
Nitin Goyal
Dept. of Computer Science and Engineering
JMIT, Radaur
INDIA
er.nitin29@jmit.ac.in

Alka Gaba
Dept. of Computer Science and Engineering
JMIT, Radaur
INDIA
alkagaba16@gmail.com

Abstract- In wireless ad-hoc networks, there are number of characteristics diverse than wired networks. The diversity is due to change of network topology as well as limited resources like bandwidth and energy and so on. As the bandwidth issue need additional imperative, it is obligatory to research about the efficient resource allocation methods optimized in wireless networks. In the paper, we improve LAR (Location-Aided Routing) which is one of the most famous location based routing methods. It uses information regarding the location of mobile node through GPS technique. Our new protocol considers together areas of routing as well as bandwidth. To improves the quality of services at first, propose a more efficient routing method which. Secondly, a bandwidth aware method is proposed to select proper transmission bandwidth node by using a minimum available bandwidth.

Index Terms—MANET, Expected Zone, Requested Zone, LAR,

I. INTRODUCTION
A key feature of future mobile wireless networks is the ability to adapt as well as exist even without a fixed infrastructure. To establish communication, an ad-hoc network is a collection of possibly mobile devices or nodes without a fixed infrastructure or central administration. To fulfill the dream of seamless network architecture and to play an important role in next generation wireless networks and services, an ad-hoc networking is expected. Thus, the task of efficient outing the data packets in terms of QoS and energy consumption and bandwidth becomes very important. Many routing protocols have been proposed for efficient routing. Earlier on-demand routing protocols were based on flooding the routing packets all directions irrespective of the location of the destination node, result increase bandwidth consumption where as table driven protocol maintains large amount of information as well as they perform large computations in order to select the best node which results in premature loss of battery life. This bandwidth consumption was reduced by the Location Aided Routing Protocols. These location based protocols uses the Global Positioning System (GPS) to find the direction of propagation of the packets. By finding the direction of propagation we can decrease the bandwidth consumption. In this paper, we are proposing a power aware routing approach which helps to decreasing the routing overhead by utilizing the concept of global location information and provide optimal path en terms of bandwidth. The proposed protocol Enhance Location Based Power Aware Routing (ANALAR) protocols use location information to minimize the Request Zone to reach the destination node with a certain amount of bandwidth.

II. RELATED 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.

1. 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 Ti. 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:

\[ r = V_D (T - T_i) \]  

Figure 1 Expected Zone

Indicate the Expected Zone
2. 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 is broadcasted in all directions to find the optimal path from 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 receiver.

![Figure 2 Expected Zone](image)

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

TYPE OF ROUTING PROTOCOL

There is following type of routing protocol those are used by Location Based Routing Protocol.

1. ENERGY AWARE LOCATION BASED ROUTING PROTOCOL

Energy aware location based routing technique use location information by using GPS system and additionally takes a grid method. In this routing protocol each node has GPS in Ad-Hoc network divided by virtual grid [10]. This assumption means that each node knows the location of itself and where they are included in the grid network. To maintaining information of neighborhoods, nodes in each grid communicate each other by beacon message which includes ID, geographical location, and energy. From this communication, node which has the largest energy becomes grid header. And header node is changed when the rest of its energy equals to 1/2 of second node. Grid headers communicate each other by longer period than the one of general node. The data sent by each grid header includes information of all nodes in its grid. So grid header can get the information of entire nodes.

2. IMPROVED LOCATION AIDED ROUTING

ILAR (Improved Location Aided Routing) is another location based technique which uses the concept of base line lying in between the source and destination node. On the basis of Node which is closest to this line of sight will be chosen as the next intermediate node. As the transmitting node check the distance of every neighboring node from base line and find the closest neighbor for further transmission.

3. LOCATION AWARE ROUTING PROTOCOL WITH DYNAMIC ADAPTATION OF REQUEST ZONE

Mobile Ad hoc Networks is an on demand routing protocol which decreases the search area given by LAR [2]. In LAR the search area is the smallest rectangle containing both sender as well as receiver. LARDAR reduces this rectangle to triangular zone, which helps in reducing the routing overheads. But the calculations done to find whether the node lie in the forwarding zone or not increases the overhead on the node. This result decreases the battery life of the node.

4. LOCATION BASED POWER AWARE ROUTING

LARDAR uses the concept of Triangle zone and the angles α and β. The protocol LBPAR uses the concept of triangle zone [6]. But instead of using the angular values in route request packet as in LARDAR it using the concept of slopes of line (Figure 3) which can be calculated using the following formula

\[ mp = \frac{(XP - XS)}{(YP - YS)} \]  

The Base objective of LBPAR is to find an optimal path in terms of bandwidth consumption along with the reduction in power loss of a node. Here, the route discovery process starts when source node S initiates a request to send the data packet to destination node D. m1 and m2 are the slopes of the line.
5. PROBLEM DEFINITION

Location Based Power Aware Routing (LBPAR) protocols use location information to minimize the Request Zone to reach the destination node. LBPAR will also help in reducing the overheads at each node by decreasing the number of calculations performed at each node, which in turn increased the battery life of node. But it can’t provide the guarantee to delivery of packet on existing path due to more demand of bandwidth for sending the packet from source to destination. For example if source A want to send the data to the destination F by using path A-B-E-F. Every node in this path has his available bandwidth. When data packet is travelling between these source and destination, every node on that path also have some data or RREQ packet or RREP packet to send to other node on this network. Then at that time when A want to send data packet to F, intermediate node B and E not have sufficient bandwidth to send data receiving from node A to B or B to E. It means that when node B or E are not have sufficient bandwidth to forward the data packet to his neighbor. So these nodes are dropping the data packet.

III. PROPOSED WORK

The proposed protocol is an efficient routing protocol that uses location information of source, destination and intermediate nodes by using GPS system to improve the efficiency of location-aided routing (LAR) which improves the quality of services. Proposed scheme is an extended version of Location Based Routing. In this routing protocol, there are following parameters is use for calculation of expected zone and requested zone are minimum slope, $m_1$ and $m_2$.
maximum slope, TTL and minimum available bandwidth for communication. Route request packet can be send to the neighbor node based on the minimum, maximum slope. This protocol is use to improve the packet delivery ratio from source to destination because it provide the optimal path in terms of bandwidth, that improve the quality of service. This approach provides solution of flooding and utilized the available bandwidth.

1. MINIMUM AVAILABLE BANDWIDTH

Minimum available bandwidth list is the parameters of packet header that contain all the available bandwidth value of current path. By using available bandwidth list this protocol calculate the minimum available bandwidth for communication on current path between sources to destination.

2. PHASES OF ANALAR

There are three phase in this protocol
   I. Route discovery
   II. Route Reply
   III. Route maintenance

1. ROUTE DISCOVERY

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, AB_list, 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 destination address of RREQ, if destination address is the address of neighbor node then it consume the packet and send RREP packet to the source node. If destination address is not equal to the neighbor node address then it check the value of TTL, if TTL is less than or equal to zero the node discard the RREQ, else it calculate the slope of from source node. If slope lies between the maximum slope and minimum slope, then attach its own address to list of visited node, enter available bandwidth value into available bandwidth list and forward the RREQ packet to its neighbor nodes. If route cannot qualify neither minimum slope nor maximum slope then node discard the RREQ packet. This process is follows by every node which receive the RREQ packet until the RREQ receive the by destination node. Above figure is an example of route discovery process of ANALAR which find the path between source need S and destination node D. Source node S to destination node D path is S-1-2-3-4-5-6-7-D.

2. ROUTE REPLY PHASE

In route reply phase if destination receives the RREQ packet then it check the packet header destination address. If destination address is the address of node then it check minimum and maximum slope. If slope lying between these two slope then it calculate minimum available bandwidth for current path and then consume the RREQ packet and sent RREP packet to source node via same path with minimum available bandwidth ofr current path which path is use to receive RREQ packet from source to destination. Otherwise discard the RREQ packet. Figure show the route reply path from destination to source node as D-7-6-5-4-3-2-1-s.

Figure 5 Route Discovery process of ANALAR

3. ROUTE MAINTENANCE

In Ad-hoc network there is high mobility of nodes, links between nodes are likely to break. Thus, we need to maintain the routing path. For example node 4 in Figure move outside to the reach of its neighbor then route from source to destination is break. In this case route maintenance process is use to maintain the route from source to destination. In this phase when a node does not receive a RREP packet it will break the path. In this case, the node sends a route error (RERR) packet to the source node. When the source node receives the packet, it will reconstruct a new path to the destination node. In Figure node 4 move outside of the reach of its neighbors, so path is brooked. Then again new path is
created by source node using node 8. So the source to
destination path after maintenance is S-1-2-3-8-5-6-7-d.

Algorithm:
If (TTL>Count)
{
If (Node ID ==Destination ID)
{
Consume RREQ Packet;
Find minimum available bandwidth;
Send RREP to source;
}
Else if (Node ID! = Destination ID)
{
Calculate m;
If (m1>m2)
{
Enter Node ID hooked on visited node list;
Enter available bandwidth hooked on available
bandwidth list;
Flood the RREQ packet to neighbor;
}
}
Else
{
Drop the packet;
}

IV. SIMULATION

In order to validate the proposed protocol and show its
efficiency we present simulations using MATLAB. MATLAB
is a very popular network simulation tool. MATLAB is an
interactive software package which was developed to perform
numerical calculations on vectors and matrices. The
simulation environment settings used in the experiments are
shown in Table4.1. The network area is 150 pixels x 150
pixels that include variable number of mobile nodes ranging
from 15 to 35. The radio transmission range is assumed to be
20 pixels. The scenario of nodes mobility is generated
randomly based on random way point model where a mobile
node moves to a new position and pauses there for time period
between 0 to 3 seconds, then it move to another position.
Table 1 Simulation Environment Settings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Network Area</td>
<td>150x 150</td>
</tr>
<tr>
<td>Number of Mobile Nodes</td>
<td>10 to 35</td>
</tr>
<tr>
<td>Mobility Model</td>
<td>Random</td>
</tr>
<tr>
<td>Node Transmission Range</td>
<td>20</td>
</tr>
</tbody>
</table>

SIMULATION RESULT FOR PACKET DELIVERY RATIO WITH NUMBER OF NODES

Figure shows the packet delivery ratio with different number of node. In this graph radio transmission range is 20 Pixel. It suggests that when the number of node increases then packet delivery ratio is also increases.

SIMULATION RESULT FOR AVERAGE NUMBER OF PATH WITH SPEED OF MOBILE OF NODES

Figure shows that when number of node is increases then the average number of path found also increases.

SIMULATION RESULT FOR PACKET DELIVERY RATIO WITH NUMBER OF NODES BETWEEN ANALAR AND FLBPAR

Figure show the compression between ANALAR and FLBPAR in terms of AVG path found (%) with different number of mobile nodes. radio transmission range is 20 Pixel. When number of node increase then average path found ratio is increases in both the protocol but ANALAR provide better AVG path found ratio than FLBPAR due to bandwidth factor.

V. CONCLUSION & FUTURE WORK

In wireless ad-hoc networks, there are several characteristics different with wired networks. The differences are changing of network topology, limited resources like bandwidth and energy and so on. LAR (Location-Aided Routing) which is one of the most famous locations based routing methods that uses information about the location of mobile node through GPS technique. Our new protocol “A new Approach of Location Aided Routing” considers both areas of routing and bandwidth. At first, propose a more efficient routing method which improves the quality of services in terms of routing overhead. Secondly, a bandwidth aware method is proposed to select proper transmission bandwidth of node by using a minimum value of bandwidth.

V. FUTURE WORK

“A NEW APPROACH OF LOCATION AIDED ROUTING” is a protocol which helps in dealing with the two major quality factors bandwidth and RREQ flooding. But there is one more important quality factor named as “delay” that also needs to be handled. Due to dynamic nature of nodes, the paths are unstable. Also, limited power is another reason for link failure and in turn packet drop. This protocol can further be enhanced on the bases of power enable routing along with RREQ and RREP packet.
VI. REFERENCES

[1] Natraj Meghanathan, “A Location Prediction-Based Reactive Routing Protocol to Minimize the Number of Route Discoveries and Hop Count per Path in Mobile Ad Hoc Networks” Department of Computer Science, Jackson State University, Jackson, MS 39217, USA.


