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# Load Balanced AOMDV-An Enhancement to AOMDV Protocol

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***Abstract*—** MANETs are one of the most challenging and growing search fields because of their demand and challenges in delivering services. Load balancing is one of MANET's key problems since network load balancing is essential for better network life, QoS, and congestion control. The approach proposed in the research emphasizes on load stability and the distribution of traffic on the network on the basis of energy of the nodes. The simulations are performed in NS2. The results show that the proposed algorithm was able to reach the distribution and performance of the battery pack without increasing overhead in the network. But Average remaining energy is still more in case of AOMDV which further leads to trade-off. The algorithm proposed has also managed to consume a balanced energy of all nodes in the network.
*Keywords- DSDV, OLSR, AOMDV, AODV, MANET*

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## I. INTRODUCTION

The Routing process is the process in which the information is moved from the source point to the destination. The Routing protocol will decide on how the communication will take place between two nodes and how the pe path will be chosen when the information will be sent via that route. Routing algorithms will look for the particular path which will be chosen by that particular algorithm. In this paper we have also made an algorithm in which the path selection is done. Every router which is connected in a network has pre knowledge about the path which is to be followed. Then, further the routing protocol will shares a information between immediate neighbors & then via the network. This is the method that routers follows in order to gather information about the entire network topology. Through the path determination process routing algorithms will determine & maintain routing tables which will contain the total path knowledge of the packet. The routing table [5] is kind of data table which is either stored on a router or on a computer network which defines routes to certain network destinations & in some cases. Moreover, this routing table also has information about the entire network topology around it. So, the design of routing tables is the main aim of these protocols. The routing are of two types, one is static routing and other is dynamic routing [6]. The process of manually entering routes into the routing table of a device is called static routing. In this type of routing the routing device is run by the router through a configuration file that is loaded. Otherwise also such paths may also be entered via network administrator who manually configures the routes. These statically configured paths hardly change after they have been configured.

Different types of Routing Protocols

- **Proactive Routing Protocols:**

These kind of routing protocols try to hold consistent routing information. Routing information is maintained in a different routing tables and these routing tables updates consistently after an update is performed. These routing methods are designed for ad hoc networks & such methods are further inherited from traditional routing protocols. Such routing tables are sometimes also called as table based routing protocols. Proactive protocols are further divided into seven other types:

1. Destination-Sequence Distance-Vector Routing (DSDV)
2. State Routing Optimal Link (OLSR)

The primary benefit of such proactive routing protocols is that, others can quickly receive information regarding the path & ghastly maintain a session. On the contrary, the disadvantage is the Overload control.

- **Reactive Routing Protocols:**

Reactive routing approaches deviate from traditional approaches to routing. In this case a path between all pairs of network nodes are not constantly same. On the Contrary side, these paths are only discovered when there is a need for a path. Every time a sending node wants to forward data packets to receiving nodes, it will check the path table to look if it has a path. In case, there is no such path, then a route search is run to look for a route to the destination. Some of the reactive protocols are:

- **Dynamic Source Routing (DSR)**

1. Adhoc On demand Multipath Distance Vector Routing Protocol (AOMDV)
2. Adhoc On demand Distance Vector Routing Protocol (AODV)

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## II. LITERATURE REVIEW

Yanfeng Mansoor Ali et al. said that Mobility gives connection errors again and again in ad hoc networks. Hence there occurs a big impact on the performance especially in the case of high-node mobility. Further, this happens due to the fact that routing standards in case of ad hoc networks are not made in way that it can manage high mobility. This paper presents a new approach with the help of an algorithm in order to maintain stability of links. This innovative approach relies upon signal strength measures. The OLSR approach makes use of Hello received or lost packages to look in case it can establish a connection or not. The riddle with this method comes when the mobility is too high, in which there id frequent link breakage. To overcome this riddle, the authors proposed used "Signal strength" in order to look whether the quality of the link gets improved or it further gets deteriorated due to some problem. Therefore on combining these two mechanisms makes eradication of problem quite simple & also guide to anticipate breakage of links, greatly improving performance. The authors developed an algorithm where, for each received hello packet, destinationed signal strength is then the strength of the received signal is calculated & forwarded towards the OLSR daemon. On the other hand if the strength of signal is higher than Threshold(ss_threshold_high) then it is counted as received. While on contrary, when this signal strength is not larger than the threshold(ss_threshold_low), then that is considered lost.

While, when the strength of signal lies inbetween the ss_threshold_high as well as ss_threshold_low, the settlement relies upon the state of the connection as well as the signal strength values formerly gathered from that link. On the receipt of the incoming packet, the standard of the connection is hounored as a rule of stability. Strength of signal is utilized to look on whether the standard of the link actually becomes better or it deteriorates. On the other side packet loss is looked up by the "hysteresis mechanism". Thus helps in making the links more reliable and robust but also assists to forecast link breaks as well as improves the performance. More specifically this mechanism skips loops in the network which leads towards better utilization of system.

Nikhil Saxena et al. presented that the wireless mesh networks (WMNs) are built-up of exclusive nodes which are known as mesh routers. According to him,all the network routers cannot be handled by the ISPs in a WMN community. With the short capacity of wireless channels & the shortage of a single reliable authority in these networks can lead network routers to act selfishly, expelling bandwidth & traffic to give better performance to their users. Previous solutions to uplift co-operation in multi-network networks use probes for monitoring or exchanging promiscuous packages to detect selfish nodes. Such schemes hardly or not at all work well when applied on WMNS having a multi-radio with relatively static environment topology. They have proposed architecture for a WMN community that can find selfish behavior on the network & implement collaboration between routers on the network. Architecture acquires a decentralized survey scheme by splitting mesh routers into manageable clusters.

## III. PROBLEM FORMULATION

According to the literature, the problem is that real time communication or audio and video transmission in MANET is quite difficult due to node mobility or network congestion orlimited battery resources. Existing existing routing protocols are unable to achieve proper load balancing without increasing overhead nodes. Therefore, our goal is to provide a load balancing approach with AOMDV as a routing protocol that can provide load balancing to routing protocols so as to remove polarizations in the network and network resources to better use. In normal scenarios, nodes falling into the center of the network are consumed more than nodes in the densest part of the network, which causes the rapid exhaustion of node energy falling into the center of the networks.

AOMDV stores multiple paths for data transmission in the networks, it uses on path for data transmission and keeps the other as backup in case of breakage of paths, but AOMDV does not considers the stability and energy of the nodes in the route. The node sends the RREQ packet when it needs to transfer data to other node. The node which receives the request packet then checks the signal strength of the received packet, when signal strength is above the threshold, then it will be further processed. By doing this we are ensuring the stability of the link, that it can withstand the mobility of the nodes. In the further processing of the request packet, if the request is received at the destination node, reply is sent back to the source and the transmission takes place. If the intermediate node receives the request packet then it calculates it's energy level, if the energy level is above a threshold, then only it will entertain a new request, otherwise it drops the request. By doing this we are able to spread the traffic towards the nodes with more power so that we can maintain the connectivity of the network.

## IV. PERFORMANCE METRICS

**1. Normalized MAC Overhead:** Normalized Mac overhead is the ratio of the number of data packets transmitted in the network and the number of control packets on the mac layer transmitted in the network.

**2. Average Energy Remaining**: It is the average amount of energy remaining in every node after the simulation is over. The model used in this case is based on NS2 simulator. DCF which stands for distributed coordination model is model on 802.11 which is utilized as medium access layer protocol. Distributed Coordination Model on 802.11 makes use of RTS which is request to send & CTS which

means clear to send for one way communication or data transfer to the nearby nodes. Virtual sensing & medium reservation is used in order to minimize the riddle of invisible

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terminal in wireless type of networks. To send data via medium CSMA or CA is utilized.

**Table 1 Simulation Parameters**

| Parameter | Value |
|---|---|
| Areas | 1000 x 1000 ($m^{2)}$ |
| No. of Nodes | 50 |
| Simulation time in sec | 200(sec) |
| Type of Traffic | CBR |
| No. of Connections | 10 |
| Size of Packet | 512 (bytes) |
| Media Access Control Layer | IEEE 802.11b |
| Buffer Size | 50 |
| Propagation Radio (Model) | Two Ray Ground |
| Physical Layer | Bandwidth (2Mb/s) |
| Pause Time | 10 |
| Speed(Rate) | (4 packets per sec) |

The type of traffic used is CBR traffic which is constant bit rate traffic. Various pairs of source & destinations are spread arbitrarily throughout the entire network. Packet size of 512 bytes is made along with the random waypoint mobility. The number of connections taken is 10 and rate of packet is 4 packets per seconds. Moreover, 1000 * 1000 rectangular areas is taken along with the number of nodes being 50. The simulation is then run for 200 seconds. The further explanation of the simulation scenario is mentioned in table 1.

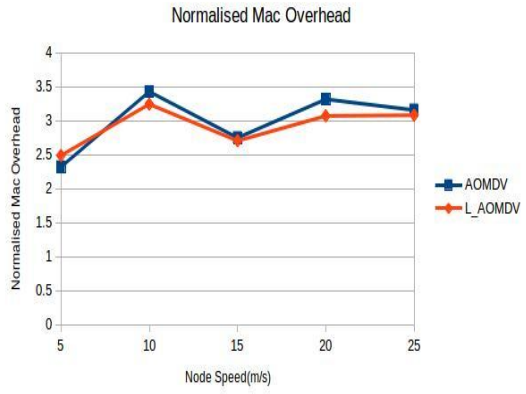


**Figure 1 Normalized MAC Overhead comparison between AOMDV & L_AOMDV**

Figure 1 is showing the comparison of L_AOMDV and AOMDV based on Normalized MAC Overhead. The graph shows that the overhead in case of L_AOMDV is less than that of AOMDV. The reasons for this are same as that of routing overhead. Since the paths are stable the requirement of control packets is less than the normal AOMDV protocol.

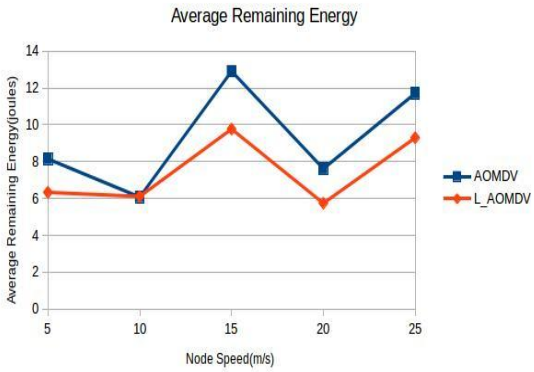


**Figure 2 Comparison of AOMDV and L_AOMDV based on Average remaining energy**

Figure 2 shows the average remaining energy after the simulation is over. L_AOMDV has less energy remaining in the nodes because load was divided and the resources are consumed in a fair manner. On the other hand in case of AOMDV the nodes in the middle of the networks are exhausted and terminal nodes are hardly used in the routing scenarios, leading to an uneven consumption of energy in the network.

## V. CONCLUSION

This paper has done an improvement to AOMDV protocol by introducing concept of Load balancing inside AOMDV. Our results clearly indicate good improvement in MAC overhead. Designing a Balanced Load Routing Protocol to Improve the QoS Network is a Challenge. The goal of this research is to provide load balancing in the network to improve QoS in the network. The proposed protocol has the following characteristics:

1. L_AOMDV has the ability to provide stability in high mobile scenarios, giving us the ability to support the mobility of network nodes.
2. L_AOMDV also offers us a better way to distribute traffic to the less charged parts of the network for more uniform power consumption in the network.

But Average Energy remaining is better in case of AOMDV protocol than AOMDV with Load balancing leading to trade-off.

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