Simulation based Study on Fisheye State Routing Protocol

Kumar Gaurav, Bhawna Agarwal, Abhishek Singh, Biswaraj Sen

Abstract: Mobile Ad Hoc Networks (MANETs) have gained immense popularity because of its simplicity, low cost and ease of deployment. It also enables mobile node to form a network without any centralized administrator. However, routing in adhoc network has always been challenging due to absence of any fixed infrastructure. It is self-organizing and adaptive wireless network. In this paper a simulation based study of Fisheye State Routing protocol has been made to understand the sensitivity of afore mentioned (Fisheye State Routing) protocol in highly dynamic network topology. The proposed paper is aimed to analyze the various parameters including throughput, jitter and delay involved on the nodes in FSR. Simulation based analysis of the protocol has been done using QUALNET.

Keywords: Mobile Ad Hoc Networks (MANETs), centralized administrator, FSR, QUALNET.

I. INTRODUCTION

As the wireless and embedded computing technologies continue to advance, increasing numbers of small size and high performance computing and communication devices will be capable of tether less communications and ad hoc wireless networking [4]. A mobile adhoc Network (MANET) is an infrastructure less, decentralized multi-hop network where the mobile nodes are free to move randomly, these making the network topology dynamic. MANET routing protocols show different performance in different mobile network scenarios. An important characteristics which sets adhoc networks apart from cellular networks is the fact that they don't rely on a fixed infrastructure. Each device in a MANET is free to move independently in any direction, and will therefore change its links to other devices frequently. Each must forward traffic unrelated to its own use, and therefore be a router. The primary challenge in building a MANET is equipping each device to continuously maintain the information required to properly route traffic. They may contain one or multiple and different transceivers between nodes. This results in a highly dynamic, autonomous topology.

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Mobility, potentially very large number of mobile nodes, and limited resources (e.g.:- bandwidth and power) make routing in adhoc network extremely challenging. Mobility, potentially very large number of mobile nodes, and limited resources (e.g.:- bandwidth and power) make routing in adhoc network extremely challenging. The routing protocols including Fisheye State Routing protocol have to adapt quickly to the frequent and unpredictable changes of topology. Fisheye State routing protocol is an implicit hierarchical routing protocol it uses the "fisheye" technique proposed by Kleinrock and Stevens. The eye of a fish captures with high detail the pixels near the focal point [1]. The random waypoint model was used in the simulation runs [5]. In this model, a node selects a destination randomly based on the scenario created within the roaming area and moves towards that destination at a predefined speed. Once the node arrives at the destination, it pauses at the current position for t seconds ('t' is the pause time for the nodes in that scenario). After all the packet transfer between the nodes are done i.e. the network scenario is simulated, we determine the performance metrics delay, jitter and throughput based on the data extracted from the individual nodes.

II. LITERATURE SURVEY

A. Guangyu Pei et.al [2000] presented a novel routing protocol for wireless ad hoc networks FSR. Simulation experiments shown that FSR is simple, efficient and scalable routing solution in a mobile ad hoc environment.

B. Natarajan Meghanathan [2005] has investigated the scalability of the fisheye state routing protocol for ad hoc networks. FSR successfully delivers packets for a majority of the time with relatively lower energy cost in comparison to DSR.

C. L. Kleinrock et.al [1998] has investigated the behavior of existing traditional routing algorithms and proposed to implement Fisheye Routing.

D. Jatin Gupta et.al [2013] have investigated and compared the performance of FSR, DSR, ZRP routing protocols on basis of various parameters.

III. METHODOLOGY

The above Protocol is simulated using the simulator QUALNET and then the effect on the various performance metrics are observed. As it is the easy modeling and simulation tool that can explore and analyze early stage device designs and application code enclosed synthetic networks at real time speed or faster. Routing scheme in a multihop, mobile Wireless network simulator are implemented using the QUALNET. The simulation

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parameters taken in general for any scenario are shown in Table no 1

Parameter	Value
Simulator	Qual Net
Simulation time	300 seconds
Area of the network	1500 m X 1500 m
Number of nodes	100,150, 200
Pause time	5, 10, 20 (seconds)
Minimum speed of nodes	0 meter per second
Maximum speed of nodes	10 meters per second
Mobility Model	Random waypoint
Node Placement	Non-uniform
Traffic Pattern	Constant Bit Rate(CBR)
No. of simulations	5 times

Table no.1 Simulation parameters

IV. RESULTS AND DISCUSSIONS

The effect on the various performance metrics analyzed after the simulation are:-

A. Throughput-The throughput is defined as the total amount of data receiver receives from the sender divided by the time taken for the receiver to get the last packet. The throughput is measured in bits per second (bit/s or bps).It is shown for all the nodes i.e.100,150 and 200 according with their increase in pause time in Fig.1.

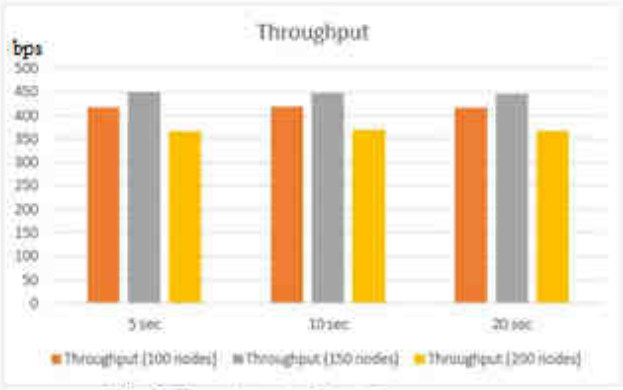

Fig 1: Throughput vs Pausetime

In case of throughput it is seen that, it is maximum for any scenario of 150 nodes in a map area of 1500X1500 meters. So we get to know that it is the optimum case be it for any pause time (5/10/20 seconds) and so, within the optimum no. of nodes the throughput increases and otherwise it decreases thereafter.

B. Average end-to-end delay-End-to-end delay indicates how long a packet takes to travel from the CBR source to the application layer of the destination. This includes all possible delays caused by buffering during route discovery latency, queuing at the interface queue, retransmission delays at the MAC layer, propagation and transfer times. The average delay from the source to the destination's network layer is shown in Fig.2.

It is seen from the graph that the delay of the nodes decreases with increase in pause time. It is low when seen

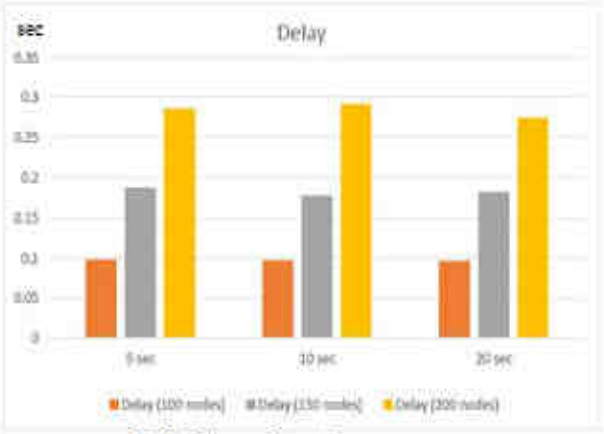

Fig 2: Delay vs Pausetime

for 10 sec of 200 nodes, and even more low when seen for 20 sec of 200 nodes. It is because of the reason that the route has already been established before and also because there are no frequent breaks in the routes established.

C. Jitter-Jitter is the variation in the time between packets arriving, caused by network congestion, timing drift, or route changes. Jitter should be small for a routing protocol to perform better. It is shown in Fig.3 the value of jitter for all the scenario of 100,150 and 200 nodes with their increasing pause time. It is seen from the graph that the performance becomes less jittery for large networks which are often more stable because of the increase in pause time.

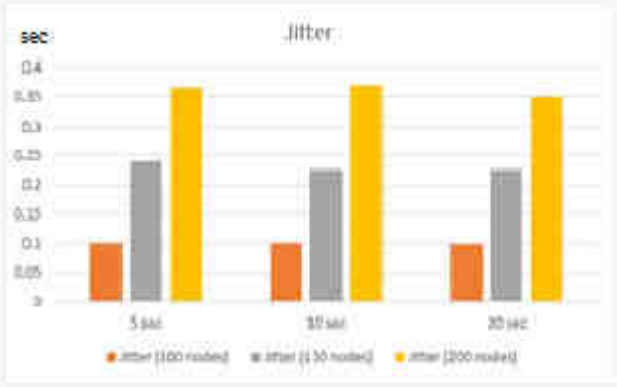

Fig 3: Jitter vs Pausetime

V. CONCLUSION

In this paper, we present the routing scheme, Fisheye State Routing protocol, which provide an efficient, scalable solution for wireless, mobile adhoc networks. The routing accuracy of Fisheye State Routing protocol is comparable with an ideal LS scheme and the routing overhead is kept low. As a result, Fisheye State Routing protocol is more desirable for large mobile networks where the mobility is high and the bandwidth is low [3]. Fisheye State routing protocol proves to be a flexible solution to the challenge of maintaining accurate routes in adhoc networks. One use of the FSR is reducing overhead control traffic. It has also shown a good performance in terms of successful packet delivery in the presence of low mobility. The choice of the number of hops associated with each scope level has a significant influence on the performance of the protocol at different mobility values, and hence must be carefully chosen.

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VI. FUTURE WORK

The performance metrics could be more for which the evaluation is to be done. Furthermore scenarios can be created based on fixed pause time and fixed nature of mobile nodes as well. The FSR protocol can be compared with other such efficient protocol and can be determined as to which one is better. The protocol could be analysed for further more real life scenarios with large node density.

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