Performance Evaluation of Ad Hoc Routing Protocols TORA, OLSR and GRP under Pathway Mobility Model

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ABSTRACT: MANET stands for Mobile Ad hoc Network. An ad hoc network is often referred to as an "infrastructure less" network, because the network does not need fixed routers [1]. These nodes are mobile communicating through wireless medium. Each ad hoc node may be capable of acting as a router. It's characterized by multi-hop wireless connection and frequently changing networks. In this paper we evaluate the performance the performance of ad hoc routing protocols i.e TORA (Temporary Ordered Routing Algorithm), OLSR (Optimized Link State Routing) and GRP (Gathering Based Routing Protocol) under Pathway Mobility model by undertaking three parameters such as delay, network load, and throughput.

Keywords- MANET, TORA, OLSR, GRP, OPNET, Pathway Mobility Model

I.INTRODUCTION

Mobile Ad hoc Network (MANET) is a collection of independent mobile nodes that can communicate to each other via radio waves. The mobile nodes that are in radio range of each other can directly communicate, whereas others need the aid of intermediate nodes to route their packets. These networks are fully distributed, and can work at any place without the help of any infrastructure. This property makes these networks highly exile and robust.

In mobile ad hoc network, nodes do not rely of any existing infrastructure. instead, the nodes themselves form the network and communicate through means of wireless communications. Mobility causes frequent topology changes and may break existing paths. routing protocols for ad hoc networks can be classified into two major types: proactive and on-demand. Proactive protocols attempt to maintain up-to-date routing information to all nodes by periodically disseminating topology updates throughout the network. on demand protocols attempt to discover a route only when a route is needed.

The general problem of modelling the behaviour of the nodes belonging to a mobile network has not a unique and straightforward solution. Mobility and disconnection of mobile hosts pose a number of problems in designing proper routing schemes for effective communication between any source and destination.

In Pathway Mobility Model, Initially, the nodes are placed randomly on the edges of the graph. Then for each node a destination is randomly chosen and the node moves towards this destination through the shortest path along the edges. Upon arrival, the node pauses for T time and again chooses a new destination for the next movement. This procedure is repeated until the end of simulation.

II. SIMULATION SETUP

We check these protocols by three parameters such as throughput, delay and load. We used two scenarios i.e. 35 nodes, and 75 nodes.

Parameter	Value
Simulator	Opnet 14.5
Area	3.5×3.5 Km

Wireless MAC	802.11
Number Of Nodes	35, 75
Mobility Model	Pathway Mobility
Data Rate	11 Mbps
Routing Protocols	TORA,OLSR and GRP
Simulation Time	5 minutes

Table 1.1: Simulation parameters

I. RELATED WORK

1) Fan Bai et al.,[1] In this chapter, they survey and examine different mobility models proposed in the recent research literature. Beside the commonly used Random Waypoint model and its variants, we also discuss various models that exhibit the characteristics of temporal dependency, spatial dependency and geographic constraint. Hence, we attempt to provide an overview of the current research status of mobility modeling and analysis.
2) Kuldeep Vats et al.,[5] in "Simulation and performance Analysis of OLSR, GRP, DSR Routing Protocol using OPNET''2012. In this paper simulation and performance analysis the routing protocols OLSR, GRP, DSR for mobile ad hoc network .Further, the implementation of a network using network simulator OPNET will be done to simulation and performance analysis of these three network protocol for delay, load, traffic sent and received, retransmission and data dropped or throughput using 150 mobile node.

IV. RESULTS AND DISCUSSION

1. Throughput:

It is the total size of useful packets that received at all the destination nodes. It is the total number of bits (in bits/sec) forwarded from wireless LAN layers to higher layers in all WLAN nodes of the network.

It is observed that:

a) OlSR outperforms both TORA and GRP in overall performance.
b) As the number of nodes increase throughput for OLSR also increases. It is due to the availability of routing tables before the communication commences. On the other hand, TORA and GRP has to find the path spontaneously.
c) In case of TORA considerable time overhead occurs due to the Route creation process where a source broadcasting and destination reply establishes an acyclic graph.

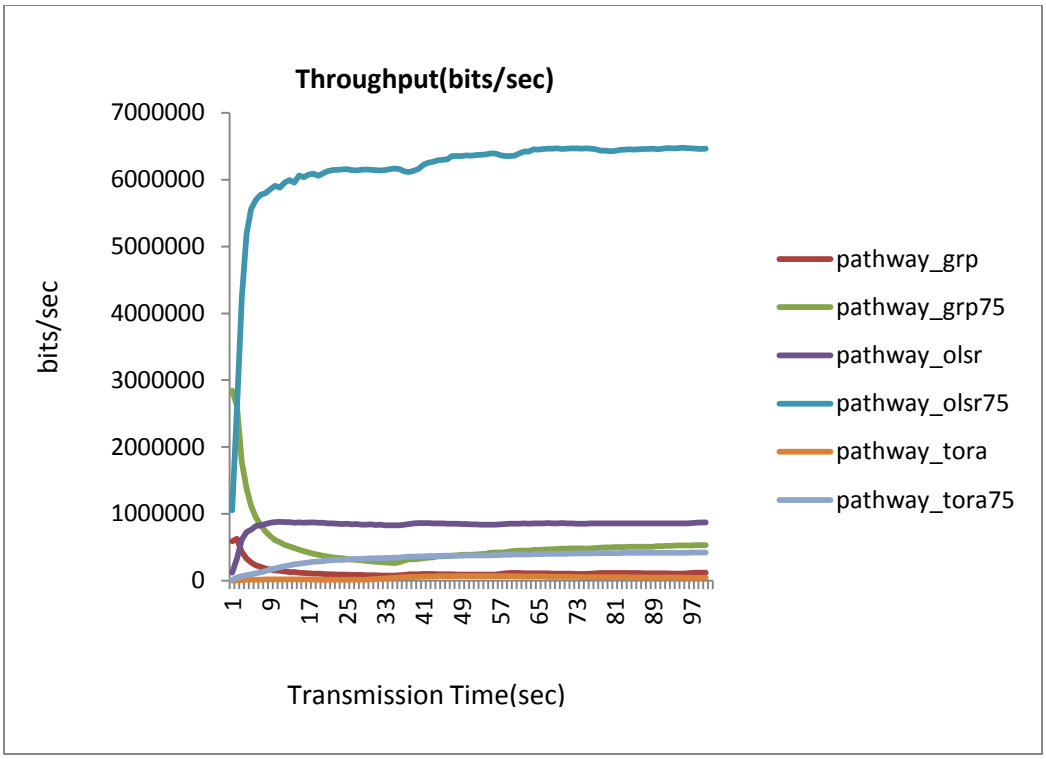

Fig. 1.2.Throughput (Pathway Model)

	TORA		OLSR		GRP	
	35	**75**	**35**	**75**	**35**	**75**
Throughput (Bits/Sec.)	100012.368	301965.407	905376.648	6700391.067	110943.238	311031.444

Table 1.2.1 Throughput (Pathway Model)

2. Load:

It is the total data traffic (in bits/sec) received by the entire WLAN. Load represents the capacity and efficiency of network. More load means more capable is network of handling the data traffic.

It is observed that:

a) OLSR sends more data information as compared to TORA and GRP because in OLSR routing information is pre-maintained that reduces the amount of control information.

b) GRP being a hybrid protocol GRP Shows an average performance with unpredictable changes.

c) TORA reactive protocol is more busy in maintaining control information than other two because every time data is to be sent, first the route has to be established.

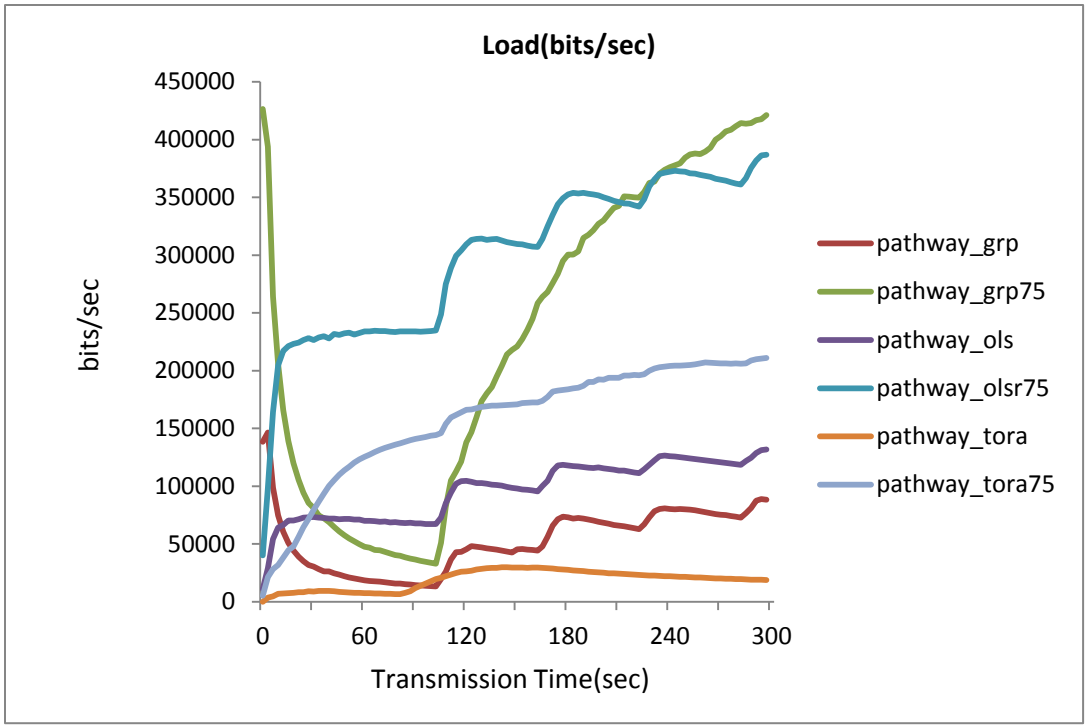

Fig. 1.3.Load (Pathway Model)

	TORA		OLSR		GRP	
	35	**75**	**35**	**75**	**35**	**75**
Load (Bits/Sec.)	43340.368	200965.407	111376.648	362500.265	98544.238	411031.444

Table 1.3.1 Load (Pathway Model)

3. Routing overhead:

Routing overhead refers to the extra time spent deciding on the routing process. It includes time overhead for path calculation, route allocation. For better performance minimal routing overhead is desired. Following figure provides a comparative analysis of Routing overhead for GRP, TORA and OLSR for 25 and 75 nodes density.
It is observed that:
a. GRP has the minimum routing overhead of all three protocols. Whereas TORA suffers from largest time overhead.
b. OLSR routing overhead lies in between TORA and GRP.
c. We observe increase in routing overhead as the number of nodes increase and this is particularly significant in case of TORA. For GRP this increase is relatively small and for OLSR this is medium.

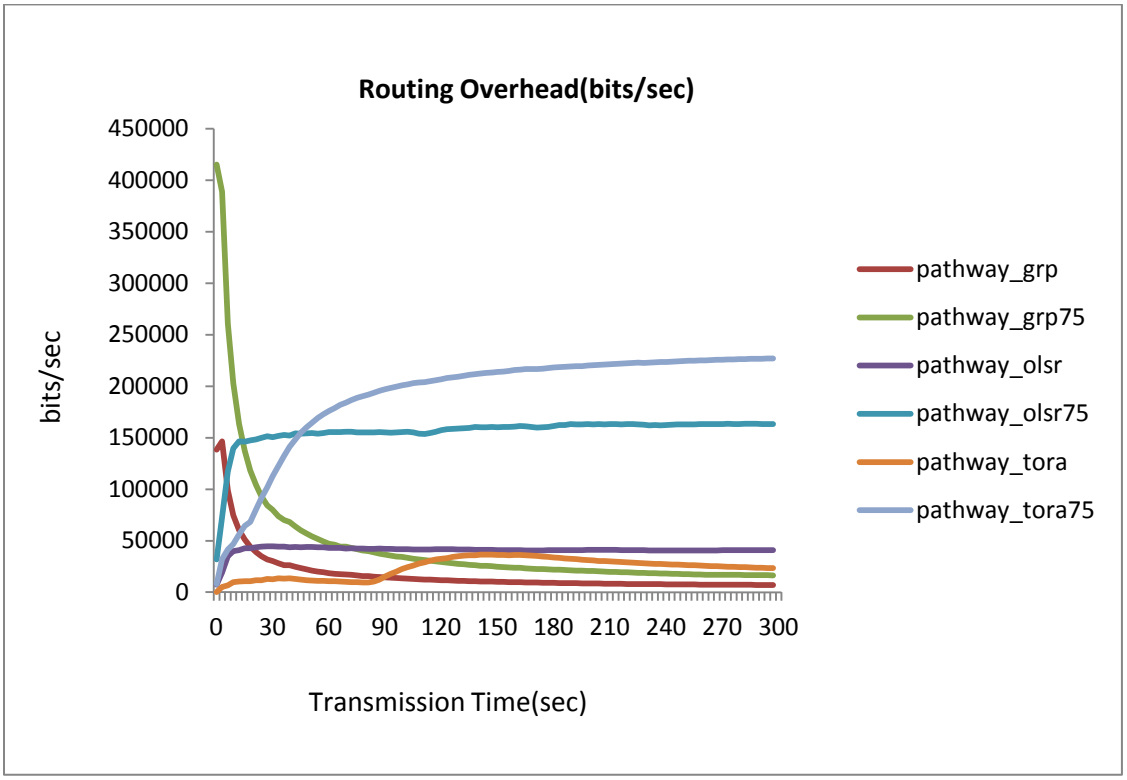

Fig.1.4 Routing Overhead

V. CONCLUSION

We have evaluated the three performance measures i.e. Load, End-to-end delay and Throughput with Pathway mobility model while taking 35 and 75 as the node density. From the extensive simulation results, it is found that OLSR shows the best performance in terms of throughput, and GRP in Load and Routing overhead . Reactive protocol lacks behind Hybrid and Proactive protocols.

In future, We will compare the performance of Pathway mobility model with Overlap mobility model for these three routing protocols and analyse the changes taking place in varying node density.

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