

Comparative Study of AODV, DSR, DSDV, and OLSR Routing Protocols in MANET

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ABSTRACT

MANET is an infrastructure less network based on a multi-hop relaying concept. It is relay from source node to destination node. Because MANETS are working distributed manner and without operating any fixed infrastructure. The routing protocols are employed in MANET for efficient communication. It is used as to finding a new route and selecting a best route from source to correct destination through the intermediate node. Every intermediate node is act as a router. So, this paper is encompasses the routing protocols such as table driven routing protocol and on-demand routing protocol is to maintain up-to-date routing information from each node to every other nodes. On-demand routing protocol is creates route only when these routes are available. The aim of this paper proposes a comparative study of efficient particular routing protocols in MANET.

Key Words-

MANET, AODV, DSR, DSDV, OLSR.

1. INTRODUCTION

The wireless network can be classified into two types: Infrastructured and another one is infrastructure less. In infrastructure wireless networks, the mobile nodes can move while communicating, the base stations are fixed and as the node goes out the range of a base station, it gets into the range of another base station. In Infrastructure less network or Ad Hoc Network, the mobile node can move while communicating, there are no fixed base stations and all the nodes in the network act as routers.

The mobile nodes in the Ad Hoc Network dynamically establish routing among themselves to form their own network 'On the fly'. On wireless computer networks, **Ad-Hoc** mode is a method for wireless devices to directly communicate with each other. Operating in ad-hoc mode allows all wireless devices within range of each other to discover and communicate in peer-to-peer fashion without involving central access points (including those built in to broadband wireless routers).

Ad Hoc networks make sense when needing to build a small, all-wireless LAN quickly and spend the minimum amount of money on equipment. Ad Hoc networks also work well as a temporary fallback mechanism if normally-available infrastructure mode gear (access points or routers) stop functioning.

A Mobile Ad Hoc Network (MANET) is a collection of wireless mobile nodes forming a temporary/ Short-lived network without any infrastructure where all nodes are free to move about arbitrarily and where all the nodes configure themselves. In MANET, each node acts both as a router and as a host & even the topology of the network may also change rapidly.

2. ROUTING PROTOCOLS

A Routing Protocol [1], [2] is needed whenever a packet needs to be transmitted to a destination via number of nodes and numerous routing protocols have been proposed for such kind of Ad Hoc Networks. These Protocols find a route for packet delivery and deliver the packet from source to correct destination.

Mainly the routing protocols can be used for this purpose:

1. find a route
2. select a best route

Routing is the main issues in Ad Hoc Wireless Networks. So, the responsibilities of routing protocols are used for exchanging the information from one host to another host through the intermediate node. Therefore every intermediate node is act as a router based on a hop count, power measurement, and lifetime of the wireless links and gathering the information for path break, link failures. Because, the routing protocols are used for discover a new route, will utilize the minimum power consumption, recover a path failure, and minimum bandwidth utilization.

In the topology based routing protocols can be categorized into three forms:

1. Table Driven Routing protocol (Pro-Active Routing Protocol)
2. On-Demand Routing Protocol (Re-Active Routing Protocol)
3. Hybrid Routing Protocols.

But, this paper encompasses on two types of routing protocols in MANET (see in Fig 1)

1. Table Driven Routing protocol (Pro-Active Routing Protocol)
2. On-Demand Routing Protocol (Re-Active Routing Protocol).

There are two types of Network Routing Algorithm is used (see in Fig 2)

- Link-State algorithm- Each node maintains a view of the network topology
- Distance-Vector algorithm- Every node maintains the distance of each destination

2.1. ON-DEMAND ROUTING PROTOCOLS

On-Demand routing strategies create and maintain routes between a pair of source-destination only when necessary and it does not maintain a permanent routing entry to each destination.

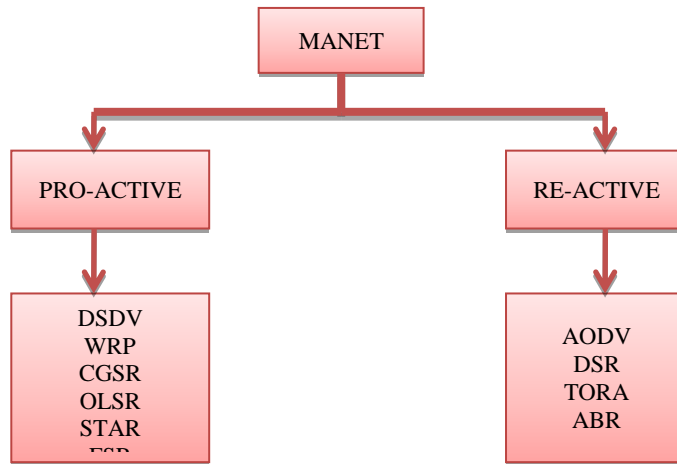


Fig.1. Classification of on-demand and Table-Driven routing protocols in MANET.

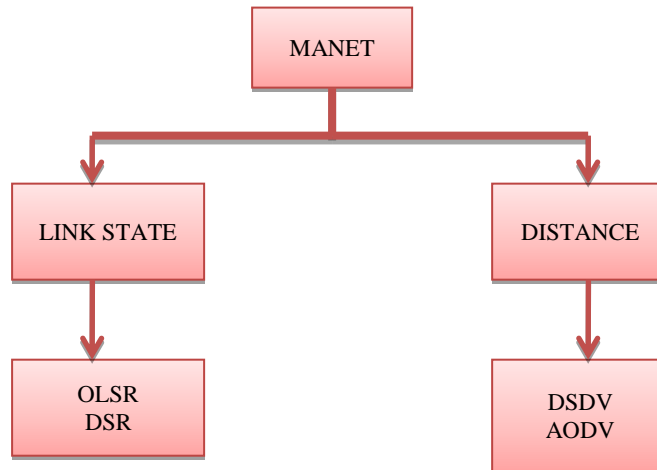


Fig. 2. Link State and Distance Vector Routing Protocol.

2.1.1. AD-HOC ON-DEMAND DISTANCE- VECTOR (AODV)

Ad Hoc On-Demand Distance Vector routing algorithm [3], [5] is an on-demand based protocol. It works at infrastructureless network. Using distance vector, each node stores available routes for known destinations. AODV propagates a route request message to its neighbors to discover new routes.

First the source node propagates the RREQ message to neighbors, and then the neighboring nodes will propagate the RREQ messages to all of its intermediate nodes within the network for discover a new routes. Each RREQ send through the intermediate nodes until it reaches the destination. Also, AODV protocols are used for find the best and shortest path. The AODV Protocols act as in two basic principles:

- Route Discovery
 - Route Maintenance
- **Route Discovery**
 The source node initiates the RREQ message to the correct destination. In first, the RREQ message propagated all neighboring nodes in the network for until it reaches the

correct destination and find the best and shortest path. So, the neighboring nodes contain the source address, Destination address, Broadcast ID, Time To Live, Source initial sequence number and Destination Last sequence number. In this way the new nodes are discovered and one by one connected in the network.

When the RREQ are send from the source the timer will be starts based on a Time-To-Live concepts. Time to live is used the life time of the process (that is RREQ (send from source to destination) to RREP (destination to source)) are reaches the source within the Timeline. Suppose the timeline is end, the source node reinitiates the new route to the destination. Once the routes are created for communication, Each and every time the new routes or existing routes are stored in the table. This table will be used in future. If the node creates a new route, the routing protocol is checked in the table. If it is there, the routes are reused otherwise, thus the protocols are create a new route.

- **Route Maintenance**
 During the route discovery process, the link node break or failure or some bandwidth disruptions, when the time

will start the route maintenance process. If route break or failure, the route error message is sent to the source node through the intermediate node. The path failure also entered in the routing table. Firstly, RERR message is sent to the destination predecessor node and the predecessor node will propagate the RERR message to the source through all of its neighbors, when the RERR message is received by the source node the process will be stop either, the new route process again starts using the table entry or reinitiate the route and propagate the messages to all of its neighbors. Again the route discovery process will start. So, the route maintenance process is gathered the overall routing information about the network.

2.1.2. DYNAMIC SOURCE ROUTING (DSR)

Dynamic Source Routing is an Ad Hoc Wireless Networks [3], [4], [5] it is basically acted as a source initiated routing itself without any network infrastructure. It is designed for multi-hop wireless networks of mobile nodes. So, that is called self configuring or self organizing. It is act as using two basic concepts: 1. Route Discovery, 2. Route maintenance.

➤ **Route Discovery**

In networks, each and every node is connected, the source node initiate the route from one node to another using the cache, that means the route is already there and stored in its. So, easily discover the route by the cache. First when node desires send the packet from source to destination, it first checks the cache for the path available or not.

If the path is available in it, the source sends the packet to the destination using the source address of the packet otherwise the route request are send to all intermediate nodes within the network. If the discovery process taking more time, so long time the network is in idle mode. During the wait mode, the sender can perform another task such as sending/forwarding other packets. As the route requests are reaches to any nodes in the network they check from the neighbor or cache. Then, when the route is discovered the packets are from the source to destination through the correct discovered path. Then, the discovered paths are inserted in cache for future use.

When the data packet is received by any intermediate node, it first checks whether the data packet meant for itself or not. If the intermediate node is the destination, the packet is received otherwise the same message will be forwarded using the path attached on the data packet.

➤ **Route maintenance**

After the route discovery process, the route maintenance process will be started. The route maintenance process are notified all nodes in the network. Like path failure, broken link, packet loss etc. suppose the link failure occur, the routes are change and again initiate new route. So, the route maintenance constantly notifying all that and will change about the paths and nodes information this is also inserted in route cache.

2.2. TABLE DRIVEN ROUTING PROTOCOL

Table-Driven Routing Protocols are maintains and distributing routing tables throughout the network. In proactive protocol, when an application needs to initiate a data call, routing information is immediately available thus eliminating route acquisition delays.

2.2.1. DESTINATION SEQUENCED DISTANCE VECTOR ROUTING PROTOCOL

Destination Sequenced Distance Vector Routing Protocol [4] is a first routing protocol in MANET and it is Pro-Active or Table-Driven Routing Protocol and it is based on the Distance Vector Routing Algorithm. It is also provide

loop freedom. In this method every node maintains up-to-date information about every other node in the network.

It is also provide consistently maintain the routing table for routing information's are transmitted throughout the network. Each and every time the routing table is updated by finding the change in routing information about all possible destinations with number of nodes that particular destination. The DSDV algorithm mainly used the sequence number and the distance. In case, if a route has already existed before traffic arrives, transmission occurs without delay.

The DSDV protocol is used to highly dynamic network environment. Suppose the failure occur in the route, the node immediately updates the sequence number and broadcasts the information updates to its neighbors. When a node receives routing information then it checks in its routing table. If it does not find such entry into the routing table then updates the routing table with routing information it has found, in case, if the node finds that it has already entry into its routing table. Then it compares the sequence number of the received information with the routing table entry and updates the information.

2.2.2. OPTIMIZED LINK STATE ROUTING PROTOCOL (OLSR)

OLSR is a proactive or Table-Driven link-state routing protocol, link state protocols has selects best route. The link state routes are more reliable, accurate and stable in calculating the best route and more complicated than hop count. The OLSR protocols are using MPR selectors for update topological information in each node; the periodic message is broadcast over the network. So, the MPR is used to flooding technique. In this method the updated control message information are flooded throughout the network. So, the route calculations are done by multipoint relays, to form the route calculations from a given node to any destinations in the network.

There are three basic ideas in it have: in OLSR, the link-state information is generated only by nodes elected by MPRs, minimizing the number of control messages flooded in the network, and MPR node may chose to report only links between itself and its MPR selectors. This uses hello and topology control (TC) messages to discover and then disseminate link state information throughout the mobile Ad Hoc network. Individual nodes use this topology information to compute next hop destinations for all nodes in the network using shortest hop forwarding paths. Link state algorithms choose best route by determining various characteristics like packet delay, bandwidth etc. OLSR also provide optimal route (i.e. number of hops) it is mainly used for large and dense network.

3. COMPARISON OF ON-DEMAND AND TABLE DRIVEN ROUTING PROTOCOLS IN MANET

There are four routing protocol is used in this paper. And the protocols are selected based on the flat routing protocol. Flat routing protocol distributes routing information to routers that are connected to each other without any organization or segmentation structure between them. The four protocols are act as loop free routing Like that, quick route access, and reduce the packet loss and improve the efficiency of route reconfiguration and less delay (see in table 1).

Table 1:

PARAMETER	DSDV	OLSR	AODV	DSR
Routing structure	Flat	Flat	Flat	Flat
Route Acquisition Delay	Low	Low	High	High
Control Overhead	High	High	low	Medium
Loop free	Yes	Yes	Yes	Yes
Updates Transmitted to	Neigh- bor	Neigh- -bor	Source	Source

4. CONCLUSION

Routing protocols are act as important role in MANETs. It is an essential concept of communication protocols in Mobile Ad Hoc Networks. The AODV, DSR, DSDV, OLSR protocols based on significant QOS parameters like throughput, bandwidth, control overhead, routing structure, communication overhead etc. And the performance of routing protocols in MANET.

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