Comparative Study of Adhoc Routing Protocol AODV, DSR and IARP in Mobile Adhoc Network

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Abstract- **A mobile Ad-hoc network are self-organized wireless network which are able to connect on a wireless medium without the use of a infrastructure or any centralized administration. The mobile nodes perform both as a host and a router forwarding packets to other nodes routing in these network is highly complex nodes within each other's radio range communication directly via wireless links while those that are far apart use other nodes as relays in a multi-hop routing fashion.**

This paper present performance comparison of four mobile ad-hoc network routing protocols i.e Ad-hoc On-Demand Distance Vector (AODV), Dynamic Source Routing(DSR), Intrazone routing protocol (IARP)using Qualnet 5.0.2 The performance analysis is based on different network metrics such as End-to-End delay(s), Average Jitter(s), Total packet received and Throughput

***Keywords*: MANET, QUALNET, AODV, DSR, IARP**

I. INTRODUCTION

An ad-hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any stand-alone infrastructure or centralized administration [1]. Mobile Ad-hoc networks are self-organizing and self-configuring multihop wireless networks where, the structure of the network changes dynamically. This is mainly due to the mobility of the nodes [3]. Nodes in these networks utilize the same random access wireless channel, cooperating in a friendly manner to engaging themselves in multihop forwarding. The node in the network not only acts as hosts but also as routers that route data to/from other nodes in network [2].

II. Ad-hoc routing protocols

2.1 Types of routing protocols

Ad-hoc routing protocols can be divided into three categories, Proactive (Table driven) routing protocol, Reactive (On demand) routing protocol and Hybrid routing protocol.

2.1.1 Proactive (Table driven) routing protocol

Proactive routing protocols maintain information continuously. Typically, a node has a table containing information on how to reach every other node and the algorithm tries to keep this table up-to-date. Changes in network topology are propagated throughput the network

2.1.2 Reactive (On demand) routing protocol

On demand protocols use two different operations to Route discovery and Route maintenance operation. In this routing information is acquired on-demand. This is the route discovery operation. Route maintenance is the process of responding to change in topology that happen after a route has initially been created.

2.1.3 Hybrid routing protocol

Hybrid routing protocols are a new generation of protocol, which are both are Proactive and Reactive in nature. 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. Normally, Hybrid routing protocols for MANETs exploit hierarchical network architectures.

2.2 The protocols studied here are:

2.2.1 AODV

AODV has the merits of DSR and DSDV protocol. DSDV maintains routes to all destinations with periodical route information flooding and uses sequence numbers to avoid loops. AODV inherits the sequence numbers of DSDV and minimizes the amount of route information flooding by creating routes on-demand, and improves the routing scalability and efficiency of DSR, which carries the source route in the data packet.

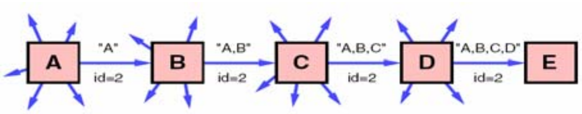
In AODV protocol, to find a route to the destination, the source broadcasts a route request packet (RREQ). Its neighbors relay the RREQ to their neighbors until the RREQ reaches the destination or an intermediate node that has fresh route information. Then the destination or this intermediate node will send a route reply packet (RREP) to the source node along the path from which the first copy of the RREQ is received. AODV uses sequence numbers to determine whether route information is fresh enough and to ensure that the routes are loop free. If any node receives already processed RREQ, nodes discard the RREQ and do not forward it. If the source node later receives a RREP containing a greater sequence number or contains the same sequence number with a smaller hop-count, it may update its routing information for that destination node and begin using the better route. As long as the route remains active, it will continue to be maintained. A route is active if there are data packets periodically travelling from the source node to the destination node along that path.

2.2.2 DSR

The Dynamic Source Routing protocol (DSR) is a simple and efficient routing protocol designed specifically for use in multi-hop wireless ad hoc networks of mobile nodes. DSR allows the network to be completely self-organizing and self-configuring, without the need for any existing network infrastructure or administration All aspects of the protocol operate entirely on-demand, allowing the routing packet overhead of DSR to scale automatically to only that needed to react to changes in the routes currently in use The DSR protocol allows nodes to dynamically discover a source route across multiple network hops to any destination in the ad hoc network. Each data packet sent then carries in its header the complete, ordered list of nodes through which the packet must pass, allowing packet routing to be trivially loop-free and avoiding the need for up-to-date routing information in the intermediate nodes through which the packet is forwarded. By including this source route in the header of each data packet, other nodes forwarding or overhearing any of these packets may also easily cache this routing information for future use. The DSR protocol is composed of two mechanisms that work together to allow the discovery and maintenance of source routes in the ad hoc network:

1-Route Discovery is the mechanism by which a node **S** wishing to send a packet to a destination node **D** obtains a source route to **D**. Route Discovery is used only when **S** attempts to send a packet to **D** and does not already know a route to **D.**

2-*Route Maintenance* is the mechanism by which node **S** is able to detect, while using a source route to **D**, if the network topology has changed such that it can no longer use its route to **D** because a link along the route no longer works. When Route Maintenance indicates a source route is broken, **S** can attempt to use any other route it happens to know to **D**, or can invoke Route Discovery again to find a new route. Route Maintenance is used only when **S** is actually sending packets to **D**.



2.2.3 IARP

The Intrazone Routing Protocol (IARP) proactively maintains routes to destinations within a local neighborhood, which is referred to as a routing zone. More precisely, a node's routing zone is defined as a collection of nodes whose minimum distance in hops from the node in question is no greater than a parameter referred to as the zone radius. Note that each node maintains its own routing zone. An important consequence is that the routing zones of neighboring nodes overlap. In IARP each node monitors the changes accurse in R-hop neighborhood and avoids the global route discovery to local destination. IARP's routing provides enhanced, route maintenance after routes have been discovered.

III. Simulation environments:

To evaluate and compare the effectiveness of these routing protocols in a Mobile Ad-Hoc network, we performed extensive simulations in QualNet5.0.2 each simulation is carried out under a constant mobility. The simulation parameters are listed in Table 1.

Table 1: Simulation Parameters

PARAMETER	VALUE
Data Rate	1 Mbps
Buffer Size	150000
Antenna	Steerable
Terrain Range	1500mx1500m
Traffic Type	CBR
No. of nodes	50
Channel Type	Wireless channel
Protocol	AODV,DSR,IARP

3.1 PERFORMANCE METRICS

The following performance metrics are used to compare the performance of the routing protocols in the simulation:

3.1.1 Average Jitter
Average Jitter is the variation (difference) of the inter-arrival times between the two successive packets received.

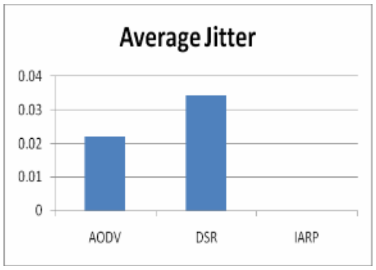
3.1.2 Average End-To-End Delay(s)
End-to-end delay refers to the time taken for a packet to be transmitted across a network from source to destination

3.1.3 Total Packet Received
It is the number of packets received by the server.

3.1.4 Throughput (bit/s)
Throughput is the average rate of successful message delivery over a communication channel The throughput is measured in bits per second (bit/s or bps), and rarely in packets per second or packets per time slot

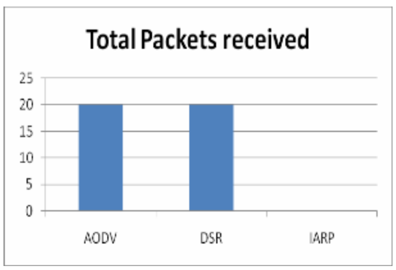
IV. Result:

I have studied the performances of routing protocols AODV, DSR, and DSR at a data rate of 1Mbps & Steerable antenna is used in place of omnidirectional antenna. As per the results the average jitter is high in AODV as compared to other three. The overall comparative study based on the performance parameters (such as average jitter, total packets received, delay & throughput) shows that the overall performance of AODV protocol is better than the other protocols (DSR & IARP) studied here.



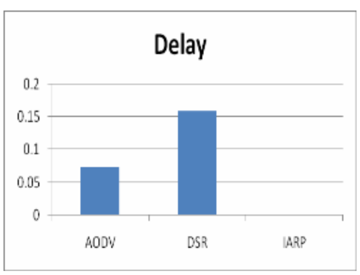
Protocols	Value
AODV	0.0219704
DSR	0.0343434
IARP	0

Total Packet Received



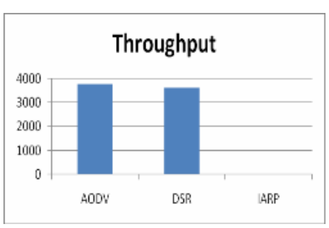
Protocols	Value
AODV	20
DSR	20
IARP	0

Average End-To-End Delay(s)



Protocols	Value
AODV	0.07361861
DSR	0.158806
IARP	0

Throughput (bit/s)



Protocols	Value
AODV	3782
DSR	3621
IARP	0

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