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Performance Analysis of Reactive (DYMO) and Hybrid (LANMAR) Routing Protocols in MANET Using QualNet Simulator

Ritu Rahar[1], Poonam Garg[2] (Asst. Prof.), Sanjay Batra[3]
[123]Computer Science and IT department, YMCA University of Science and Technology, Faridabad, India

Abstract: MANET (Mobile Adhoc network)[3][1] is the adhoc(temporary) network where all the nodes are mobile in nature consequently it is a dynamic network(since the topology of the network varies time to time) .In order to deal with the dynamic topology various routing protocols are required which can work well considering the mobility of nodes in the network. Broadly, these protocols can be divided into three main types viz. proactive, reactive and hybrid routing protocols. The links connecting various nodes are wireless. The most important feature of such networks is that there is no need of any central infrastructure. In this paper we evaluated and analyzed the performance of reactive and hybrid routing protocols by simulating the network on QualNet 5.0. We used various performance metrics for simulation like average-end to end delay, total packet received, throughput and average jitter. The result shows that LANMAR (hybrid) is better than DYMO (reactive) protocol.

Keywords: MANET, LANMAR, DYMO, QualNet 5.0

Introduction

A network is basically a combination of nodes and links .A node can be mobile or static in nature and similarly links connecting them may be wired or wireless in nature. So we may have different types of network resulting from the combination of type of link and nodes undertaken. MANET is one of these types where mobile means nodes are mobile in nature and Adhoc means temporary and network means a combination of nodes .Same scenario happens in cellular networks as well but the main difference between Cellular and MANET is that cellular network has infrastructure i.e. the base station among mobile nodes but on the other hand MANET does not have any infrastructure between nodes. So nodes in MANET act as sink and source and also as a router, which takes the packet and forward it to next node on the basis of some calculation. MANET is also known as NEED based Network.eg of MANET is Bluetooth which doesn't require any central authority. Mobility in nodes makes a network very complex. The main categories of routing protocol are as follows- proactive [1], reactive [1] [2] and hybrid.

Proactive Routing protocol-As the name suggests they are pro-active means before any node asks for a particular route; all the nodes already have all the route info in their table. The nodes share their info(routing table) to their neighbor nodes and take theirs at regular interval of time and this way they always remain prepare to send data to any node in the network.

e.g. DSDV(Dynamic Source Distance Vector Routing),IARP(IntraZone Routing Protocol).
Reactive Routing Protocol:-They initiate Route Discovery procedure only when any event happens When some source node needs to send data to the destination node, it starts route discovery by using the RREQ packet, each intermediate node forwards the packet to its neighboring node. When the destination node finds this packet, it sends RREP packet to source node and then path is confirmed between source and destination node and data transmission takes place between source and destination node. E.g. IERP (Inter Zone Routing Protocol), AODV [1] [2] (Adhoc On Demand Routing Protocol). Hybrid Routing Protocol:-Hybrid routing protocol uses the properties of both the routing protocol i.e. proactive and reactive, means between the networks it use reactive routing protocol and inside the network it uses proactive routing protocol.eg are LANMAR[3][4] and ZRP(Zone Routing Protocol). It reduces the latency in route discovery and reduces the overhead of control message.

Brief Description of Routing Protocol in MANET (LANMAR, DYMO)

LANMAR-The LANMAR utilizes the concept of landmark for scalable routing in large, mobile ad hoc networks. It relies on the notion of group mobility i.e. a logical group (for example a team of coworkers at a convention) moves in a coordinated fashion. It is a combined link state and distance vector routing protocol which exploits and adapts to the

wireless ad hoc environment. The concept of Landmark routing was first introduced in fixed wide area networks. The original scheme required predefined multi-level hierarchical addressing. Our scheme does not require predefined hierarchical address, but it borrows the concept of Landmark and extends it to the mobile environment. Basically, it implements the landmark concept to handle group mobility. LANMAR helps solve both scalability and mobility problems while keeping line and storage overhead (O/H) low. A "landmark" node is elected in each subnet. The LANMAR routing table includes only the nodes within the scope and the landmark nodes. This feature greatly improves scalability by reducing routing table size and update traffic O/H. When a node needs to relay a packet, if the destination is within its neighbor scope, the address is found in the routing table and the packet is forwarded directly. Otherwise, the logical subnet field of the destination is searched and the packet is routed towards the landmark for that logical subnet. The packet however does not need to pass through the landmark. Rather, once the packet gets within the scope of the destination, it is routed to it directly.

DYMO-The DYMO[5] routing protocol is successor to the popular Ad hoc On-Demand Distance Vector (AODV) routing protocol and shares many of its benefits. However, it is slightly easier to implement and designed with future enhancements in mind. DYMO can work as both a pro-active and as a reactive routing protocol, i.e. routes can be discovered just when they are needed. In any way, to discover new routes the following two steps take place:

1. A special "Route Request" (**RREQ**) messages is broadcasted through the MANET. Each RREQ keeps an ordered list of all nodes it passed through, so every host receiving an RREQ message can immediately record a route back to the origin of this message.

2. When an RREQ message arrives at its destination, a "Routing Reply" (**RREP**) message will immediately get passed back to the origin, indicating that a route to the destination was found. On its way back to the source, an RREP message can simply back trace the way the RREQ message took and simultaneously allow all hosts it passes to record a complementary route back to where it came from. So as soon as the RREP message reaches its destination, a two-way route was successfully recorded by all intermediate hosts, and exchange of data packets can commence.

Simulation Setup and Environment

The aim is to simulate and analyze the performance of various routing protocol with the help of Simulator QualNet5.01 [6]. The main difference between Simulation and real scenario is that in real scenario, it takes long time in setup of nodes and link creation. So when in any emergency if we require to setup a network then we need not to waste time to do experiments and check that which protocol is best in which environments and we can directly take the results from the simulator and implements the network .Although simulator is not the reality but it can be somewhat equivalent to reality. The accuracy of simulator is very much important factor before predicting any real scenario. Here in the simulation we compare different protocol (DYMO) and (LANMAR) on the basis of throughput, avg. jitter, total packet received, avg. end to end delay etc. In our scenario we have done different simulation with 30, 20, 40 nodes placed randomly in area (1200 X 1200) m2, source node (21) and destination node (30). Total byte sent is 12200 bytes. Simulation was run for 30 sec for each scenario.

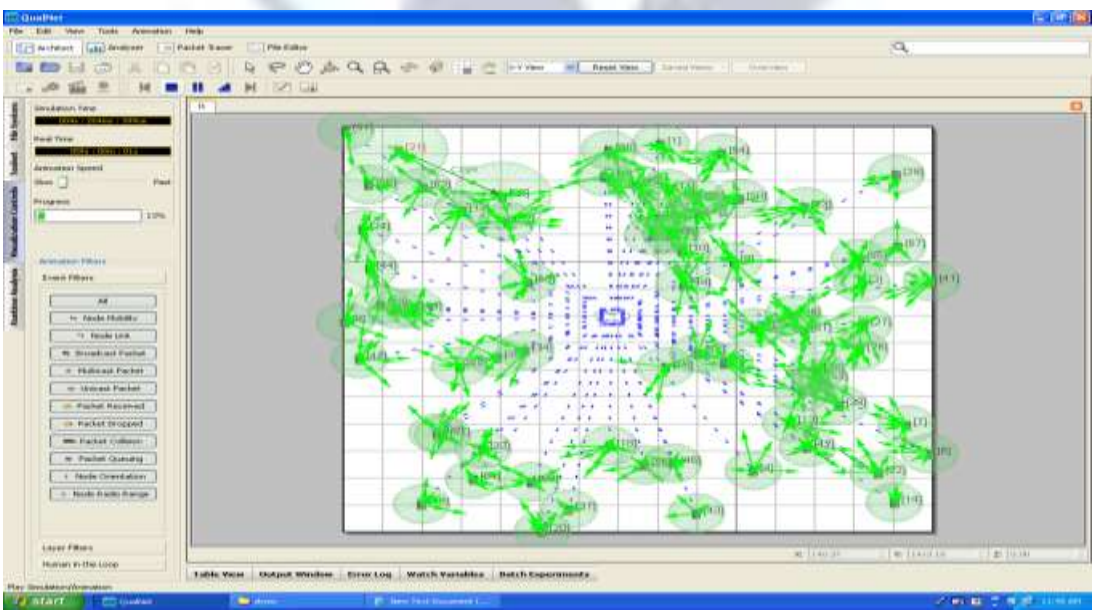

Figure:-1 Snapshot of simulation for LANMAR Routing Protocol (Hybrid routing protocol)

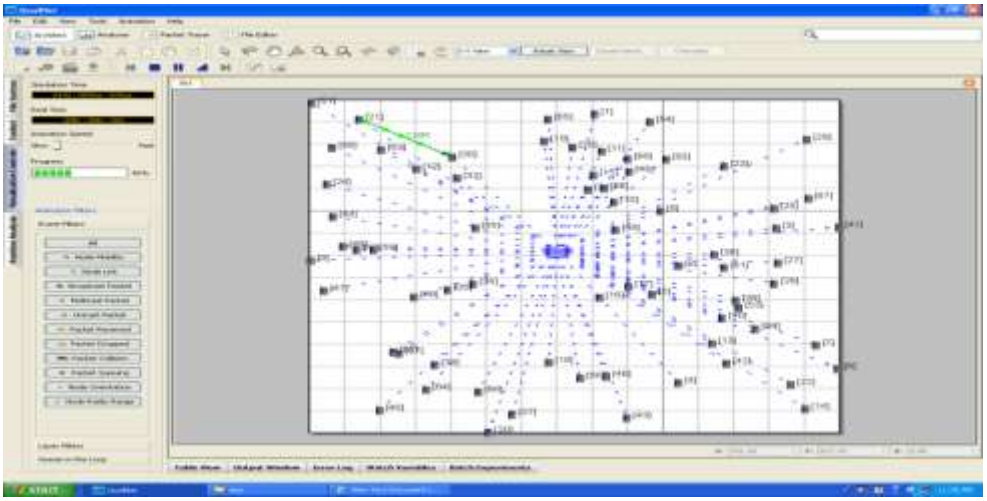

Figure 2: Snapshot of simulation for DYMO Routing Protocol (Reactive routing protocol)

Table 1: The parameters used while simulation

Configured Parameter for simulation	
Parameter	Value
Physical Layer Protocol	IEEE502.11
Routing protocol	LANMAR,DYMO
Energy Model	Mica Motes
Battery Power	Simple Linear

Snapshots of LANMAR protocol

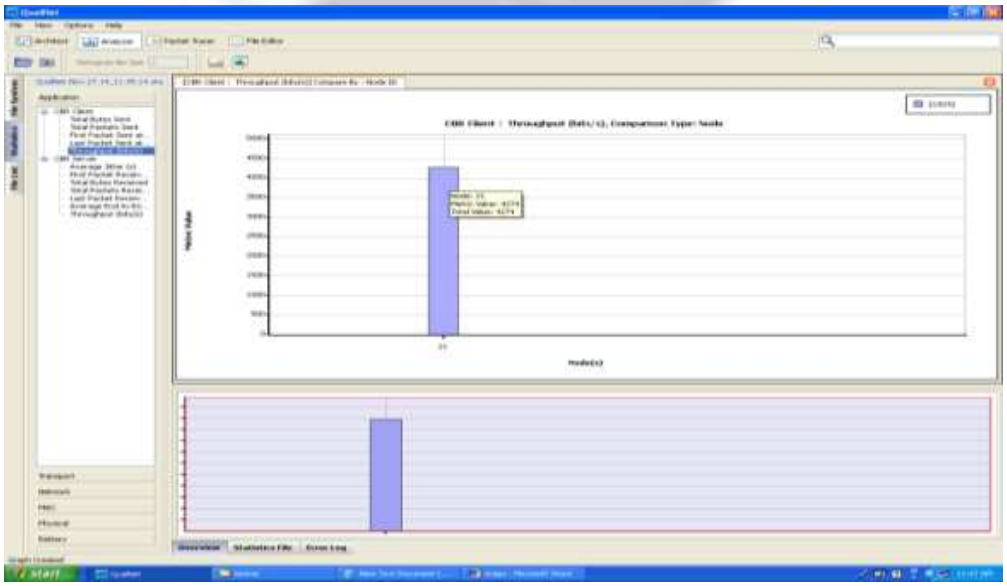

Figure- 3: Throughput

Figure- 4: Avg. Jitter

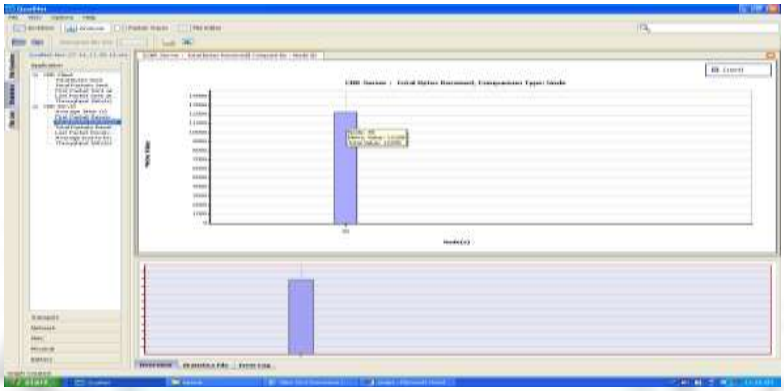

Figure- 5: Total bytes received

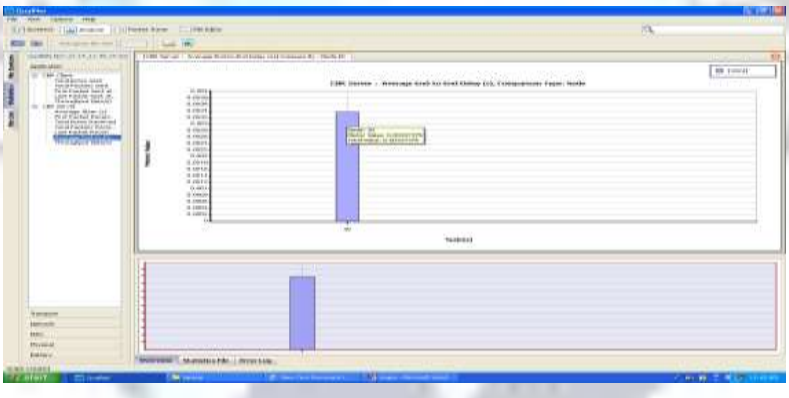

Figure- 6 Avg. end to end delay

Snapshots of DYMO protocol

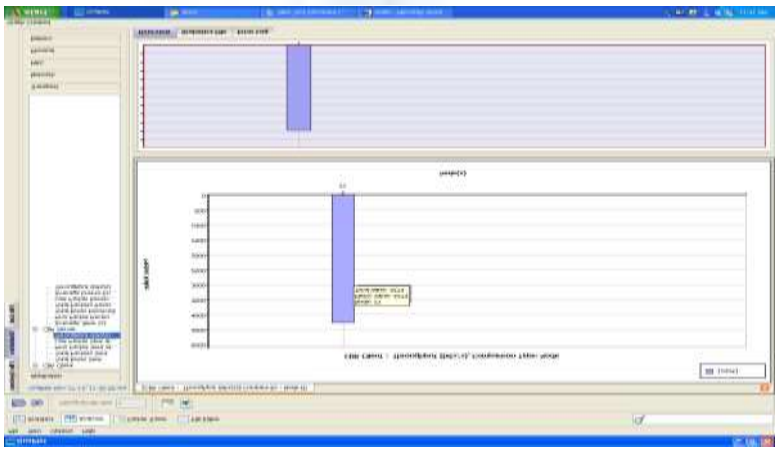

Figure- 7: Throughput

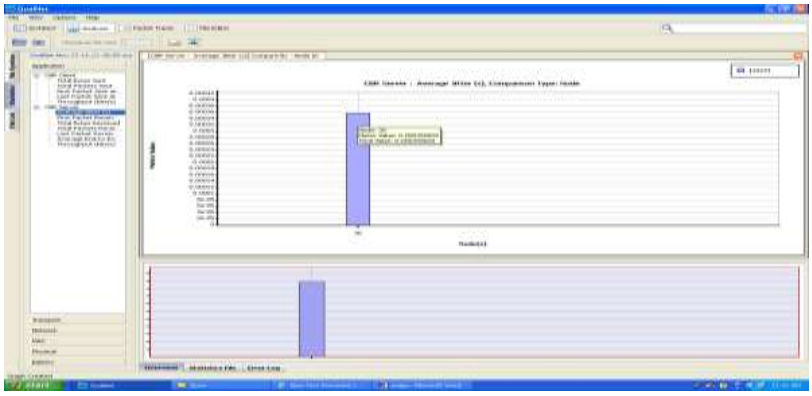

Figure- 8 Average Jitter

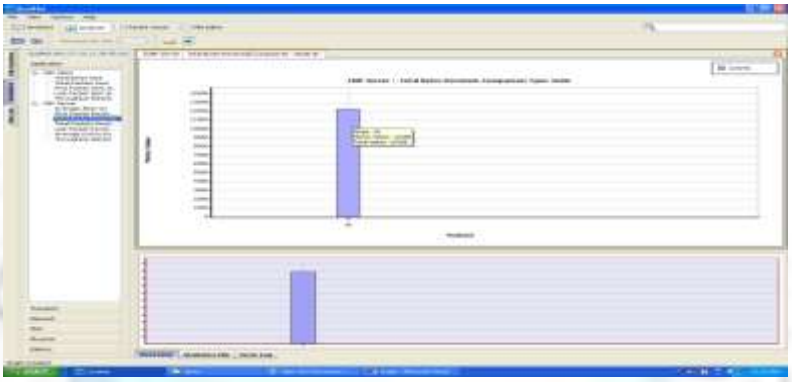

Figure- 9 Total Byte Received

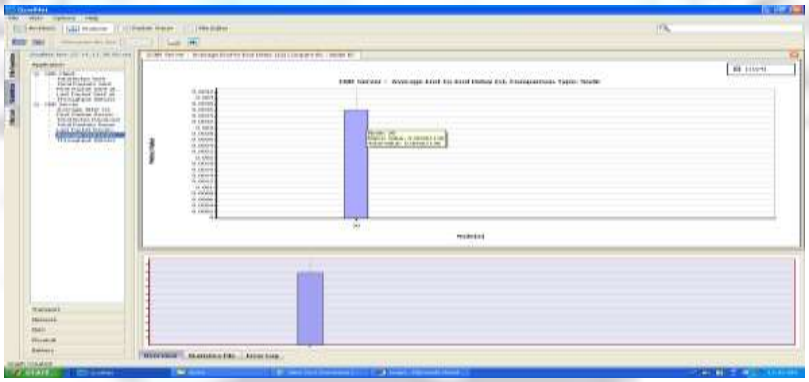

Figure- 10 Average end to end delay

Results

Different Result by using Line graph-

Figure- 11 Average Jitter

Figure- 12 Average End to End delay

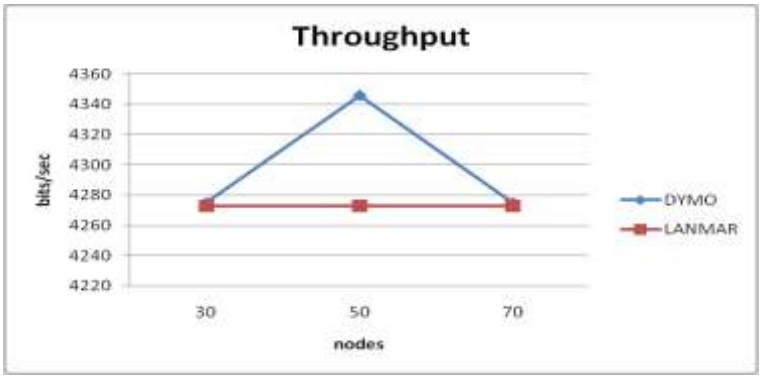

Figure- 13: Throughput

Comparison between LANMAR and DYMO

Table-2: comparing various parameters for LANMAR and DYMO

Comparison Between LANMAR and DYMO		
Parameters	LANMAR	DYMO
Avg Jitter	Low	High
Throughput	Low	Better
Avg End to End delay	Low	High
Total Byte Received	Same	Same

Conclusion

This paper compares LANMAR and DYMO routing protocols by considering various network parameters(we varied the total no. of nodes during the simulation).The evaluation and analysis shows that in the case of throughput DYMO is better than LANMAR, avg end to end delay is best in LANMAR and DYMO among their categories however better in case of LANMAR. In case of Avg. jitter LANMAR is better than DYMO. Total bytes received are same in both cases. In the future we and anybody can do a lot of research in this protocol with different parameters and can find more results. These results also throw challenges and an good opportunities to explore these protocols.

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