iJRASET
International Journal For Research in
Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 2 **Issue:** IV **Month of publication:** April 2014

DOI:

ISSN: 2321-9653

INTERNATIONAL JOURNAL FOR RESEARCH IN APPLIED SCIENCE AND ENGINEERING TECHNOLOGY (IJRASET)

Power Efficient Location Based Routing

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***Abstract*—In wireless ad-hoc networks, there are several characteristics different among wired networks. The differences are varying of network topology, limited resources like bandwidth and energy and so on. In these days as the power issue becomes more significant, it is required to research about the efficient resource allocation methods to optimize in wireless networks. Previous work on routing in MANETs has resulted in numerous routing protocols that aim at satisfying constraints such as minimum hop or low energy. In the paper, we improve LAR (Location-Aided Routing) which is one of the most prominent location based routing methods. This kind of method uses information about the location of the mobile node through GPS technique. Our new protocol deals with power and uptime value of the node. At first, we propose a more efficient routing method which improves the quality of services in terms of power.**

Keywords— MANET, LAR Routing, GPS Techniques, Mobility.

INTRODUCTION

A mobile Ad hoc network is network of mobile nodes which are capable to create a dynamic topology without any middle administration. Thus, the task of proficient routing the data packets in terms of QoS and energy utilization becomes very important. Many routing protocols have been proposed for efficient routing [1,2,3,4].Earlier on-demand routing protocols [5,6,7] were based on flooding the routing packets in all directions irrespective of the location of the destination node, result is that the increase of traffic in the network, that cause congestion in the network. This process also consumes the power of the node due to receiving and forwarding of RREQ packet. Thus, the task of efficient routing the data packets in terms of QoS and energy consumption becomes very important factor for mobile ad-hoc network. Many routing protocols have been proposed for efficient routing. Earlier on-demand Routing protocols were based on flooding the routing packets in all directions irrespective of the location of the destination node, result increase bandwidth consumption as well as power whereas table driven protocol maintains a large amount of information as well as they perform large computations in order to select the best node which results in premature that loss of battery life. This flooding was reduced by the Location Aided Routing Protocols. These location based protocols use the Global Positioning System (GPS) to find the direction of propagation of the packets. By finding the direction of propagation we can decrease the flooding by using Location Based Routing Approach. In this paper, we are proposing a power aware routing approach which helps to decrease the routing overhead by utilizing the concept of global location information and provide an optimal path in terms of power. The proposed protocol "Power Efficient Location Based Routing" protocols use location information to minimize the Request Zone to reach the destination node.

RELATED WORK

Nodes in the ad hoc network are dependent on the batteries for the power supply. As batteries have limited life, it becomes imperative to find the routing protocols which require less number of calculations. In recent times, many routing protocols have been proposed which uses the Global Positioning System (GPS). The GPS Scheme uses the concept of forwarding region. An intermediate node forwards the data packets to the next intermediate

ISSN: 2321-9653

INTERNATIONAL JOURNAL FOR RESEARCH IN APPLIED SCIENCE AND ENGINEERING TECHNOLOGY (IJRASET)

node only if it lies in within the forwarding region. A node using GPS needs to obtain the various co-ordinates such as latitude, longitude and altitude coordinates. This kind of geo-casting is helpful in sending emergency messages to the small area. The GPS plays the most vital role in all the location based routing protocols like DREAM, LAR, LARDAR, ILAR etc.

NODE MOBILITY

Nodes may move arbitrarily inside MANETs. This unbounded nature of nodes in MANETs makes MANETs exible in deployment. However, it also makes links in MANETs instantaneous. The probability of successful packet transmissions between two nodes using wireless channels can be low when the distance between these two nodes is large. The link between these two nodes can be regarded as completely failed when their separation is larger than a threshold. Generally, the threshold is referred to as the communication range. In the rest of this report, we assume that a link between two nodes ceases to exist when the distance between these two nodes is larger than the communication range. Otherwise, all links have a constant quality, in which the probability of successful transmissions through this link is equal to P. To handle packet losses caused by node mobility or network congestion, the holistic routing protocol does not depend on any previous knowledge of its neighbors. Instead, it integrates the next-hop forwarder discovery function with the lost link recovery approach in its operation to dynamically replace failed links or links to congested nodes.

NETWORK SLEEP TIME

In [2], Chia et al. propose that devices which are not currently active in any data communication may enter a sleep state, but can be powered up remotely through a signal using a simple circuit based on RF technology. Radio devices select different time-out values (sleep patterns), to enter various sleep states depending on their battery status and quality of service. In [3], Singh et al. employ a MAC layer protocol for PAMAS (Power Aware Multiple Access protocol with Signaling) in which nodes overhearing transmissions between two other nodes turn themselves off and wake up after an interval of time equal to the total transmission time as indicated in the RTS/CTS message exchange between the sender-receiver pairs. They deploy metrics such as minimize energy consumed per packet or minimize time to network partition, and verify these metrics with their proposed MAC layer protocol. In proposed protocol, the sleep and awake schedule is determined from prediction of link expiration based on the queue contents of the packet scheduler and the network interface device timeout value. The DPM schedule is somewhat conservative since it ignores the possibility of more packets being added before the timeout expires.

LAR (Location Aided Routing in Mobile Adhoc Networks)[2] is an on demand routing protocol which uses the location information to identify the request zone and expected zone. Request zone in this protocol is the rectangular area including both sender as well as receiver. By decreasing the search area, this protocol leads to the decrease in routing overheads. DREAM (A Distance Routing Effect Algorithm for Mobility) [10] is a table driven protocol which maintains each node's location information in routing tables. Data packet is send by using this location information. To maintain the location table accurately, each node periodically broadcasts a control packet containing its own coordinates.

This paper [12] introduced an Energy Efficient Location Aided Routing (EELAR) Protocol for MANETs that is based on the Location Aided Routing (LAR). EELAR makes significant reduction in the energy consumption of the mobile nodes batteries by limiting the area of discovering a new route to a smaller zone. Thus, control packets overhead are significantly reduced. In EELAR a reference wireless base station is used and the network's circular area centered at the base station is divided into six equal sub-areas. At route discovery instead of flooding control packets to the whole network area, they are flooded to only the sub-area of the destination mobile node. The base station stores locations of the mobile nodes in a position table.

This paper [13] proposed a location-based routing protocol called LARDAR. There are three important characteristics be used in our protocol to improve the performance. Firstly, it used the location information of destination node to predict a smaller triangle or rectangle request zone that covers the position of destination in the past. The smaller route discovery

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space reduces the traffic of route request and the probability of collision. Secondly, in order to adapt the precision of the estimated request zone, and reduce the searching range, we applied a dynamic adaptation of request zone technique to trigger intermediate nodes using the location information of destination node to redefine a more precise request zone. Enhance Location Based Power Aware Routing (ELBPAR) is a protocol which helps in dealing with the two major quality factors bandwidth and RREQ flooding. In ELBPAR scheme, messages can be transmitted in a request zone based on the minimum, maximum slope limit. This limitation will help in reduction in flooding of RREQ packet and in turn helpful in reduction in bandwidth consumption. Bandwidth consumption can be further reduced by using the concept of threshold value of bandwidth. Threshold bandwidth is use to check the required bandwidth on every node which receive the RREQ packet and forward the RREQ packet to next node.

This hybrid approach [14] combines geographic routing with topology based routing protocol. It overcomes the major problems of reactive routing and the end-to-end delay is reduced by this algorithm. In addition, the path length performance of geographic routing is also improved. Simulation results show that our routing protocol outperforms the pure reactive routing in terms of average delay and packet delivery rate.

PROBLEM DEFINATION

Improved Hybrid Location based routing protocols use location information to minimize the Request Zone to reach the destination node. Improved Hybrid Location based routing protocols also help in reducing the overheads at each node by decreasing the number of calculations performed at each node. But if any node of the current path is not having the require amount of power for communication, then the communication path break in between communication and this cause the packet loss and delay.

PROPOSED WORK

There are many location based routing protocol that provide path from source to destination in terms of QOS parameter. These routing protocol uses following parameter.

EXPECTED ZONE

Consider, source node s wants to send the data packet to destination node d at time t [8]. Assume that s knows the location of d at time it. Also it also knows velocity (vd) of d with which d is traveling. Maximum distance traveled by d in any direction can be calculated as:

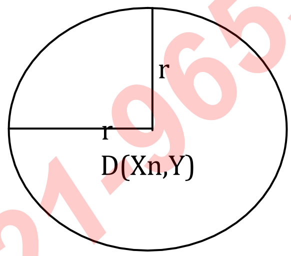
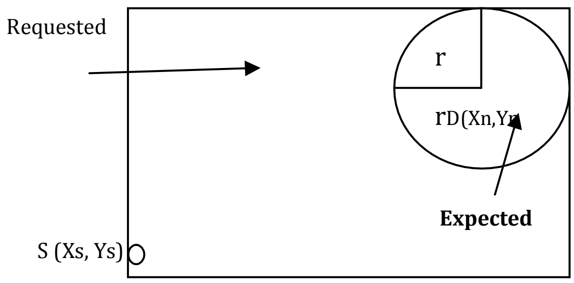


Figure 3.1 Expected Zone

$$r = VD(T - Ti)$$

REQUEST ZONE

Request zone is the area where the request packets are sent or broadcast to find a path from source to destination. In the traditional routing algorithms it is the complete network [8]. For e.g. In AODV, DSR, etc. RREQ packet broadcasts in all directions to find the optimal path from the source to the destination node. LAR tries to minimize the request zone by confining it to the smallest rectangular area containing both sender as well as the receiver.



GLOBAL POSITION SYSTEM

GPS is a system of satellites [3], ground control stations, and receivers that allows users to determine their position. By capturing and storing that position, GPS receivers "digitize" spatial data as they walk, drive, or otherwise traverse the land. Receivers differ in their ability to receive and process GPS signals and

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users can have a huge affect on accuracy depending on the methods used to collect and process data.

1. Broadcast ID:
The broadcast id is a number stored in packet header which is incremented before a new request is disseminated.

2. Source Address:
Source address is address of source node which is used to send the request between source and intermediate node.

3. Destination Address:
Destination Address is address of destination node which is used to receive the reply from the source or intermediate nodes.

4. Available Power list:

This field contains the available power of the node which is used in current path for communication

Maximum and Minimum slope

Source node S initiates a request to send the data packet to destination node D. m1 and m2 are the slopes[6] of the line. D(XT,YT) are the points where the tangents drawn from source to the expected zone touches the expected zone. These two slopes can be calculated from the following quadratic equation.

$$mXD - mXS - YD + YS = r * (1 + m^2)^{1/2}$$

PROPOSED ALGORITHM

```
RREQ Processing Algorithm

if(TTL<=0)
{
        drop the packet;
}
else if (Node_id ==Dest_id)
{
Consume the RREQ packet;
Calculate Averageup_time  of current path;
calculate minimum power node of current path;
        if(minimum_power>threshold_power)
        {
Send RREQ to source with  current path &up_time value  ;
        }
}
else
{
calculate M by using source and current node location value;
            if(M1>M>M2)
            {
            Add node id into visited node list;
            Add node up time value into node up time list;
            Add Available power into available power list of the
               node;
            Flood the RREQ packet to his neighbors;
            }
```

1. Source node 'S' initiates route request to destination node 'D'.
2. S calculates the expected zone and slope of tangent drawn from source to expected zone.
3. S broadcast RREQ packet with Source Id, Destination Id, Broadcast Id, m1 (max. slope), m2 (min slope).
4. At the receiving node N, N will check whether destination Id matches with its own Id. If N is the destination node then consume RREQ and calculate Minimum power node of current path , rout up time value of current path and then revert back RREP packet to source. Else check whether it has already received RREQ packet with the same broadcast Id. If yes, then drop RREQ packet.
5. If TTL is greater than zero then N will calculate m_N (slope of line joining S and N). If m_N lies between m1 and m2 i.e. if m1 ≥ m_N ≥ m2 then N attach its own address to list of visited nodes, attach node up time value, available power of node and re-broadcast the RREQ packet else N drops the RREQ packet.

S (Xs,Ys) is the source node which want to communicate with destination D (Xd,Yd) and 1,2,3,4,5,6,7 are intermediate nodes. Source node S calculate expected zone by using destination coordinate and then calculate the requested zone by using the expected zone. Source node S initiate the RREQ request that packet contain the information like TTL, min_slope, max_slope,, broadcast id, source address, and destination address. All these information is collected by source node before sending the RREQ packet to his neighbors. When source node neighbors receive the RREQ packet then first of all it check the TTL value of the RREQ packet by using above algorithm and send RREP to source with up time value of the path and available power of the path.

CONCLUSION

This new protocol "Power Efficient Location Based Routing" considers areas of routing between source to destination and available power of current path. At first, this approach provides a more efficient routing method which reduces flooding in the network. Secondly, power calculation method is proposed to find the optimal path for communication between source to destination. This protocol provides a stable path in terms of power between source to destination.

ISSN: 2321-9653

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