

## Load Balanced AOMDV- An Improvement over AOMDV Protocol

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### Abstract

*MANET is a kind of network which is self organizing and has a centralized control which means it has group of nodes which communicate with each other. Every Node in a network exchanges information with other node in the same network if source and the destination nodes are within transmission range boundary. In a network each source node and destination node can act as network router. There is a tremendous demand of MANET's nowadays because of the dynamic nature that it possesses. Moreover there are many factors that are affecting MANETs such as delay, MAC Overhead, Routing Overhead and many more. This paper presents a comparison of AOMDV and load balanced AOMDV with different parameters like delay and Routing Overhead. The proposed work is implemented in NS2 Simulator. Further, results indicates that this novel approach is able to achieve better Routing Overhead and delay without increasing the overhead in the network. In this case Energy consumption is also very less as compared to the standard AOMDV protocol.*

**Keywords**—AOMDV, MANET, Delay, Routing Overhead, Load Balancing

### 1. Introduction

During 1970s DARPA sponsored a packet radio network which is now renamed as MANET so called Mobile ad hoc network. Communication with each other on the battlefield was actually possible with the help of packet radio which were having number of wireless terminals. Early The Mobile Ad hoc network consists of many mobile nodes which does not need any administration. Due to limited range these nodes takes the help of their neighboring nodes in order to transfer the data from the initial stage to the reaching point node. Many user applications are run by the nodes and nodes can also transfer the data from one place to another which is actually working of these nodes. While also these types of networks are only suitable for certain places like one of these is place where nodes cannot be deployed and other is where it is actually not possible to deploy infrastructure. There exists certain place where we cannot setup infrastructure. So in these types of places we make use of Mobile ad hoc network. Though there are many applications of Mobile adhoc networks like:

1. Military
2. Sensor deployment
3. Mobile phones Bluetooth

Every field or application has specific requirement for some protocol Due to mobile nodes the topology is dynamic in this case, which has good results on the characteristics. There is always limitation of bandwidth and power because as the nodes are wireless therefore these nodes are battery powered. Hence battery powered sources always have such limitations. This gives birth to fluctuation in the bandwidths of of the wireless networks which further gives high rates of error in it.

The MANET has distinct features such as:

1. Firstly, the system topology can vary randomly.
2. MANET has limited data transfer capacity which means that the wireless associations have less capacity than wired systems.
3. In a MANET, nodes can rely upon restricted batteries as a vitality source. Note that a few nodes might not have enough transmit battery to achieve all nodes in the system.
4. Loss of messages is increasingly possible due to crashes as well as obstructions.
5. MANET has limited physical security as information packets travel through the air.

There are several applications of MANET which varies from little and static systems to vast scale and exceedingly powerful adaptable structures. Some realized applications are:

1. For protected and swift interchanges among law authorization tasks.
2. For correspondence in conditions where the current foundation is left unused.
3. For correspondence in territories with unimportant or no distant foundation support.

## 2. Classification of Routing Protocols in MANETs

Classification of routing protocols in mobile ad hoc network can be done in many ways; the routing protocols can be categorized as Proactive (Table Driven), Reactive (on-demand) and Hybrid depending on the network structure. The below figure explains the classification of routing protocols in MANETS:

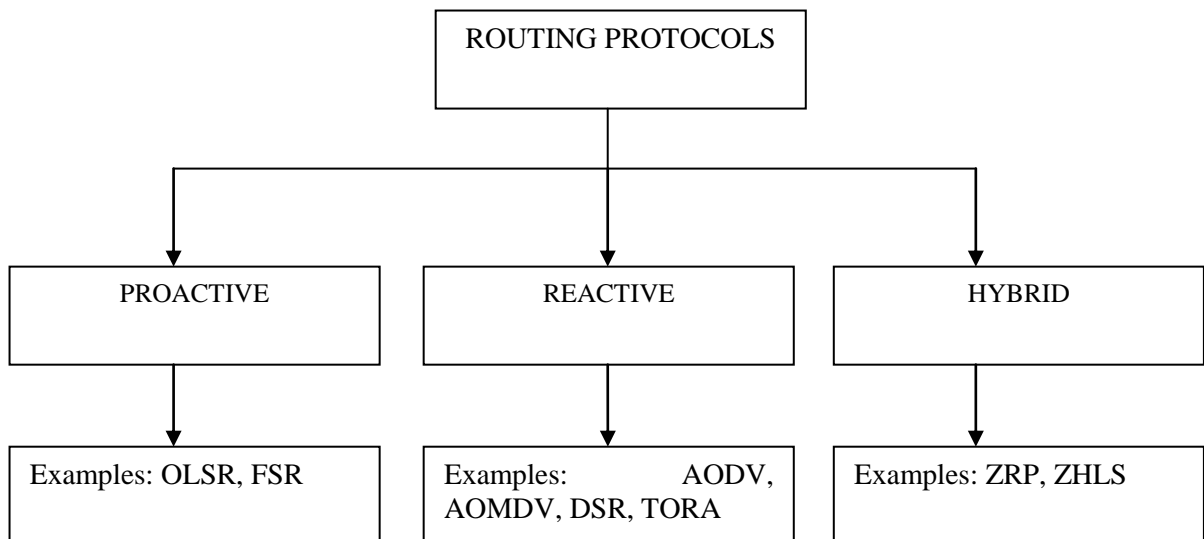


Figure1: Classification of Routing Protocols

The above figure 1 illustrates the routing classification of protocols. In first category of Proactive routing protocol, every node continuously maintains up-to-date routes to other nodes in the network. Routing table consistency is properly maintained in a table. The other category is Reactive routing protocol which is on demand and it initiates a path discovery process whenever there is a need to transmit the data from the source to the destination. Finally, the last type is Hybrid routing Protocol which is a combination of two protocols. In the above given table, OLSR is Optimized Link State Routing Protocol which is a type of protocol that uses hello and topology control messages to determine and distribute link state information. The other is FSR which is Fish Eye state routing protocol. In this type of protocol, every node in a network keeps on updating a topology map which further helps to compute the shortest route.

In the On-demand category, AODV is ad hoc on demand distance vector routing protocol and AOMDV is ad hoc on demand multipath distance vector routing protocol. In the primary type of protocol, whenever, there is a need to transmit data to the destination, the path is decided on the spot and it will be used only when being used. After the transmission of data, the route will not be saved. However, in AOMDV protocol, the routing entries for each destination include next hops along with the subsequent hops. In DSR which is dynamic source routing, the route cache is maintained which gets updated whenever there is a change in the route. TORA stands for

Temporally Ordered Routing Algorithm which aids to create multiple routes from the source to the destination.

Last broadly classified category is Hybrid routing protocol. The first protocol under this category is ZRP which is zone routing protocol. It uses proactive as well as reactive approach whenever it wants to send data to the receiver end. Further, ZHLS is zone based hierarchical link state routing protocol. In this type of routing, two types of tables are constructed namely, inter-zone and intra-zone routing table which are constructed with the help of network nodes in a network.

In this research paper, the reactive routing protocol AOMDV is studied with load balancing approach and without Load Balancing approach to see the effect of Load Balancing on this routing protocol. At last, the comparison is made with the help of performance metrics.

### 3. Related Work

B.Malarkodi, P.Rakesh and B.Venkataraman [1] evaluates the performance of AOMDV and AODV routing protocol in the presence of poisson and bursty self similar traffic and compares them with that of CBR traffic. Their simulation results indicate that the packet delivery fraction and throughput in AOMDV is increased in the presence of self similar traffic compared to other traffic. Salwa Othmen , Aymen Belghith , Faouzi Zarai, Mohammad S. Obaidat et al.[2] discussed the MANET dynamic topology and the limited battery power of mobile nodes. The power is a major constraint in ad hoc networks since the nodes operate with limited battery life. Randa K. Ahmed; Dina M.Ibrahim and Amany M. Sarhan [3], said that in order to enhance the working of WSNs CLB-AODV which stands for “communication load balanced dynamic topology algorithm” is proposed in this paper. Further the main objective to propose this algorithm is that incase every time there occurs a failure in the network topology, the same gets adjusted according to the demand by selecting optimal path. In order to minimize the routing load, the algorithm which is proposed is based on standard AODV protocol. [4] said that the smoke is produced in higher amount in the industries township via various sources like coal, diesel fossil fuel and many more. In this paper different routing protocols are placed in cloud sensing environment in Qualnet simulator and the result is noticed in each case under different parameters. In case of packets dropping, the RIP protocol performs better while in other case of signal transmitting, STAR performs better and efficiently. Finally, AODV perform better for data packet in CAP during cloud smoke sensing. [5] designed a multipath multichannel adhoc on demand which will select least distance. Traditional routing randomly choses elevated lossy links between diverse route of same least length. Therefore ,they concentrates on designing a multipath multichannel opportunistic ad – hoc on demand distance which makes use of minimum distance and expected transmission count (ETX), they also proposed some of the advantages of OR with AODV for cognitive radio wireless sensor networks(CRWSN) to improve its efficiency. [6] Stated that energy consumption is one of the most important issues in wireless sensor network due to deployed irreplaceable nodes. This leads to a major challenge in design of energy efficient routing protocols with MAC 802.11 are evaluated to analyze the feasibility of using sensor network in an agricultural land. [7] presented that MANET based routing protocols are adapted for this types of WSNs such as habitat monitoring, structural , health monitoring , logistics, patient monitoring etc. AODV is one of the most commonly used routing protocols. But in WSNs, when the mobility is high, AODV needs new oath to the destination. They proposed methods to aims at enhancing the traditional AODV protocol in such WSN application by building a stable route. This used (RSSI) received signal strength indication to determine the participation of a node in the route building process. In [8], the authors explain the notion of ad hoc networking by presenting its background and giving a few of the scientific confronts. Researcher also reveals few of the applications that can be visualized for ad hoc networking. [9] Proposed the load-change problem which is used for determining how to modify the load on a component so that it can make further use of its low-power modes. The adaptation problem is determining how to create software that allows components to be used in novel, power-saving ways. [10] Presented a route discovery protocol that mitigates the detrimental effects of such malicious behaviour, as to provide correct connectivity information. [11] Proposed a method which intends at enhancing the conventional AODV protocol in such Wireless Sensor Network applications by constructing a stable route throughout the route discovery stage, therefore circumventing link breaks which occurs because of node mobility. This process makes use of Received Signal Strength Indicator (RSSI) to decide the contribution of a node in the route creating procedure. [12] Suggested the concerns which effect the consumers and applications of mobile gadgets, and have distinguished the key role of energy-efficient aims for mobile methods operation

and usability. [13] The fitness function is used to find the optimum path in AOMDV protocol. In this paper, the function not only considers the residual energy, but it also considers the transmission power of nodes in the network.

### 3. Performance evaluation

There are 3 feasible methods used to calculate the network performance namely, analytical modeling, simulation and measurement. The experimentation, test and operation are very difficult in the real systems especially if one talks about the complex systems like communication networks. While, there are several challenges like data unavailability and high cost for the new designed systems. The major inbuilt features of the MANETs are time-varying, non-static topology, wireless channels, bandwidth limitation, and distributed control and management. The structure and performance investigation of routing protocols for MANET is presently an active field of research. In this paper, the AOMDV routing protocol is studied. There are a number of important criteria which may be used for evaluating the performance of a network. It actually means utilization, throughput, bandwidth capacity, availability, reliability, response time, and packet loss ratio. Formula for calculating these important performance metrics are explained as follows:

Average end-to-end delay is calculated by:

$$E2E \text{ delay [Pid]} = \text{received time [Pid]} - \text{sent time [Pid]}, \text{ where Pid is Packet ID}$$

Normalize Routing Load (NRL) [10][17],

$$\text{Normalized Routing Load} = \text{Number of Routing Packets} / \text{Number of Received Packets}$$

### 4. Simulation Parameters and Results

A detailed simulation model based on NS2 is used. Following table 1 shows different simulation used for the proposed approach:

Parameter	Value
Area	1000x1000m <sup>2</sup>
NN (Number of Nodes)	50
Time for simulation	200s
Traffic Type	CBR
Number of Connections	10
Packet Size	512 Bytes

Further when the simulation is run using the above mentioned parameters. The results are then analyzed using NS2 simulator. Figure 2 shows the comparison of delay between AOMDV and L\_AOMDV the graph shows an interesting curve because when the speed of the node is low AOMDV dominates L\_AOMDV but as the speed increases L\_AOMDV dominates because of smooth transmission of data during mobile scenarios but when the speed goes above a threshold the performance of L\_AOMDV decreases because it becomes difficult to find stable paths in high mobility scenario and the packets have to wait till the protocol finds path for data transmission, because of which the delay increases.

In figure 3, the comparison of AOMDV and L\_AOMDV is done based on the normalized routing overhead, since the paths in the network are stable in the network the number of path breaks

decrease, because of which the number of request packets decreases in the network, resulting in decrease of routing overhead in the network.

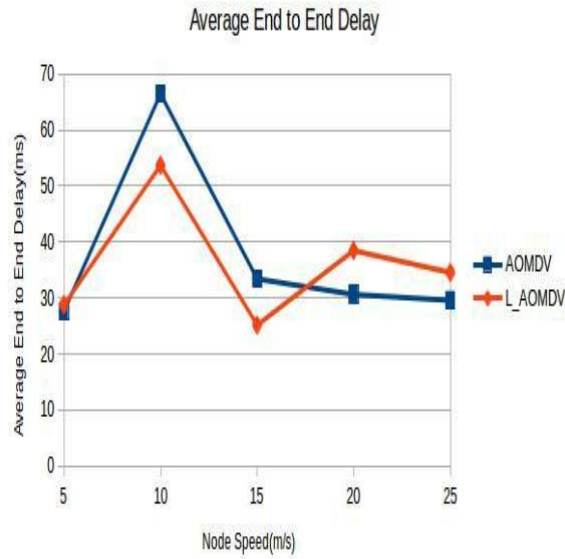


Fig. 2. Delay comparison of AOMDV and L\_AOMDV

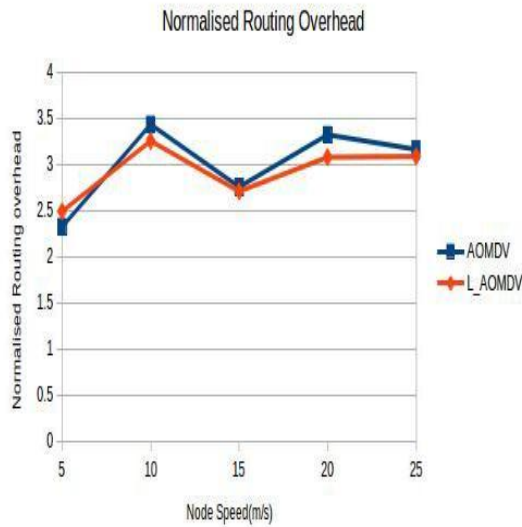


Fig. 3. Comparison of Normalised Routing Overload AOMDV and L\_AOMDV

### Conclusion

The nodes which are non static in nature are a part of wireless network and this adhoc network communicates with each other by forming a multi-hop radio network and maintaining connectivity management without an existing infrastructure. These kinds of networks are expected to have a very important role in military and civilian applications. To design a load balanced routing protocol to improve the QoS in the network is a challenging issue. The goal of this research is to provide load balancing in the network to enhance the QoS in the network. The proposed protocol has following features: L\_AOMDV has the feature to provide stability in high mobile scenarios, giving us the feature to withstand the mobility of nodes in the network. L\_AOMDV also gives us a better way to distribute traffic over the less loaded parts of the network for more even consumption

of energy in the network. The simulation is done in NS2 and comparison of existing AOMDV and L\_AOMDV is done by varying the speed of the nodes.

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