

Performance Comparison of Proactive 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 proactive 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 proactive routing protocol regarding the efficiency of the network.

Keywords: MANETs, Routing Protocols, Proactive.

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 DSDV [1] etc.) and reactive (Like AODV [2] etc.) routing 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.

1.1 Main characteristics of MANET are [3, 4] :-

- **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.
- **Limited Bandwidth:** Infrastructure less networks have lower capacity as well as less throughput than the infrastructure based network.
- **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 PROACTIVE ROUTING PROTOCOLS IN MANET

The highly dynamic natures of the mobile nodes create frequent and unpredictable network topology changes. This topology change increases the routing complexity among the mobile nodes within the network. There for traditional routing algorithms are not sufficient to the successful routing in MANET. Routing in a MANET [5] depends on many other factors including topology, selection of routers, and location of request initiator and specific underlying characteristics that could serve as a heuristic in finding the path quickly and efficiently. This makes the routing area perhaps the most active research area within the MANET domain. Especially over the last few years, numerous routing protocols and algorithms have been proposed and their performance under various network environments and traffic conditions closely studied and compared.

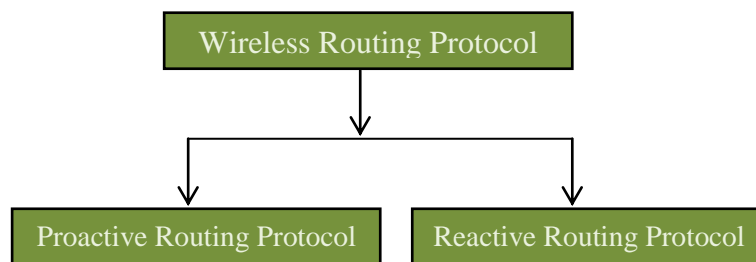


Figure1: Types of Wireless Routing Protocol

Proactive routing protocols [3, 6] attempt to maintain consistent, up-to-date routing information between every pair of nodes in the network by propagating, proactively, route updates at fixed time intervals. These protocols are sometimes referred to as table-driven protocols since the routing information is maintained in tables. The proactive routing approaches designed for ad hoc networks are derived from the traditional routing protocols. The primary characteristic of proactive approaches is that each node in the network maintains a route to every other node in the network at all times. Route creation and maintenance is accomplished through some combination of periodic and event-triggered routing updates. Periodic updates consist of routing information exchanges between nodes at set time intervals. The updates occur at specific intervals, regardless of the mobility and traffic characteristics of the network. Event-triggered updates, on the other hand, are transmitted whenever some event, such as a link addition or removal, occurs. The mobility rate directly impacts the frequency of event-triggered updates because link changes are more likely to occur as mobility increases. Proactive approaches have the advantage that routes are available the moment they are needed. Because each node consistently maintains an up-to-date route to every other node in the network, a source can simply check its routing table when it has data packets to send to some

destination and begin packet transmission. However, the primary disadvantage of these protocols is that the control overhead can be significant in large networks or in networks with rapidly moving nodes. Further, the amount of routing state maintained at each node scales as $O(n)$, where n is the number of nodes in the network. Proactive protocols tend to perform well in networks where there is a significant number of data sessions within the network. In these networks, the overhead of maintaining each of the paths is justified because many of these paths are utilized. Different Types of Proactive Routing Protocol are: Destination-Sequenced Distance-Vector (DSDV) protocol, Wireless Routing Protocol (WRP) [7] , Optimized Cluster Head Gateway Routing (CGSR) [8] .

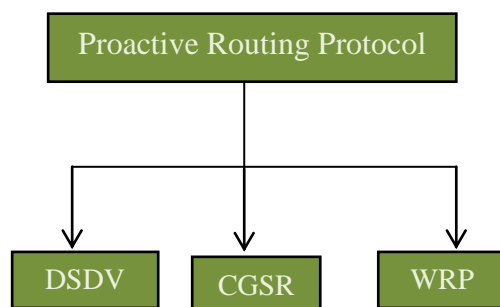


Figure 2: Classification of Proactive Routing Protocol in MANET

In DSDV every node in the network maintains a routing table in which all the possible destinations within the network as well as the number of hops to reach each destination are recorded. Each route entry is marked with a sequence number. Nodes periodically transmit routing table updates throughout the network in order to maintain table consistency. Route updates contains the address of some node, the number of hops to reach the destination, the destination sequence number as well as a sequence number that uniquely identifies the update.

WRP is another loop-free proactive protocol whereby four tables are used to maintain distance, link cost, routes, and message retransmission information. General route updates are sent among neighbouring nodes with distance and second-to-last hop information for each destination, resulting in faster convergence. In FSR protocol is also an optimization over Link State algorithm using the fisheye technique. In essence, FSR will propagate link state information to other nodes in the network based on how far away the nodes are. The protocol will propagate link state information more frequently with nodes that are in a closer scope as opposed to ones that are further away. This means that a route will be less accurate the further away the node is, but once the message gets closer to the destination, the accuracy increases.

In CGSR is a routing protocol that has a hierarchical-based design. CGSR organized nodes into cluster entrusted to a special node named cluster-head. This cluster-head is elected dynamically by employing a least cluster change (LLC) algorithm [9]. According to this algorithm, a node ceases to be a cluster-head only if it comes under the range of another cluster-head where the tie is broken either using the lowest id or highest connectivity algorithm. Clustering provides a mechanism to allocate bandwidth, which is a limited resource, among different clusters, thereby improving reuse. All member nodes of a cluster can be reached by a cluster-head to provide improved coordination among nodes that fall under its cluster. A token based scheduling [10] is used within a cluster for sharing the bandwidth among the member of the cluster. CGSR assume that all communication passes through the cluster-head. Communication between two clusters takes place through the common member nodes that are member of both the clusters. These nodes which are members of more than one cluster are called gateways.

3 COMPARATIVE STUDY

After a deep study about Mobile Adhoc Network, the author observed that there is many differences among the proactive routing protocols and explain these differences in the following table (Table 1).

Parameters	DSDV	CGSR	WRP
Routing philosophy	Flat	Hierarchical	Flat
Storage Space	Low	Low	High as each node stores 4tables
Critical Node	No, all the node have same capability	Yes, the cluster head is critical node	No, all nodes have same capability
Hello Message	Yes, hello message is used	No, hello message is not used	Yes, hello message is used
Update frequency	Periodic and where is a change	Periodic	Periodic
Update transmitted to	Neighbour	Neighbour and to cluster head	Neighbour

Table 1: Comparisons of various Proactive Routing Protocols

CONCLUSION

The author concludes here that there are various routing protocols in MANETs with different network behaviour. Proactive routing protocols have more routing overhead due to static routing technology and they require less memory for storage and low latency. All the three proactive routing protocol i.e. DSDV, CGSR, and WRP have their own importance in different scenarios.

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