International Journal of Research in Engineering, Science and Management
Volume-3, Issue-8, August-2020
journals.resaim.com/ijresm | ISSN (Online): 2581-5792 | RESAIM Publishing

Cross Layer based AODV (CLAODV) Routing for MANET

Dushyanta Dutta[1*], Abhijt Biswas[2]
[1,2]*Assistant Professor, Department of Computer Science & Engineering, ICFAI University, Tripura, India*
*Corresponding author: minkutezu@gmail.com

***Abstract*: Communication with mobility has become essential as nowadays everyone wants to get connected anytime with outside world. Further places with no network infrastructure Mobile Adhoc Networks, called MANETs can play a vital role. A MANET is a network form by a collection of wireless nodes capable of exchanging information without having a fixed network infra- structure. MANET has many applications in scenario such as in disaster man- agreement, battle field where exchange of information has to be done by mobile units without relying on any fixed network infrastructure. With the rapid growth of wireless technology, MANET themselves has become an independent wide area of research. However, this paper mainly focuses on issue of routing as routing protocol plays a vital role in performance of MANET. This paper uses AODV protocol as routing protocol for its study as AODV is widely used as routing protocol for MANET. ADOV uses flooding of Route Request packet in search of path and we know that flooding of packets degrades the performance of the network due to high congestion. Therefore, this paper mainly extends the working mechanism of AODV by implementing a Cross Layer approach term as CLAODV to reduce the flooding of Route Request. This enhancement is done in order to get better Quality of Services (QoS) in terms Throughput and Average Delay. The performance of the Extended AODV protocol is evaluated through NS2simulation.**

***Keywords*: AODV, Cross Layer based AODV (CLAODV), MANET, QoS.**

1. Introduction

MANET [1], [2] is a network designed to work for scenario with no fixed infrastructure such as at battle field, natural disaster management etc. [3]. Such scenario demands Quality of Service (QoS) in terms of throughput and delay in exchange of information for proper management. In maintaining QoS routing protocol plays a very important role as a routing protocol capable of searching path with less exchange information is always suitable. For network such as MANET where nodes are dynamic in nature, routing protocol needs to exchange more control packets to maintain path which in turns increases the congestion of the network. The paper focuses on Ad hoc On-Demand Distance Vector (AODV) which is traditionally used as routing protocol in MANET [4]. AODV uses a flooding mechanism where source node floods Route Request (RREQ) packet to all its neighboring nodes, connected within its radio range. This process is followed by other nodes till destination node is found. Now destination will forward the Route Request Reply (RREP) packet with a selected path in a unicast method [5].

As we know flooding of route request packets may degrades the performance of net- work due to high congestion, hence this paper extend s the AODV with a Cross Layer Approach which consider the status of a path before broadcasting route request in order to reduce routing overhead.

Recently many works are done related to modification of AODV for better through-put, average delay and energy consumption. Such as development of a reliability- based AODV protocol capable of preventing malicious node increasing throughput and decreasing end to end delay [6], a secured AODV improving average delay, packet loss rate, routing overhead [7], mobility and direction aware AODV (MDA- AODV) reducing overhead, end-to-end delay, and energy consumption [8], extended version of AODV improving energy consumption and packet transmission [9].

However, the above works mainly focuses on improvement of AODV by using different route strategy mechanism whereas the work presented in this paper reduces routing overhead by considering route channel status.

2. Cross Layer based AODV (CLAODV)

The proposed algorithm is an extension of standard AODV routing protocol which basically follows a cross layer approach. The objective of this extension is to reduce the congestion of the network by reducing routing overhead. Following steps are considered for extension of standard AODV which are explained below:

1. Sender node initiates the process of flooding the RREQ packet;
2. Corresponding neighboring nodes which are in radio range of source node will accept RREQ packet. However, a neighboring node before forwarding RREQ packet will count sensing information from CSMA/CA. This is done to estimate the channel status through that path;
3. If CSMA/CA finds the channel busy in its first channel sensing, then the node retain itself from forwarding RREQ packet considering the path to be busy.
4. In worst case all the neighboring nodes receiving the RREQ packet from source may find the channel busy

in its first attempt. In such case node will attempt for further channel sensing to broadcast RREQ.

5. However, before channel sensing in such condition, a node waits for fixed duration of time expecting RREQ packet from neighboring node successful in broadcasting by further channel sensing attempt.
6. If RREQ packet is received, node retains itself from broadcasting else broadcast with further channel sensing.
7. This process will continue till RREQ packet is received by the destination node.

3. Simulation Results

The performance of CLAODV is evaluated through simulation. Evaluation of the protocol is done by comparing the performance of CLAODV with standard AODV under different traffic and number of nodes. The simulation model used for evaluation is based on NS-2 [10]. The various simulation parameters considered are reported in Table 1. Simulation data considered is an average of at least 1000 runs with identical traffic models, but different randomly generated mobility scenarios.

The results obtained from simulation are plotted in Fig. 1, 2, 3 and 4. Fig. 1 and 2 shows the throughput achieved by the network under various traffic load and number of nodes. It can be observed from these figures that there is improvement in the throughput which happens due to decrease in the level of control packets which in turn decreases the level congestion. Here nodes only broadcast RREQ packets through path with having lesser of level of congestion.

Table 1
Simulation Parameter

Parameters	
Routing protocols	AODV and CLADOV
Mac layer	IEEE802.11
Packet size	512bytes
Terrain size	15,00m *1,000m
Number of nodes	10, 40
Mobility models	Random way point
Data traffic	CBR
Pause time	100sec.
Simulation time	900sec.
Maximum speed	20m/s
Minimum speed	0m/s
Transmission speed	500m

Fig. 3 and 4 shows the average delay faced by data packets under various traffic load and number of nodes. It can be observed from these figures that there is decrease in average delay of packets which too happens due to decrease in congestion.

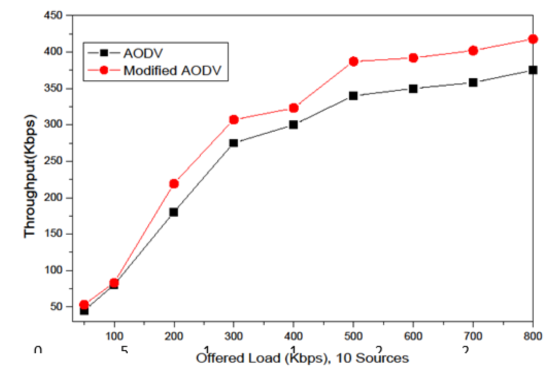

Fig. 1. Throughput achieved with AODV and CLAODV for total number of nodes 10

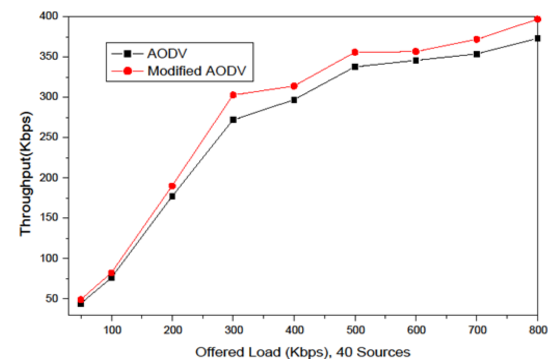

Fig. 2. Throughput achieved with AODV and CLAODV for number of node 40

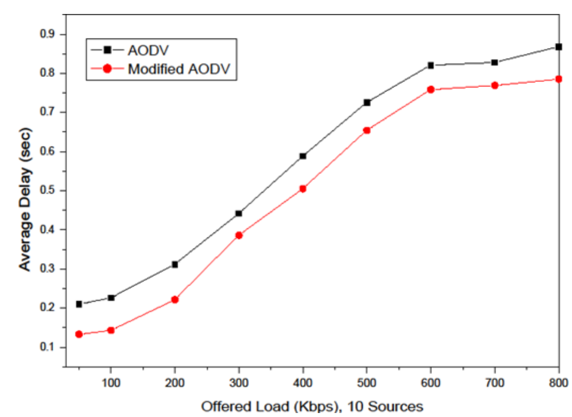

Fig. 3. Average Delay of packets with AODV and CLAODV for number of node 10

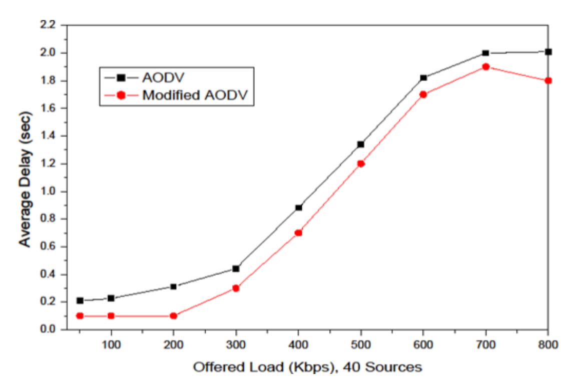

Fig. 4. Average Delay of packets with AODV and CLAODV for number of node 40

4. Conclusion

In this paper existing AODV protocol is modified with a cross layer approach to re- duce the routing overhead. The proposed algorithm broadcast RREQ packet considering the status of channel in a path. The proposed CLAODV is evaluated through simulation and result shows that CLAODV performs better than AODV in terms of throughput and average delay.

References

[1] Kurkowski, S., Camp, T., & Colagrosso, M. (2005). MANET simulation studies: the incredible. ACM SIGMOBILE Mobile Computing and Communications Review, 9(4), 50-61.
[2] Govindan, K., & Mohapatra, P. (2011). Trust computations and trust dynamics in mobile adhoc networks: A survey. IEEE Communications Surveys & Tutorials, 14(2), 279-298.
[3] Basagni, S., Conti, M., Giordano, S., & Stojmenovic, I. (Eds.). (2004). Mobile ad hoc networking. John Wiley &Sons
[4] Chakeres, I. D., & Belding-Royer, E. M. (2004, March). AODV routing protocol im- plementation design. In 24th International Conference on Distributed Computing Systems Workshops, 2004. Proceedings. (pp. 698-703). IEEE.
[5] Royer, E. M., & Perkins, C. E. (2000, September). An implementation study of the AODV routing protocol. In 2000 IEEE Wireless Communications and Networking Conference. Conference Record (Cat. No. 00TH8540) (Vol. 3, pp. 1003-1008). IEEE.
[6] Gupta, P., Goel, P., Varshney, P., & Tyagi, N. (2019). Reliability Factor Based AODV Protocol: Prevention of Black Hole Attack in MANET. In Smart Innovations in Communication and Computational Sciences (pp. 271-279). Springer, Singapore.
[7] Xie, T., Mo, J., & Huang, B. (2018, August). A Secure AODV Protocol Improvement Scheme Based on Fuzzy Neural Network. In International Conference on Security and Privacy in Communication Systems (pp. 453-467). Springer, Cham.
[8] Darabkh, K. A., Judeh, M. S., Salameh, H. B., & Althunibat, S. (2018). Mobility aware and dual phase AODV protocol with adaptive hello messages over vehicular ad hoc networks. AEU-International Journal of Electronics and Communications, 94, 277-292.
[9] Anand, M., & Sasikala, T. (2018). Efficient energy optimization in mobile ad hoc network (MANET) using better-quality AODV protocol. Cluster Computing,1-7.
[10] Issariyakul, T., & Hossain, E. (2009). Introduction to network simulator 2 (NS2). In Introduction to network simulator NS2 (pp. 1-18). Springer, Boston, MA.