OPTIMIZATION OF MULTIPATH AOMDV FOR DIFFERENT RADIO MODELS IN MANET

Sakshi Pandey
Information and Technology Department
Institute of Engineering Technology
Alwar, India

Dr. Basant Kumar Verma
Associate Professor, Computer Science Department
Institute of Engineering Technology
Alwar, India

Abstract-Mobile Adhoc network have dynamic topology and the network does not have deterministic behavior and along with this invisibility of nodes in the network makes it difficult to detect the path. **Approach:** In this paper we try to focus to study the performance in terms of characteristics of the physical layer **Result:** We first examined then displayed the simulation findings; how different radio propagation models influence the network performance of AOMDV. In order to get the result the study was performed over the nodes mobility and number of connections using NS-2-3.5

***Index Terms*— MANET, ad-hoc networks, routing protocol AOMDV, radio propagation, economic effect**

I. INTRODUCTION

A mobile ad hoc network [1] is a collection of digital data terminals equipped with wireless transceivers that can communicate with one another without using any fixed networking infrastructure. Communication is maintained by the transmission of data packets over a common wireless Channel. The most important characteristics of MANET are i) Dynamic topologies ii) Bandwidth-constrained links iii) Energy constrained operation and iv) limited physical security [1,2].

Routing protocols play a vital role in MANET to find routes for packet delivery and make sure that the packets are delivered to the correct destinations. These protocols are classified as: (i) proactive, (ii) reactive, and (iii) hybrid. Among these protocols, the reactive category is widely used because they find routes whenever needed (i.e. on-demand). We present a simulation-based performance study of the multipath routing protocol AOMDV. Along with the routing protocol before using a wireless network or installing the stations of a cellular network, one has to determine the radio waves targeted coverage. The targeted radio coverage has a crucial economic impact because it determines the equipment to be utilized.

II. AD-HOC ON-DEMAND MULTIPATH DISTANCE VECTOR (AOMDV)

To eliminate the occurrence of frequent link failures and route breaks in highly dynamic ad hoc networks, AOMDV has been developed from a unipath path on-demand routing protocol AODV. The AOMDV [2,5,6] protocol finds multiple paths and this involves two stages which are as follows: i) A route update rule establishes and maintains multiple loop-free paths at each node, and ii) A distributed protocol finds link-disjoint paths.

The AOMDV protocol finds node-disjoint or link-disjoint routes between source and destination. Link failures may occur because of node mobility, node failures, congestion in traffic, packet collisions, and so on. For finding node-disjoint routes, each node does not immediately reject duplicate RREQs. A node-disjoint path is obtained by each RREQ, arriving from different neighbor of the source because nodes cannot broadcast duplicate RREQs. Any two RREQs arriving at an intermediate node through a different neighbor of the source could not have traversed the same node. To get multiple link -disjoint routes, the destination sends RREP to duplicate RREQs regardless of their first hop. For ensuring link-disjointness in the first hop of the RREP, the destination only replies to RREQs arriving through unique neighbors. The RREPs follow the reverse paths, which are node-disjoint and thus link-disjoint after the first hop. Each RREP intersects at an intermediate node and also takes a different reverse path to the source to ensure link-disjointness.

The protocol AOMDV have been selected due to it's edges over other protocols in various aspects. The study of AOMDV protocol is carried out in terms of variation in number of connections and speed of the node under Random Way point Mobility (RWM) in CBR Traffic.

III. RADIO PROPAGATION MODEL

These models are used to predict the received signal power of each packet. At the physical layer of each wireless node, there is a receiving threshold. When a packet is received, if its signal power is below the receiving threshold, it is marked as error and dropped by the MAC layer. In our simulation we have included three radio propagation models, which are the free space model, two-ray ground reflection model and the shadowing model

.

A. Free Space Model

The free space propagation model assumes the ideal propagation condition that there is only one clear line-of-sight path between the transmitter and receiver. H. T. Friis presented the following equation to calculate the received signal power in free space at distance d from the transmitter:

$$P_r(d) = \frac{P_t G_t G_r \lambda^2}{(4\pi)^2 d^2 L}$$

where Pt is the transmitted signal power. Gt and Gr are the antenna gains of the transmitter and the receiver respectively. L(L $\geqslant$ 1) is the system loss, and _ is the wavelength. It is common to select Gt = Gr = 1 and L = 1 in ns simulations.

The free space model basically represents the communication range as a circle around the transmitter. If a receiver is within the circle, it receives all packets. Otherwise, it loses all packets.

B. Two Ray Ground

A single line-of-sight path between two mobile nodes is seldom the only means of propation. The two-ray ground reflection model considers both the direct path and a ground reflection path. It is shown that this model gives more accurate prediction at a long distance than the free space model. The received power at distance d is predicted by:

$$P_r(d) = \frac{P_t G_t G_r {h_t}^2 {h_r}^2}{d^4 L}$$

where ht and hr are the heights of the transmit and receive antennas respectively, assumes L = 1. To be consistent with the free space model, L is added here.

C. Shadowing

The shadowing model consists of two parts. The first one is known as path loss model, which also predicts the mean received power at distance d, denoted by Pr(d). It uses a close-in distance d0 as a reference. Pr(d) is computed relative to Pr(d0) as follows:

$$\frac{\overline{P_r(d_0)}}{\overline{P_r(d)}} = \left(\frac{d}{d_0}\right)^{\beta}$$

β is called the path loss exponent, and is usually empirically determined by field measurement.

IV. METHODOLOGY

In this study, on one hand we study the impact of different propagation models in order to analyse the environment effect on the ad hoc networks performance. We have compared the routing protocol performance of AOMDV according to every propagation models. In order to obtain valid results, we have inserted the notion of the nodes speed and the number of connections. The assessment is twofold: First, we diversified the nodes speed. Second, we altered the number of connections.

A. Scenario 1

So as to analyse the ad hoc routing protocols behavior, we selected traffic sources with a constant output (CBR) related to UDP protocol. The packet emission rate is settled at 8 packets per second with a maximal speed variation of nodes. Ten speed values were considered: 1, 2, 3, 4, 5, 6, 7, 8, 9 and 10 m sec$_{-1}$. The assessed protocol is AOMDV. This is available in 2.35 of ns-2. The propagation models under study are: the free space, the two-Ray ground and Shadowing models. The simulation span is of 1000 sec. The data packet size is 512 octets. The mobile nodes utilize the random waypoint mobility model (Geetha and Gopinath, 2008). The Mobile nodes move within a square dimension area 500X500 m. At the moment, we limit the number of sources in 10 and we analyse the impact of the nodes' speed.

B. Scenario 2

The number of sources may be another parameter that can be altered so as to look at the different routing protocols' performance. In this part, we display the impact of the traffic load on the routing protocols. For this reason, we have varied a number of connections. Six cases were considered: 5, 10, 15, 20, 25 and 30 connections. For the time being, let's limit the nodes' maximal speed at 10 m sec$_{-1}$ while the other parameters are similar to those in the first case..

C. Performance Indicators

For the present paper we have restricted our study to only three parameters

D. Routing Overhead

Total number of control packet or routing packets generated by routing protocol during simulation and is obtained by:

$$\textit{Routing Overhead} = \textit{Number of RTR packets.}$$

E. Packet Delivery Fraction (PDF)

PDF is the ratio of the data packets delivered to the destination to those produced by the source and is calculated by:

$$\textit{Packet Delivery Fraction} = \frac{\textit{Number of Packets Received}}{\textit{Number of Packets Sent}} \times 100$$

F. End to End Delay

Average End-to-End [18] delay is the average time of the data packet to be successfully transmitted across a MANET from source to destination. It includes all possible delays such as buffering during the route discovery latency, queuing at the interface queue, retransmission delay at the MAC (Medium Access Control), the propagation and the transfer time. The average e2e delay is computed by,

$$D = \frac{\sum_{i=1}^{n} (R_i - S_i)}{n} \; m\,sec,$$

where D is the average end-to-end delay, n is the number of data packets successfully transmitted over the MANET, ' i ' is the unique packet identifier, Ri is the time at which a packet with unique identifier ' i ' is received and Si is the time at which a packet with unique identifier ' i ' is sent. The Average End-to-End Delay should be less for high performance

)

V. RESULTS

The graphs obtained by the simulation results were as follows:

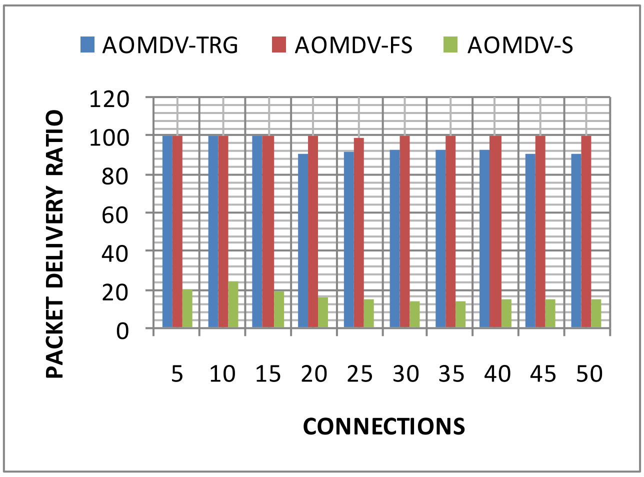

FIG 1: PDR GRAPHS VARAITIONS IN NO OF CONNECTIONS

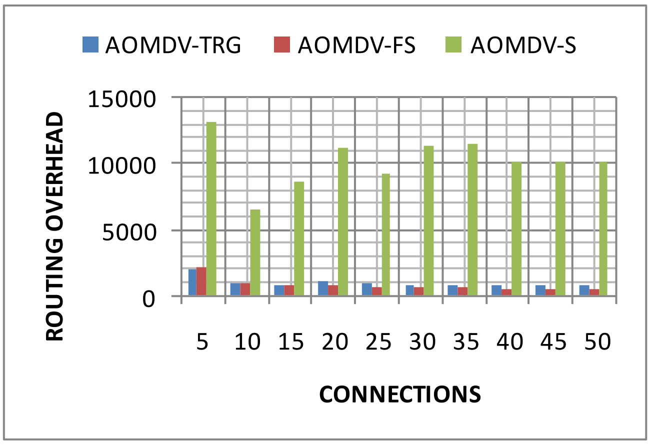

FIG 2: RO WITH VARAITION IN NUMBER OF CONNECTIONS

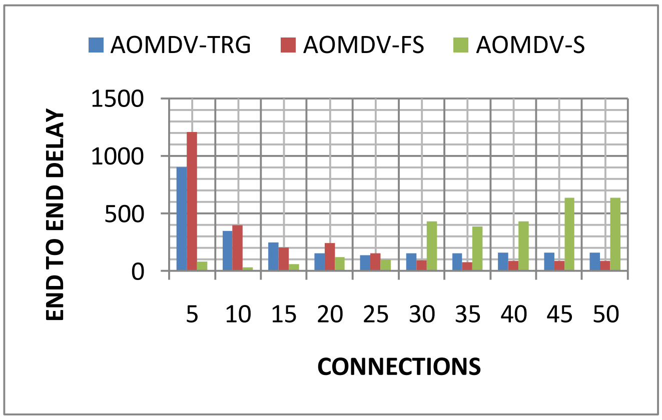

FIG 3: END TO END DELAY WITH VARAITION IN NUMBER OF CONNECTIONS

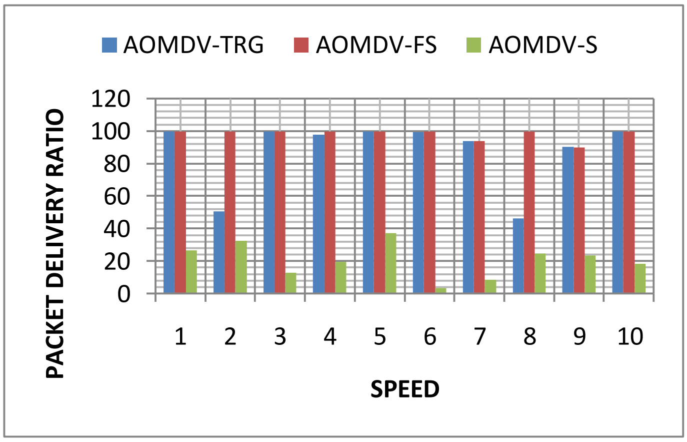

FIG 4: PDR WITH VARAITION IN SPEED

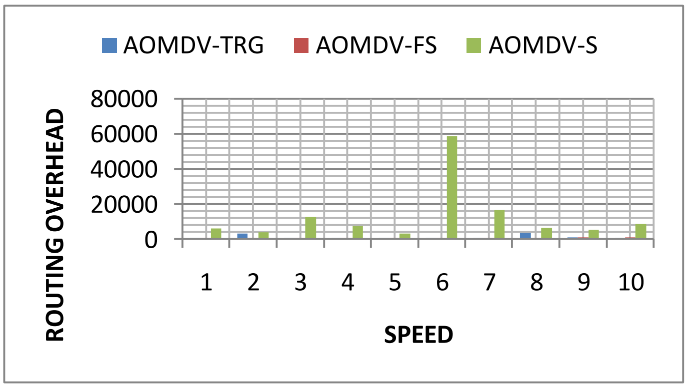

FIG 5: RO WITH VARAITION IN SPEED

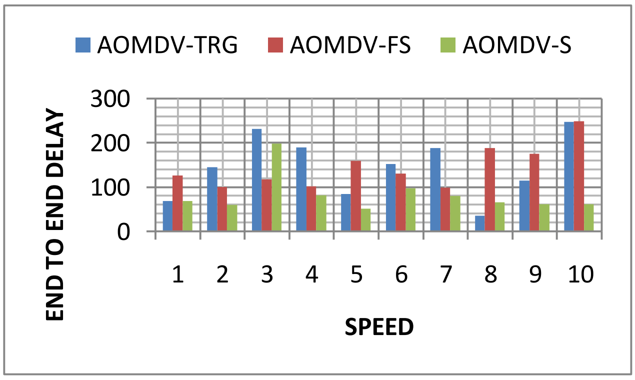

FIG 6: END TO END DELAY WITH VARAITION IN SPEED

CONCLUSION

In this paper the optimization of the multi-path routing protocol AOMDV under the different radio propagation model is done.

As seen from the Fig.1-3 which modifies number connections which changes the traffic file shadowing does not show better results as the routing overhead and end to end delay have large value while the values of two ray ground and free space is consistent in the performance. Also from the Fig.4-6 modifies the speed of nodes which is controlled by the scenario files in which again Shadowing model shows a poor performance but Two Ray Ground model gives the best performance.

In general Two ray ground model gives better performance in all the three cases with multi path routing protocol

REFERENCES

[1] E. M. Royer and C. K. Toh, "A Review of Current Routing Protocols for Ad Hoc Mobile Wireless Networks", IEEE Personal Communications, Vol. 6, No. 2, April 1999, pp 46-55.

[2] C. Perkins and E. Royer, "Ad Hoc On-Demand Distance Vector (AODV) Routing," Internet Draft, MANET Working Group, draft-ietf-manet-aodv-O5,txt March 2000.

[3] Q. Xue and A. Ganz, "Ad hoc QoS On-demand Routing(AQOR) in Mobile Ad hoc Networks," in Journal of Parallel and Distributed Computing (JPDC), February 2003.

[4] K: Fall and K. Varadhan, (Eds.) "ns Notes and Documents", The VINT Project. UC Berkeley, LBL, USC/ISI, and Xerox PARC, February 25, 2000. Available from http://www.isi.edu/-salehi/ns doc/.

[5] Tao Yang, Makoto Ikeda, Giuseppe De Marco, Leonard Barolli "Performance Behavior of AODV, DSR and DSDV Protocols for Different Radio Models in Ad-Hoc Sensor Networks", 2007 International Conference on Parallel Processing Workshops (ICPPW 2007)

[6] B.Malarkodi, P.Rakesh and B.Venkataramani "PERFORMANCE EVALUATION OF ON-DEMAND MUTIPATH DISTANCE VECTOR ROUTING PROTOCOL UNDER DIFFERENT TRAFFIC MODELS", 2009 International Conference on Advances in Recent Technologies in Communication and Computing

[7] Mahesh K. Marina Samir R. Das "Ad hoc on-demand multipath distance vector routing", WIRELESS COMMUNICATIONS AND MOBILE COMPUTING

[8] Wirel. Commun. Mob. Comput. 2006; 6:969-988