Performance Analysis of LAR and Fisheye Routing Protocols in Different Environments

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***Abstract*—Mobile Ad hoc Network is an autonomous and decentralized network formed by wireless devices. Each device dynamically participates into the network and exits from it as they wish. Therefore establishing route in each situation is a difficult task. The big challenge in MANETs is to analyze the suitability of a routing protocol in various situations. The main aim of this paper is to analyze the performance of two well known routing protocols namely LAR and Fisheye state routing protocols in different placement environments. The experimental evaluation is performed using the Qualnet 7.0 simulator. The performance analysis is done in the QoS metrics mainly jitter, end-to- end delay, throughput and packet delivery ratio. The simulation result reveals that LAR protocol is better in random environment and fisheye state routing protocol is preferable in Grid environment.**

Keywords- MANET, LAR, Fisheye, QoS Metrics

I. INTRODUCTION

The decentralized networks are the only solution to establish a communication among the wireless devices in a less amount of time. Mobile Ad hoc Network [3][6] is an infrastructure-less network formed by wireless devices. Recently, Mobile Ad hoc Network gained a lot of popularity in the wireless communication era. There are many challenges in MANETs such as routing, energy consumption, QoS and security. During the design and deploying of communication, the suitability of each protocol is to be analyzed in various scenarios. In this paper the two major routing protocols namely LAR and Fisheye are considered for evaluation. The rest of the paper is structured as given below. Section 2 describes a brief explanation of LAR , Fisheye routing protocols and various placement models. Section 3 presents a brief related work. Section 4 describes Experimental methodology adopted for evaluation. Section 5 describes the results and discussion and finally concluded with section 6.

II. ROUTING PROTOCOLS AND PLACEMENT MODELS

The aim of the routing protocols is to establish a path from a source to destination. This is a complex task in MANETs due to dynamic topology caused by the random movement of wireless devices. Various routing protocols such as AODV[7], DSR[1], LAR[11][12] and Fisheye[2] etc., were proposed for MANETs. Each protocol exhibits its own significance in different situations. In this paper, LAR and Fisheye routing protocols are considered for evaluation purpose.

A. Location Aided Routing (LAR) Protocol

LAR assumes that each wireless device can get its location through Global Positioning System (GPS). This location information is used for maintaining the routes in MANETs. The protocol attempts to reduce the overhead involved in the network with the help of location information. The main drawback of the protocol is to posses GPS by each node.

B. Fisheye State Routing (FSR) Protocol

FSR routing protocol works on the principle of capturing the pixels near to the focal point of fish eye.

If the distance from the focal point increases, the capturing capacity decreases slowly. FSR protocol incorporates the same concept in discovering the routes. The protocol maintains the routes through exchange of link state information.

C. Placement Models

The placement models or deployment models describes how to deploy the network for communication. The two major deployment models are Random placement and Grid Placement Models.

1. Random Placement

In the Random Placement Model, the wireless devices are distributed randomly and are placed within the physical terrain as shown in the figure 1.

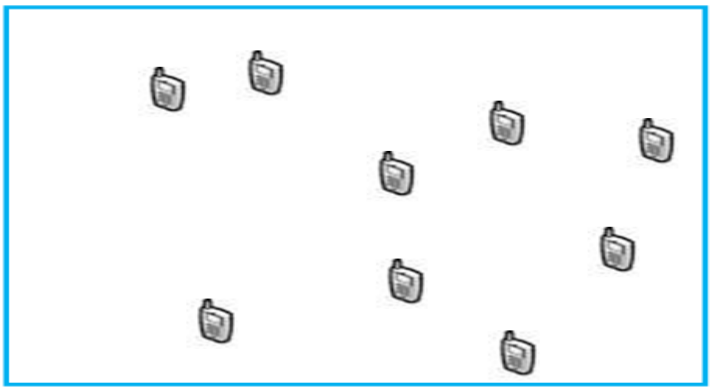

Figure 1: Typical Random Deployment of Nodes

2. Grid Placement

In this model, the wireless devices can be deployed in a grid format as shown in the figure 2. Generally, if the wireless devices are deployed in a grid format, the number of devices is advised to be a square number. (for example 4,16,25,36,49 etc)

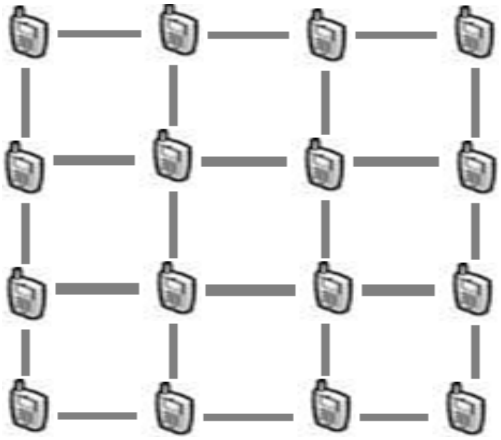

Figure 2: Typical Grid Deployment of Nodes

III. RELATED WORK

Imrich Chlamtac et.al [4] described that mobile ad hoc network will become significant part in the next coming wireless paradigms. They gave brief explaination about the design constraints in MANETs. Marco Conti et.al [5] discussed that design and deployment can be described by considering pragmatic development strategy. Ashish Srivastava et.al [9] provided a survey and overview on different routing protocols and investigated to find out which protocol will fit for larger network or so. S.P.setty et.al [10] evaluated AODV performance in Random, Grid and Uniform environments. They investigated the QOS metrics through various simulation scenarios with network size and speed of the nodes.

IV. METHODOLOGY

The suitability of the protocol can be analyzed by conducting number of experiments. In this, various number of experiments are conducted in different placement environments. The two routing protocols LAR and FSR are evaluated in different placement environments namely Random and Grid situation using Qualnet 7.0 simulator [8]. The experiments are conducted at 49 nodes in a simulation area of 1500m x 1500m. Table 1 illustrates the detailed simulation parameters involved in the experimental setup. Figure 3 illustrates the running scenario of a simulation.

Table 1: Experimental environment parameters

	Simulation Environment
Area	1500 x 1500 sq.m
Simulation Time	360 s
Nodes	49
Node placement	Random and Grid
Mobility Model	Random Way point
Pause Time	0
Max Speed	10m/s
Traffic	CBR
Number of Items	100
Item size	512 bytes
MAC	802.11

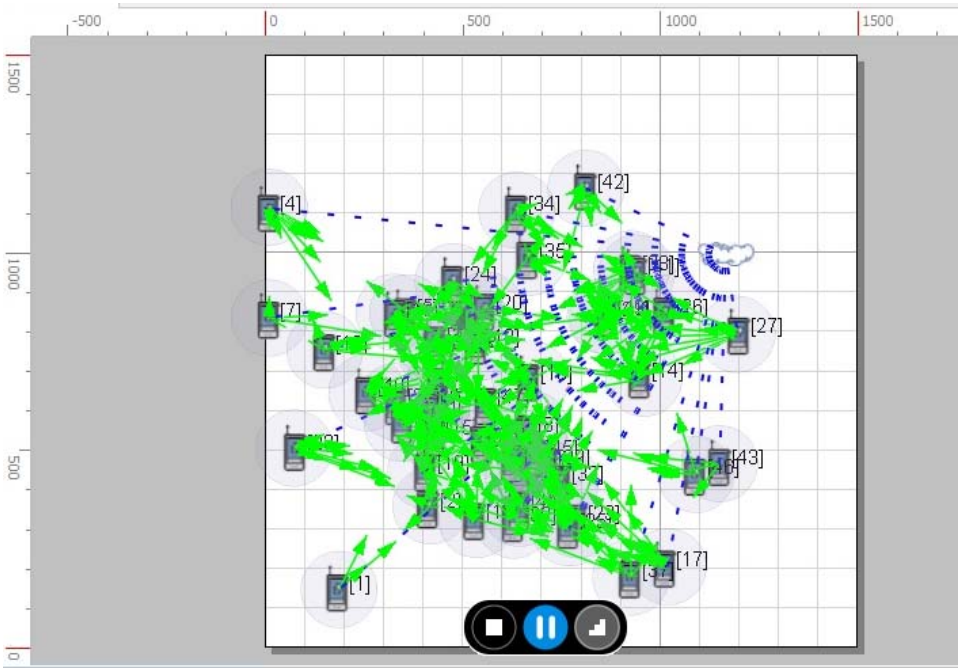

Figure 3 illustrating the running scenario of a simulation.

V. RESULTS AND DISCUSSION

The results are evaluated in the QoS metrics namely Average jitter, Average throughput, Average end-to-end delay and packet delivery ratio. Jitter determines the difference of delay between the two consecutive packets received. Throughput determines the capacity of the channel i.e. it determines the amount of data that can be received in a unit time. End-to-end delay determines the amount of time the packet takes to reach the destination. Packet delivery ratio determines the amount of data packets received in a given number of packets.

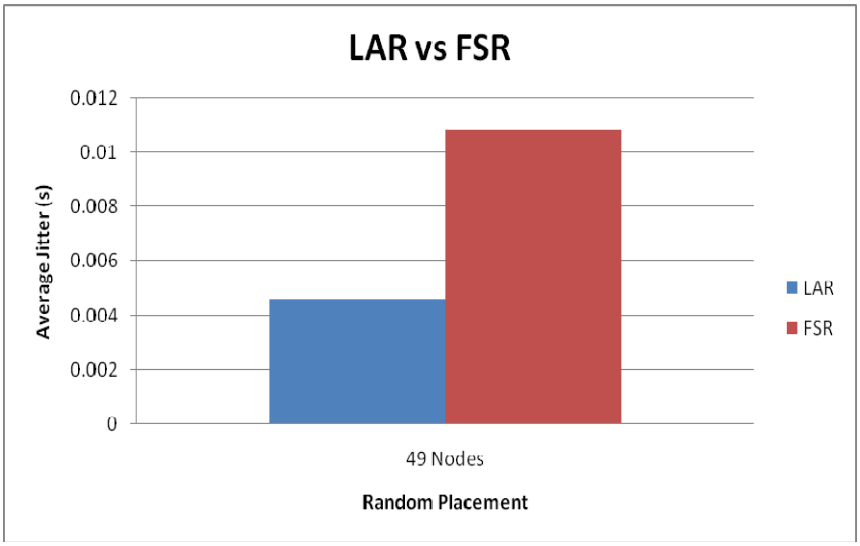

Figure 4: Comparision of LAR and FSR protocols with Average Jitter in Random Placement at 49 nodes

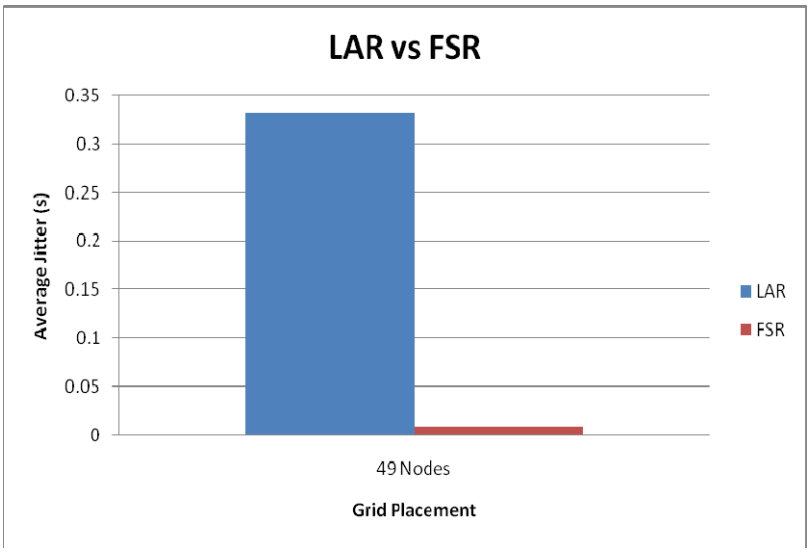

Figure 5: Comparision of LAR and FSR protocols with Average jitter in Grid Placement at 49 nodes

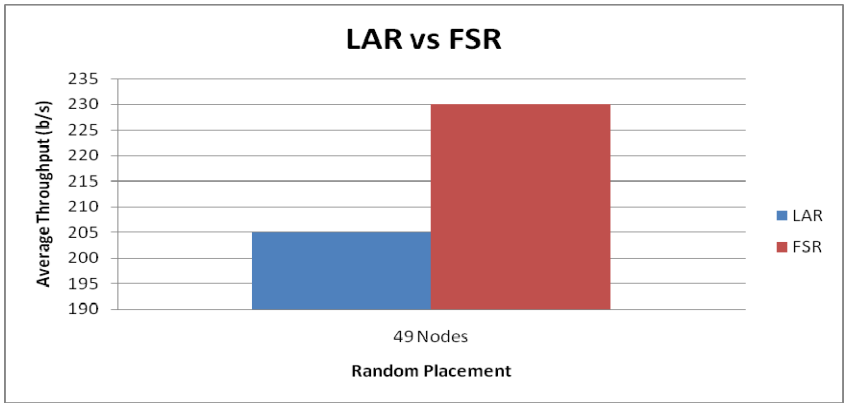

Figure 6: Comparision of LAR and FSR protocols with Average throughput in Random Placement at 49 nodes

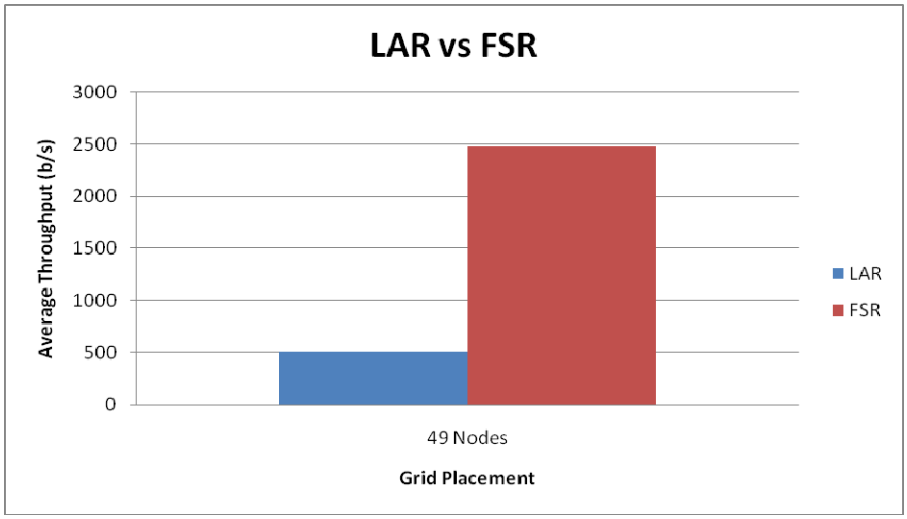

Figure 7: Comparision of LAR and FSR protocols with Average throughput in Grid Placement at 49 nodes

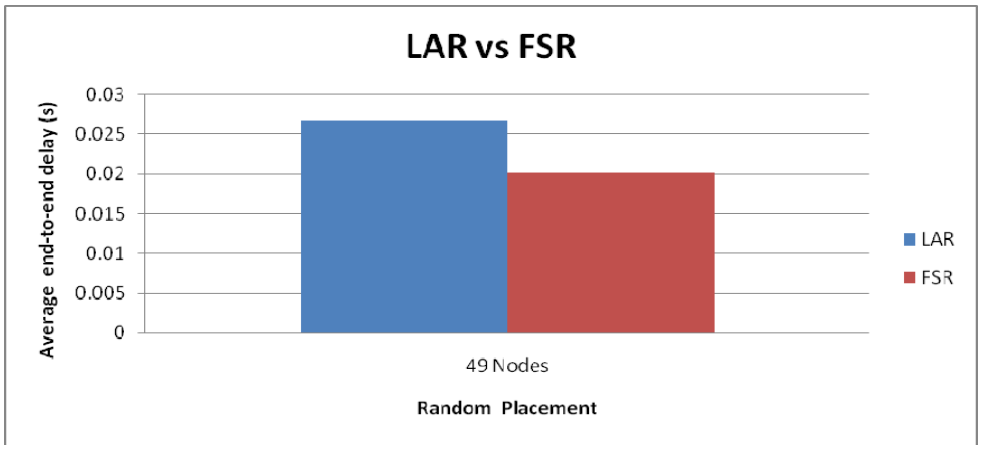

Figure 8: Comparision of LAR and FSR protocols with Average end-to-end delay in Random Placement at 49 nodes

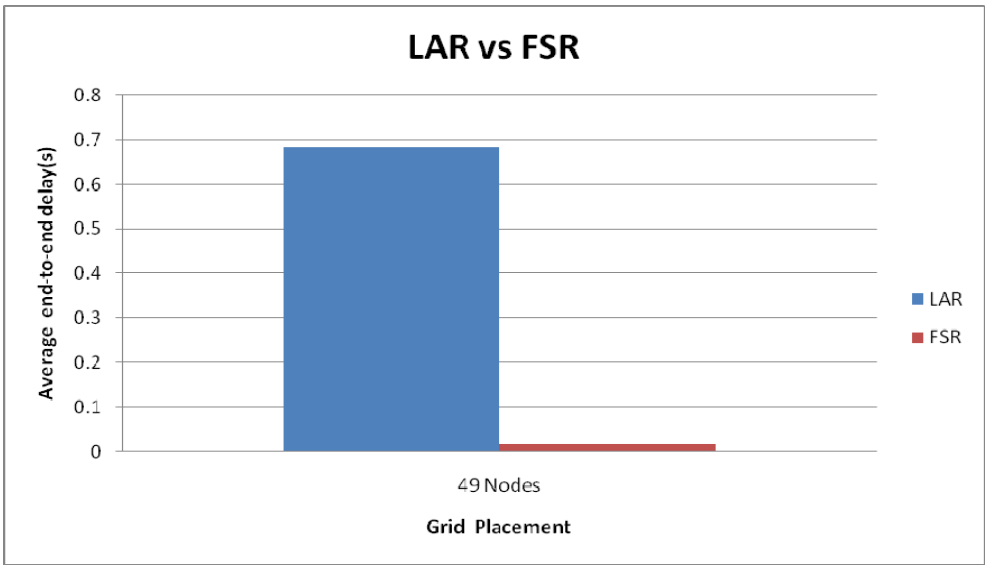

Figure 9: Comparision of LAR and FSR protocols with Average end-to-end delay in Grid Placement at 49 nodes

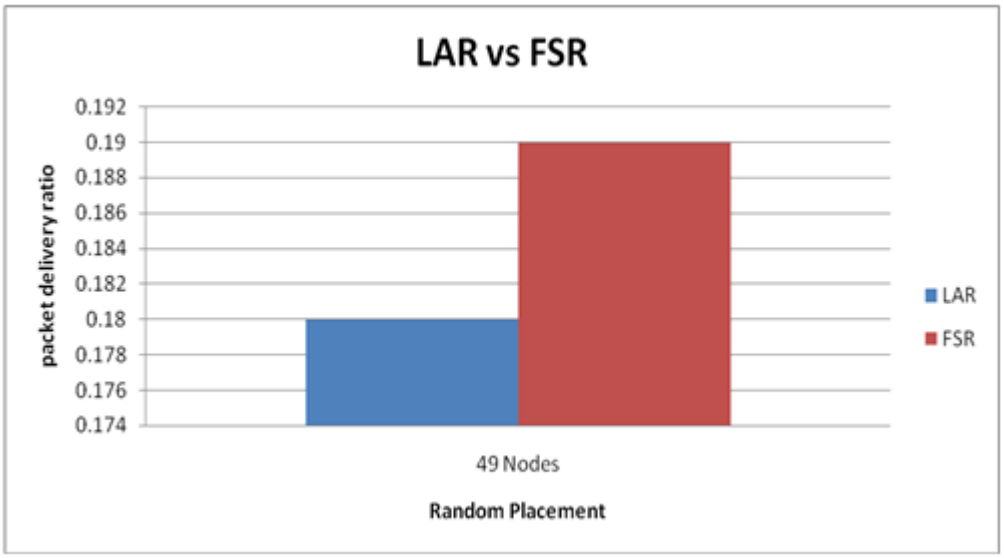

Figure 10: Comparision of LAR and FSR protocols with packet delivery ratio in Random Placement at 49 nodes

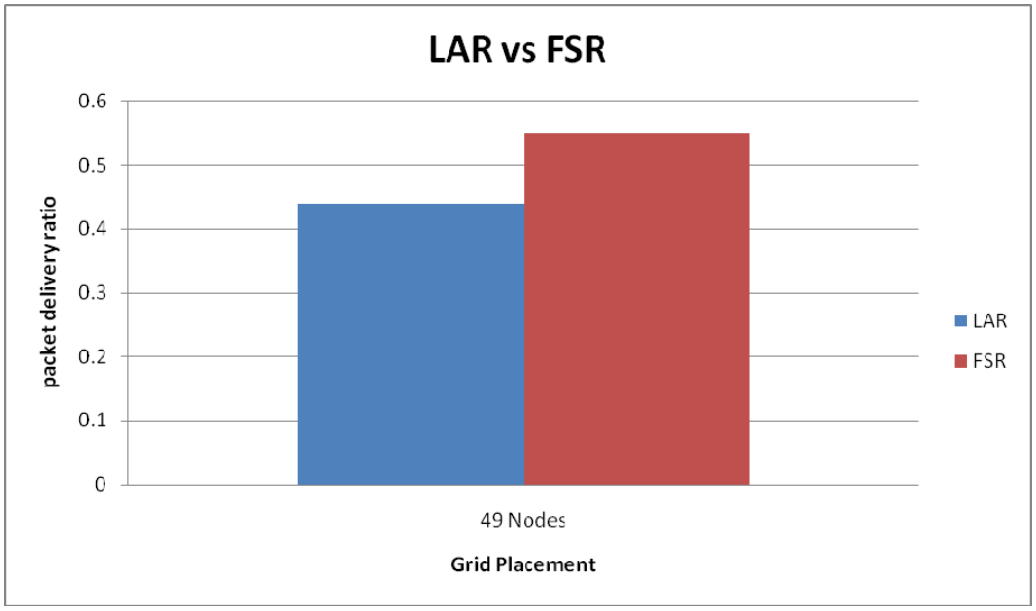

Figure 11: Comparision of LAR and FSR protocols with packet delivery ratio in Grid Placement at 49 nodes

From figure 4, it is clear that LAR routing protocol exhibits less jitter in Random Placement model. From 5 to Figure 11 , it clearly shows that FSR provides better performance in grid environment in terms of the metrics namely end-to-end delay, throughput and packet delivery ratio.

VI. CONCLUSION AND FUTURE SCOPE

In this paper, the two major routing protocols namely LAR and FSR are analyzed in Random and Grid environments. LAR routing protocol is advisable for Random environment and FSR is suggested for Grid environment. In future, LAR and FSR protocols can be evaluated in different traffic models and propagation models.

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