

# Performance Analysis of Reactive (DSR) and Hybrid (LANMAR) Routing Protocols in MANET using QualNet Simulator

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**Abstract:** MANET (Mobile Adhoc network) is the Adhoc (temporary) network where nodes are mobile in nature which makes it a dynamic network (since the topology of the network varies time to time) hence various routing protocols are required which can deal with mobility of nodes. 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 on QualNet 5.0. We used various performance metric for simulation average-end to end delay, total packet received, throughput and average jitter. The result shows that LANMAR (hybrid) is better than DSR (reactive) protocol .

**Keywords:** MANET, LANMAR, DSR, QualNet 5.0.

## 1. Introduction (MANET)

As we know that a network is a combination of nodes and links .A node can be mobile and static in nature and similarly links are wire and wireless in nature. So we are having 4 different combination of network and MANET [3][4] is one of them. MANET is Mobile Adhoc Network, here mobile means nodes are mobile in nature and Adhoc means temporary and network means a combination of nodes. Same scenario is also happens in cellular network but the main difference between Cellular and MANET is that cellular network have infrastructure that is base station among mobile nodes but on the other hand MANET does not have any infrastructure between nodes. So nodes in MANET acts as sink and source So a node in MANET also acts as Router which takes the packet and forward it to next node on the basis of some calculation. MANET also known as NEED based Network.eg of MANET is Bluetooth which doesn't require any central infrastructure. So due to mobility in nodes make a network very much complex , because after a certain amount of time Topology of network get change[10].so different routing protocol are required to route the packet in network. So, different routing protocol have been proposed by scientist. Three main categories of routing protocol is Reactive protocol ,Proactive and Hybrid routing protocol. Eg:

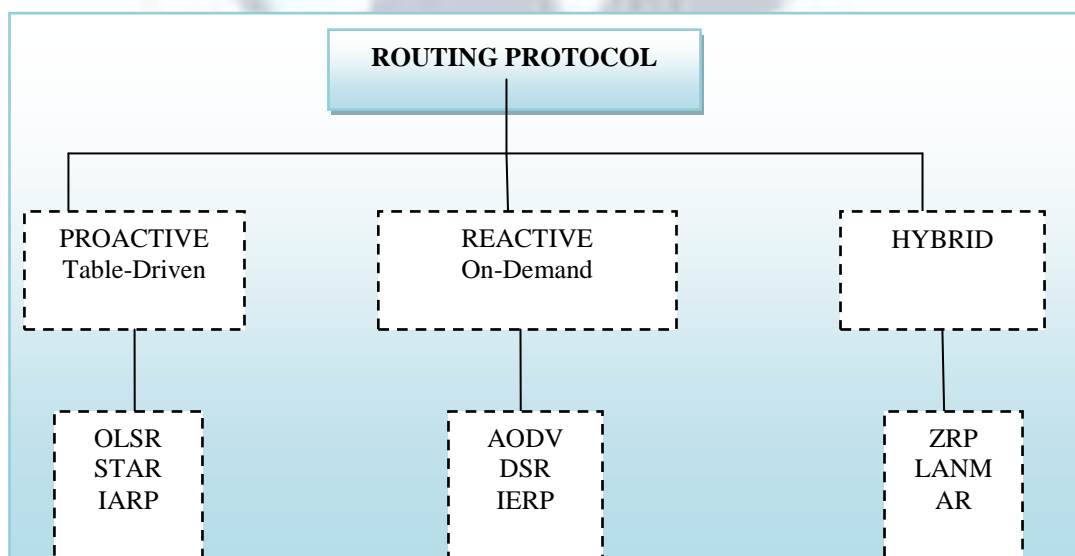


Fig:1 MANET Routing Protocols

**1. Proactive Routing protocol-[3]**As the name suggests that they are pro active means before any action occur for route finding they already have all the route info in their table.They at a regular interval of time share their info(routing table) to their neighbour nodes and take theirs and this way they always remain prepare to send data to any node in the network.

Some of the Example of Proactive routing protocol is DSDV(Dynamic Source Distance Vector Routing),IARP(Intra Zone Routing Protocol)

**2. Reacive Routing Protocol:-**They involve Route Discovery when any action happens means when any node required to send data then only they find the route by sending RREQ packet to their neighbouring nodes and when the destination node find this packet and send RREP packet to source node and then path is conform between source and destination node and data is traverse between source and destination node. Some of the example if reactive routing protocol is IERP(Inter Zone Routing Protocol) ,AODV[9] (Adhoc On Demand Routing Protocol).[4][3]

**3. Hybrid Routing Protocol:-**Hybrid routing protocol which 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 and ZRP(Zone Routing Protocol). It reduce the latency in route discovery and reduces the overhead of control message.

## **II. Brief Description of Routing Protocol in MANET (LANMAR, DSR)**

**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. Specifically, it exploits 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 routing scheme itself is modified version of FSR. The main difference is that the FSR routing table contains “all” nodes in the network, while 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.

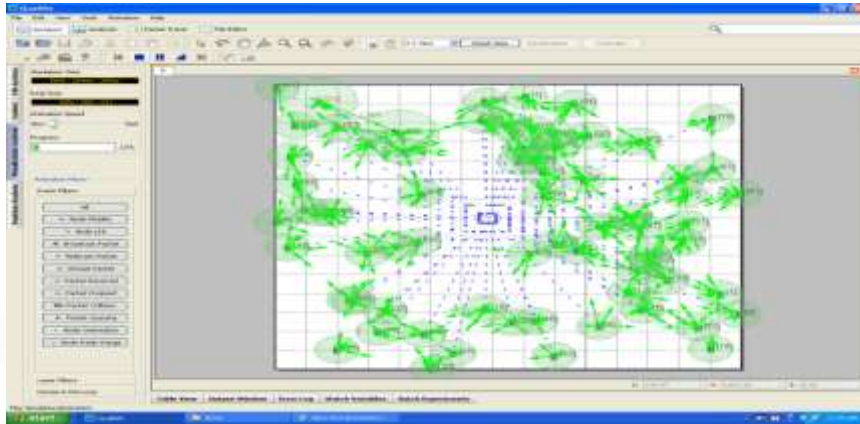
**DSR** - This [11] is a routing protocol similar to AODV in that it forms a route on demand when a transmitting node request one . However ,it uses source routing instead of relying on the routing table at each intermediate device. Determining source route requires accumulating the address of each device between the source and destination during route discovery .The accumulated path information is cached by nodes processing the route discovery packets. The learned paths are used to route packets .To accomplish source routing ,the routed packet contain the address of each device the packet will traverse .This may result in high overhead for long path or large address. like IPv6.To avoid source routing ,DSR optionally defines a flow id option that allows packets to be forwarded on a hop by hop basis.

This protocol is truly based on source routing whereby all the routing information is maintained at mobile nodes. It has only 2 major phases, which are route discovery and route maintenance. Route reply would only be generated if the message has reached the intended destination node .to return the route reply, the destination node must have a route to the source node .If the route is in the destination node’s route cache, the route would be used. Otherwise the node will reverse the route based on the route record in the route request message header. In the event of fatal transmission, the route maintenance phase is initiated whereby the route error packets are generated at the node. The erroneous hop will be removed from the node’s route cache, all route containing the hop are truncated at that point. Again, the Route Discovery Phase is initiated to determine the most viable route.

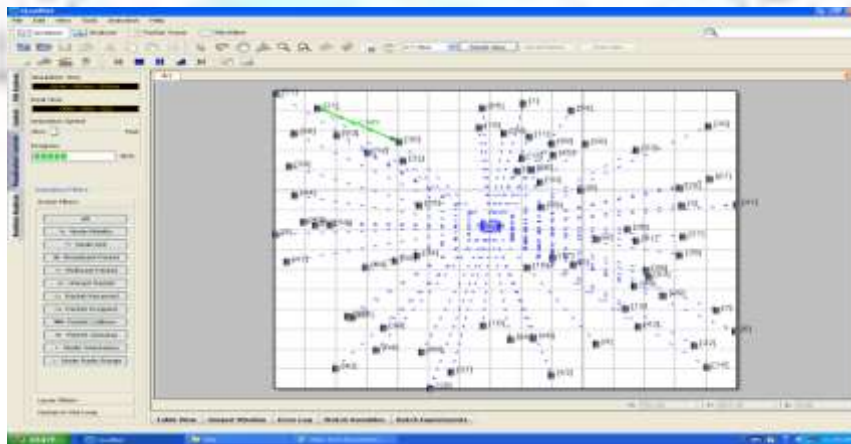
Consider a source node that does not have a route to the destination. When it has data packets to be sent to destination, it initiates a route request packet. This route request is flooded throughout the network. each node, upon receiving a route request packet, rebroadcasts the packet to its neighbors if it has not forwarded it already, provided that the node is not the destination node and that the packet’s TTL counter has not been exceeded .Each route request carries a sequence no generated by the source node and the path it has traversed. A node ,upon receiving a route request packet, checks the sequence no on the packet before forwarding it. The packet is forwarded only if it is not a duplicate route request. The sequence no on the packet is used to prevent loop formations and to avoid multiple transmissions of the same route request by an intermediate node that receives it through multiple paths .Thus all nodes except the destination forward a route request packet, replies to the source node through the reverse path the route request packet had traversed.

### III. SIMULATION SETUP AND ENVIRONMENT

The aim is to simulation and analyzing of various routing protocol performance with the help of Simulator that is QualNet 5.01[7]. 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 a network then we need not to waste time to do experiments and check that which protocol is best in which environments 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 imp factor before predicting any real scenario. Here in the simulation we compare different protocol (DSR) and (LANMAR) on the basis of throuhput, avg jitter, total packet received, avg end to end delay etc. In our scenario we have done different simulation with 30,50,70 nodes placed randomly in area (1500 X 1500 )m2 ,source node(21) and destination node(30). Total byte sent is 12200 bytes. Simulation was run for 30 sec for each scenario.



**Fig: 2 Snapshot of simulation for LANMAR Routing Protocol(Hybrid routing protocol).**



**Fig: 3 Snapshot of simulation for DSR Routing Protocol(Reactive routing protocol).**

TABLE 1

Configured Parameter for simulation	
Parameter	Value
Physical Layer Protocol	IEEE802.11
Routing protocol	LANMAR,DSR
Energy Model	Mica Motes
Battery Power	Simple Linear

Area	1500X1500
Mobility	Random way point[8]
Application Layer	CBR Traffic
Total Power	1200 ma
Antenna Model	Omni      Directional Antenna

**IV. RESULTS**

Snap shot of LANMAR protocol:

Throughput:

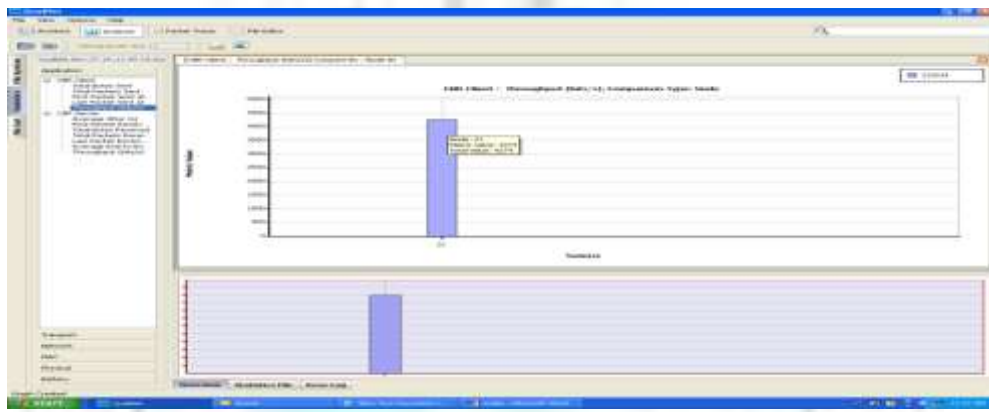


Fig: 4

Average Jitter:

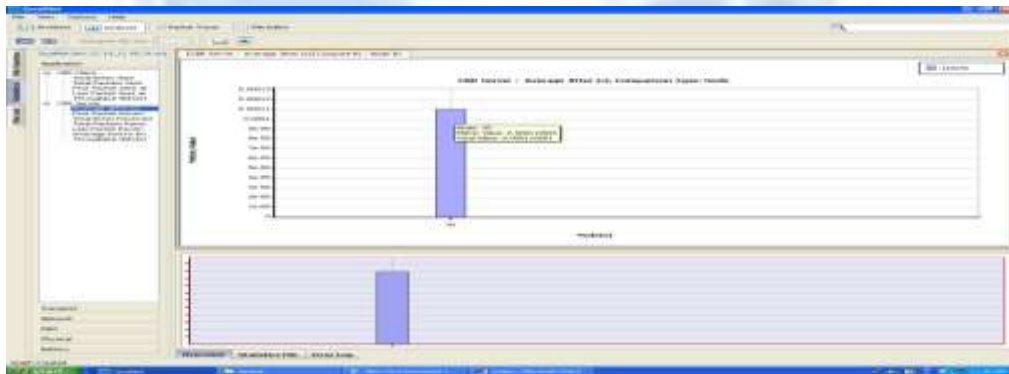


Fig: 5

Total Byte Received:

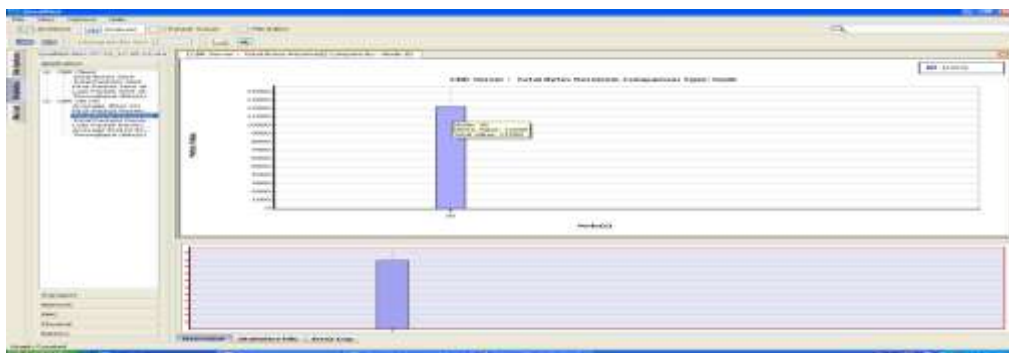


Fig: 6





Average end to end delay:

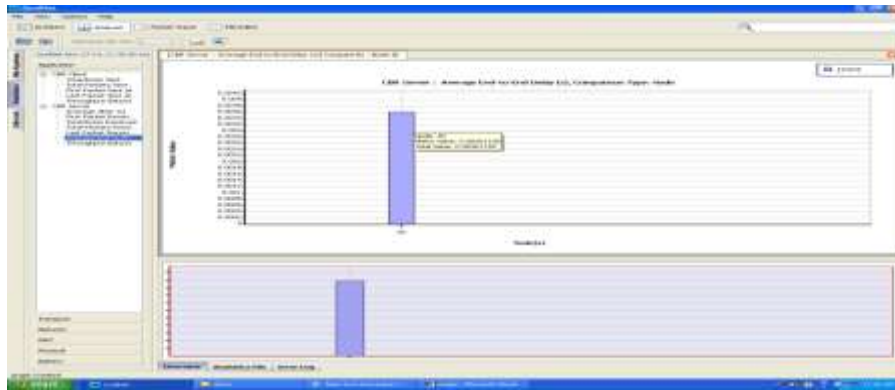


Fig:11

Different Result by using Line graph:

Average Jitter:-

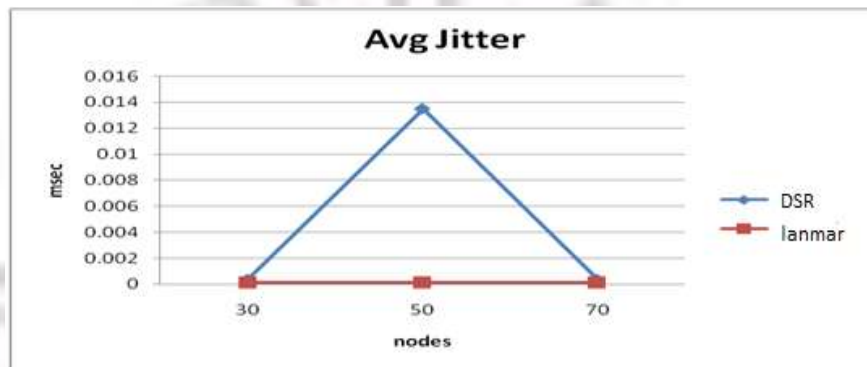


Fig: 12

Total Bytes received:

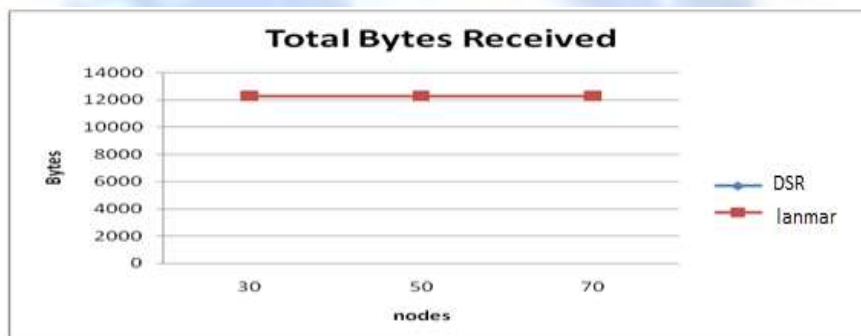


Fig: 13

Average End to End delay:

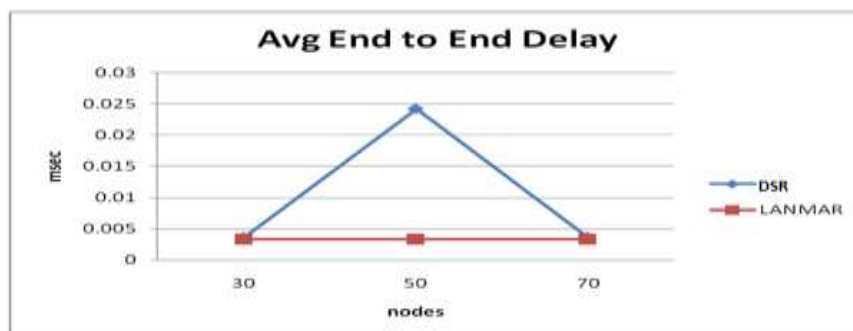


Fig:-14

Throughput:

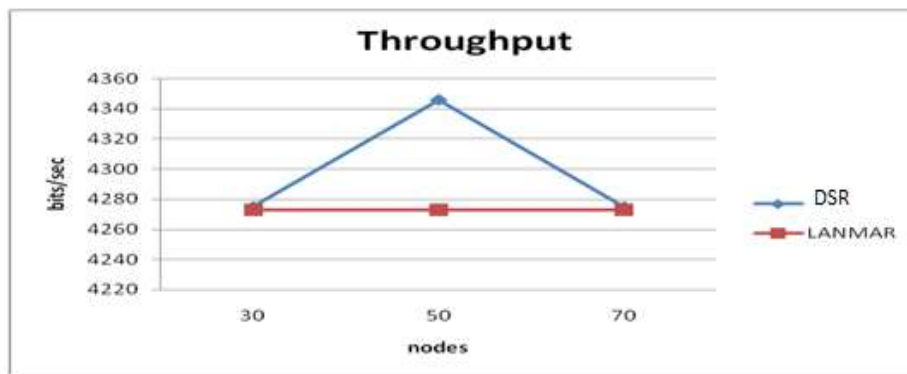


Fig: 15

**Comparison Between LANMAR and DSR**

**TABLE 2**

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

**CONCLUSION AND FUTURE WORK**

The paper compares LANMAR and DSR routing protocols by comparing various network parameter also we varied the total no. of nodes during the simulation. The evaluation and analysis shows that in the case of throughput DSR is better than LANMAR, avg end to end delay is best in lanmar and DSR among their categories however better in case of LANMAR. In case of Avg jitter LANMAR is better than DSR. Total bytes received are same in both cases. In the future we and anybody can do a lot of research in these 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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