Energy Efficient Algorithm for AOMDV with Load Balanced Feature

Mohit Angurala
Computer Science & Technology, Guru Nanak Dev University, Regional Campus, Gurdaspur, Punjab

Sukhvinder S Bamber
Computer Science & Engineering. Panjab University SSG Regional Centre, Punjab.

Sonia Digra
Computer Science & Engineering, Golden College of Engineering & Technology,Gurdaspur, Punjab.

Abstract— MANET is one of the most challenging and growing research fields due to their demand and challenges in the provision of services. Load balancing is one of the main problems of MANET since the load balancing of the network is essential for a better network life, QoS and congestion control. The approach proposed in the research emphasizes the stability of the load and the distribution of traffic in the network based on the energy of the nodes. The simulations are done in NS2. The results show that the proposed algorithm was able to reach the distribution and performance of the battery pack without increasing the overload in the network. But the average residual energy is even greater in the case of AOMDV, which leads to further compensation. The proposed algorithm has also managed to consume a balanced energy of all the nodes of the network

Keywords- *DSDV, OLSR, AOMDV, AODV, MANET*

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I. Introduction

The routing process is the process in which information is moved from the point of origin to the destination. The routing protocol will decide how communications will be made between two nodes and how the PE route will be chosen when the information will be sent through that route. The routing algorithms will look for the particular path chosen by that particular algorithm. In this document we have also created an algorithm in which the path selection is made. Each router connected in a network has a preliminary knowledge of the path to follow. In addition, the routing protocol will share information between immediate neighbors and then through the network. This is the method that routers use to gather information about the complete network topology. Through the process of determining the path, the routing algorithms will determine and maintain the routing tables that will contain the knowledge of the total path of the package. The routing table [5] is a type of data table that is stored in a router or computer network that defines routes to certain network destinations and in some cases. Furthermore, this routing table also contains information on the entire network topology that surrounds it. Thus, the design of the routing tables is the main objective of these protocols. Routing is of two types, one is static routing and the other is dynamic routing [6]. The process of manually entering routes into a device's routing table is called static routing. In this type of routing, the router runs from the router through a configuration file that is loaded. Otherwise, these paths can also be entered through the network administrator who manually configures the routes. These statically configured paths change just after being configured.

Different types of routing protocols

• Proactive routing protocols:

These types of routing protocols try to keep routing information uniform. Routing information is handled in several routing tables and these routing tables are constantly updated after an update is performed. These routing methods are designed for ad hoc networks and these methods are inherited from traditional routing protocols. These routing tables are sometimes also referred to as table-based routing protocols. Proactive protocols are divided into seven other types:

1. Destination path: distance path vector (DSDV)
2. Optimum state routing (OLSR)

The main advantage of such proactive routing protocols is that others can get information quickly on the road and keep a terrifying session. On the contrary, the disadvantage is the overload control.

• Reactive routing protocols:

Reactive routing approaches deviate from traditional routing approaches. In this case, a route between all network node pairs is not constant. On the other side, these roads are only discovered when a road is needed. Whenever a sending node wishes to forward data packets to receiving nodes, it will check the route table to see if it has a path. In the event that there is no such route, a route search is performed to find a route to the destination. Some of the reactive protocols are:

• Dynamic Source Routing (DSR)

1. Adhoc On request Distance vector multipath routing protocol (AOMDV)
2. Protocol of the ad hoc remote vector routing on request (AODV)

II. Literature Review

Yanfeng Mansoor Ali et al. suggested that Mobility repeatedly gives connection errors in ad hoc networks. Therefore, there is a major impact on performance, especially in the case of high node mobility. Furthermore, this is due to the fact that routing standards in the case of ad hoc networks are not executed in order to be able to manage high mobility. This article presents a new approach with the help of an algorithm to maintain link stability. This innovative approach is based on measurements of signal strength. The OLSR approach uses the received or lost Hello packets to look for when a connection can be established or not. The enigma with this method occurs when the mobility is too high, where frequent connection interruptions are detected. To overcome this enigma, the authors proposed to use "signal strength" to see if the quality of the link improves or deteriorates due to some problem. Therefore, the combination of these two mechanisms makes the uprooting of the problem quite simple and also a guide to anticipate the breakdown of connections, greatly improving performance. The authors developed an algorithm in which, for each received greeting card, the intensity of the destination signal is then the intensity of the received signal is calculated and sent to the OLSR daemon. On the other hand, if the signal strength is greater than the threshold (ss_threshold_high) then it is counted as received. Whereas, on the other hand, when the signal strength is not above the threshold (ss_threshold_low), then it is considered lost.

Meanwhile, when the signal strength is between ss_threshold_high and ss_threshold_low, the regulation is based on the connection status and the signal strength values previously collected on that link. Upon receipt of the incoming packet, the connection standard is considered a stability rule. Signal strength is used to determine if the connection standard improves or deteriorates. On the other hand, packet loss is sought through the "hysteresis mechanism". Therefore, it helps to make connections more reliable and robust, but also helps to predict link interruptions and also improves performance. More specifically, this mechanism ignores loops in the network that lead to better use of the system.

Nikhil Saxena et al. stated that Wireless mesh networks (WMNs) are made up of exclusive nodes known as mesh routers. According to him, all network routers can not be managed by ISPs in a WMN community. With the limited capacity of wireless channels and the scarcity of a single trusted authority in these networks, network routers can act selfishly, allowing them to expel bandwidth and traffic to deliver better performance to their users. . Previous solutions to increase cooperation in multi-network networks use probes to monitor or exchange promiscuous packages to detect selfish nodes. Such schemes barely work or do not work well if applied in WMNS that has a multiple radio with a relatively static environment topology. They proposed an architecture for a WMN community able to find selfish behaviors on the network and implement collaboration between the routers of the network. The architecture acquires a decentralized survey scheme by dividing the mesh routers into manageable clusters.

Problem Formulation

According to the literature, the problem is that real-time communication or transmission of audio and video in MANET is rather difficult due to node mobility or network congestion or limited battery resources. Existing routing protocols cannot achieve proper load balancing without increasing overall nodes. Therefore, our goal is to provide a load-balancing approach with AOMDV as a routing protocol capable of providing load balancing to routing protocols in order to eliminate network biases and network resources for better use.

In normal scenarios, the nodes that fall in the middle of the network are consumed more than the nodes in the densest part of the network, which causes the rapid exhaustion of the energy of the node that falls at the center of the networks.

III. METHODOLOGY

AOMDV stores multiple paths for data transmission in networks, uses the data transmission path and keeps the other as a backup in case the path is interrupted, but AOMDV does not take into account the stability and energy of the nodes in the network . way. The node sends the RREQ packet when it is necessary to transfer data to another node. The node that receives the request packet then checks the signal strength of the packet received, when the signal strength is above the threshold, then it will be further processed. In this way, we guarantee the stability of the connection, which can support the mobility of the nodes. In the further processing of the request packet, if the request is received in the destination node, the reply is sent back to the source and the transmission takes place. If the intermediate node receives the request packet, it calculates its energy level, if the energy level exceeds a threshold, then it will contain only a new request, otherwise it will discard the request. In this way, we can distribute traffic to nodes with more power so we can maintain network connectivity.

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 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.

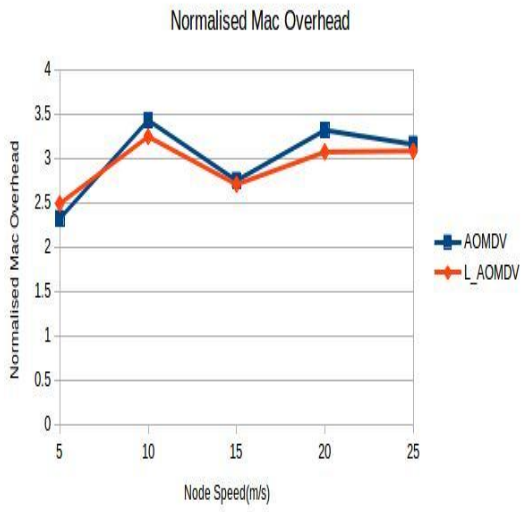

Figure 1 Normalized MAC Overhead comparison between AOMDV & L_AOMDV

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.

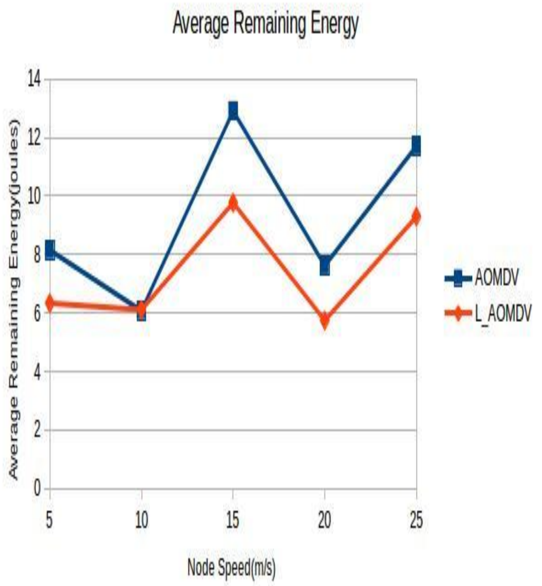

Figure 2 Comparison of AOMDV and L_AOMDV based on Average remaining energy

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

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exhausted and terminal nodes are hardly used in the routing scenarios, leading to an uneven consumption of energy in the network.

V. Conclusion

This document has improved the AOMDV protocol by introducing the concept of Load Balancing within AOMDV. Our results clearly indicate a good improvement of the MAC overload. Designing a balanced load routing protocol to improve the QoS network is a challenge. The objective of this research is to provide load balancing in the network to improve the quality of network service. The proposed protocol has the following characteristics: First characteristic says that the L_AOMDV has the ability to provide stability in high mobility scenarios, giving us the possibility to support the mobility of network nodes. While according to second featureL_AOMDV also offers us a better way to distribute traffic to the less loaded parts of the network for more uniform power consumption in the network. But the average residual energy is better in the case of the AOMDV protocol than AOMDV with Load Balancing which leads to a compromise solution.

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