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MANET Routing Protocols: A Comparison

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Abstract- Mobile Ad-hoc Networks (MANETs) have built up another measurement in field of remote systems. It permits any number of hubs to speak with each other without brought together support. This paper provides a detailed classification and comparison of the different routing protocols proposed and designed for mobile ad hoc networks (MANET). The network topology in MANET is highly dynamic i.e. changes accordingly to the environment. Routing protocols used in MANET need to confront numerous difficulties because of progressively evolving topologies, route discovery, device discovery, bandwidth constrained, low transmission power and asymmetric links.
Keywords- MANET, routing protocol, proactive, reactive, hybrid.

I. INTRODUCTION

MANETs is one of the most prominent fields for research in modern era and growth of the wireless network. As the popularity of the mobile ad-hoc network (MANET) will be increasing day by day. Now it becomes one of the most spirited and sporty fields of communication in the wireless network [1]. MANET is self-arrange and decentralized networks or infrastructure less network. There are no conditions on these nodes to unite or leave the network. Nodes are free to move independently and change its links with other devices or nodes frequently. MANET provides a routable process for exchange of packets from one node to another, because of there is wireless networking environment [2]. Mobile Ad-Hoc networks are extremely dynamic networks characterized by the nonappearance of physical infrastructure. The functionality of Mobile Ad-Hoc Network finds the routes and maintains the routes with the help of routers in such networks; nodes are capable of moving and coordinating with their neighbours [3]. MANET each node activate both as host as well as a router to forward packet to intermediate nodes, with the uniqueness of self-configuring and self-club which enable it to form a new network speedily. Speedy and easy establishment of such networks makes them possible to use in military, disaster area recovery and in another environment where no physical infrastructure exists [4]. The key issues related to MANET protocols are routing technique and dynamic network topology which changes when mobile nodes move from one node to other node as well as speed of mobile nodes. The quality of Service (QoS) is also the important MANET performance parameter for controlled traffic flow. Other than that some other challenges related to MANETs are Frequency of updates or Network overhead, Scalability, Mobile agent based routing, Energy efficient/Power-aware routing, Secure routing [5].

Fig.1 A Mobile Ad-Hoc Network (MANET)

The Characteristics of MANET are:

A. Dynamic Network Topology

In MANETs, hubs may move bringing about change of the topology. In this way, depiction of system is legitimate just for a little timeframe. This makes classic protocols utilized for wired systems unacceptable for MANETs.

B. Power Constraint

Versatile hubs are for the most part remote gadgets running on battery control. Along these lines, while planning conventions uncommon power-saving modes and power administration capacities ought to be considered.

C. Bandwidth Constraints:

In MANETs, mobile nodes utilize remote connections which have fundamentally lower capacity than their hardwired partners till date.

C. Security

Wireless networks are more prone to threats than wired networks. The expanded possibility of various security attacks like eavesdropping, denial of Service ought to be taken care of deliberately. The performance of MANET relies on upon the routing protocol, battery consumption by the nodes. There are various Quality of service parameters which influence the execution like a bandwidth delay, jitter, throughput etc. Due to dynamic topology routing is the major challenging these networks because the transfer speed gave to the nodes at one purpose of time gets to be inaccessible if the nodes move from a specific position and go to other position. Moreover, routing affects the performance of these networks. Therefore accordingly productive directing convention should be created to meet every one of these difficulties . Routing protocol in MANET is arranged into three classes on the basis of route discovery reactive also called as the on-demand routing protocol , proactive also known as the table driven protocol and Hybrid protocol. Further classification of routing protocols is done on the premise of network organization as flat based, hierarchical based and location based. In flat based protocol all the nodes are equal i.e. they play the similar role in the network. In hierarchical protocol different hubs play unlike roles i.e. in this different cluster heads are chosen among cluster members. In location-based protocol nodes depend in light of the area data and utilize this data for correspondence.[8]

II. LITERATURE REVIEW

A. January 2015, Prabhu.K, SenthilKumar.C

In this paper a few obscurity updating methods are overviewed for the security of secrecy correspondence in mobile ad hoc networks (MANETs). The present study incorporates different assaults and its comparing conventions utilized for moderating anonymous communication in MANETs [6]. Finally comparative measures of every strategy are introduced which gives the centrality and restrictions of every convention on different attacks in mobile ad hoc networks (MANETs).

B. August 2015, authors Rjab Hajlaoui, Sami Touil and Wissemachour

This paper aims at providing a replacement schema to boost Dynamic source Routing (DSR) Protocol. The aim behind the planned enhancement is to seek out the most effective route in acceptable point in time while not having broadcast storm[7]. Moreover, O-DSR allows network not only to overcome congestion however additionally maximize the time period of mobile nodes. Some simulations results show that the Route Request (RREQ) and the Control Packet Overhead decrease by 15% when O-DSR is employed, consequently. Also the global energy utilization in O-DSR is lower until to 60%, which leads to an extended period of the network.

C. Chaudhary P. et al; [2014]

Performed the evaluation of AODV, DSR(reactive) and DSDV(proactive) routing protocols. These routing protocols depend on Packet Delivery Ratio, standard end to end delay beneath the different mobility model with varying the speed of mobile. These routing protocols are quantifiable efficient. Simulation is done utilizing network simulator-2(NS-2). AODV performs higher when contrasted with DSR and DSDV in mobility model. The packet delivery ratio is 0 high of AODV in random walk and random direction. However the end to end delay was likewise high for AODV protocol. So the general execution of DSR is superior than the AODV and DSDV in random walk and random direction mobility model [10].

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III. CLASSIFICATION OF ROUTING PROTOCOLS

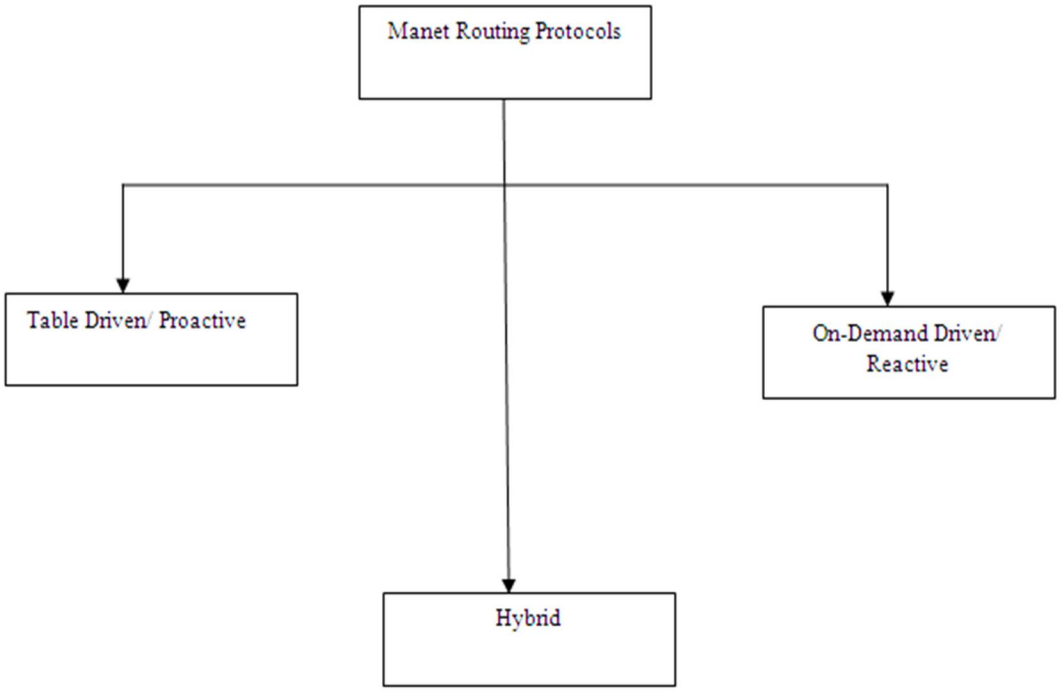

Fig. 2 Routing Protocols in MANET

The routing protocols are basically categorized into three main categories i.e.:

A. Proactive Routing Protocol or Table Driven

Proactive routing protocols are additionally called as table driven routing protocols. In this protocol routing tables are maintained for each known goal [11]. Since the routes are maintained, there is diminishment in the amount of control traffic overhead as the packets are sent utilizing the maintained routes. But the timely redesigning of the routing tables is required which utilizes memory and nodes have to send upgrade message regularly to their neighbours. Regardless of the possibility that there is no traffic, the bandwidth is wasted [12]. Proactive routing is not reasonable for profoundly dynamic networks. Examples are: Destination sequenced distance vector protocol (DSDV), Optimized link state protocol (OLSR), etc

1) *Destination Sequence Distance Vector Routing (DSDV):* The DSDV protocol is a proactive routing protocol [13]. It is augmentation of classical bellman ford routing method. In DSDV each node keeps up a routing table that contains information about all destinations i.e. the aggregate number of hops needed to achieve these nodes, next hop to reach the goal and a sequence number initiated by the goal node. The route with the latest sequence number is considered as a new route. To maintain routes dependability, each node must periodically impart its routing table with its neighbours. The routing table redesigns can be sent in two ways: a “full dump” or an “incremental” overhaul. DSDV convention ensures the circle free routes; it additionally keeps only the optimal path to every node, rather than keeping multiple paths which will support to decrease the complete size of routing table.
2) *Optimized Link State Routing (OLSR) Protocol:* This protocol depends upon link state algorithm and is a point to point routing protocol [14]. In this protocol, each node keeps up the information with respect to the topology and is exchanged occasionally. The main advantage of OLSR is that it decreases the size of control message and in this manner minimizes the number of rebroadcasting nodes by using multipoint answering procedure. At the point when the topology changes, each node selects its neighbouring nodes to retransmit the data. These arrangements of nodes are called as multipoint relays for that node. OLSR utilizes two sorts of control messages i.e. “hello” message and “topology control” message. Hello messages are for the status of link and host’s neighbours. While the topology control messages are for its own particular neighbours and used for broadcasting data.

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Table 1: Comparison of Proactive Protocols

Parameters	DSDV	OLSR
Loop Free	Yes	Yes
Required Routing Table	Two	Three
Critical Nodes	No	No
Routing Philosophy	Flat	Flat

B. Reactive Routing Protocol or On Demand Driven

The reactive routing protocols also known as demand routing protocols are intended to lessen the measure of overheads in the proactive protocols by keeping up the dynamic routes data as it were. Reactive protocols utilizes the procedure of route discovery by flooding the system with the route inquiry demands when there is a requirement for the transmission of packets by utilizing either source routing or distance vector routing [15]. Source routing uses packet headers which mainly contains the routing data. This routing has high network overhead. Distance vector routing uses the destination address to deliver the packets, which make nodes to maintain information about dynamic courses. In this routing protocol, flooding is most reliable strategy for sending the information over the network; however it requires more transmission capacity and creates more routing overhead. However this will bring about delay in transmission as the count for the shortest distance path is there. But this protocol expands scalability [16]. Examples of these protocols are Dynamic Source Routing (DSR), Temporarily Ordered Routing Algorithm (TORA) and Ad hoc On-demand Distance Vector routing (AODV).

1) *Dynamic Source Routing (DSR):* Dynamic Source Routing depends on the source route approach [17]. In this, the convention is based on the link state algorithm in which start to route discovery is done by source and is done on request premise. The route from source to destination is dictated by the sender which incorporates the address of the intermediate nodes. This protocol was proposed for the multi node networks having small diameters i.e. small area. In this flooding is not required since it is a beaconless protocol and no demand messages are exchanged between the nodes in the network. The main advantage of this protocol is that nodes are able to store numerous routing information in their route cache memory. This is exceptionally profitable in low mobility networks.[9]
2) *Ad-hoc On Demand Distance Vector Routing (AODV):* AODV routing protocol works simply on request premise [18]. At the point when a source node needs to speak with another node, it begins route discovery process by broadcasting a route request message to its neighbour including the last known sequence number for that goal node. Each node that advances the route request additionally makes a turnaround course for itself back to the source node. When the route request reaches a node with a route to destination node that node produces a route reply that contains the quantity of hops necessary to reach destination and the sequence number for goal node most recently seen by the node generating the answer. The state created in each node along the way from source to the goal is hop-by-hop state; that is each node remembers only the following node and not the whole route, as would be done in source routing. The primary features of AODV are quick response to link breakage in active route and circle-free routes by utilizing destination sequence numbers.[9]
3) *Temporarily Ordered Routing Algorithm (TORA):* TORA is a reactive protocol with a few improvements in the proactive protocol where a link is built up between the nodes by making a Directed Acyclic Graph (DAG) in the network from source node to the destination node. This protocol utilizes link reversal mechanism while doing the route disclosure. First of all, question for route discovery is broadcasted into the network till it reaches the goal node. Main feature of this protocol is the spread of control message around the connection disappointment point. When there is link failure in the network, there is no compelling reason to re-start process of route discovery since TORA has the capability to fix itself around the failure point. Primary elements of this protocol are: Creating, Maintaining, Erasing and Optimizing course.

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Table 2: Comparison of Reactive Protocols

Parameters	AODV	DSR	TORA
Route Creation	By source	By source	Locally
Routers maintained in	Route table	Route Cache	Route table
Route Reconfiguration Methodology	Erase route, notify source	Erase route, notify source	Link reversal, route repair
Routing Philosophy	Flat	Flat	Flat
Multiple Route possibilities	No	Yes	Yes

C. Hybrid Routing Protocol

Hybrid Routing Protocol acquires the features of proactive protocols and reactive protocols [19]. This is used to give various level i.e. hierarchical routing. Proactive and Reactive conventions are utilized for the system having less number of nodes. Hybrid protocols are utilized to accomplish higher execution as the quantity of hubs in the system is expanded. At the network level this convention uses reactive routing methodology and employs proactive procedure in local neighbourhood level. Examples are Zone Routing Protocol (ZRP).

1) *Zone Routing Protocol (ZRP):* ZRP confines the nodes into sub zones or networks [20]. In every zone, proactive routing is used to build the communication speed among the neighbours. Network is separated into zones as per the separation between the hubs. Each node redesigns the routing information occasionally inside the zone. Local routing optimization is performed at each node which incorporates i.e. expulsion of redundant routes, shortening of routes, identifying of connection failures. The major advantage of this protocol is that it fundamentally diminished the measure of overhead information when contrasted with proactive protocols. It has additionally diminished the delay as compared with reactive protocols.

IV. CONCLUSION AND FUTURE WORK

This paper described the classification of several routing protocols according to the routing strategy. We discussed some important characteristics of the three routing strategies such as Reactive, proactive and Hybrid protocols. Table 3 highlighted few differences between them. In this paper, an effort has been made to concentrate on the comparative study of DSDV, AODV, DSR, TORA, OLSR, ZRP. Moreover, a single routing protocol can't carry out finest in all situations. In this way, the decision of routing protocol ought to be done carefully as indicated by the prerequisites of the particular application. The concentration of the study in our future research work is to propose an expansion of the existing conventional routing protocols which will be better as far as security, throughput, productive usage of constrained resources and nature of administration..

Table 3: Comparison between three categories of Routing Protocols

Parameeters	Proactive	Reactive	Hybrid
Route Availability	Always	Only when needed	Depends on location of
Routing Philosophy	Flat	Flat	Hierarchical
Scalability	100 nodes	>100 nodes	1000 nodes

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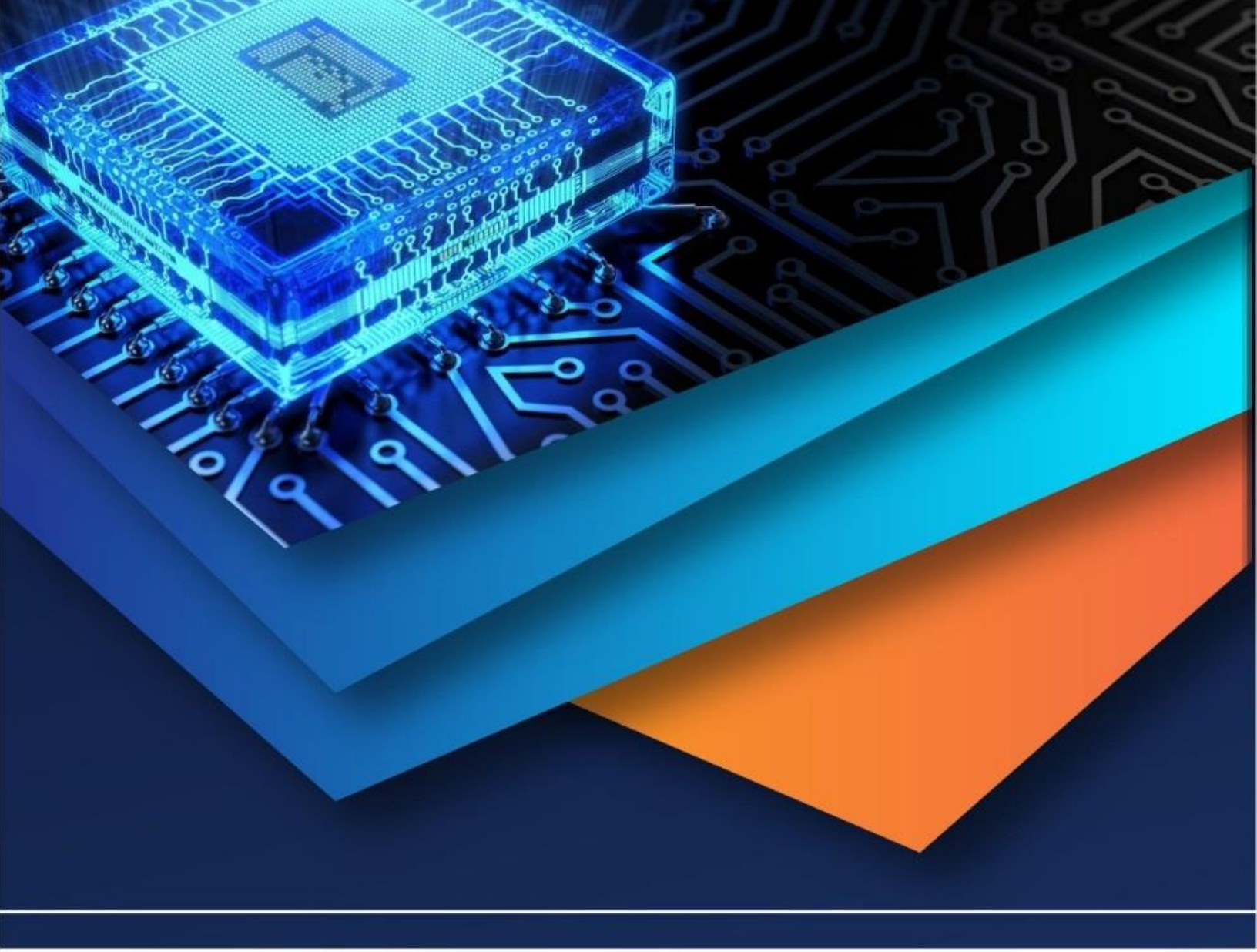

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