Review paper on performance analysis of routing protocols in MANET.

Sunil Dutt, Dr. Vidushi Sharma, Alok Kumar Sharma

***Abstract*— A mobile ad-hoc network is a self-configure and infrastructure less Network .in MANETS nodes are moving randomly so the topology changes randomly nodes communicate in MANET in a multi-hop fashion. Each node work as a Router, Actually we need MANET in such situation, where deployment of in infrastructure is difficult. In this paper we discuss five Routing Protocol and analyses their performance on the basic of and to and delay. The Routing protocols correspondence i.e. Fisheye state Routing (FSR) location added Routing (LAR), Zone Routing protocol, Ad-hoc on demand distance vector Routing and Dynamic source Routing.**

***Index Terms*—MANET Constant bit rate (CBR), IEEE802.11, FSR, ZRP, IARP, IERP, LAR, AODV.**

I. INTRODUCTION

Mobile ad-hoc Network is a self-organizing and self-configuring network. One on the best thing about this network is its infrastructure less deployment in MANETS, All the nodes are moving or may not be moving but all nodes surely work as a Router also. To forward packet to the other node it work in multi-hop fashion some application of MANETS includes student using laptop and computer to participate in a conference, soldier communicate in a battle field, distance relief operation in a city offer a hurricane or earthquake at the sometime, mobile ad-hoc network exists in industry, airport construction site, Railway stations convention Centre. The key point in MANET is to determine how efficiently a multi-hop wireless network reacts to topology changes and movement of nodes of nodes in the Routing protocol that provides routes for every node in the network. Several Routing Protocol were proposed in the post both of Reactive and proactive nature.

In this paper we compared all major Routing Protocols in MANETS like DSR, FSR, ZRP, AODV AND LAR and DSR in the main Routing Protocol of the reactive family of protocol while AODV uses a unique approach in hop by hop routing sending every packet to its destination. Zone routing protocol is a hybrid routing protocol.

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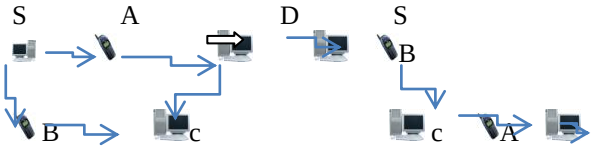

Path is S-A-D due to mobility path changed to S-B-C-A

Fig:-1, the dynamic scenario of network topology.

II. ROUTING PROTOCOL:

Classification: Routing is the process of finding a efficient shortest path from source to destination. Broadcasting is inevitably and a common operation in MANET. It consists of sending message to all the nodes in network except the host node or sender. Broadcast can be used in different message to the whole network. It can also be used for route discovery protocol in MANETs. The routing protocols are classified on the basis of the way of network infrastructure is obtain.

2.1 Proactive or Table driven Routing: It continuously evaluates the routes within the networks. Proactive routing will be use when:-

- A network consist of only few nodes
- Network connected to the internet only through the single ISP.
- Destination sequenced distance vector routing (DSDV)
- Fisheye state routing (FSR)

2.2 Reactive or on demand Routing Protocol: Reactive or On demand Routing Protocol establishes a connection only on demand or in need.

For example: (1) Dynamic source routing (DSR)

(2) Ad hoc On Demand distance vector routing (AODV)

2.2 Hybrid Protocol: Three types of protocols combine the advantage of both Protocols.

For example-(1) Zone Routing Protocol (ZRP)

(2) Temporally Ordered Routing Algorithm (TORA)

These types of routing protocols are discussed in paper but it is difficult to choose best in them because one may be performing well in one type of scenario and other may work well in another type of scenario.

III. FISHEYE STATE ROUTING (FSR):

FSR is based on proactive routing. Klein and Stevens proposed the term "Fisheye" technology to reduce graphic and image data. The characteristic of "Fisheye" is the data across the local length can be clearly caught, while the data

beyond the local length is vague. FSR protocol makes use of this feature of fisheye vision to broadcast routing update into with different frequencies to reduce the routing overhead and decrease the flood cost of updating information. ASR distributes the information using the fisheye technology, and does not broadcast routing update information in the whole network, thus reducing the controlling overhead.

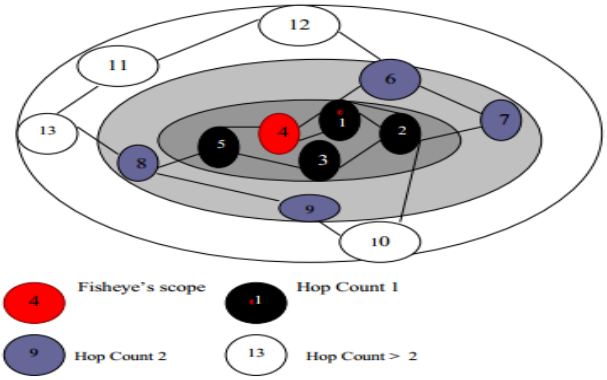

Fig:-2 Scope of Fisheye [1]

The given figure shows the scope of the Fisheye specified by the Centre red node. Number of specified by the Centre red node. Number of the hops required to arrive at a specific node is defined as scope. In FSR, information of node is exchange more than farther node as the update message size is less. The Centre node maintains the information regarding the nodes located in the inner circle. As a result, when the node is far, the correctness of the information node decreases. Advantage of FSR is that, it is appropriate for larger networks thereby controlling overhead. FSR is simple due to maintain updated shortest routes. The disadvantage of FSR is scalability. It has limited scalability the often disadvantages are storage complexity and processing overhead. It does not provide security compared to other protocol.

IV. Location Aided Routing:

It is an improvement to flooding algorithms to reduce overhead due to flooding. The aim of LAR is to send to the route request to the particular area expected to include the destination. So it reduces the overhead. LAR uses two zones:- Request zone and Expected zone. Expected zone is the zone where the destination is located. The request zone shall covering to the entire network on unsuccessful path discoveries. The route request flooding is restricted to request zone during the route discovery procedure containing the location of the sender node and expected zone. Hence there should be a careful balance between reduce overhead and increased latency.

V. 1 LAR Schemes

IV.I.I Expected zone and Request zone

Zone node D is the destination and node S is the source. Node S expects to have node D in the region called as expected zone for the destination. Node S considers the speed with which node D travels to determine the expected zone D [1]. Circular expected zone is decreased to a semicircle. FSR distribute the information using the Fisheye technology and does not broadcast routing update information in the whole network, thus reducing the controlling overhead.

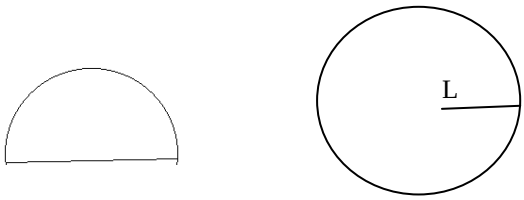

Fig:-3 Expected Zone and semi zone

VI. Zone Routing Protocol:

ZRP is propose to reduce the control overhead of proactive routing protocol and decrease the latency caused by routing discover in reactive routing. Zone Routing Protocol is a kind of hybrid routing protocol which combines the benefit of proactive routing and reactive routing. ZRP divides the network in various zones. This protocol is also known as a flat protocol due to overlapping of zones. As a result network congestion can be reduced and optimal routes can be detected. Peripheral nodes are the node having minimum distance from the node equal to the Zone Radius. IARP requires Neighbor discovery protocol. Hello message ensure that the when IARP is unable to locate the destination the routing Zone and IERP is used between the two routing zones. Route is established within the local zone with the help of proactively cached routing table of the source by IARP. It means, if the source and destination are in the same zone the packet can be delivered immediately. Most of the existing proactive routing algorithm can be used as the IARP for ZRP. In routes are beyond the range of local zone, route discovery happens reactively. Then source node sends route request to border node, containing its own address, the destination address and unique sequence number. Border nodes are nodes which are exactly the maximum no of hops to the defined local zone away from the source. IERP is adapted as reactive component of ZRP. Hence the complexity of ZRP is very high.

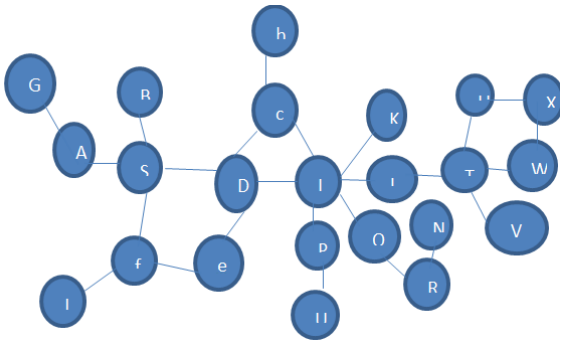

Fig:-4 Zone Routing Protocol [2]

In this example, source nod S, sends packet to destination, i.e. node X, Zone radius r=2, firstly check, whether the node is in local zone or not in zone then route request sends the request to IERP. Request will be broadcast to peripheral nodes represented by grapy in fig.

The advantage of this type of protocol is that there is a significant reduction in communication overhead and delay when compared with proactive routing. FSR performs fast route discovery than this. Actually disadvantage of ZRP is that when zone radius is less, it performs in proactive manner for reduced values it acts in a reactive manner. [2]

VII. DYNAMIC SOURCE ROUTING:

The Dynamic Source Routing composes two main mechanisms to allow the discovery and maintenance of source routes.

- Route Discovery: It is the mechanism of sending packet from source node to destination node, after obtaining a source route to the destination. Route discovery is used when source does not know the route to the destination.
- Route **Maintenance:** It is the mechanism by which sending node detects the packet before reaching it to the destination. A routing entry in DSR contains all the intermediate node of the router rather than just the next hop information maintained in DSDV and AODV. A SOURCE puts the entire routing path in the data packet, and the packet is sent through the intermediate node specified in the path. If the source does not have a routing path to the destination, then it performs a route discovery by flooding the network with a route request (RREQ) packet. If we want to reduce the cost of route discovery, the RREQs are initially broadcasted to neighbours only, and then to the entire network if no reply received. when a node overhears a message containing its address in the unused portion of path in the packet header, it sends the shorter path information to the source of the message. Another important optimization includes the technique to prevent Route Reply storms because many routes replies may be initiated simultaneously and a delay time proportional to the hops distance can be used in order to give higher priority to near nodes. One more method "Packet Salvaging" is used in DSR. If in case, any intermediate node may be broken and there is another route to destination then it uses that route rather than discard it. Some characteristic of DSR are –

1. Provides loop free routes
2. Uses Source Routing
3. Supports Unidirectional links and asymmetric routes

7. Ad-hoc on Demand Distance Vector Routing (AODV): AODV means it finds the routes only when source needs to transmit message to the destination. It employs **destination sequence number** to identify the most recent path. In AODV, source node floods the Route Request packet in the networks when a route is not available for the desired destination. There may be a chance to get more than one route for the destination the major difference between AODV and other on demand routing protocol, it uses **destination sequence number**. A node update its path information only when the **destination sequence number** of the current packet received is greater than the last destination sequence number (DesSeqNum) stored at the node.[3]

A Route Request Carries the Destination Identifier (Dest-ID) Source Identifier (Src Seq Num), the Source Sequence Number, the broadcast identifier (Bcast-ID) and the time to live (TTL) field DestSeqNum shows the freshness of the route that is accepted by the source. The validity of a route at the intermediate node is determined by comparison of the sequence no. at the intermediate node with the destination Seq Num in the RREQ packet.

Characteristic Summary of ZRP, FSR, LAR AODV and DSR:

Protocol	**ZRP**	**FSR**	**LAR**	**AODV**	**DSR**
Category	Hybrid	Table driven	Reactive	Reactive	Reactive
Metric	Shortest path	Scope range	Shortest path	Sequence number	Shortest path
Route Repository	Inter zone, Intra zone table	Routing table	Request zone and expected zone	Routing route discovery	Route maintenance
Multicast Capability	No	No	No	Yes	No
Route Recovery	Start repair at failure point	Notify source	Notify source	Route discovery cycle	Search new route at failure node
Multiple path	Yes	Yes	Yes	Yes	Yes
Hello Message Requirement	Yes	No	No	No	No
Communication Overhead	Medium	Low	Medium	Low	Low

Comparative Study:

Dr. Jitendranath Nungara et.al gave same analytical comparison of ZRP versus AODV and DSR. In his paper, the evaluated performance on Qualnet simulator. Unfortunately ZRP was not up to the task. It performed poorly in all the simulation sequence it gives a low packet delivery ratio when compared with AODV and DSR. AODV performed better than ZRP. On the other hand, DSR performed well and would be the clear winner.

Another Researcher S.C. Sharma et.al worked on performance analysis of FSR and ZRP. They also simulate their result on Qualnet, and compare Throughput, End to End delay, Packet delivery ratio, Jitter and First packet received time. It is found that throughput of FSR is better than ZRP because of its throughput of FSR is better than ZRP because of its Multilevel scope technique. It has been seen that ARP has not performed better than FSR due to Zone method. End to End delay is more in ZRP as compare to FSR. End to End delay of FSR is less because it reduced routing overhead and queuing delay. Performance analysis shows that PDR is better in case of FSR. Similarly, another Researcher K.Santhi et. Worked on Performance Analysis of FSR, LAR and ZRP and simulate their result on Qualnet. According to their research FSR performs better than ZRP and LAR. According to author, FSR gives better throughput in case of high mobility but it other cases it has lower throughput. End to End delay is more in case of ZRP. LAR also has variable delay with respect to node density. PDR is better in case of FSR as compare to LAR and ZRP.

Raphace Frank et.al worked on performance bound for routing in Urban Scenario. According to his research AODV performs better than OLSR. PDR is better in case of AODV as compare to OLSR. End to End delay is low in case of AODV and for most of the tested scenarios, AODV provided the best results.

Analytical Summary of ZRP, FSR, LAR, AODV and DSR:

Protocol	ZRP	FSR	LAR	AODV	DSR
End to end delay	Very high	Low	High	Low	Low
Throughput scale(0-5000)	Low (>2000)	Medium(<3000)	High	Medium	High
Packet delivery	Medium	Medium	High	Fair	Good
Jitter	High	Medium	Low	Less	Very less
First packet received time	Very high	High	Minimum	Medium	minimum

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