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A REVIEW : AODV AND DSDV ROUTING PROTOCOLS IN MANET

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ABSTRACT

In Mobile Ad-hoc Network (MANET), each node can freely move in any direction and every node also act as router as they forward traffic for other nodes. So, various routing protocols such as AODV, DSDV, TORA, WRP and DSRare designed for routing in ad-hoc networks. This paper analyzed the literature of routing protocols which are discussed by comparing the various routing protocols on the basis of different schemes.

Keywords: MANET, AODV and DSD AODV, DSDV, TORA, WRP and DSR etc.

I. INTRODUCTION

MANET consists of dynamically establishing mobile nodes having short-lived networks in the absence of fixed infrastructure. Each mobile node is equipped with wireless transmitter and a receiver with an appropriate antenna. These mobile nodes are connected to other nodes by wireless links and they act as routers for all other mobile nodes
in network. Nodes in mobile ad hoc networks are free to move in the network and they can organize themselves in an arbitrary manner. These features make MANETs very practical and its deployment is easy in places where existing infrastructure is not capable enough to allow communication, for instance, in disaster zones, or infeasible to deploylocations. MANETs are the short term temporary spontaneously wireless networks of mobile nodes communicating with each other without intervention of any fixed infrastructure or central control. It is an autonomous system of mobile nodes, mobile terminals, or mobile stations serving as routers interconnected by wireless links. The nodes move oradjust their transmission and reception parameters as MANET topology may change from time to time.

Figure 1: Mobile ad-hoc network

II. LITRATURE SURVEY

There are various schemes used to compare and find best routing protocol from various routing protocols:

[1] A proximity-based dynamic path shortening scheme, called DPS in which on the basis of local link quality estimation at each own node, find active route paths dynamically to node mobility without exchanging control packets such as Hello packets. In DPS, each node monitors its own local link quality only when receiving packets and estimates whether to enter the „proximity" of the neighbor node to shorten active paths in a distributed manner. Simulation results of DPS in scenarios of various node mobility and traffic flows reveal that adding DPS to DSR and AODV reduces end-to-end packet latency up to 50

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percent and also number of routing packets up to 70 percent, in heavy traffic cases.

An AODV_SQ (Ad-hoc On-demand Distance Vector link Stability Quality of service) protocol which adopts back-up route mechanism and take bandwidth as QOS (quality of service) parameter. Testified by simulation, this protocol gives better improvement in the rate of packet transmission, time delay and route expense relative to AODV [2].

AODV protocol is based on minimum delay path as route selection criteria, find the route before starting send packets, creates the routing table and the topology on on-demand basis, issue the control signal to establish and maintain paths, which could reduce the cost of producing the path, saving a certain amount of network resources, but drawback is to send data packets. The routing of blindness, results in some of the routing node congestion and delays or even data loss and other issues. The simulation results show that the improved AODV protocol in terms of throughput and network delay, especially in higher network load [3].

The four performance measures i.e. end-to-end delay, PDR, throughput and control overhead with different number of nodes, different speed of nodes and different size of network are used for analysis the performance of AODV, DSR, DSDV and OLSR protocols. AODV and DSR protocols are the best in terms of average PDR. AODV and DSR give better packet delivery ratio than other protocols if network size is less than 600x600sqm. If the network size is more than 600x600sqm, the OLSR protocol is the better solution for high mobility condition [5].

III. SOME CHALLENGES FACED BY THE MANET

MANET is very different network environment from the infrastructure based network. MANET has to faced various threat in order to achieve best quality of service for basic network

1. Routing is the primary challenge in MANET due to frequent and unpredictable changes occur in network topology and absence of any centralized control.
2. The primary challenge in building a MANET is set up each device to successively manage the information required to accurately route traffic.
3. Unicast and multicast routing
4. Dynamically change of tropology
5. Speed and network overhead
6. Limited Power supply and bandwidth
7. Secure routing
8. Energy efficient routing

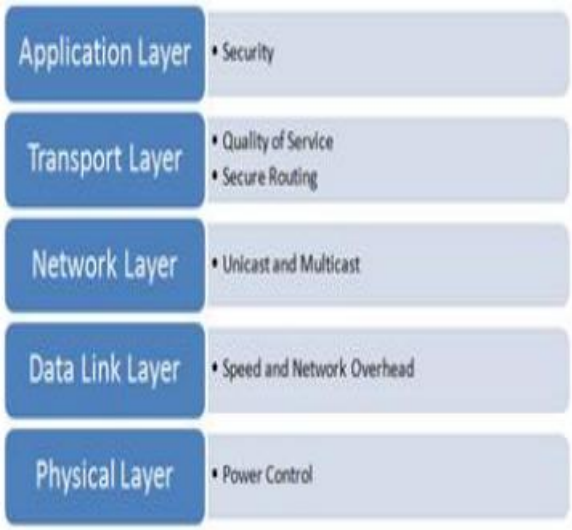

Figure 2: Challenges are faced at the different layer of MANET's

IV. CLASSIFICATION OF ROUTING PROTOCOLS IN AD- HOC NETWORKS

Several routing protocols have been implemented for MANETs in order to improve bandwidth utilization, higher throughput, lesser overheads per packet, minimum consumption of energy. Ad hoc routing protocols possess two properties like qualitative properties(loop freedom ,security) and quantitative properties(throughput, delay).Most of them are

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quantitatively enabled. There are many ways to classify routing protocols in ad hoc networks depending on how the protocols handle the packets to deliver it from source to destination. However routing protocols are divided into three classes which are proactive, reactive and hybrid [2].

Proactive or Table-driven protocols: It always maintains current information of routes from one node to all other node in the network. Routing information is stored in the routing table of node and route updates are propagated in the network to store the recent routing information. But these protocols have some disadvantages such as irrespective amount of data for maintenance, slow reaction on restructuring and failures. The main examples of proactive protocols are destination sequence distance vector (DSDV), optimized link state routing (OLSR), wireless routing protocol (WRP).

Reactive or on-Demand protocol: These are also known as source initiated. Here routes create only when source requests a route to a destination. The route discovery process is used to create the route. Once a route is formed or multiple routes are formed to destination, the route discovery process comes to an end. The main disadvantages of these protocols are high latency time in route finding, excessive flooding. Ad hoc on demand distance vector (AODV), Dynamic source routing (DSR) are on-demand protocols.

Hybrid protocols: This type of protocol combines the advantages of proactive and reactive routing. The routing is initially established with proactively prospected routes and then serves the demand from additionally activated nodes. The main disadvantage of such protocol is that these protocols depend on number of other activated nodes. Zone routing protocol (ZRP) is a hybrid protocol.

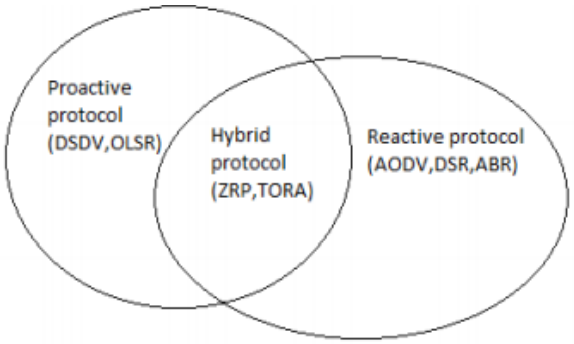

Figure 3: Classification of routing protocols

Distance Sequence distance vector (DSDV): It is one of the earliest ad hoc routing protocols. It depends on the Bellman -Ford algorithm. Every node maintains a routing table which contains the possible destinations in the network with hop counts and sequence number created by destination. This sequence number is used for identification of stale entries and for loop free routes [10]. Routing updates are forwarded through full dump and incremental. A full dump sends entire routing table to the neighbors and requires several network protocol data units. Incremental updates transmit only those entries which have changed since last full dump update. Only incremental updates are sent in stable network. The route labeled with most recent sequence number is used.

Optimized link state routing (OLSR): It is the optimization of pure link state protocol. To reduce the overhead in network, multipoint relays (MPR) are used. MPRs guarantee the shortest path to a destination by declaring as well as rearranging the link information periodically for their MPR's selectors [14]. By doing so, the nodes are able to gain topology information of the network. If there is any new significant change for the routing information, the updates are sent immediately. It reduces the number of nodes which broadcast the routing information in the network. Each node selects a set of one-hop neighbors which are called MPR for the node. The neighbors of the node which are not MPRs process the packets but don't forward them since only MPR forward the packets. MPR set must be chosen such that its range covers all two-hop neighbors. This set must be minimum set to broadcast the least number of packets. The multipoint relay set of node N should be such that every two-hop

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neighbors of N has a bi-directional link with node in MPR set of N. These links can be determined by HELLO packets containing information about all neighbors and link status. The source does not know complete routes, but only next hop information to forward the messages.

Wireless routing protocol (WRP): It is based on Bellman –Ford algorithm. The routing table in WRP contains an entry for each destination with next hop and cost metric. The route is chosen by selecting a neighbor node which minimizes the path cost. To maintain the routing tables, update routing packets must be forwarded to all neighbors of node and contain all routes in which node is aware of. Only recent path changes are included instead of whole routing table[13].To keep the links updated, empty HELLO packets are forwarded at periodic interval, only if no other update messages need forwarding. In figure2, there is a short example which is showing how WRP updates routing tables of nodes, when a link failure occurs. Link costs are as marked in this figure. The arrows which is next to links indicate the direction of update messages and the label in parentheses gives the distances as well as the predecessor to destination J. The figure focuses on update messages to destination J only.

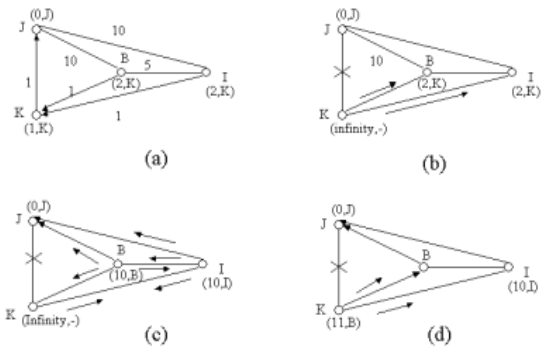

Figure 4.WRP routing protocol's operation

Dynamic source routing (DSR): It is reactive protocol which is source initiated rather than hop-by-hop. This is considered for use in multihop wireless ad hoc networks. It allows the nodes to determine a route having multiple hops to any destination [10]. Each packet in its header carries an entire ordered list of nodes through which the packets must pass.

Ad hoc on demand distance vector routing (AODV): It reduces the number of broadcast messages in network by discovering routes on-demand in reverse keeping complete up-to-date route information. A source node which wants to send data to destination checks its route table to see if it has a valid route to destination node. If route exists, it forward the data .Otherwise route discovery process starts, it broadcasts RREQ messages to all other nodes. This route request message contain sender IP Address, destination IP address, last known Sequence number. An intermediate node reply to RREQ Packet if its destination sequence number is greater than or equal to that sequence number which is in RREQ's header. When these nodes send packet further, these store the address of its neighbor from which it receive the packet. This information is used for route reverse path for route reply packets. If same RREQ packet arrived later, that will be discarded [9].When route reply packet arrives from destination or intermediate node, the node forwards it along the established reverse path and stores the forward route entry in their route table by using symmetric links. RERR packets are send when there is any failure in link, these packets are send to all its neighbor nodes.

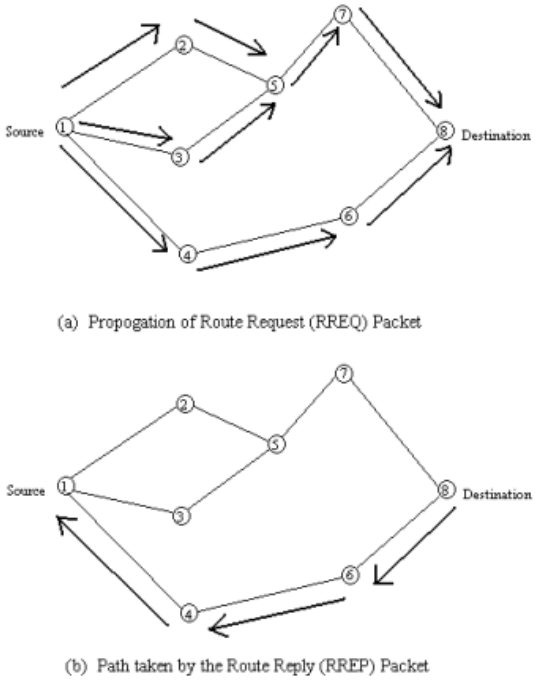

Figure5: Route discovery in AODV

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Temporally ordered routing algorithm (TORA): It is based on the concept of route reversal. It finds multiple routes from source to destination. Three basic functions of this protocol are route creation, route maintenance, route erasure. Nodes use the metric" height" to set a direct acyclic graph rooted to destination during route creation and maintenance. The link may be upstream or downstream, it depends on the height metric of adjacent nodes. TORA's metric contain unique ID, Link failure's logical time, unique ID of node which defined new reference level, a reflection indicator bit.DAG creation depends on query-reply process in LMR(Light weight mobile routing).The main strength of TORA is to handle failure of link. The reaction of TORA is optimistic to link failure. It reverse the link to re position DAG for searching an alternative path. Each link reversal sequence searches for alternative routes to the destination. This mechanism requires a single pass of distributed algorithm since routing tables are modified simultaneously during outward phase of search procedure [10] .The "height" metric is dependent on the logical time of a link failure.

Parameter	AODV	DSDV	DSR	TORA	WRP	ABR	OLSR
Routing Structure	Flat	Flat	Flat	Flat	Flat	Flat	Flat
Multiple route support	No	No	Yes	Yes	No	No	No
Loop Free	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Route Metric	Fresh and shortest path	Shortest path	Shortest path	Shortest path	Shortest path	Associatively and shortest path	Shortest path
Utilize hello messages	Yes	Yes	No	No	Yes	Yes	Yes
Overall complexity	Medium	High	Medium	High	Low	High	Low
Frequency of update transmission	Event Driven	Periodically and as needed	Event Driven	Event Driven	Periodically and as needed	Periodically	Periodically
Routing Scheme	On-Demand	Table-Driven	On-Demand	Hybrid	Table-Driven	On-Demand	Table-Driven
Periodic Updates	No	Yes	No	Yes, needed inside the zone	Yes	No	Yes
Latency	High	Low	High	Inside Zone low, outside zone high	Low	High	Low
Time complexity	O(2d)	O(d)	O(2d)	O(2d)	O(d)	O(2d)	O(d)
Bandwidth Requirement	Low	High	Low	Medium	High	Low	High
Updates transmitted to	Source	Neighbors	Source	Neighbors	Neighbors	Source	Neighbors

Table1: Comparison of routing protocols

Zone routing protocol (ZRP): The nodes have routing zone in ZRP. This defines a range that each node is required to maintain network connectivity proactively. Routes are immediately enabled to those nodes which are within routing zone. The routes are determined on-demand if node lie outside routing zone and it can use any on-demand routing protocol to determine the route to required destination[8].It reduces the communication overheads when compared to pure proactive protocols. It has reduced the delays linked with pure reactive protocols.

V. Benefits and Application of MANET

The various benefits enjoyed by the users of these networks have been:-

Autonomy and Infrastructure less:- There is no centralized entity to control the communication between the devices. The devices act as peers and the routing functionality is inbuilt in them

Multi-hop routing: - There packet sent by a source node to its destination may travel through a number of nodes on its journey towards the destined node.

Dynamic network topology: - The network is dynamic. The nodes can move away from one location to another thereby making the topology dynamically changing.

Heterogeneous devices: - There may be devices having different functionalities communicating with each other. For example, a mobile phone and a laptop.

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Scalability :- The nodes can move away and join some other network at any time. The addition of new nodes into the network is also possible at any time.

Self-creation, self-organization, self-administration:- The network can be created at any time by the nodes themselves and is organized and administered by the nodes only.

- **Various Applications of Mobile Ad Hoc Networks (MANETs)**

Tactical Networks: - Various military combat operations in which military personnel's need secure ad hoc communication and automated battlefields.

Emergency Services:-

- Various Rescue operations in disaster prone areas
- Hospitals for better services in situations of environmental tragedies
- police and fire fighting operations

Education: - Virtual classrooms, online tutorials & lectures, worldwide conferences and meetings

Commercial and Civilian Situations: - Ecommerce, business applications, vehicular services, airports, shopping centers, sports stadiums

Entertainment: - Multi-user gaming, wireless P2P networking, internet access.

Sensor Networks: - Smart homes, data tracking of animal movements, chemical and biological monitoring.

VI. CONCLUSION

In this paper we have identified and reviewed a range of literature on the topic of MANET routing protocols, our initial work discussed a pair of survey papers from which we identified early reactive and proactive MANET routing protocols. Our review focuses upon protocols developed by Perkins, namely the Destination Sequenced Distance Vector (DSDV) and Ad-hoc On-demand Distance Vector (AODV) which researchers claim is the most popular MANET routing protocol. Due to the popularity of the AODV protocol a number of variations and improvements on the core protocol have been proposed by researchers to address specific issues with the protocol.

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