# Energy Efficient Optimized AOMDV Routing Protocol for MANET

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*Abstract*— A Mobile Ad hoc Network (MANET) is an accumulation of portable hubs depending neither on settled correspondence constructs nor in light of any base stations to give network. Accordingly, the steering conventions for a MANET must be versatile and equipped for keeping up courses as the qualities of the system integration change. Outlining a proficient and dependable directing convention for such systems is a testing issue. The AOMDV (Ad hoc on interest Multipath Distance Vector) is an on interest directing convention taking into account separation vector idea and uses jump by-bounce steering way to deal with do transmission. In this exposition work, we propose a plan which could consider energy conservation and briefest way. In this steering plan, we have consider both the most limited way and the vitality preservation in multipath route with proposed vitality based multipath directing. The whole recreations are performed in Network Simulator 2.

***Key words:*** MANET, AOMDV, Optimize, EEAOMDV

## I. INTRODUCTION

A mobile ad hoc network is a gathering of remote portable node framing an impermanent system with no framework or incorporated administration [1]. Specially appointed remote system is generally another model of multi-hop remote systems administration and has get to be well known. It is a critical piece of the processing environment, comprising of framework less versatile systems. In manet, every node speaks with different nodes straightforwardly or by implication through middle nodes. The credit for the increment of specially appointed system lets it all out self-arranging and self-designing properties. All nodes in a manet basically reason as portable switches taking an interest in some directing protocol needed for choosing and keeping up the routes.

Since MANETs are baseless, self-arranging, rapidly deployable remote systems, they are extraordinarily suitable for applications associating exceptional outside occasions, correspondences in areas with no remote interchanges, crises and common debacles, and military operations, concentrate site operations, critical business gatherings and robot information accomplishment. By and large, routes between nodes in an ad hoc network may incorporate numerous hops and, thus, it is right to call such systems as "multi-hop remote specially appointed systems". The nodes in the MANET are battery operated[1].

Disappointment of a few nodes operation can significantly postpone execution of the system and even influence the fundamental accessibility of the system, i.e., routing. The development design, area, heading of development, space opportunity, rates and quickening change over the long haul of the portable nodes can be portrayed by their portability models.

## II. CLASSIFICATION OF MANET ROUTING PROTOCOLS

Routing protocols between any pair of nodes inside MANET can be troublesome on the grounds that the nodes can move randomly and can likewise join or leave the network[2]. This implies that a best possible route at a distinct time may not work seconds after the fact. The routing protocols are classified into three categories:

- Proactive or Table Driven Protocols
- Reactive or On Demand Routing Protocols
- Hybrid Routing Protocols

### *A. Proactive or Table Driven Protocols:*

Work out courses out of sight free of movement requests. Every node uses steering data to store the area data of different nodes in the system and this data is then used to move information among distinctive nodes in the network[2]. This sort of protocol is moderate to join and may be inclined to directing circles. These protocols keep a steady diagram of the system and this can be an impediment as they may respond to change in the system topology regardless of the fact that no movement is influenced by the topology adjustment which could make pointless overhead. Indeed, even in a system with little information movement, Table Driven Protocols will utilize constrained assets, for example, power and connection transmission capacity in this way they may not be consider steering answer for Ad-hoc Networks. DSDV, Fisheye State Routing are the sample of a Table Driven Protocol.

### *B. Reactive or On Demand Routing Protocols:*

Establish courses between nodes just when they are obliged to course information bundles. There is no upgrading of each conceivable course in the system rather it concentrates on courses that are being utilized or being set up. At the point when a course is needed by a source node to a destination for which it doesn't have course data, it begins a course revelation process which goes from one node to the next until it lands at the destination or a node in the middle of has a course to the destination[2]. On Demand protocols are for the most part thought to be proficient when the course disclosure is less incessant than the information exchange on the grounds that the system activity brought on by the course revelation step is low contrasted with the aggregate correspondence data transfer capacity. This makes On Demand Protocols more suited to substantial systems with light movement and low versatility. A case of an On Demand Protocol is Dynamic Source Routing.

### *C. Hybrid Routing Protocols:*

Combine Table Based Routing Protocols with On Demand Routing Protocols. They utilize separation vectors for more exact measurements to build up the best ways to destination systems, and report directing data just when there is an adjustment in the topology of the network[2]. Every node in the system has its own particular steering zone, the span of which is characterized by a zone sweep, which is characterized by a metric, for example, the quantity of jumps. Every node keeps a record of steering data for its own particular zone. Zone Routing Protocol (ZRP) is a sample of a Hybrid directing protocol.

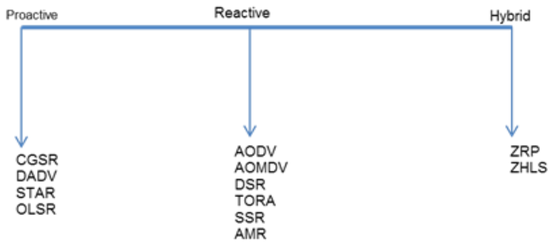



Fig. 1: Categories of Ad Hoc Network Routing Protocols

## III. RELATED WORK

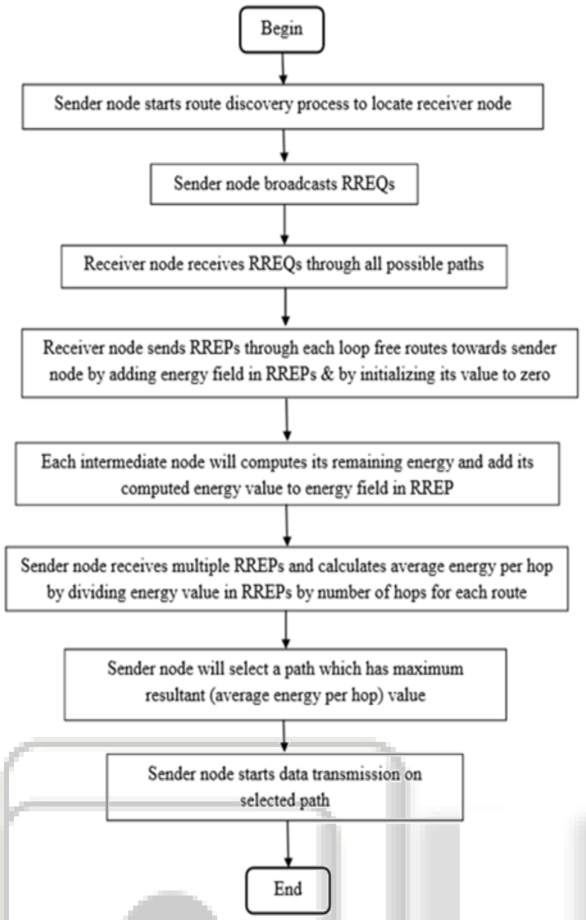
### *A. Ad Hoc On-Demand Multipath Routing Protocol (AOMDV):*

AOMDV [4] is one of the most popular on-demand multipath protocols. It is an extension of a single-path routing scheme known as Ad Hoc On Demand Distance Vector(AODV) [3], and it allows to compute multiple loop-free and link-disjoint paths between any source and destination nodes. We briefly illustrate some of the key features of AODV and AOMDV to provide sufficient background for our proposal. The AODV route discovery is started by the source node with a flooding of route request packets (RREQs) targeting the destination. The source node waits for a route reply (RREP) message testifying the discovered path, up to a given timeout limit. Each intermediate node receiving a RREQ packet checks its local routing table to see if there is a valid route towards the RREQ destination: if a route is available, a RREP packet is generated; otherwise the RREQ is propagated in broadcast. In both cases, the intermediate node saves the reverse path towards the source node, by setting a backward pointer to the previous hop of the current RREQ. Eventually, if the destination node receives the RREQ, it produces the RREP message, which is routed back to the source by using the unicast reverse path established by the corresponding RREQ. A detailed description of AODV can be found in [3]. AOMDV [4] extends the AODV protocol by computing multiple paths during route discoveries. To keep track of multiple routes, the routing entries in intermediate nodes contain a list of the next-hop nodes towards the destination node, and the corresponding hop counts. Additional information is required to ensure loop freedom and to compute node-disjoint and link-disjoint paths. In AOMDV, different instances of RREQs are not discarded by intermediate nodes, because they may provide information about potential alternate reverse paths: if a new RREQ instance preserves the loop free condition and comes from a different last-hop node, then a new reverse route towards the source node is logged in the intermediate node. If the intermediate node knows one or more valid forward paths to the destination, a RREP packet is produced and forwarded back to the source along the reverse path. If possible, the intermediate node includes in the new RREP a forward path that was not used in any previous RREP, for this RREQ. The intermediate node re-broadcasts the new RREQs to neighbor nodes. When the destination receives more RREQ instances, in order to get multiple link-disjoint routes, it replies with multiple RREP messages. Node-disjointedness may be computed from link-disjoint paths simply preventing intermediate nodes from having more than one path passing through them. A complete description of AOMDV can be found in [4].

### *B. Energy-Aware Routing*

Power saving techniques for ad hoc networks can be broadly classified into two categories: power saving protocols and power control for transmission. A power saving protocol [5] aims to put wireless nodes into periodical sleep state in order to reduce the power consumption in the idle listening mode. Power control for transmission [6] manages energy consumption by adjusting transmission ranges. Several on demand energy-aware routing protocols have been designed. In[7], localized rerouting techniques were presented to perform per-link localized optimizations to improve the power efficiency of a power-unaware path by iteratively reroute each of the high-power links via a local low-power alternate path, if possible. In [8], Liu et al. proposes a novel Collision-Constrained Energy Algorithm (ECCA). The algorithm defines correlation factor to weigh collision probability when using node-disjoint multipath to transmit data simultaneously. It can calculate an upper limit for correlation factor according to service requirement, and find a minimum energy node-disjoint multipath routing to satisfy the upper limit. In [9], Liang et al.have proposed an energy and mobility aware geographical multipath routing for wireless sensor networks. The remaining battery capacity, mobility, and distance to the destination node of candidate sensors in the local communication range were taken into consideration for next hop relay node selection, and a fuzzy logic system was applied to the decision making. Simulation results showed that this scheme could extend the network lifetime. In [10], Bergamo et al. designed a DPC(Distributed Power Control) Energy Efficient routing protocol for ad hoc networks, which acts in combination with the routing layer. This is realized by means of a mechanism which estimates the amount of power which is needed for reliable communications over any link. This power is then used both to transmit a packet over the link, and as the link weight in a minimum-weight path search algorithm. In this way, transmit power can be tuned in order to build the desired connectivity diagram. In addition, the transmit power information is used to privilege lower energy paths when looking for a packet route. Existing routing protocols, such as proactive and reactive protocols, can be modified in order to incorporate this power control feature which tries to jointly minimize the interference in the network and the energy consumption of multi hop operation. They have included this technique in AODV protocols and significant performance was shown for energy savings.

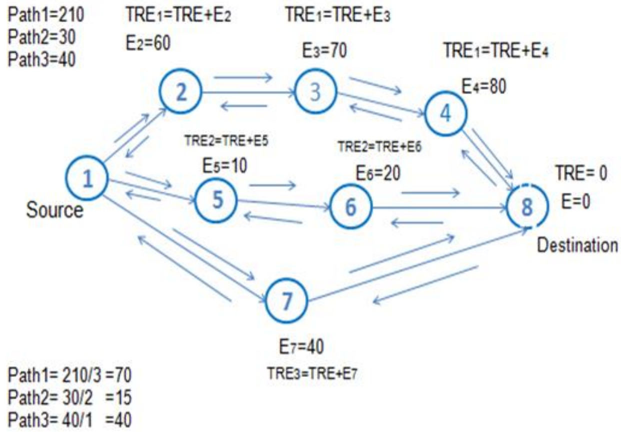
## IV. PROPOSED ALGORITHM




### A. *Step for Proposed Algorithm:*

1) Routing Protocol: AOMDV
2) Sender node starts route discovery process to locate receiver node
3) Sender node broadcasts RREQs
4) Receiver node receives RREQs through all possible paths
5) Receiver node sends RREPs through each loop free routes towards sender node by adding energy field in RREPs & by initializing its value to zero
   Let's assume that energy field value as TRE = 0, where TRE is Total Route Energy.
6) Each intermediate node will computes its remaining Energy and add its computed energy value to energy field in RREP. TREr = TREr + REi
   Where REiis remaining energy of an intermediate node i and TREris total route energy of a route r.
7) Sender node receives multiple RREPs and calculates average energy per hop by dividing energy value in RREPs by number of hops for each route.
   TREr = TREr / HCr
   Where TREris total route energy of a route r and HCris
   the total number of hop counts in route r.
8) Sender node will select a path which has maximum resultant (average energy per hop) value.
9) Sender node starts data transmission on selected path.

### B. *Proposed Method Diagram:*




## V. SIMULATION ENVIRONMENT

To evaluate the performance of proposed E-AOMDV protocol, we present simulation using network simulator 2. NS-2 are not support windows then install 'ubantu' to provide linux environment in windows. The simulation parameters That are used in the experiments are shown in table 1.

| **Parameters** | **Value** |
|---|---|
| Simulator | NS-2(Version 2.34) |
| Channel type | Wireless |
| Radio-propagation model | Propagation /TwoRayGround |
| Link layer type | LL |
| Antenna model | Antenna/OmniAntenna |
| X dimension of the topography | 700 |
| Y dimension of the topography | 700 |
| Max packet in ifq | 50 |
| Number of mobile nodes | 20,30,40,50 Nodes |
| Traffic Type | CBR |
| Routing Protocols | AOMDV |

Table 1: Simulation Parameter

### A. *Simulation Results:*

This section evaluated the results in AOMDV case and proposed EE-AOMDV case. The performances of proposed scheme are better than previous.

*1) Delivery Rate Analysis in case of AOMDV and EE-AOMDV*

Delivery Rate is the rate of number of packets received and number of packets sends in network. This performance metrics important to analyse the packet percentage successfully received in network. In this graph the performance of proposed EE- AOMDV routing protocol is better than the normal AOMDV routing protocol. Here in case of normal AOMDV the delivery rate are about 99.23(%) to 94.23(%) for 20nodes to 50nodes but in case of proposed scheme the Delivery Rate value is about 99.34(%) to 95.33(%) for 20nodes to 50nodes. The packet transmission difference in case of normal and proposed scheme are almost same but the delivery rate arises in case of including energy factor means life time.

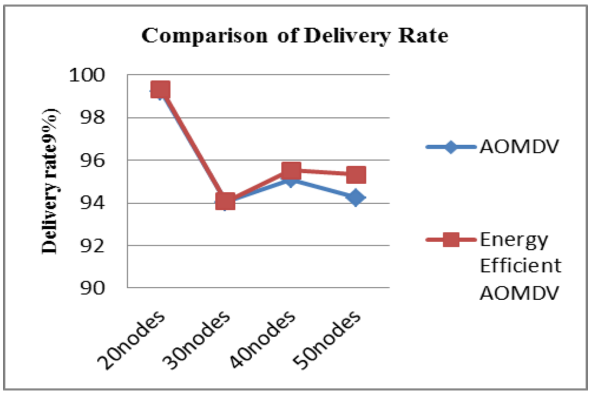



Fig. 2: Delivery Rate Analysis

*2) Average End to End Delay Analysis in case of AOMDV and EE-AOMDV:*

The average end to end delay is calculated by adding all the times taken by all received packets divided by their total numbers. In this gragh the performance of proposed AOMDV is better than the normal AOMDV. Here in case of normal AOMDV the average end to end delay are about 97.412 seconds to 82.6289 seconds for 20nodes to 50nodes but in case of proposed scheme the average end to end delay value is about 50.6302 seconds to 77.8732 seconds for 20nodes to 50nodes.

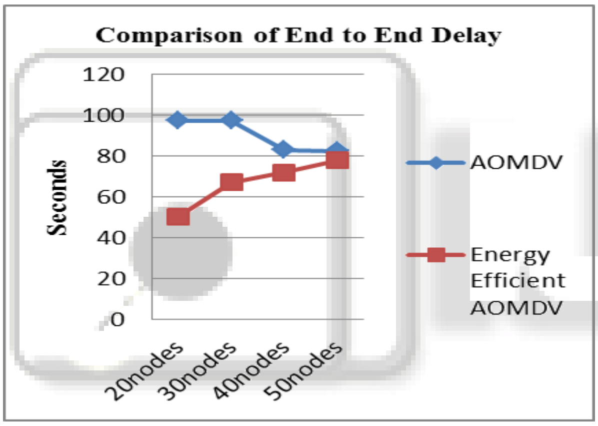



Fig. 3: Average End to End Delay Analysis

*3) Average Throughput Analysis in case of AOMDV and EE-AOMDV:*

The average throughput represents the number of packets send and received in per unit time.In this graph the average throughput in case of normal AOMDV routing is less as compare to proposed EE-AOMDV routing. Here in case of normal AOMDV the average throughput is about 3.37 kbps to 34.78 kbps for 20nodes to 50nodes but in case of proposed scheme the average throughput value is about 3.85 kbps to 40.38 kbps for 20nodes to 50nodes.

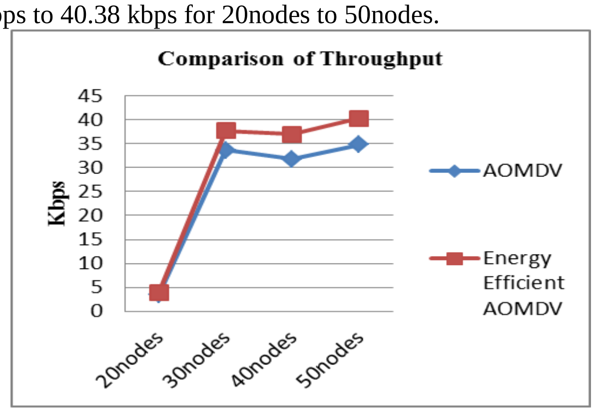



Fig. 4: Average Throughput Analysis

## VI. CONCLUSION AND FUTURE WORK

### *A. Conclusion:*

Designing an efficient and reliable routing protocol for such networks is a challenging issue. Multipath protocol are provided the alternative path from source to destination by the load in network distributed but only multipath routing are not essential for load distribution. If the load are not distributed properly then in that case the limited life of node i.e.energy are wasted for retransmission and efficient energy consumption are the main issue in this research. The simulation's result is show in NS2 for the significant performance improvement of the network in terms of end-to-end delay, network life time and energy of each node.

### *B. Future Work:*

Implementation of proposed algorithm in AOMDV protocol in NS2 by modifying existing files of AOMDV protocol along with changes in traditional packet formats as per the algorithm in NS2. Perform various deployment of nodes in different scenarios and various mobility & Traffic models. Proposed scheme will be also tested for large number of nodes.

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