hoc Network is equipping each device to continuously maintain the information required to route traffic. MANET is that which allows the mobile nodes to communicate with each other via a wireless medium without any infrastructure i.e. forms a temporary network. There is no need of access points, each node act as a router and node at the same time. These mobile nodes (router) can leave and join the network according to their own wish [7].

II ROUTING PROTOCOLS

MANET routing protocols can be classified into proactive, reactive and hybrid protocols. Proactive or table-driven protocols attempt to maintain consistent up-to-date routing information from each node to every other node in the network. Each node maintains tables to store routing information, and any changes in network topology need to be reflected by propagating updates throughout the network. Reactive or on demand protocols are based on source-initiated on-demand reactive routing. This type of routing creates routes only when a node requires a route to a destination [9].

A. Ad-Hoc on Demand Distance Vector

The Ad Hoc on-Demand Distance Vector Routing (AODV) is a routing protocol for mobile ad hoc networks (MANETs) and other wireless ad-hoc networks provides on-demand route discovery. It is a reactive routing protocol, meaning that it establishes a route to a destination only on demand. Whenever the nodes need to send data to the destination, if the source node doesn't have routing information in its table, route discovery process begins to find the routes from source to destination. A node requests a route to a destination by broadcasting an RREQ message to all its neighbors. RREQ message comprises broadcast ID, two sequence numbers, the addresses of source and destination and hop count [3].

B. Destination-Sequenced Distance-Vector

Destination - Sequenced Distance - Vector (DSDV) Routing protocol is a proactive table driven algorithm based on classic Bellman-Ford routing. In proactive protocols, all nodes learn the network topology before a forward request comes in. In DSDV protocol each node maintains routing information for all known destinations. The routing information is updated periodically. Each node maintains a table, which contains information for all available destinations, the next node to reach the destination, number of hops to reach the destination and sequence number. The nodes periodically send this table to all neighbors to maintain the topology, which adds to the network overhead. Each entry in the routing table is marked with a sequence number assigned by the destination node [4].

C. Dynamic Source Routing (DSR)

Dynamic Source Routing protocol is a reactive protocol i.e. it determines the proper route only when a packet needs to be forwarded. The DSR protocol is composed of two main mechanisms that work together to allow the discovery and maintenance of source routes in the ad hoc network. Route discovery is done by DSR to find the route and to send the data from a source to destination where the source node is not aware of the destination route. When a source node *S* wishes to send a packet to the destination node *D*, it obtains a route to *D*. This is called Route Discovery. DSR protocol enables the route maintenance procedure while transmitting the packets from source to destination. When the route between the source and the destination is broken or else a change in topology is observed. It will result in failure of the packet transmission between source node and destination node. In this case, DSR protocol uses the route maintenance procedure, to find out other possible known route towards the destination to transmit data through cached routes during route discovery process [4].

III MOBILITY MODELS

A mobility model should attempt to emulate the movements of real mobile nodes. Mobility models are based on setting out different parameters related to node movement. Basic parameters are the starting location of mobile nodes, their movement direction, velocity range, speed changes over time [9].

A. Manhattan Grid Mobility Model

Manhattan model emulate the movement pattern of mobile nodes on streets. It can be useful in modeling movement in an urban area .The scenario is composed of a number of horizontal and vertical streets. However, the map composed of a number of horizontal and vertical streets. The mobile node is allowed to move along the grid of horizontal and vertical streets on the map. At an intersection of a horizontal and a vertical street, the mobile node can turn left, right or go straight with certain probability.

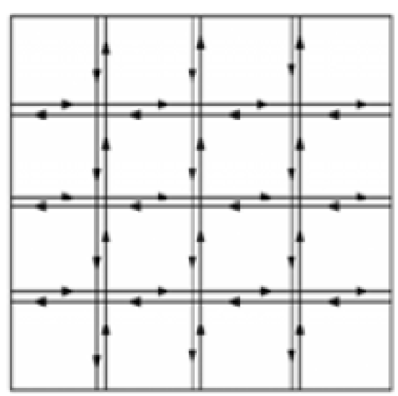

Figure 1: An example of node movement in Manhattan Grid Mobility Model

B. *Reference Point Group Mobility (RPGM)*

In [1], Reference Point Group Mobility model represents the random motion of a group of mobile nodes and their random individual motion within the group. All group members follow a logical group center that determines the group motion behavior. The entity mobility models should be specified to handle the movement of the individual mobile nodes within the group. Purpose of logical group center is to guide group of nodes continuously calculating group motion vector and this way defining behavior, speeds and directions for mobile nodes. Once the updated reference point $RP(t+1)$ has been updated they are combined with random motion vector $R\vec{M}$ values to represent the random motion of each mobile node around its reference point.

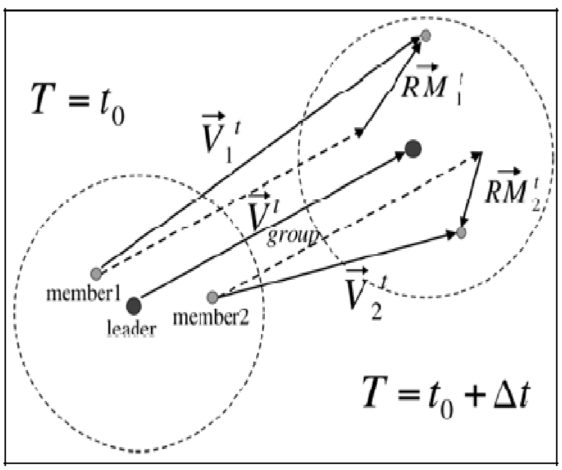

Figure 2: An example of node movement in Reference Point Group Mobility Model

C. *Gauss-Markov model*

The Gauss-Markov Mobility Model was first introduced by Liang and Haasand widely utilized. In this model, the velocity of mobile node is assumed to be correlated over time and modeled as a Gauss-Markov stochastic process. When the node is going to travel beyond the boundaries of the simulation field, the direction of movement is forced to flip 180 degree. This way, the nodes remain away from the boundary of simulation field. In the Gauss-Markov model, the temporal dependency plays a key role in determining the mobility behaviour [2].

$$V_n = \beta V_{n-1} + (1-\beta)\Omega + \sqrt{(1-\beta)^2}\, X_{n-1} \quad (1)$$

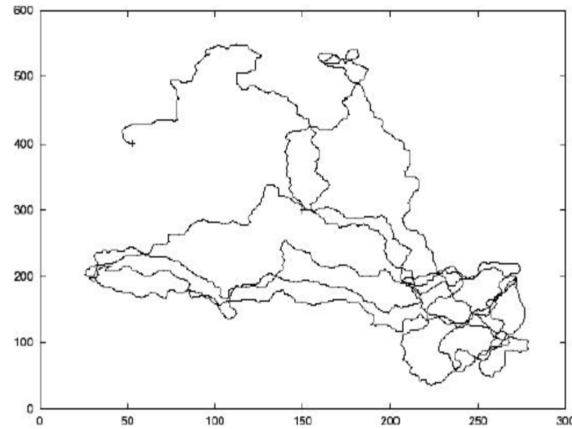

Figure 3: Example of mobile node moving in 2D area using Gauss Markov mobility model

Simulation Environment

Parameter	Value
Terrain Region	1500m x 1500 m
Routing Protocol	AODV, DSDV , DSR
Mobility model	Manhattan Grid model , Reference Point Group Mobility Model , Gauss Markov model
Node Placement	Uniform Distribution
Pause Time	0
Traffic	CBR
Tool	Bonnmotion-2.1a
Simulator	NS-2.35

Table 1: Simulation Parameters

IV SIMULATION AND RESULTS

Manhattan Grid Mobility Model

Throughput of sending packets of AODV, DSDV, DSR routing protocols

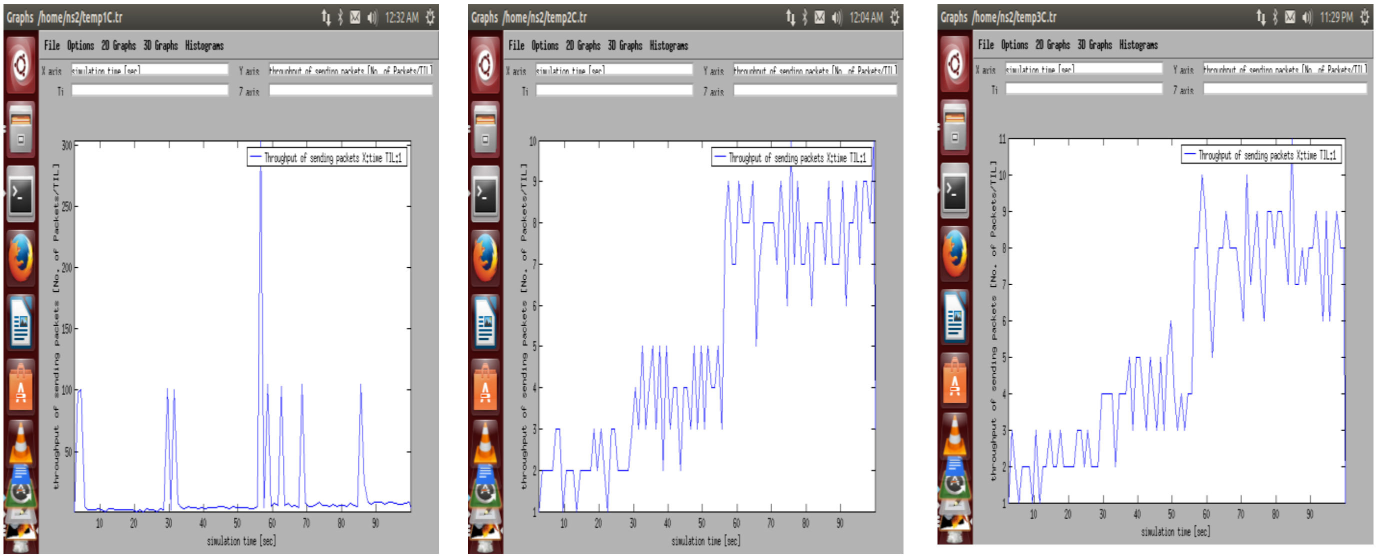

Figure 4: Throughput of sending packets of AODV, DSDV, DSR routing Protocols in Manhattan Grid mobility model

Throughput of sending bits Vs Minimal Simulation Jitter of AODV, DSDV, DSR routing protocols

.

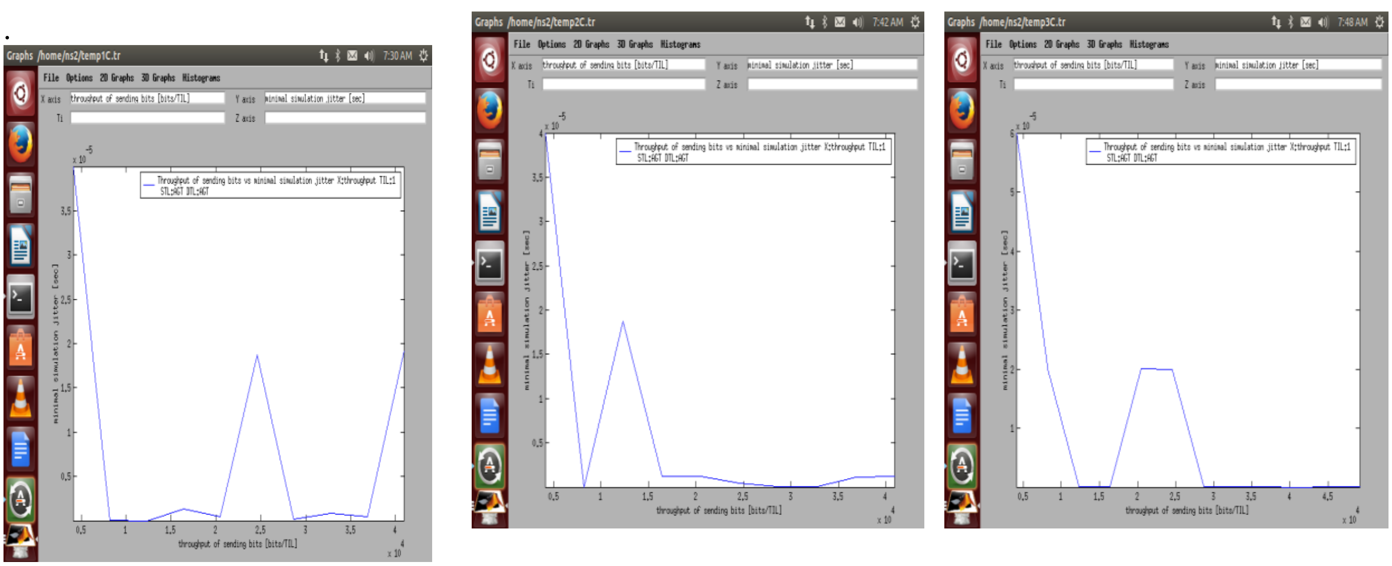

Figure 5: Throughput of sending bits Vs Minimal Simulation Jitter of AODV, DSDV, DSR routing Protocols in Manhattan Grid mobility model

Reference Point Group Mobility Model

Throughput of sending packets of AODV, DSDV, DSR routing protocols

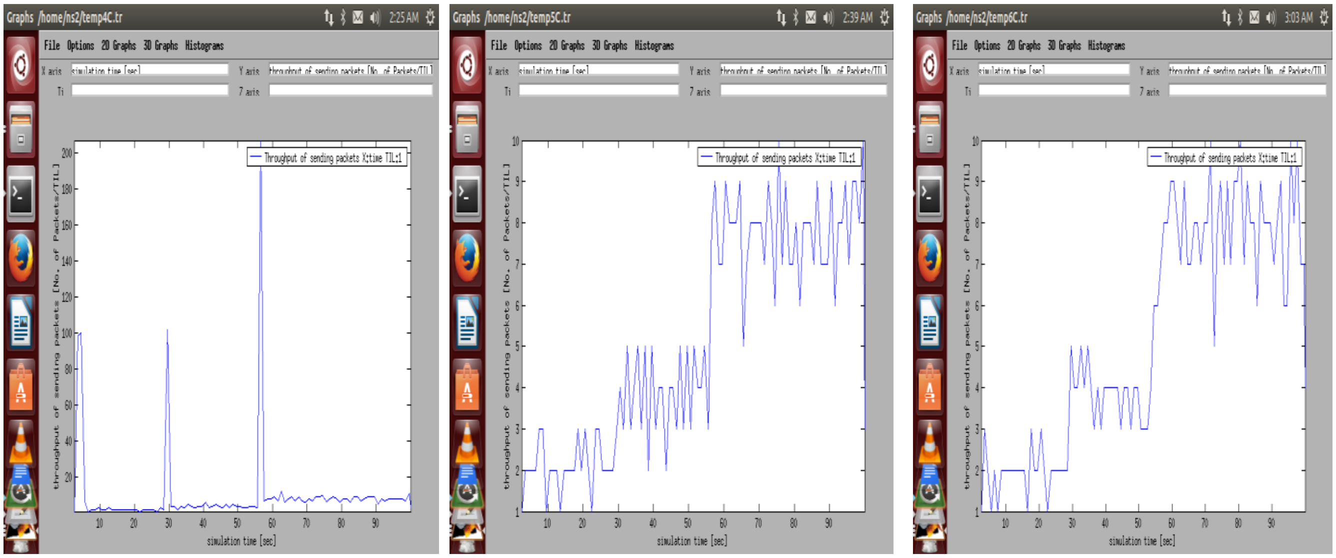

Figure 6: Throughput of sending packets of AODV, DSDV, DSR routing Protocols in Reference Point Group Mobility Model

Throughput of Sending bits Vs Minimal Simulation Jitter of AODV, DSDV, DSR routing protocols

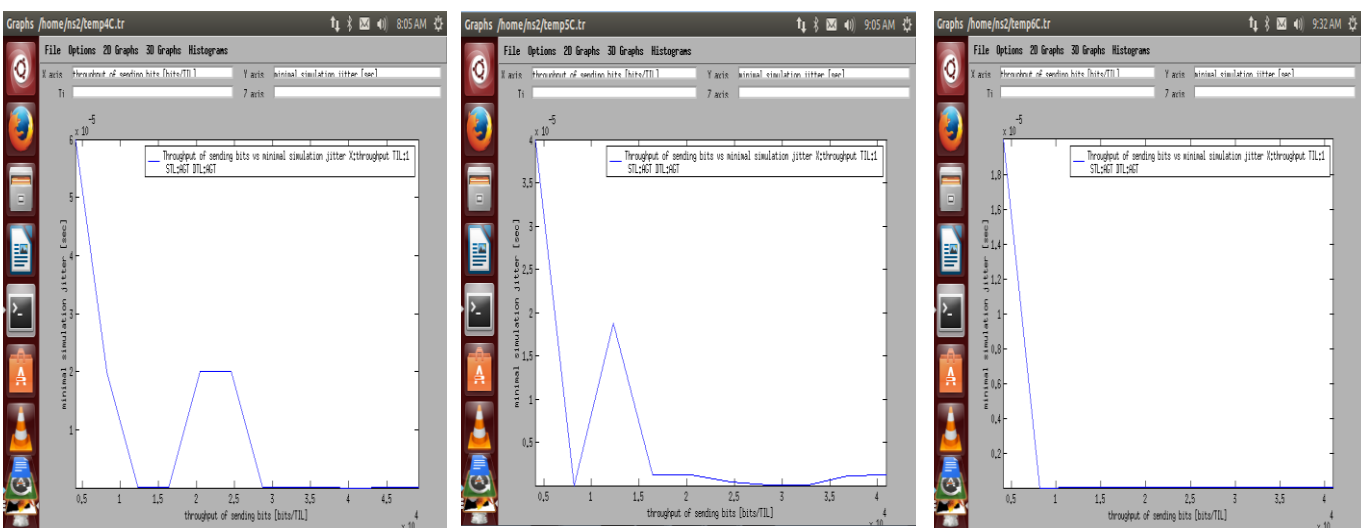

Figure 7: Throughput of sending bits Vs Minimal Simulation Jitter of AODV, DSDV, DSR routing Protocols in Reference Point Group Mobility model

<u>Gauss Markov Mobility Model</u>

Throughput of sending packets of AODV, DSDV, DSR routing protocols

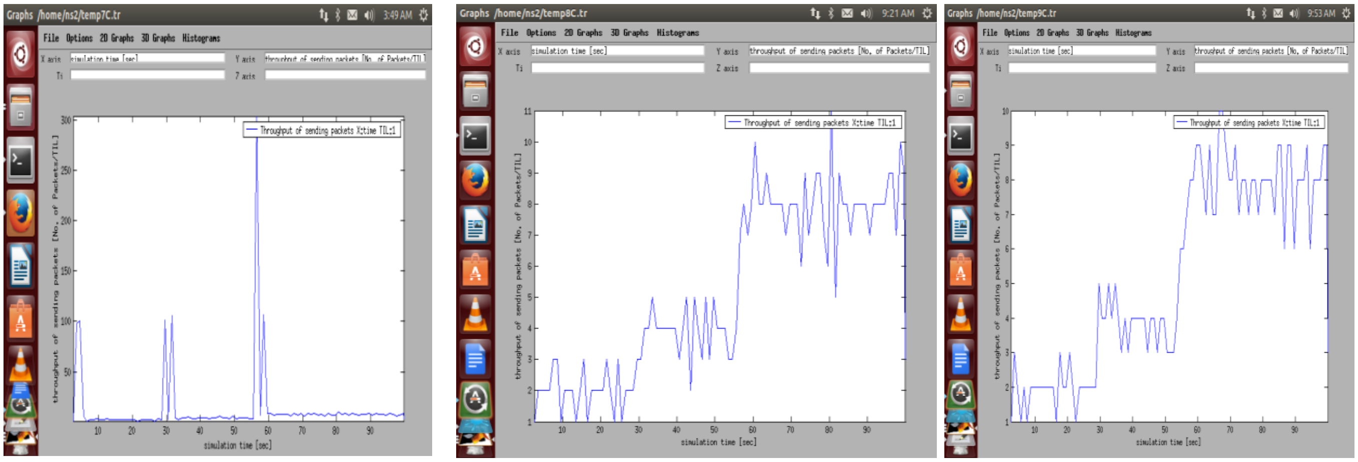

Figure 8: Throughput of sending packets of AODV, DSDV, DSR routing Protocols in Gauss Markov Mobility

Throughput of sending bits Vs Minimal Simulation Jitter of AODV, DSDV, DSR routing protocols

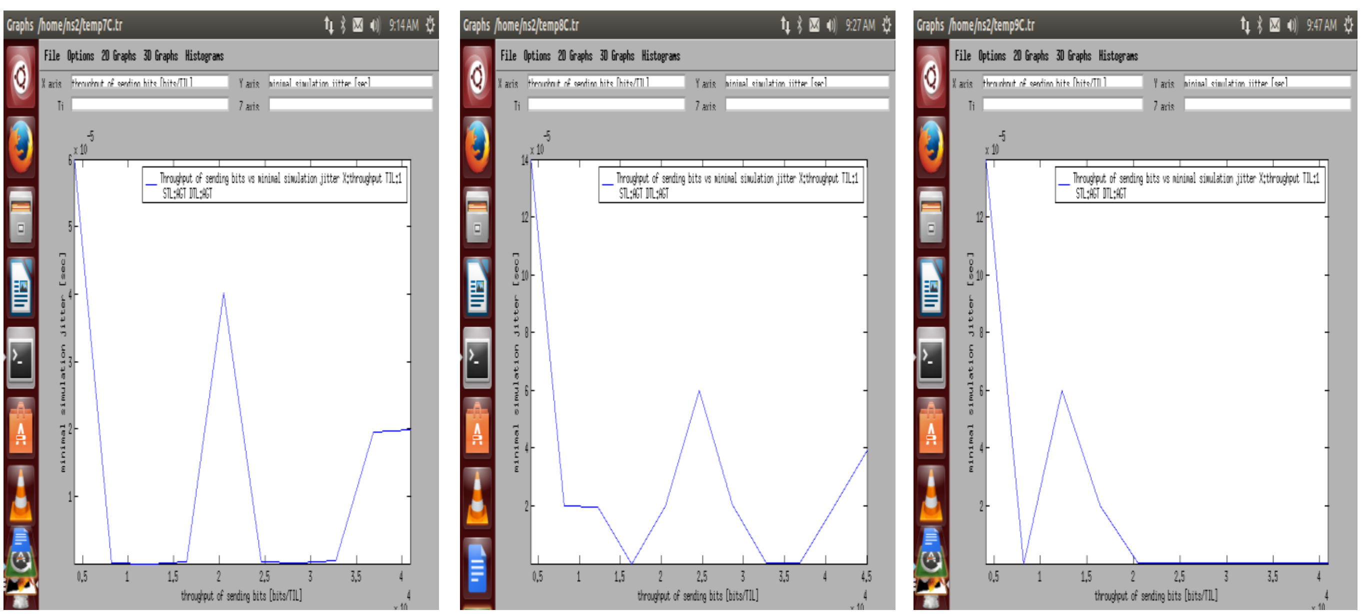

Figure 9: Throughput of sending bits Vs Minimal Simulation Jitter of AODV, DSDV, DSR routing Protocols in Gauss Markov mobility model

RESULTS AND DISCUSSION

The implementations can be performed in three different scenarios, such as Manhattan Grid, Reference Point Group Mobility Model and Gauss Markov models. The routing protocols such as AODV, DSDV and DSR can be used to discern the best mobility model.

A. Throughput of sending packets

Throughput

Throughput represents the average rate of successful packet delivery per unit time over a communication channel.

$$Throughput = \frac{\sum Packet\ received}{Transmission\ time}$$

Fig 4,6,8 show the Throughput of sending packets of AODV, DSDV, DSR routing Protocols in Manhattan Grid, Reference Point Group Mobility Model and Gauss Markov model. Throughput of sending packets seems to be high in Manhattan Grid, Reference Point Group Mobility Model and Gauss Markov model while running simulation at 10 to 90 seconds, at 50 to 60 seconds it attains maximum point. Comparatively DSDV, DSR acquired higher throughput. Within DSDV, DSR Reference Point Group Mobility Model gets optimum output in the aspect of mobility models. There are no much discrepancies between three mobility models in the perspective of throughput of sending packets.

B. Throughput of sending bits Vs Minimal Simulation Jitter

Jitter

Jitter is defined as a variation in the delay of received packets. The sending side transmits packets in a continuous stream and spaces them evenly apart. Because of network congestion, improper queuing, or configuration errors, the delay between packets can vary instead of remaining constant. Fig 5,7,9 show the Throughput of sending bits Vs Minimal Simulation Jitter of AODV, DSDV, DSR routing Protocols in Manhattan Grid, Reference Point Group Mobility Model and Gauss Markov model.

Considering AODV in Reference Point Group Mobility Model

From fig 7, Jitter measure shows low at the end of simulation in Reference Point Group Mobility Model. The number of packets gets increases the jitter measures gradually decreases. From 3×10^4 packets jitter level is diminishes. I.e. from 2 to 6 seconds variation in the delay of received packets is very low in RPGM model while compared with MG and GM models. In MG and GM model, when number of packets gets increased the jitter measures can also be increased.

Considering DSDV in Reference Point Group Mobility Model

From fig 7, Jitter measures based on throughput of sending bits has been demonstrated. Jitter level is more at 0.5 to 2 seconds after that it gradually diminishes. I.e. From 2×10^4 packets or from 2 to 4 seconds variation in the delay of received packets is very less in RPGM model. From Fig 5, similarly the MG mobility model can also provide the less jitter.

Considering DSR in Reference Point Group Mobility Model

From Fig 7, it shows that the Throughput of sending bits Vs Minimal Simulation Jitter of DSR routing protocol, in which it is obvious that RPGM has lesser variation in simulation. From 1×10^4 packets jitter level is diminishes. By considering overall simulation, Reference Point Group Mobility Model can provide less jitter when compare to Manhattan Grid and Gauss Markov model.

V CONCLUSION

Throughput of sending packets seems to be high in Manhattan Grid, Reference Point Group Mobility Model and Gauss Markov model while running simulation at 10 to 90 seconds, at 50 to 60 seconds it attains maximum point. Comparatively DSDV, DSR acquired higher throughput. Within DSDV, DSR Reference Point Group Mobility Model gets optimum output.

Throughput of sending bits Vs Minimal Simulation Jitter of AODV, DSDV, DSR routing Protocols in Manhattan Grid, Reference Point Group Mobility Model and Gauss Markov model has been demonstrated. Jitter is defined as a variation in the delay of received packet, variation in the delay of received packets is very low in RPGM model. By considering overall simulation, Reference Point Group Mobility Model can provide less jitter when compare to Manhattan Grid and Gauss Markov model.

VI REFERENCES

[1] Anuj K. Gupta, Harsh Sadawarti and Anil K. Verma, " Performance Analysis of MANET Routing Protocols in Different Mobility Models ", I.J. Information Technology and Computer Science, 2013, 06, 73-82 Published Online May 2013 in MECS (http://www.mecs-press.org/)

[2] B.A.S Roopa Devi, Dr.J.V.R Murthy and Dr.G.Narasimha, **"**Impact of Different Mobility Models on AODV Protocol in MANET with NS-2.35 and Bonnmotion-2.1a", International Journal of Advanced Research in Computer and Communication Engineering, Vol. 3, Issue 10, October 2014

[3] Bonn Motion – A Mobility Scenario Generation and Analysis Tool, July 2013.

[4] Bhavyesh Divecha, Ajith Abraham, Crina Grosan and Sugata Sanyal, "Impact of Node Mobility on MANET Routing Protocols Models", Mumbai University, India, Email: bhavyesh@gmail.com

[5] K.Kavitha, K.Selvakumar, "ANALYSING MULTICAST ROUTING PROTOCOLS WITH DIFFERENT MOBILITY MODELS ", International Journal of Emerging Technology and Advanced Engineering Website: www.ijetae.com (ISSN 2250-2459 (Online), An ISO 9001:2008 Certified Journal, Volume 3, Special Issue 1, January 2013)

[6] Mayank Mathur, Ashish Joshi and Prakash Rao Ragiri," PERFORMANCE ANALYSIS OF REACTIVE ROUTING PROTOCOLS FOR CITY SCENARIO MOBILITY MODEL IN MANETS", International Journal of Engineering Sciences & Emerging Technologies, Volume 5, Issue 2, June 2013

[7] Sanjeev Kumar*, Dr. Jagbir Ahlawat, " Investigate and Improving Routing Mobility Based On Random Way Point Mobility Model Using FTP Traffic in MANET ", International Journal of Advanced Research in Computer Science and Software Engineering, Vol.3, Issue 4, April 2013

[8] Suman Kumari, Sunil Maakar ,Suresh Kumar and R K Rathy, " Traffic Pattern Based Performance Comparison of AODV, DSDV & OLSR MANET Routing Protocols using Freeway Mobility Model", International Journal of Computer Science and Information Technologies, Vol. 2 (4), 2011

[9] VALENTINA TIMCENKO, MIRJANA STOJANOVIC AND SLAVICA BOSTJANCIC RAKAS, "MANET Routing Protocols vs. Mobility Models: Performance Analysis and Comparison", Proceedings of the 9th WSEAS International Conference on APPLIED INFORMATICS AND COMMUNICATIONS (AIC '09)

[10] Youssef Saadi, Said El Kafhali1, Abdelkrim Haqiq and Bouchaib Nassereddine, "Simulation Analysis of Routing Protocols using Manhattan Grid Mobility Model in MANET ", International Journal of Computer Applications (0975 – 8887) ,Vol 45, No.23, May 2012