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Performance Evaluation of Ad-Hoc on-Demand Distance Vector Routing Protocol and its Multi-Path Variant AOMDV

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Abstract— This paper represents a simulation based comparison of two variants of a MANET routing protocol viz. Ad-hoc On-demand Distance Vector. Simulation is through Network Simulator 2.35. Packet delivery ratio, average end to end delay and throughput have been used as comparison matrices. Simulation results shows, that AOMDV performs almost equivalent to AODV in terms of Packet Delivery Fraction. The study also proves that for the given scenario AODV will be a better choice for a time-constrained network application.

Keywords **— AODV, AOMDV, MANET, Ad hoc network, Ad hoc routing.**

I. INTRODUCTION

Ad hoc network [1] is one sort of multi-hop, self-organizing and dynamically changing network. There are various challenges in designing a wireless ad hoc network like dynamic topology, limited shared bandwidth and limited battery power. Topology changes continuously because nodes in the wireless ad hoc network are mobile. Often due to dynamically changing topologies the route from source to destination breaks quite frequently. Consequently, to find a new route from source to destination, network initiates a route discovery. The frequent discovery of route increases the routing overhead and delay. There is a need is to find a routing protocol that considers link stability while designing the route. The provision of multiple paths may also achieve good performance compared to a single path. This paper focuses on reactive routing protocols where in the routes are created on requirement basis.[2] The paper aims to provide a comparison of performance of two variants of reactive routing protocols; Ad-hoc On Demand Distance Vector (AODV) [2] [3] which finds a stable and single path and Ad-hoc On Demand Multi-path Distance Vector (AOMDV) [2] [3] which finds multiple paths in a single route discovery. Section II covers the study outcome of a few important references considered at the time of literature survey. Simulation setup used for experimenting is described in section III, section IV showcases the simulation results followed by section V discussing the conclusion based on the study and experimentation.

II. LITERATURE SURVEY

The findings after studying various research outcomes were used to identify two protocols for the intended comparative study [5]. This section highlights the important points from the referred papers. In [4] authors have compared the most popular ad-hoc routing protocols namely, Dynamic Source Routing (DSR), Ad-hoc On Demand Distance Vector (AODV), and Destination-Sequenced Distance Vector (DSDV) routing protocol. In this paper, we are going to compare Mobile Ad-Hoc network routing protocols DSDV, AODV and DSR using network simulator NS-2. The performance matrix includes PDF (Packet delivery fraction), Average end-to-end delay, and Normalized Routing Load. They have compared the performance of routing protocols by varying various parameters like pause time, number of nodes and maximum speed. The comparison result demonstrates that AODV has the highest PDF and NRL while DSR gives the highest Average End-to-End delay. The authors of reference [6] have given a comprehensive analysis among Destination Sequence Distance Vector (DSDV), Dynamic Source Routing (DSR) and Ad-hoc on Demand Distance Vector (AODV) routing protocols of ad-hoc networks using simulations implemented on Network Simulator (NS-2). The paper concludes based on simulation with a varying workload such as throughput, packet count, and packet drop and propagation delay of ad-hoc network. It is found that for packet received DSR is superior to DSDV and AODV. But in rest of the cases AODV has proved to be superior. [7] Showcases a comparative study of AODV, DSDV, DSR, and AOMDV. The experiments are performed considering area of 500X500 meters, and node varies from 10 to 50. As mentioned in section III in this paper, no of nodes is varied from 25 to 200. In [7] we had experimented with varing maxim speed limit where as this paper talks about stable maximum speed and drastically varying node density. Through [7] it was well proved that AODV is the best out of the four protocols mentioned in terms of packet delivery ration.

III. SIMULATION SETUP

Table 1: Simulation Parameters

Total Number of Nodes	25,50,75,100,150,200
Area	500 m X 500 m
Simulation time	100 seconds
Mobility model	Random Way Point mode
Minimum Speed	1 ms
Maximum Speed	10 ms
MAC layer	IEEE 802.11
Propagation Model	Two Ray Ground model
Direction antenna mode	OmniAntenna
Data payload size	512 bytes

Identical simulation environments are used for performance evaluation of both the protocols. The simulation environment set up is mentioned in table 1.

IV. PERFORMANCE EVALUATION

For performance evaluation, following matrices have been used:

Packet Delivery Ratio (PDF): The ratio of data packets delivered to the destinations to those generated by the constant bit rate. [3]

Throughput: The amount of packet actually transmitted through the system.

Average End-to-End delay of data packets: This includes all possible delays caused by buffering during route discovery, queuing at the interface queue, retransmission delays at the MAC, propagation and transfer times. [3]

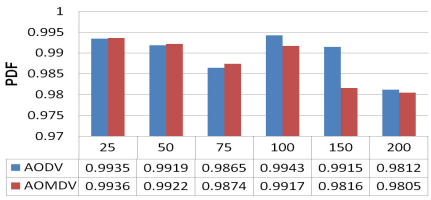

Fig 1: Simulation Results (Packet Delivery Fraction)

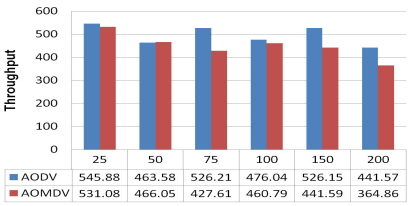

Fig 2: Simulation Results (Throughput)

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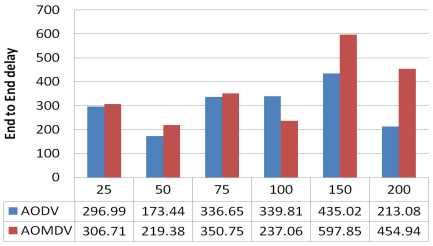

Fig 3: Simulation Results (End to End Delay)

From the simulation results shown in Fig 1 we can conclude that performances of AODV and AOMDV are almost same in terms of PDF. As the number of node increases AODV is turns to be a better choice. Fig. 2 shows the results in terms of throughput. It can be clearly visualized that AODV outperforms AOMDV when it

is about throughput. Fig. 3 specified the simulation outcome in terms of end-to-end delay. Based on this matrix also it can be said that AODV is better than AOMDV.

V.CONCLUSION

This paper focuses on comparison of two variants of AODV routing Protocol. First one finds single path between source and destination and the latter finds multiple paths. It can be clearly specified from results in section IV, that AOMDV and AODV performs almost same in PDF although AOMDV performs inferior in terms of throughput and average end-to-end delay as compared to AODV. It can be clearly stated from the results that, for the applications where delay is bound AODV is better option.

VI. REFERRENCES

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