An Energy Aware and Reliable Route Selection in MANET

P.Dhivya[1], R.M.Thiriburabhavan[2], R.M.Bhavatharani[3], Dr. S. Karthik[3]
[1] Final ME (CSE) (Department of Computer Science and Engineering, SNS College of Technology, India)
Email: dhivyasnsce@gmail.com)
[2] Final ME (SE) (Department of Computer Science and Engineering, SNS College of Technology, India)
Email: bhavanme2011@gmail.com)
[3]Associate Professor (Department of Computer Science and Engineering, SNS College of Technology, India)
Email: rmbhavadharani@gmail.com)
[4] Professor & Dean (Department of Computer Science and Engineering, SNS College of Technology, India)
Email: profskarthik@gmail.com)

ABSTRACT

Ad-hoc networks are wireless networks without a fixed infrastructure and the mobile nodes can communicate with each other in a wireless environment. The specific characteristics of any routing protocol consider the mobility and battery power. Nodes are intrinsically mobile and consequently, routes between nodes suffer from changes. Mobile node in an Ad-hoc network equipped with low power battery could difficult for a mobile device to send and receive data more often. An intermediate node in a network is called as relay node. The relay node selection is based on the GPSR routing [2]. This is a problem to find and maintain a reliable route. In the proposed approach the relay node selection based on the probability of a node. Probability will be given based on the mobility, battery power in Zone Routing Protocol (ZRP). So the reliable route selection can be established between the two mobile hosts. It reduces the number of broken routes, thus improves the network performances.

Keywords-MANET, ZRP, ALERT, GPSR, Mobility, Battery power, Random Forwarder,

I. INTRODUCTION

A Mobile Ad-hoc Network (MANET) is an infrastructure less and self configured network of mobile terminals connected by wireless links. Mobile terminals such as cell phones,
Portable gaming devices, PDAs (Personal Digital Assistants) and tablets all have wireless networking capabilities. Algorithms for a MANET must self-configure to adjust to environment and traffic where they run, and goal changes must be posed from the user and application. Ideally, a routing algorithm for an Ad hoc network should not only have the general characteristics of any routing protocol but also consider the specific characteristics of a mobile environment—in particular, bandwidth and energy limitations and mobility [3].

Based on the routing information update mechanism, Ad hoc wireless network routing protocols are basically divided into pro-active routing and re-active protocols. The Proactive routing algorithms aim to keep consistent and up-to-date routing information between every pair of nodes in the network by proactively propagating route updates at fixed time intervals [1].

The pro-active routing protocol learns the network topology before a request comes in for forwarding. Since the proactive routing algorithms maintain routing tables for all nodes in the network, a route is found as soon as it is requested [3].

Reactive or also called on-demand routing algorithms establish a route to a given destination only when a node requests it by initiating a route discovery process. Once a route has been established, the node keeps it until the destination is no longer accessible, or the route expires. The re-active routing protocol becomes active only when a node is willing to forward a request. In spite of a reactive protocol gives the low overhead of control messages, it has higher latency in discovering routes as it determine the route using flooding RREQ packet in the network and builds the route on demand from the responses it receives[3].

ZRP is a hybrid protocol which effectively combines the best features of both proactive and reactive routing protocol. An intra zone routing protocol (IARP) is used in the zone where a particular node employs proactive routing. The reactive routing protocol used beyond this zone is referred to as Inter Zone Routing Protocol (IERP).IERP is responsible for finding paths to nodes which are not within the routing zone [3].IERP effectively uses the information available at every nodes routing zone. In IARP each node maintains the information about routes to all nodes within its routing zone by exchanging periodic route update packets.

Remainder of the paper is structured as follows. Section II describes the related work. Section III describes the proposed work. Finally, conclusions are given in section IV.

II. RELATED WORK

ZRP provides a hybrid framework of protocols which enables the use of any routing strategy according to various situations. Dynamic Zone Topology Routing protocol (DZTR) for scalable routing in a MANET is proposed in [4]. DZTR breaks the network into a number of zones by using a GPS. The topology of each zone is maintained proactively and the route to the nodes in other zones is determined reactively. DZTR proposes a number of different strategies to reduce routing overhead in large networks and reduce the single point of failure during data forwarding. [4]

Fisheye Zone Routing Protocol (FZRP) was proposed in [5]. FZRP provides the advantage of a larger zone with only a little increase of the maintenance overhead. Two levels of routing zone are defined in FZRP: the basic zone and the extended zone. Different updating frequencies of changes of link connectivity are associated with the basic zone and extended zone. Performance of route query control mechanisms for the ZRP for ad hoc networks is proposed in [5].

Virtual Backbone Routing (VBR) is a scalable hybrid routing framework for ad hoc networks, which combines local proactive and global reactive routing. The Zone hierarchy is maintained through a novel distributed Virtual backbone maintenance scheme, termed the Distributed Database Coverage Heuristic (DDCH). VBR limits the proactive link information exchange to the local routing zones only [6].

In ZLERP, stability of link is determined on the basis of signal strength received at periodic time interval by node which is on the periphery of other node's zone. Signal strength depends on many factors such as distance between nodes, angles between nodes, obstacles, blocked

regions, noise, interference etc. ZLERP considers two main factors, distance between nodes and blocked terrains. ZLERP divides its network in different zones. That's the node's local neighborhood. Each node may be within multiple overlapping zones, and each zone may be of a different size. The size of a zone is not determined by geographical measurement. It is given by a radius of length, where the number of hops is the perimeter of the zone. Each node has its own zone [7].

In the ALERT routing algorithm, the information of the bottom-right and upper left boundary of the network area is configured into each node when it joins in the system. This information is used to locate the positions of node in the entire area for zone partitions. It can be explained in Fig1.

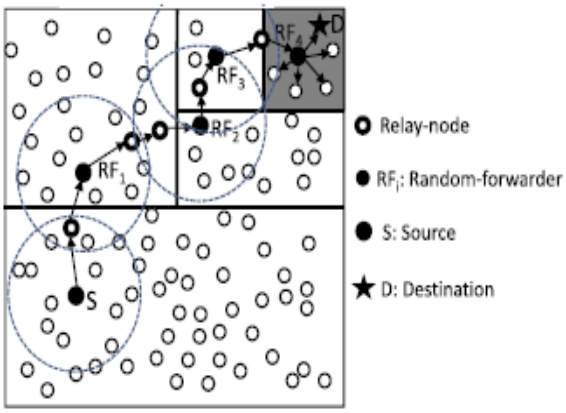

Fig1. Routing among zones in ALERT

In ALERT algorithm, it first checks whether destination are in the same zone. If so, it divides the zone alternatively in the horizontal and vertical directions explained in Fig 1. This node repeats this process until itself and Z_D are not in the same zone. ALERT uses the hierarchical zone partition and randomly chooses a node in the partitioned zone in each step as an intermediate relay node (i.e. Data Forwarder) using GPSR routing.mix zone is an anonymous location service that unveils the positions of mobile users in a long time period in order to prevent user's movement from being tracked. Each location aware application that can monitor node's locations on the top of mix zone. It is a only node to monitor the needs that are registered to it. The zone division in ALERT occurs when selecting a next forwarding node. So the zones are formed dynamically as a message is being forwarded. ALERT uses dynamic hierarchical zone partitions and random relay node selection to make it difficult for an intruder to detect the two endpoints and nodes route.

When uses GPSR routing for select RF, the reliable route selection cannot be possible. If it moves out of the zone then resending the broadcast can occur. A node in a mix zone can register the mobility of node. It could not suggest the reliable node as a relay node .in the proposed approach, based on the mobility of a node and battery consumption to select the relay node. So the rebroadcasting and network overhead will be reduced.

We observed from the literature that most of the earlier works focus on different routing strategies which efficiently find shortest route to the destination. However the main Problem faced by routing protocols in very dynamic conditions is that, links may be broken soon after routes have been established. This leads to a high number of control packets and do not take into account of network overheads caused by routing; neither have they dealt with the problem of unstable messages and data packets that are propagating inside the network, which result in higher bandwidth contention and consequently reduced throughput.

III. PROPOSED APPROACH

The importance of routing protocol include exchanging the route information finding a feasible path to a destination based on criteria such as hop length, minimum power required and lifetime of the wireless link.

One of the important properties of ad-hoc wireless network is the mobility associated with the nodes. The mobility of nodes results in frequent path breaks, packet collisions, transient loops, stale routing information and difficulty in resource restriction's good routing protocol should be able to effectively solve all the above issues [3]. The constraint on resources such as battery power also limits the capacity of routing protocol. Transmission power management techniques attempt to find an optimum power level for the nodes in the ad-hoc wireless network.ad-hoc wireless networks are prone to constant link failure due to node mobility. Hence the stability of the node cannot be assumed in such situations [3].

In the proposed approach, the relay node for reliable route selection based on two specific characteristics

i) Mobility of a node
ii) Battery power

i) Mobility of a node

A protocol that selects a route which has very low probability of link failure is proposed in [3].a parameter called affinity that decides the stability of a route is defined. Node m samples a set of signals from the node n and calculates the affinity (a_{nm}) as follows

A_{nm}={high if s_{nm}(ave)>0

S_{thresh}-s_{nm}(current)/s_{nm}(ave)}

That is the link is assumed to be disconnected between the nodes n and m .if the signal strength s_{nm} (current) .it well below the threshold signal strength (s_{thresh}).s_{nm}(ave) is the average of the rate of change of signal strength over the last few samples[3]. To identify the mobility of a node by using an arrival angle. Calculating the arrival angle by using the nodes coordinates in two consecutive measurements. The nodes arrival angle and the relative speed between the nodes both determine by the lifetime of their communication link. Bordering node is more likely to get out of the coverage area then more likely to break the established route.

In the dynamic hierarchical zone partition itself, a zone can be classified into two types

a) Stable zone
b) Danger zone

The border of the zone called danger zone. A node inside the zone area called stable zone. Based on the angle between sender and the neighbor node called arrival angle.Q_d is a danger zone angle. If the arrival angle is less than or equal to the danger zone angle then it will be selected as a relay node. If it is equal or greater than the danger zone, then a node will not selected as a relay node[2]. The mobility speed of the node can calculate by using arrival angle.

ii) Battery Power

The power consumption requirements and power availability adds to the importance of energy management. The relay node has more battery power then it will be selected for routing the information again and again. It first checks whether a battery power for transmission the request is enough or

not [3]. The medium battery power node is enough to transmit the information.

Based on these two criteria a node probability was given as follows

a) If a node arrival angle less than the danger zone angle and medium battery power then it will be selected as relay node to send the data.
b) If a node arrival angle is equal and medium battery power then it will be taken as second highest priority.
c) If a node's arrival angle is greater and medium/low battery power then it will not selected as relay node.

If there is no node in the border zone then the inner zone with high probability will be selected as relay node.

IV. CONCLUSION

In the related approach a relay node intermediate nodes are selected based on the GPSR routing. The mix zone method can only used to monitor the nodes. It will not suggest selecting the reliable route to send the data. In the proposed approach the random selection of relay node based on the probability of a node. So the reduced overhead and reliable route will be discovered. In the future work, the simulation analysis will be used to evaluate the performance of the proposed approach using NS-2 simulator.

REFERENCES

i) Haiying Shen, Member, IEEE, and Lianyu Zhao, Student Member, IEEE, ALERT: An Anonymous Location-Based Efficient Routing Protocol in MANETs, IEEE TRANSACTIONS ON MOBILE COMPUTING, VOL. 12, NO. 6, JUNE 2013P.K.Keong Loh, H.WJing, and Yi Pan, "Performance Evaluation of Efficient and Reliable Routing Protocols for Fixed-Power Sensor Networks" IEEE on wireless communications, vol. 8, no. 5, may 2009

ii) D. G. Reina, Student Member, IEEE, S. L. Toral, Senior Member, IEEE, P. Jonhson, Member, IEEE, and F. Barrero, Senior Member, IEEEA Reliable Route Selection Scheme Based on Caution Zone and Nodes' ArrivalAngle., IEEE COMMUNICATIONS LETTERS, VOL. 15, NO. 11, NOVEMBER 2011.

iii) B. Tavli, M. Burak, and K. Bicakci, "Impact of limiting number of links on the lifetime of wireless sensor networks," *IEEE Commun. Lett.*, vol. 5, no. 1, pp. 43U″ 45, 2011.

iv) M. Abolhasan and T. Wysocki, .Dynamic zone topology routing for MANETs., *European Transactions on Telecommunications*, pp. 351-368, Vol. 18, Issue 4, June 2007.

v) Chun-Chuan Yang and Li-Pin Tseng, Fisheye zone routing protocol: A multi-level zone routing protocol for Mobile Ad Hoc Networks., *Journal of Computer Communications*, pp. 261-268, vol. 30, Issue 2, Jan. 2007.

vi) Zygmunt J. Haas and Marc R. Pearlman, .The performance of query control schemes for the Zone Routing Protocol., *IEEE/ACM Transactions on networking*, pp. 427-438, Vol. 9, No. 4, August 2001.

vii) S. S. Manvi, M. S. Kakkasageri, Savitha Paliwal, Rekha Patil," ZLERP: Zone and Link Expiry based Routing Protocol for

MANETs" Int. J. Advanced Networking and Applications Volume: 02, Issue: 03, Pages: 650-655 (2010).

viii) Ben Liang and Zygmunt J. Haas, .Hybrid routing in ad hoc networks with a Dynamic Virtual Backbone., *IEEE Transactions on wireless communications*, pp. 1-14, Vol. 5, No. 6, June 2006.

ix) Hongyan Du, Hossam Hassanein, Chihsiang Yehomas Kunz and Ed Cheng, .Zone-based routing protocol for high-mobility MANET., *Proc. IEEE Canadian Conference On Electrical And Computer Engineering*, pp. 1055-1058, Vol. 2, Canada, May 2003.

x) San-Yuan Wang, Jia-Yu Liu, Chun-Chien Huang, Mao-Yuan Kao and Yi-Ho, .Signal strength based routing protocol for Mobile Ad-hoc Networks. *Proc. The 19th International Conference on Advanced Information Networking and Applications (AINA'05)*, pp. 17-20, Vol. 2, Taipei, March, 2005.

