

MANET Routing Protocols: A Review

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Abstract

MANET is a kind of wireless ad hoc network in which nodes are mobile. It is a self-designing network of mobile routers connected by wireless links with no access point. Every mobile device in a network is independent. The mobile devices are free to move irregularly and organize themselves illogically. Mobile ad hoc network do not rely on any fixed infrastructure. The Communication in MANET is supported by multi-hop paths. Nodes in the MANET share the wireless medium and the topology of the network changes unreliably and dynamically. In MANET, breaking of communication link is very frequent, like as nodes are free to move to anywhere. The density of nodes and the number of nodes are depends on the applications in which we are using MANET. This paper presents a review on various routing protocols in MANET and selects one of the routing protocols which may be perform better.

Keywords: *Mobile Ad hoc Networks (MANET), Routing Protocols (OLSR, AODV etc.)*

1. Introduction

MANET is a collection of two or more devices or nodes or terminals with wireless communications and networking capability that communicate with each other without the aid of any centralized administrator also the wireless nodes that can dynamically form a network to exchange information without using any existing fixed network infrastructure. And it's an autonomous system in which mobile hosts connected by wireless links are free to be dynamically and sometime act as routers at the same time. All nodes in a wireless ad hoc network act as a router and host as well as the network topology is in dynamically, because the connectivity between the nodes may vary with time due to some of the node departures and new node arrivals. The special features of Mobile Ad Hoc Network (MANET) bring this technology great opportunity together with severe challenges [1].

A mobile ad-hoc sensor network follows a broader sequence of operational, and needs a less complex setup procedure compared to typical sensor networks, which communicate directly with the centralized controller. A mobile ad-hoc sensor or Hybrid Ad Hoc Network includes a number of sensor spreads in a large geographical area. Each sensor is proficient in handling mobile communication and has some level of intelligence to process signals and to transmit data. In order to support routed communications between two mobile nodes, the routing protocol determines the node connectivity and routes packets accordingly. This condition has makes a mobile ad-hoc sensor network highly flexible so that it can be deployed in almost all environments [2].

MANETs offer the freedom to use mobile devices and move independently of the location of base stations (and outside their coverage) with the help of other network devices.[3] The lack of predefined infrastructure makes them suitable for emergence conditions like for example after physical disasters. Also, the widespread of mobile devices that are equipped with Wi-Fi interfaces opens new research areas that study the IEEE 802.11 performance over these networks. The communication between two distant nodes is through the number of intermediate nodes which sends the information from one point to another. In MANETs nodes can move randomly within the network, routing packets between any pair of nodes become an interesting task [4].

2. MANET Routing Protocols

Routing is the process to send information from one host to another host. Routing means route packet to its destination using efficient path. Protocols are set of rules. Ad-Hoc network is known as Mobile Ad-Hoc Network (MANET) because of motion of nodes

in network. They are IBSS (Independent Basic Service Set), because they do not need AP (Access Point) for communication in nodes [5]. MANETs is a self-constructing network and form an unaware topology. Every node acts as routers in network to route the packet. MANETs are used in those areas where wire and wireless infrastructures are unreachable i.e. disaster area, war zone. Due to rapid change of topology in MANETs, MANETs routing protocols are required. The routing protocol is required whenever the source needs to communicates with destination.

MANETs routing protocols are classified as:-

- A. Reactive protocols
- B. Proactive protocols
- C. Hybrid protocols

2.1 Reactive Routing Protocols:

The reactive routing protocols are based on some sort of query-reply dialog. Reactive protocols proceed for establishing route(s) to the destination only when the need arises. They do not need periodic transmission of topological information of the network.

2.2 Proactive Routing Protocols:

Proactive protocols continuously learn the topology of the network by exchanging topological information among the network nodes. Thus, when there is a need for a route to a destination, such route information is available immediately. If the network topology changes too frequently, the cost of maintaining the network might be very high. If the network activity is low, the information about actual topology might even not be used.

2.3 Hybrid Routing Protocols:

Often reactive or proactive feature of a particular routing protocol might not be enough; instead a mixture might yield better solution. Hence, in the recent days, several hybrid protocols are also proposed.

Based on the method of delivery of data packets from the source to destination, classification of MANET routing protocols could be done as follows:

Unicast Routing Protocols:

The routing protocols that consider sending information packets to a single destination from a single source.

Multicast Routing Protocols:

Multicast is the delivery of information to a group of destinations simultaneously, using the most efficient strategy to deliver the messages over each link of the network only once, creating copies only when the links to the destinations split. Multicast routing protocols for MANET use both multicast and unicast for data transmission.

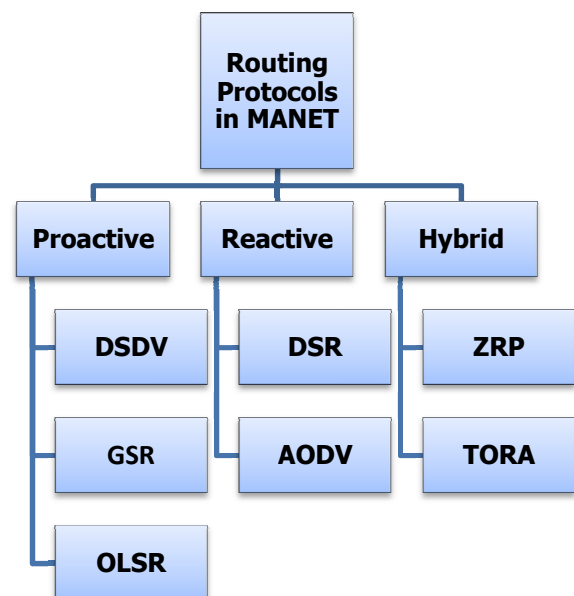


Figure1: Overview of Routing Protocols in MANET

2.4 Proactive Routing

2.4.1 DSDV (Destination-Sequenced Distance-Vector)

Destination-Sequenced Distance-Vector Routing [6,7] is based on traditional Bellman-Ford routing algorithms were developed by the improvement, and a routing table-based protocol. Each node in an operation must be stored a routing table, which records all the possible links with the nodes in the node and the distance like the number of hops, routing table within each record also contains a

sequence number, which is used to determine are there any more old path in order to avoid routing table generation. DSDV is basically on the Internet Distance-Vector Routing the same, but more destination sequence number of the record, makes the Distance-Vector Routing more in line with this dynamic network MANET needs. In addition, when network topology changes are less frequent when the routing table does not need to exchange all the information, DSDV, within each node, together with a table, is used to record the routing table changes from the last part of the exchange so far, if you change a lot of the conduct of all the information The exchange, known as the full dump packets, if the change very little, it is only for the part of the exchange, known as the incremental packet.

2.4.2 GSR (Global State Routing)

Global State Routing (GSR) [8] is almost the same as DSDV, because it has the idea of link state routing but it makes a progress by decreasing the flooding of routing messages. In this algorithm, each node maintains a neighbour list, a topology table, a next hop table and a distance table.

- The neighbour list of a node includes the list of its neighbours (all nodes that can be heard by it).
- The link state information for each destination is maintained in the topology table together with the timestamp of the information.
- The next hop table includes the next hop to which the packets for each destination must be dispatched.
- The distance table contains the shortest distance to each destination node. The routing messages will be created on a link change as in all link state protocols. Whenever it accepts a routing message, the node updates its topology table if the sequence number of the message is later than the sequence number stored in the table and it then reconstructs its routing table and broadcasts the information to its neighbours.

2.4.3 Optimized Link State Routing

Optimized Link State Routing [9] is a proactive protocol that is based on the link state algorithm. OLSR has been modified and optimized to efficiently operate MANET routing. The main concept of the

protocol is to adapt the changes of the network without creating control messages overhead due to the protocol flooding nature. Thus, the designers of OLSR decided to have only a subset of nodes, named Multipoint Relays (MPRs), in the network responsible for broadcasting control messages and generating link state information. A second optimization is that every MPR may choose to broadcast link state information only between itself and the nodes that have selected it as an MPR.

2.5 Reactive Protocol Routing

2.5.1 DSR Dynamic Source Routing (DSR)

Dynamic Source Routing [10,11,12] As the name suggests is the use of the concept of source routing, the routing information that is directly recorded in the inside of each packet, but to be in the MANET environment, the use of such a special, DSR is needed only when the path to find out the path, that is, on-demand. Route Discovery with AODV is similar, but also broadcast from the source client to send a Route Request, the difference is, Route Request after one for each hop, this hop of the ID will be recorded in the Route Request a Route Record, the way, When the Route Request reaches destination, they will have all the nodes in the path of information, destination in many elected a Request where the best path, according to Route Record to send a Route Reply back to source, source will be recorded in the route reply stored inside the route record in the routing table, then all should be sent to the destination of the packet will have the route record on the inside, only the source path need to have this information, source and destination paths between other nodes in the packet as long as the view inside the route record and then forward you can go out without having to re-select the path.

2.5.2 Ad-Hoc on Demand Distance Vector Protocol (AODV):

AODV [13] is reactive protocol, when a source wants to initiate transmission with another node as destination in the network, AODV use control messages to find a route to the destination node in the network. AODV will provide topology information (like route) for the node. Figure:2 shows the message routing for AODV protocol. Node "A" wants to send messages to another node "F". It will generate a Route Request message (RREQ) and forwarded to

the neighbors, and those node forward the control message to their neighbors' nodes. Whenever the route to destination node is located or an intermediate node have route to destination. They generate route reply message (RREP) and send to source node. When the route is established between "A" and "F", node then they communicate with each other.

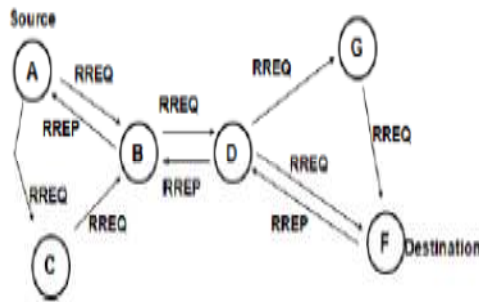


Figure2. Message Routing in AODV Protocol

2.6 Hybrid Routing Protocol

2.6.1 Zone Routing Protocol (ZRP)

Zone Routing Protocol combines the path to the establishment of two kinds of reactive and proactive way on the one hand enables the network to keep the record inside a node near the node routing information when a node wants to communicate with neighboring nodes in the path when you can get immediate information, but if you want to, and distant node links, only allow web of a small number of nodes involved in routing. ZRP defines a node n of neighbors within a hop distance of all the other nodes, as n , routing zone, since each node has its own different adjacent nodes, so ZRP, the entire Internet is in many overlapping routing zone. In the same zone where the routing is called intra-zone routing, mainly using the same zone of nodes exchange distance vector, is a form of distance vector routing, but all the distance vector are limited to the size of the zone. When a source is not looking for a destination within its routing zone, when, source use Border-casting, that is, the route query sent to the source of all the nodes within the routing zone, each node checks the query's destination is within its routing zone if not, continues to make Border-casting, if there is, you can reply, said that it has found the path can be connected to

the destination. Such a process across a number of zones is called inter-zone routing. [14]

2.6.2 Temporary Ordered Routing Algorithm (TORA)

The Temporally Ordered Routing Algorithm (TORA) is a highly adaptive, efficient and scalable distributed routing algorithm based on the concept of link reversal. TORA is proposed for highly dynamic mobile, multi-hop wireless networks. It is a source-initiated on-demand routing protocol. It finds multiple routes from a source node to a destination node. The main feature of TORA is that the control messages are localized to a very small set of nodes near the occurrence of a topological change. To achieve this, the nodes maintain routing information about adjacent nodes. The protocol has three basic functions: Route creation, Route maintenance and Route erasure. TORA can suffer from unbounded worst-case convergence time for very stressful scenarios. TORA has a unique feature of maintaining multiple routes to the destination so that topological changes do not require any reaction at all. The protocol reacts only when all routes to the destination are lost. In the event of network partitions the protocol is able to detect the partition and erase all invalid routes. [15]

When a node detects a network partition, it will generate a CLEAR packet that results in reset of routing over the ad-hoc network. The establishment of the route mechanism based on the Direct Acyclic Group (DAG). Using DAG mechanism, we can ensure that all the routes are loop free. Packets move from the source node having the highest height to the destination node with the lowest height like top-down approach. [15] [16]

3. Conclusion

In this paper we presented a survey about the Mobile Ad Hoc Network (MANET). There are numerous applicable protocols for mobile ad hoc networks simply one confusing problem is the vast number of separate protocols. All of these protocols are designed to perform its task as well as it is possible according to its design criteria. Protocol to be chosen must cover all states of a specified network and never is allowed to consume too much network resources by protocol overhead traffic. This survey paper deals with a classification of mobile ad hoc routing

protocols and also presents some specified protocols according to that classification.

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