Energy Efficiency And Better Throughput In MANET Using Improved AOMDV

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Abstract—In Mobile Ad hoc Network (MANET) all the nodes are mobile in nature having limited battery capacity that is called energy. Because of the dynamic behavior of network link are not maintained for long time. All nodes in network are energy dependent and efficient energy utilization is one of the important issues in MANET. The location based DREAM (Distance routing Effect Algorithm for Mobility) protocol are maintained the location information of each node with respect to sender and receiver. Our Work is towards a new location based energy efficient scheme with better throughput AOMDV protocol. In this scheme energy dependent nodes are do routing with AOMDV protocol by using the concept of location based protocol DREAM. Nodes in network are not intimated about their energy status, for that remove the suddenly link breakage. If the nodes in network are know about the energy status and also about the status of location of receiver that reduces the energy consumption with better throughput. The Final Result gives better energy utilization and improved the throughput in network with better packet delivery ratio and end to end delay. Simulation did by using ns-2 simulator for efficient use of energy with better throughput. The performance measured on the basis of performance parameter like Routing Protocol, Simulation time, Traffic type (TCP & UDP), Packet size, Node movement at maximum Speed, Transmission range, Transmission Energy, Receiving Energy, Idle Energy Consumption, Sleep Energy Consumption, Normal Routing Load and Packet Delivery Ratio.

keyword:- AOMDV, better energy and throughput, wireless ad-hoc network, MANET.

I. Introduction

Wireless ad-hoc network can be characterized by various categories like Mobile ad-hoc network, Vehicular ad-hoc network and wireless sensor network. A variety of widely differing techniques and methodologies for scheduling processes of saving energy with better throughput have been proposed. There are various protocols available to improve energy with better throughput. These protocols are mainly classified into three different types: Reactive protocol, Proactive protocol, and Hybrid protocol. Reactive protocol also called as on demand routing protocol. Reactive protocol is based upon some sort of request –reply dialog. Reactive protocol is better than the proactive protocol. For example reactive protocols are AODV, EEAODV etc. In the proactive protocol all the nodes maintains the information about the next node. All the nodes of any protocol have to depends on its entire to its adjacent nodes. Hybrid protocol is based upon distance vector protocol but contain many features and advantage of link state protocol. The main goal of most of the protocols is to equalize the workload among the nodes by minimizing the energy requirement, increasing the network capacity, minimizing communication delays, maximizing resource utilization and maximizing throughput The main goal of MANET is to increase the mobility into the realm of autonomous, mobile and wireless domains, where a set of nodes form the network routing infrastructure in an ad-hoc structure.

We focus particularly on energy aware geographic routing since it is the one of the research of geographic routing includes DREAM that proposed constrained flooding. The expected zone is defined by predicting the boundary of the destination node's movement. In this protocol, prediction is made based on the time difference between sending data and the location information's update, as well as the destination node's speed. In the DREAM protocol, however, according to the location information, the data packet is flooded in a restricted directional range without sending a routing packet. Although this kind of forwarding effectively guarantees delivery, its energy use is notably high, especially in large-scale networks.

We also focus on the improvement of the throughput of the network by providing higher cpu utilization in the network. The table for the throughput will maintain the information of the destination routing path. The next packet forwarding path should be selected on the basis of node having higher residual energy with shortest path in descending order to improve the throughput of the network. After this selection, a new route with maximum residual energy is selected to forward rest of the data packets. These results in the improvement of the individual node's battery power consumption and enhance the entire network lifetime.

So the network always works better for the nodes with higher residual energy with shortest path.

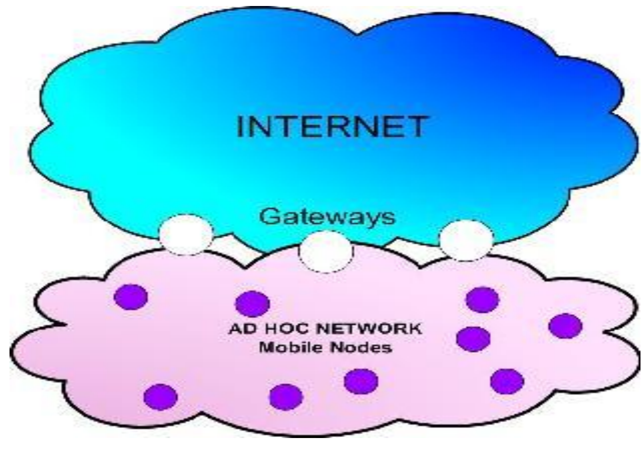

Fig. 1: Mobile Ad Hoc Network [4]

II. RELATED WORK

In Wireless ad-hoc network, energy efficiency and throughput have gained interest among researchers and lots of work had been done in this regard to provide better network with each node having advanced advantages.

A. International journal of engineering research and applications (IJERA),"Development of Energy Efficient and Reliable Congestion Control Protocol for Multicasting in Mobile Adhoc Networks compare with AODV Based on Receivers", K.Srinivasa Rao, R.Sudhistna Kumar, P. Venkatesh, R.V.Sivaram Naidu,2012.[1]

1) *Functional Description:* The author has given simulation results shows that the proposed EERCC protocol has better delivery ratio and throughput with less delay and energy consumption when compared with existing AODV Protocol.

2) *Conclusion:* EERCC protocol overcomes the disadvantages of existing multicast congestion control protocols which depend on individual receivers to detect congestion and adjust their receiving rates. Because of the on-the-spot information collection and rate control, this scheme has very limited control traffic overhead and delay. Moreover, the proposed scheme does not impose any significant changes on the queuing, scheduling or forwarding policies of existing networks. Simulation results have shown that our proposed protocol has better delivery ratio and throughput with less delay and energy consumption when compared with existing protocol and the performance is better than existing multicast congestion control protocols. EERCC concluded that energy efficient and congestion control for multicasting in mobile ad-hoc networks works far better than multicast congestion control protocols in giving more lifetimes to the network.

B. International joint conference on information & communication technology," Energy Efficient Techniques for Wireless Ad Hoc Network", Niranjan Kumar Ray, Ashok Kumar Turuk,2010.[2]

1) Functional Description: This paper suggests three energy efficient techniques to reduce energy consumption at protocol level. The first technique conserves energy by reducing number of route request message while other two techniques suggest different approach to achieve that.

2) *Conclusion:* The comparison shows that Route request minimization technique can be done by implementing logical grouping; power control techniques reduce the transmission power of a node while topology control approach increases the network longevity by satisfying network constraints. The simulation result suggests that multi-hop is ideal for energy point of view but the limitation is the increase chance of link failure.

C. Journal of information, knowledge and research in computer engineering," A review paper on energy efficient algorithm in manet", N. C. Kaneriya, Dr. P. P. Kotak, Prof. A. M. Lathigara,2013.[3]

1) *Functional Description:* This paper presents survey on different approaches of Energy efficient Algorithm for MANET. After that we have presented two factors DISTANCE FACTOR (DF) and TIME INTERVAL OF RREP (TIRREP) for making them a more energy efficient.

2) *Conclusion:* In this paper two factor: DF (Distance Factor) and TIRREP (Time interval of RREP packet) plays an important roll to save energy as well. So using this concept we can save energy at some what level.

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III. AD-HOC ON DEMAND MULTIPATH DISTANCE VECTOR ROUTING PROTOCOL

One of the most commonly used AOMDV is a multipath routing protocol provides loop-free extension to another multipath routing protocol AODV. [6] AOMDV with a route tables contain a list of paths for each destination, to support multipath routing. All the paths have the same destination sequence number to a destination. All the routes with the old sequence number are removed, once a rout advertisement with higher sequence number is received. Two additional fields, hop count and last hop, are stored in the route table entry to help address respectively the problems of loop freedom and path disjointness. The loop freedom guarantee from AODV is no longer required here, because the multipath routing protocol implement multipath discovery. [6] In AOMDV, RREQ propagation from the source towards the destination establishes multiple reverse paths both at intermediate nodes as well as the destination. Multiple RREPs traverse these reverse paths back to form multiple forward paths to the destination at the source and intermediate nodes. Note that AOMDV also provides intermediate nodes with alternate paths as they are found to be useful in reducing route discovery frequency[9]. The core of the AOMDV protocol lies in ensuring that multiple paths discovered are loop-free and disjoint, and in efficiently finding such paths using a flood-based route discovery.[22] AOMDV having two table fields hop count field and last hop field, in which hop count field initialized once at the time of the first advertisement for that sequence number and contains length of the longest path for a specific destination sequence number. That's why hop count field remain unchanged till a path for a higher destination sequence number is received. To ensure disjointness of that path in the route table, a node discards a path advertisement that has either a common last hop or a common next hop as already stored in the route table.

IV. DREAM PROTOCOL

DREAM is a location-based routing protocol work for Ad-hoc networks. It stands for Distance Routing Effect Algorithm for Mobility. Here in this comparison distance and mobility plays an important role, so in our named as Distance Routing Effect Algorithm for Mobility (DREAM) protocol for ad hoc networks. [6] DREAM protocols have some desirable properties of providing bandwidth and energy efficiency. We can say that with respect to existing protocols, in DREAM more bandwidth and energy (required for transmission in each mobile node) can be used for the transmission of data messages. Most importantly: 1. The rate of control message generation is determined and optimized according to the mobility rate of each node individually. [6] 2. Due to the "distance effect" the number of hops (radius from the moving node) it will be allowed to travel in the network before being discarded will only depend on the relative (geographic) distance between the moving node and the location tables being updated. DREAM protocol provide loop-free path, since each data message propagates away from its source in a specific direction. DREAM protocol is also adaptive to mobility, since the frequency with which the location information is disseminated depends on the mobility rate. All nodes location information can be maintained by using the location table of nodes which also reduce the average delay of the network.[15]

A. Advantages of DREAM

- This Kind of packet forwarding effectively guarantees packet delivery.
- In the large scale network more energy can be occupy by nodes.
- The location of mobile node can be easily maintained.

B. Disadvantages of DREAM

- It only works fine with some energy efficient protocol.

V. Problem With Current Approach

AODV Protocol provides single path from source to destination so it does not have any alternate path if one path break. The EERCC protocol has better energy consumption and delay but still it takes too much time to transmit the packets from source to destination.

The power control techniques reduce the transmission power of a node but increase the chance of link failure. AODV node catching will provide less packet delivery ratio. AODVMPR is used to overcome the issues of energy and looping problem with the loss of throughput.

AOMDV Protocol having more than one path, if the first one is break then second provides the proper packet delivery, this causes some reduction of node energy consumption and the topology of MANET always changes due to high mobility of nodes.But still by providing proper energy efficient algorithm we can improve the performance of the same protocol. More nodes will be mobile in nature so chances of location loss will be more in AOMDV protocol. Apart from that, it is very difficult to have better throughput with the less lose of energy of nodes in AOMDV protocol.

VI. Proposed Work

In order to balance the requests of the resources it is important to recognize a few major goals of energy efficiency and improved throughput parameters:

A. Packet Delivery Ratio: primary aim is to achieve an overall improvement in system performance at a reasonable cost. [6]

B. End To End Delay: Includes all the delays encountered by the packet at the different hops from the time it was sent by the source until the time it was received at the destination. [6]

C. Routing Load: Number of routing packets (and supporting protocol control packets) transmitted per data packet delivered at the destination. [6]

D. Calculation of Node Residual Energy: [2]

Consider a network with multicast groups G1, G2 …Gn. Each group {Gi} consists of N nodes. Every node in the MANET calculates its remaining energy periodically. The nodes may operate in either transmission or reception mode. Let {E1, E2……….En} are the residual energies of the nodes measured by the following method.

The power consumed for transmitting a packet is given by the Eq (1)

Consumed power = Transmitted power (TP) * time (t) … (1)

The power consumed for receiving a packet is given by

Consumed power = Receiving power (RP) * time (t) … (2)

Where t=Data size(Ds)/Data rate(Dr) … (3)

So the residual energy(E) of each node can be calculated using equation (1), (2) and (3)

E = Current energy – Consumed energy

Wherever we get the value of the residual energy (E), We calculate the nest path with minimum nodal residual energy. Then we select the routes on the basis of descending value of nodal residual energy. Finally select the path with maximum nodal residual energy to forward the data packets In order to improve the throughput by dynamically controlling the contention window (CW).[19] The throughput is the average of the throughputs of all hosts active in the network. We can also use the idle sense method for increasing the number of host and improve the value of throughput. The advantage of *Idle Sense* is more in providing better fairness along with similar level of throughput.[9].If the value of contention window will set to minimum in order to improves the throughput. This value is the smallest one that allows any other host which becomes active to enter the competition for channel access.

AOMDV route table entry has a new field for the advertised hop count. Besides a *route list* is used in AOMDV to store additional information for each alternate path including: next hop, *last hop*, hop count, and expiration timeout.

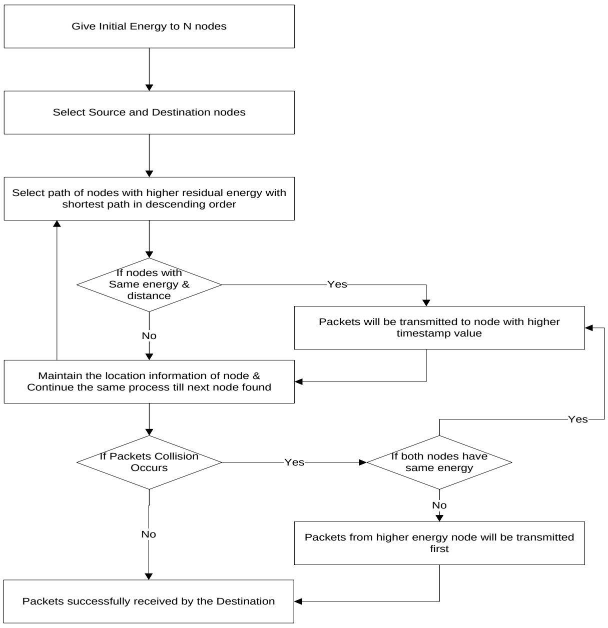
destination
sequence number
advertised_hopcount
route_list
{seqnumid {(nexthop1,hopcount1),(nexthop2,hopcount2),…}
expiration timeout

Table.1 Routing table entry structure in AOMDV

The Algorithm Steps

- Step 1: N nodes are distributed in network.
- Step 2: Initially all nodes conserve same energy.
- Step 3: Each packet sensed by a node is assigned a unique number id & broadcast it to all nodes in the network.
- Step 4: Each node that receives the id checks if it is already stored in its memory.
- Step 5: If yes, the data will be discarded.
- Step 6: Else, select the higher residual energy node with the shortest distance path.
- Step 7: Else if node with same residual energy and distance then packets will be transmitted with higher timestamp value.
- Step 8: Maintain the location information of node and continue the same process till destination found.

- Step 8: If packets collision occurs then reduce the contention window by giving the priority to node with higher residual energy.
- Step 9: check whether the data reach to the destination
- Step 10: If yes, broadcast the packet id to all nodes.



VII. SIMULATION PARAMETERS AND RESULTS

A. *Simulation Parameters*

The experiments were carried out using the network simulator (ns-2). The scenarios developed to carry out the tests use as parameters the mobility of the nodes and the number of active connections in the network.

The module explained above was tested with the previously developed attacks. The choices of the simulator parameters that are presented in table I consider both the accuracy and the efficiency of the simulation.

Type	Value
Number of nodes	60
Transmitting Power	1.6 W
Receiving Power	1.8 W
Traffic Model	CBR
Packet Size	50
Routing Protocol	AOMDV
Location Protocol	DREAM
X Dimension topography	1500,800,1000
Y Dimension topography	500,800,500
Initial Energy	50 J
Simulation Time	300 sec

Table 1: Simulation parameter

B. Result: Throughput Analysis: Throughput improves using the proposed algorithm. Table shows throughput results for different values of X and Y Dimensions. Graph for the X=1500 and Y=500 shows the improvement in throughput.

X	Y	AOMDV(kbps)	Imp_AOMDV
1500	500	17.64	23.03
800	800	14.12	16.53
1000	500	13.60	18.09

Table 2: Throughput Analysis

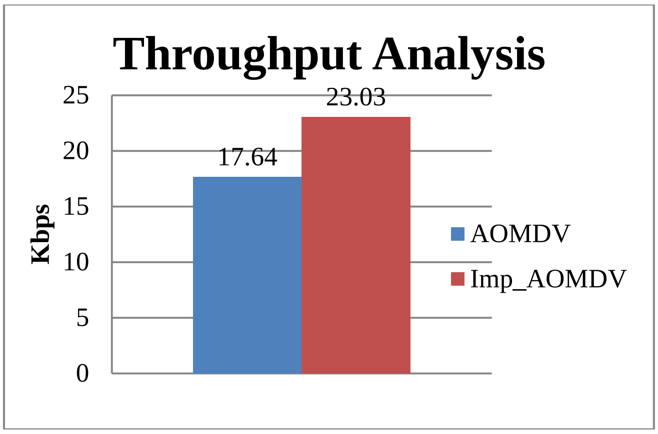


Fig. 2

C. Packet Delivery Ratio: PDR improves using the proposed algorithm. Table shows PDR results for different values of X and Y Dimensions. Graph for the X=1500 and Y=500 shows the improvement in PDR.

X	Y	AOMDV	Imp_AOMDV
1500	500	0.78	0.91
800	800	0.81	0.86
1000	500	0.80	0.90

Table 3: Packet Delivery Ratio

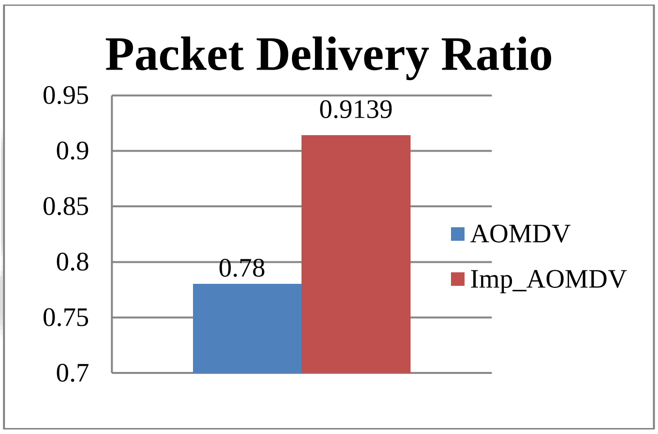


Fig. 3

D. End To End Delay: It improves using the proposed algorithm. Table shows results for different values of X and Y Dimensions. Graph for the X=1500 and Y=500 shows the improvement in end to end delay.

X	Y	AOMDV(sec)	Imp_AOMDV
1500	500	148.935	192.897
800	800	140.584	194.897
1000	500	117.01	184.628

Table 4: End to End Delay

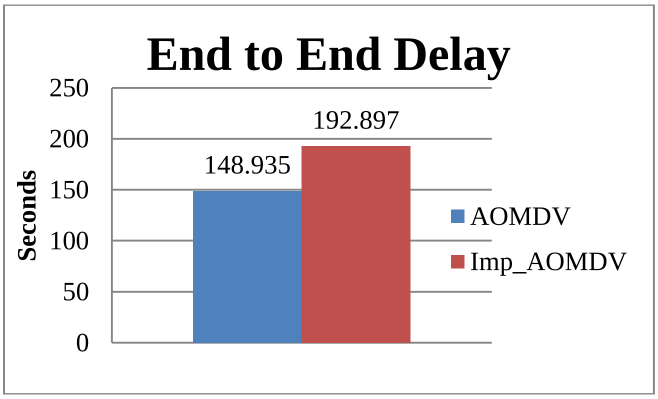


Fig. 4: Dropped packets

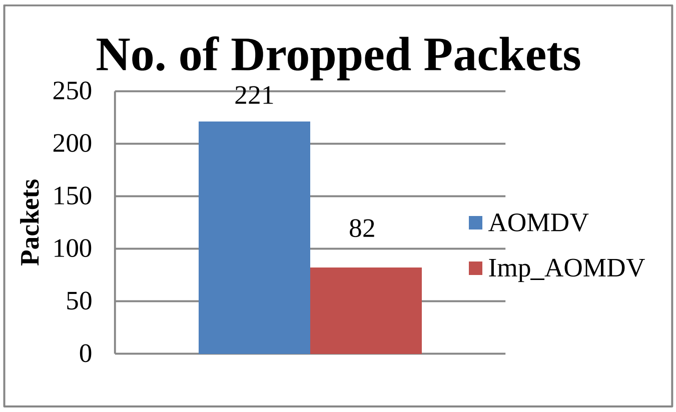


Fig. 5: Hop Count

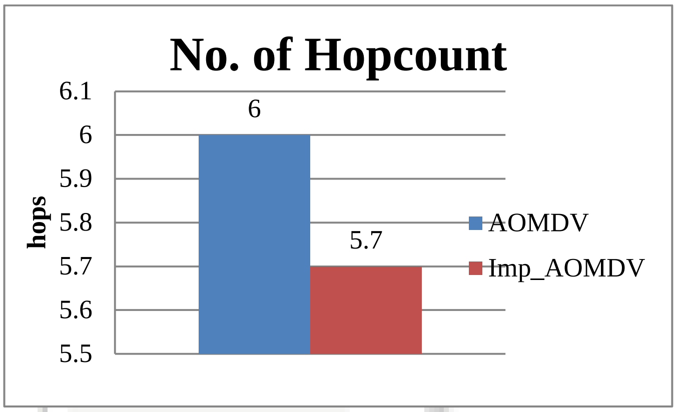


Fig. 6

E. Energy Efficiency: The Imp_AOMDV is more energy efficient as compare to AOMDV as shown by the below graph.

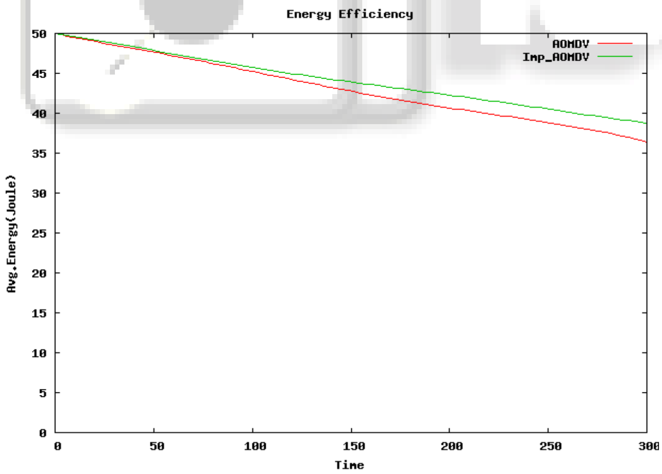


Fig. 7

VIII. Conclusion And Future References

There are various algorithms available for energy efficiency but very few works better with other parameters like packet delivery ratio, end to end delay. The proposed work can be useful to improve values of multiple parameters of the network in multipath routing environment. The proposed work also has less delay which gives more life time to the network. Due to less number of packets dropped in proposed multipath routing so it becomes necessary to control the load of the network.

Future work includes, analyze the performance of proposed algorithm with different values of parameters. Also try to further reduction of load in the network by increasing the lifetime of the network. Furthermore, the proposed algorithm can also be replaced with the existing work to improve the performance of the network.

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