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ANALYSIS OF DIFFERENT REACTIVE, PROACTIVE & HYBRID ROUTING PROTOCOLS: A REVIEW

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ABSTRACT

Collection of mobile nodes without any infrastructure is known as mobile adhoc network i.e. MANET. MANET has nodes that move independently toward all direction in network, thereby topology in network changes frequently. MANET network is self-constructing wireless network where the nodes dynamically execute mobility related to the wire line network. There is different type of routing protocols are classified in MANET like reactive, proactive and hybrid protocols. This paper describes the survey of reactive protocol (AODV, DSR), proactive protocol (OLSR, DSDV) and zone routing protocol (ZRP, FSR).

Keywords: MANET, AODV, DSR, DSDV, OLSR, ZRP, FSR

I. INTRODUCTION

Mobile Ad-hoc network consists of wireless nodes in which there is no central access point. There is no centralized administrator [1]. There is no need of fixed router and there is each node act as router and send packet to other nodes. In MANET, topology changed rapidly i.e. nodes are dynamically connected in network. Nodes can join and leave network. There are different types of protocols: Proactive protocols, Reactive protocols and hybrid protocols.

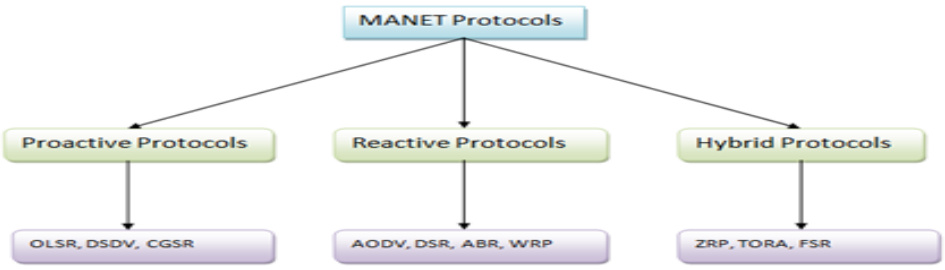

Fig.1 MANET Routing Protocols

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II. PROACTIVE ROUTING PROTOCOLS

In Proactive routing protocols, there is periodic update in topology in network [1]. Every node maintains its own routing table in which the information of neighbor node is stored. Routing tables are updated whenever topology changes. Proactive protocols are OLSR, DSDV and CGSR etc.

2.1 OLSR (Optimized Link State Routing Protocols)

OLSR is table driven routing protocol which is based on link state routing. Each node transfer the information, is used for maintaining routing table. There is concept of MPR which is used in OLSR. MPR stands for multipoint relay i.e. each node select a number of neighboring node to broadcast the information [2]. It has three mechanisms: a) HELLO message b) MPR flooding Control packet c) Shortest Path Selection [3].

Source node consists of the information about the one-hop neighbor. Source node send HELLO message to one-hop neighbors [4]. After that it selects the MPR nodes which cover all its 2-hop neighbors. There are two types of link defined: Symmetric link (Bidirectional) and Asymmetric link (Unidirectional). In Symmetric links, nodes can send and receive the message and in asymmetric link, node can only receive the message, it can't be forward the packet.

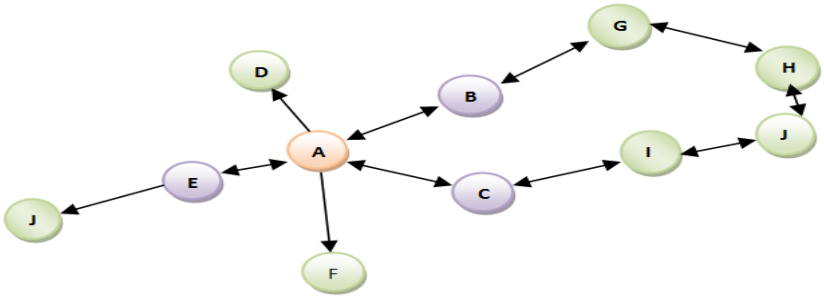

Fig.2 OLSR Protocol

Fig.2 Depicts That A Is Sender Node And H Is Destination Node. Node a Send the HELLO Message to Neighboring Node. After That Node A Select As The MPR Nodes Like E, B and C.

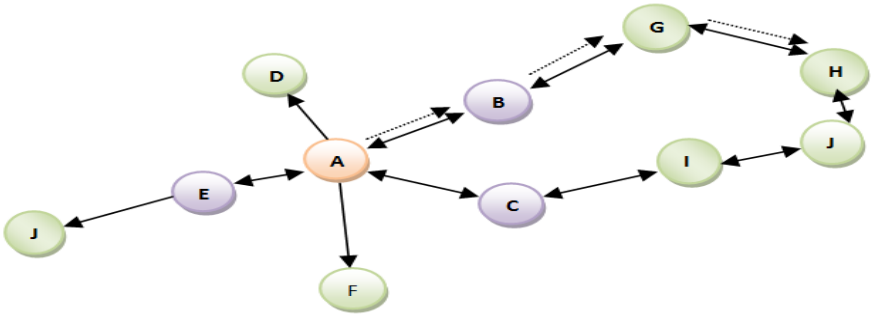

Fig.3 Path Selected In OLSR

Fig.3 Shows that MPR Nodes Broadcast the Message and find the Shortest Route to Transfer Packets.

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2.2 DSDV (Destination-Sequenced Distance Vector)

DSDV is a proactive protocol or also known as a table driven protocol. It is hop-by-hop distance vector routing protocol in which each node have to broadcast routing updates periodically. The basic idea is that each and every node in networks has to maintain a routing table which carries information about all possible destinations in network, Number of hops to reach that destination and a unique sequence number assigned by destination node. Sequence number is used to check stale routes from new ones and thus it avoids formation of loops[5].

Nodes manage their own sequence number by assigning a value two greater than old one and if a link is not present between nodes then an odd number is used. Entries of routes are replaced when new routes of higher sequence numbers are received. Routing updates are transmitted periodically or immediately after detecting change in network topology. Sequence number is used to select appropriate route from different available routes. Nodes always select route with greatest sequence number, thus selecting most recent information. Thus, its main contribution is to solve routing loop problem.

For example: - routing table of node A in this network is

Table 1: DSDV Table Entries

Destination	Next Hop	No. Of Hops	Sequence Number	Install Time
A	A	0	A46	001000
B	B	1	B36	001200
C	B	2	C28	001500

Table contains description of all possible paths reachable by node A, along with next hop, number of hops and a unique sequence number.

III. REACTIVE ROUTING PROTOCOLS

Reactive protocols are demand driven i.e. the route is build only when required. There is route discovery process in which the route creates when node need to transmit the packets. Whenever the transmission completed, the route is deleted [5]. Examples are AODV, DSR and WRP etc.

3.1 AODV (Ad Hoc On-Demand Distance Vector)

AODV is on-demand routing protocol and is based on distance vector. In this, route is established when it requires. It keeps these routes as long as they are desirable by the sources [6]. Source node send RREQ (Route Request) message to their neighbouring nodes. The node send back RREP (Route Reply) to the sender node. If any kind of error occurs during transmission then RERR (Route Error) message send back to the sender node [7]

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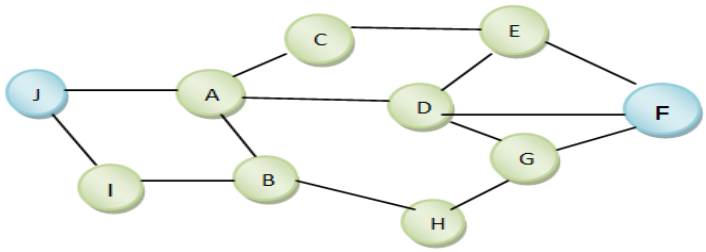

Fig.4 Example of AODV

Fig.4 shows that J is sender node and F is receiver node. Sender node broadcast the RREQ to its neighboring nodes. And then the neighboring nodes rebroadcast the packets to its connected nodes. The nodes send immediate back reply to the node.

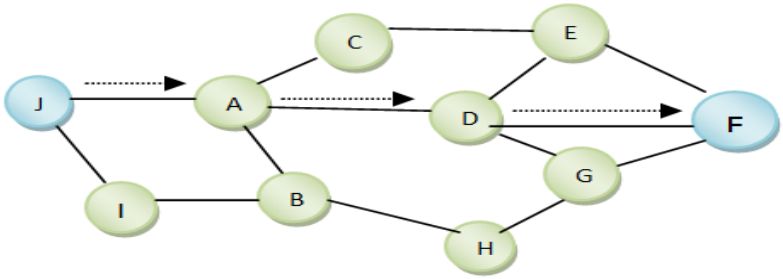

Fig.5: Packet Transmission

Fig.5 shows that after the transmission of message the source node select the shortest path for communication. And then the Node J sends the message to destination node F through selected path.

3.2. DSR (DYNAMIC SOURCE ROUTING)

DSR is on-demand routing protocol, where Route discovery process is initiated only when there is requirement. It is specially designed for multihop adhoc networks of mobile nodes. It is completely self configuring and self organizing and does not need any administration and infrastructure. It uses concept of source routing, That is routing information will be fixed in the header of each packet whenever source wants to send some data packet to destination. It uses no periodic routing messages like AODV protocol, thereby; it reduces network bandwidth overhead, avoids large routing updates and conserves battery power.

DSR consist two mechanisms that is route discovery and route maintenance. They work together to allow nodes to discover routes from source to destination node. Route reply will be generated only if data has reached to intended destination node. [8] To generate route reply destination node must have a route to source node. If route is available in destination node's route cache, route will be used. Otherwise, node will reverse route based on route record available in route reply message header. Whenever route error packet generated at a node route

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maintenance is initiated. Erroneous hop will be removed from node's route cache and all routes containing that hop are truncated at that point. Again, Route discovery process is initiated to determine best route [9].

IV. HYBRID ROUTING PROTOCOLS

Hybrid routing protocols is combination of proactive and reactive routing protocols.Main feature of Hybrid Routing protocol is that the routing is proactive for short distances and reactive for long distances [10]. Examples: ZRP, TORA and FSR etc.

4.1 ZRP (Zone Routing Protocol)

It combines the advantage of proactive and reactive approach by maintaining an up-to-date topology map of zone created on each node. ZRP defines the different zones around each node having its k-neighbourhood [11]. ZRP has three parts, IARP proactive part, IERP reactive part and BRP used with IERP to reduce query traffic.

IARP: IARP is intra zone proactive routing protocol. It is local routing protocol [12].

IERP: IERP is global inter routing protocol. The existing reactive routing protocol implementation is adopts in this protocol.

BRP: BRP stands for border cast resolution protocol. BRP uses query mechanism to transmit RREQ away from the network area that has already covered by query.

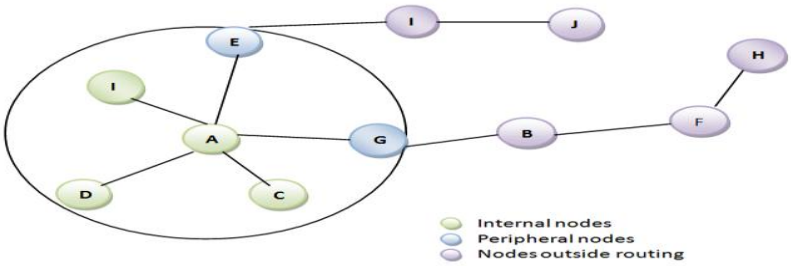

Fig.6 Example of ZRP

Fig.6 shows that node A is sender node and node H is receiver node. Node A sends the message to neighboring nodes using IARP. Node is check whether the destination node is within zone or not. Destination node is not in zone then check in another zone.

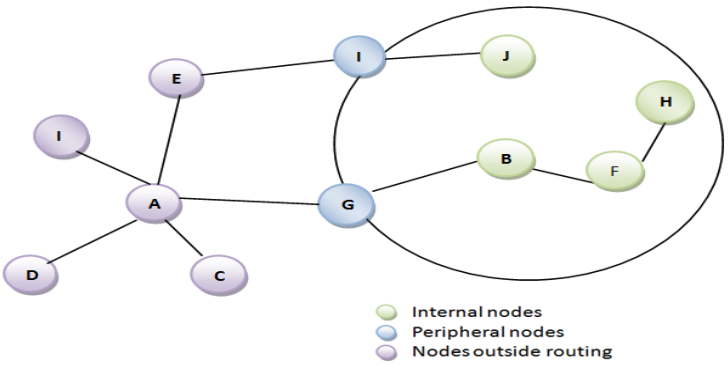

Fig.7 Route Finding

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In this zone, B is center node and Node B sends the message. Destination node is received in region. Node H sends back route reply to source node A.

4.2 FSR (Fisheye State Routing Protocol)

FSR is a link state routing protocol. As its names implies, node maintain a link state table based on up to date information from their neighboring nodes and periodically changes this information with their local neighbors. Through this exchange process, the table entries with large sequence number replace the ones with smaller sequence number [13]. Like ls, full topology map is kept at each node and shortest path are completed using this map. In wireless environment, a radio link between mobile nodes may experience frequent disconnect and reconnect. The ls protocol release link state update for each such changes which flood the network and cause excessive overhead, but FSR avoid this problem by using periodic instead of event driven, exchange of topology map greatly reduce the control message overhead.

Topology table update frequency decreases with distance to destination. It updates for nearly destination are propagated more frequently than updates for remote destination [13]. Every node holds neighbors list, topology table, next hop table, distance table. Relatively to each node the network is divided into different scopes. The link state updates of nodes in scope k are sent every 2 k-1 T to all neighboring nodes. K is hop distance. T is link state update transmission period.

Table 2: Illustrates Comparison between Table Driven, Demand Driven and Hybrid Routing Protocols

	Reactive Protocol (On-Demand)	Proactive (Table Driven)	Hybrid
Routing Protocols	DSDV, OLSR, WRP	AODV, TORA, DSR	ZRP, FSR
Control Overhead	Low	High	Medium
Bandwidth Requirement	Low	High	Medium
Route Acquisition Delay	Higher	Lower	Low for Intra-zone; Higher for Inter-zone
Power Requirement	Low	High	Medium

VI. CONCLUSION & FUTURE WORK

In this Paper, we provide description of various routing schemes in network. In the study of reactive, proactive and hybrid protocols, the main feature of AODV, is less connection delay and loop free. In OLSR, routes are known and maintain before the use of it. There is no discovery delay because OLSR is table driven routing protocol. In ZRP, nodes are work independently to give efficient outcome.

In future, the performance evaluation of reactive, proactive and hybrid routing protocols that are AODV, DSR, DSDV, OLSR, FSR and ZRP under different attacks can be evaluated and provide different security mechanism is developed to prevent routing protocols from the different types of attacks in network.

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