Current Project Work on Routing Protocols for MANET: A Literature Survey

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Abstract: Mobile ad hoc networks (MANETs) are autonomously self-organized networks without infrastructure support. In a mobile ad hoc network, nodes move arbitrarily; therefore the network may experience rapid and unpredictable topology changes. Because nodes in a MANET normally have limited transmission ranges, some nodes cannot communicate directly with each other. Hence, routing paths in mobile ad hoc networks potentially contain multiple hops, and every node in mobile ad hoc networks has the responsibility to act as a router. This paper is a survey of active project work on routing protocols for MANET.

Keywords- MANETs, Proactive and Reactive Routing Protocols, Unicasting, Multicasting.

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I. INTRODUCTION

Active research work for MANETs is carrying on mainly in the fields of Medium Access Control (MAC), routing, resource management, power control, and security. Because of the importance of routing protocols in dynamic multihop networks, a lot of MANET routing protocols have been proposed in the last few years. Considering the special properties of MANET, when thinking about any routing protocol, generally the following properties are expected, though all of these might not be possible to incorporate in a single solution.

◎ A routing protocol for MANET should be distributed in manner in order to increase its reliability.

◎ A routing protocol must be designed considering unidirectional links because wireless medium may cause a wireless link to be opened in unidirection only due to physical factors.

◎ The routing protocol should be power-efficient.

◎ The routing protocol should consider its security.

◎ A hybrid routing protocol should be much more reactive than proactive to avoid overhead.

◎ A routing protocol should be aware of Quality of Service (QoS).

A. Classification of Routing Protocols for MANET

MANET routing protocols could be broadly classified into two major categories: Proactive and Reactive.

Proactive Routing Protocols: Proactive protocols continuously learn the topology of the network by exchanging topological information among the network nodes. Thus, when there is a need for a route to a destination, such route information is available immediately. If the network topology changes too frequently, the cost of maintaining the network might be very high. If the network activity is low, the information about actual topology might even not be used.

Reactive Routing Protocols: The reactive routing protocols are based on some sort of query-reply dialog. Reactive protocols proceed for establishing route(s) to the destination only when the need arises. They do not need periodic transmission of topological information of the network.

Hybrid Routing Protocols: Often reactive or proactive feature of a particular routing protocol might not be enough; instead a mixture might yield better solution. Hence, in the recent days, several hybrid protocols are also proposed.

Based on the method of delivery of data packets from the source to destination, classification of MANET routing protocols could be done as follows:

◎ Unicast Routing Protocols: The routing protocols that consider sending information packets to a single destination from a single source.

◎ Multicast Routing Protocols: Multicast is the delivery of information to a group of destinations simultaneously, using the most efficient strategy to deliver the messages over each link of the network only once, creating copies only when the links to the destinations split.

Multicast routing protocols for MANET use both multicast and unicast for data transmission. Multicast routing protocols for MANET can be classified again into two categories: Tree-based multicast protocol and Mesh-based multicast protocol. Mesh-based routing protocols use several routes to reach a destination while the tree-based protocols maintain only one path.

II. PROPOSED PROACTIVE ROUTING PROTOCOLS: MAJOR FEATURES

A. Dynamic Destination-Sequenced Distance-Vector Routing Protocol (DSDV)

DSDV[1] is developed on the basis of Bellman–Ford routing[2]algorithm with some modifications. In this routing protocol, each mobile node in the network keeps a routing table. Each of the routing table contains the list of all available destinations and the number of hops to each. Each table entry is tagged with a sequence number, which is originated by the destination node. Periodic transmissions of updates of the routing tables help maintaining the topology information of the network. If there is any new significant change for the routing information, the updates are transmitted immediately. So the routing information updates might either be periodic or event driven. DSDV protocol requires each mobile node in the network to advertise its own routing table to its current neighbors. The advertisement is done either by broadcasting or by multicasting. By the advertisements, the neighboring nodes can know about any change that has occurred in the network due to the movements of nodes. The routing updates could be sent in two ways: one is called a ''full dump'' and another is ''incremental.'' In case of full dump, the entire routing table is sent to the neighbors, where as in case of incremental update, only the entries that require changes are sent.

B. Wireless Routing Protocol (WRP)

WRP[3] belongs to the general class of path-finding algorithms [2,4,5], defined as the set of distributed shortest path algorithms that calculate the paths using information regarding the length and second-to-last hop of the shortest path to each destination. WRP reduces the number of cases in which a temporary routing loop can occur. For the purpose of routing, each node maintains four things: 1. A distance table 2. A routing table 3.A link-cost table 4. A message retransmission list (MRL). WRP uses periodic update message transmissions to the neighbors of a node. The nodes in the response list of update message (which is formed using MRL) should send acknowledgments. If there is no change from the last update, the nodes in the response list should send an idle Hello message to ensure connectivity. A node can decide whether to update its routing table after receiving an update message from a neighbor and always it looks for a better path using the new information. If a node gets a better path, it relays back that information to the original nodes so that they can update their tables. After receiving the acknowledgment, the original node updates its MRL. Thus, each time the consistency of the routing information is checked by each node in this protocol, which helps to eliminate routing loops and always tries to find out the best solution for routing in the network.

C. Global State Routing (GSR)

In GSR protocol [7], nodes exchange vectors of link states among their neighbors during routing information exchange. Based on the link state vectors, nodes maintain a global knowledge of the network topology and optimize their routing decisions locally. Functionally, this protocol is similar to DSDV, but it improves DSDV in the sense that it avoids flooding of routing messages.

III. PROPOSED REACTIVE ROUTING PROTOCOLS :MAJOR FEATURES

A. Associativity-Based Routing (ABR)

ABR [9] protocol defines a new type of routing metric "degree of association stability" for mobile ad hoc networks. In this routing protocol, a route is selected based on the degree of association stability of mobile nodes. Each node periodically generates beacon to announce its existence. Upon receiving the beacon message, a neighbor node updates its own associativity table. For each beacon received, the associativity tick of the receiving node with the beaconing node is increased. A high value of associativity tick for any particular 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.

B. Dynamic Source Routing (DSR)

DSR [10] allows nodes in the MANET to dynamically discover a source route across multiple network hops to any destination. In this protocol, the mobile nodes are required to maintain route caches or the known routes. The route cache is updated when any new route is known for a particular entry in the route cache. Routing in DSR is done using two phases: route discovery and route maintenance. When a source node wants to send a packet to a destination, it first consults its route cache to determine whether it already knows about any route to the destination or not. If already there is an entry for that destination, the source uses that to send the packet. If not, it initiates a route request broadcast. This request includes the destination address, source address, and a unique identification number. Each intermediate node checks whether it knows about the destination or not. If the intermediate node does not know about the destination, it again forwards the packet and eventually this reaches the destination. A node processes the route request packet only if it has not previously processed the packet and its address is not present in the route record of the packet. A route reply is generated by the destination or by any of the intermediate nodes when it knows about how to reach the destination.

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

AODV [11] is basically an improvement of DSDV. But, AODV is a reactive routing protocol instead of proactive. It minimizes the number of broadcasts by creating routes based on demand, which is not the case for DSDV. When any source node wants to send a packet to a destination, it broadcasts a route request (RREQ) packet. The neighboring nodes in turn broadcast the packet to their neighbors and the process continues until the packet reaches the destination. During the process of forwarding the route request, intermediate nodes record the address of the neighbor from which the first copy of the broadcast packet is received. This record is stored in their route tables, which helps for establishing a reverse path. If additional 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 drifted node can detect the link failure and sends a link failure notification 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.

## IV. PROPOSED HYBRID ROUTING PROTOCOLS :MAJOR FEATURES

POSITION BASED HYBRID ROUTING ALGORITHM:

PBR[12] In the previous section, algorithms in MANET were classified into three categories as table driven, on demand and hybrid algorithms. The proposed algorithm, PBHRA takes place in position based algorithm class in hybrid main category. The working principle of infrastructured wireless networks is also benefited in the proposal. As known, there is a central node or base station in infrastructure wireless networks and it is stationary. The nodes in coverage of this station take the information for routing from that and realize the operation of sending and receiving process through this station. However, procedures in infrastructured wireless networks could not be used in *ad hoc* networks since there is not a central node in *ad hoc* networks or in other words, all nodes are mobile.

In the proposed algorithm, a central node, in other words a master node is assigned as it is in infrastructure wireless networks and directs the routing information. When nodes require to send data to a target node, they take the location of target node and the route to achieve it from master node. Accordingly, they send their data through that route. At this stage, the proposed algorithm differs from infrastructured wireless networks since data is sent via central station in infrastructured wireless networks. However in proposed algorithm, the master node behaving as if it is central node helps only while finding the route to achieve the target.

Figure 1. Flow chart of PBHRA algorithm.
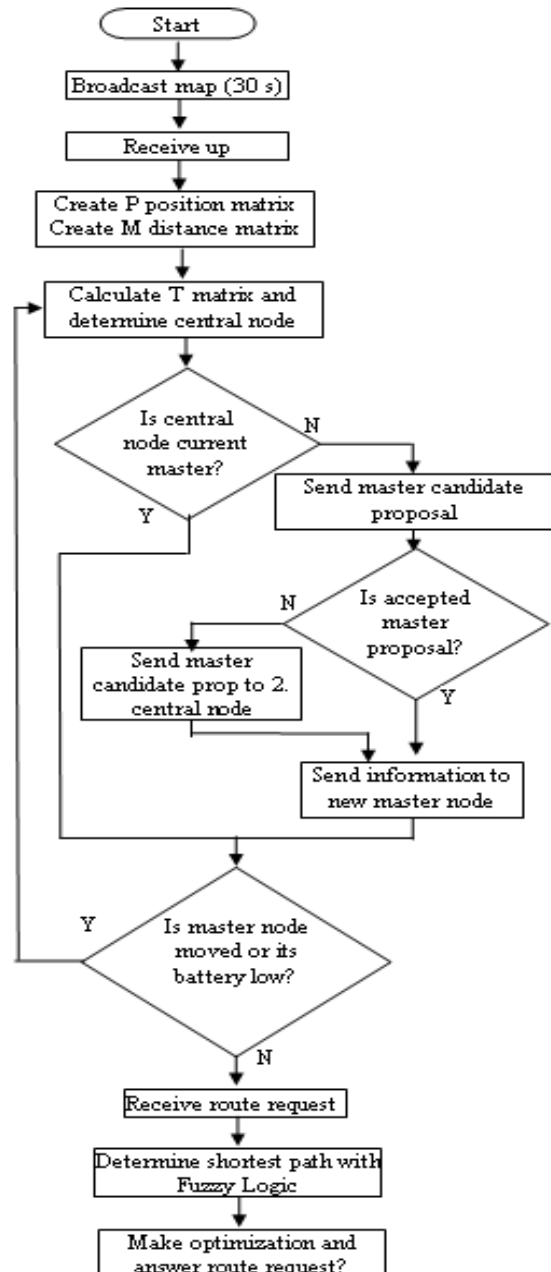
VI. OTHER RECENT WORKS ON MANET ROUTING

This section mentions a list of references of the recent works on routing in MANET so that it could be used as a reference by the practitioners. Some of these works have

taken the major routing protocols as their bases and some of them have enhanced various performances of the previous routing protocols. Mentionable recent works are: node-density-based routing [13], load-balanced routing [14], optimized priority based energy-efficient routing [15], reliable on-demand routing with mobility prediction [16], QoS routing [17], on-demand utility-based power control routing [18], secure position-based routing protocol [19], scalable multi-path on-demand routing [20], etc.

VII. CONCLUSION

This paper presents a number of routing protocols for MANET, which are broadly categorized as proactive and reactive. Proactive routing protocols tend to provide lower latency than that of the on-demand protocols, because they try to maintain routes to all the nodes in the network all the time. But the drawback for such protocols is the excessive routing overhead transmitted, which is periodic in nature without much consideration for the network mobility or load. On the other hand, though reactive protocols discover routes only when they are needed, they may still generate a huge amount of traffic when the network changes frequently. Depending on the amount of network traffic and number of flows, the routing protocols could be chosen. When there is congestion in the network due to heavy traffic, in general case, a reactive protocol is preferable. Sometimes the size of the network might be a major considerable point. For example, AODV, DSR are some of the protocols suitable for relatively smaller networks. Network mobility is another factor that can degrade the performance of certain protocols. When the network is relatively static, proactive routing protocols can be used, as storing the topology information in such case is more efficient. On the other hand, as the mobility of nodes in the network increases, reactive protocols perform better. Overall, the answer to the debating point might be that the mobility and traffic pattern of the network must play the key role for choosing an appropriate routing strategy for a particular network. It is quite natural that one particular solution cannot be applied for all sorts of situations and, even if applied, might not be optimal in all cases. Often it is more appropriate to apply a hybrid protocol rather than a strictly proactive or reactive protocol as hybrid protocols often possess the advantages of both types of protocols.

ACKNOWLDGMENT

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