



Review on Comparison of Various Routing Protocols in MANET

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Abstract – Mobile ad-hoc networks (MANET) are one of the recent research areas. It means a type of temporary network in which all nodes are moving without any main or centralized administration.[3] As the number of wireless devices is increasing day by day, the complex distributed systems are being generated. The MANET has various routing protocols which help in better data communication using the wireless spectrum. In this paper we will discuss the various routing protocols will define them and their comparison will be done. At last we will end up with the conclusion.

Keywords: Ad hoc networks, wireless communication, MANET, etc.

I. INTRODUCTION

Mobile ad hoc network (MANET) is a wireless network of computers in which nodes help in the transfer of packets without any central administration. They don't have any fixed access point; any node can act as router in it. These nodes are helpful in controlling the bandwidth, computational power, consumption, performance etc.[1] MANET can be used as standalone or it may connect to a larger internet network. It requires a flexible technology. Routing in MANET is different as in traditional wired networks. We will discuss and compare the various routing protocols in this paper.

II. GENERAL CHARACTERISTICS OF MANET

A MANET is a type of ad hoc network that can change locations and configure itself on the network. All nodes in this network are mobile and they use wireless connections to communicate with various networks. Some of the general characteristics of MANET are as follows:

Bandwidth constrained, this means that it has a fluctuating bandwidth.

It uses dynamic topologies means nodes are free to move arbitrary.

It uses energy constrained operation.

It has autonomous behavior means any node can act as router.

Limited physical security means these networks are more prone to physical security than fixed cable nets.[7]

III. CLASSIFICATION OF ROUTING PROTOCOLS IN MANET

The ad hoc routing protocols in MANET are classified as three types as explained further (FIG 1).

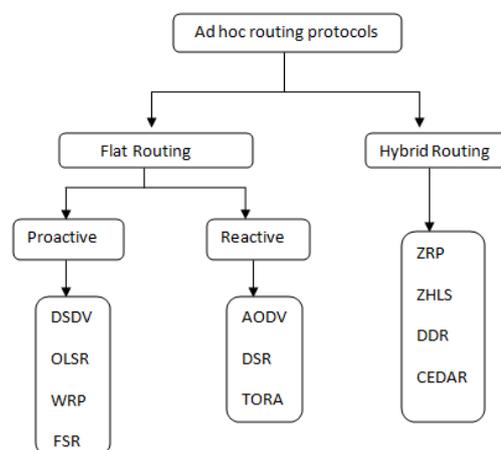


Fig 1. Classification of ad hoc routing protocols.

The ad hoc routing protocols are classified into three categories the first is reactive (on-demand), second is proactive (table driven) and the third is hybrid. The reactive and proactive routing protocols are further part of flat routing which is a network communication protocol implemented by the routers in which all routers are each other's peer's.[9] The hybrid routing protocol is combination of both reactive and proactive routing protocols.

IV. PROACTIVE OR TABLE DRIVEN ROUTING PROTOCOLS

Proactive routing protocols can be defined as type of Unicast routing protocols in which it passes information to every other node so as to find a shortest path from source to destination.[6] It maintains information in tables. These routing protocols are updated periodically whenever the network topology changes. The proactive routing protocols are not suitable for highly dynamic networks as they have to maintain the node entries for every table which increases overheads which as a result degrades the performance.

The examples of proactive routing protocols are destination-Sequenced Distance- Vector (DSDV), Optimized Link State Routing protocol (OLSR), Wireless Routing Protocols (WRP) etc. (Table 1).



Optimized Link state Routing protocol (OLSR): OLSR is a type of protocol which is used on wireless and ad hoc networks. This protocol adapts the stability of link state algorithm. It is an optimization of pure link state routing protocol. It first reduces the size of control packet ten of links and creates multipoint relay sectors. Then it controls the flooding of traffic by using selected nodes and then retransmitting and broadcasting the relevant data packets using shortest path algorithm. But being a proactive routing protocol it uses a large amount of bandwidth and CPU power to compute optimal paths in the network.

Destination-Sequenced Distance- Vector (DSDV): DSDV is a table driven routing protocol which was proposed by C.Perkins and P.Bhagwat in 1994. It is merely based on Bellman-Ford algorithm which helps to solve the routing loop problem. In this in order to update the routing table the messages are broadcasted to the neighbors and then the neighbor compare the link with the one in his table if the value doesn't exist then it will update the table.

Wireless Routing Protocol (WRP): The wireless routing protocol (WRP) is a table driven routing protocol which introduces a mechanism to reduce route loops and to ensure reliable message exchange. It is similar to DSDV. Each node implementing WRP keeps a table of routes and distances and link costs. It also maintains a 'message retransmission list' (MRL).[9] Whenever a update message is received a node updates its distance table and reassesses the best routing path. It also carries out a consistency check on neighbors to help to eliminate loops. It has faster convergence when there is a failure then DSDV but there is complexity in maintaining multiple tables.

Parameters	DSDV	WRP	OLSR
Route updates	Periodic	Periodic	Periodic
Loop free	Yes	Yes	Yes
Routing overhead	High	High	Low
Caching overhead	Medium	High	High
Throughput	Low	Low	Medium
Routing tables	2	4	4

Table 1. Comparison of Proactive protocols.

V. REACTIVE OR ON- DEMAND ROUTING PROTOCOLS:

The reactive routing protocols are called on-demand routing protocols because they seek to set up routes on demand.[6] This means that if a node wants to initiate communication to a node to which it has no route then the routing protocol will try to establish such a route. They are based on some type of query-reply dialog. They doesn't continuously maintain the up-to-date topology of the network, inspire of this they produces another route to the destination. The reactive protocols were generated in order to reduce the wastage of bandwidth. The examples of reactive routing protocol are DSR and AODV etc. (table 2)

Ad Hoc on-Demand Distance Vector Routing (AODV): AODV is a routing protocol which adopts flat routing

protocol, one entry per destination. In this when a node wishes to transmit traffic to a host to which it has no route then it will generate a route request (RREQ) which will be flooded to all nodes and this helps in controlling overheads. In this routes are maintained as long as they are necessary. The connection setup delay is low. Only disadvantage is that it consumes unnecessary bandwidth. It does not provide any type of security.

Dynamic source routing (DSR): DSR is a simple and efficient routing protocol which allows the network to be completely self organizing. This protocol can also function with cellular telephone when used to up 200 nodes. DSR includes two main parts: route discovery and route maintenance. Route reply would be generated if the message has reached the desired destination. Thus it is an on-demand protocol which is designed to restrict the bandwidth and eliminate the periodic table update messages that are required in table driven approach.

Parameters	AODV	DSR
Route Creation	By source	By source
Periodic updation	No	No
Performance Metrics	Speed	Shortness
Routing overhead	High	High
Caching overhead	Low	High
Throughput	High	Low
Multipath	No	Yes
Route updation	Non-periodic	Non-periodic

Table 2. Comparison of Reactive routing protocols.

HYBRID ROUTING PROTOCOLS:

Hybrid routing protocol is a combination of both distance vector and link state routing protocols. In this every node acts as reactively in the region close to its proximity and proactively outside of that region. It works for both reactive and proactive protocols. It has high level of topological information which maintains more routing information. The hybrid protocols work on the basis of zones which means a network is divided into number of zone by each mobile node. Examples of hybrid protocols are ZRP, ZHLS etc. (table 3)

Zone Routing Protocol (ZRP): ZRP known as zone routing protocol is a routing protocol which uses both reactive and proactive routing protocols when sending information over a network. It was designed to speed up and reduce processing overhead by selecting the most efficient type of protocol to use throughout the route. [10] When a node receives its data packet that has to be delivered to some destination then it checks if the particular destination node is in its zone or not. A zone of a node is nothing but the area of logical neighborhood of that node (fig 2).

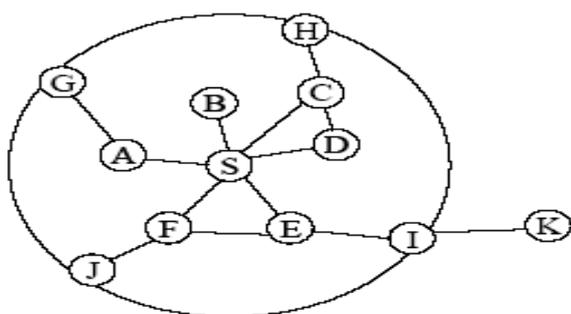


Fig 2. Routing zone of node S with radius= 2.

Zone-based Hierarchical Link State Routing (ZHLS): ZHLS is a protocol in which all network nodes construct two routing tables, an intra-zone routing table and inter-zone routing table, by flooding node LSP's(link state packet) with the zone and zone LSP's throughout the network.[13] In this before transmitting the message the source node checks its own routing table, if the destination lies in that table then the information will be available otherwise it sends location request to all zones which in turn reply the location of the destination. ZHLS has low routing overheads as compared to reactive and proactive routing protocols.

Parameters	ZRP	ZHLS
Routing Structure	Flat	Hierarchical
Multiple routes	No	Yes
Beacons	Yes	No
Route information stored in	Intrazone & Interzone tables	Intrazone & Interzone tables
Route metric	Shortest path	Shortest path
Advantage	Reduced transmissions	Low control overhead
Disadvantage	Overlapping zones	Static zone map required

Table 3. Comparison of Hybrid Routing Protocols.

VI. COMPARISON OF THREE ROUTING PROTOCOLS:

All of the above discussed routing protocols are useful in wireless ad hoc networks but all of them have certain advantages and disadvantages which differentiate them from each other. We have explained it in the form of a table (table 4) by comparing their certain feature or properties.

	Proactive	Reactive	Hybrid
Network organization	Flat / Hierarchical	Flat	Flat Hierarchical
Topology dissemination	Periodical	On-demand	Both
Route Latency	Always available	Available when needed	Both
Communication overhead	High	Low	Medium

Table 4. Comparison of three routing protocols.[9]

Summarizing the protocols as follow (table 5):

Parameters	Table-Driven (Proactive)	On-Demand (Reactive)	Hybrid
Storage Requirements	Higher	Dependent on no. of routes maintained or needed	Depends on size of each zone or cluster
Route Availability	Always available	Computed as per need	Depends on location of destination
Periodic Route Updates	Required always	Not required	Used inside each zone
Delay	Low	High	Low for local destinations and high for Interzone
Scalability	100 nodes	> 100	> 1000
Control Traffic	High	Low	Lower than other two types
Routing Information	Keep stored in table	Doesn't store	Depends on requirement
Routing Philosophy	Mostly flat	Flat	Hierarchical

Table 5. Summary of three routing protocols.

VII. CONCLUSION:

In this paper we have discussed the various routing protocols in wireless and ad hoc networks. They are classified as the proactive (table-driven), the reactive (on-demand) and the Hybrid routing protocols. Every protocol has its own types and features which are helpful in various aspects of networking. It's upon you that based on the working environment we have to choose a routing protocol. But as hybrid routing protocol can be used as it includes properties of both proactive and reactive routing protocols. In this we helped to link it up with secure routing as these techniques help in secure routing. We hope that this paper will be helpful for new researchers to find their area of routing which is best suitable for their work.

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