

Performance Analysis of an Enhanced AODV Routing Protocol

Vipin kumar sahu¹, Prof. Aishwarya mishra²

Department of Computer Science and Engineering,
IES Institute of Technology & Management, Bhopal
vipinsahu25@gmail.com, mishra.aishy@gmail.com

Abstract-

This Paper has modified AODV protocol, designed to improve the performance of Mobile Ad Hoc networks. This paper describes the characteristics, working and deficiency of AODV routing protocols, and modified AODV routing protocol (MAODV). Finally, using NS2 simulation, results compared to the AODV routing protocol, MAODV routing protocol in terms of packet delivery ratio, end to end delay, Routing-load and Throughput. Experimental result shows that MAODV routing protocol is more advantages than the AODV routing protocol.

Keywords- Mobile Ad hoc Networks, routing protocol; Ad Hoc on-demand distance vector

Introduction

Mobile Ad Hoc Network (MANET) is multi-hop, self-organizing, mobile wireless networks. The MANETs can be rapidly deplorable due to the absence of any fixed infrastructure. Applications of MANETs are at special events such as conferences, military operations, and other tactical applications such as emergency rescue or exploration missions, where a network infrastructure is unavailable or not reliable. These types of networks are characterized by the highly dynamic topology and the very limited resources of bandwidth and computational power. Routing is one of the primarily issue in mobile ad-hoc network. Routing is the process of transmitting information packets and messages across a network from a source node to a destination node. Routing of packets involves two basic activities: determining optimal routing paths and transporting message packets through network. An effective routing mechanism can be helpful to extend the successful deployment of mobile ad-hoc networks. Basically, routing protocols can be divided into two categories: proactive and reactive. The proactive protocols, such as Destination Sequence Distance Vector (DSDV) [1], periodically disseminate routing

information among all the nodes in the network, so that every host has the up-to-date information for all possible routes. On reactive routing protocols, such as Ad hoc On-Demand distance Vector (AODV) [2], operate on demand basis, discover and maintain only active route that are currently used for delivering data packets and in this work will be focus on the AODV protocol. Abolhasan et al. [3] have reviewed the current routing protocols that have been proposed for MANETs.

Proactive protocols periodically disseminate routing information from each node to each other node, and find routes continuous manner, whereas reactive protocols find routes only basis of on demand, i.e. only when a source sends information for forwarding to a destination. Performance analysis shows that, in general, reactive protocols outperform proactive protocols.

In this paper for result approach we create scenario in two levels namely level 0 and level 1 with 8 routing parameters and 5 Metrics like throughput, packet delivery ratio (PDR), average delay, DROP and routing over head according to 5 design points and analyze the result.

- 1. Throughput:** Per unit time number of packet received by the receiver, is being represented by-
(i)

2. Packet delivery ratio: Packet delivery ratio is a percentage of data receiving by the genuine receiver. It is formalized by-

$$*100 \dots\dots\dots(ii)$$

3. Routing over head: Normalized routing load provide the over head arises in the network and its calculation by-

$$\dots\dots\dots(iii)$$

4. Drop data: Data drop is measure in packet base and that calculation is formulized by-

$$\text{Drop data} = \text{Total no of packets sent} - \text{Total no of packets received} \dots\dots\dots(iv)$$

5. Average E-E delay: The average end to end delay is a summation of per packet delay.

$$\dots\dots\dots(v)$$

Where,

E_i = End to End delay of i^{th} packet

n = Number of packets

AD HOC ON-DEMAND DISTANCE VECTOR ROUTING

AODV routing protocol is a typical demand-driven routing protocol, which combines the features of DSR routing protocol and DSDV routing protocol [4], It borrowed the DSR route discovery and route maintenance in the own foundation program, and the DSDV by hop (Hop-by-Hop) routing, the destination sequence number and the route maintenance phase of the cycle update mechanism, the bases of DSDV, combined with the DSR on-demand routing ideas and improvements. ADOV routing protocol use Route Request (RREQ), Route Reply (RREP) and Route Error (RERR) as a control signal.

1. Discovery route

When a source node need to communicate with some destination node and does not have a valid route there to destination. it initiates a route discovery method to locate the destination node by broadcasting a RREQ packet to its neighbors, which are then forward the request to their neighbors, and so on, till either the destination or an intermediate node with a "fresh

enough" route to the destination is found. During the whole process of forwarding the RREQ, intermediate nodes record their route tables the address of the neighbors from which the first copy of the broadcast packet is received, thereby establishing a reverse path. If additional copies of the same RREQ are later received, these packets are discarded. Once the RREQ reaches the destination or an intermediate node with a fresh enough routes, the destination/or the intermediate node responds by uni-castea RREP packet back to those neighbor from that its initial received the RREQ. As the RREP is routed back on the reverse path, nodes along this path started forward route entries in their route tables, that purpose to node that the RREP came. These forward route entries indicate the active forward route, related to every route entry is a route timer which is able to cause the deletion of the entry if it's not used among the specified lifetime. As a result of RREP is forwarded along the path established by the RREQ, AODV only supports the employment of symmetric links.

2. Maintenance route

AODV routing protocol uses RERR packet once link failure, the RERR from a broken communication link to the corresponding routing source node. The next hop link disruption, RERR packet to the neighboring node, destination node communication links broken links starting node. Once a node becomes inaccessible next hop node, then link it to the active use of the harm to the upstream node to send RERR packet, The RERR packet with a new serial number and the number of hops is set to 2. Node receives the RERR packets can then successively forwards the packet to their respective RERR active neighbors, this method continues till all links with the damage related with the active nodes have been notified so far. Source node, once receiving notification of broken links, then it contact with the destination node, it has to re-Launch a new route discovery process. At this time, it will broadcast a RREQ packet, the main purpose of this RREQ packet sequence number in the source node to the last known destination sequence number plus 1 above, to make sure that those that do not know the most recent position within the middle of the destination node of this node RREQ packet to respond, thereby ensuring the establishment of a new, efficient routing.

Enhanced AODV Routing Protocol

In the proposed method we have added a mechanism to select the route with minimum congestion and ignore the congested route. The route selection procedure involves with AODV route selection procedure in which selection is based on load on nodes in the particular route and forward the packets on alternative route if available. This procedure is done by adding some delay on RREQ packet if there exists the congestion on that route, this add some additional delay thus the RREQ packet on congested route and RREP received from non congested route will receive faster than congested route.

Result and Analysis

In our simulation structure we used 8 numbers of loss dependent parameters and retrieve maximum as well as minimum dependent parameters. For that purpose here we define two level of simulation as follows.

Table1: Experimental Parameters and their Levels

Parameter	Level 0	Level 1
Terrain Size(A)	800*800	1000*1000
No of Nodes(B)	5 0	1 0 0
No of Source Nodes(C)	5	1 0
Node Speed (D)	2	1 0
Pause time(E)	5 0	1 5 0
Queue Size(F)	5 0	1 0
Transmission Rate (G)	5	2 0
Transmission range(H)	5 0 0	6 0 0

TABLE 2 EXPERIMENTAL LAYOUTS

Design Points	
1	0 0 0 0 0 0 0 0
2	0 0 0 0 1 1 1 1
3	1 1 1 1 0 0 0 0
4	1 1 0 0 1 1 0 0
5	1 1 1 1 1 1 1 1

1. Average End to End delay:

The average end to end delay is a summation of per packet delay.

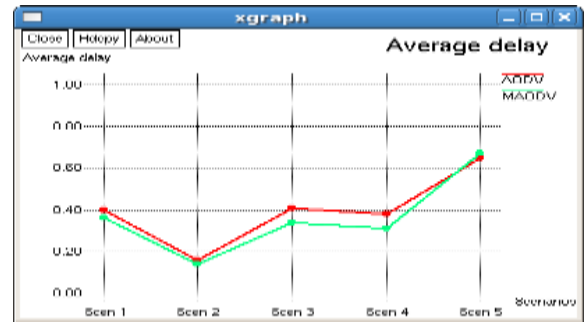


Figure 1: Average delay

Figure 1, shows that the Average Delay of MAODV is constantly lower than that of standard AODV protocol, in each varying scenario used during simulation.

2. Packet delivery ratio:

Packet delivery ratio is a percentage of data receiving by the genuine receiver. It is formalized by-

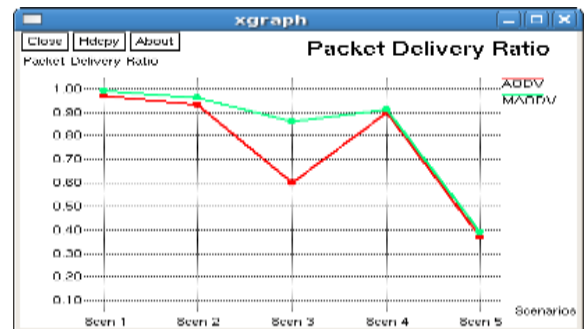


Figure 2: Packet delivery Ratio

Figure 2, shows that the packet delivery ratio of MAODV is constantly higher than that of standard AODV protocol, in each varying scenario used during simulation.

3. Routing over head:

Normalized routing load provide the over head arises in the network

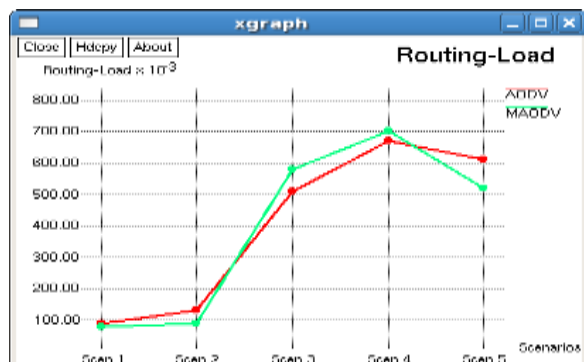


Figure 3: Routing-Load

Figure 3 shows that Routing load of MAODV is constantly lower than that of standard AODV protocol

4. Throughput:

Per unit time number of packet received by the receiver, is generally represented by-

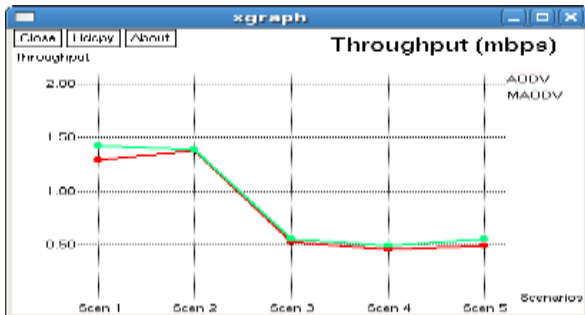


Figure 4: Throughput

Figure 4, shows that the Throughput of MAODV is constantly higher than that of standard AODV protocol, in each varying scenario used during simulation.

Conclusions

This paper presented a new protocol for mobile ad hoc networks based on link stability of paths. We

conducted extensive simulation study to evaluate the performance of MAODV and compared it with that of AODV using NS-2. The results show that MAODV improves the performance of AODV in most metrics, as the packet delivery ratio, end to end delay, and Throughput.

References

- [1] Perkins, C.E. and Bhagwat, P. "Highly Dynamic Destination-Sequenced Distance-Vector Routing (DSDV) for Mobile Computers". ACM Special Interest Group on Data Communications (SIGCOMM). (1994).
- [2] Johnson, D. B. and Maltz, D. A. (1998). "Dynamic Source Routing in Ad Hoc Wireless Networks", In: T. Imelinski and H. Korth eds., Mobile Computing, Norwell, Mass., Kluwer Academic Publisher, pp. 151–181.
- [3] Abolhasan, M., Wysocki, T. and Dutkiewicz, E, "A review of routing protocols for mobile ad hoc networks", Ad Hoc Networks 2(1), January 2004, pp. 1–22.
- [4] Ling Liu, Lei Zhu, Long Lin, Qihui Wu, "Improvement of AODV Routing Protocol with QoS Support in Wireless Mesh Networks", 2012 International Conference on Solid State Devices and Materials Science, in Elsevier B. V., 2012.
- [5] Ashish Bagwari, Raman Jee, Pankaj Joshi, Sourabh Bisht, "Performance of AODV Routing Protocol with increasing the MANET Nodes and its effects on QoS of Mobile Ad hoc Networks", 2012 International Conference on Communication Systems and Network Technologies, 2012, IEEE.
- [6] Zuhong Feng, Long Wang and Xiujuan Gao, "An improved routing protocol Ad-AODV Based on AODV", International Conference on Information Science and Computer Applications (ISCA 2013) Published by Atlantis Press. 2013.