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The Ad-hoc routing protocol – DSR simulation

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Abstract- Multi-hop wireless connections, regularly shifting network structures, and the requirement for effective routing protocols that are dynamic are characteristics of these networks. The multilayer interconnections and their efficacy implications are studied using a comprehensive simulation framework that includes MAC and physical component models. The standard functions fully upon request, enabling DSR's route packets latency to automatically expand to just what is required to respond to modifications in those paths that are presently in use. This study established and showed the outstanding performance of the procedure by evaluating DSR through extensive modelling on a range of communication and movement structures, as well as through execution and extensive testing in a real outside ad hoc connecting test bed. Additionally, give an overview of some of our modelling and test bench deployment findings for the procedure, as well as the design of DSR.

Keywords−**Ad hoc networks, Routing, DSR.**

I. INTRODUCTION

A straightforward and effective routing technique created especially for application in multi-hop ad hoc networks made up that utilize mobile node is called dynamic source routing (DSR). DSR removes the requirement for any current network management or architecture and enables the network to be fully self-organizing and self-configuring. In order to facilitate communications across several "hops" among nodes that are not immediately inside communication distance from another, the networking node—computers—cooperate to relay packets for the sake of communication. The navigation will be determined and preserved by the DSR protocols for routing when nodes move around or become part of the network in question, and as communication circumstances like sources of resistance change. The ensuing network architecture may be highly rich and dynamic, as the number or order of intermediary hops required for reaching any point may vary at any time. Nodes in a network that is ad can automatically find an initial route to any destinations by making numerous connections using the DSR interface. This document highlights some of our recent simulations test bed development findings for DSR and outlines the conceptual framework of the DSR protocols. explains the DSR design hypotheses in addition, outlines the DSR protocol, and provides a summary of some of the simulation results for DSR. QUALNET was one of the software packages that was looked into for the study's project.

II. ASSUMPTIONS

Assuming that every node in an ad hoc network that wants to interact with other nodes is prepared to engage completely in the network's communication protocols. Specifically, any node involved in the network ought to be prepared to forward packets on behalf of any additional nodes in the network's hierarchy. On a wireless connection, packets could get lost or damaged during delivery. When a damaged message is received, a node can identify the problem and reject the packet. Every node in the network that is ad hoc chooses a unique IP address to identify it. Every node must choose one networking connection and employ it exclusively for DSR protocols participation, even if it may have several distinct physical network connections, each of which in a normal IP system would be assigned a different IP address. Because of this, every node in an ad-hoc network may be identified by every other node as an individual, independent of the network's interface that they connect via with it.

III. DSR PROTOCOL DESCRIPTIONS

The Route identification and Route Management methods, which together enable the identification and ongoing upkeep of source pathways in the so-called ad hoc network, make up the DSR protocols. Both Route Management and Route Discovery are fully on-demand services. Specifically, in contrast with other procedures, DSR doesn't need any form of periodic messages at every network level. Both directions linkages and asymmetrical routes can be readily accommodated by the way that DSR's Network Exploration and Network Management functions. When required, DSR enables the efficient use of such bidirectional lines, enhancing system efficiency and connection to the network. Additionally, DSR facilitates connectivity across many wireless connection types, enabling an initial route to consist of hops across a variety of accessible kinds of networks.

The usage of routing sources is the primary characteristic that sets DSR apart. Since adaptive source routing (DSR) does not rely on recurring commercials, it is a reactive system. When needed, it determines the paths and then keeps them up to date. With source travel, the message sender chooses the entire list of the nodes the packet must pass through and includes this path clearly in its header. Each sending "hop" is identified by the physical address of the node identified as the packet must go to in order to reach its ultimate host.

IV. DSR EVALUATION

The following section outlines some of our encounters with assessing DSR via execution, real-world operation, and hands-on work with the protocol's usage in an ad hoc broadband test bed context. We have also conducted extensive research applying simulations of discrete events. Random way points movement approach: This easy-to-understand model is frequently used to assess MANET efficiency. There is pause time in the arbitrary way points movement concept between each of the directional and/or change in speed. A Movable Node (MN) remains in one place for a predetermined amount of time after it starts to move. Following the designated pause, the vehicle moves at its lowest and highest speeds, with V being the evenly selected speed within the interval (0, Vmax), where Vmax is a variable that can be adjusted to represent the level of movement. After then, the MN keeps travelling at the predetermined velocity in the direction of the newly specified location. The MN decides the next location in the simulated area and decides on a speed evenly split among its lowest and the highest velocity. It travels at an initial accelerate V with a value that is consistently selected as (0, Vmax). As quickly as the MN reaches the intended location, it continues further for the demonstrated time period before reciting the procedure.

After then, the MN keeps travelling at the predetermined speed in the direction of the newly specified location. The MN stays once more for the designated pause period after reaching the intended location before starting the procedure over. The Qualnet 4.5 simulation was used to conduct this experiment.

A. Steps Carried Out To Perform The Experiment:

1. In order to place 15 nodes in a chain topology, we need to change the default values of the co-ordinate system. For that, the Inspector -> Config Settings -> General -> Terrain -> Co-ordinate System - >Dimension -> 4000 x 4000.

2. Every node is positioned 200 meters apart from one another.

3. After placing the 15 nodes in chain topology, set the parameters for the nodes in the following way:

Node Configuration -> MAC protocol -> 802.11 Node Configuration -> Radio/Physical Layer -> Radio type ->Auto rate fallback -> No Node Configuration -> Radio/Physical Layer -> Radio type -> Data Rate->11 Mbps In the Node Configuration -> Radio/Physical Layer -> Radio type,

Change the parameter of Transmission Power from 15 to 6 dbm. This change is required to ensure that the packets from one node are able to reach only the adjacent nodes. The value was derived through the method of observation of the simulation.

4. Now, adjust the following settings to switch to DSR as the route procedure: Node Configuration -> Routing protocol -> Routing policy -> Routing protocol for IPV4 -> DSR.

In order to ensure that there is no loss of packets due to packets being dropped, set the Buffer Packets parameter to an arbitrary value say, 5000 and accordingly also set the Buffer size. (E.g. 5000 x 4096 (pkt size).

5. Set the subsequent variables on the CBR UDP connection that connects nodes 1 through 2 (and ultimately node 15 as the hop counts increase)

6. Config Settings -> Wireless Settings -> Channel -> Path loss model -> Free Space

Config Settings -> Wireless Settings -> Radio Physical Layer -> Noise Factor-> 0 Config settings -> General -> General -> Simulation time -> 200 seconds

7. In order to set the mobility parameters for the second part of the experiment, set the following parameters:

Node Configuration -> Mobility -> Position Granularity -> 0.5

Node Configuration -> Mobility -> Mobility Model -> Random Waypoint

Node Configuration -> Mobility -> Pause -> 10 seconds

Node Configuration -> Mobility -> Min. speed -> 1 meters/sec

Node Configuration -> Mobility -> Max speed -> 10 meters/sec

8. The following are the simulation's findings for the various hop counts that measured starting postponement, average overall delay, and performance.

Table 1: Initial Delay

No of hops	Initial delay (seconds)
1	0.15
2	0.20
3	0.26
4	0.27
5	0.36
6	0.40
7	0.49
8	0.58
9	0.68
10	0.68
11	0.70
12	0.75
13	0.79
14	0.85

The initial delay of the packet has been calculated using the tracer facility of the Qualnet simulator.

For Eg.: the initial packet delay for a hop count of 13 (the message sequence no. = 0 and source node = 1 (originating node) and destination node = 14 (tracing node)) is 1.78557877-1.0 ~ 0.79

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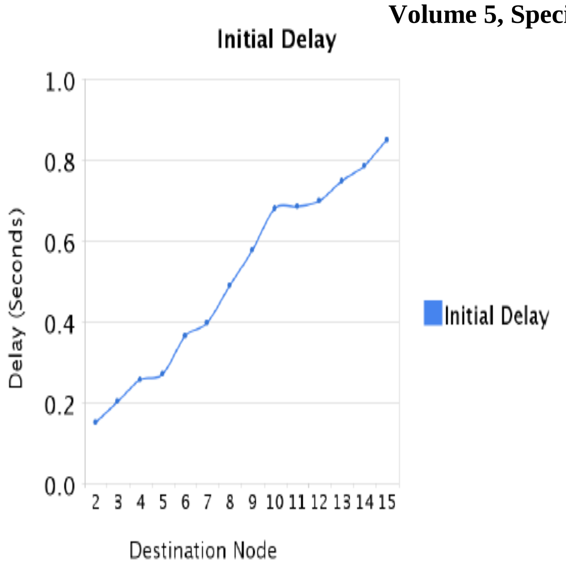


Fig.1. Delay results

Table 2: Average total Delay

No of hops	Average total delay (seconds)
1	0.15
2	0.35
3	0.57
4	0.80
5	1.73
6	2.14
7	2.25
8	2.33
9	2.34
10	2.36
11	2.36
12	2.36
13	2.36
14	2.4

Through the use of charts, the qualnet services offer the mean End to End latency metrics for the various hop numbers. Simply import every hop count's number into a text file, then use that file to create a chart.

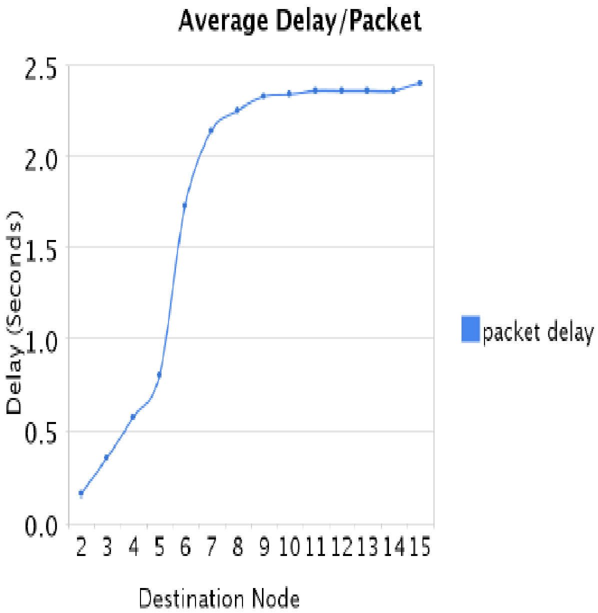


Fig.2. Average packet delay measure

Table 3: Throughput

No of hops	Throughput
1	2530
2	1360
3	729
4	539
5	385
6	263
7	301
8	291
9	279
10	275
11	268
12	270
13	275
14	270

The identical process as outlined in the paragraph above is used to generate a chart.

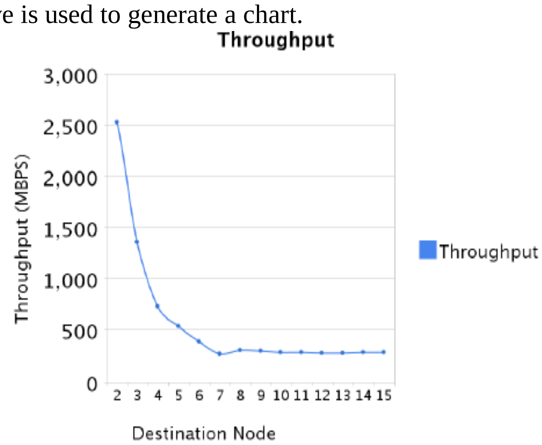
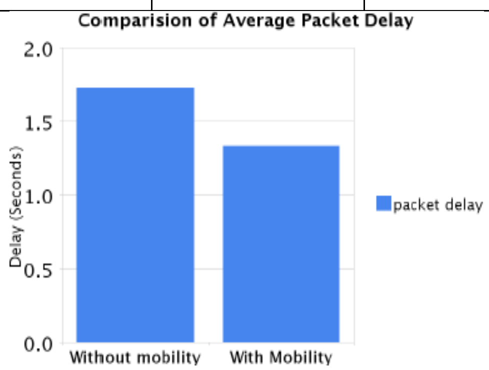


Fig.3. Calculated Throughput

Simulation with mobility enabled for hop count of five

After setting the mobility parameters as described in the first section, we got the following results from the simulation.

Parameters	Without Mobility	With Mobility #
Average total delay (seconds)	1.73	1.32
Throughput (Kbits/sec)	385	103



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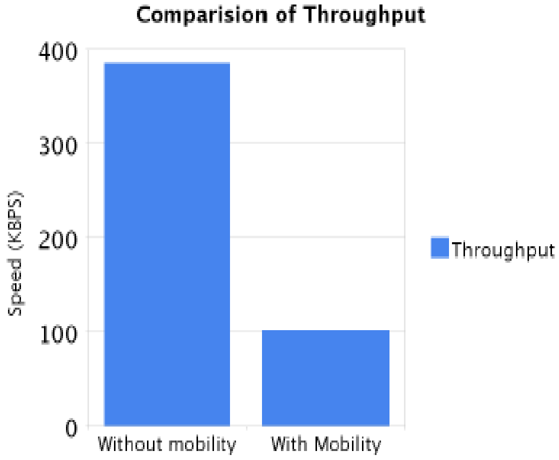

Fig.4. Paramedic comparison

V. OBSERVATIONS

Impact of mobility on Throughput and Delay

From the above results, due to mobility there has been a significant decrease in the Throughput of the data. But at the same time also observe a decrease in the Average total delay of the packets. The reason for this is that as the nodes start moving randomly, there occurs a change in the topology. Some nodes that were not within the radio range of each other previously, may come into contact now while some who were in touch with each other previously, may lose their radio contact.

As a consequence of this change in topology, it may happen that the sender and the receiver may come closer to each other during certain duration of time. During this period, the data transfer between the sender and the receiver will be much faster than when they were distant. Hence, there is drop in the average total delay. But as soon as the sender and the receiver start moving away from each other, and the sender is also not able to find a route to the receiver via any of its adjacent nodes, the receiver is unable to receive packets from the sender. Hence, there is drop in the throughput.

VI. CONCLUSION

Consequently, these findings are drawn from running the mathematical models for the experiment's goals:-The initial delay in packets rises essentially linearly with the amount of hops.

As the amount of hops grows, the median overall delay of the packet first rises very quickly before levelling after a particular amount of flights (in our instance, it starts regulating around hop count 9). Similarly, for Throughput, it first decreases very rapidly as the number of hops increase, but it starts to settle down at almost a constant value after a certain number of hops (e.g. It stabilizes at around 270 kbps after hop count 9).Due to mobility, there is a decrease in the Average total delay of the packets but at the same time, there is a significant decrease in the throughput also.

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