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BRIEF OVERVIEW OF ROUTING IN AD HOC NETWORKS

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Abstract: *Mobile ad-hoc networks (MANET) are characterized as networks without any physical connections. In these Networks there is no fixed topology due to the mobility of nodes, interference, multipath propagation and path loss. Hence a dynamic routing protocol is needed for these networks to function properly. Many Routing protocols have been developed fro accomplishing this task .MANET routing protocols can be categorized as Proactive or Table driven Routing Protocols Reactive or On Demand routing protocols and Hybrid routing Protocols. This Paper presents the three types of routing protocols in MANET and makes a comparative discussion of the features of each type of that routing protocol.*

***Keywords**: MANET, Ad hoc Networking, Routing, Routing Protocol.*

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1. INTRODUCTION

Mobile Ad hoc Network (MANET) is the new emerging technology which enables users to detect the presence of other devices devices and perform necessary set up to facilitate communication and sharing of data and service .Ad hoc networking allows the devices to maintain connection to the networking as well as easily adding and removing devices to and from the network. Due to the mobility nature of MANET, the network topology may change rapidly and unpredictably over time. Message routing is problem in a decentralize environment where the topology fluctuates, While the shortest path from a source to a destination based on a given cost function in a static network is usually the optimal route ,this concept is difficult to extend in MANET. The routing concept basically involves, two activities :firstly determining optimal routing paths and secondly ,transferring the information groups(called packets) through an Internetwork. Routing protocols for wired networks typically do not need to handle mobility of nodes within the system. On the contrary, mobility and resource constraints are basic features in MANET. Mobile Ad hoc networks also do not have trusted entities such as routers ,since every node in the network is is expected to participate in the routing function .Therefore, routing protocols need to be specifically designed for MANET .Routing is the most fundamental research issue in MANET and must deal with limitation such as high power consumption, low bandwidth, high error rates and unpredictable movements of nodes.Generally,current routing protocols for MANET can be categorized as: Proactive or Table-driven Routing ,Reactive or On Demand routing protocols and Hybrid routing protocols.

The aim of this paper is to presents the routing protocols in MANET and comparison between these protocols in term of routing methods and overhead that associated with each method. The paper is organized as follow Section 2 present the routing concept extends with the problem with routing in MANET. Section 3 provides an overview of the routing method in MANET and discusses different routing protocols for each method as well as comparison between reviewed routing protocols. Section 4 concludes the paper

2 ROUTING IN MANET

The routing concept basically involves, two activities: firstly, determining optimal routing paths and secondly, transferring the information groups(called packets) through an internetwork..Since the topology of the network is constantly changing, the issue of routing packets between any pair of nodes becomes a challenging task. Most protocols should be based on reactive routing instead of proactive.Multi cast routing is another challenge because the multi cast tree is no longer static due to the random movement of nodes within the network .Routes between nodes may potentially contain multiple hops ,which is more complex than the single hop communication.

2.1 Problem with routing in MANET

Routing is the most fundamental research issue in MANET and must deal with limitations such as high power consumption, low bandwidth, high error rates and unpredictable movements of nodes.

The following is the problem with routing in MANET:

I. Asymmetric links: Fixed networks rely on the symmetric links which are always fixed. But in ad-hoc networks the nodes are mobile and constantly changing their position within network.

II. Routing Overhead: Because the node in the ad hoc network often changes their location within network.So, some stale routes are generated in the routing table which leads to unnecessary routing overhead.

III. Interference: In mobile ad hoc networks links come and go depending on the transmission characteristics, one transmission might and can corrupt the total transmission.

IV. Dynamic Topology: The Mobile node might move or medium characteristics might change. In ad-hoc networks, routing tables must somehow reflect these changes in topology and routing algorithms have to be adapted.

3 ROUTING PROTOCOLS IN MANETS

Generally Routing protocols in MANETs are classified into three different categories according to their functionality: Proactive or Table-driven Routing Protocols, Reactive or On Demand routing protocols and Hybrid routing protocols.

3.1 Proactive or Table-driven Routing Protocols

Proactive protocols maintain the routing information even before it is needed]. These protocols are attempts to maintain consistent, up-to-date routing information from each node to every other node in the network. Routes information are generally store in number of different tables to use to forward a packet when needed. These tables are periodically updated as the network topology changes. This can be seen in Wireless Routing Protocol (WRP) and Destination-Sequenced Distance-Vector (DSDV).

3.1.1 Destination-sequenced distance - vector (DSDV)

Destination-Sequenced Distance Vector (DSDV) is a traditional table-driven protocol for MANET. In DSDV routes are established based on constant control traffic and they are available all the time. Each node maintains one or more tables that contain route information to other nodes in the network. Nodes continuously update the tables to provide fresh view of whole network. Updates are so frequent that the advertisement must be made regularly enough to make sure that every node can almost always find every other node in the network.

3.1.2 Wireless routing protocol (WRP)

Wireless routing protocols (WRP) is a loop free routing protocol. WRP is a path-finding algorithm with the exception of avoiding the count-to-infinity problem by forcing each node to perform consistency checks of predecessor information reported by all its neighbors.

3.2 Reactive or On Demand routing protocols

Reactive or On demand routing protocols create routes only when they are needed. Reactive protocols use two different operations to find and maintain routes: *the route discovery process operation and the route maintenance operation*. When a node requires a route to destination, it initiates route discovery process within the network. This process is completed once a route is found or all possible route permutations are examined. Route maintenance is the process of responding to changes in topology that happens after a route has initially been created. The nodes in the network try to detect link breaks on the established routes. Examples of on-demand protocols are Dynamic Source Routing (DSR)], Ad Hoc On-Demand Distance Vector (AODV), Temporally-Ordered Routing Algorithm (TORA) and Dynamic MANET On-Demand (DYMO) . In reactive approach, the sending node has to discover a route to the destination, this process makes the initial delay before data is exchanged between two nodes is be long.

3.2.1 Dynamic source routing (DSR)

DSR is a reactive routing protocol. Thus, routes get created only when they are needed and there is no periodic routing traffic for creating or maintaining routes. DSR also makes use of source routing. In source routing, when a node originates a data packet it puts in the header of the packet all the hops that the packet needs to traverse to get to the destination. DSR has two main components: route discovery and route maintenance. When a node needs a new route to a destination it initiates the route discovery process by sending a route request message. The route request is broadcast by the originator and contains the address of the originator and the destination. The route request also has a unique identity associated with it. When a node receives the route request, it checks the unique identity to determine whether it has seen this request before. If it has not seen the request before, it appends its address in the route request message and then broadcasts the message to its neighbors. If the node has seen this request before, it just ignores it. Once the destination receives the route request message, it sends back a route reply message that contains the route information accumulated in the route request message.

3.2.2 Ad hoc on-demand distance vector (AODV)

AODV is a reactive routing protocol in which the network generates routes at the start of communication. AODV obtains the routes purely on-demand which is makes it a very useful and

desired algorithm for MANETs. AODV routing protocol consists of two protocol operations: route discovery and route maintenance. When a node does a route discovery towards a destination node, it broadcasts a Route Request (RREQ) message to all its neighbors. If the node is the destination or the node has a route to the destination that meet the freshness requirement, it unicasts a route reply (RREP) back to the source node. The source node or the intermediate nodes that receive RREP messages will update their forward route to destination in the routing tables. Otherwise, they continue broadcasting the RREQ. If a node receives a RREQ message that has already processed, it discards the RREQ and does not forward it.

3.3 Hybrid routing protocols.

Hybrid routing protocols aggregates a set of nodes into zones in the network topology. In each zone the proactive approach is used to maintain routing information. To route packets between different zones, the reactive approach is used. Consequently, in hybrid schemes, a route to a destination that is in the same zone is established without delay, while a route discovery and a route maintenance procedure is required for destinations that are in other zones. The Zone Routing Protocol (ZRP) and Zone-based Hierarchical Link State (ZHLS) routing protocol provide a compromise on scalability issue in relation to the frequency of end-to-end connection, the total number of nodes, and the frequency of topology change. The key idea of ZRP is to utilize the features of both proactive and reactive routing. With proactive routing Table1: feature of routing Protocols in MANET.

Table1 show the compressions between features of the three types of routing protocols on MANET

Routing Protocols	Features
Proactive Routing Protocols	✓ not suitable for large networks. ✓ Need to maintain node entries for each node in the routing table of every node. ✓ Overhead in the routing table leading to consumption of more bandwidth
Reactive routing protocols	✓ Routes are always available(regardless of need),with the consumption of signaling traffic and power ✓ Both categories of routing protocols have been improving to be more scalable,higher quality of service
Hybrid routing Protocols	✓ Utilize the features of both proactive and reactive routing. ✓ Reduce connection establishment time (Proactive routing outside zone). ✓ Candidate for rounting in a large network.

4. CONCLUSION

Routing is the most fundamental research issue in MANET. The routing concept basically involves, two activities: firstly, determining optimal routing paths and secondly, transferring the information groups (called packets) through an internetwork. Ad hoc network need to specifically design for routing protocol. Generally, current routing protocols for MANET can be categorized as: Proactive or Table-driven Routing Protocols, Reactive or On Demand routing protocols and Hybrid routing protocols. Overall, a significant amount of work has been done on routing protocol in MANET. Clearly the problem in MANET is that the routing must deal with limitations such as high power consumption, low bandwidth, high error rates and unpredictable movements of nodes.

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