



A Review of Various Routing Protocols in MANETs

Yogita Khasa

*Computer Science and Engineering
CBS Group of Institutions
Jhajjar, Haryana*

Pooja

*Assistant Professor
Department of Computer Science and Engineering
CBS Group of Institutions, Jhajjar, Haryana*

Abstract - Mobile Ad hoc Networks (MANETs) are composed of autonomous mobile nodes with communication capability that is often deployed in an unattended environment, thus leaving them vulnerable. Research concerning in MANETs routing is gaining much attraction because of its never ending improvement. There is no centralized hierarchy in MANETs, so nodes itself behave as routers. In this paper we provide an overview of a wide range of the existing routing protocols with a particular focus on their characteristics and functionality. Also, the comparison is provided based on the routing methodologies and information used to make routing decisions. The performance of all the routing protocols is also discussed. Further this study will help the researchers to get an overview of the existing protocols and suggest which protocols may perform better with respect to varying network scenarios

Keywords - Mobile ad hoc networks, Routing Protocols comparison.

I. INTRODUCTION

Mobile Ad Hoc Network (MANET) is a collection of communication devices or nodes that wish to communicate without any fixed infrastructure and pre-determined organization of available links. The nodes in MANET themselves are responsible for dynamically discovering other nodes to communicate. It is a self-configuring network of mobile nodes connected by wireless links the union of which forms an arbitrary topology[1]. The nodes are free to move randomly and organize themselves arbitrarily; thus, the network's wireless topology may change rapidly and unpredictably. The network is decentralized. MANETs are usually set up in situations of emergency for temporary operations or simply if there are no resources to set up elaborate networks. These types of networks operate in the absence of any fixed infrastructure, which makes them easy to deploy, at the same time however, due to the absence of any fixed infrastructure, it becomes difficult to make use of the existing routing techniques for network services, and this poses a number of challenges in ensuring the security of the communication, something that is not easily done as many of the demands of network security conflict with the demands of mobile networks, mainly due to the nature of the mobile devices (e.g. low power consumption, low processing load. MANETs have range of applications from military networks to emergency preparedness telecommunications. The paper is described as follows: Part II presents the routing in MANETs. Part III presents the classification of various routing protocols. Part IV, V and VI presents the

detailed analysis of all the three categories of ad hoc routing protocols and part VII presents the overall comparison of the different routing protocols based on the review presented. Finally part VIII concludes the paper.

II. ROUTING IN MANETS

Routing is the act of moving information from a source to a destination in an internetwork. The routing concept basically involves, two activities: Firstly, determining optimal routing paths and secondly, transferring the information groups (called packets) through an internetwork[2]. Routing protocols use several metrics to calculate the best path for routing the packets to its destination. These metrics are a standard measurement that could be number of hops, which is used by the routing algorithm to determine the optimal path for the packet to its destination. The process of path determination is that, routing algorithms initialize and maintain routing tables, which contain the total route information for the packet. This route information varies from one routing algorithm to another. In MANETs there is no base station and fixed infrastructure. In MANETs the protocols nodes to cooperate to provide routing services-

- A node communicates directly with nodes in wireless range.
- For all other destinations, a dynamically determined multi-hop route through other nodes.
- Rely on each other to forward packets to their destinations.

Routing in MANETs has been an active area of research and in recent years numerous protocols have been introduced for addressing the problems of routing, reviewed in later sections. These protocols are divided into two classes-Reactive and Proactive.

III. CLASSIFICATION OF ROUTING PROTOCOLS

We will discuss the classification of existing wireless ad hoc routing protocols, their characteristic features & types. The Routing Protocols for ad hoc wireless networks can be divided into three categories based on the routing information. These protocols are of three type i.e Proactive, Reactive and Hybrid routing protocols[3]. The proactive protocols are table driven and reactive protocols are on-demand driven. Figure 1 shows the three categories of Ad hoc routing protocols and various proposed Protocols under each category.

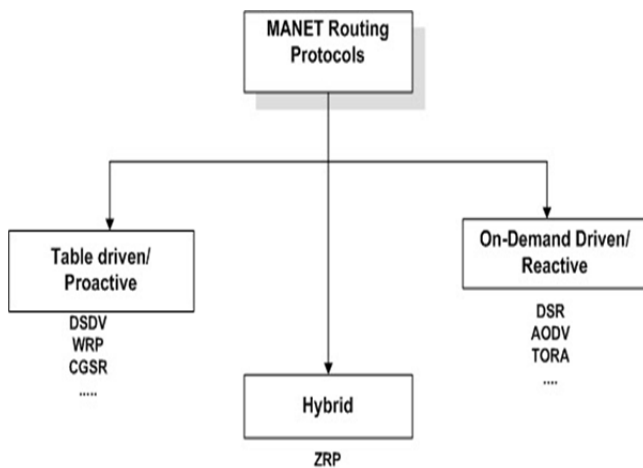


Figure-1

IV. PROACTIVE PROTOCOLS

The table driven or proactive protocols are more similar to conventional routing and these protocols update table information with a period. It relies on an underlying routing table update mechanism that involves the constant propagation of routing information. These protocols always maintain up-to-date information of routes from each node to every other node in the network. In this every node maintain routing table which contains information about the network topology even without requiring it[4]. This feature although useful for datagram traffic, incurs substantial signaling traffic and power consumption. The different types of the proactive routing protocols are-

Dynamic Destination-Sequenced Distance-Vector Routing Protocol (DSDV)

DSDV is developed on the basis of bellman-ford algorithm. In this routing protocol, each mobile node in the network keeps a routing table. Each of the routing table contains the list of all available destinations and the number of hops to each. Each table entry is tagged with a sequence number, which is originated by the destination node. Periodic transmissions of updates of the routing tables help maintaining the topology information of the network. If there is any new significant change for the routing information, the updates are transmitted immediately. So, the routing information updates might either be periodic or event driven.

Optimized Link State Routing (OLSR)

It is a proactive protocol where the routes are available as needed. OLSR can optimize the reactivity for periodic control message transmission by reducing the maximum time interval. It is more suited for the applications that do not have long delays in transmission of packets. Dense network is ideal environment where communication is between a large numbers of nodes. One of the disadvantage is increase of overhead if increase of control message[5]. There are two ways to done Optimizations: By reducing the volume of the control packets and the Second way by tumbling the number of associations used for promoting the link state packets.

Wireless Routing Protocol (WRP)

WRP belongs to the general class of path-finding algorithms which is defined as the set of distributed shortest path algorithms that calculate the paths using information regarding the length and second-to-last hop of the shortest path to each destination. WRP reduces the number of cases in which a temporary routing loop can occur.

V. REACTIVE PROTOCOLS

The reactive or on-demand-driven protocols only obtain route information when needed. In the On-Demand approach, when a node desires a route to a new destination, it will have to wait until such a route can be discovered i.e. routes are discovered whenever a source node have packets to send[6]. The different types of the Reactive routing protocols are - DSR, AOD, TORA etc.

Dynamic Source Routing (DSR)

Dynamic Source Routing (DSR) is a reactive protocol based on the source route approach. In DSR, the protocol is based on the link state algorithm in which source initiates route discovery on demand basis. The sender determines the route from source to destination and it includes the address of intermediate nodes to the route record in the packet. DSR was designed for multi hop networks for small Diameters.

Ad Hoc On-Demand Distance Vector Routing (AODV)

The Ad hoc On-Demand Distance Vector routing protocol uses mobile nodes to identify fast route. Its algorithm enables autonomous, dynamic, multi hop routing between nodes it routing can be divided into both unicast and multicast routing. Further, its protocols are divided into two functions: Route discovery and Route maintenance[7]. It minimizes the number of broadcasts by creating routes based on demand, which is not the case for DSDV.

Temporarily Ordered Routing Algorithm (TORA)

Temporarily ordered routing algorithm (TORA) is highly adaptive, loop-free, distributed routing algorithm based on the concept of link reversal. It uses directed acyclic graphs (DAG) to define the routes either as upstream or downstream. This graph enables TORA to provide better route aid for networks with dense, large population of nodes[8]. This protocol uses a 'link reversal' model in route discovery. A route discovery query is broadcasted and propagated throughout the network until it reaches the destination or a node that has information about how to reach the destination.

VI. HYBRID PROTOCOLS

The hybrid protocols are both proactive and reactive in nature. It is used to find a balance between both protocols[12]. As a result hybrid routing protocols are mainly used in large networks to find route discovery easily and maintain fast mechanism between nodes in wireless ad hoc network. The different types of the hybrid routing protocols are – ZRP, DDR etc.

Zone Routing Protocol (ZRP)

ZRP protocol combines the advantage of both reactive and proactive routing protocol into a hybrid scheme, taking advantage of pro-active discovery within a node's local neighborhood, and using a reactive protocol for communication between these neighborhoods, and using a reactive protocol for communication between these neighborhoods[9]. In a MANET, it can safely be assumed that the most communication takes place between nodes close to each other.

VII. COMPARISON OF PROTOCOLS

In this section we have presented a comparison between existing routing protocols. TABLE 1 below provides an overall comparison of the three categories of routing protocols. The comparisons basically consider the characteristic properties of routing protocols in high load networks[10] [11]. The comparison is done with respect to routing structure, availability of route, traffic control volume, periodic updates, control overhead, route acquisition delay, storage requirements, bandwidth requirement, power requirement, scalability problem, handling effects of mobility and quality of service support.

Parameters	Reactive Protocol	Proactive Protocol	Hybrid Protocol
Routing Philosophy	Flat	Flat/Hierarchical	Hierarchical
Routing Scheme	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 Level	Not suitable for large networks	Low	Designed for large networks
Availability of routing information	Available when required	Always available stored in tables	Combination of both
Periodic Updates	Not needed as Route available On demand	Yes. Whenever the topology of the network changes	Yes needed inside the zone
Storage Capacity	Low generally Depends upon the number of routes	High due to the routing tables	Depends on the side of the zone
Mobility Reports	Route maintenance	Periodical updates	Combination of both
Topology Dissemination	Periodical	On demand	Both

VIII. CONCLUSION

This article described the classification of several routing schemes according to the routing strategy. We discussed some important characteristics of the three routing strategies such as Reactive, proactive and Hybrid protocols Table 1 highlighted few differences between them In this paper, an effort has been made to concentrate on the comparative study of DSDV, AODV, DSR, TORA, OLSR, WRP, DSDV. Moreover, a single routing protocol cannot perform best in all situations. So, the choice of routing protocol should be done carefully according to the requirements of the specific application The focus of the study in our future research work is to propose an extension of the existing conventional routing protocols which will be better in terms of security, throughput, efficient utilization of limited resources and quality of service. Each routing protocol has unique features. Based on network environments, we have to choose the suitable routing protocol. The overall conclusion of is that, the performance demand and the network size plays a key role in selecting the protocol to be implemented. It is quite natural that one particular solution cannot be applied for all sorts of situations and, even if applied, might not be optimal in all cases.

REFERENCES

- [1] N. S. Yadav and R.P. Yadav "Performance Comparison and Analysis of Table- Driven and On- Demand Routing Protocols for Mobile Adhoc Networks," "International Journal of Information Technology", vol.4, no. 2, pp 101-109, 2007
- [2] A. Boukerche, B. Turgut, N. Aydin, M. Z. Ahmad, L. Bölöni, and D.Turgut, "Routing protocols in ad hoc networks: A survey," "Elsevier Computer Networks", 55 (2011) 3032-3080
- [3] A. K. Gupta and H. Sadawarti, "Secure Routing Techniques for MANETs," "International Journal of Computer Theory and Engineering", vol. 1 no. 4, pp. 456-460, October 2009
- [4] Harmanpreetkaur and Jaswinder Singh "Performance comparison of OLSR, GRP and TORA using OPNET" in International Journal of Advanced Research in Computer Science and Software Engineering Vol 2 Issue 10 October 2012
- [5] N. Adam, M.Y. Ismail et al., "Effect of Node density on Performances of Three MANET Routing Protocols." In International Conference on Electronic Devices, Systems and Applications (ICEDSA2010), p.p. 321-325, October 2010.
- [6] R. Al-Ani, "Simulation and performance analysis evaluation for variant MANET routing protocols", International Journal of Advancements in Computing Technology, Volume 3, Number 1, February 2011 .
- [7] Mr. L Raja, Capt. Dr. S SanthoshBaboo "Comparative study of reactive routing protocol AODV, DSR, ABR and TORA" in International Journal Of Engineering And Computer Science Vol 2 Issue 3 March 2013 Page No. 707-718
- [8] Bhat, M.S., Shwetha, D. and Devaraju, J. (2011) A Performance Study of Proactive, Reactive and Hybrid Routing Protocols using Qualnet Simulator. International Journal of Computer Applications, 28, 10-17.
- [9] Reddy, P.N., Vishnuvardhan, C. and Ramesh, V. (2013) An Overview on Reactive Protocols for Mobile Ad-Hoc Networks. International Journal of Computer Science and Mobile Computing, 2, 368-375.
- [10] Krishna Gorantala , "Routing Protocols in Mobile Ad-hoc Networks", A Master' thesis in computer science, pp-1-36, 2006.
- [11] Abdellah Jameli, Najib Naja and Driss El Ouadgiri "Comparative Analysis of Ad Hoc Networks Routing Protocols For Multimedia Streaming", IEEE, 1999.
- [12] Shakkeera "Optimal path selection technique for Flooding in Link State Routing Protocol Using Forwarding Mechanisms in MANET".