International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056
Volume: 03 Issue: 07 | July-2016 www.irjet.net p-ISSN: 2395-0072

DISCERNING BORDER CASTING LOCATION ORIENTED ZONE ROUTING PROTOCOL FOR MANET

JAYASHREE BHAT[1], SAVITHA S.[2]

[1]*Student, M. Tech in Computer Network Engineering, Department of CSE, CMRIT, Bangalore*

[2]*Asst. Professor, Department of CSE, CMRIT, Bangalore*

Abstract - *Mobile ad hoc network is collection of wireless nodes that can dynamically be set up anywhere and anytime without using pre-existing infrastructure. It is autonomous system in which mobile hosts connected by wireless links are free to move randomly and often act as routers at the same time. MANET has some attributes like simplicity of use, continually changing topology, wireless connection and distributed operations. Here defined Problem is to find routes between mobile nodes to facilitate communication within the network. The main goal of such an ad hoc network routing protocol is to establish correct and efficient route between a pair of mobile nodes. Route should be discovered and maintained with a minimum of overhead and bandwidth consumption. Zone Routing Protocol (ZRP) is a hybrid routing protocol that maintains routing details proactively for local neighborhood (routing zone) and acquiring routes to farther neighborhood (beyond the routing zone) is done reactively. However, it generates many routing overhead control packets consuming already limited energy and bandwidth in MANETs. The main goal of this work is to reduce the end-to-end delay and energy consumption incurred in routing in ZRP by discerning border casting and location oriented route discovery process which results in reduced target area to send control packets.*

Key Words*: *Zone Routing Protocol (ZRP), MANE, wireless links, topology, routing zone

1. INTRODUCTION

Mobile ad-hoc network (MANET) is one of the most promising fields for research and development of wireless network. As the popularity of mobile device and wireless networks significantly increased over the past years, wireless ad-hoc networks has now become one of the most vibrant and active field of communication and networks. Due to severe challenges, the special features of MANET bring this technology great opportunistic together. 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.

Mobile ad hoc network is collection of wireless nodes that can dynamically be set up anywhere and anytime without using pre-existing infrastructure. It is autonomous system in which mobile hosts connected by wireless links are free to move randomly and often act as routers at the same time. MANET has some attributes like simplicity of use, continually changing topology, wireless connection and distributed operations. Here, defined problem is to find routes between mobile nodes to facilitate communication within the network. The main goal of such an ad hoc network routing protocol is to establish correct and efficient route between a pair of mobile nodes. Route should be discovered and maintained with a minimum of overhead and bandwidth consumption.

MANET was planned only for military use in the beginning, but now the MANET used in several areas like electronic payments, virtual classrooms, video conferences, meetings, rescue systems, automated battlefields, voting systems, offices and vehicular computing. Mobile nodes use radio transmits medium for message sending. It is a self-organized network. Mobile nodes in wireless network can communicate with one other in specific range. MANET has some feature like Mesh network, dynamic topology, highly adaptable and rapidly deployable network.

There are several routing protocols used in MANET, mainly classified under proactive/reactive routing protocols and hybrid classes which are combination of proactive and reactive routing finding approaches. Among them, Zone Routing Protocol (ZRP) emerged as a most efficient hybrid routing protocol that maintains routing details proactively for local neighborhood (routing zone) and acquiring routes to farther neighborhood (beyond the routing zone) is done reactively. Routing process begins with a proactive approach (IntrAzone Routing Protocol- IARP) and then the algorithm serves the request from additionally-activated nodes through reactive flooding (IntErzone Routing Protocol - IERP). By adapting these two approaches ZRP not only minimizes control overhead but also reduces end-to-end delay. However, it generates many routing overhead control packets consuming already limited energy and bandwidth in MANETs.

Routing in MANET is quite challenging and vibrant task. There are many researches in the field of routing in MANET.

Many scientific works are being carried by various researchers and they have been classified into various categories such as proactive and reactive classes and also, combination of these two classes which comes under hybrid category [1]. E. Alotaibi *et al.* have done the survey of routing algorithms used in wireless Ad-Hoc network which categorizes the routing algorithms into proactive and reactive and hybrid categories [2]. A new idea of geographical location orientation is proposed in the literature. According to this, the location aided details in routing is considered in order to reduce the packet overhead while routing [3]. Two receptive routing protocols Dynamic Source Routing (DSR) and Ad hoc On Demand Distance Vector (AODV) as reference for analysis of ZRP by considering delay and link failure repairmen, delay and link failure repairmen have their effect on expansion in end to end delay, this consequently diminishes the quantity of packets got subsequently the throughput [4]. The process of discovering and maintaining routes in MANET by Zone Routing Protocol is more effective and flexible. An interesting protocol called Fisheye Zone Routing Protocol (FZRP) is proposed by C. C. Yang *et al.* 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. They have also made a simulation study to shows that FZRP is more efficient than ZRP in terms of route finding cost with only a little increase in the maintenance overhead [5]. The basic and an extended zone are the two stages of routing zones in FZRP. Loss of path is due to link failures. Link failures are because of changing the position of the mobile nodes in mobile ad hoc networks (MANETs). Route discovery operating cost is really more here. Broadcast storming is a major problem in such networks. X. M. Zhang *et al.* proposed a neighbor coverage-based probabilistic rebroadcast protocol for decreasing operating cost caused by routing in MANETs [6]. Marc R. Pearlman *et al.* verified the special effects of density (relative node), velocity, span of the network, and consumer data action on the ZRP performance. Also, they set up schemes that permit every node to find and so respond to changes in configuration. It is based on the details taken out from ZRP traffic [7]. An effective evaluation of the performance is presented by Sandeep Kaur *et al.* Evaluation is made by comparing three hybrid routing protocols ZRP (Zone Routing Protocol), SHARP (Sharp Hybrid Adaptive Routing Protocol) and ZHLS (Zone Hierarchical Link State) using simulator OPNET 14.0. Various criteria such as load, data dropped, delay and throughput are used for evaluation [8]. The research work presented by M. N SreeRanga Raju *et al.* are upgrading the existing ZRP Model with enhancement. These enhancements are MDVZRP, SBZRP, and QCS to achieve better performance. The design goals of ZRP enhancement were to enhance the performance in the area such as quick route reconfiguration [9]. Author in his research paper analyzes the performance of ZRP by variation in mobility rate of the nodes and transmission distance along with the zone radius on QoS based matrices [10].

2. EXISTING SYSTEM

There exists many routing protocols and algorithms which are proposed to address the complexity and difficulty of routing among the mobile nodes. They are mainly subdivided into three main categories - Proactive routing protocols, Reactive on-demand routing protocols, Hybrid Protocols.

Destination-Sequenced Distance Vector (DSDV) is one of the examples for proactive routing protocol. In DSDV, routing tables are maintained in each node and regular update of the routing table which uses the battery power and bandwidth even if the network is idle. And also, propagating the topology change information to entire network is costly. Ad hoc On-demand Distance Vector (AODV) is one of the reactive routing protocols which establish the route to a destination only on demand.

Here, distance vector routing is simple but requires more time to establish a connection, and the initial communication to establish a route is heavier. Zone Routing Protocol (ZRP) one of the hybrid routing protocol combines the advantages of proactive and reactive routings. The routing is initially established with some proactively prospected routes and then serves the demand from additionally activated nodes through reactive flooding.

2.1 DISADVANTAGES OF EXISTING SYSTEM

Each protocol has its own advantage and disadvantages in different MANET settings or environments. Therefore, it is hard to say which one is the best. This work concentrates mainly on Zone Routing Protocol (ZRP).In ZRP, First it sends the message and discovers the route with proactive approach (IntrAzone Routing Protocol - IARP) and then the algorithm uses reactive flooding(IntErzone Routing Protocol - IERP). Using these 2 protocols it overheads are reduced and minimizes end-to-end delay. Still routing overhead is a cause of concern. Routing overhead and end-to-end delay is still a significant issue in ZRP and there is a scope of improvement.

3. PROPOSED SYSTEM

The advancement in science and technology has made devices such as mobile to be smaller and have various functions which are far advanced than basic with the speed of high data transfer rate. This became advantageous for

MANETs viz. Mobile Ad Hoc Networks. MANET is a group of mobile can be in touch with one another with the help of a wireless even if a fixed communication structure is not present. Here each mobile communicates with each other through hops. Thus a path gets formed amongst the mobiles (or hosts) in the network. If a structure which is flexible, then MANET may not use base stations at all but use its widespread application range. However what is advantage may also act as disadvantage since in the network there exists free nodes and they don't have any pre-existing infrastructure. Hence now many a times the topology gets changed. Hence it is very important of find and keeps the routes significantly.

There are many algorithms to solve such problems. One of them is Zone Routing Protocol (ZRP).First it sends the message and discovers the route with proactive approach (IntrAzone Routing Protocol - IARP)) and then the algorithm uses reactive flooding (IntErzone Routing Protocol - IERP). Using these 2 protocols it overheads are reduced and minimizes end-to-end delay .Still routing overhead is a cause of concern. Routing overhead and end-to-end delay is still a significant issue in ZRP and there is a scope of improvement. In this approach, efforts are towards improving ZRP with respect to routing overhead with assistance from location information. It brings advantages of hybrid routing protocol and location information. It not only inherits advantages of hybrid routing protocol type but also utilizes the location information provided to almost mobile devices nowadays.

4. LOCATION-ORIENTED ZONE ROUTING PROTOCOL

4.1 Target Location Information

Today with advancement in technology, Through Global Positioning System (GPS) it is been easy to detect location of mobile nodes with better accuracy. Here it's been assumed that all nodes which are in the network have got their own coordinates from GPS. Now the problem is while each node does have easily information about its own location, the source node S has no idea about the intended destination location. For this, destination location information is mentioned in the table of Route REPly (RREP) packets that destination D replies to source S. If we add the destination location information then efficiency of the network degraded is trivial because of marginal increment in packet size, the method can minimize the redundant routing overhead packets (Route REQuest messages [RREQ]).

Initially the source node S does not have any information when it wants to send data to destination D, hence RREQ packet S sent to another node is set to -1 for destination node. This packet spreads to entire network till the needed destination D receives it. This Destination D creates another RREP packet which contains the location information in destination location field and returns it to source node S through the inverse path of RREQ packet. Every node has to keep a tab about location of destinations and its duty is to update whenever it receives RREP packets or RREQ packets and refreshes periodically. The information helps in next route request.

4.2 Re-Bordercasting

The request route process made in ZRP is bifurcated into two stages. In the 1st stage source node S searches the existence of destination D in its zone by using IARP table. Zone routing for a specific node means it is an area which is covered by nodes which have the shortest paths to this node and this is equal to the radius of zone (counting is done by hop). The border nodes of every zone are called peripheral nodes. For example, in Fig. 1, nodes C, M, N, K, J, and H are the peripheral nodes in the routing zone of source node S. After 1st stage, if S cannot find out any routes to D, then it will turn to the 2nd stage, i.e. global reactive routing (Interzone). Here it does not simply broadcasting RREQ packets, but uses border casting i.e. the RREQ packets are directly sent to peripheral nodes. However, if we spread the RREQ packets to entire network, it causes waste of energy, redundancy and overhead for routing.

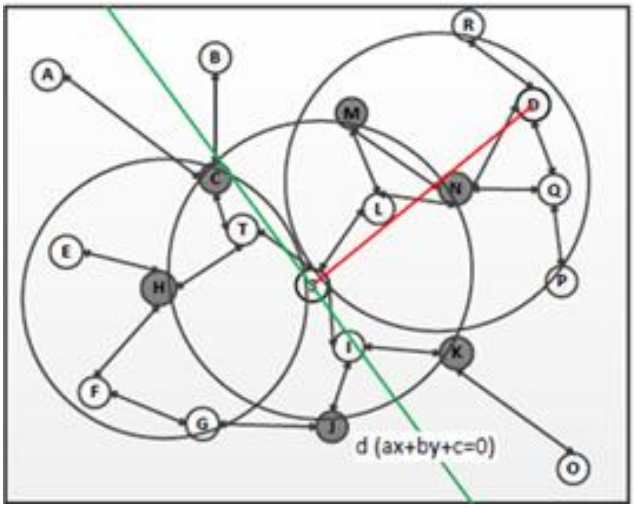

Fig- 1: Routing in the Protocol [3]

If we know destination's location, we can decrease the number of redundant RREQ packets. In Fig. 1, the straight line *d (ax + by + c = 0)* separates the network into two parts:

- The opposite side of D is non-reborder casting side and
- The side with D is reborder casting side.

Let a node X use IERP to find path to destination. Then, it decides: which are the peripheral nodes which continue to border-casting RREQ packets and on which side the peripheral nodes belong to. In the Fig- 1, the nodes M, N, K continue route discovery process whereas the nodes C, H, J cannot receive RREQ packets. Else X will not forward RREQ packet to P. It is assumed that any peripheral node cannot

satisfy this condition. Then to find out a path to the destination, all of the peripheral nodes will necessarily have to take part in route discovery process.

Straight line D is built as per two conditions:

- D is perpendicular to SD
- S belong to D

The equation of straight line *d*:

$$X(X_D - X_S) + Y(Y_D - Y_S) + 2X_S(X_S - X_D) + 2Y_S(Y_S - Y_D) = 0; \quad (1)$$

Where (X_S, Y_S), and (X_D, Y_D) are the coordinates of source *S* and destination *D*, respectively.

We denote:

$$F(x, y) = ax + by + c; \quad (2)$$

Where,

$a = (X_D - X_S);$

$b = (Y_D - Y_S);$ *and*

$c = 2xS(X_S - X_D) + 2yS(Y_S - Y_D)$

Peripheral node $P\ (X_P, Yp)$ will be a candidate to continue route discovery process if it satisfies the following condition:

$$F(X_P, Yp)F\ (X_D, Y_D) >= 0 \quad (3)$$

A new algorithm based on above principle will be introduced in IERP route finding process. A simulation study will be planned accordingly after adding modification in source code of zone routing protocol.

5. CONCLUSION

MANET is a very popular system of communication which helps users to exchange various natures of data within not-wired medium without any prior administration irrespective of their physical location. The principle objective of such system is to set up cost-free effective path between the pair of moving nodes. Path among the moving hosts needs to be correct and most efficient in terms of path finding cost and other costs. Finding the path with least overhead and transmission capacity utilization and maintaining the same is a challenging task in such communication. Zone Routing Protocol (ZRP), among these protocols, which is a hybrid(combination of on-demand and ready available routing) routing protocol that pro-actively holds routing details for a local region (routing zone), while re-actively getting routes to targets further than the routing zone. However, it generates many routing operating cost control packets consuming already limited resources (energy, bandwidth etc) in MANETs.

In this work, a new approach is implemented and tested by adding location assisted information to ZRP in order to reduce the routing operating cost by limiting the area of routing. In route finding approach traditional ZRP creates many redundant packets which results in high waste of resources and delay in finding the target. By applying location assisted routing, explained in this work presents the increase in performance in operating cost needed for routing and reduced delay in communication between the origin and the target nodes.

REFERENCES

[1] S.S. Dhenakaran, A. Parvathavarthini, "An Overview of Routing Protocols in Mobile Ad-Hoc Network," International Journal of Advanced Research in Computer Science and Software Engineering, vol. 3, Issue 2, February 2013.

[2] E. Alotaibi, B. Mukherjee, "A Survey on Routing Algorithms for Wireless Ad-Hoc and Mesh Networks," Department of Computer Science (Kemper Hall), University of California, Davis, CA 95616, USA, 15 November 2011.

[3] T. Pham Thi Minh, T. T. Nguyen and D. S. Kim, "Location Aided Zone Routing Protocol in Mobile Ad Hoc Networks," 2015 IEEE 20th Conference on Emerging Technologies & Factory Automation (ETFA), Luxembourg, 2015, pp. 1-4.

[4] S. R. Raju, K. Runkana and J. Mungara, "ZRP versus AODV and DSR: A Comprehensive Study on ZRP Performance on MANETs," Computational Intelligence and Communication Networks (CICN), 2010 International Conference on, Bhopal, 2010, pp. 194-199.

[5] Chun-Chuan Yang and Li-Pin Tseng, "Fisheye Zone Routing Protocol for Mobile ad hoc Networks," Second IEEE Consumer Communications and Networking Conference, CCNC.2005, 2005, pp. 1-6. doi: 10.1109/CCNC.2005.1405134.

[6] X. M. Zhang, E. B. Wang, J. J. Xia and D. K. Sung, "A Neighbor Coverage-Based Probabilistic Rebroadcast for Reducing Routing Overhead in Mobile Ad Hoc Networks," in IEEE Transactions on Mobile Computing, vol. 12, no. 3, pp. 424-433, March 2013.

[7] M. R. Pearlman and Z. J. Haas, "Determining the optimal configuration for the zone routing protocol," IEEE Journal on Selected Areas in Communications, vol. 17, No. 8, pp. 1395-1414, Aug 1999, doi: 10.1109/49.779922.

[8] Sandeep Kaur, Supreet Kaur, "Performance Evaluation of Hybrid Routing Protocols in Mobile ad hoc Networks", International Journal of Advanced Research in Computer Science and Software Engineering, vol. 3, Issue 9, September 2013.

[9] M. N SreeRanga Raju, Jitendranath Mungara, "Enhanced ZRP Protocol for Mobile Ad-hoc Networks," International Journal of Wireless and Mobile Networks (IJWMN), vol. 3, No. 4, August 2011.

[10] Anil Manohar Dogra, Rajvir Singh, "Zone Based Analysis of ZRP under Varying Mobility and Transmission Range in MANETs," International Journal Of Engineering And Computer Science, vol. 3, Issue 2, February, 2014, pp. 4007-4016.

BIOGRAPHIES

Smt. Jayashree Bhat is currently pursuing her M. Tech. Degree in Computer Network Engineering, Department of CSE, CMR Institute of Technology, Bangalore, Karnataka, India. She has B.E in E & C. She has more than 15 years of industry experience, worked in various multinational software companies like Oracle Corporation, Cisco, JP Morgan, Amdocs as Database Administrator/ System Administrator. She has managed the team for diverse platforms and global customers. Her research interest includes wireless and Ad-hoc networks.

Prof. Savitha S. is Assistant Professor in CSE Dept. of CMR Institute of Technology, Bangalore, Karnataka, India. She is quite dynamic and interested in teaching and research. Her areas of interest are Wireless sensor networks, Cryptography, Bio-informatics, Bio-metrics, Cloud computing.