Enhanced Ad-Hoc On-Demand Multipath Distance Vector Routing (Aomdv) Protocol Based On Quality Of Service For Efficient Network Coverage In Mobile Adhoc Network

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Received: 07.04.2024 Revised : 10.05.2024 Accepted: 28.05.2024

ABSTRACT
MANET is a collection of mobile nodes that rely on communication, a permanent infrastructure, or a base station for connectivity. Each node in a MANET will serve as either the host or the router, or both. All hosts will be able to roam freely and at random, and the network architecture may evolve over time. Thus, all routing protocols in the MANET will need to be adaptable and continue to maintain routes as the connectivity characteristics of the network may change. Designing a network routing protocol that is both efficient and reliable is a difficult undertaking, and other additional protocols may be devised in an effort to achieve the task more effectively. This study's primary purpose was to develop a new Enhanced-based AOMDV routing protocol for MANETs. The routing protocol suggested for AOMDV is a multipath extension of AODV that addresses multiple QoS issues for MANETs. The results demonstrate that Enhanced-AOMDV has a smaller jitter than AOMDV.

Keywords: MANET, AOMDV, AODV, communication

I. INTRODUCTION

The Mobile Ad Hoc Networks field is one of the most active in terms of research activity because of the problems that are offered to all of the protocols that are associated to it (MANETs). Users may be able to communicate with one another without the need for any physical infrastructure, hence reducing the burden on the network. It is possible for there to be an increase in the number of devices that are both cheaper and smaller, but significantly more powerful. This can make the MANET a highly fast network, while also allowing the ad hoc network to be self-organizing and adaptable. One more group of these applications for the MANET can be diverse, and they can range from dynamic to static to mobile to large or small networks that are limited by the power source. Routing protocols help in the process of path discovery to communication, data forwarding, selection of paths, route maintenance, and handling changes in node movement that take place regularly. As a result, MANET communication is typically achievable. None of the protocols that are now in use or that have been used in the past were able to solve the problems that were found in the QoS. There were a few additional applications that were built in real time within the framework of the multimedia programmes, and all of their QoS requirements were satisfactorily met. Because it offers improved fault tolerance and load balancing in addition to increased throughput, multipath routing has emerged as an incredibly promising component in the provisioning of ad hoc networks. This is because it distributes traffic across a number of different paths.

A multipath routing 52 that is ideal is required so that bottlenecks and congestions can be improved, and so that the MANET's resources can be maximized. Moreover, this multipath routing is required so that the MANET can function as intended. This is to ensure that the requirements of the QoS are met in a satisfactory manner. The fundamental goal of these quality of service (QoS) solutions was to make the network together with the deterministic behaviour that was carried out by that of the wireless network while delivering data. MANET is presenting several protocols that are currently in use and have been targeting the minimization of traffic in data of wireless networks as well as the reduction of hops that have been taken for the delivery of packets. These protocols are presented by MANET. The primary reason for such solutions and their non-provision within the existing routing protocols was that they were not ideally designed with a new load balancing approach that was made for coping with various conditions found in the MANET, its mobility, or the data traffic. This was the primary reason behind such solutions and their non-provision within the existing routing protocols. The distribution of the load was the key concern in this case.

II. LITERATURE REVIEW

This particular sort of multipath routing is required to determine the routes that connect their source and their destination. Because of the unpredictability and fluidity of their operation, they often serve in the capacity of node pairs. The operation of multipath routing is dependent on the following three components: The route discovery that indicates multiple route identification for both the source and the destination, for which there is an effort to identify the node disjoint, link disjoint, and the other non-disjoint nodes. This type of route discovery is also known as "multiple route identification." Distribution of traffic consisted of the node selecting a new set of the routes to the final location while simultaneously beginning to send data to all pathways. This was handled in such a way that the data was evenly dispersed among all of the paths. In an ad hoc network, when a few of the paths fail due to link node failure, the preservation of this path will become the restoration method after the beginning path has been discovered. Lastly, there is path maintenance, in which once a few paths fail due to link node failure, this path is maintained. This might be taken further into consideration as soon as the path ends up being unsuccessful (Hasan et al. 2017).

The AODV, which was developed on the basis of the revelation of reactive routing, makes use of three distinct sorts of messages, which are referred to as the RREQ, the RREP, and the RERR respectively. In addition, there are route request numbers that are used to guarantee that there are no loops in the system on a consistent basis. In the AODV, every such base station will discover an additional route utilizing restricted flooded of the RREQ in conjunction with a new cycle expansion that acquires another path to the final point using the RREP. This will be done in order to fulfil the requirements of the algorithm. The AOMDV protocol extends the functionality of AODV even further by turning it into a multipath routing protocol. According to this protocol, a source node would store several routes coming from different RREPs. This choice of look absolutely for the AOMDV could not be able to manage any dynamic changes to the network, such as extreme congestion that may be generated by traffic that is skewed in a particular direction (Balakrishna et al. 2010). In order to accomplish the goals of this study, the QoS will be discussed alongside the AOMDV.

III. METHODOLOGY

Using multipath routing has a number of important advantages, some of the most important of which are load balancing, network scalability, fault tolerance, route resilience, and better aggregate bandwidth. In order to reach this goal, we tackled QoS AOMDV in addition to other routing metrics such as bandwidth, load, and node delay estimations. It is possible for QoS-AOMDV to improve the AOMDV algorithm by helping to save energy and ensuring that the routes it uses are more uniformly dispersed. A cross-layer architecture was implemented into the network in order to enhance the operation of the system as a whole. Throughout the process of selecting the best path, not all of the final-hop nodes will instantly re-reply to the RREQ. As a result, the RREP bases its decisions on the overarching criterion of cost. Throughout the course of the transmission phase, the data will be transferred in a sequence via a number of different routes in order to balance out the energy consumption and traffic loads across all of the channels that are available. In addition, in comparison to AOMDV, QoS-AOMDV has both a higher throughput and a shorter latency from beginning to finish.

3.1 QoS based bandwidth estimation

Each node's initial estimate of the bandwidth and packet tracking used to send data packets through the network is based on an estimate of the maximum bandwidth that nodes may use for their routes. Every node in the network calculates its share of the total bandwidth and keeps tabs on each packet as it travels across the network. When a node learns how much of its bandwidth is being used, it compares its 1-hop neighbours to those 2 hops away and calculates its leftover bandwidth. The overhead of the routing protocol in this case will be within the range of interference of the sender, thus this is increased by the residual bandwidth to account for it. This is necessary because of the overhead of the IEEE 802.11 MAC. Under this scenario, the sender has no idea how much bandwidth is being used. However, this is not a common occurrence because it must fulfil all the stringent requirements; hence, the weight factor is applied appropriately to circumvent this problem. The estimate of conservation, combined with the potential for additional interference traffic, is given by the following equation.

$$B_{avail} = \alpha(B_{raw} - B_{all\_consumed})$$
$$where,\ 0 < \alpha < 0.8865$$

3.2 QoS based Load Estimation

The Congestion Window (CW) is a statistic that is used for the purpose of contention in terms of the traffic and its state. It reflects how busy a medium is deemed to be and provides an indication of how busy it is. For instance, a mobile node with a total of three active neighbours has a good probability of being able to access a shared channel, although it will only have a single active neighbour. This is because the mobile node has a large number of active neighbours. On the other side, it could possibly have some idle neighbours who do not have any difficulties while attempting to evaluate this channel. As a result, an estimation of the traffic node may be produced by using the method of computing the average contention for a mobile node. All information will have to be delivered to the routing agent and will be used for making such types of routing decisions, and for this the primary purpose was to identify routes with higher accessibility and a lower load. Taking into consideration this contention along with a Queue aware Routing (CQR), all information will have to be delivered to the routing agent (Gao et al. 2007). The CW is often utilised both for the purpose of computing the CW for each node and also for the purpose of estimating the traffic load. This is done in order to be able to mitigate any and all traffic surges.

It is set as to 0.3 in order to be able to reflect the current situation for this node, and this further provides a higher priority to the current sample of the CW. This is done in order to reflect the current condition for this node. These packets are added to a queue, which then becomes the metrics that reflect the traffic load, particularly for the node that has more traffic passing through the packets that are stored in their interface queue. This node is identified by its average queue size, which provides information about its traffic load as measured over a longer period of time. Calculating such an average queue size is updated appropriately every T seconds.

IV. IMPLEMENTATION RESULTS

In this part, we show you what happened when we ran simulations of AOMDV and Enhanced-AOMDV based on Quality of Service. In order to test the routing protocols, networks of varied sizes were simulated (100, 200, 300, 400 and 500). Average packet loss, average end-to-end delayand control packet overhead were used to evaluate the network's efficiency.

Table 1. Average packet loss

Nodes number	AOMDV	Enhanced AOMDV
100	13.1	12.8
200	14.2	14
300	16.9	16.5
400	18.7	18.1
500	19.4	18.9

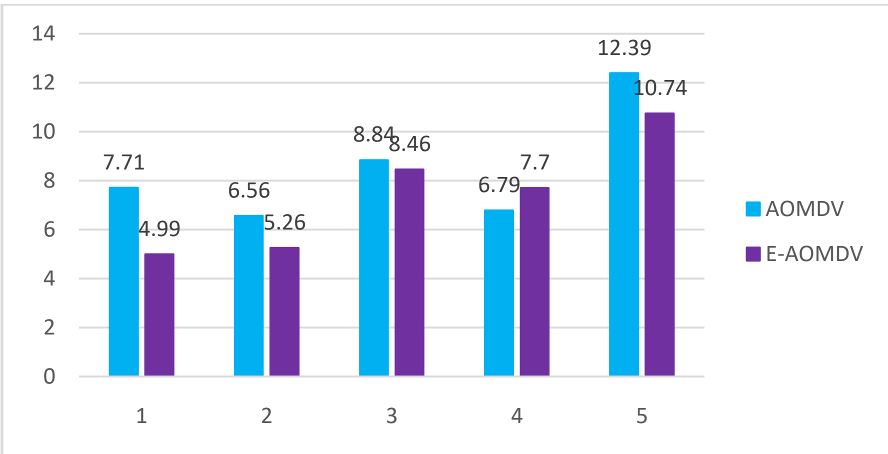

Fig 1. Average packet loss

Table 2. Delay in packet delivery end to end

Nodes number	AOMDV	Enhanced AOMDV
100	22.2	20.2
200	27.9	26.6
300	35.7	33.9
400	37.8	36.2
500	44.6	43.1

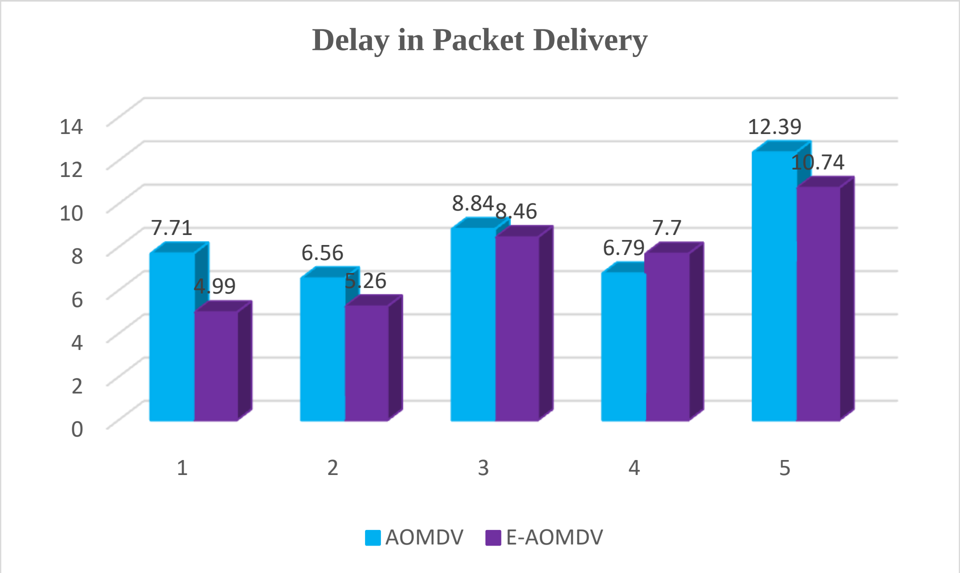

Fig 2. Delay in packet delivery end to end

Table 3. Average packet overhead in seconds

Nodes number	AOMDV	Enhanced AOMDV
100	7.71	4.99
200	6.56	5.26
300	8.84	8.46
400	6.79	7.7
500	12.39	10.74

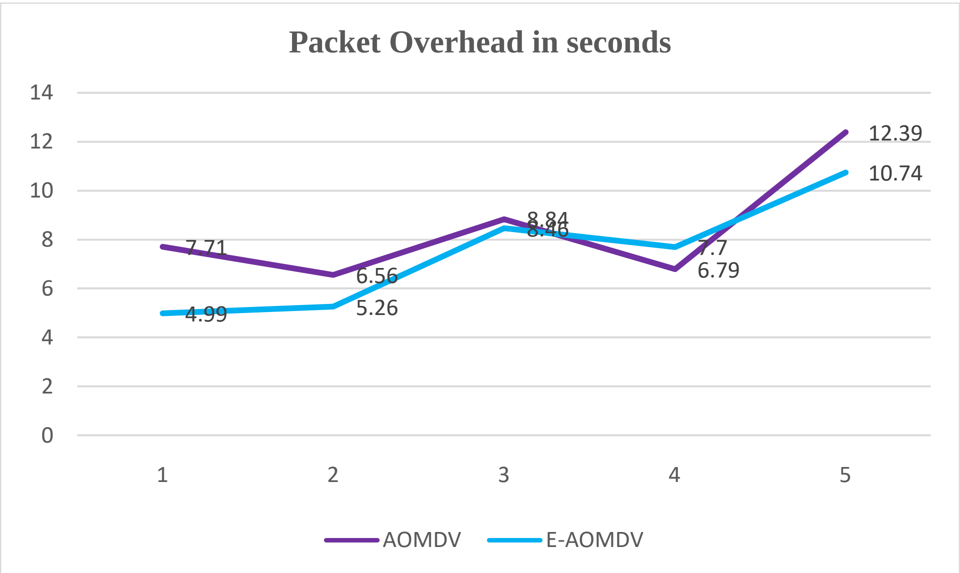

Fig 3. Average packet overhead in seconds

V. CONCLUSION

You may set up a MANET network whenever and wherever you choose. To put it simply, the load balancing issue in a MANET is critical. In the past, several different standard routing protocols were created without taking load balancing into account. As the wireless bandwidth had been shared among neighboring nodes, the topology changes become unexpected, making it difficult to satisfy the QoS for ad hoc networks and their wired equivalents. In this paper, we propose the AOMDV as a routing protocol for MANETs; it is an extension of the AODV that takes use of multiple paths, and we examine related difficulties in the context of quality of service for these networks. In order to preserve the energy of the nodes, an algorithm is developed for this job that is both energy efficient and employed in the development of the backbone. The findings show that the QoS-AOMDV reduces delay in comparison to the AOMDV.

REFERENCES

[1] Hasan, MZ, Al-Rizzo, H & Al-Turjman, F 2017, 'A survey on multipath routing protocols for QoS assurances in real-time wireless multimedia networks'. IEEE Communications Surveys & Tutorials, vol. 19, no. 3, pp. 1424-1456

[2] Balakrishna, R, Rao, UR &Geethanjali, N 2010, 'Performance issues on AODV and AOMDV for MANETS'. International Journal of Computer Science and Information Technologies, vol. 1, no. 2, pp. 38-43.

[3] Dayanand Ambawade, Dr. Deven shah, Prof. Mahendra Mehra, "Advance Computer Network", Wiley India

[4] Nishu Garg and R.P.Mahapatra, "MANET Security Issues", IJCSNS International Journal of Computer Science and Network Security, VOL.9 No.8, August 2009

[5] Chin-Fu Kuo, Member, IEEE, Ai-Chun Pang, Member, IEEE, and Sheng-Kun Chan, "Dynamic Routing with Security Considerations", IEEE Transactions On Parallel And Distributed Systems, Vol. 20, No. 1, January 2009

[6] Ghori, M. R., Zamli, K. Z., Quosthoni, N., Hisyam, M., &Montaser, M. (2018). Vehicular ad-hoc network (VANet): Review. In 2018 IEEE international conference on innovative research and development (ICIRD), Bangkok (pp. 10–16).

[7] Cooper, F. D., Ros, M., Safaei, F., &Abolhasan, M. (2017). A comparative survey of VANet clustering techniques. In IEEE communications surveys and tutorials (vol. 19, no. 1, pp. 657–681). https://doi.org/10.1109/COMST.2016.2611524

[8] Mirza, S., &Bakshi, S. Z. (2018). Introduction to MANET. International Research Journal of Engineering and Technology, 5(1), 17–20.

[9] Rasheed, A., et al. (2017). Vehicular ad hoc network (VANet): A survey, challenges, and applications. In Vehicular ad-hoc networks for smart cities (pp. 39–51). Springer.

[10] Rathi, D., & Ranade, R. (2017). Performance evaluation of AODV routing protocol in VANet with NS2. IJIMAI, 4(3), 23–27.

[11] Devangavi, A. D., & Gupta, R. (2017). Routing protocols in VANet A survey. In 2017 international conference on smart technologies for smart nation (SmartTechCon), Bangalore (pp. 163–167)

[12] Bentaleb, A, Harous, S &Boubetra, A 2015, 'A new topology management scheme for large scale mobile ad hoc networks'. In Electro/Information Technology (EIT), IEEE International Conference on, pp. 31-37.

[13] Das, SK, Yadav, AK & Tripathi, S 2017, 'IE2M: Design of intellectual energy efficient multicast routing protocol for ad-hoc network'. Peerto-Peer Networking and Applications, vol. 10, no. 3, pp. 670-687.

[14] Dhenakaran, DS &Parvathavarthini, A 2013, 'An overview of routing protocols in mobile ad-hoc network'. International Journal of Advanced Research in Computer Science and Software Engineering, vol. 3, no. 2.