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A Behavioral Comparison of LAR with AODV And DSR Routing Protocols

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ABSTRACT**:** The field of Mobile Ad-hoc NETworks (MANETs) has gained very important part of the interest of researchers and become very popular in the last few years. MANETs can operate without fixed infrastructure and can survive rapid changes in the network topology. In this each node operates not only as an end system, but also as a router to forward packets.. A Reactive (on-demand) routing strategy is a popular routing category for wireless ad-hoc routing. It is relatively new routing philosophy that provides a scalable solution to relatively large network topologies. Here we have compared the performance of three prominent on-demand protocols for MANETs: Ad hoc On Demand Distance Vector (AODV), Dynamic Source Routing (DSR), Location Aided Routing (LAR1) protocols. All three are reactive gateway discovery protocols where mobile device of MANET connects by gateway only when it is needed i.e. On-demand. The performance differentials are analyzed using varying no. of nodes and simulation time by using GlomoSim simulator.

Keywords: MANET, AODV, LAR, DSR

I. INTRODUCTION

Wireless networks have grown tremendously in last few decades [1]. In future, for wireless systems to be most reliable and efficient network communication media, demand of effective protocols in diverse network traffic has arosed. Recent advancements such as Blue tooth introduced a fresh type of wireless systems which is frequently known as mobile ad-hoc networks. MANETs (Mobile Ad-hoc Network) or “short live” networks control in the nonexistence of permanent infrastructure. AODV creates trees which connect multi cast group members. DSR allows the network to be completely self-organizing and self-configuring, without the need for any existing network infrastructure or administration [2], [3]. LAR Protocol uses location information to diminish routing overhead of the mobile ad-hoc network. Normally the LAR protocol uses the GPS (Global Positioning System) to get this location information.

A. ROUTING:

Routing protocols [5] use several metrics as a standard measurement to calculate the best path for routing the packets to its destination that could be number of hops, which are used by the routing algorithm to determine the optimal path for the packet to its destination. by sending the packet to a router representing the “next hop” on its way to destination. This routing primarily depends on the state of the network i.e., the routing table is affected by the activeness of the destination. Routing protocols are broadly classified as follows:

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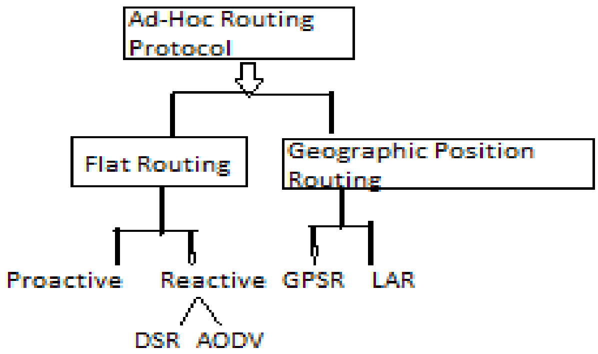

Figure 1: Classification of Routing Protocols in Mobile Ad-hoc Networks

B. FLAT ROUTING PROTOCOLS:

Flat routing protocols are divided mainly into two classes; the first one is proactive routing protocols and other is reactive routing protocols. Proactive MANETs [7] protocols also called as table-driven protocols; actively determine the layout of the network through a regular exchange of network topology packets between the nodes of the network, at every single node an absolute picture of the network is maintained. Reactive (On Demand) protocols: Reactive protocols start to set up routes on-demand. This kind of protocols is usually based on flooding the network with Route Request (RREQ) and Route reply (RERP) messages The different types of On Demand driven protocols are [6]:

- Ad-hoc On Demand Distance Vector (AODV).
- Dynamic Source routing protocol (DSR).
- Location-Aided Routing Protocol (LAR).

C. GEOGRAPHICAL ROUTING PROTOCOLS:

There are two approaches to geographic mobile ad-hoc networks:
1. Actual geographic coordinates as obtained through GPS (Global Positioning System).
2. Reference points in some fixed coordinate system. An advantage of geographic routing protocols is that they prevent network-wide searches for destinations. If the recent geographical coordinates are known then control and data packets can be sent in the general direction of the destination. This trim downs control overhead in the network.
Examples of geographical routing protocols are [4]:

- Greedy Perimeter Stateless Routing (GPSR).
- Location Aided Routing (LAR).

D. LOCATION-AIDED ROUTING PROTOCOL (LAR):

This Routing Protocol uses location information to diminish routing overhead of the mobile ad-hoc network. Normally the LAR protocol uses the GPS to get this location information. The mobile hosts recognize their physical location by the availability of GPS. LAR uses the modified Dijkstra's Algorithm to find the shortest path: it relies on a flooding based route discovery procedure which causes a huge amount of routing overhead. Destination lies in a circular region of certain radius centered at a position at certain time, known as the Expected Zone, which indicates which zone of the network should be reached by RREQ packets. GPS enabled terminals to know its own position and speed, while dissemination is performed by piggybacking location information in all routing packets. LAR works with two schemes [8] which are as follows:

- Under first scheme LAR1 defines request zone that includes sender and receiver on opposite corner of a geographical rectangle. The rectangle dimensions are estimated according to the receiver average speed at a certain time. Nodes within this zone respond to the RREQ of sender by forwarding the RREQ to their neighbors. This scheme reduces network overhead but causes delay.

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- Another LAR scheme (LAR2) depends on the calculated distance between source and the estimated position of destination. Each node receives the RREQ calculates the distance toward destination, if the distance is less than of the distance from the previous sender node to destination, it forwards the packet. In this scheme, intermediate receiving node may be the closest node to destination, and so the algorithm reaches a dead-end [9].

II. BACKGROUND

In 2000**, Young-Bae Ko and Nitin H. Vaidya**in their paper, they have suggested an approach to decrease overhead of route discovery by utilizing location information for mobile hosts. They have proposed two algorithms to reduce route discovery overhead using location information. With the use of the Metricom network infrastructure uses a geographically based routing scheme to deliver packets between base stations. Two LAR schemes were developed based on request zone and expected zone for route discovery .To evaluate our schemes, we performed simulations using modified version of a network simulator, MaRS. They have presented in their paper several cases by varying the number of nodes, transmission range of each node, and moving speed.

In 2010, Natarajan **Meghanathan**. have focused only on the reactive on-demand routing protocols. They have worked on the assumption that all the nodes are position-aware using techniques like Global Positioning Systems. On ns-2 (version 2.28) as the simulator they have implemented the LPBR, FORP and LAR protocols and used the implementation of DSR that comes with NS. The network dimension used is a 1000m x 1000m square network. The transmission range of each node was assumed to be 250 m. The numbers of nodes used were 25 and 75 nodes representing networks of low and high density respectively with Traffic sources are constant bit rate (CBR) Traffic sources.

III. METHODOLOGY

We have mainly compared three routing protocols based on On-demand behavior, namely, AODV and DSR, LAR1 for wireless ad-hoc networks for various parameters by using simulator GlomoSim

A. Performance metrics: End to End delay:

It refers to end-to-end packet delay. When source node sends a data packet towards destination node, it takes some time to deliver and this time is called latency rate/delay or transmission time.

Parameters	**Value**
Simulator	GlomoSim
Protocol Studied	AODV, DSR, LAR1
Simulation Time	50s, 100s, 150s, 200s, 250s
Terrain Dimension	2000*2000
No. of Nodes	25, 50, 100, 150, 200
Node placement	Random
Node mobility model	RANDOM-WAYPOINT
Bandwidth	2 Mbps
Traffic Type	CBR

TableI: Performance metrices for End-to-End delay

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The analysis is to be shown with the help of graphs:

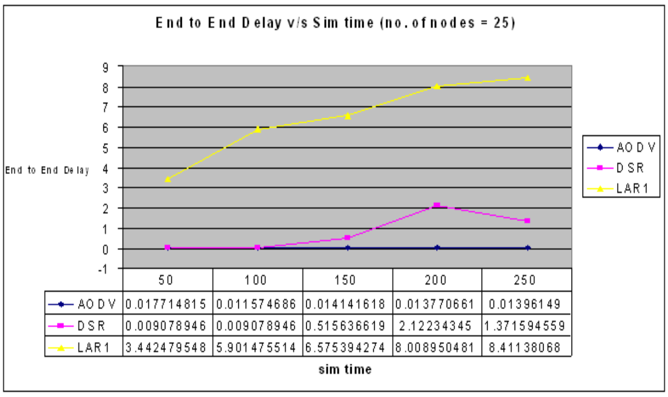


Figure: 2 Screenshot 21 of end-to-end delay when no. of nodes = 25.

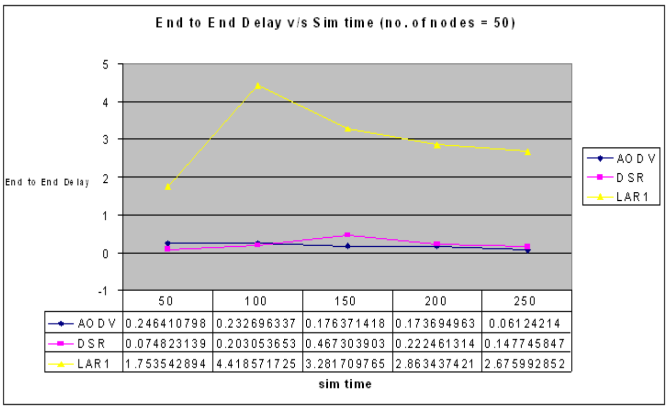


Figure: 3 Screenshot 22 of end-to-end delay when no. of nodes = 50.

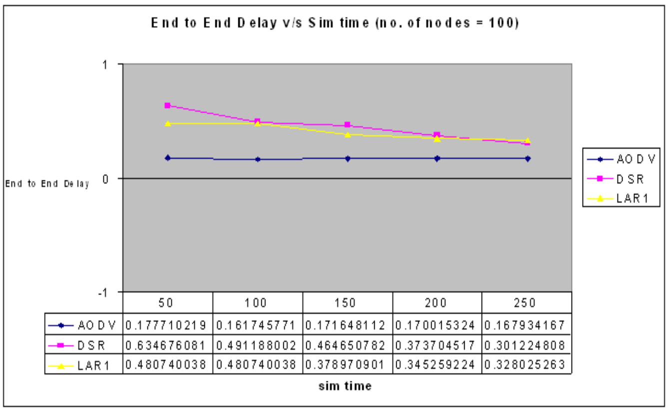
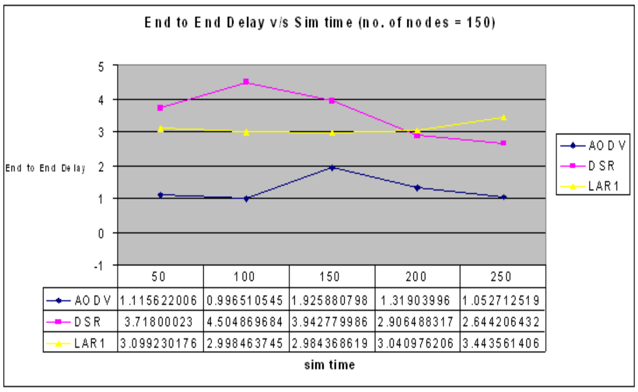
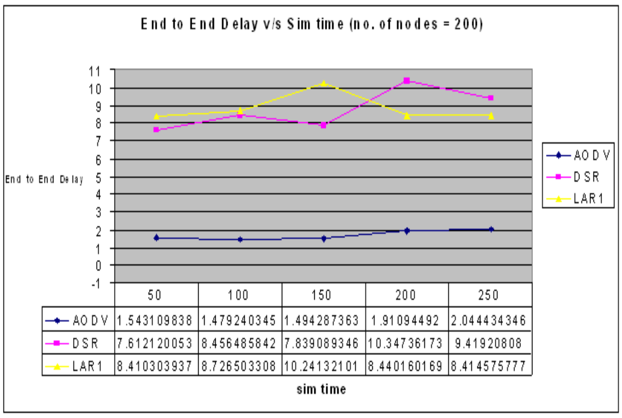


Figure: 4 Screenshot 23 of average end-to-end delay when no. of nodes = 100.



	50	100	150	200	250
AODV	1.115622006	0.996510545	1.925880798	1.31903996	1.052712519
DSR	3.71800023	4.504869684	3.942779986	2.906488317	2.644206432
LAR1	3.099230176	2.998463745	2.984368619	3.040976206	3.443561406

Figure: 5 Screenshot 24 of end-to-end delay when no. of nodes = 150.



	50	100	150	200	250
AODV	1.543109838	1.479240345	1.494287363	1.91094492	2.044434346
DSR	7.612120053	8.456485842	7.839089346	10.34736173	9.41920808
LAR1	8.410303937	8.726503308	10.24132101	8.440160169	8.414575777

Figure: 6 Screenshot 25 of end-to-end delay when no. of nodes = 200.

IV. CONCLUSION

Different kinds of protocols were included in this comparison, as we had on-demand hop-by-hop, and location aided routing. In the last few years, there were several performance examinations of such routing protocols, although the performance was almost always analyzed on the node placement i.e. Grid or Uniform, but here we have described on the basis of random placement of nodes. As can be seen through figure 2 and figure 3 that AODV and DSR are very similar in terms of their end to end delay with respect to 25 and 50 nodes , but AODV mechanism was easier to implement and to integrate with other mechanisms in comparison to other routing protocols. When the nodes density is increased then DSR degraded in performance. A remarkable thing about LAR in these conditions as seen in figure 4 is that the delay decreased with increasing number of nodes. From figure 5 and 6 it can be drawn that LAR shows high end to end delay and its characteristics could be compared with that of DSR.

Scalability is a very important factor for mobile ad-hoc network protocols, as it determines if a protocol will function or fail when the number of mobile users increases. Routing in MANETs is a very active area of research because no one solution fits all criteria of an ideal protocol. One interesting direction of research is Routing with Local Information. It can be said that DSR performs very poor in larger networks, as it shows extreme high delays. It must be added that the comparison between LAR1 and the other protocols is not so fair, as LAR1 additionally uses geographic information.

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BIOGRAPHY

Noor Fatima Rizvi is an Assistant Professor at Manav Rachna International University where she received several awards for research and teaching excellence. She has published over 9 papers in various international journals and conferences. Her current research interests focus on the areas of computer networks and management, Image Processing. She has recently filed an International Patent on "Non – Invasive measurement of Bilirubin level" at Kingdom of Saudi Arabia.

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