Study of Routing Protocols in Mobile Ad-Hoc Network

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Abstract

In current year's mobile ad hoc networks have developed very popular and lots of research is being done on dissimilaraspects of MANET. Mobile Ad Hoc Networks (MANET) is a collection of mobile nodes interfacing withoutthe support of centralized infrastructure. There are dissimilar aspects which are taken forresearch like routing, management, power consumption, bandwidth considerations etc. This paper focusses on routingtechniques which is the most interesting issue due to the dynamic topology of ad hoc networks. There are different strategiesproposed for effective routing which claimed to provide improved performance. There are different routing protocols proposedfor MANETs which makes it quite difficult to regulate which protocol is suitable for dissimilar network conditions. A mobile ad hoc network (MANET) consists of mobile wireless nodesin which the communication between nodes is carried out without any consolidated control. MANET is a self-organized andSelf-configurable network where the mobile nodes move arbitrarily. The mobile nodes can receive and onward packets as arouter. Routing is a critical issue in MANET. Therefore focus in this paper is to compare the presentation of three routingprotocols DSDV, DSR and AODV.

Keywords - *MANET, DSDV, DSR and AODV, Medium Access Control.*

I. INTRODUCTION

Mobile Ad hoc Networks (MANETs) is a gathering of wireless nodes which are associated without any infrastructure orany centralized control. In MANET each node can be used as either as endpoint or as a router to forward packet to nextnode. In divergence to fixed infrastructure networks, MANETs require fundamental changes to network routing protocols.These are considered by the mobility of nodes, which can move in any direction and at any speed that may lead toarbitrary topology and frequent partition in the network. This characteristic of the MANET makes the routing achallenging issue. In mobile ad hoc network, nodes do not rely of any existing infrastructure. Instead, the nodesthemselves form the network and interconnect through means of wireless communications. Flexibility causesfrequent topology changes and may break existing paths. Routing protocols for ad hoc networks can be classifiedinto two major types: proactive and on-demand. Proactive protocols attempt to preserve up-to-date routinginformation to all nodes by periodically broadcasting topology updates throughout the network. On demandprotocols attempt to discover a route only when a route is needed. The general problem of modeling the behavior ofthe nodes belonging to a mobile network has not a unique and straightforward solution.

Number of problems inmanipulating and then routing schemes for actual communication between any source and destination. The mobile adhoc networks are projected to support dynamic and rapidly changing the multi-hop topologies which are expected tobe composed of relatively bandwidth constrained wireless links. A generic framework to thoroughly analyze theimpact of mobility on the performance of routing protocols for MANET has become important. As numerous studies have used reference point (RP) and random waypoint (RWP) as reference model in reference point (RP) model anintermediate node can instantaneously serve as relay for more than one source. Therefore the resources are shared in anon-demand fashion. This is typical for most of the routing protocols for wireless ad hoc networks. In the accidentalwaypoint (RWP) model, the nodes, that is, mobile users, move along a zigzag path comprising of straight legs fromone waypoint to the next. Mobility and disconnection of mobile hosts pose a Wireless networks provide joiningelasticity between users in different places. Moreover, the network can be stretched to any place or building withoutthe need for a wired connection. Wireless networks are classified into two categories; Infrastructure networks andAd Hoc networks as shown in Figure 1.

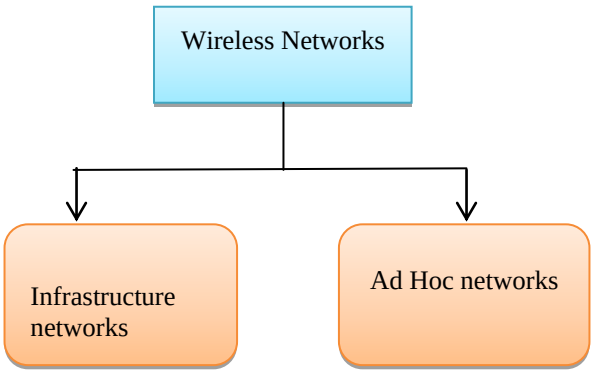

Fig 1. Wireless Network Categories

A. Infrastructure Networks

An Access Point (AP) signifies a central coordinator for all nodes. If any node can bejoining the network through AP. In accumulation, AP organizes the connection between the Basic Set Services (BSSs) sothat the route is organized when it is desired. Though, one drawback of using an infrastructure network is the largeoverhead of sustaining the routing tables. Infrastructure network as shown in Figure 2.

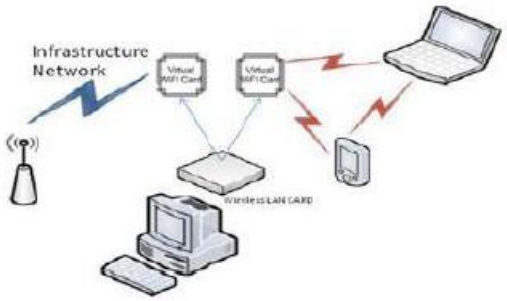

Fig 2.Infrastructure Network

B. Ad Hoc Networks

A wireless ad hoc network is a reorganized type of wireless network. The network is ad hoc because it does notrely on a preexistent infrastructure, such as routers in wired networks or access points in managed wireless networks. Ad Hoc networks do not have a confident topology or a central coordination point. Therefore,sending and receiving packets are more difficult than infrastructure networks. Figure 3 illustrates an Ad Hocnetwork.

Fig. 3 Ad Hoc Network

II. CHARACTERISTICS OF MANET

Currently, with the enormous growth in wireless network applications like handheld computers, PDAs and cellphones, researchers are stimulated to improve the network services and performance. One of the challenging designissues in wireless Ad Hoc networks is supportive mobility in Mobile Ad Hoc Networks (MANETs). The mobility ofnodes in MANETs increases the complication of the routing protocols and the degree of connection's flexibility.Though, the elasticity of allowing nodes to join, leave, and transfer data to the network pose security challenges.MANET is a gathering of mobile nodes sharing a wireless channel without any consolidated control or establishedcommunication backbone. MANET has active topology and separately mobile node has partial resources such asbattery, processing power and on-board memory, This kind of infrastructure-less network is very useful insituation in which ordinary wired networks is not feasible like battlefields, natural disasters etc. The nodes which arein the transmission range of each other communicate directly otherwise communication is done through intermediarynodes which are ready to forward packet hence these networks are also called as multi-hop networks. MANETas shown in Figure 4.

Fig 4.MANET

The characteristics of these networks aresummarized as follows:

- ✓ Communication via wireless means.
- ✓ Nodes can perform the roles of both hosts and routers.
- ✓ Bandwidth-constrained, variable capacity links.
- ✓ Energy-constrained Operation.
- ✓ Limited Physical Security.
- ✓ Dynamic network topology.
- ✓ Frequent routing updates

III. CLASSIFICATION OF ROUTING PROTOCOLS

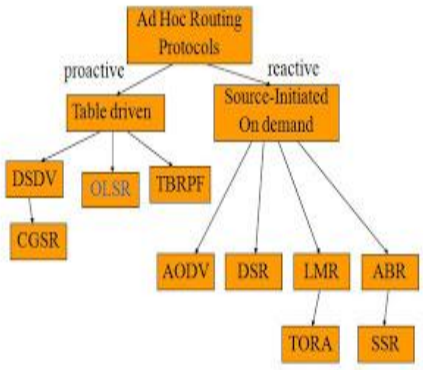

Fig 5. Routing Protocols in MANET

A. Proactive Routing Protocols

Proactive routing protocols are also called as table driven routing protocols. In this each node preserve routing able which comprises information about the network topology even without needing it This feature though useful for datagram traffic, incurs extensive signaling traffic and power feasting The routing tables are efficient sporadically whenever the network topology changes. Proactive protocols are not suitable for large networks as they necessity to preserve node entries for each and every node in the routing table of every node These protocols maintain dissimilar number of routing tables varying from protocol to protocol. There are various well known proactive routing protocols. Example: DSDV, OLSR, CGSR etc.

B. Destination-Sequenced Distance-Vector Routing Protocol (DSDV)

DSDV is established on the basis of Bellman–Ford routing algorithm with some alterations. In this routing protocol, each mobile node in the network preserves a routing table. Each of the routing table contains the list of all accessible destinations and the number of hops to each. Each table entry is identified with a sequence number, which is originated by the destination node.Periodic transmissions of updates of the routing tables help preserving the topology information of the network. Ifthere is any new substantial change for the routing information, the updates are transmitted immediately. So, therouting information updates potency either be periodic or event driven. DSDV protocol requires each mobile node inthe network to promote its own routing table to its current neighbors. The advertisement is done either bybroadcasting or by multicasting.

C. Cluster Gateway Switch Routing Protocol (CGSR)

CGSRdeliberates a clustered mobile wireless network instead ofa flat network. For constructing the network into separate but consistent groups, cluster heads are elected using acluster head selection algorithm. By creating several clusters, this protocol achieves a distributed processingmechanism in the network. Though, one drawback of this protocol is that, frequent change or selection of clusterheads might be resource hungry and it might disturb the routing performance. CGSR uses DSDV protocol as thefundamental routing scheme and, hence, it has the same overhead as DSDV. But, it changes DSDV by using aclassified cluster-head-to-gateway routing method to route traffic from source to destination. Gateway nodes arenodes that are within the communication ranges of two or more cluster heads. A packet sent by a node is first sent toits cluster head, and then the packet is sent from the cluster head to a gateway to another cluster head, and so on untilthe cluster head of the destination node is reached.

D. Reactive Routing Protocols

This protocol is also known as on demand routing protocol. In this protocol route is exposed whenever it is desirable Nodes initiate route discovery on demand basis. Source node sees its route. Cache for the available route from source to destination if the route is not available then it initiates route discovery process. The on- demand routing protocols have two major modules. There are numerous well known reactive routing protocols existing in MANET for example DSR, AODV, TORA and LMR.

Dynamic Source Routing (DSR) -This is a one of the reactive protocol, it based on the source route approach. In Dynamic Source Routing (DSR), shown in Figure.6, the protocol is based on the link state algorithm in which source initiates route discovery on demand basis. The sender defines the route from source to destination and it includes the address of intermediary nodes to the route record in the packet. DSR was designed for multi hop networks for small Diameters. It is a beaconless protocol in which no

HELLO messages are exchanged between nodes to notify them of their neighbors in the network.

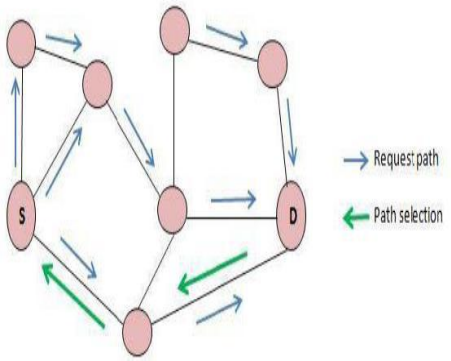

Fig 6.Dynamic Source Routing

E. Ad Hoc On-Demand Distance Vector Routing (AODV)

AODV is fundamentally an improvement of DSDV. But, AODVis a reactive routing protocol instead of proactive. It minimizes the number of broadcasts by generating routes based ondemand, which is not the case for DSDV. When any source node wants to send a packet to a destination, itBroadcasts a route request (RREQ) packet. The bordering nodes in turn broadcast the packet to their neighborsand the process continues until the packet reaches the destination. During the process of forwarding the routerequest, intermediate nodes record the address of the neighbor from which the first copy of the broadcast packet isreceived. This record is placed in their route tables, which helps for founding a reverse path. If supplementary copies of the same RREQ are later received, these packets are discarded. The reply is sent using the reverse path. For route maintenance, when a source node moves, it can reinitiate a route discovery process. If any intermediate node moves within a particular route, the neighbor of the coasted node can detect the link failure and sends a link failure notice to its upstream neighbor. This process continues until the failure notification reaches the source node. Based on the received information, the source might decide to re-initiate the route discovery phase.

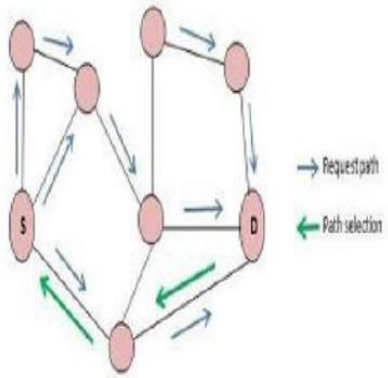

Fig 7. Ad Hoc On-Demand Distance Vector Routing

F. Associativity-Based Routing (ABR)

ABR protocol clarifies a new type of routing metric “degree of association stability” for mobile ad hoc networks. In this routing protocol, a route is particular based on the degree of association stability of mobile nodes. Each node occasionally generates beacon to announce its existence. Upon receiving thebeacon message, a neighbor node apprises its own associativity table. For each beacon received, the associativity tick of the receiving node with the beaconing node is enlarged. A high value of associativity tick for any specific beaconing node means that the node is relatively static. Associativity tick is reset when any neighboring node moves out of the neighborhood of any other node.

IV. CONCLUSION

We have seen an excessive expansion in the field of wireless networks and in the field of Mobile ad hoc network. In this paper a number of routing protocols for MANET, which are broadly considered as proactive and reactive protocols. The effort has been made on the comparative study of Reactive, Proactive and Hybrid routing protocols has been presented in the form of table. There are various absences in dissimilar routing protocols and it is difficult to choose routing protocol for different situations as there is compromise among various protocols. There are various tasks that need to be met, so these networks are going to have widespread use in the future the simulation to compare the performance of two on-demands and one table driven (DSDV) routing protocols on different presentation parameters packet delivery ratio, end-to-end delay, routing overhead and throughput. The results showed that the performance of the two reactive protocols was better than DSDV. The inclusive presentation of DSR was better than the other two protocols except in the case of end to end delay.

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