IEEE 802.11a based Simulation and performance Analysis of DSR Routing Protocol using OPNET

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ABSTRACT

A (MANET) mobile ad hoc network is a set of wireless mobile nodes forming a dynamic autonomous network. MANET nodes communicate with each other without the intervention of centralized access point or base station. DSR is a reactive protocol it computes the route when necessary and then maintains through two significant stages in working of DSR: route discovery and route maintenance. In this paper to study the routing protocols DSR for mobile ad hoc network .Further, the implementation of a 50 node and 100 network using network simulator OPNET will be done to simulation and performance analysis of these network protocol for delay, network load, total traffic sent and received, ftp upload and download response time or throughput.

Key words: MANET, DSR, ieee802.11, parameter value, OPNET.

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INTRODUCTION

A Mobile Ad-Hoc Network (MANET) [2] is a collection of mobile nodes which communicate with each other via wireless link either directly or relying on other nodes as routers. The operators of MANETs don't depend on pre-existing infrastructure or base station. Network nodes in MANETs are free to move randomly. Due to mobility of nodes, network topology of MANET may change dynamically without turning to any existing centralized administration [3]. All network activities such as discovering the topology and delivering data packets have to be executed by the nodes themselves, either individually or collectively [1].

In MANETs every node is a potential router for other nodes. The task of specifying a routing protocol for a mobile wireless network is not a trivial one. The main problem in mobile networking is the limited bandwidth and the high rate of topological changes and link failure caused by node movement. Therefore routing in Ad-Hoc network play an important role for data forwarding at each mobile node can act as a relay in addition to being a source or destination node [4].

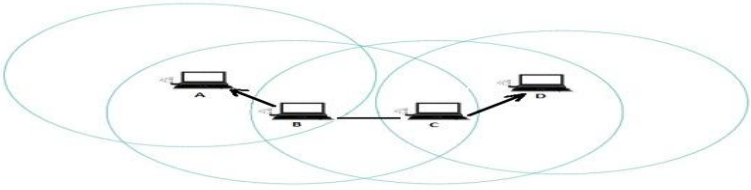

Figure 1 Ad Hoc Network

Because of this reason, a great number of routing protocols has been developed to provide services with Ad-Hoc Network.There are many type of routing protocols are shows in the figure 2.

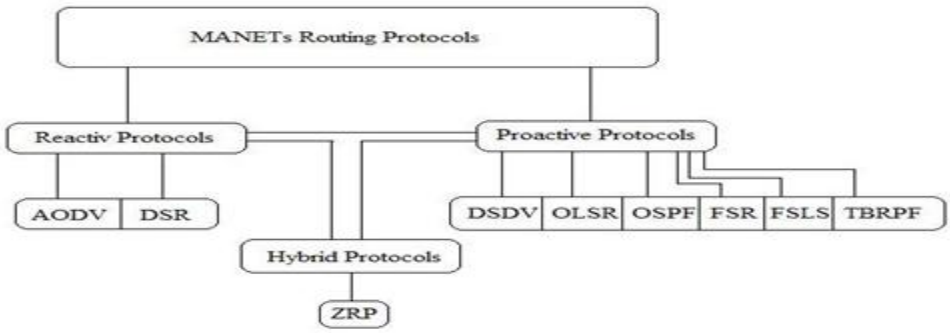

Figure 2 MANET Routing protocol

Mobile Ad-Hoc Routing protocols are traditionally divided into two classes (Reactive and Proactive) depending on when nodes acquire a route to a destination [8]. Reactive protocols are characterized by node acquire and maintain routes on demand. i.e., a route to a destination is not acquired by anode until packet is not received by a destination node. Examples of reactive protocols are "Ad-Hoc on Demand Distance Vector Routing Protocol" (AODV) [5]. Proactive protocols are characterized by all nodes maintain routes to all destination in the network at all. Thus using a proactive protocol, a node is immediately able to route (or drop) a packet. Examples of proactive protocols include the "Optimized Link State Routing Protocol" OLSR [6].

DSR PROTOCOL

Dynamic Source Routing (DSR) [7] is a reactive protocol i.e. it doesn't use periodic advertisements. It computes the routes when necessary and then maintains them. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which the packet has to pass; the sender explicitly lists this route in the packet's header, identifying each forwarding "hop" by the address of the next node to which to transmit the packet on its way to the destination host. There are two significant stages in working of DSR: Route Discovery and Route Maintenance. A host initiating a route discovery broadcasts a route request packet which may be received by those hosts within wireless transmission range of it. The route request packet identifies the host, referred to as the target of the route discovery, for which the route is requested. If the route discovery is successful the initiating host receives a route reply packet listing a sequence of network hops through which it may reach the target. While a host is using any source route, it monitors the continued correct operation of that route. This monitoring of the correct operation of a route in use is called route maintenance. When route maintenance detects a problem with a route in use, route discovery may be used again to discover a new, correct route to the destination.

That node will send a RREP packet to the sender having complete route information. This route is considered the shortest path taken by the RREQ packet. The source node now has complete information about the route in its route cache and can starts routing of packets. Figure 3-3 shows the route discovery procedure. Here we have four nodes i.e. A, B, C and D such as node A is the source and node D is destination. When node A wish to send a data packet to the node D, It will first check its route cache that whether it has direct route to node D or not. If node A does not have a direct route to node D, then it will broadcast a RREQ message in the network. The

neighbor node B will get the RREQ message. First node B will check its route cache that whether it have a direct route to the destination node D or not, If it finds a route to the destination node D. So it will send a RREP message to the source node A. In the reply of that message the source node A will start sending the data packets (DP) on the discovered route. If it didn't discover the route from node B to node D so it forwards the message RREQ to the next node C and store the route AB in the cache. The process is going on until the RREQ message reached to destination node D. The destination node D caches the routes AB, BC and CD in its memory and sends a RREP message to the source node A.

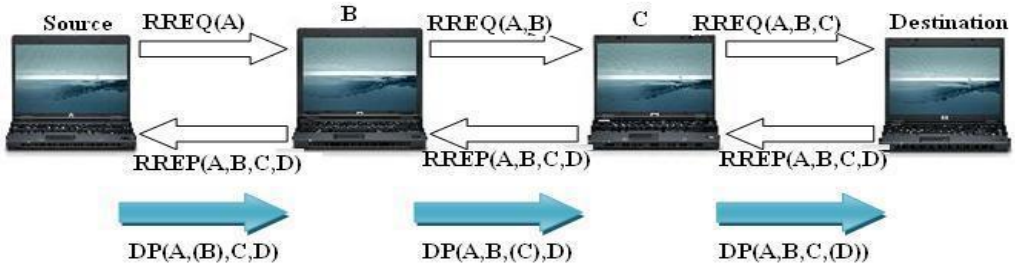

Figure 3 Route discovery procedure in MANET using DSR

The next mechanism is the route maintenance. The route maintenance uses two kind of messages i.e. route error (RERR) and acknowledgement (ACK). The messages successfully received by the destination nodes send an acknowledgement ACK to the sender. Such as the packets transmitted successfully to the next neighbors nodes gets acknowledgement. If there is some problem in the communication network a route error message denoted by RERR is transmitted to the sender, that there is some problem in the transmission. In other words the source didn't get the ACK packet due to some problem.

So the source gets the RERR packet in order to re initiate a new route discovery. By receiving the RERR message the nodes remove the route entries. In figure 3-4 four nodes are shown i.e. A, B, C and D. The node A sends a message to destination node D. The message goes on up to the node C, while receiving the ACK message up to node B. When the node C forward the RREQ message to the node D and it does not receive the ACK message from node D. The node C recognizes that there is some problem in the transmission. So the node C sends a RRER message to the source node A. Which in return search for a new route to the destination node D.

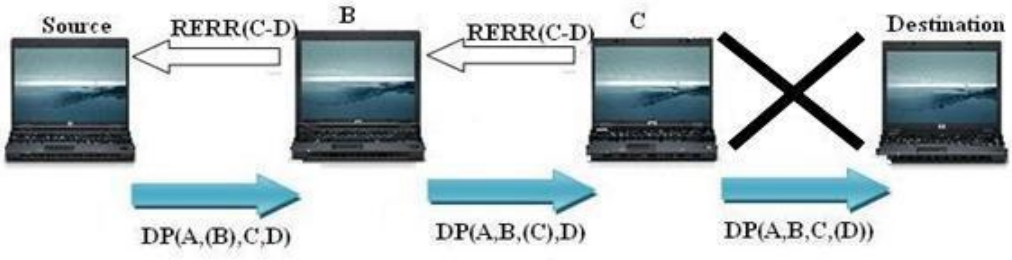

Figure 4 Route maintenance procedures in MANET using DSR

OPNET-Based Simulation Parameter and network model

We use the OPNET[9] modular 14.5 to evaluate our experimental network shows the network model of Mobile Ad-hoc network consist on Number of mobile nodes distributed in Rectangular area through wireless communication link. Simulation, we compare the DSR routing protocol 50

node topology and 100 node topology under various parametric values. To define a simulation parameter in 50 and 100 mobile nodes are created with the data rate of 54 mbps and transmit power of 0.10 watts. Each node moves randomly within the network range 1200*1200 m. And another parameters or its value define in Parameter Table (A). In designing the model we have to run the OPNET modeler and then to create a 50 and 100 node scenario for using different parameter value of MANET

Routing protocol or wireless network parameter value we can create our choice value either manually or wizard after define the mobility parameter value the trajectory in designing the model as per the requirement for the our network model, node model or process model and we can assign 50 node network model assign the routing protocol to be used by the nodes for routing. In this paper we have used DSR routing protocol parameter value show in the table (B)

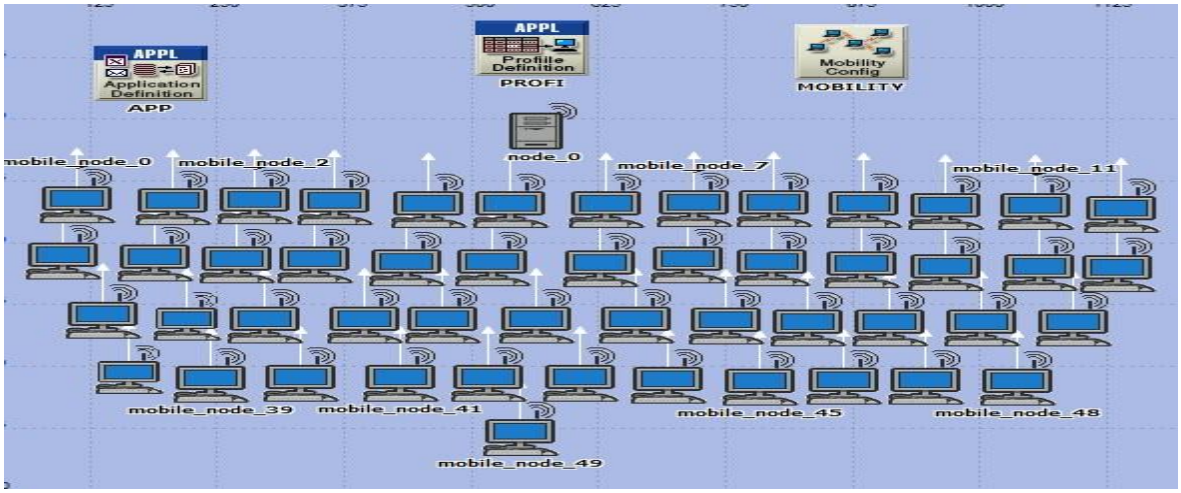

Figure 5 Network model using mobile node

Parameters	Value
Operation Mode	802.11a
No. of Nodes	50,100
Simulation Time	1200 sec
Seed	128
Value per Statistic	100
Update Interval	50,000 event
Simulation kernel	Based on 'Kernel-Type' preference
Routing protocol	DSR
Buffer Size	1024000
Transmit power(w)	0.10
Bit Rate (mbps)	54
Packet reaction-power threshold	-95
Addressing Mode	IPV4

Table A-Wireless Network parameter

DSR PROTOCOL PARAMETER

The many parameter type or its value shows in table of DSR protocol are

Route Discovery Parameters	Request Table Size (nodes)	64
	Maximum Request Table Identification	16
	Maximum Request Retransmission (Seconds)	16
	Maximum Request Period (Seconds)	10
	Initial Request Period (Seconds)	0.5
	Non Propagation Request Timer	0.03
	Gratuitous Route Reply Timer (Seconds)	1
Route Maintenance Parameter	Maximum Buffer Size (Packets)	50
	Maintenance Hold Off Time (Seconds)	0.25
	Maximum Maintenance Retransmission	2
	Maintenance Acknowledgement	0.5
DSR Routes Export	Do not Export	
Route Replies Using Cached Routes	Enabled	
Packet Salvaging	Enable	
Non Propagating Request	Disable	
Broadcast Jitter (Seconds)	Uniform (0,0.01)	

Table- B

RESULT ANALYSIS

The simulation is done to analyze the performance matrices of the network. The matrices used to evaluate the performance of DSR are given below. During Simulation time of 1200 seconds,

DSR 50 node scenario one average speed are 246079 event/second and memory used 123 mb or another DSR 100 nodes scenario simulation average speed are 334813 event/second or memory used 156 mb.

In this paper we have analyze the performance of Mobile ad hoc network routing protocol DSR using different scenario in OPNET modeler 14.5[9].In each scenario apply the various routing protocol comparisons have been made between DSR routing protocol through traffic sent and received, delay, data dropped, load, media access delay, retransmission and throughput.

All result is analysis show through the DES graphs using global statistics. The output result slides are presentation two statistics (overlaid statistics, stacked statistics) and different type functions are Probability density (PDF), Adder, Average, Gain, Limiter, and Reciprocal, Sample sum, Exponential, Sample sum etc.

TOTAL TRAFFIC SENT AND RECEIVED:

During transmission of data in simulated ad hoc network total routing traffic sent and Received by all wireless nodes is show in the figure 6 respectively. Figure 6 shows the results of how many traffic sent and received by source node to destination node with the help of intermediate node in simulated area using MANET routing protocol. In DSR protocol total traffic sent in 50 node and 100 node are 1000(pkts/sec) and 2800(pkts/sec) or total traffic received rate in 50 node and 100 node are 1250(pkts/sec) and 7500(pkts/sec) .

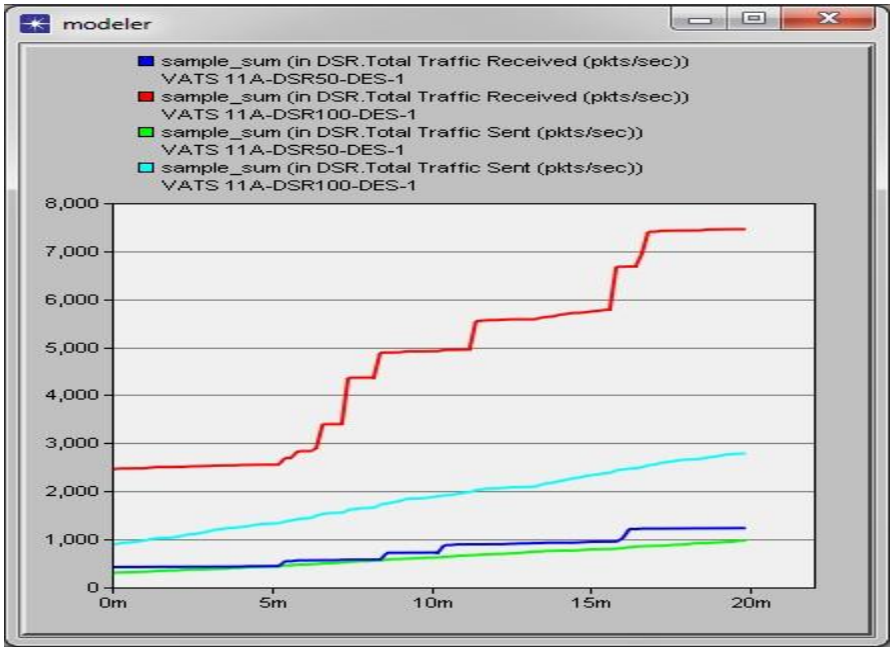

Figure 6 Total Traffic Sent and Received (pkts/sec)

DELAY:

The delay is the time taken by a packet from the movement it is transmitted on the network by the source node to reach the destination node. Figure 7 illustrates the average delay in DSR mobile ad hoc network routing protocol of 50,100 nodes function or value. According to Figure DSR delay in 50 node topology 0.077 and 100 node topology 0.110 end of simulation time.

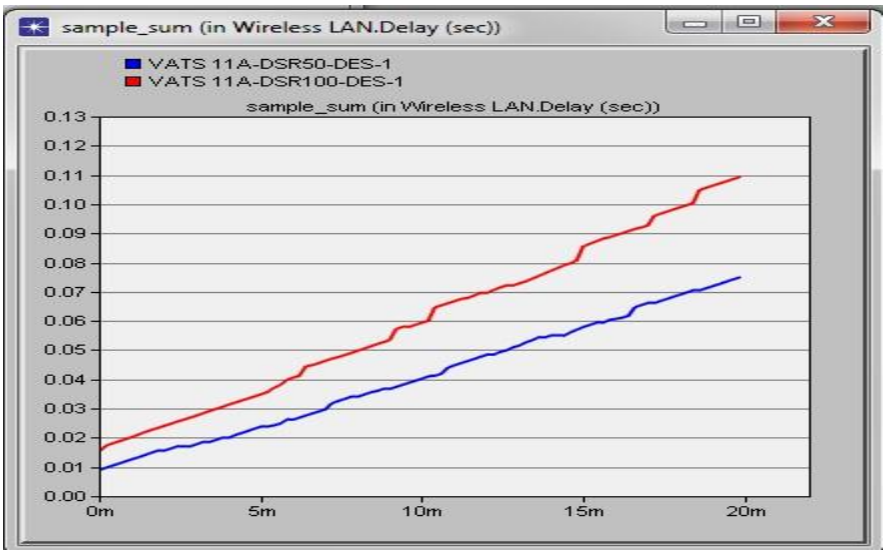

Figure 7 WLAN Delay (sec)

NETWORK LOAD:

The normalized routing load is defined as the fraction of all routing control packet sent by all nodes over the number of received data packet at the destination node. In other word it is the ratio between the total numbers of routing packets sent over the network to the total number of data packet received. According to Figure 8 DSR load 50 is 7600000(bit/sec) and 100 node topology is 19500000(bit/sec) after end of simulation time.

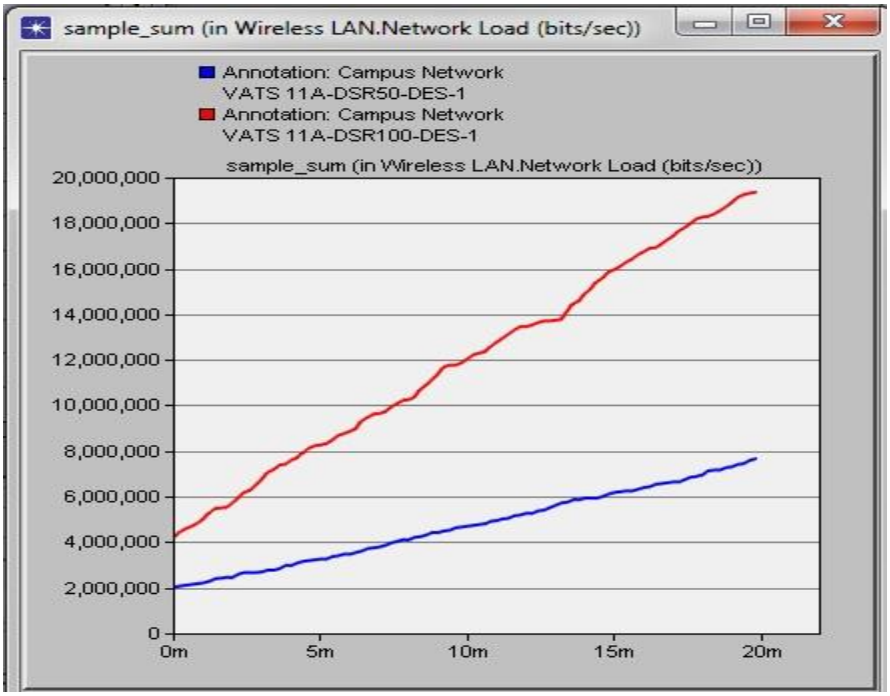

Figure 8 WLAN (ad hoc) Load (bits/sec)

THROUGHPUT:

According to Figure 9 DSR throughput in 50 node topology is 8000000(bit/sec) and 100 node topology is 21200000(bit/sec) after end of simulation time.

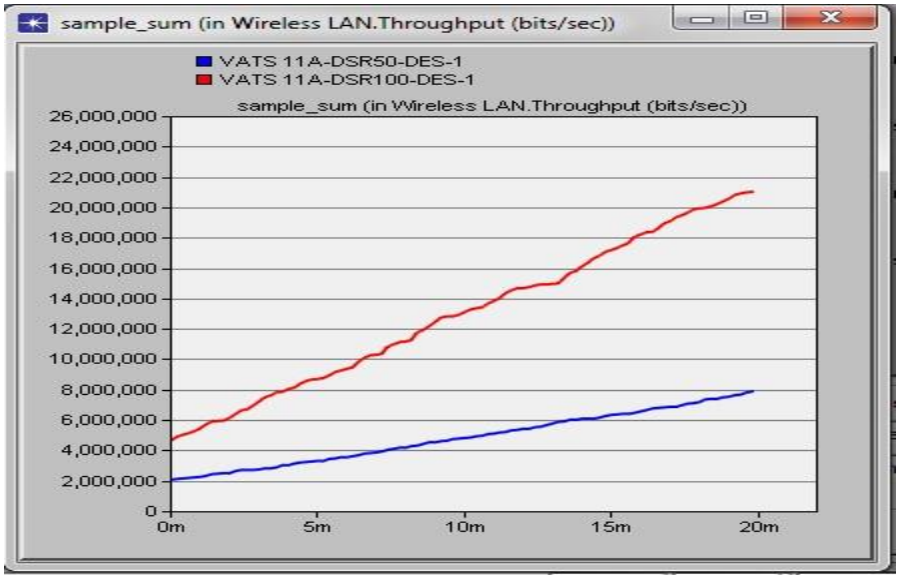

Figure 9 throughputs (bit/sec)

FTP UP LOAD AND DOWNLOAD RESPONSE TIME:

According to Figure 9 DSR upload response time in 50 node topology is 6.5(sec) and 100 node topology is 37(sec) and download response time in 50 node topology is 22(sec) and 100 node topology is 25(sec) after end of simulation time.

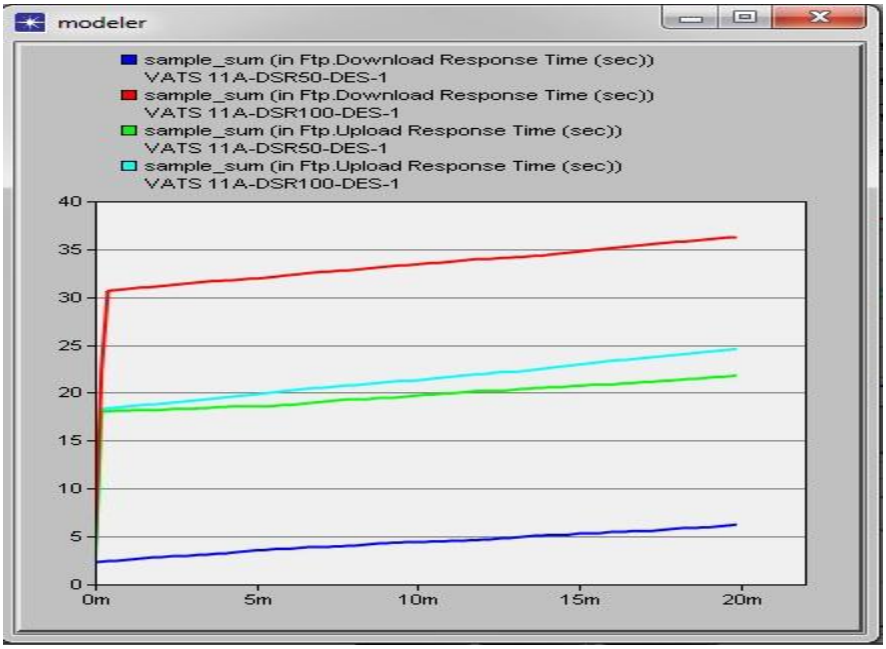

Figure 10 FTP Upload and Download Response Time (sec)

CONCLUSION

A Mobile AD-hoc Network DSR routing protocol was simulated with 50 nodes topology and 100 node topology in ieee802.11a moving randomly in an area of within the network range 1200*1200 m. In this paper, MANET routing protocol in the DSR were performance analyzed. The performance of DSR protocol through a network different size carried out a comparative analysis of the performance and found it had better performance in all aspects in a network. The performance of DSR which can be achieved by delay, network load, and total traffic sent and received, ftp upload and download response time or throughput. According to the simulation results DSR 50 node presents the best performance and DSR 100 node presents the low performance. Finally DSR presents the small network is better performance to large network is analyze.

REFRENCE

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