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Comparative Study on a comparison in packet drop among the reactive (on-demand) protocols of Mobile Ad hoc Network (MANET) using Qualnet

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Abstract:- This review paper proposes a comparison in packet drop among the reactive (on-demand) protocols of Mobile Ad hoc Network (MANET) which includes Ad-hoc on-demand distance vector routing protocol (AODV), Dynamic source routing protocol (DSR), and Location aided routing protocol (LAR) in Qualnet 6.1. Various parameters like number of nodes, packet drop probability, data packets etc. are included for comparison.

Keywords— MANET, AODV, DSR, LAR, Qualnet, Unipath, Multipath, Packet drop probability;

I. INTRODUCTION

Mobile AdHoc network is a network which doesn't require any type of infrastructure for connecting one node to other node or connecting more than two nodes to each other irrespective of their hardware and software difference. The nodes in MANETs communicate with each other through radio waves. If two nodes are not in radio range of each other then they have to depend on intermediate nodes for communication. Routing in the MANETs is a challenging task and has received a large amount of attention from researchers. This has led to development of many different routing protocols for MANETs, and each author of each proposed protocol assures that the protocol proposed by him/her provides an improvement over other routing protocols developed before their protocol in the literature for a given network scenario. Therefore, it is quite difficult to determine which protocols may perform best under a number of different network scenarios, such as increasing node density and traffic, packet drop probability etc.

So in this review paper we used three reactive routing protocols AODV, DSR, and LAR for comparing least packet drops when numbers of nodes and packet drop probability are increasing in the scenario. Qualnet 6.1 [9] is the tool used for the comparison and Qualnet 6.1 user guide [8] is used for learning and reference for Qualnet.

II. CLASSIFICATION OF ROUTING PROTOCOLS

MANET Routing Protocols are classified into three categories i.e. Proactive Routing Protocols, Reactive Routing Protocols, and Hybrid Routing Protocols. In proactive routing protocols, each node maintains routing information to every other node in the network in a number of different tables. The difference between these protocols exists in the way the routing information is updated, detected and the type of information kept at each routing table. Furthermore, each routing protocol may maintain different number of tables. This protocol includes DSDV, WRP, FSR etc routing protocols. [1]

On-demand routing protocols were designed to reduce the overheads in proactive protocols by maintaining information for active routes only which means that routes are determined and maintained for nodes that require to send data to a particular destination. Route discovery usually occurs by flooding a route request packets through the network. When a node with a route to the destination (or the destination itself) is reached a route reply is sent back to the source node using link reversal if the route request has travelled through bi-directional links or by piggy-backing the route in a route reply packet via flooding. This protocol includes AODV, DSR, LAR, TORA, ARA etc. [1]

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Hybrid routing protocols are both proactive and reactive in nature. Hybrid routing protocols have the potential to provide higher scalability than pure reactive or proactive protocols. This is because they attempt to minimize the number of rebroadcasting nodes by defining a structure which allows the nodes to work together in order organizing how routing is to be performed. By working together the best or the most suitable nodes can be used to perform route discovery. Most hybrid protocols proposed to date are zone-based, which means that the network is partitioned or seen as a number of zones by each node. This protocol includes ZRP, ZHLS etc. [1]

There is a comparison done in AODV, DSR, and LAR for packet drops by increasing the number of nodes and it has been concluded that AODV gives best result as number of nodes will increase. Packet drop in AODV is less as compared to DSR when number of nodes is more while LAR may behave like AODV or DSR as number of packets dropped may be more or less when number of nodes is increased.

1. AODV Routing protocol

The AODV [2] routing protocol is based on DSDV [4] and DSR [3] algorithm. It uses the periodic beaconing and sequence numbering procedure of DSDV and a similar route discovery procedure as in DSR. However, there are two major differences between DSR and AODV. The most important difference is that in DSR each packet carries full routing information, whereas in AODV the packets carry the destination address. This means that AODV has less routing overheads than DSR. The other difference is that the route replies in DSR carry the address of every node along the route, whereas in AODV the route replies only carry the destination IP address and the sequence number. The advantage of AODV is that it is adaptable to highly dynamic networks. The disadvantage is that node may experience large delays during route construction, and link failure may initiate another route discovery, which introduces extra delays and consumes more bandwidth as the size of the network increases.

2. DSR Routing protocol

DSR [3] protocol requires each packet to carry the full address (every hop in the route), from source to the destination. As a result, when network diameter increases, the overhead carried in the packet will also increase. Hence, this protocol is not very effective when network is large. Therefore in highly dynamic and large networks the overhead may consume most of the bandwidth. This protocol performs better in small sized networks; hence this protocol has a number of advantages over routing protocols such as AODV and TORA [5] in small size networks. An advantage of DSR is that source can check for a valid route before initiating the route discovery as nodes can store multiple routes in their route cache. If a valid route is found there is no need for route discovery. This is very beneficial in network with low mobility. Another advantage of DSR is that nodes can enter in sleep mode for conserving the power as it does not require any periodic beaconing (or hello message exchanges). Hence a considerable amount of bandwidth is saved in the network.

3. LAR Routing protocol

LAR [6] is based on flooding algorithms (such as DSR). However, LAR uses the location information to reduce the routing overheads present in traditional routing protocols like DSR and AODV. In this protocol, it is assumed that each node knows its location with the help of Global Positioning System (GPS). Two different LAR scheme were proposed in [6], in the first scheme an expected zone and a request zone is calculated. Expected zone calculates the expected location of the destination and the request zone calculates the boundary where the route request packets can travel to reach the required destination. In the second method the coordinates of the destination in the route request packets is stored. These packets travel only in the direction where the relative distance to the destination from the intermediate packets becomes smaller as they travel. Both the methods help in conserving the bandwidth by limiting the control overhead transmitted over the network. They will also determine the shortest path (in some cases) to the destination, as the route request packets travel towards the destination and away from the source. The main disadvantage that this protocol consists is that each node is required to carry a GPS. Another disadvantage is (mainly for the first method), that protocols may behave similar to flooding protocols (e.g. DSR and AODV) in highly mobile networks.

III. Packet Drop probability

The energy resources, which includes battery power, and the bandwidth of the mobile nodes is limited. Due to this, the intermediate nodes sometimes, may behave selfish and can drop the packets, i.e. packets are not forwarded further

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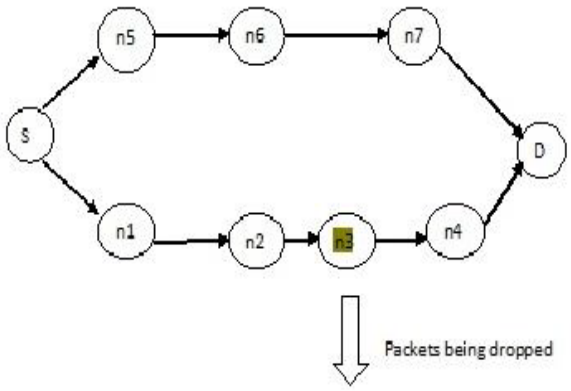
to next nodes. Packet drop probability is the probability of dropping these packets without forwarding them further when the retry limit is reached. Packets can be dropped for many reasons. The first reason may be link breaks or heavy traffic or selfishness of any intermediate node to save its resources. The next may be overflow of transmission queue. Lack of proper energy resource may be one reason. Security attack might also a reason. [7]



IV. PARAMETERS INCLUDED FOR THE COMPARISON

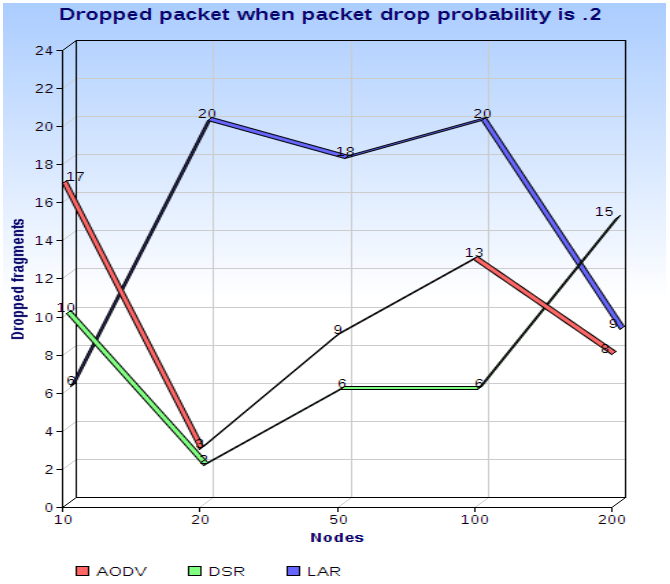
In this paper a comparison is for the packet drop in various reactive protocols. The parameters included for the comparison are as follows:-

S.N.	Parameter name	
1	Terrain	Grid(1500m*1500m)
2	No. of Nodes	10,20,50,100,200
3	Items to send	10000
4	Item size	512bytes
5	Mobility	Random Waypoint
6	Traffic	CBR
7	Packet drop probability	.2,.3,.4,.5
8	Battery model	Linear

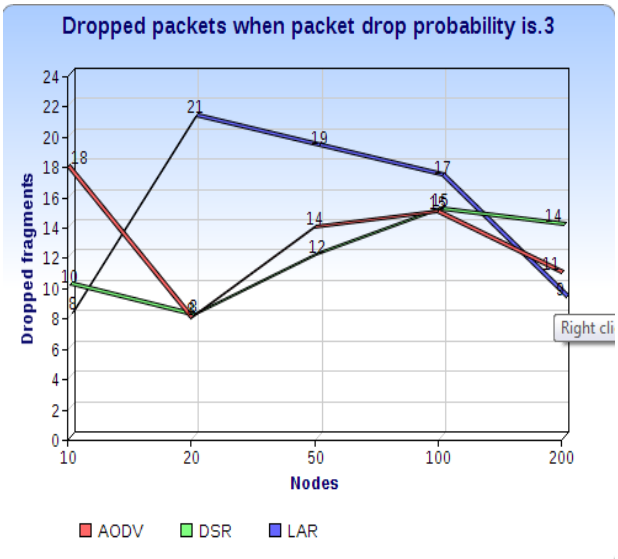
V. SIMULATION RESULTS

In the figures we can see comparison among AODV, DSR, and LAR with respect to the number of nodes and the packets dropped. It is concluded from the graph that AODV has the least number of packet drop among three when the number of nodes is highest while LAR may or may not have the lower packet drop. The packet drop probability is 0.2, 0.3, 0.4, and 0.5 respectively for the graphs shown below.

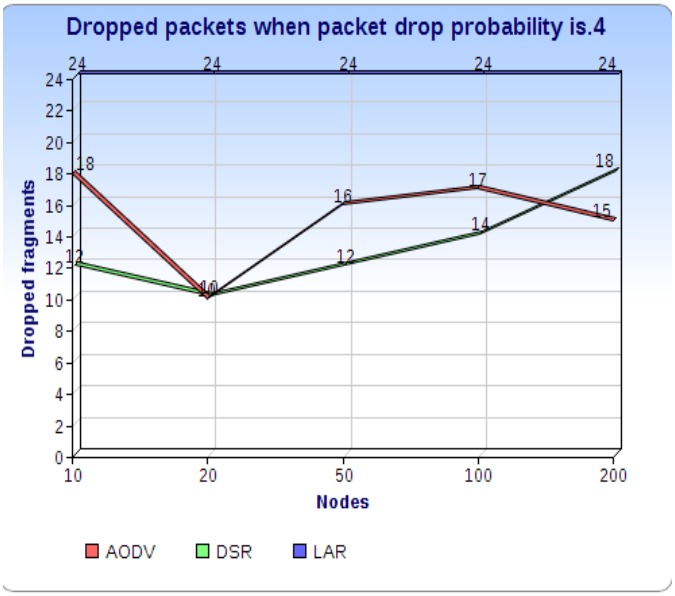
1. WHEN PACKET DROP PROBABILITY IS 0.2



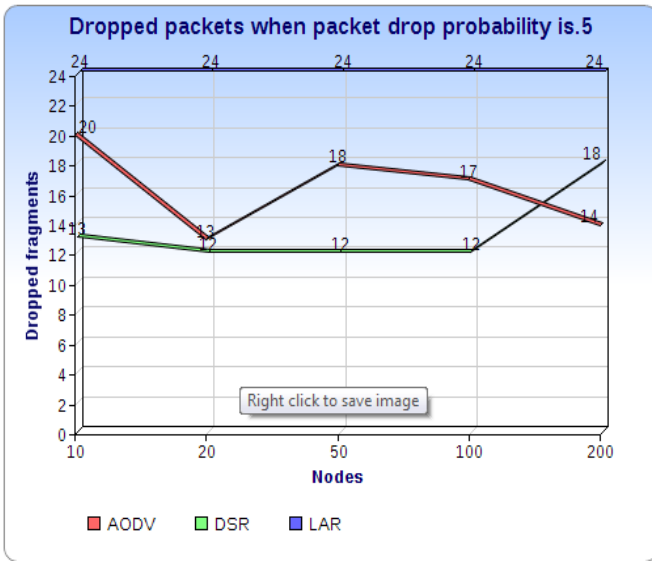
2. WHEN PACKET DROP PROBABILITY IS 0.3



3. WHEN PACKET DROP PROBABILITY IS 0.4



4. WHEN PACKET DROP PROBABILITY IS 0.5



VI. CONCLUSION

From the above simulation results, we have seen that when drop probability is lower, LAR may drop packets less than AODV and DSR or packet drop may be greater than those. When drop probability is increased (i.e. 0.4 and 0.5) the packet drop is 100% in LAR. While in AODV packet drop is more than that of DSR when number of nodes is less and as number of nodes is largest (200 nodes) packet drop is less than that of DSR irrespective of the packet drop probability. So it can be concluded that AODV will be the best in three of them when the network is large sized. DSR don't perform better for large sized networks as it requires each packet to carry the full address (every hop in the route), from source to the destination. LAR uses geographical information for searching, creating and sending the data from source to destination; hence each node has to carry a GPS. Another disadvantage is that LAR can behave like DSR in highly mobile networks. AODV performs better when the network is large sized. So AODV with multipath will be implemented in Qualnet by this conclusion.

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VIII. REFERENCES

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