Dynamic Performance Analysis of DSR Routing Protocol in MANET using NS-2

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ABSTRACT

In the mobile ad hoc network, many routing protocols are discovered to increase the efficiency for the packet delivery in between two and more than two nodes. In the same mobility model many routing protocols are used but there DSR is working best? The main goal of this article to analyze the dynamic performance in DSR using random way point mobility model and calculations of the packet delivery and end to end delay in mobile ad hoc network. Network simulator 2 will be using for Simulation of DSR routing protocol. In this paper, we will do change and analysis in the number of connection and simulation time parameter. After this using these parameter estimate the performance of DSR routing protocol in random way point mobility model. We are graphically analyzing the performance the routing protocol and evaluate the efficiency for DSR using the parameter.

Keywords

DSR, Mobility Model, Packet delivery ratio, end to end delay, NS-2, MANET;

1. INTRODUCTION

In last few years the ad hoc network is the most development network, it was self configuring, self control network having mobile nodes. The mobile nodes are changing its location and topology dynamically without any centralized control. All the nodes may act as an end node and router. The entire router takes the information to all other nodes and they moves randomly. The mobile nodes are sending information to it neighbor node then forward the packet to its destination. The main limit is that in ad hoc network there is fixed range in the same range all the nodes send the packet to the destination. [1, 5, 10] The mobility model play vital role to manage the all mobile nodes. The mobility model manages the dynamic location. The ad hoc network has some characteristic like random location, limited bandwidth, dynamic topology and multihop nature etc. the ad hoc network is used many application like battlefield, disaster management, moving vehicles, rescue operations, conference halls. IPL match. The main goal of paper is simulation based experiment of routing protocol and its activity. The mobility model using some parameter and check the dynamic performance of the DSR routing protocol in mobile ad hoc network [2, 4, 6].

2. OVERVIEW OF DSR ROUTING PROTOCOL

The Dynamic source routing is the reactive routing protocol which uses the source routing algorithms. It is also use the multi hop routing protocol that is very easy and best to calculate the mobile node for the destination. In this routing protocol is using the other neighbor mobile nodes information and transfer to other nodes. All the information is stored in route cache and routing protocol are using two important route algorithms "Route Discovery" and "Route Maintenance", these both algorithms are working simultaneous and acquire the information for the network. In mobile ad hoc network all the nodes are distribute randomly, so the Route Discovery algorithm is used and find the source and destination nodes in the network. If there any nodes are disconnected then route maintenance algorithms maintain the link between the nodes. The main advantage of the DSR protocol is provides the loop free link in the network, if there any node change the topology then DSR measure the changed node data rate and the moving speed [10, 11, 13] and send to other nodes.

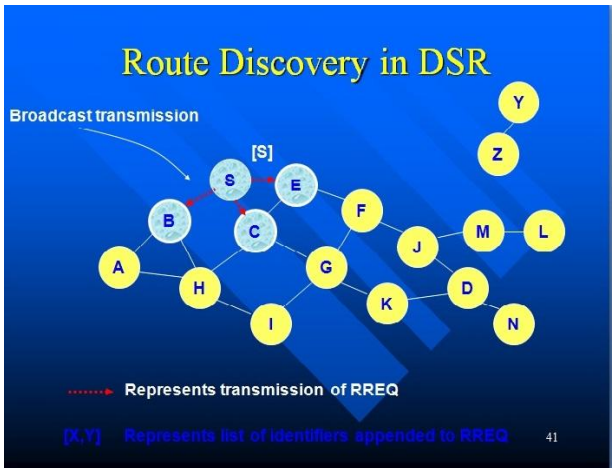

Fig 1: Route Discovery in DSR

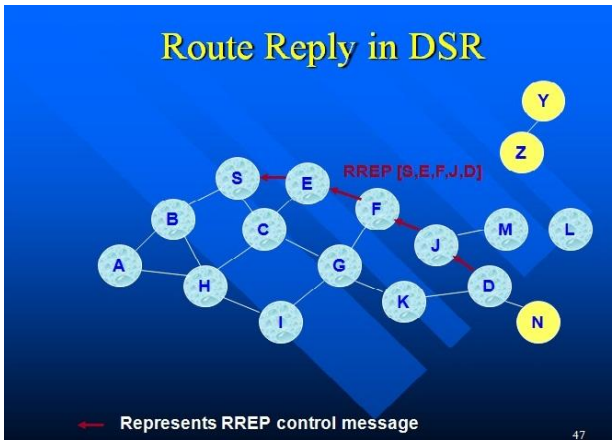

Fig 2: Route Reply in DSR

If any node want to transmit some data too fast so initially it will check the route cache then finalized the destination if it is get the destination route feasible then the source node transmit

the packet. At end condition there source node not gets the feasible route then source node broadcast a route message so every node update route cache for feasible destination. If there any node does not have any sequence route then it append own address to the route record of the route demand packet. then it will send to neighbor nodes. If the route request packet transmit to the destination or at the middle node then routing information send to the destination. A route reply packet generates from the destination and forward to source. The source node compare the travel path with requested packet path and update in route cache, so it is find feasible path then it will send the packet. At any condition any link is disconnected then a route_error message send in network in order to retain the route information, the source node again send a route discovery message in the network so it will work as a store the all broken link nodes message. Then the entire broken nodes information store in the route cache. The main advantage of the routing protocol is that update the route information for all nodes, disadvantage is that mounting size header with route period due to source routing [9, 14].

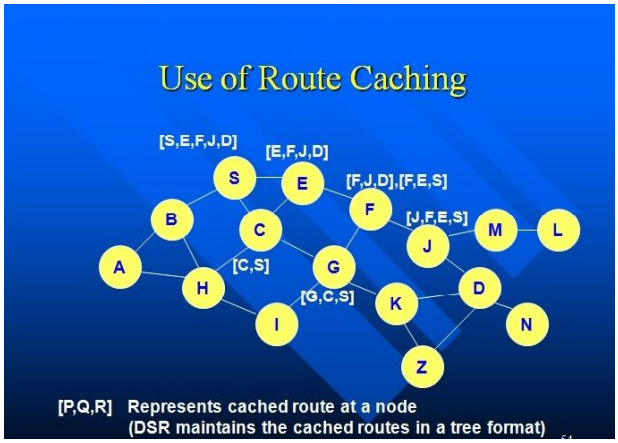

Fig 3: Route Caching

3. DESCRIPTION OF MOBILITY MODEL

The mobility model shown the mobile nodes movement in network, the ad hoc network all the node change its location an position randomly, every node have own average speed over the average time. The mobility model checks the performance of the mobile nodes according to the average speed and pause time.

3.1 Random Way Point Mobility Model

It provides the mobility management of the mobile nodes in the network. In network every node has its own average speed, position and location which are change according to the pause time. The random way point mobility model proposed by the Johnson, the mobility model work same as random walk mobility model if there is pause time is zero. According to the model every node has original position and it will change according its average speed, the nodes are choosing the new coordinate as per new location within the network range. The nodes are choosing the location randomly or regularly. The node also uses the maximum velocity and minimum velocity in the network. That is Vmax and Vmin. To check the mobility linux platform is used and in the linux NS2 simulator also used. Every node chooses it location till the pause time in the network area [12, 13, 14].

4. SIMULATION AND PERFORMANCE METRICS

4.1 Simulation model

Evaluate the performance of DSR routing protocol with major parameter so that we are using network simulator 2 version 35 on the ubuntu 13.04 platform. The NS 2 provide animated and comparative results. In NS 2 used object oriented programming language as a front end and the OTcl as a backend programming language. According to the output file, it will draw with AWK command. Here we generate the mobility scenario using the random way point mobility model. Here also generate the movement file and traffic file using CBR traffic and the network simulator 2. The traffic generate between all the mobile users in traffic scenario generator script.

Table 1. Simulation parameter

Parameter	Value
Mobile Nodes	20, 30, 40, 50
Simulation time	250, 500 sec
Pause time	20 sec
Simulation range	1500m X 300m
Number of connections	10, 20
Transmission range	250m
Traffic size	CBR
Packet size	512 bytes
Maximum Packet	50
Maximum movement speed	20 m/s
Packets rate	4 p/s
Simulator	NS-2.35
Mobility model	Random Waypoint
Antenna Type	Omnidirectional

This algorithm is applied for the mobility model. Node parameters are selecting through this algorithm and evolution of node results.

Algorithm 1

Step 1: Initially we selecting the destination directory
Step 2: Go to ns directory and configure for run, create make file for setdest.
Step 3: Go to directory and run make file which first create create a standalone object file for ns/rng.cc and then create the executable file for setdest.
Step 4: Run setdest with following arguments are provide below
[-n num-of-nodes] [-p pause time] [-s maxspeed] [-t simtime] [-x maxx] [-y maxy]
Step 5: Produced output in file scen-20-test or run make-scen.csh to generate multiple scenario file
Step 6: call to traffic model algorithm go to below
Step 7: exit
This algorithm is applied for the traffic model. Node parameters are selecting through this algorithm and evolution of node results.

Algorithm II

Step 1: Generate connections two pattern file
Step 2: select the directory ns/indep-utils/cmu-scen-gen and generating two types of connection for cbrgen.tcl file
a. CBR connection
b. TCP connection
Step 3: Run the above file through these connection format

Ns cbrgen.tcl [-type cbr|tcp] [-nn node] [-seed seed] [-mc connection] [-rate rate]
Example: ns cbrgen.tcl –type tcp –nn 20 –seed 0 –mc 20

Step 4: then output produced on terminal as figure number 4.

Step 5: exit

5. PERFORMANCE PARAMETER

The dynamic source routing uses some important metrics.

5.1 Packet Delivery Ratio (PDR)

The PDR mainly show that successful packet transmits source to destination. It is work on transport layer. [6, 8] the entire packet delivery ratio runs on the top of network layer. PDR also provide the maximum throughput of the network. The PDR is defined as ratio number of packet is generating by the application or source and number packet received by the destination. The packet delivery ratio is.

$$PDR = (Pr/Ps)*100$$

Where Pr= Number of Packets at receiver end, Ps= Number of Packets .transmit by source

5.2 Average End to End Delay

It define as total time for delay that cause by the route discovery, data buffering, retransmission delay, propagation and transfer time. The data delivery time for data transmit source to destination in mobile ad hoc network. [8, 9]

D= (Tr-Ts),

Where D= End to End delay, Tr =Receive Time, Ts=Sent Time.

6. SIMULATION RESULT AND ANALYSIS

The DSR routing protocol is simulated on the one mobility model. The simulation time is 250 sec, 500 sec and the simulation area is 700mX700m with 250m transmission range. In result basically two parameters is used that is packet delivery ratio and the average end to end delay.

6.1 Packet Delivery Ratio (PDR)

The random way point mobility model performed better in transferring packet data to destination by the pause time. In DSR routing protocol the packet delivery ratio; In small mobile ad hoc network the packet delivery is less but when the nodes are increase then it will increase the packet delivery ratio but more mobile nodes are increase then it will again decrease the packet delivery ration due to route discovery time and route cache so it will decrease the packet delivery ratio.

Table 2. Packet Delivery Ratio in different node with different simulation time and number of connection in MANET

Node/parameter	20	30	40	50
Simulation time 250, connection 10	81.41	80.9	80.21	87.82
Simulation time 250, connection 20	56.58	65.66	57.82	47.89
Simulation time 500, connection 10	89.74	98.13	89.31	96.60
Simulation time 500, connection 20	45.97	72.94	54.00	47.06

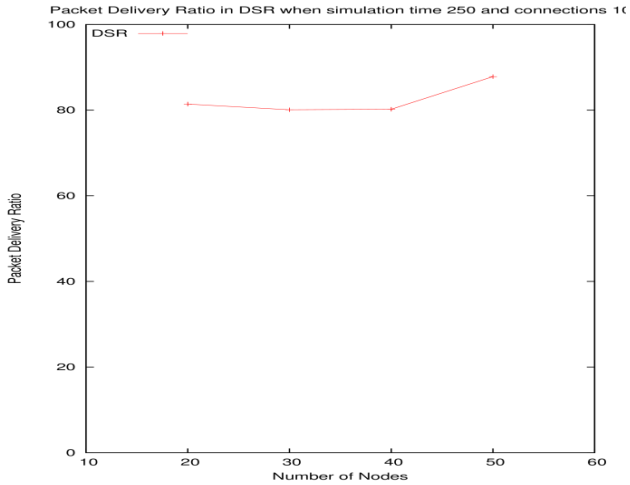

Fig 4: Packet Delivery Ratio of DSR with simulation time 250 sec and 10 numbers of connection

Fig 4 shown the packet delivery ratio in different nodes with 250 sec simulation time and 10 number of CBR connection, in small nodes packet delivery ratio almost constant but when nodes are increase packet delivery also increase using these parameters.

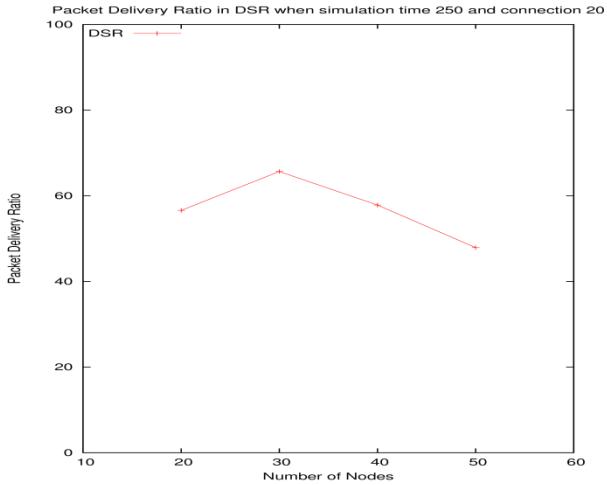

Fig 5: Packet Delivery Ratio of DSR with simulation time 250 sec and 20 numbers of connections

Fig 5 also shown the packet delivery ratio in different nodes with same simulation time and 20 number of CBR connections. In this figure at small nodes packet delivery increase but at large nodes packet delivery continues decrease.

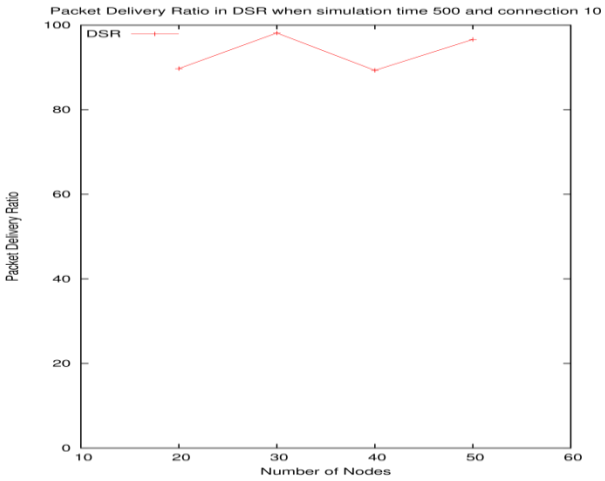

Fig 6: Packet Delivery Ratio of DSR with simulation time 500 sec and 10 number of connection

Fig 6 shows the packet delivery ratio with 500 sec simulation time and 10 numbers of CBR connections. Using these parameters the packet delivery in increase then decreases after again increase that shows the dynamicity in different nodes.

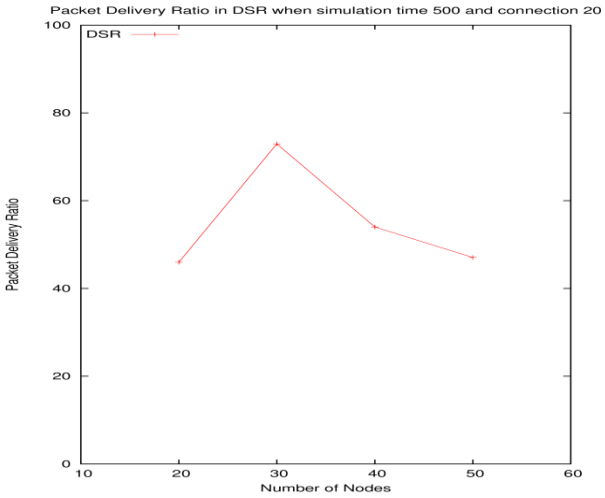

Fig 7: Packet Delivery Ratio of DSR with simulation time 500 sec and 20 number of connection

Fig 6 also shown the packet delivery ratio in different nodes with same simulation time and 20 number of CBR connections. In this Figure when the nodes are increase packet deliveries also increase but continue nodes are increase then the packet delivery continues decrease so that simulation parameter is not good for the packet delivery.

6.2 Average End to End delay

The end to end delay in the DSR routing protocol with different simulation time and number of connection between the nodes in mobile ad hoc network. Using the graph the end to end delay is decrease when the nodes are increase in the network. Because initially nodes are take time for the route discovery then the entire node transfer it information to other nodes then they are transmit data to destination. So using the Dynamic Source Routing the average end to end delay is decrease when the mobile nodes are increase.

Table 3. End to end delay in different node with different simulation time and number of connection in MANET

Node/parameter	20	30	40	50
Simulation time 250, connection 10	1.631	1.753	2.071	1.146
Simulation time 250, connection 20	2.460	3.008	2.420	5.565
Simulation time 500, connection 10	0.996	0.422	2.002	0.446
Simulation time 500, connection 20	4.375	1.775	5.098	4.481

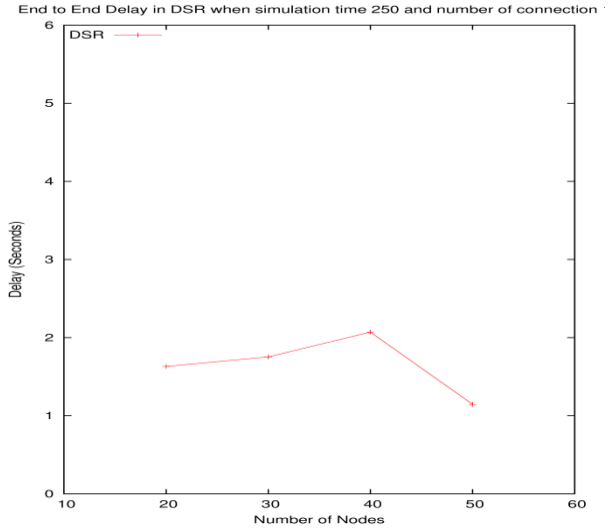

Fig 8: End to end delay for different node in MANET with simulation time 250 sec and 10 number of connection

Fig 8 shown end to end delay using 250 sec simulation time and 10 number of CBR connections, nodes are increase in MANET then end to end delay also increase but in large number of nodes the delay is decrease. So these parameters are best for large network.

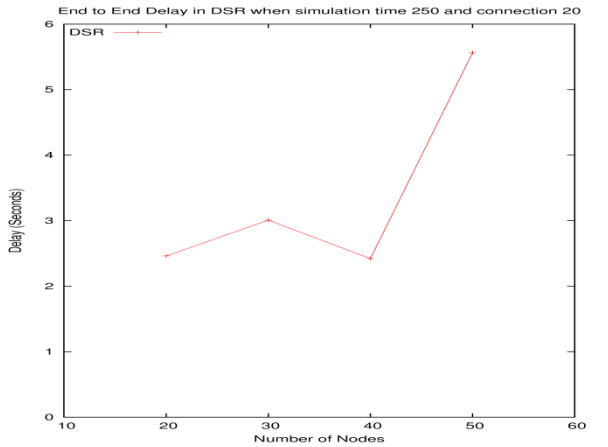

Fig 9: End to end delay for different node in MANET with simulation time 250 sec and 20 number of connection

Fig 9 also shown the same parameters as a fig 8 with 20 number of CBR connection. small network delay is less but in large network delay is more.

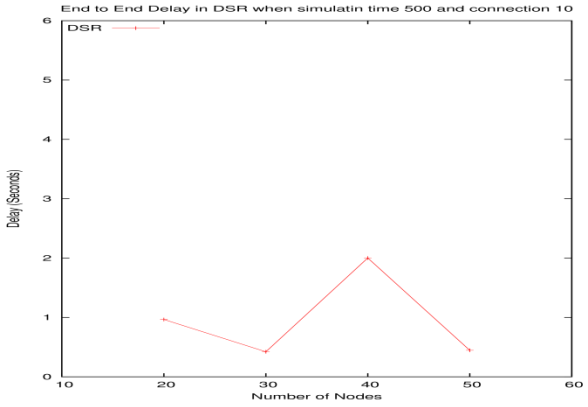

Fig 10: End to end delay for different node in MANET with simulation time 500 sec and 10 number of connection

Fig 10 shown the 500 sec simulation time and 10 number of CBR connection for different nodes, it shows end to end delay; small nodes have less delay but when increase nodes so delays also increase but in large network it decreases so these parameters are best for large network.

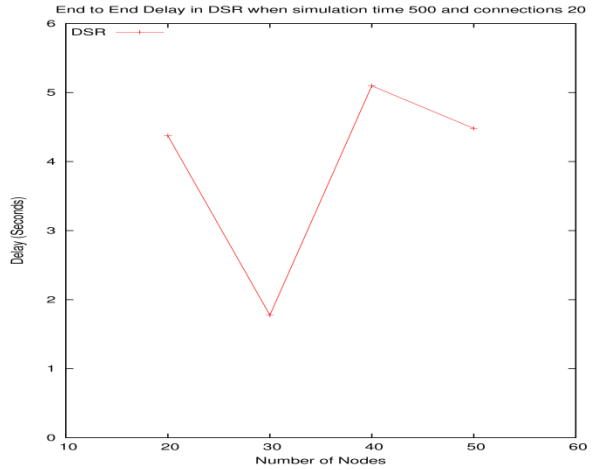

Fig 11: End to end delay for different node in MANET with simulation time 500 sec and 20 number of connection

Fig 11 also shown same simulation time with 20 number of CBR connection. small node have more less delay but in large network the delay more dynamically increase, the simulation time and connection are not good for small and large network. But best for intermediate networks.

7. CONCLUSION

The random way point mobility model evaluate the DSR routing protocol in different mobile nodes. The random way point mobility model give the best result in DSR routing protocol. It performs the high packet delivery ratio. The performance measure using the packet delivery ratio and end to end delay in mobile ad hoc network. The main goal of this paper is that to check the dynamic performance of DSR routing protocol in mobile ad hoc network with some traffic paramete. There are some experiment result describe below:-

1. When increase the number of nodes so the end to end delay is decrease in MANET.
2. When increase the number of node in network then in small network the packet delivery ratio is increase after that decrease it.

The future scope is that implementation of the different parameters in this routing protocols in the mobile ad hoc network using different scenario calculate the movement and the traffic of the mobile nodes. Using DSR routing protocol can calculate the latency, power consumption of the mobile nodes when they are change their location dynamically.

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