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An Energy Efficient Zone Based Routing Protocol Over MANET

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Abstract - Mobile Ad Hoc Network (MANET) is a collection of wireless mobile nodes dynamically forming a network. There is no fix infrastructure in MANETs. Energy efficiency in MANET is biggest challenge for researchers. ZRP is based on border casting of data which is also used in our work. In this paper our work is on zone based routing protocol from one zone to the next zones which contains of the Intra zone routing within a zone (with 30mW power level) and Inter zone routing between the zones (with 60mW power level).

Keywords - Mobile Ad Hoc Network (MANET), Zone Based Routing Protocols, Energy Efficient, ZRP

I. INTRODUCTION

Mobile Ad-hoc Networks (MANETs) are communication networks in which all nodes are join with each other via wireless connections. It is a self-configuring, infrastructure-less and self-organizing network of portable nodes which permits the systems to be transferred without any wires. A few characteristics of MANETs are Packet should be progressed via one or more middle nodes, each node can function as both host and a router, Network topology may change arbitrarily and at randomly, there is certainly not centralized control of the network operations [1].

In this paper we propose energy efficient zone based routing protocol. In this select zone head using max-heap tree algorithm. Then set power level for Intra zone routing and Inter zone routing. This algorithm is more efficient as compared to simple zone routing protocol (ZRP) in terms of throughput, e2edelay, energy.

II. LITERATURE SURVEY

Table 1.Literature Survey Table

TITLE	AUTHOR'S NAME	PUBLICATION	DETAILS
NEMA: Node Energy Monitoring Algorithm for Zone Head Selection in Mobile Ad-Hoc Network using Residual Battery Power of Node[3]	Ms. Sushma D. Ghode, Dr. K.K. Bhoyar	IEEE 2016	In this paper we focus on improving ZRP protocol by adding energy constraints in it so that the protocol works efficiently in MANET and improves network lifetime.To implement this we divide our proposed algorithm in two parts.We design NEMA.
Hierarchical ZRP's Performance vs ZRP's Performance in MANET[4]	Zhang Xijie, Xu Chunxiu, Xu Jiaqi	IEEE 2015	In this paper we propose a hierarchical routing protocol HZRP based on ZRP to avoid redundant or duplicate route requests.
A Literature Survey of MANET [5]	Parul Gupta	International Research Journal of Engineering and Technology (IRJET) 2016	The main of this paper is to provide a survey of MANET including its need, characteristics and its applications along with the routing protocols used for communication.
A Survey On Hybrid Routing Protocols In MANETS[6]	Parinaz Shahbazi	International Journal on Recent and Innovation Trends in Computing and Communication	This paper represents survey and compare each type of hybrid protocols

		2013	
A Survey on Different Hybrid Routing Protocols of MANET[7]	Kanishka Raheja , Sunil Kr Maakar	(IJCSIT) International Journal of Computer Science and Information Tech 2014	This paper describes the various Hybrid protocols with their advantages and Disadvantages.
Study of MANET: Characteristics, Challenges, Application and Security Attacks[1]	Aarti, Dr. S. S. Tyagi	International Journal of Advanced Research in Computer Science and Software Engineering,2013	In this paper we study mobile ad-hoc network and its characteristics, challenges, application, security goals
Vulnerabilities, Challenges and Threats in Securing Mobile Ad-hoc Network[8]	Nawneet Raj, Priyanka Bharti, Sanjeev Thakur	IEEE 2015	This paper discusses the basic properties of MANET, the vulnerabilities in it, different types of attacks
A Novel Review on Routing Protocols in MANETs[9]	Robinpreet Kaur & Mritunjay Kumar Rai	Undergraduate Academic Research Journal (UARJ),2012	This paper provides an overview of different routing protocols proposed in literature and also provides a comparison between them.
Survey and Overview of Mobile Ad-hoc Network Routing Protocols[10]	Ashish Srivastava, Atul Mishra, Bikash Upadhyay, Akhilesh kumar Yadav	IEEE 2014	In this paper we provide a survey and overview of different routing protocols even survey of comparison
A Survey on Zone Routing Protocol Techniques[11]	Pravinder Singh, Monica Lamba, Vikas Deep	International Journal of Innovations in Engineering and Technology (IJIET)	In this paper , shows The Zone Routing Protocol (ZRP) is details and maintaining an up-to-date geography map on each node of a zone centred.
A Survey on Various Enhancements Made on ZRP[12]	Kanishka Raheja, SunilKr Maakar	International Journal of Computer Applications, 2014	This paper studies various enhancements that have been made on ZRP to improve its performance.
Novel Approach to Zone routing Protocol[13]	Heena Mehta, Er. Sukhbir	International Journal of Advanced Research in Computer Science and Software Engineering,2016	In this paper proposed approach is on enhancement of ZRP to resolve mainly two issues power management and bandwidth utilization.

III. ZONE ROUTING PROTOCOL

The Zone Routing Protocol, as its allocation indicates, is firm on the motivation of regions. A routing division is incisive for all nodes variously, and the regions of close together nodes overlay. A routing zone is defined based on radius in terms of hop counts. Here we take radius 2 (hop count 2). We can take any radius r for defining zones.

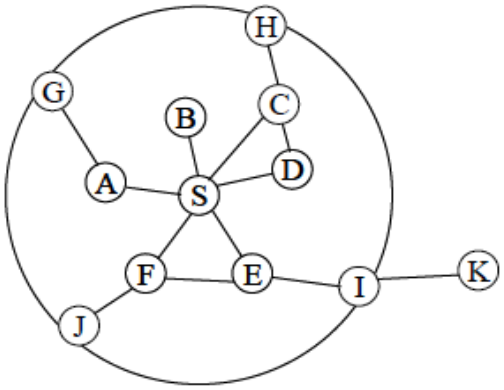


Figure1. Routing zone with r = 2[2]

An example routing zone is shown in Figure1, where the routing zone of S includes the nodes A–I, but not K. In the diagrams, the radius is marked as a circle around the node.

The nodes of a zone are divided into peripheral nodes and interior nodes. Peripheral nodes are nodes whose minimum distance to the central node is exactly equal to the zone radius r. The nodes whose minimum distance is less than r are interior nodes. In Figure, the nodes A–F are interior nodes, the nodes G–J are peripheral nodes and the node K is outside the routing zone.

ZRP refers to the locally proactive routing component as the IntrA-zone Routing Protocol (IARP). The globally reactive routing component is named IntEr-zone Routing Protocol (IERP). IERP and IARP are not specific routing protocols [2].

IV. LIMITATION OF ZRP

Two Major limitations of Zone Routing Protocol (ZRP) which is mention as below:

Power Consumption

In ZRP, the packets are sent with full power without considering the node's position inside the zone or outside the zone. According to Inverse Square Law, the power received by the receiving node is inversely proportional to square of the distance between the nodes (i.e).

$$\gamma = Pt / 4\pi r2 \text{.....[14]}$$

The node could waste power if the distance between the sender and the receiver node is less [2].

Bandwidth Deployment

As the distance between the sender and border nodes increases, the zone area will also increase, which means the radio coverage of the sender node will not be able to reach the border nodes in the zone. For that reason, the sender node will increase the number of broadcasts to find the border nodes in the zone, which will obviously increase the bandwidth utilization [2].

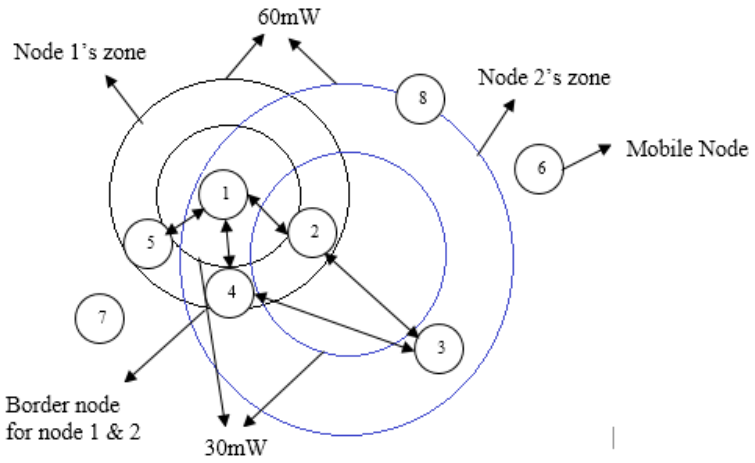
V. PROPOSED ALGORITHM

Step 1: Zone creation using max heap tree algorithm.
Step 2: The source node checks if the destination node is in its zone then set power level of intra zone routing 30mW.
Step 3: If not, then set power level of inter zone routing 60mW transmit the packet using ZRP.
Step 4: Repeat these steps until find out a route to the destination node.

Example for Proposed Algorithm

From the below figure it can be seen that every node generates their own routing zones and in the beginning when the node switches on, it creates the zone with 30mW and 60mW, since that is the threshold power level set initially by the protocol. But if a node is unable to find a border node since the node's threshold power level is high (30 & 60mW), then the corresponding node will start dropping its threshold power level until it's able to find the border node. If we consider the figure, if node 1 wants to talk with node 3 then node 1 should pass through one of its border nodes to reach the neighboring zone, they are nodes 2, 4 or 5. To calculate the power consumption, consider node 1 wants to

forward a packet to destination node 8.The source node sends a border cast with 60mW to all its border nodes (i.e) nodes 2, 4 and 5.



Fighre2. Proposed Algorithm Example

Then the corresponding nodes check their own routing table and in that node 2 can reach node 8 since it is the border node of node 2's zone. After seeing that, node 2 sends a unicast packet to destination node 8 with 60mW. Therefore, the source node found the destination node by shedding only 60mW in the modified ZRP protocol.

VI. SIMULATION RESULT ANALYSIS

In order to validate our analysis result, we have implemented a series of experiments trough simulation. We have used NS2 network simulator version 2.33. Table show the environment used in our experiments. Here we have used random waypoint mobility model. An extensive simulation model having scenario of n (user defined) mobile nodes and n cbr/tcp connections is used to study inter-layer interactions and their performance implications.

Table2. Simulation Environment

Channel Type	Wireless Channel
Simulation Run time	200 seconds
Area in which nodes move	500*500
Packet size	1024 bytes
Routing protocol	ZRP, ZRP with (30mW & 60mW)
No. of Nodes	7, 14, 21, 28
Propagation Model	Two Ray Ground
N/W interface type	Wireless Physical
MAC type	Mac/802.11
Antenna type	Omni Antenna

Throughput Comparison for ZRP and Proposed ZRP (30mW & 60mW)

From this graph we can conclude that throughput of ZRP is less as compare to the intra-zone routing of modified ZRP. In ZRP for inter-zone and intra-zone all the resources are waste same in terms of energy and power of network. But when we use the modified ZRP then we can save bandwidth utilization of network using two different routing with two different power level. Graph clearly mentions that the throughput for the intra-zone in modified ZRP is better than the ZRP.

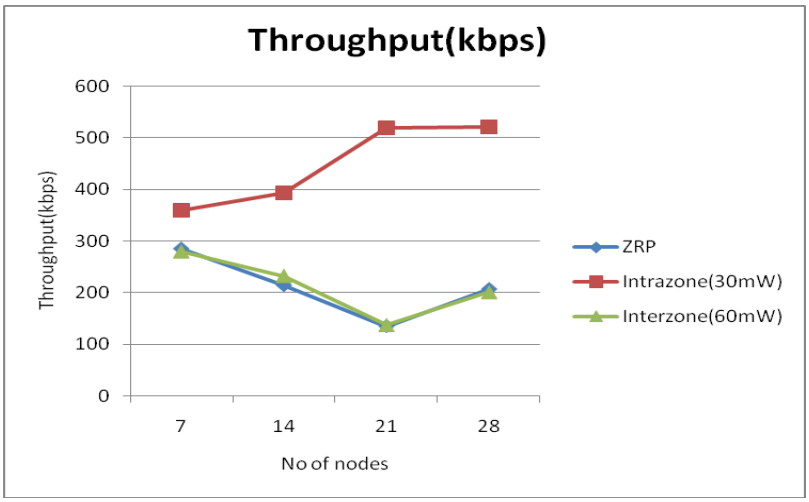


Figure3. Throughput Comparison for ZRP and Proposed ZRP

E2EDelay Comparison for ZRP and Proposed ZRP (30mW & 60mW)

From this graph we can conclude that E2EDelay of ZRP is more as compare to the intra-zone routing of modified ZRP. In ZRP for inter-zone and intra-zone all the resources are waste same in terms of energy and power of network. But when we use the modified ZRP then we can save bandwidth utilization of network using two different routing with two different power level. Graph clearly mention that the E2EDelay for modified ZRP is less than the ZRP.

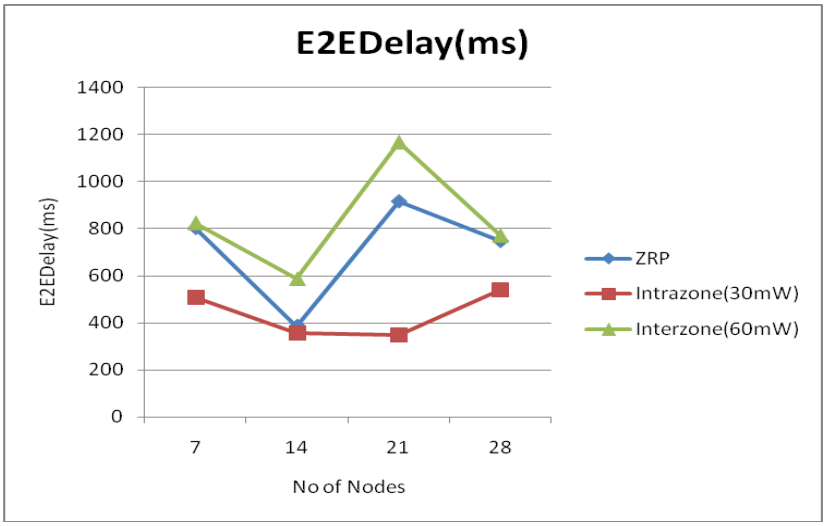


Figure4. E2EDelay Comparison for ZRP and Proposed ZRP

VII. CONCLUSION

We proposed an energy efficient zone based routing protocol for MANETs. In our work, the network is divided into two zones. The algorithm supports reactive routing between zones and proactive routing within a zone. There are two power values used for intra (30mw) and inter (60mw) based on the radius. Each node consumes power to transfer the data. In intra-zone direct communication is possible between source and destination, so we fix low power. For inter-zone, there are several intermediate nodes are present, so it consumes more power compare to intra-zone routing. To obtain shortest path in inter-zone, the zrp is used. In this way by the simulation results we can say our proposed algorithm is perform better in terms of throughput, and e2edelay.

REFERENCES

[1] Aarti, Dr. S. S. Tyagi ," Study of MANET: Characteristics, Challenges, Application and Security Attacks" International Journal of Advanced Research in Computer Science and Software Engineering,Volume 3, Issue 5, May 2013

[2] N. Beijar, "Zone Routing Protocol(ZRP)".
[3] Ms. Sushma D. Ghode, Dr. K.K. Bhoyar" NEMA: Node Energy Monitoring Algorithm for Zone Head Selection in Mobile Ad-Hoc Network using Residual Battery Power of Node" c 2016 IEEE
[4] ZhangXijie, Xu Chunxiu, Xu Jiaqi, " Hierarchical ZRP's Performance vs ZRP's Performance in MANET", IEEE International Conference on Communication Software and Networks (ICCSN), pp. 423 - 426, June 2015
[5] Parul Gupta, "A Literature Survey of MANET", International Research Journal of Engineering and Technology (IRJET), Volume:03 Issue:02|Feb-2016
[6] Parinaz Shahbazi," A Survey On Hybrid Routing Protocols In MANETS", International Journal on Recent and Innovation Trends in Computing and Communication, Volume: 1 Issue: 12
[7] Kanishka Raheja , Sunil Kr Maakar," A Survey on Different Hybrid Routing Protocols of MANET", International Journal of Computer Science and Information Technologies (IJCSIT), Vol. 5 (4) , 2014
[8] Nawneet Raj, Priyanka Bharti, Sanjeev Thakur" Vulnerabilities, Challenges and Threats in Securing Mobile Ad-hoc Network", 2015 Fifth International Conference on Communication Systems and Network Technologies,2015 IEEE
[9] Robinpreet Kaur & Mritunjay Kumar Rai, "A Novel Review on Routing Protocols in MANETs", Undergraduate Academic Research Journal (UARJ), ISSN: 2278 – 1129, Volume-1, Issue-1, 2012.
[10] Ashish Srivastava , Atul Mishra , Bikash Upadhyay , Akhilesh kumar Yadav , "Survey and Overview of Mobile Ad hoc Network Routing Protocols", "IEEE International Conference on Advances in Engineering &Technology Research (ICAETR - 2014),
[11] Pravinder Singh, Monica Lamba , Vikas Deep ," A Survey on Zone Routing Protocol Techniques", International Journal of Innovations in Engineering and Technology (IJIET), Vol. 2 Issue 4 August 2013.
[12] Kanishka Raheja, Sunil Kr Maakar," A Survey on Various Enhancements Made on ZRP", International Journal of Computer Application Volume 99 – No.14, August 2014
[13] Heena Mehta, Er. Sukhbir," Novel Approach to Zone routing Protocol", International Journal of Advanced Research in Computer Science and Software Engineering,2016.
[14] http://www.cs.hut.fi/~mart/mail/manet/1999/0106.html