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Energy Proficient Position Based Routing In Mobile Ad Hoc Network: A Survey

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ABSTRACT:

Mobile Ad hoc network (MANET) is a collection of mobile nodes that are communicate with each other in the absence of centralized administration and fixed infrastructure. In MANET each node having a routing capability but their mobility speed are different and due to mobile behaviour it is difficult to find out the location of mobile nodes. Due to mobility the routing procedure will affected then the multipath routing protocols are one of best option to reduce the problem of mobility but in multipath routing protocol are phases the problem of flooding. Now Location based routing is one of the possible options to find the location of each mobile node through global positioning system and only that location routing procedure will call. But energy is also one of the main constraints in MANET because if any node having sufficient energy then this one is capable to send, receive and forward the packets in network. Now in this paper we study the approaches in all three areas like Routing, Energy and Location based protocols in Mobile Ad hoc network and examines the performance of different proposed approaches that are discussed in this survey, that provides the important suggestion about to do something new research in this field.

KEYWORDS: *- MANET, Mobility, Multipath routing, Location and Energy.*

I. INTRODUCTION

Mobile ad hoc network are self organised without any administration capability. Ad hoc networks [1] can be subdivided into two classes like static and mobile. In static ad hoc networks the position of a node may not change once it has become part of the network. In mobile ad hoc networks, systems may move arbitrarily. Examples where mobile ad hoc networks may be employed are the establishment of connectivity among handheld devices or

between vehicles. Since mobile ad hoc networks change their topology frequently and without prior notice, routing in such networks is a challenging task.

In MANET, operations of nodes rely on batteries or other exhaustible power supplies for their energy [2]. Hence depletion of batteries will have greater effect on overall network. As a consequence, energy saving is an important system design criterion. Furthermore, nodes have to be power-aware: the set of functions offered by a node depends on its available power (CPU, memory, etc.) [3]. Significant energy savings can be obtained at the routing level by designing minimum energy routing protocols that take into consideration the energy costs of a route when choosing the appropriate route. The routing protocols [4] consist of finding the routes between a source node and a destination node. The established route can be used to compensate for the dynamic and unpredictable nature of ad hoc networks. Routing protocols have to suggest best possible path from source to destination for efficient data transfer. For any application, the mobility of nodes as well as limited battery resources must be considered as design issues for expecting best performance from the network under consideration. It is very difficult to have correct data delivery under mobility conditions and to save the node power at the same time.

The rest of the paper is organized as follows. Section 2 presents the overview of Routing Protocol in Ad hoc network. Section 3 describes about AODV routing Protocol. Section 4 describes the DREAM Location based protocol. Section 5 describes Energy Constraint in MANET .Section 6 presents the Literature Survey and Section 7 describes the Conclusion.

II. ROUTING PROTOCOLS

Routing protocols use the information about the links that exist in the network to perform packet forwarding. They can be further divided into proactive, reactive, and hybrid approaches.

*A. **Proactive Routing Protocols**:*

Proactive protocols like Destination Sequenced Distance Vector (DSDV) [1], Optimized Link State Routing (OLSR) [5] 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.

B. ***Reactive Routing Protocols****:*

The reactive routing protocols Dynamic Source Routing protocol (DSR) [6], Ad Hoc on Demand Distance Vector protocol (AODV) [7], Temporally Ordered Routing Protocol (TORA) [8] 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.

C. ***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 like ZRP [9].

III. AODV ROUTING PROTOCOL

The Ad hoc On-Demand Distance Vector (AODV) routing algorithm enables dynamic, self-starting, multihop routing between participating mobile nodes wishing to establish and maintain an ad hoc network. AODV protocol allows mobile nodes to obtain routes quickly for new destinations, and does not require nodes to maintain routes to destinations that are not in active communication. AODV protocol allows mobile nodes to respond to link breakages and changes in network topology in a timely manner. The operation of AODV is loop-free, and by avoiding the Bellman-Ford "counting to infinity" problem offers quick convergence when the ad hoc network topology changes (typically, when a node moves in the network). When links break, AODV causes the affected set of nodes to be notified so that they are able to invalidate the routes using the lost link. One distinguishing feature of AODV is its use of a destination sequence number for each route entry. The destination sequence number is created by the destination to be included along with any route information it sends to requesting nodes. Using destination sequence numbers ensures loop freedom and is simple to program. Given the choice between two routes to a destination, a requesting node is required to select the one with the greatest sequence number. Route Requests (RREQs), Route Replies (RREPs), and Route Errors (RERRs) are the message types defined by AODV.

IV. DISTANCE ROUTING EFFECT ALGORITHM FOR MOBILITY

Distance Routing Effect Algorithm for Mobility (DREAM) framework [10], each node maintains a position database that stores position information about each other node that is part of the network. It can therefore be classified as an all-for-all approach. An entry in the position database includes a node identifier, the direction of and distance to the node, as well as a time value that indicates when this information was generated. Of course, the accuracy of such an entry depends on its age. Each node regularly floods packets to update the position information maintained by the other nodes. A node can control the accuracy of its position information available to other nodes by:

- The frequency at which it sends position updates (temporal resolution)
- Indicating how far a position update may travel before it is discarded (spatial resolution)

The temporal resolution of sending updates is coupled with the mobility rate of a node (i.e., the higher the speed, the more frequent the updates). The spatial resolution is used to provide accurate position information in the direct neighbourhood of a node and less accurate information at nodes farther away. The costs associated with accurate position information at very remote nodes can be reduced since, as the authors argue, "the greater the distance separating two nodes, the slower they appear to be moving with respect to each other" (termed the distance effect) [11].

V. ENERGY CONSTRAINT IN MANET

MANETs lack fixed infrastructure and nodes are typically powered by batteries with a limited energy supply wherein each node stops functioning when the battery drains. One of the most critical issues in mobile ad hoc networks (MANET) is energy saving. Since mobile nodes usually operate on batteries, a power saving technique is required to guarantee a certain amount of device lifetime. It also directly affects the network lifetime because mobile nodes themselves collectively form a network infrastructure for routing in a MANET. Energy efficiency can be improved in two different ways: Reducing the energy used for active communication activities and reducing the energy spent during an inactive period. Energy efficiency is an important consideration in such an environment. Since nodes in MANETs rely on limited battery power for their energy, energy-saving techniques aimed at minimizing the total power consumption of all nodes in the group (minimize the number of nodes used to establish connectivity, minimize the control overhead and so on) and at maximizing the life

span should be considered. As a result of the energy constraints placed on the network's nodes, designing energy efficient routing protocols is a crucial concern for MANETs, to maximize the lifetime of its nodes and thus of the network itself [12], [13].

VI. RELATED WORK

Several energy-efficient techniques are proposed to reduce energy consumption in MANET. These techniques use energy aware metrics to establish a path in a network. Some of them are motioned here.

In this research [14] paper is presenting an Energy-Efficient Routing protocol that will improve the utilization of link by balancing the energy consumption between utilized and underutilized nodes to meet the above challenge. The protocol deals with various parameters as Residual Energy, Bandwidth, Load and Hop Count for route discovery. The failure of any node in the route when the transmission of data packet is in progress leads to the degradation of the QoS (Quality of Service). To overcome with this issue, the paper proposes two methods for maintenance of the route.

GPSR (Greedy perimeter stateless routing) [15] is based on two principles: greedy forwarding and perimeter forwarding. In greedy forwarding it chooses the node that is lying closer to destination and forwards the packet via that node. When packet come to a dead end then it performs perimeter forwarding in which position using relative neighbourhood graph (RNG) is calculated and traversing is done using right hand rule.

LABAR (Location Area Based Ad hoc Routing) [16] routing protocol is based on virtual backbone formation which is used for representing position of nodes. G-node (root) initiates virtual backbone formation and tracks the information using GPS which later on helps in directional routing over the network. Source G-node instructs node of its zone for how to forward packet inside the zone. Each zonal node consults its G-node for best directionality instructions to forward packet to destination node.

LAKER (Location Aided Knowledge Extraction Routing) [17] uses a cached guiding route which helps in assisting the route discovery process. In this protocol structure do not change rapidly. So it uses guiding locations from source to destination for easy transmission. LAKER request zone helps in reducing routing overhead involved during transmission. Guiding route also helps in finding void areas present over the network.

Geographical protocols uses location information for traversing so these protocol calculate the position of each node using GPS [18,19] (Global positioning system) which requires use of GPS satellite and GPS receiver for communication and the whole process works as follows:

- GPS receiver communicates with GPS satellite for calculating its position.
- Receiver receives the message via satellites.
- Using those signals position is then displayed in the form of latitude and longitude.

Niranjan Kumar Ray and Ashok Kumar Turuk have discussed different energy efficient techniques for wireless ad-hoc network [20]. One of the techniques is based on reduction of number of route request messages. In second Power control technique, next hop node is chosen depending on the power level of the node. Topology control technique is used to remove the energy-inefficient link from the network by examining the power level of the node. This technique helps network devices to take decision about their transmission range.

Morteza Maleki, Karthik Dantu, and Massoud Pedram in [21] have proposed a new power-aware source-initiated (on demand) routing protocol for mobile Ad-hoc networks that increase the network lifetime up to 20%. A greedy policy was applied to fetched paths from the cache to make sure no path would be overused and also make sure that each selected path has minimum battery cost among all possible path between two nodes. Power-aware Source Routing (PSR) has taken care of both the node mobility and the node energy depletion that may cause a path to become invalid.

Energy-based Route Discovery Mechanism in Mobile Ad Hoc Networks [22] selects the route which has lowest energy cost in the network. The energy cost represents energy consumption of the network in order to prolong all connections between source and destination nodes. The energy cost is calculated using realistic energy consumption modelling which is used the channel quality to decide whether each packet is successfully received.

Location aided Energy-Efficient Routing protocol (LEER) protocol finds out the all possible paths from source to destination and selects minimum energy path to route the packets [23]. The selection of next hop node is based on whether it is situated near to destination than to source as well as transmit power of that node.

An energy aware routing scheme in location based ad-hoc network has proposed by Jangsu Lee, Seunghwan Yoo and Sungchun Kim in [24]. This method modifies the LAR protocol in

which the virtual grid is applied to ad hoc network region and high energy node is selected as header for each grid which communicates information about nodes in that particular grid. The transmit power of nodes is adjusted according to the distance between them. The next hop node will be selected based on transmit power and its distance from the destination.

Nen-Chung Wang and Si-Ming Wang [25] have proposed a scheme which decides the baseline line between the source node and the destination node, for route discovery. The next hop is then selected based on baseline by broadcasting the request packets in request zone. The neighboring node with the shortest distance to the baseline is chosen as the next hop node. This method reduces control overheads by finding a better routing path than LAR scheme. They have proposed a partial reconstruction process for maintaining broken links of routing path.

Arthi Kothandaraman has proposed a protocol which based on transmission power control [26]. It varies the transmission range of a node to exclusively accommodate an independent node's neighbor set. This purely distributed as well as protocol independent scheme and preserves connectivity, and allows low power transmissions.

ZRP [27] 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 neighbours are or the number of nodes that are in the radio range of sender. A neighbour is a node by that sender direct communication can be established, and that is, within one hop transmission range of a node. Neighbour discovery information is used as a basis for Intra-zone Routing Protocol (IARP), which is described in detail in [28]. 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 neighbour or not. If yes, then it marks all of its known neighbouring nodes in its same zone as covered. 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.

VII. CONCLUSION

In order to facilitate secure (in terms of lack of energy link are break suddenly) and reliable communication within a MANET, an efficient routing protocol is required to discover routes between mobile nodes. Energy efficiency and location finding some challenges faced in MANETs, especially in designing a routing protocol. In this paper, we surveyed a number of energy efficient routing protocols with location based routing protocols. In many cases, it is difficult to compare these protocols with each other directly since each protocol has a different goal with different assumptions and employs mechanisms to achieve the goal. According to the study, these protocols have different strengths and drawbacks. A protocol can hardly satisfy all requirements. In other words, one routing protocol cannot be a solution for all energy efficient and location based issues that are faced in MANETs, but rather each protocol is designed to provide the maximum possible requirements, according to certain required scenarios. In future we simulate the location based DREAM protocol with AODV Routing can be modified to provide support for reliable communication, minimize storage and resource consumption, ensure optimal paths and minimize network load.

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