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A REVIEW OF MOBILE AD HOC NETWORKS FOR PROACTIVE ROUTING PROTOCOL

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Abstract

An ad hoc mobile network is a collection of mobile nodes that are vigorously and randomly located in such a way that the interconnections flanked by nodes are capable of changing on a continual basis. The main goal of such an ad hoc network routing protocol is truthful and well-organized route establishment between a pair of nodes so that communication may be delivered in a timely manner. In this study we examine routing protocols for ad hoc networks and evaluate these protocols based on a given set of parameters. Mobile Ad hoc Network (MANET) allows portable devices to establish communication independent of a central infrastructure. The wireless links in this network are highly error prone and can go down frequently due to mobility of nodes. Therefore, routing in MANET is a critical task due to highly dynamic environment. Efficient Routing Protocols will make MANET reliable. Mainly protocols are of three kind i.e. proactive, hybrids. But, we will discuss Proactive Protocols. Several Routing Protocols for MANET are Dynamic Source Routing (DSR), Ad hoc On-demand Distance Vector (AODV), Destination Sequence Distance Vector (DSDV) and Temporally Ordered Routing Algorithm (TORA). This paper provides an overview of these protocols by presenting their characteristics, functionality, benefits and then their comparative analysis parameters. Depending on parameters one can compare the performance of Routing Protocols. The objective is to make observation about the working and performance metrics of these protocols. Security and Power are major issues while designing Routing Protocol. Because of air as a transmission medium for wireless networks, so there must be security for data and devices are mobile, hence battery should have long life. This paper presents the survey of Proactive Routing Protocols in MANET.

Keywords: *Mobile, Ad Hoc Networks, Proactive, Routing Protocol,MANET, DSR, DSDV, AODV, TORA, communication, evaluate, portable devices, wireless, environment, benefits, performance, etc.*

INTRODUCTION:

A proactive methodology to MANET routing looks to keep up an always upgraded topology understanding. The entire system ought to, in principle, be known not hubs. This outcomes in a consistent overhead of routing traffic, however no underlying postponement in correspondence.In MANET mobile nodes communicate with each other using multihop wireless links without infrastructure [1]. Every node in the network act as a router as well as packet forwarding agency for other nodes. A central challenge in the design of MANET is the

development of dynamic routing protocols that can efficiently find routes between two communicating nodes. In MANET nodes moves randomly, therefore the network may experience sudden and unpredictable change in topology. Nodes in MANET normally have limited transmission ranges, therefore some nodes cannot communicate directly to other nodes and those are beyond the limit of range of mobile node. So many protocols have been proposed for MANETs for achieving the efficient routing. Every protocol uses a new searching methodology for new route or modifying a known route, when hosts move. Energy consumption in MANET is very critical issue [2]. Because, mobile devices have limited battery power and processing power. In MANET, Routing Protocols can be divided into three categories: Proactive Routing Protocols or Table Driven Routing Protocols, Reactive Protocols or Demand Routing Protocols and Hybrid Routing Protocols. Proactive Routing Protocols contain consistent and up-to-date routing information to all nodes which is maintained at each node. Reactive Protocols the routes are created, when required, when source wants to send to a destination, it invokes the route discovery mechanisms to find the path to the destination [3].

Ad Hoc networks:

A wireless ad hoc network is a decentralized type of wireless network. The network is ad hoc because it does not rely on a preexisting infrastructure, such as routers in wired networks or access points in managed (infrastructure) wireless networks [1]. Ad Hoc networks do not have a certain topology or a central coordination point. Therefore, sending and receiving packets are more complicated than infrastructure networks. Figure 1 illustrates an Ad Hoc network.

Figure 3: Ad Hoc network

Nowadays, with the immense growth in wireless network applications like handheld computers, PDAs and cell phones, researchers are encouraged to improve the network services and performance. One of the challenging design issues in wireless Ad Hoc networks is supporting mobility in Mobile Ad Hoc Networks (MANETs). The mobility of nodes in MANETs increases the complexity of the routing protocols and the degree of connection's flexibility. However, the flexibility of allowing nodes to join, leave, and transfer data to the network pose security challenges [3].

Figure 2: MANET

A MANET is a collection of mobile nodes sharing a wireless channel without any centralized control or established communication backbone. MANET has dynamic topology and each mobile node has limited resources such as battery, processing power and on-board memory[3] This kind of infrastructure-less network is very useful in situation in which ordinary wired networks is not feasible like battlefields, natural disasters etc. The nodes which are in the transmission range of each other communicate directly otherwise communication is done through intermediate nodes which are willing to forward packet hence these networks are also called as multi-hop networks. MANET [2] as shown in Figure 2.

Characteristics of MANET: Mobile ad hoc network nodes are furnished with wireless transmitters and receivers using antennas, which may be highly directional (point-to-point), omnidirectional (broad-cast), probably steerable, or some combination. At a given point in time, depending on positions of nodes, their transmitter and receiver coverage patterns, communication power levels and cochannel interference levels, a wireless connectivity in the form of a random, multichip graph or "ad hoc" network exists among the nodes. This ad hoc

topology may modify with time as the nodes move or adjust their transmission and reception parameters [6]. The characteristics of these networks are summarized 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.

REVIEW OF LITERATURE:

If there are only two nodes that want to communicate with each other and are located very closely to each other, then no specific Routing Protocols or Routing decisions are necessary. On the other hand, if there are a number of mobile hosts wishing to communicate beyond the limit of transmission range, then the Routing Protocols come into play because in this case, some critical decisions have to be made such as which is the optimal route from the source to the destination which is very important because, the mobile nodes operate on some kind of battery power. Thus it becomes necessary to transfer the data with the minimal delay so as to waste less power. There may also be some kind of compression involved which could be provided by the protocol so as to waste less bandwidth [4]. In addition to this, Quality of Service support is also needed so that the least packet drop can be obtained. The other factors which need to be considered while choosing a protocol for MANET are as follows:

A. Multicasting: This is the ability to send packets to multiple nodes at once. This is similar to broadcasting except the fact that the broadcasting is done to all the nodes in the network. This is important as it takes less time to transfer data to multiple nodes.

Loop Free: A path taken by a packet never transits the same intermediate node twice before it arrives at the destination. To improve the overall, we want the routing protocol to guarantee that the routes supplied are loop-free. This avoids waste of bandwidth or CPU consumption.

B. Multiple Routes: If one route gets broken due to some disaster, then the data could be sent through some other route. Thus the protocol should allow creating multiple routes.

C. Distributed Operation: The protocol should be distributed. It should not be dependent on a centralized node.

OLSR: The *Optimized Link State routing* (OLSR) is described in RFC3626. It is a table-driven pro-active protocol. As the name suggests, it uses the link-state scheme in an

optimized manner to diffuse topology information. In a classic link-state algorithm, link-state information is flooded throughout the network. OLSR uses this approach as well, but since the protocol runs in wireless multi-hop scenarios the message flooding in OLSR is optimized to preserve bandwidth. The optimization is based on a technique called *Multi Point Relaying*. Being a table-driven protocol, OLSR operation mainly consists of updating and maintaining information in a variety of tables. The data in these tables is based on received control traffic, and control traffic is generated based on information. The route calculation itself is also driven by the tables.

OLSR is a proactive routing protocol for mobile ad hoc networks. The protocol inherits the stability of a link state algorithm and has the advantage of having routes immediately available when needed due to its proactive nature. OLSR is an optimization over the classical link state protocol, tailored for mobile ad hoc networks [5]. OLSR minimizes the overhead from flooding of control traffic by using only selected nodes, called MPRs, to retransmit control messages. This technique significantly reduces the number of retransmissions required to flood a message to all nodes in the network. Secondly, OLSR requires only partial link state to be flooded in order to provide shortest path routes. The minimal set of link state information required is that all nodes, selected as MPRs, MUST declare the links to their MPR selectors. Additional topological information, if present, MAY be utilized e.g., for redundancy purposes [6]. OLSR MAY optimize the reactivity to topological changes by reducing the maximum time interval for periodic control message transmission.

OLSR defines three basic types of control messages -

HELLO - *HELLO* messages are transmitted to all neighbors. These messages are used for neighbor sensing and MPR calculation.

TC - *Topology Control* messages are the link state signaling done by OLSR. This messaging is optimized in several ways using MPRs.

MID - *Multiple Interface Declaration* messages are transmitted by nodes running OLSR on more than one interface. These messages list all IP addresses used by a node.

OLSR - core functionality: The Optimized Link State Routing Protocol (OLSR) is produced for mobile advertisement hoc networks. The protocol is archived in the trial Request for Comment (RFC) 3626. OLSR is table-driven and master dynamic and uses an optimization called Multipoint Relaying for control traffic flooding. RFC3626 modularizes OLSR into core functionality, which is always required for the protocol to operate and an arrangement of assistant capacities. This part shows the center functionality of OLSR. The center

functionality specifies, in its own privilege, a protocol able to give routing in a stand-alone MANET. Every helper capacity gives extra usefulness, which might be appropriate in particular situations, e.g., on the off chance that a hub is giving availability between the MANET and another routing domain [7]. All assistant functions are perfect, to the degree where any auxiliary function might be executed with the center. Moreover, the protocol is said to permit heterogeneous hubs, i.e., hubs which actualize diverse subsets of the auxiliary functions, to exist together in the network. As we might later, this is not the situation for all auxiliary functions [8].It is important to understand that OLSR *does not route traffic*. It is not in any way responsible for the actual process of routing traffic. OLSR could rather be described as a *route maintenance protocol* in that it is responsible for maintaining the routing table used for routing packages, but such protocols are usually referred to as routing protocols [9].

Proactive protocols & Reactive Protocols: In this kind of routing protocol, every hub in a network keeps up one or more routing tables which are redesigned routinely. Every hub sends a broadcast message to the whole network if there is an adjustment in the network topology. In any case, it acquires extra overhead cost because of keeping up and coming data and subsequently; throughput of the network might be influenced yet it gives the actual information to the accessibility of the network. Distance vector (DV) protocol, Destination Sequenced Distance Vector (DSDV) protocol, Wireless Routing protocol Fisheye State Routing (FSR) protocol are the case of Proactive protocols.

DSDV:DSDV is based on the bellman ford algorithm and developed by Charles E. Perkins and PravinBhagwat in 1994. In DSDV, packets are transmitted between mobile nodes by using Routing Tables which are stored at mobile node. Each Routing Table, at each of the mobile node contain list of all available destinations and the number of hops to each. Each Route Table entry is tagged with a sequence number (SN) which is originated by the destination node [10]. To achieve the consistency in the dynamically changing topology based network, every mobile node periodically transmits updates and Routing Tables are updated. Routing information is advertised by multicasting the packets which are transmitted periodically and incrementally as topological changes are detected. Consider Node A wants to send a data to Node C as shown in Fig. 3, but Node C is not in the coverage area of Node A. Node A and Node C are in the range of Node B. Hence, Node A has to forward packet to Node B and Routing Table of Node B comes into picture, it will act as routing agency for forwarding packet from Node A to Node C.

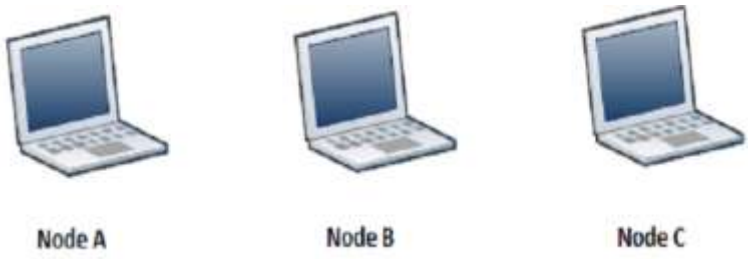

Fig. 3.Mobile Ad hoc Network

Consider MH4 (Mobile Host 4) in Fig. 4. Suppose the address of each Mobile Host is represented as MHi. Suppose further that all Sequence Numbers are denoted SN_MHi (Sequence Number by Mobile Host i), where MHi specifies the Host that created the SN. Also suppose that there are entries for all other Mobile Hosts, with sequence numbers SN_MHi , before MH1 moves away from MH2. The install time field helps determine when to delete stale routes. With our protocol, the deletion of stale routes should rarely occur, since the detection of link breakages should propagate through the Ad hoc Network immediately.

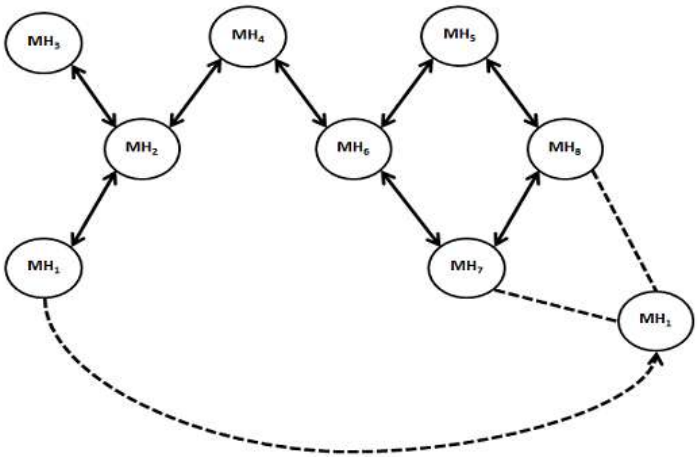

Fig. 4- Movement in an Ad hoc network

Reactive Protocols: In this sort of routing protocol, every hub in a network finds or keeps up a course taking into account request. It surges a control message by worldwide communicate amid finding a course and when course is found then transfer speed is utilized for information transmission. The primary favorable position is that this protocol needs less touting information however the hindrances are that it produces huge control bundles due to route discovery amid topology changes which occurs frequently in MANETs and it brings about higher dormancy. The cases of this write of protocol are Dynamic Source Routing (DSR), Ad-hoc On Demand Routing (AODV) and Associatively Based Routing (ABR) protocols.

Reactive protocols try to set up routes on-interest. On the off chance that a hub needs to start correspondence with a hub to which it has no course, the routing protocol will attempt to set up such a course. The Ad-Hoc On-Demand Distance Vector routing protocol is depicted in

RFC 3561. The rationality in AODV, similar to all reactive protocols, is that topology information is just transmitted by hubs on-interest. At the point when a hub wishes to transmit traffic to a host to which it has no course, it will produce a route request (RREQ) message that will be overflowed limitedly to different hubs. This causes control movement overhead to be dynamic and it will bring about an underlying deferral when starting such correspondence. A course is viewed as found when the RREQ message comes to either the destination itself, or a middle hub with a legitimate course passage for the destination. For whatever length of time that a course exists between two endpoints, AODV remains passive. At the point when the course gets to be invalid or lost, AODV will again issue a solicitation.

RREP - A *route reply* message is unicasted back to the originator of a RREQ if the receiver is either the node using the requested address, or it has a valid route to the requested address. The reason one can unicast the message back, is that every route forwarding a RREQ caches a route back to the originator.

RERR - Nodes monitor the link status of next hops in active routes. When a link breakage in an active route is detected, a RERR message is used to notify other nodes of the loss of the link. In order to enable this reporting mechanism, each node keeps a ``precursor list'', containing the IP address for each its neighbors that are likely to use it as a next hop towards each destination.

Classification of Routing Protocols: Routing protocols define a set of rules which governs the journey of message packets from source to destination in a network. In MANET, there are different types of routing protocols each of them is applied according to the network circumstances. Figure 5 shows the basic classification of the routing protocols in MANETs[1].

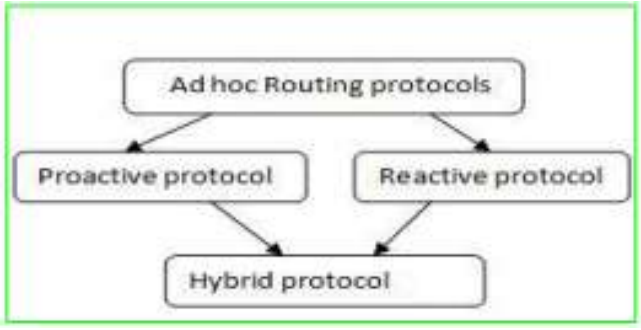

Fig. 5 Classification of Routing protocols

CONCLUSION:

This study is based on the design and performance evaluation of a proactive multipath routing protocol for mobile ad hoc networks. The Reactive and Proactive Protocols and every

Protocol have its limitations and delimitations. Some time they may work better and sometime not. Many of the research studies have been focused on performance metric for comparing the performance of Routing Protocols. Performance metric like Pack-et Delivery Ratio is throughput, average End-to-End Delay and Normalized Routing Overhead. For simulation of Routing Protocols in MANET mostly used simulation tools are ns-2, Net-Sim, GloMo-Sim and Qualnet. There are many issues that require further investigation like traffic control, power control and security. In case of security, due to the broadcast nature of the wireless node security becomes more difficult. Further research is needed to investigate how to stop an intruder from joining an ongoing session or stop a node from receiving packets from other sessions. The field of MANET is rapidly growing and changing and while there are still many challenges that need to be met.Mobile ad hoc networks (MANET) are networks which routing is based on multi-hop routing from a source to a destination node or nodes. These networks have quite a many constrains because of uncertainty of radio interface and its limitations e.g. in available bandwidth. Also some terminals have limitations concerning battery energy in use.In this study we found that the various aspects of mobile ad-hoc networking, the different routing protocols used for wireless sensor networks and the NS-2 network simulator. Also, we compared DSDV and AODV routing protocols for ad hoc networks using ns-2 simulations. DSDV uses the proactive table-driven routing strategy while AODV uses the reactive On-demand routing strategy. AODV performs better under high mobility simulations than DSDV. High mobility results in frequent link failures and the overhead involved in updating all the nodes with the new routing information as in DSDV is much more than that involved AODV, where the routes are created as and when required. AODV is uses on -demand route discovery, but with different routing mechanics. AODV uses routing tables, one route per destination, and destination sequence numbers, a mechanism to prevent loops and to determine freshness of routes. There are still many challenges facing wireless ad hoc networks. However because of these advantages, wireless ad hoc networks are becoming more and more prevalent in the world.

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