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# A PERFORMANCE COMPARISION OF VARIOUS ENERGY EFFICIENT ALGORITHM ON AODV PROTOCOL IN MANET

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*Abstract*— Mobile ad-hoc networks have nodes that are highly dynamic in nature. As there is no centralized infrastructure each node will perform by its own and make its own decision. But battery life of each node is limited. Nodes are highly mobile and battery power is limited so battery power needs to be taken care of and need to create some provision for utilizing it as efficient as possible. Various algorithms have proposed for restricting energy at some level. In this Paper various approaches have been compared. Proposed algorithm is also discussed based on all comparison which will helpful for efficient battery utilization.

*Keywords*— MANET, AODV, ESAR, EEAODR

## I. INTRODUCTION

During some decades so many research works are carried out for transferring message from source to destination. Some researches are on wired media while maximum research works are on wireless media. More specifically researchers prime focus mainly on MANET (Mobile ad-hoc Network) now a days. In mobile ad-hoc network nodes are highly dynamic in nature and it doesn't have any centralized or fixed infrastructure so each and every node will take decision on its own. It's been critical task in MANET to forward data packet from source to destination as no any two nodes are physically connected with each other and as mobiles term says nodes are also highly dynamic in nature. So its performance is totally dependent on routing approaches (like. Proactive, Reactive, Hybrid). Each approach does their work efficiently in their particular field like if moderate or low traffic is concerned then proactive approach (Like DSR and others..) performs finer but if in high traffic scenario it will not work as efficiently as reactive approach(Like AODV and others..) does[4][5][6][10][11][16][17][18][24]

AODV (Ad-hoc On demand Distance vector) routing approach have so many advantages like better scalability, constant header, dynamic routing decision and so on will lead to the front. But it also suffers from battery limitation [5][6][16][24].

Paper [16] tells that on demand approach works far efficient as compared to proactive when routing overhead and delivery ratio is concerned. So it is obvious thing to design an Energy Efficient algorithm based on On-Demand approach

Traditional Routing Protocol selects only those routes which have minimum Hop Count. So it can use energy unevenly among the various nodes and for that reason only some nodes may get crashed & the whole network may collapse [20][21][23].

For utilizing energy efficiently so many approaches are proposed and developed like MBCR(Minimum Battery Cost Routing), MMBCR(Min-Max Battery Cost Routing), CMMBCR(Conditional Min-Max Battery Cost Routing), DEAR (Distributed Energy Efficient Ad-hoc Routing), ONM (Online Max-Min Routing), BECA (Basic Energy Conserving Algorithm), AODV-DF, SPAN, AFECA (Adaptive Fidelity Energy Conserving Algorithm), AODV-SLEEP, LEAR, MDR (Minimum Drain Rate), EDDSR (Energy Dependant DSR), AODV-BR and so many others approaches are used to utilize energy efficiently [4][8][11][13].

Each and every approaches works finer to improve battery life and to improve network life as well but they also have some limitations [4][7][25].

So our proposed algorithm tries to improve battery life efficiently. This paper tries to survey all the related paper of various energy efficient approach and give some suggestions to improve energy of each node as well as tries to improve network life.

This paper proposed an energy efficient approach in which each node will maintain some predefined threshold limit. If any node goes below threshold limit then that intermediate node will not forward RREQ packet to the destination so at destination only those routes will be made available which have sufficient energy. Along with this parameter this paper also proposed cost function at destination node.

In our paper, section 2 presents related work, section 3 presents proposed algorithm and in last section 4 overall work is concluded.

## II. RELATED WORK

So many approaches and algorithm works efficiently to improve energy and network lifetime continuously.

EEAODR (Energy Efficient Ad-hoc on Demand Distance vector Routing) algorithm also help us to improve network life time by adding three more parameter at destination i.e. hop count, time and battery power.[2]

Utkarsh, Mishra and Chinra proposed an algorithm i.e. ESAR for energy utilization in which they suggest that based on actual distance and threshold limit we can improve energy efficiently.[1]

According to [13] MaxMin zPmin algorithm works nicely in their area but it finds so many difficulties to implement into On-Demand approach.

MBCR (Minimum Battery Cost Routing) uses battery power evenly with the help of some cost function which is inversely proportional to remaining battery power. Something like F(bi)=1/bi, Where bi is the remaining battery power of node i. But the limitation of this approach is it works on Total Energy Power only so individual node's energy are not accounted for. So this is the big issue for such type of approach [14].

MMBCR (Min-Max Battery Cost Routing Protocol) tries to overcome the problem of MBCR approach. But lot of total transmission energy is to be used.

So, Balance of total transmission energy and individual node power can be improved by CMMBCR (Conditional Min-Max BCR) approach but the performance mainly lies on threshold value. So when it becomes zero, CMMBCR goes similar to MTPR and when it moves infinity, it will be worked like MMBCR [14].

DEAR (Distributed Energy Efficient Ad-hoc Routing) works more efficiently as compared to MMBCR and CMMBCR as it works on fair node selection and minimum transmission energy scenario.[19]

ONM(Online Max-Min Routing) Protocol maintain two different matrices in which one will be worked for minimizing power consumption and second will be worked for maximizing the minimum residual/remaining power at each node. Dijkstra Algorithm will help to find best efficient path which takes less energy using both these matrices. But maintaining and handling such matrices at each time is not feasible all the time.[25]

AODV-DF and AODV-BR also efficiently works to find alternate path that takes less Energy as compared to traditional concept [12].

Sleeping, listening and active are the three modes of any individual node. By switching the node between these three modes one can efficiently save energy.BECA (Basic Energy Conserving Algorithm) & AFECA (Adaptive Fidelity Energy Conserving Algorithm) does the same [8].

Multi Grid Based Reliable Routing Protocol for Tactical Mobile Ad-Hoc Network works on deployment region and geographical Information in which multiple Grid are to be constructed. MGRR works on the same region to construct a Graph but it can also find difficulties when network becomes dense.[3]

Among all these concepts there are so many other concepts that works fairly for improving energy like by using directional antenna one can also improve system throughput[8][10],By using Dynamic Beacon Period,By periodically changing connected dominating set of nodes and so on.

So many other algorithms also used to work on the same principle like EDDSR (Energy Dependant Dynamic Source Routing), MDR (Minimum Drain Rate), and AODV-SLEEP mode, SPAN Protocol, PEN (Prototype Embedded Network) and many more.

But each approach has its own pros and cons so we have to identify it first and we have to work accordingly.

Table 1 : Tabular comparison of various techniques

| SR.NO. | PAPER DESCRIPTION | PAPER EXTRACTS |
|---|---|---|
| 1 | Security and Energy Efficiency in Ad Hoc Networks | AODV is better where Higher traffic is concerned as compared to others.<br>-ECSRP(Error Aware Candidate Set Routing Protocol)<br>-PUMA(Protocol for unified Multicasting Through Announcement) |
| 2 | Energy Efficient Routing Protocols in Mobile Ad hoc Network based on AODV Protocol, | Key Challenge :<br><br>Sufficient Energy Level must be maintained by each node,<br>Along with this parameter minimum hop Count must also be maintained. |
| 3 | Energy Efficient Adaptive Routing Algorithm in MANET with SLEEP mode | Each and every node has to maintain some threshold energy value. if any node goes below minimum threshold value than we have to switch those node into sleep mode. |
| 4 | Energy Efficient Routing in Mobile Ad-hoc Networks based on AODV Protocol | Residual Energy at each node will be tracked by some parameter (Eres).<br><br>The header of RREQ packet will keep track on route discovery process. |
| 5 | EENMDRA: Efficient Energy and Node Mobility based Data replication Algorithm for MANET | Proposed Algorithm maintains three parameter,<br>i.e. Primary Assistant,<br>Secondary Assistant,<br>Customers.<br>It works on one general principle that node consumes more power when Data is held by other node.<br>So they replicate the Data for better improvement of Energy. |
| 6 | An Energy Efficient Algorithm for Distributed Mutual Exclusion in Mobile Ad-Hoc Networks, | Author proposed an algorithm which is token based mutual exclusion approach, in which cluster will be organized and cluster head will be assigned and overall logical tree is formed.<br>Here, Inter node communication can be done by Token passing Method only. |
| 7 | An On-Demand Energy Efficient Routing Algorithm for Wireless Ad-hoc Networks | Node with relatively large battery energy will rebroadcast RREQ packets earlier.Because on Demand Routing Protocols drop duplicate RREQ packet without rebroadcasting them.<br><br>DEAR can therefore setup the route composed of the nodes with relatively high battery power. |
| 8 | Ad-hoc On-Demand Distance Vector Routing (AODV Protocol) | Best Approach when high traffic is concerned<br>Destination will reply to source on the basis of first RREQ and path will be established.<br>It will work on First Come First Serve Basis |
| 9 | An energy efficient ad hoc on demand routing protocol for mobile ad hoc network (EEAODR) | In Route Discovery Process,<br>Destination will reply based on three parameter i.e. Hope count, Time , Residual Energy of Each node<br>On the basis of these parameters cost function will be evaluated and best path is selected. |
| 10 | An Energy Saving Ad Hoc Routing Algorithm for MANET (ESAR) | Destination will reply to Source based on Two Parameters.<br>1)minimum available battery power of a node<br>2)Actual distance between the source and the destination in the ith path |

## III. PROPOSED ALGORITHM

We choose AODV approach due to its greater functionality and features. Additionally, Traffic is increasing day by day in recent environment so reactive approach will be well suited for the same. But as we have said this approach also suffers from limited battery power so our proposed algorithm will tries to improve battery life and can improve network life as a whole.

Our proposed algorithm will increase the network life and minimize the energy at each node. So it will provide energy efficient route from source destination pair.

ESAR and EEAODR works better for improving battery life but all the energy calculations is to be done by destination end only.[1][2]

Each node will maintain some threshold limit and if any node doesn't have sufficient energy as compared to predefined threshold limit than that node will not forward the data packet to the next level. By using this approach only higher energy node will take part to forward the packet and only those route will be selected which have higher energy level. So overall Energy Level can be maintained.

Along with the above concept, we will buffer the path which comes from the source and based on this stored path, predefined cost function will be evaluated which gives the best path from source to destination and all other path are reserved for the future purpose. Cost function will be working on three parameter i.e. total path energy, time, hop count.

By using this concept, network energy as well as network longevity will also be improved.

## IV. CONCLUSION

Energy is an important parameter for any routing protocol and it should be utilized as efficiently as possible. Various approaches have been developed for maintaining energy efficiently. Each approach works better in their particular region. This paper also proposed an approach which tells that by implementing cost function at destination and maintain threshold limit at intermediate node, only best energy efficient path will be made available .So energy of each node will also improve as well as network life and longevity will also be improved.

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