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Comparative Study of Routing Protocols in MANET

SACHIN LALAR and ARUN KUMAR YADAV

Department of Computer Science and Applications Kurukshetra University, Kurukshetra, India.
*Corresponding author E-mail: sachin509@gmail.com

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ABSTRACT

Routing protocol is the essential and vital performance factor in the Mobile Ad-hoc Network. The routing protocols in MANET are accomplished to handle a lot number of nodes with restricted resources. There is a variety of routing protocol exist in MANET. The routing protocol which is chosen may have an effect on the performance of network. In this paper, We perform a comparative study of DSDV, CSGR, WRP, AODV, OLSR, DSR, TORA, ZRP, ZHLS, DYMO routing protocol with respect to Routing Approaches, Routing structure, Route selection, Route, Routing table, Route maintenance, Operation of protocols, Strength, Weakness.

Keywords: MANET, Routing Protocol, DSDV, CSGR, WRP, AODV, OLSR, DSR, TORA, ZRP, ZHLS, DYMO.

INTRODUCTION

MANET (Mobile Ad hoc Network) is collection ofmobile nodes which having the Autonomous Self -configuring network. In MANET, the nodes can flow freely and at any time it can connect to different nodes. Mobile nodes having the bandwidth restricted, dynamic topologies, Energy limited operation, variable infrastructure & capacity links. Routing protocol performs an essential function in any network[1]. Routing protocol specifies the routes between the nodes and disseminating information which choose the routes between any two nodes on a network.

The rest of the paper is organized as follows. The classifications of routing protocol in MANET are explained in section II. Further the comparisons of routing protocols DSDV, DSR, AODV & OLSR are explained in Section III. Concluding remarks are given in section IV.

Classification of Routing Protocol

There are different routing protocols existing in MANET. Routing protocols can be classified into three types:Proactive, Reactive routing protocol and Hybrid protocols. The routing protocols in MANET are accomplished to handle a lot number of nodes with restricted

resources. The major concern in routing protocol is disappearing/ appearing of the nodes in various places. It is important to reduce routing message overhead despite the growing number of mobile nodes. Another important concern is to maintain the size of routing table small because if the size of routing protocol is larger than it can affect the control packet transferred inside the network.

Routing protocol is categorized on the idea of how and at what time route are discovered, however both pick the shortest path to the destination.

Proactive Routing Protocols

This type of routing protocols uses link-state routing algorithms which floods link information about its neighbours frequently. Proactive routing protocol stores the routing information and maintains the information up to date by exchanging the control packet from their neighbours. The examples of proactive routing protocols are DSDV, OLSR, and WRP etc[8].

Reactive Routing Protocols

Reactive routing protocols reduce overheads that are present in proactive protocols. It uses distance-vector routing algorithm and establishes the route to given destination only when a node request it by initiating route discovery process. There are number of reactive routing protocols available in MANET[4] like DSR, AODV, TORA and LMR etc.

Hybrid Routing Protocols

It is the mixture of reactive and proactive routing protocols. The example of Hybrid routing protocols are ZRP, BGP, EIGRP. Table 1 show the difference between the Proactive, Reactive routing protocol and Hybrid protocols in different features.

The figure 1 shows the example of the type of routing protocol.

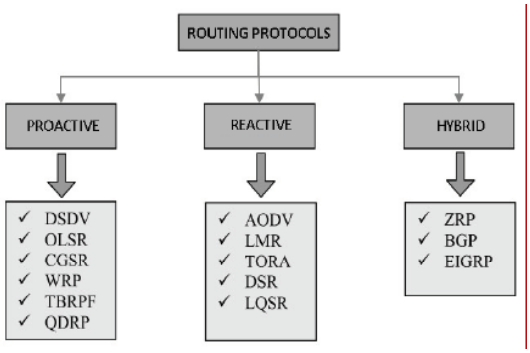

Figure 1. Types of Routing Protocols[2]

Table 1: Comparison between protocols[2]

Features	Reactive	Proactive	Hybrid
Routing Structure	Mostly Flat	Both Flat & Hierarchical	Hierarchical
Route Acquisition	On demand	Table driven	Combination of both
Routing Overhead	Low	High	Medium
Latency	High due to flooding	Low due to routing tables	Inside zone Low outside similar to reactive protocols
Scalability	Not suitable for large networks	Low	Designed for large networks
Routing information	Available when required	Always available	Combination of both
Periodic Updates	Not needed	Yes whenever the topology of the network changes	Yes
Mobility	Route Maintenance	Periodic updates	Combination of both
Storage Requirement	Low	High	Medium
Bandwidth Requirement	Low	High	Medium
Power Requirement	Low	High	Medium

Table 2: Comparsion between routing protocol

S.No	Parameters	DSDV	CSGR	WRP	AODV	OLSR	DSR	TORA	ZRP	ZHLS	DYMO
1	Protocol type	Destination sequence distance vector	Cluster switch gateway routing	Wireless routing protocol	Adhoc on demand distance vector routing	Optimized Link State Routing Protocol	Dynamic source routing	Temporally Ordered Routing Algorithm	Zone Routing Protocol	Zone-based Hierarchical Link State	Dynamic MANET On-demand
2	Routing approaches	Proactive	Proactive	Proactive	Reactive	Proactive	Reactive	Reactive	Hybrid	Hybrid	Reactive
3	Routing structure	Flat structure	Hierarchical Structure	Flat structure	Flat structure	Flat structure	Flat structure	Flat structure	Flat structure	Hierarchical	Flat
4	Route selection	Link state	Shortest path	Shortest path	Shortest and updated path	Link State	Shortest and updated path	Link Reversal	Link Reversal	zone-based hierarchical link state	unicast multipath routes
5	Route	Single route	Single and multiple route	Single route	Multiple Route	Multiple Route	Multiple Route	Single route	Multiple Route	Multipath	Multipath
6	Routing table	Each node maintain a complete address to each destination	Two table 1.Routing table 2.Cluster member table	Four tables	Each node maintain a route table in which next hop routing information for destination node is stored	Each node maintain a complete address to each destination	Route cache Full route to destination	Use the Direction of the next destination Construct the Direct Acyclic Graph	Route Table	Depended on the performance of proactive and reactive routing protocols chosen	Route. Address, Route.Prefix, Route.SeqNum, Route.NextHop-Address, Route.NextHop-Interface, Route.Forwarding, Route.Broken
7	Route maintenance	Each node in the mobile network maintains a routing table	Each node maintains a routing table which is used to determine the next hop to reach the destination.	Routing node maintains the distance and second to last hop information for each destination	Every node maintains two counters Sequence no and broadcast ID.	Control messages sent in advance	Two different processes: 1.Hop by hop acknowledgement 2.End to end acknowledgement	Link reversal and Route Repair	Link Reversal and information stored in link table	Proactive routing for intrazone communication and reactive routing for interzone	It perform route discovery again for that destination when receive RERR message
8	Operation of protocols	Routing information is always available, whether the source node require a route or not because each	Mobile nodes are grouped into cluster and each cluster has cluster head and cluster head to gateway routing	In WRP, routing nodes communicate the distance and second to last hop information	1.RREQ broadcast 2.RREP Propagation 3.RERR message	OLSR supports three mechanisms: neighbor sensing, efficient flooding of	1.RREQ broadcast 2.RREP Propagation 3.RERR message	Route Creation, Route Maintenance and Route Erasure	1.RREQ broadcast 2.RREP Propagation 3.RERR message	two routing tables, an intrazone routing table and an interzone routing table	1.RREQ broadcast 2.RREP Propagation 3.RERR message

		node in the mobile network maintains a routing table.	approach to move traffic from source to destination.	for each destination in wireless network and it belong to path finding algorithm.		control traffic and sufficient topology informaion.					
9	Advantages	1.Loop free 2. Shortest path to every destination is chosen.	1.Cluster head can control a group of adhoc hosts. 2. Cluster provide a framework for code separations, channel access, routing, bandwidth allocation.	1. Avoid the count to infinity problems by forcing each node to perform consistency checks. 2. Routing information is accurate, mobile send updates messages periodically to their neighbors.	1.Adaptable to high dynamic topology. 2. loop free 3 AODV has higher bandwidth efficiency because of lesser overheads	1. Minimize the overhead 2. Improve the transmission quality	1.Support Multipath routing	1. Able to rapidly build routes 2. Decrease the communication's overhead, Multiple routes	1.With properly configured zone radius, outperform both proactive routing protocols and reactive routing protocols.	1. Generates less overhead than the schemes based on flooding 2. Reduces the traffic and avoids a single point of failure	1.It is loop-free protocol 2.Handles a wide variety of mobility patterns, handles a wide variety of traffic patterns 3. Supports routers with multiple interfaces
10	Limitation	1.High overhead 2.It does not support multipath routing	1. If a cluster head is changing frequently and nodes will be spending a lot of time converging to a cluster head.	1. More overheads are required due to „hell" messages.	1.Scalability problems due to large delay 2.AODV takes more time to build the routing table.	1.Require more processing power and bandwidth	1 Scalability problems due to source routing and flooding. 2. Being a reactive protocol DSR suffers from high route discovery latency.	1. In large networks the overhead, consume a large bandwidth, Temporary routing loops and Overall complexity	1. Path to a destination may be suboptimal. 2. Memory requirement is greater	1. Additional traffic produced by the creation and maintaining of the zone level topology, needed a system location assistance such as GPS	1. Increases the size of the routing packets

Comparsion of Routing Protocol

In this section, we will make the comparison of explain the ten routing protocol DSDV, CSGR, WRP, AODV, OLSR, DSR, TORA, ZRP, ZHLS, DYMO. The comparison is done with respect to Protocol type, Routing Approaches, Routing structure, Route selection, Route, Routing table, Route maintenance, Operation of protocols, Advantages, Limitation as shown in Table 2[5,6,7,8,9,10,11,12,13,14].

CONCLUSION

This paper presents a comparative study of routing protocols in mobile ad-hoc networks. These protocols are divided into three: proactive or table-driven, reactive or on-demand, and Hybrid routing protocols. For each of these classes, we have reviewed several representative protocols. Each routing protocol has unique features. The main factor that distinguishes the protocols is the method of determining routes within source destination pairs. The routing protocol DSDV, CSGR, WRP, AODV, OLSR, DSR, TORA, ZRP, ZHLS, DYMO is compared with respect to Protocol type, Routing Approaches, Routing structure, Route selection, Route, Routing table, Route maintenance, Operation of protocols, Advantages, Limitation.

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