Improving the performance of the Mobile Ad hoc Networks by enhancing M-AODV

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Abstract - The nodes in mobile ad hoc networks communicate wirelessly with each other. The basic function the nodes need to perform is to find path from source to destination node for which the nodes have to broadcast the route request messages. Such mechanisms cause lot of energy to be consumed on the part of the nodes. This paper takes into account the issues of the energy consumption and link breakage in mobile ad hoc network which occurs due to movement of the nodes. The performance of the network has been analyzed on the basis of energy consumption, throughput and packet delivery ratio which have shown improvement over the existing scheme.

Keywords— MANET, energy efficient, broadcasting, throughput, packet delivery ratio

I. INTRODUCTION

Mobile Ad Hoc Networks (MANETs) are self-organizing, infrastructure less, reliable networks of mobile nodes connected through wireless links without any centralized controller. Each node can send and receive data, and also forward the unwanted traffic unrelated to its own use. In MANETs the nodes need to maintain their independence and to preserve its resources like battery power, network lifetime, bandwidth etc. The mobile nodes can also leave the network at anytime. So they are suitable for many types of networks like Personal area network, disaster relief, military areas or when the infrastructure is damaged due to earthquakes, floods etc.

The routing in MANETs involves selecting the best route where many routes are available. However, due to the freedom of movement of nodes, new routes need to be constantly recalculated. Most routing protocols use pure broadcasting to discover new routes, which takes up a substantial amount of bandwidth. Intelligent rebroadcasting reduces these overheads by calculating the usefulness of a rebroadcast, and the likelihood of message collisions.

In MANETS the link connectivity and energy consumption are main issues which decide the performance of the network. In this paper the work has been presented which takes into account both the issues and gives a solution for these. This paper first gives a review of the past study in section 2, then presents the proposed scheme and the results have been shown.

II. RELATED WORKS

[1] In this paper the authors Sunil Taneja et.al. proposed a new protocol Energy Efficient, Secure and Stable Routing Protocol for MANET (EESSRP) and did an effort has been done to combine the factors like security, power and stable Routing protocol. The simulation of these new proposed protocols has been done with network simulator NS2.34. This random way point mobility model has been used to move the nodes within the network. The varying no. of nodes had been taken to simulate the results using wireless scenario. The performance metrics used for evaluating the results are packet delivery ratio, average end to end delay, throughput, normalized routing load and packet loss. The conclusion is that the proposed protocol i.e. EESSRP provides energy efficient, secure and stable routing strategy for mobile ad hoc networks.

[2] In this paper the Researchers Shiva Prakash1 et.al. Did the review on the various energy efficient routing protocols for Mobile Ad-Hoc Networks. Because of the nodes in the mobile ad hoc networks are mobile devices so managing the battery power and routing is the important issue in these days. This paper concluded that there is not a one protocol which can give the best performance in ad-hoc network. Performance of the protocol varies according to the variation in the network parameters, as we know that in ad-hoc network properties continuously vary. Sometimes the mobility of the node of the network is high while sometimes energy of the node is our main aim. So, select the protocol in such a way that which perform best for that particular type of network.

[3] In this research paper the researchers Mads Darø Kristensen et.al. adopt a new technique for energy efficient routing in mobile ad-hoc networks. Two well known techniques for preserving energy and lifetime or lifespan are, Span and BECA/AFECA, and they are combined with a well-known re-active routing protocol, AODV, to build a new energy efficient routing protocol. Moreover this protocol is tuned towards the utilization of network setting where some nodes are fixed i.e. at rest and have a steady power source. The protocols are simulated and evaluated to test their energy conserving abilities, and the results of these simulations are presented in the paper.

[4] In this paper the researcher T.Sukumar proposed a protocol known as "Energy Efficient Multicast Routing Protocol (EEMRP)" which has maximize the lifetime of every mobile hub by evenly utilization of power. In order to implement the energy efficient multicast routing protocol a wireless scenario has been created. When a node receives a packet, it opens the packet and performs time calculation. The each node is grouped and based on the energy of the neighbouring node. The packets are forwarded to the group of nodes and route cache consistency functions are incorporated that the extent to which the consistency is maintained and analyzed. The EEMRP algorithm is implemented or evaluated for multicasting environment with 70 % efficient energy of saving and save the life time of the network. The limitation in the system is more energy has been used when numbers of mobile nodes are increased. So this technique is good with lesser number of mobile nodes

[5] The researchers N. C. KANERIYA et.al address the problem of energy efficiency in MANET's at various layers. In last few years many researchers have concentrated on the prevention of utilization of the energy of mobile devices, from different point of view. There are many proposed techniques which try to define the energy efficient techniques or routing protocol which are capable routing data over the network and preserve the battery lifetime of the nodes. Some techniques are latest and some try to add the energy aware functional in the previous techniques. This paper presents the survey on different techniques of energy efficiency routing protocols or algorithms for mobile ad hoc networks. After that the researchers have presented two factors DISTANCE FACTOR (DF) and TIME INTERVAL OF RREP (TIRREP) for creating them highly energy efficient. From the results of this paper it is clear that in steady time interval, HELLO packet should be generated. But by making it dynamically we can also save energy of each node. The two factors considered DF and TIRREP plays an important role to save battery lifetime of the nodes.

[6] In this Research paper Xiao Wang et.al. have proposed a new protocol names as a novel group key management protocol with high energy efficiency for the wireless mobile scenarios in MANETs, which is provided with three functions to address the Problems of improving security and energy efficiency performance: (1) designing a self-organized group establishing algorithm for strategy mobile application scenarios to ensure stable groups in spite of users' mobility with reducing the cost of rekeying operation, (2) proposing a lightweight contributory key agreement and authentication mechanism based on the group Diffie-Hellman protocol for increasing overall security globally, and (3) researching a strategic mobile management mechanism based on the Prufer codec method handling the effect of mobility impacts to enhance the multicast energy efficiency and provide secret communication among roaming users in MANETs. Both theoretical analyses and simulation results have demonstrated that this proposed protocol is more energy-efficient for strategy mobile application scenario of MANETs with a large number of mobile users.

[7] In this paper researchers Vijayan R et.al. discuss that the energy conservation is the main issue in mobile ad hoc networks. Researchers tried to conserve energy so that the mobile devices can be used for the longer time without the need of charging. The main limitation of mobile ad hoc networks is the data can't be transfer due to

not enough energy in the nodes. So more amount of energy consumption of nodes should be conserved. This paper used the Cross layered approach to conserve the energy because we can conserve the energy of nodes at each layer. The researchers used the congestion prevent algorithm for the MAC layer and discover the maximum residual energy path in the network layer for transferring the data. To be sure for an efficient cross layer interaction, problems related to efficient channel access, quality-of-service (QoS) and congestion control are addressed with an energy efficient MAC protocol that adjusts with the enhancements in the performance of the network layer protocol.

[8] In this paper Manpreet kaur did the work on energy efficiency in mobile ad hoc networks. The main objective of this work is to conserve the energy of nodes in the network and make the network highly energy efficient. So much research work has been done on energy efficiency in MANET with different restrictions and with different protocols. One main issue in MANETs is how to conserve energy of devices in the network. So, the researcher proposed an Energy model which is used in GPSR protocol and various threshold are implemented at the MAC Layer to preserve energy of the nodes. At last the performance of entire network has been analyzed using different parameters like Total Energy Consumed and Throughput.

[9] A Mobile Ad-hoc Network (MANET) is a collection of mobile nodes communicating and cooperating with each other without any pre-determined topology. The mobile node in the network operates not only as a host but also as a router in forwarding packets to other mobile nodes in the network. Each node contains a limited resource constraint such as battery power, bandwidth, etc. Since nodes are dynamic, energy drains quickly. Energy consumption and selecting an efficient path between source and destination are the major challenges in this type of network. Lots of approaches have been proposed in developing an energy efficient route. This paper presents some of the latest approaches that provide an energy efficient route in delivering the packets from source to destination and also enhance the lifetime of the network.

III. PROPOSED WORK

The nodes in mobile ad hoc networks are mobile in nature and they continue to move from one position to another. In any kind of network the reliability of data is very important. All the packets sent by the source node must reach the destination node intact otherwise it results in loss of data packets. The packets loss in the network can be due to packet collision, it may result due to presence of some malicious node in the network, the packet loss may be resulting out of link breakage etc. The mobile nature of nodes in ad hoc networks result in link breakage between the nodes. This leads to packet loss and the result is decrease in the throughput which is defined as amount of data that is received at the destination node. In the study done by Latif Ullah Khan [11] et al in "M-AODV: Modified Ad hoc on Demand Distance Vector routing scheme", the authors have considered the throughput of the links into account while forming the source between source and destination node. In normal AODV the route between the source and destination is made on the basis of minimum hop count. The authors modified the route discovery process, the throughput of the links is taken into account. The link which has minimum throughput is considered as the throughput of the whole route. This approach showed better results than the normal AODV.

However, the throughput of the links depends on the mobility of the nodes. If the nodes are moving at high speed it results in link breakage between the nodes resulting in packet loss and the decrease of throughput. The mobility of the nodes must be taken into account to avoid the link breakage between the nodes and increase the performance of the network.

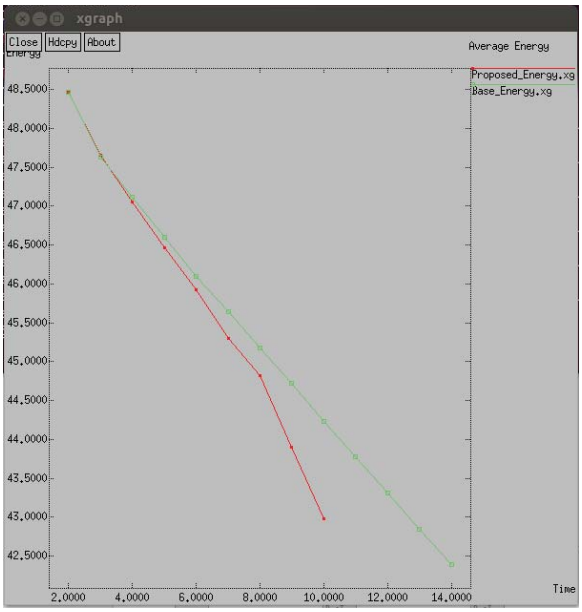
Thus in the proposed scheme the path between source and destination has been chosen on the basis of the highest throughput as well as the lowest mobility of the nodes in the path.

IV. RESULTS AND DISCUSSION

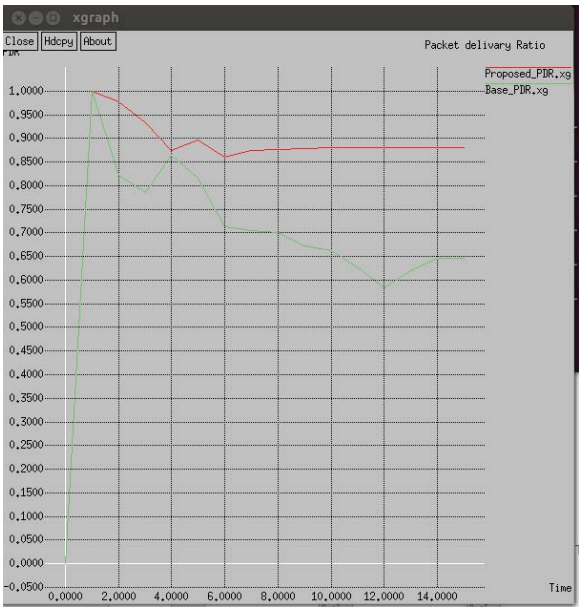
The proposed scheme has been implement in NS2.35. The simulation parameters used in the work are defined below:

Parameter	Value
Channel	Wireless
Propagation Model	Two Ray Ground
Mobility Model	Random Way Point
Routing Protocol	AODV
Number of nodes	50
Mac	802.11
Antenna	Omni Directional
Initial Energy	50 Joules
Network Area	1300m * 1300m
Queue	Drop Tail

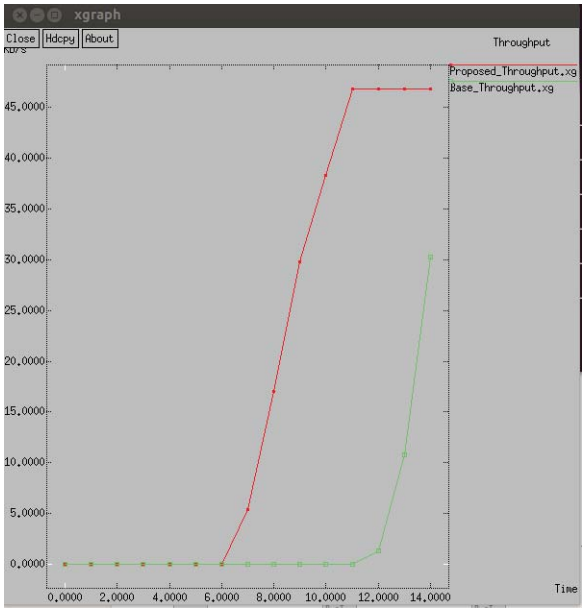
Table : Simulation Parameters



The above figure shows the comparison between energy consumption values achieved during the simulation of the proposed scheme as well as existing scheme. The initial energy of 50 Joules was given to the nodes in the network. At the end of simulation the remaining energy in the proposed scheme was 43 Joules showing the consumption of 7 Joules. Whereas in case of existing scheme the remaining energy was found to be 42 Joules showing consumption of 8 Joules.



The mobility of the nodes has been taken into account in addition to the throughput of the links while selecting the path between source and destination node. The lower mobility of the nodes ensures the better links and the consequently the packet delivery ratio has shown to outperform the existing scheme's same factor.



The throughput is the amount of data received at the destination node per unit of time. Better the throughput would mean that more amount of data is received at destination, better the performance of the network. In case of the proposed scheme, the amount of throughput achieved is 46 Kbps whereas the throughput achieved in case of existing scheme was found to be 30 Kbps.

V. CONCLUSION AND FUTURE WORK

The proposed scheme as well as the existing scheme has been implemented on Ns2.35 and the performance of the network has been evaluated on the basis of parameters namely packet delivery ratio, energy consumption and throughput of the network. The path having link with highest throughput is considered for data transmission, however since the topology of the network keeps on changing in mobile ad hoc networks so the

inclusion of the mobility factor in the proposed scheme while selecting the path for data transmission helped increased the performance of the network.

The many probabilistic broadcasting approaches have found to reduce the energy consumption of the networks. Thus in future the proposed work can be combined with various other techniques that reduces energy consumption of the network to further increase the performance.

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REFERENCES

[1] Sunil Taneja & Ashwani Kush, "Energy Efficient, Secure and Stable Routing Protocol for MANET", Global Journal of Computer Science and Technology, Network and Web Security, Volume 12 Issue 10 Version 1.0 May 2012.

[2] Shiva Prakash, J. P. Saini, S. C. Gupta, "A review of Energy Efficient Routing Protocols for Mobile Ad Hoc Wireless Networks", International Journal of Computer Information Systems, Vol. 1, No. 4, 2010.

[3] Mads Darø Kristensen and Niels Olof Bouvin, "Energy Efficient MANET Routing Using a Combination of Span and BECA/AFECA", Journal Of Networks, Vol. 3, No. 3, March 2008.

[4] T.Sukumar, "Energy Efficient Multicast Routing Protocol For MANETs", International Journal of Advanced Engineering Technology, IJAET, Vol. I, Issue I, April-June, 2010,65-74.

[5] N. C. Kaneriya, Dr. P. P. Kotak, Prof. A. M. Lathigara, "Review Paper On Energy Efficient Algorithm in MANET", Journal of Information, Knowledge And Research in Computer Engineering, Nov 12 to Oct 13, Volume – 02, Issue – 02.

[6] Xiao Wang*, Jing Yang, Zetao Li and Handong Li, "The energy-efficient group key management protocol for strategic mobile scenario of MANETs", EURASIP Journal on Wireless Communications and Networking 2014.

[7] Vijayan R, Mareeswari V , Samyukta V, "Enhancing Energy Efficiency of Routing Protocol through Cross Layer Interactions in MANET", International Journal of Engineering and Technology (IJET), Volume 5 No 2 Apr-May 2013.

[8] Manpreet Kaur, Pooja Saini, "Analysis of Energy Efficiency and Throughput for IEEE 802.11 based Mobile Ad hoc Networks", International Journal of Science and Research (IJSR), Volume 4 Issue 6, June 2015.

[9] Dharani D, Devaki P, Ph.D, " A Study on Energy Consumption in Mobile Adhoc Network", International Journal of Computer Applications, International Conference on Innovations in Computing Techniques (ICICT 2015).

[10] Amit Shrivastava, Nitin Chander, "Overview of Routing Protocols in MANET's and Enhancements in Reactive Protocols" ,Available Online.

[11] Latif Ullah Khan, Sahibzada Ali Mahmud, M. Haseeb Zafar, Gul M. Khan, Hamed. S. Al-Raweshidy, "M-AODV: Modified Ad Hoc On-demand Distance Vector Routing Scheme" , 9th International Symposium on Communication Systems, Networks & Digital Sign (CSNDSP). IEEE. 2014