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Types of Routing Protocols in MANET

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ABSTRACT

An ad-hoc network (MANET) is set of different types of mobile node. MANET is mobile so they utilize wireless connection to attach with network. MANET can be deployed at low cost in variety of application. In MANET different types of routing protocols have been recommended. These protocols can be classified into three main categories reactive (on-demand), proactive (table-driven) and hybrid routing protocols namely AODV, OLSR and ZRP. This paper focus on the survey of reactive, proactive and hybrid routing protocols like AODV, OLSR and ZRP.

Keywords: MANET, AODV, OLSR, ZRP.

I. INTRODUCTION

The routing concept basically involves, two activities: firstly, determining optimal routing paths and secondly, transferring the information groups (called packets) through an internetwork. The later concept is called as packet switching which is straight forward, and the path determination could be very complex [4]. 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.

II. METHODS AND MATERIAL

Classification of routing protocols:

The MANET protocols are classified into three huge groups, namely Proactive (Table-Driven), Reactive (OnDemand) routing protocol and hybrid routing protocols (Tamilarasan et al,2011)(Chen et al, 1998)(Das et al,1998)(Pei et al,2000)(Abolhasan et al,2004).

1. Proactive Routing Protocols

Proactive routing protocols are also called as table driven routing protocols. In this every node maintain routing table which contains information about the network topology even without requiring it[6]. This feature although useful for datagram traffic, incurs substantial signalling traffic and power consumption [4]. The routing tables are updated periodically whenever the network topology changes. Proactive protocols are not suitable for large networks as they need to maintain node entries for each and every node in the routing table of every node [5]. These protocols maintain different number of routing tables varying from protocol to protocol. There are various well known proactive routing protocols. Example: DSDV, OLSR etc.

1.1 DSDV: The destination sequenced distance vector routing protocol is a proactive routing protocol which is a modification of conventional Bellman-Ford routing algorithm. This protocol adds a new attribute, sequence number, to each route table entry at each node. Routing table is maintained at each node and with this table, node transmits the packets to other nodes in the network. This protocol was motivated for the use of data exchange along changing and arbitrary paths of interconnection which may not be close to any base station.

The DSDV protocol requires that each mobile station in the network must constantly, advertise to each of its neighbors, its own routing table. Since, the entries in the table my change very quickly, the advertisement should be made frequently to ensure that every node can locate its neighbors in the network.

1.2 OLSR : Optimized Link State routing protocol is a proactive link state routing protocol, which uses hello and topology control (TC) messages to discover and then disseminate link state information throughout the mobile ad-hoc network. Individual nodes utilize this topology information to work out next hop destinations for all nodes in the network using shortest hop forwarding paths. Being a proactive protocol, routes to all destinations within the network are known and maintain before using it. Having the routes available within the standard routing table can be useful for some systems and network applications as there is no route discovery delay associated with finding a new route

2. Reactive Routing Protocols

Reactive routing protocol is also known as on demand routing protocol. In this protocol route is discovered whenever it is needed 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 components

2.1 AODV : AODV is a very simple, efficient, and effective routing protocol for Mobile Ad-hoc Networks which do not have fixed topology. This algorithm was motivated by the limited bandwidth that is available in the media that are used for wireless communications. It borrows most of the advantageous concepts from DSR and DSDV algorithms. The on demand route discovery and route maintenance from DSR and hop-by-hop routing, usage of node sequence numbers from DSDV make the algorithm cope up with topology and routing information. Obtaining the routes purely on-demand makes AODV a very useful and desired algorithm for MANETs . AODV deals with node mobility using sequence numbers to identify and discard outdated routes, this is combined with route error (RERR) messages which are sent when broken links are detected, RERR packets travel up to the source informing nodes to delete the broken links and trigger new route discovery if alternative routes are not available [7].

2.2 Dynamic Source Routing (DSR) : The reactive DSR Protocol was developed by [9], operation of the DSR protocol is broken into two stages; route discovery phase and route maintenance phase, these phases are triggered on demand when a packet needs routing. Route discovery phase floods the network with route requests if a suitable route is not available in the route [8]. DSR uses a source routing strategy to generate a complete route to the destination, this will then be stored temporarily in nodes route cache [10]. DSR addresses mobility issues through the use of packet acknowledgements; failure to receive an acknowledgement causes packets to be buffered and route error messages to be sent to all upstream nodes. Route error messages trigger the route maintenance phase which removes incorrect routes from the route cache and undertakes a new route discovery phase [9].

2.3 Associativity-Based Routing (ABR) : ABR is a source initiated on-demand routing protocol. It is free from loops, deadlock and packet duplicates. It only maintain routes for sources that actually desire routes. However, ABR does not employ route re-construction based on alternate route information stored in intermediate nodes (thereby avoiding stale routes). In addition, routing decisions are performed at the destination and only the best route will be selected and used while all other possible routes remain passive. Its distinct feature is the use of associativity ticks which is required to only form routes based on the stability of nodes, under the fact that there is no use to form a route using a node which will be moving out of the topology and thus making the route to be broken. ABR has three modes of operation namely route discovery phase, route reconstruction phase and route deletion.

3. Hybrid Routing Protocol

There is a trade-off between proactive and reactive protocols. Proactive protocols have large overhead and less latency while reactive protocols have less overhead and more latency. So a Hybrid protocol is presented to overcome the shortcomings of both proactive and reactive routing protocols. Hybrid routing protocol is combination of both proactive and reactive routing protocol. It uses the route discovery

mechanism of reactive protocol and the table maintenance mechanism of proactive protocol so as to avoid latency and overhead problems in the network. Hybrid protocol is suitable for large networks where large numbers of nodes are present.

3.1 Zone Routing Protocol (ZRP)

ZRP [11] is suitable for wide variety of MANETs, especially for the networks with large span and diverse mobility patterns. In this protocol, each node proactively maintains routes within a local region, which is termed as routing zone. Route creation is done using a query-reply mechanism. For creating different zones in the network, a node first has to know who its neighbors are.

A neighbor is defined as a node with whom direct communication can be established, and that is, within one hop transmission range of a node. Neighbor discovery information is used as a basis for Intra-zone Routing Protocol (IARP), which is described in detail in [12]. Rather than blind broadcasting, ZRP uses a query control mechanism to reduce route query traffic by directing query messages outward from the query source and away from covered routing zones. A covered node is a node which belongs to the routing zone of a node that has received a route query. During the forwarding of the query packet, a node identifies whether it is coming from its neighbor or not. If yes, then it marks all of its known neighboring nodes in its same zone as covered[13]. The query is thus relayed till it reaches the destination. The destination in turn sends back a reply message via the reverse path and creates the route.

3.2 TORA

Temporally Ordered Routing Algorithm (TORA) The Temporally Ordered Routing Algorithm (TORA) is a highly adaptive, efficient and scalable distributed routing algorithm based on the concept of link reversal. TORA is proposed for highly dynamic mobile, multi-hop wireless networks. It is a source-initiated on-demand routing protocol. It has a unique feature of maintaining multiple routes. to the destination so that topological changes do not require any reaction at all. The protocol reacts only when all routes to the destination are lost. In the event of network partitions the protocol is able to detect the partition and erase all invalid routes.

III. CONCLUSION

In this paper we have seen a number of routing protocols for MANET, which are broadly categorized as proactive and reactive and Hybrid protocols. The effort has been made on the comparative study of Reactive, Proactive and Hybrid routing protocols has been presented .There are various shortcomings in different routing protocols and it is difficult to choose routing protocol for different situations as there is tradeoff between various protocols. There are various challenges that need to be met, so these networks are going to have widespread use in the future. In the study of reactive, proactive and hybrid routing protocols, the main feature of AODV less connection delay and loop free and In OLSR routes to every destination inside the network are known and maintain before use. There is no route discovery delay associated with finding a new route in OLSR and ZRP provide framework to other routing protocols And each component of ZRP works independently to give efficient result.

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