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Study of Location Based Energy Efficient AODV Routing Protocols In MANET

Sourabh Pandey, Rajender Singh Yadav
Dept of Electronics and communication Gyan Ganga College Of Technology, Jabalpur (India)
Dept of Electronics and Communication Gyan Ganga College Of Technology, Jabalpur (India)

ABSTRACT: *A Mobile Ad hoc Network (MANET) is a collection of mobile hosts that move in different directions and speeds without the need to maintain connectivity with existing network infrastructure. If two mobile nodes are within each other's transmission range, they can communicate with each other directly; otherwise, the nodes in between have to forward the packets for them. In such a case, every mobile node has to function as a router to forward the packets for others. Thus, routing is a basic operation for the MANET.Energy is one of the important issue in Mobile Ad hoc Network (MANET). Nodes are in network are working in the presence of limited energy then energy efficient routing is necessary for reducing energy consumption. Efficient minimum energy routing schemes can greatly reduce energy consumption and extends the lifetime of the networks. Now location aware DREAM protocol is reduces the energy consumption because due to the awareness of location less number of routing packets are flooded in the network by that energy consumption are reduces. In this paper we focus on the previous researches that had been done in field of location aware energy efficient routing in MANET.*

Key words: *MANET, Location aware, Energy, Dream, Routing.*

I. INTRODUCTION

Mobile Ad Hoc Networks (MANETs) has become one of the most prevalent areas of research in the recent years because of the challenges [1] it poses to the related protocols. MANET is the new emerging technology which enables users to communicate without any physical infrastructure regardless of their geographical location, that's why it is sometimes referred to as an infrastructure less network. The proliferation of cheaper, small and more powerful devices make MANET a fastest growing network. An ad-hoc network is self-organizing and adaptive. Device in mobile ad hoc network should be able to detect the presence of other devices and perform necessary set up to facilitate communication and sharing of data and service. Ad hoc networking allows the devices to maintain connections to the network as well as easily adding and removing devices to and from the network. Due to nodal mobility, the network topology may change rapidly and unpredictably over time. The network is decentralized, where network organization and message delivery must be executed by the nodes themselves. Message routing is a problem in a decentralize environment where the topology fluctuates.

While the shortest path from a source to a destination based on a given cost function in a static network is usually the optimal route, this concept is difficult to extend in MANET. The set of applications for MANETs is diverse, ranging from large-scale, mobile, highly dynamic networks, to small, static networks that are constrained by power sources. Besides the legacy applications that move from traditional infrastructure environment into the ad hoc context, a great deal of new services can and will be generated for the new environment. MANET is more vulnerable than wired network due to mobile nodes, threats from compromised nodes inside the network, limited physical security, dynamic topology, scalability and lack of centralized management. Because of these vulnerabilities, MANET is more prone to malicious attacks.

II. OVERVIEW OF ROUTING PROTOCOLS

Routing protocols have been developed for ad hoc networks and have been classified into two main categories Proactive or (table-driven) protocols, Reactive (on-demand) protocols and Hybrid routing protocol. In a proactive routing protocol, nodes periodically exchange routing information with other nodes in an attempt to have each node always know a current route to all destinations. In a reactive protocol, nodes exchange routing information only when needed, with a node attempting to discover a route to some destination only when it has a packet to send to that destination. Ad hoc network routing protocols that are hybrid have combination of table-driven and on-demand mechanisms.

AODV is a reactive routing protocol; that do not lie on active paths neither maintain any routing information nor participate in any periodic routing table exchanges. Further, the nodes do not have to discover and maintain a route to another node until the two needs to communicate, unless former node is offering its

services as an intermediate forwarding station to maintain connectivity between other nodes [2]. Route Discovery process is initiated by broadcasting a Route Request (RREQ) packet to its neighbors. Each neighboring node either responds the RREQ by sending a Route Reply (RREP) back to the source node or rebroadcasts the RREQ to its own neighbors after increasing the hop count field. If a node cannot respond by RREP, it keeps track of the routing information in order to implement the reverse path setup or forward path setup [2].

The destination sequence number specifies the freshness of a route to the destination before it can be accepted by the source node. Eventually, a RREQ will arrive to node that possesses a fresh route to the destination. If the intermediate node has a route entry for the desired destination, it determines whether the route is fresh by comparing the destination sequence number in its route table entry with the destination sequence number in the RREQ received. The intermediate node can use its recorded route to respond to the RREQ by a RREP packet, only if, the RREQ's sequence number for the destination is greater than the recorded by the intermediate node.

Instead, the intermediate node rebroadcasts the RREQ packet. If a node receives more than one RREPs, it updates its routing information and propagates the RREP only if RREP contains either a greater destination sequence number than the previous RREP, or same destination sequence number with a smaller hop count. It restrains all other RREPs it receives. The source node starts the data transmission as soon as it receives the first RREP, and then later updates its routing information of better route to the destination node. Each route table entry contains the following information:

- Destination node
- Next hop
- Number of hops
- Destination sequence number
- Active neighbors for the route
- Expiration timer for the route table entry

The route discovery process is reinitiated to establish a new route to the destination node, if the source node moves in an active session. As the link is broken and node receives a notification, and Route Error (RERR) control packet is being sent to all the nodes that uses this broken link for further communication. And then, the source node restarts the discovery process.

III. ENERGY EFFICIENCY ISSUE IN MANET

Nodes within an ad hoc network generally rely on batteries (or exhaustive energy sources) for power. Since these energy sources have a limited lifetime, power availability is one of the most important constraints for the operation of the ad hoc network. There are different sources of power consumption in a mobile node. Communication is one of the main sources of energy consumption.

Following are the types of energy consumption that have been identified:

- Energy consumed while sending a packet
- Energy consumed while receiving a packet
- Energy consumed while in idle mode
- Energy consumed while in sleep mode

It should be noted that the energy consumed during sending a packet is the largest source of energy consumption of all modes

Since the rate of battery performance improvement is rather slow currently, and in the absence of breakthroughs in this field, other measures have to be taken to achieve the goal of getting more performance out of the currently available battery resources. Within this study, we focus our efforts on methods to reduce the power consumed in communications between ad hoc network nodes.

IV. LOCATION WITH DREAM

DREAM [3] is a location-based routing protocol work for Ad-hoc networks. It stands for Distance Routing Effect Algorithm for Mobility. Here in this comparison distance and mobility plays an important role, so in our named as Distance Routing Effect Algorithm for Mobility (DREAM) protocol for ad hoc networks. DREAM protocols have some desirable properties of providing bandwidth and energy efficiency. We can say that with respect to existing protocols, in DREAM more bandwidth and energy (required for transmission in each mobile node) can be used for the transmission of data messages. Most importantly:-

a. The rate of control message generation is determined and optimized according to the mobility rate of each node individually.

b. Due to the "distance effect" the number of hops (radius from the moving node) it will be allowed to travel in the network before being discarded will only depend on the relative (geographic) distance between the moving node and the location tables being updated.

DREAM protocol provide loop-free path, since each data message propagates away from its source in a specific direction. DREAM protocol is also adaptive to mobility, since the frequency with which the location information is disseminated depends on the mobility rate.

V. LITERATURE SURVEY

There are various previous work have been done in the field of Efficient energy, for the improvement of routing with energy efficient techniques.

In this paper [4] proposed a new protocol that consider in both areas of routing and energy. At first, propose a more efficient routing method which minimizes the spread of unnecessary control messages. Secondly, an energy aware method is proposed to select proper transmission power by the distance between nodes. This technique is made to provide efficient routing by minimizing the flooding of unnecessary control message, considering limited energy of mobile node and using appropriate transfer power to communication. And finally, we make a new function to select next hop which considers both of distance and energy. The result of simulation shows that performance of lifetime is improved about 12 % compared with LAR.

The proposed scheme [5] controls the transmission power of a node according to the distance between the nodes. It also includes energy information on route request packet and selects the energy efficient path to route data packets. LAR1 protocol uses location information of a node for setting the path from source to destination. We take this feature of LAR1 as a key factor in designing of variable range technique. The main aim is to design a technique of variable transmission power control to reduce overall energy consumption of the network. RREQ in LAR1 protocol consists of source location and destination location information. We have used this information to calculate the distance between the nodes. We also embed the energy factor of the node in RREQ packet for selection of energy efficient path.

Pariza Kamboj and Ashok.K.Sharma,[6] gives the concept of local connectivity technique and preventive route reconfiguration on the basis of the current status of the nodes are being proposed that attempts to improve the performance and reliability in terms of reduced overhead, power and bandwidth requirement. These techniques also ensure good reduction in latency in case of link breakages and prevention of the network from splitting. The Energy Efficient Routing Multicast Protocol for MANET with Minimum Control Overhead is compared with other shared tree multicast protocol i.e. MAODV. Comparison was made on various parameters like Energy Consumption, Packet Delivery Ratio, Delay, and Throughput.

H. Vijayakumar , M. Ravichandran EELAR [7] utilizes location information of mobile nodes with the goal of decreasing routing-related overhead in mobile and ad hoc networks. It uses location information of the mobile nodes to limit the search for a new route to a smaller area of the ad hoc network which results in a significant reduction in the number of routing messages and therefore the energy consumption of the mobile nodes batteries is decreased significantly.

This paper [8] presents the results of simulation done in identifying suitable ad hoc routing protocol that can be used for the target mobile grid application. The simulation comparing three ad hoc routing protocols named DSDV, DSR and AODV. In this paper, we mainly target the performance comparison based on packet delivery fraction and normalized routing load. In the future, extensive complex simulations could be carried out in gain a more in-depth performance analysis of the ad hoc routing protocols. This would include delay of data packet delivery and performance comparison on location-based ad hoc routing protocols.

A mobile ad hoc network (MANET) [9] consists of autonomous mobile nodes, each of which communicates directly with the nodes within its wireless range or indirectly with other nodes in a network. In order to facilitate secure and reliable communication within a MANET, an efficient routing protocol is required to discover routes between mobile nodes. The field of MNAETs is rapidly growing due to the many advantages and different application areas. Energy efficiency and security are some challenges faced in MANETs, especially in designing a routing protocol. In this paper, we surveyed a number of energy efficient routing protocols and secure 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

security issues that are faced in MANETs, but rather each protocol is designed to provide the maximum possible requirements, according to certain required scenarios.

We have proposed a node-disjoint multipath routing protocol GMR [10] with the group mobility model. The GMR protocol adopts intra-group routing and inter-group routing to adapt two situations: within a group and among groups. Intra-group routing uses a proactive method, which is suitable for the intra-group where nodes have the same mobile pattern. Intergroup routing uses a reactive method with the zoning method, which is adaptive to the dynamic topology, and limits the region of broadcasting RREQ packets. Thus, the GMR protocol has good scalability in large and dense MANETs.

This paper proposes a new MANET routing algorithm [11] that includes quadrant based opportunistic routing, an intelligent energy matrix and energy status request messages with packet receipt acknowledgement notification. The proposed algorithm uses an intelligent energy matrix that creates a look up table including the key characteristics: reputation value, residual battery level and energy consumption. The proposed algorithm balances the traffic uniformly across four intermediate nodes in any desired quadrant. The simulation results presented in this paper demonstrate that due to the inclusion of the energy matrix and quadrant based routing, the number of broadcast messages decreases, reducing data flooding, providing improved channel efficiency and improves bandwidth utilization. Load balancing also increases the lifetime of intermediate nodes which provides improved route stability.

In this paper, we compare the performance of different protocols for ad hoc networks [12] Multipath routing based on fresnel zone routing (FZR), and Energy aware Node Disjoint Multipath Routing (ENDMR) protocol. Simulation results show that, with the proposed network coding in ad hoc network multipath routing protocol (NC-MR), packet delivery ratio, network lifetime and packet loss can be improved in most of cases. It is an available approach to multipath routing decision.

It constructs a shared bi-directional multicast tree [13] for its routing operations rather than a mesh, which helps in achieving more efficient multicast delivery. The algorithm uses the concept of small overlapped zones around each node for proactive topology maintenance within the zone. Protocol depends on the location information obtained using a distributed location service, which effectively reduces the overheads for route searching and shared multicast tree maintenance. In this paper a new technique of local connectivity management is being proposed that attempts to improve the performance and reliability. It employs a preventive route reconfiguration to avoid the latency in case of link breakages and to prevent the network from splitting.

Location Prediction Based Routing Protocol [14] does not require the periodic broadcast of beacons in the neighborhood and it assumes nodes are position-aware and the clocks across all nodes are synchronized. In LPBR [3], each node forwards the Route-Request packet after incorporating all the relevant parameters. The destination node collects the location update vector information of all the nodes in the network from the RREQ packets and sends a Route-Reply packet to the source on the minimum hop. In LPBR [3] the source node uses the route learnt through the latest LPBR-RREP packet to send the data packets. If an intermediate node could not forward the LPBR-RREP packet, it sends a LPBR-RREP-ERROR packet to the destination informing the failure. The destination node discards all the relevant information and the source initiates the next flooding based route discovery after timing out for the LPBRRREP packet.

Location Aided Knowledge Extraction Routing Protocol [15] uses an on demand request-reply mechanism in route discovery. LAKER [15] gradually discovers knowledge of topological characteristics such as population density distribution of the network. It is based on a set of guiding routes, which includes a chain of important positions between a pair of source and destination locations. LAKER is especially suitable for mobility models where nodes are not uniformly distributed**.**

VI. CONCLUSION

Mobile Ad hoc networks are generally more susceptible to fixed or hardwired networks in term of battery energy. In general most of the schemes lack with practical implementation. Moreover, those who have been implemented are limited to a particular environment. Lack of the studies about these schemes is also an issue. Apart from some of the main schemes existing literature are silent about most of the schemes discussed in this paper. This paper has light on different energy based concepts of MANET that based on energy consumption and location based energy efficient routing, that can help to observe the usefulness of different research concepts. Especially when energy consumption has a major factor of concern for MANET, we need to

study a lot of issues and considerations based on energy consumption. Proposed different efficient energy routing schemes can greatly reduce energy consumption and extends the lifetime of the networks.

In future we measure the performance of location based AODV with energy and applying energy threshold scheme on it and compare the results with normal energy based AODV routing protocol. If the performance of energy threshold based location aware routing protocol is better than existing energy based AODV then it definitely reduces energy consumption and enhances network life time.

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