Maximizing the Network Lifetime of MANET Using Efficient Power and Life Aware Routing Protocol

Anuja.M, Jaya shree.S, Gobinath.S, Mrs. R.M.Bhavadharini

Abstract— **MANET is a group of mobile nodes that form a network independent of any centralized administration. The mobile devices are battery driven and the communication may tend to break up due to the energy exhaustion of nodes. Hence it is very important to extend the battery lifetime of mobile devices. Generally MANETs establish communication among different mobile nodes, the death of even few of the nodes due to power exhaustion might cause disconnect of services in the entire network. An on demand source routing protocol called Efficient Power and Life Aware Routing Protocol (EPLAR) is used to increase the network lifetime of MANET. The position of nodes and the time until which the nodes stay stable in the particular position are determined. The battery power of each node is calculated and thus the lowest hop energy of the path is determined. The energy consumed by the nodes will be more if the path break up due to frequent movement of nodes. Hence alternate paths from source node to destination are identified and the packets are transmitted.**

Index terms— **battery power, EPLAR, MANETs, Network lifetime.**

I.INTRODUCTION

A mobile ad hoc network (MANET) , is a dynamic distributed system of wireless mobile nodes in which the nodes can move in any direction independent of each other. The mobile nodes in such network can communicate with each other through direct wireless links or multi-hop routing. It is used in a wide range of applications such as Battle Fields and Rescue operations.The energy consumption is also very important because it directly relates to the operational lifetime.

Ms.M.Anuja, *Computer Science and Engineering, SNS College of Technology, Coimbatore, India, +919790554105.*
Ms.S.Jayashree *Computer Science and Engineering, SNS College of Technology, Coimbatore, India, +917871230567.*
Mr.S.Gobinath*, Computer Science and Engineering, SNS College of Technology, Coimbatore, India, +917418110563.*

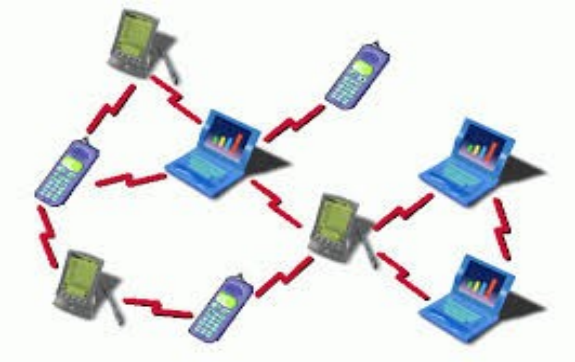

Fig.1: Mobile Ad-Hoc Network

MANETs have several operating constraints such as limited battery charge per node, limited transmission range per node and limited bandwidth. A node consumes its battery power for each transmission and reception of data packet. During transmitting and receiving of data packets the power consumption will also be increased. We mainly focus on reducing the energy consumption of the communication sub-system and increasing the life of the nodes in the system. Routing is an important factor for power management. On-demand routing is composed of route discovery and route maintenance. In route discovery, a source uses flooding to find a route to its destination. The large number of packets generated by flooding consumes energy of nodes unnecessarily. Route maintenance is responsible for reacting to topological changes in the network, and its implementation differs from one algorithm to the other. On-demand protocols include schemes like Adhoc On-demand Distance Vector routing (AODV) and Dynamic Source Routing (DSR). In these protocols, route discovery and maintenance may become inefficient under heavy network load since intermediate nodes will have a higher probability of moving due to the delay in packet transmissions attributed to MAC contention. Routes have a higher

probability of breaking as a result of mobility. The flooding of route request and route reply packets in on-demand routing protocols may result in considerable energy drain. Every station that hears the route request broadcasts will consume an amount of energy proportional to the size of the broadcast packet. In a multi-hop adhoc network, nodes must always be ready and willing to receive traffic from their neighbors. All the nodes unnecessarily consume power due to reception of the transmissions of their neighbors. This wastes an extensive amount of the total consumed energy throughout the lifetime of a node. We propose the Efficient Power and Life-Aware Routing Protocol which we have designed increase the life of the nodes and network by selecting the path with maximum lifetime and providing alternate paths in case of exhaustion of node in the original path.

II.RELATED WORK

The previous work on routing in wireless ad-hoc networks deals with the problem of finding and maintaining correct routes to the destination during mobility and changing topology . The authors presented a simple implementable algorithm which guarantees strong connectivity and assumes limited node range. Shortest path algorithm is used in this strongly connected network. However, the route may not be the minimum energy solution due to the possible omission of the optimal links at the time of the network calculation. The authors have also developed a dynamic routing algorithm for establishing and maintaining connection-oriented sessions while the topology changes.

III .SYSTEM ASSUMPTIONS AND DEFINITIONS

To conserve energy, the amount of energy consumed by all packets traversing from source node to destination node should be minimized. The total amount of energy consumed by the packets when it travels from each and every node on the route must be known. There are two routing objectives such as minimum total transmission energy and total operational lifetime of the network. They can be mutually contradictory. The selection of routes can also be made regarding the performance requirement policies. The battery power of the nodes undergo depletion when several minimum energy routes share a common node which leads to the shortening of netwok's lifetime. The EPAR(Efficient Power and Life Aware Routing) protocol used in the existing system minimizes the variance in the remaining energies of all nodes and therefore the network lifetime can be increased. EPAR makes the routing decisions to improve the performance of power or energy related evaluation metrics. The EPAR mainly chooses the path based on energy. The battery power of each path is calculated thus the lowest hop energy of the path is determined. The path is then selected by choosing the one with the maximum lowest hop energy. For example, consider two paths named path1 and path2 with battery power 18 and 25 respectively. According to EPAR algorithm, the path2 will be chosen because the battery power is greater than that of path1.

EPAR is an on demand source routing protocol that uses battery lifetime prediction. It identifies the capacity of the nodes by their residual battery power and the expected energy spent in reliably forwarding the data packets over a specific link. It uses mini-max formulation. The network lifetime of the MANET can be increased based on the following equation,

$$\text{Max } T_k\ t = \text{Min } T_i\ t$$

where, $T_k\ (t)$ = lifetime of path k

$T_i\ (t)$ = predicted lifetime of node i in path k

The network metrics considered for this approach are Remaining battery power, Power consumption, Dropped packets and Network lifetime.

The main drawback of this system is that it does not consider the frequent movement of the nodes and hence the mobility is not determined. Also no alternate paths are provided for the transmission of data packets in case of depletion of nodes in the original path.

IV. NETWORK METRICS CONSIDERED BY THE PROTOCOL :

Remaining Battery Power:
The number of nodes in the network versus the average remaining battery power is considered as the metric to analyze the performance of the protocols in terms of power.

Power Consumption:
The battery power consumption refers to the power spent in calculations that take place in the nodes for routing and other decisions.
The number of nodes in the network versus average consumed battery power is considered as a metric.

Dropped Packets:
The performance at a node is often measured not only in terms of delay, but also in terms of the probability of dropped packets. Dropped packet may be retransmitted on an end-to-end basis in order to ensure that all data are eventually transferred from source to destination.

Network lifetime:
If the battery power is high in all the mobile nodes in the MANET, network lifetime is increased. So this considers node energy.

Mobility Prediction:
The fifth metric checks and predicts the mobility of mobile nodes. This helps to predict the lifetime and availability of the node.

Proactive and reactive process:
The protocol performs both proactive and reactive mechanism. In the reactive process the system select equal cost link after link failure.

V.PROPOSED APPROACH TO MAXIMIZE THE NETWORK LIFETIME OF MANET:

Increasing the network lifetime of MANET is very essential because most of the devices in this network operate with the help of battery power. If the battery power goes down in any one of the nodes in this network, the route established via that node gets affected and leads to improper transmission of data packets. One major problem is that establishing the route and maintaining the route is very difficult in MANET. This problem arises due to the frequent movement of nodes and exhaustion of nodes due to the low battery. We can increase the network lifetime of MANET with the help of our proposed protocol EPLAR(Efficient Power and Life Aware Routing).

The EPLAR protocol is an on demand source routing protocol that uses battery lifetime and mobility prediction. This protocol selects the path which has the node with high lifetime to transfer the data packets from source to destination. The nodes in this network will be splitted into many clusters. Each cluster constitutes group of nodes with different lifetime. The battery power of each and every node in these clusters are calculated. Thus the lifetime of the nodes can be determined. The route is established among various clusters by connecting the nodes with high lifetime. Therefore the data packets can be transmitted through the route discovered. The figure given below shows the formation of clusters in the network.

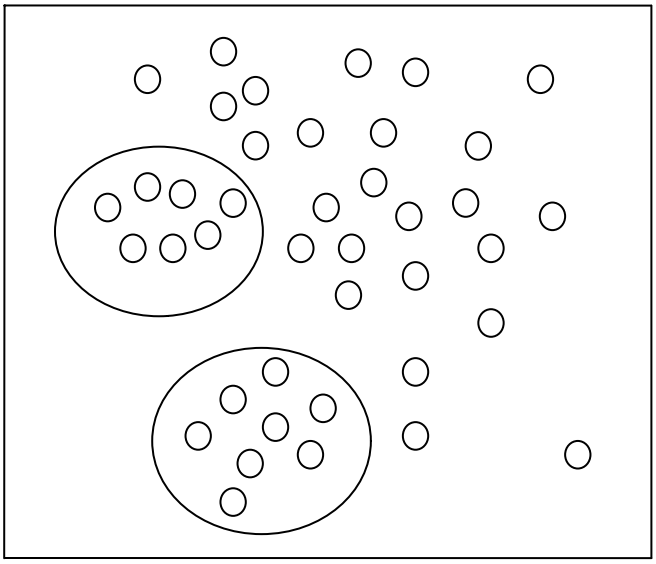

Fig. 2 : Formation of clusters

If the determined path gets failed, alternate paths are provided in order to transmit the data packets without any problem from source to destination. The alternate paths are selected based upon almost equal cost as that of the original path so that the network will not get affected.

VI.CONCLUSION

Our proposed system deals with the Random Mobility model to determine movements of mobile sensor nodes. In the Random mobility model, each node moves to a randomly chosen location with a randomly selected speed between a predefined minimum and maximum speed. After reaching that location, it stays there for a predefined pause time. It then randomly chooses another location after that pause time and moves to that location. This random movement process is repeated during a simulation time. the effective routing with the consideration of link stability as well as black hole attack identification using the sequence number from every RREQ. The proposed system provides two advantages one is it maintains link stability by fading duration and average non fading duration and the another one is black hole prevention. The message is transmitted between sender and destination using many intermediate nodes.The Message Transmission can be based protocol selected path and maximum life time of the path.The Source can choose initially which path has the maximum Lifetime.

ACKNOWLEDGMENT

We take immense pleasure in expressing our humble note of gratitude to our project guide **Mrs.R.M.BHAVADHARINI**, Assistant Professor, Department of Computer Science and Engineering, SNS College of Technology, for her remarkable guidance and useful suggestions, which helped us in completing the paper before deadline.

REFERENCES

[1] Gurpinder Singh, Asst. Prof. Jaswinder Singh , MANET: Issues and Behavior Analysis of Routing Protocols, Volume 2, Issue 4, April 2012 .

[2] Shivashankar, et al. "Study of Routing Protocols for Minimizing Energy Consumption Using Minimum Hop Strategy in MANETS International Journal Of Computing communication and Network Research (IJCCNet Research) Vol. 1. No. 3, pp.10-21, 2012.

[3] Shivashankar, et al."Implementing a new algorithm for Analysis of Protocol Efficiency using Stability and Delay Tradeoff in MANET", International Journal of Computers & Technology, Vol. 2. No. 3, pp.11-17, 2011

[4] Muthuramalingam et al., "A Dynamic Clustering Algorithm for MANETs by modifying Weighted Clustering Algorithm with Mobility Prediction", International Journal of Computer and Electrical Engineering, Vol. 2, No. 4,pp.709-714, 2010.

[5] Priyanka goyal et al.,"MANET: Vulnerabilities, Challenges, Attacks, Application", IJCEM International Journal of Computational Engineering & Management, Vol. 11, pp.3,2011.

[6] Subhankar Mishra et al.," Energy Efficiency in Ad Hoc Networks",Internetional Journal of Bussiness Data Communications and Networking,8(1),pp.1-3,2012.

[7] C.Poongodi and A. M. Natarajan,"Optimized Replication Strategy for Intermittently Connected Mobile Networks", International Journal of Business Data Communications and Networking, 8(1), pp.1-3, 2012.

