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Performance Comparison of Reactive Based Routing Protocols in MANET's

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Abstract: A Mobile Ad-Hoc Networks does not possess any fixed infrastructure. Due to mobility of nodes, and frequent link breakage carry out, no central administrator is required. Hence, in MANETs routing is challenging job and it generating multiple types of routing protocols. In this paper, the author describe on reactive routing techniques that have the major challenges in ad hoc networks. Therefore, to determine the actual suitability of the proactive routing protocol for MANET is very difficult for different network conditions. At this point, the author suggests about comparison of various reactive routing protocol regarding the efficiency of the network.

Keywords: MANETs, Routing Protocols, Reactive.

1. INTRODUCTION

Ad hoc wireless networking is a new approach to wireless communication with potential applications in very unpredictable and dynamic environments. In contrast to cellular and wired networks, an ad hoc wireless network does not depend on any established infrastructure or centralised administration such as a base station. It is a set of autonomous system of mobile nodes that move freely and randomly. Therefore, its network topology is dynamic in nature and may change speedily and unpredictably. Hence, the intercommunications among nodes will change continuously. Such networks have no infrastructure for achieving end-to-end routing of packets. The nodes communicate with each other without the intervention of a centralized administration; thus each acts both as a router and as a host. Mobile ad hoc networks support multi hop routing where the deployment of central base station is neither economic nor easy. Efficient routing of the packets is a major challenge in the ad hoc networks. There exist several proactive (like CGSR [1] etc.) and reactive (Like DSR [2] etc.) as shown in figure 1routing algorithms for the dynamic networks. The proactive or the table driven routing algorithms maintain consistent information about the path from each node to every other destination by periodically updating their routing tables.

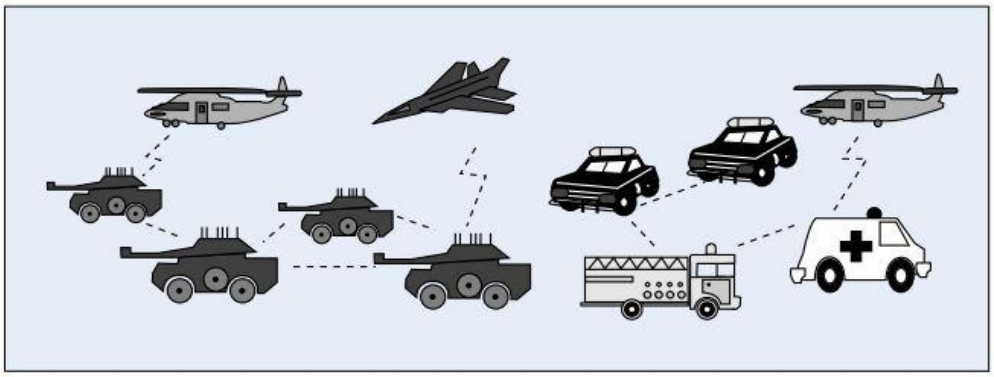

Figure1: Mobile Ad-hoc Networks

1.1 CHARACTERISTICS OF MANET [3, 4]

Table 1: Characteristics of Mobile Ad-hoc Networks

Wireless	The nodes are connected by wireless links and the communication among nodes is wirelessly.
Ad hoc based	A MANET is a need based network formed by the union of nodes and the connecting links in an arbitrary fashion. The network is temporary and dynamic.
Autonomous and infrastructure less	Network is self-organizing and is independent of any fixed infrastructure or centralized control. The operation mode of each node is distributed peer-to-peer capable of acting as an independent router as well as generating independent data.
Multi hop Routing	There is no dedicated router and every node acts as a router to pass packets to other nodes.
Dynamic Topologies	Due to arbitrary movement of nodes at varying speed, the topology of network may change unpredictably and randomly.
Energy Constraint	Energy conservation becomes the major design issue as nodes in the MANET rely on batteries or some other exhaustible source of energy.
Security Threats	There are higher chances of physical security threats like eavesdropping, spoofing and denial of service (DoS) in wireless networks as compared to wired networks.

2. APPLICATIONS OF MANETs

Because of their flexibility, MANETS are seen as important components in 4G architecture and ad hoc networking capabilities are believed to form a significant part of overall functionalities of next generation. The application of MANET (shown in Table 2) has become wide and varied from email to ftp to web services. Some common MANET applications are:

Table 2: Applications of Mobile ad-hoc Networks

Military Environments	Since it is not possible to install base station in the enemy territories or inhospitable terrain MANET provides communication services where soldiers act like nodes. The required coordination among the soldiers and in military objects can be seen as another application of MANET in military services.
Civilian Environments	MANET finds its use in many civilian activities like meeting room, boats, taxi cab network, small aircraft, sport stadium etc.
Emergency Operations	Because of its easy deployment, the use of MANET in situations like crowd control, search and rescue, disaster recovery and commando operations, the use of mobile ad hoc networks is very much suitable. MANET can also be established when conventional infrastructure based communication is damaged due to any calamities.
Local Level	Ad hoc networks can autonomously link an instant and temporary multimedia network using notebook computers or palmtop computers to spread and share information among participants at e.g. conference a classroom. Another appropriate local level application might be in home networks where devices can communicate directly to exchange information.

3. REACTIVE ROUTING PROTOCOLS IN MANET

Reactive routing [4, 5] techniques, also called on-demand routing, take a very different approach to routing than proactive protocols. A large percentage of the overhead from proactive protocols stems from the need for every node to maintain a route to every other node at all times. In a wired network, where connectivity patterns change relatively infrequently and resources are abundant, maintaining full connectivity graphs is a worthwhile expense. The benefit is that when a route is needed, it is immediately available.

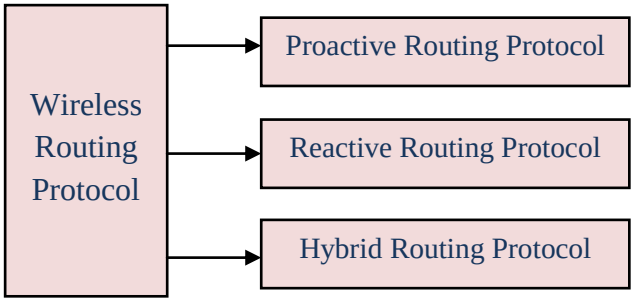

Figure1: Types of Wireless Routing Protocol

In an ad hoc network, however, link connectivity can change frequently and control overhead is costly. Because of these reasons, reactive routing approaches take a departure from traditional Internet routing approaches by not continuously maintaining a route between all pairs of network nodes. Instead, routes are only discovered when they are actually needed. When a source node needs to send data packets to some destination, it checks its route table to determine whether it has a route. If no route exists, it performs a route discovery procedure to find a path to the destination. Hence, route discovery becomes on-demand. If two nodes never need to talk to each other, then they do not need to utilize their resources maintaining a path between each other. The route discovery typically consists of the network- wide flooding of a request message. To reduce overhead, the search area may be reduced by a number of optimizations. Different Types of Proactive [6] Routing Protocol (shown in figure 3) are: Dynamic Source Routing (DSR) [2] protocol, Ad hoc On-demand Distance Vector (AODV) [7] protocol, Temporally Ordered Routing Algorithm (TORA) [8].

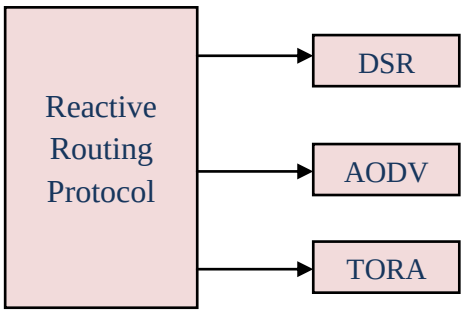

Figure 3: Classification of Reactive Routing Protocols in MANET

DSR is based on the concept of source routing. In source routing each packet carries the complete ordered list of nodes in which the packet should pass through the network. This is done by maintaining a cache with route from source to destination. It includes two phases: Route discovery and Route maintenance. Route discovery is based on flooding the network with a RREQ packet. A RREQ message includes the senders address, the target address, a unique number to identify the request and a route record listing the addresses of each intermediate node through which the RREQ is forwarded. On receiving RREQ packet, the destination replies to the originator with a RREP packet.

AODV is an improvement on the DSDV protocol. AODV minimizes the number of route broadcasts by creating routes on an on-demand basis, as opposed to maintaining a complete list of routes as in the DSDV algorithm. Like DSR, route discovery is initiated on an on-demand basis, the route request is then forward to the neighbours, and so on, until either the destination or an intermediate node with a fresh route to the destination are located.

TORA is another source-initiated on-demand routing protocol, built on the concept of link reversal of Directed Acyclic Graph (ACG). In addition to being loop-free and bandwidth-efficient, TORA has the property of being highly adaptive and quick in route repair during link failure, while providing multiple routes for any desired source/destination pair. These features make it especially suitable for large highly dynamic mobile ad hoc environments with dense populations of nodes. The limitation in TORA's applicability comes from its reliance on synchronized clocks. If a node does not have a GPS positioning system or some other external time source, or if the time source fails, the algorithm cannot be used.

4 COMPARATIVE STUDIES

After a deep study about Mobile Ad-hoc Network [9], the author observed that there is many differences among the reactive routing protocols and explain these differences in the following table (Table 3).

Table 3: Comparisons of various Reactive Routing Protocols

Parameters	DSR	AODV	TORA
Routing Type	Source Routing	Distance Vector	Link Traversal
Loop Freedom	Yes	Yes	No
Multiple Routes	Multiple routes not there	There are multiple routes	Multiple routes are not there
Destination update Procedure	Source	Source	Neighbour
Route Stored	In Route cache	In routing table	In routing table

CONCLUSION

The author concludes here that there are various routing protocols in MANETs with different network behaviour. Reactive protocols have less overhead as their dynamic routing technology. It set up route when it needed and it needs high latency and more memory for storage. All the three reactive routing protocol i.e. DSR, AODV, and TORA have their own importance in different scenarios.

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