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A Survey on Various Proactive routing protocols of MANET

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Abstract: **Ad hoc networks are a new wireless networking paradigm for mobile hosts. Unlike traditional mobile wireless networks, ad hoc networks do not rely on any fixed infrastructure. Instead, hosts rely on each other to keep the network connected. The military tactical and other security-sensitive operations are still the main applications of ad hoc networks, although there is a trend to adopt ad hoc networks for commercial uses due to their unique properties. In an ad hoc network, there is no fixed infrastructure such as base stations or mobile switching centers. Mobile nodes that are within each other's radio range communicate directly via wireless links, while those that are far apart rely on other nodes to relay messages as routers. Currently, mobile ad hoc network research is a very vibrant and active field and the efforts of the research community, together with current and future MANET enabling radio technologies. As mobile ad hoc networks are characterized by a multi-hop network topology that can change frequently due to mobility, efficient routing protocols are needed to establish communication paths between nodes, without causing excessive control traffic overhead or computational burden on the power constrained devices. Routing is considered to have a vital issue in MANETs. A lot of Protocols have been designed to solve the routing problems of MANET. Proactive, reactive and Hybrid protocols are the categories of routing protocols of MANET. This paper discusses some of the Proactive routing protocols of MANET.**

Keywords: Ad hoc on demand distance vector routing, Mobile ad hoc network, Po-sitional communication systems, Query localization technique, OLSR,WRP, and wireless networks

I INTRODUCTION

The glory of communication seems new but surrounded by different evolutional eras, transformations and trends evolved for the optimization and enhance- ment of communication styles. Enormous approaches were adopted and became obsolete from time to time as new technological revolutions had set the communication parameters up-to-date. The whole phenomenon of communication process signifies the importance of reliable and unfailing transportation of data and information from source to destination. In this concern of intact data transportation, much development of protocols and their improvements yield very progressive results providing efficient transmission and reception of intact and undamaged data. Current Information Technology trends are operating to provide easy and simple measures intended for reliable, efficient and error free commu- nication. The mobile phone technology is becoming an integral part as it is accessible almost everywhere in the globe [1].

Mobile ad-hoc technology has attracted the attention of the communications and host of researchers since the development of the Mobile Packet Radio Networks in re-search projects initiated by the US military in the 1970 and 1980s. The MANET is an autonomous network of mobile computers that are connected via wireless links. There is no pre-existing infrastructure and thus each node in the network may act as a host or as a router (an intermediate node) to allow connectivity between other source and
destination hosts in the network. The term ad-hoc implies that the network is formed in a spontaneous manner to meet an immediate and specific goal. Since the nodes in the network are mobile, the network topology can be configured in an arbitrary manner and can change dynamically. An ad-hoc network can operate in an isolated fashion or it can be connected to the wider internet via gateways. Due to the mobility of the nodes in a MANET, the network topology may be connected in any arbitrary manner and may change dynamically. Such a topology is randomly changing and is unpredictable [2, 3].

Node mobility in an ad hoc network causes frequent changes of the network topology. Figure 1 shows such an example: initially, nodes A and D have a direct link between them. When D moves out of A's radio range, the link is broken. However, the network is still connected, because A can reach D through C, E, and F.

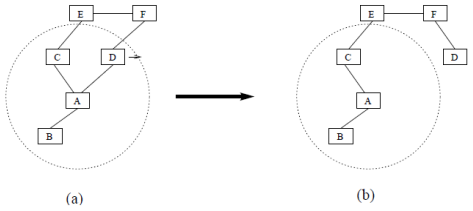

Figure 1: Topology change in ad hoc networks: nodes A, B, C, D, E, and F constitute an ad hoc network.

The circle represents the radio range of node A. The network initially has the topology in (a). When node
D moves out of the radio range of A, the network topology changes to the one in (b).

II CLASSIFICATION OF ROUTING PROTOCOLS

The routing infrastructures in MANET's should be established in a distributed self organized way due to node mobility. Different routing protocols have been proposed and are classified into two major categories as Proactive and Reactive [4]. The task of routing involves making forwarding decisions for data packets depending on the routing state of the network. The routing protocol thus has a two-fold operation. The first is to collect information about the state of the network and secondly to use this information to create routes through which data packets are forwarded.

A) Table Driven or Proactive Protocols

Destination-Sequenced Distance- Vector (DSDV) routing

Destination-Sequenced Distance-Vector Routing (DSDV) is a table-driven routing scheme for ad hoc mobile networks

based on the Bellman-Ford algorithm. The main contribution of the algorithm was to solve the Routing Loop problem. DSDV works in the following way. Each routing table entry carries hop distance and next hop for all available destinations (as in B-F). In addition, each entry is tagged with a sequence number which originates from the destination station. The routing information is advertised by broadcasting periodically and incrementally. Upon receiving the routing information, routes with more recent sequence numbers are preferred as the basis for making forwarding decisions of the paths with the same sequence number; those with the shortest hop distance will be used. That information (i.e. next hop and hop distance) is entered in the routing table, along with the associated sequence number tag. When the link to the next hop has failed, any route through that next hop is immediately assigned a 1 infinite hop distance and its sequence number is updated. When a node receives a broadcast with an infinite 1 metric, and it has a more recent sequence number to that destination, it triggers a route update broadcast to disseminate the important news about that destination.

The advantage is it is quite suitable for creating ad hoc networks with small number of nodes. The DSDV protocol is proven to guarantee loop-free paths to each destination at all instants. DSDV requires a regular update of its routing tables, which uses up battery power and a small amount of bandwidth even when the network is idle. DSDV is not suitable for highly dynamic networks. There is no commercial implementation of this algorithm.

Cluster-head Gateway Switch Routing (CGSR)

Cluster-head Gateway Switch Routing (CGSR) Protocol is a hierarchical protocol based upon the DSDV Routing algorithm using a cluster head to manage a group of action nodes. The algorithm works in a very simple manner. Then which in turn transmits it to the gateway of the destination cluster. The destination cluster-head transmits it to the destination node. There are numerous optimized cluster-head election mechanisms. On receiving a packet, a node finds the nearest cluster-head along the route to the destination according to the cluster member table and the routing table. Then the node consults its routing table to find the next hop in order to reach the cluster-head selected in step one and transmits the packet to that node. The node consults its routing table to find the next hop in order to reach the cluster-head selected in step one and transmits the packet to that node.

The Wireless Routing Protocol (WRP)

WRP is a proactive unicast routing protocol for mobile ad hoc networks. WRP uses improved Bellman-Ford Distance Vector routing algorithm. Using WRP, each mobile node maintains a distance table, a routing table, a link-cost table and a Message Retransmission List (MRL). An entry in the routing table contains the distance to a destination node, the predecessor and the successor along the paths to the destination, and a tag to identify its state, i.e., is it a simple

path, a loop or invalid. Storing predecessor and successor in the routing table helps to detect routing loops and avoid counting to infinity problem, which is the main shortcoming of the original distance vector routing algorithm. A mobile node creates an entry for each neighbor in its link-cost table. In WRP, mobile nodes exchange routing tables with their neighbours using update messages. The update messages can be sent either periodically or whenever link state changes happen. The MRL contains information about which neighbour has not acknowledged an update message. Additionally, if there is no change in its routing table since last update, a node is required to send a Hello message to ensure connectivity. On receiving an update message, the node modifies its distance table and looks for better routing paths according to the updated information. In WRP, a node checks the consistency of its neighbours after detecting any link change. WRP has the same advantage as that of DSDV. In addition, it has faster convergence and involves fewer table updates. Algorithm is simple in functionality. The complexity of maintenance of multiple tables demands a larger memory and throughout the entire network, this increases the protocols bandwidth usage.

Optimized Link State Routing (OLSR) Protocol

The protocol is an optimization of the classical link state algorithm tailored to the requirements of a mobile wireless LAN. The key concept used in the protocol is that of multipoint relays (MPRs). MPRs are selected nodes which forward broadcast messages during the flooding process. This technique substantially reduces the message overhead as compared to a classical flooding mechanism, where every node retransmits each message when it receives the first copy of the message. In OLSR, link state information is generated only by nodes elected as MPRs. Thus, a second optimization is achieved by minimizing the number of control messages flooded in the network. As a third optimization, an MPR node may chose to report only links between itself and its MPR selectors. Hence, as contrary to the classic link state algorithm, partial link state information is distributed in the network. This information is then used for route calculation. OLSR provides optimal routes (in terms of number of hops). The protocol is particularly suitable for large and dense networks as the technique of MPRs works well in this context. Advantages of OLSR is it is a flat routing protocol, it does not need central administrative system to handle its routing process Due to the OLSR routing protocol simplicity in using interfaces, it is easy to integrate the routing protocol in the existing operating systems, without changing the format of the header of the IP messages. The one great advantage of the OLSR protocol is that it immediately knows the status of the link and it is possibly to extend the quality of service(QoS) information to such protocol so that the hosts know in advantage the quality of the route. The proposed protocol is best suitable for large and dense ad hoc networks. OLSR protocol needs that each host periodic sends the updated topology information greater processing power from nodes in the ad hoc wireless network.

The Fisheye State Routing (FSR)

The Fisheye State Routing (FSR) is a proactive unicast routing protocol based on Link State routing algorithm with effectively reduced overhead to maintain network topology information. As indicated in its name, FSR utilizes a function

similar to a fish eye. The eyes of fishes catch the pixels near the focal with high detail, and the detail decreases as the distance from the focal point increases. Similar to fish eyes, FSR maintains the accurate distance and path quality information about the immediate neighboring nodes, and progressively reduces detail as the distance increases. In Link State routing algorithm used for wired networks, link state updates are generated and flooded through the network whenever a node detects a topology change. In FSR, however, nodes exchange link state information only with the neighbouring nodes to maintain up-to-date topology information. Link state updates are exchanged periodically in FSR, and each node keeps a full topology map of the network. To reduce the size of link state update messages, the key improvement in FSR is to use different update periods for different entries in the routing table. Link state updates corresponding to the nodes within a smaller scope are propagated with higher frequency. The **advantage of FSR is** it exhibits a better scalability concerning the network size compared to other link state protocols. But Traffic Overhead is there.

III.COMPARISON OF WRP, DSDV AND FSR

Control traffic overhead and loop-free property is two important issues when applying proactive routing to mobile ad hoc networks. Although belonging to the same routing category for mobile ad hoc networks, WRP, DSDV and FSR have distinct features. Both WRP and DSDV exploited event-triggered updates to maintain up-to-date and consistent routing information for mobile nodes. In contrast to using event-triggered updates, the updates in FSR are exchanged between neighbouring nodes and the update frequency is depended on the distance between nodes. In this way, update overhead is reduced and the far-reaching effect of Link State routing is restricted. Different mechanisms are used in WRP, DSDV and FSR for loop-free guarantee. WPR records the predecessor and the successor along a path in its routing table and introduces consistence-checking mechanism. In this way, WRP avoids forming temporary route loops but incurs additional overhead. In DSDV, a destination sequence number is introduced to avoid route loops. FSR is a modification of traditional Link State routing and its loop-free property is inherited from Link State routing algorithm. Both periodic and triggered updates are utilized in WRP and DSDV; therefore, their performance is tightly related with the network size and node mobility pattern. As a Link State routing protocol, FSR has high storage complexity, but it has potentiality to support multiple-path routing and QoS routing, mobility pattern. As a Link State routing protocol, FSR has high storage complexity, but it has potentiality to support multiple-path routing and QoS routing.

IV.CONCLUSION

In this paper, several existing routing protocols for ad hoc Wireless Networks were described. In table-driven protocols, each node maintain up-to-date routing information to all the nodes in the network where as on-demand protocols a node finds the route to a destination when it desires to send packets to the destination. Several table-driven protocols were discussed. GSR is table-driven protocols that use destination sequence numbers to keep routes loop-free and up-to-date. HSR are hierarchical routing.WRP is a table-based distance-vector routing protocol. Each node in OLSR discovers and maintains topology information of networks, and builds a shortest path tree to achieve preferred paths to destinations. DSDV updates its Routing table by periodically transmitted throughout the network in order to maintain table consistency.

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