Performance Evaluation of DSR in Various Placement Environments

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ABSTRACT
The main method for evaluating the performance of MANETs is simulation. This paper is subjected to the Dynamic Source Routing protocol (DSR) and evaluated its performance in three different placement environments namely Random, Grid and Uniform. We investigated the QOS metrics namely Average jitter, Average end-to-end delay, Packet delivery ratio and Throughput by varying network size. From the simulation results and analysis, a suitable protocol can be chosen for a specified environment. The result shows that the performance of DSR is better in Uniform Environment comparative to other environments.

Keywords

DSR, MANETs, Placement Environments

1. INTRODUCTION

An ad-hoc network is a collection of mobile nodes that are capable of communicating with each other without the aid of any established infrastructure or centralized administration. The mobile nodes in an ad hoc network [1 2] moves randomly resulting in a dynamic topology. They are self organized, dynamically changing multi-hop networks. The rest of the paper is organized as follows. The operation of Dynamic Source Routing (DSR) is summarized in section 2. The simulation environment is described in section 3. We present results in section 4 and conclude with section 5.

2. PROTOCOL DESCRIPTION

In Reactive routing, when a source node needs to send data packets to some destination then it checks for route availability. If no route exists, it performs a *route discovery* procedure to find a path to the destination. Hence, route discovery becomes on-demand. Therefore the Reactive routing techniques, also called *on-demand* routing. The route discovery typically consists of the network-wide flooding of a request message. Once a route has been established, it is maintained by some form of route maintenance procedure until either the destination becomes inaccessible or until the route is no longer desired. The reactive routing protocols include Dynamic Source Routing (DSR) [3 4 5] and Ad hoc on Demand Distance Vector Routing (AODV) [6 7].

2.1 Dynamic Source Routing Protocol (DSR)

Network nodes cooperate to forward packets for each other to allow communication over multiple hops between nodes within wireless transmission range of one another. Since the number or sequence of intermediate hops needed to reach any destination may change at any time, the resulting network topology may be quite rich and rapidly changing. The DSR protocol is composed of two main mechanisms that work together to allow the discovery and maintenance of source routes in the ad hoc network. The following sections explain these mechanisms in more detail.

2.1.1 Route Discovery

When node S wants to send a packet to node D, but does not know a route to D, node S initiates a route discovery process. Source node S floods Route Request (RREQ) packet to its Neighbours and each node appends own identifier when forwarding RREQ as shown in the figure 1.

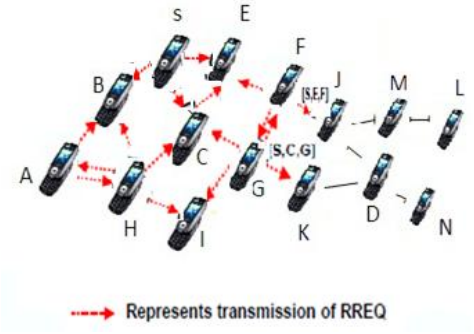


Figure 1: Transmission of RREQS for Route Discovery

When the RREQ is received by the destination node it replies the route reply (RREP) towards the source node via the traversed path as shown in the figure 2.when the RREP reaches the source node, a route from source to the destination is established.

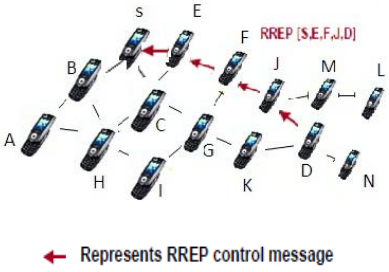


Figure 2: Destination D on receiving the first RREQ sends a Route Reply (RREP)

2.1.2 Route Maintenance

When a link break in an active route is detected, the broken link is invalid and a RERR message is sent to other nodes until the source node is reached. If there is a failure in the current route then for sending other packets to this same destination D, if S has in its Route Cache another route to D, it can send the packet using the new route immediately. Otherwise, it should perform a new Route Discovery for this target.

3. SIMULATION ENVIRONMENT

The aim of this simulation study is to evaluate the performance of existing wireless routing protocol DSR in various nodes placement models like Grid, Random and Uniform i.e. the nodes are placed in various arrangements and moves arbitrarily. The simulations have been performed using QualNet version 5.0 [8 9], a software that provides scalable simulations of Wireless Networks. For this, the simulation is carried out within a 1000m X 1000m area by varying the number of nodes (one source and one destination) and keeping the speed and pause time constant. Table 1 shows the simulation parameters used in the evaluation.

4. RESULT AND DISCUSSION

To evaluate the performance of routing protocols, the following metrics are considered.

1) Average End-to-end delay: End-to-end delay indicates how long it took for a packet to travel from the source to the application layer of the destination. The variation of Average End-to-End Delay with varying the number of mobile nodes is shown in the Figure 3.

2) Packet Delivery Ratio: The fraction of packets sent by the application that are received by the receivers. The variation of Packet Delivery ratio with varying the number of mobile nodes is shown in the Figure 4.

3) Average Jitter: The delay variation between each received data packet. It measures the stability of the algorithm's response to topological changes. The variation of Average jitter with varying the number of mobile nodes is shown in the Figure 5.

4) Throughput: The total amount of data a receiver R actually receives from the sender divided by the time it takes for R to get the last packet. The variation of Throughput with varying the number of mobile nodes is shown in the Figure 6.

Table 1: SIMULATION ENVIRONMENT

Area	1000m x 1000m
Simulation Time	200 Sec
Nodes	10,20,40,80,100
Nodes Placement	Random, Grid, Uniform
Path loss Model	Two Ray
Mobility Model	Random Way Point
Pause Time	30 sec
Maximum Speed	10mps
Traffic	CBR
Packet Size	512 bytes
MAC layer	802.11

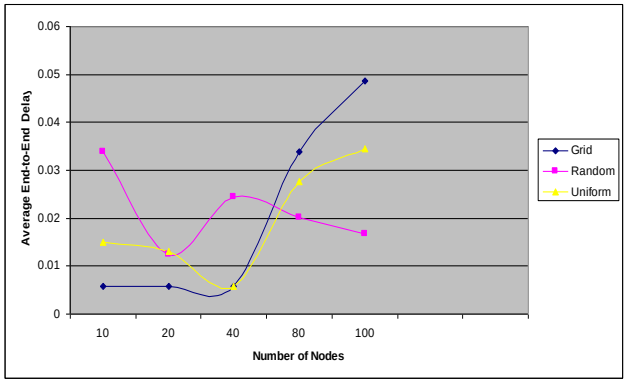
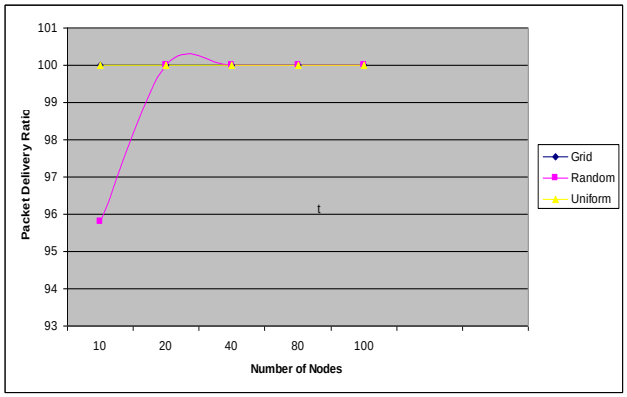


Figure 3: Average End-to-End Delay with Number of nodes



4: Packet Delivery Ratio with Number of nodes

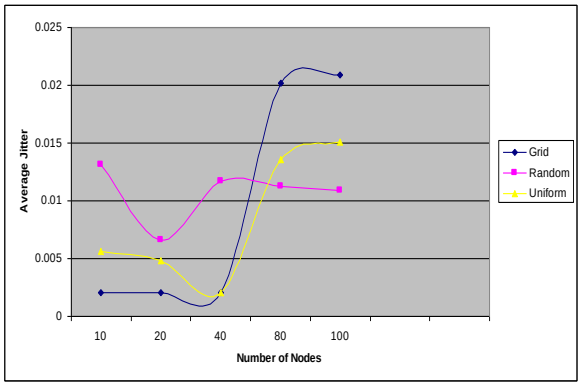


Figure 5: Average Jitter with Number of Nodes

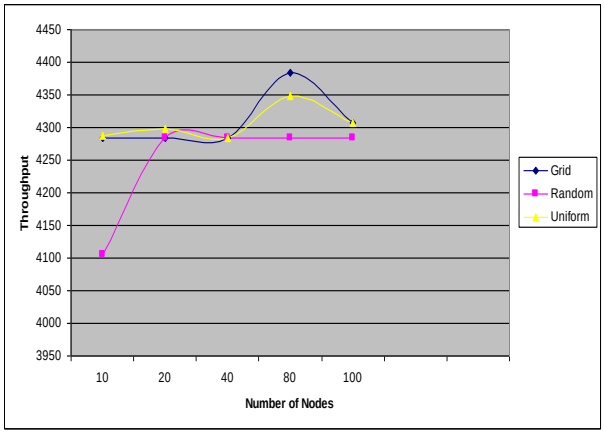


Figure 6: Throughput with Number of Nodes

5. CONCLUSION

The performance of DSR is studied by placing the nodes in various arrangements. The simulation results shows that DSR achieves better performance in Uniform Environment. One of our future research studies is the study of the behaviour of DSR in various environments with various mobility models.

6. REFERENCES

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