# Performance Evaluation of AODV in varying network size

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***Abstract*— An ad hoc is a decentralized type of wireless network which does not rely on a preexisting infrastructure, such as routers (in wired networks) or access points (in wireless networks). Routing is a procedure of transmitting the data packets from source node to destination node. The main method for evaluating the performance of MANET is simulation. But, almost always the network protocols were simulated as a function of mobility, but not as the function of size of network. The main aim of this paper is to check the performance of AODV with varying network size.**

**Keywords—MANET; AODV; RREP; RREQ; Packet Delivery Ratio; Control Overhead**

## I. Introduction

A MANET is continuously self-configuring, infrastructure-less network of mobile devices connected without wires, allowing the people and devices to seamlessly communication with each other. Each node in the MANET acts as router, forwarding data packets for other nodes. If two hosts are not within the radio range, then the message communication must pass between them through intermediate nodes which act as routers. The hosts are free to move around randomly thus the routing protocol must be adaptive and able to maintain the route in spite of changing network connectivity [4] .A central challenge in the design of MANET is the development of routing protocols that can efficiently find the transmission paths between two communicating nodes[1]. The set of applications for MANET is diverse ranging from large scale, mobile, highly dynamic networks to small power- constrained static network. Our goal is to measure the performance of AODV protocol in varying network size for MANET.

The motivation for the proposed system lies in the fact that almost always the network protocols were simulated as a function of mobility and not as a function of network size [5] .Because of nodes movements, routing protocols of MANET have to cope up with frequent topology evolution. But it is also essential to understand the performance of protocols in MANET with varying network sizes. The main interest of the paper is to test the ability of AODV routing protocol in varying network size.

In MANET there should be effective communication between the nodes for the successful packet transmission. To serve the effective routing transmission, must be continuing even with any network size. Also, to make the path connection node must execute the shortest path algorithm up to the destination node. So, the shortest path identification for communication must satisfy the rules for end-to-end connectivity. The main aim is to detect the shortest path for data transmission with varying network size. This paper will also focus on evaluating the performance of AODV protocol with varying network size.

The rest of the paper is organized as follows: Section 2 describes the related work; proposed system is presented in section 3. Section 4 shows the experimental results.

## II. Related Work

1. Samir R. Das et.al evaluates several routing protocols for mobile, wireless, ad hoc networks via packet level simulations. A discrete event, packet-level, routing simulator called MaRS (Maryland Routing Simulator) was used for comparative performance evaluation. Both small (30 nodes) and medium sized (60 nodes) networks are used. It is observed that the new generation of on-demand routing protocols use much lower routing load, especially with small number of peer-to-peer conversation.

2. Nilesh P. Bobade et.al performs experiment for performance comparison of AODV and DSR on-demand routing protocol. In their NS-2 simulation, network densities of 50 nodes were chosen.

3. Yu-Doo Kim et.al presents the comparative study of reactive routing protocols. It also proposes the enhanced AODV routing protocol that removes the limitations of original AODV routing protocol. Enhanced AODV resets the shortest routing path during moving nodes. The simulation was done using NS-2 with 5 mobile nodes.

## III. Proposed System

Ad Hoc ON Demand Distance Vector (AODV) routing protocol is a reactive protocol that initiates a route discovery process only when it has data packet to send and it does not know any route to the destination node [1]. Figure 1.1 shows the architectural diagram for AODV Protocol. When a node wishes to transmit data packet to some destination, it checks its routing table to determine if it has current route to the destination:

a. If yes, then forwards the packet to next hop node
b. If no, then it initiates the route discovery process

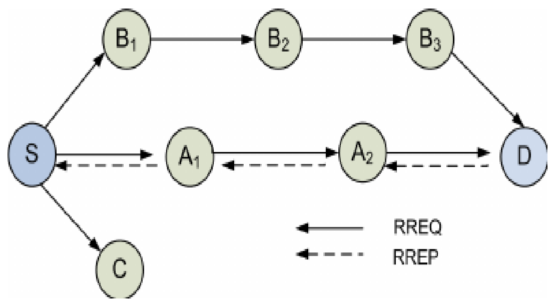


Figure 1.1-AODV Architecture

### A. Route Discovery

During a route discovery process, the source node broadcasts a Route Request (RREQ) packet that can be received by all neighboring nodes. In AODV each router maintains route table entries with the destination IP address, destination sequence number, hop count, next hop and life time. If any of the neighbors has a route to the destination, it replies to the query with the route reply (RREP) packet otherwise the neighbors rebroadcast the RREQ packet and let it propagate to other neighbors [3]. As the RREP prorogates, each intermediate node creates a route to the destination and when source receives the RREP, it records the route to the destination. If multiple RREP's are received by the source, the route with the shortest hop count is chosen. After shortest path is detected, source begins sending the data. During route discovery packets with an unknown destination should be queued. If the route is found the packets are sent. Hello messages may be used to check the presence of a node. If a hello message from a particular nodes stop coming, the neighbor can assume that the node has moved away. This can be helpful to detect the broken links in the network if any and the node can trigger a notification to some of its neighbors informing them about the broken link. Figure 1.2 and 1.3 respectively shows the RREP and RREQ packets.

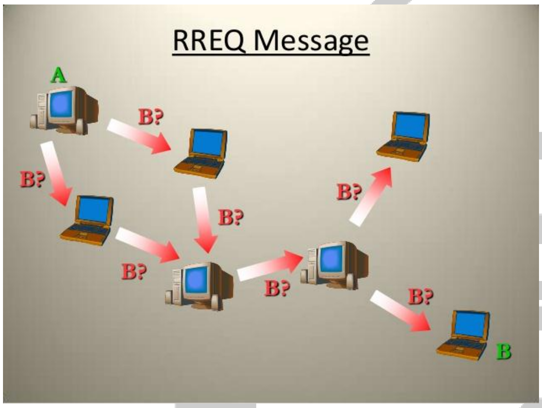


Figure 1.2 RREQ Messages

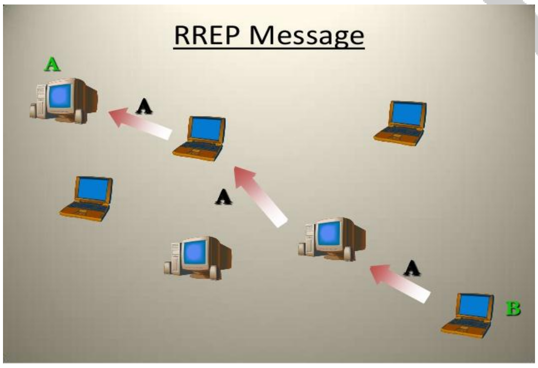


Figure 1.3 RREP Messages

### B. Route Maintenence

To handle the cases in which a route does not exist or the RREQ packets are lost, the source node rebroadcasts the query packets if no reply is received after a time out. AODV also uses the route maintenance to monitor the operation of the route being used. If the source node receives the notification of broken link, it can reinitiate the route discovery process.

## IV. Simulation Environment

Here the simulations have been performed using JAVA with varying number of mobile nodes running on Netbeans IDE. The nodes forward the data packet via the next hop link as per the routing information.

### A. Simulation Model

We consider a network nodes placing within an area of 550m*550m and the performance of AODV is measured by keeping the network speed and pause time constant and varying the network size. Table 1 shows simulation parameter used in this evaluation:

| | |
|---|---|
| Simulator | Java |
| Protocol | AODV |
| Simulation Duration | 200 sec |
| Simulation Area | 550m*550m |
| Number of nodes | 10,20,30,40,50 |
| Transmission Range | 250 m |
| MAC Layer Protocol | IEEE 802.11 |
| Pause time | 100 sec |
| Maximum Speed | 20m/s |
| Packet Rate | 4 packets/sec |
| Traffic type | CBR(UDP) |
| Data Payload | 512 bytes/packet |

Table 1

### B. Performance Metrics

When analyzed the AODV protocol, the focus was on three performance metrics for evaluation which are Packet Delivery Ratio and Control Overhead.

a) Packet delivery ratio: The ratio of packets that are successfully delivered to the destination compared to the number of packets that have been sent out by the source.

b) Control Overhead: Control overhead refers to metadata and network routing information sent by an application, which uses a portion of the available bandwidth of a communications protocol.

## V. Experimental Results

The performance of AODV in varying network size is done using the parameters like packet delivery ratio and control overhead. Figure 1.4 shows the route discovery process using 10 nodes.

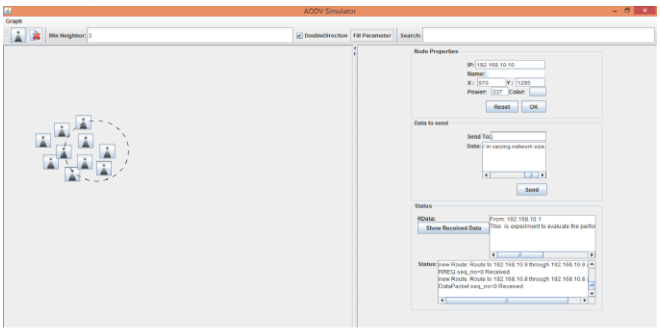

Figure 1.4 AODV with 10 nodes

Figure 1.5, highlights the relative performance of AODV i.e. it delivers a greater percentage of the originated data.

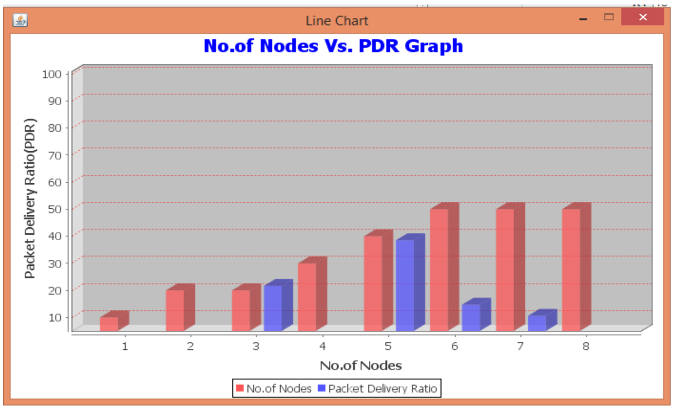


Figure: 1.5 Packet Delivery Ratio

In figure 1.3 , AODV has more control overhead with the increase in the network size. Also control overhead increases with the increase in the RREQ retries.

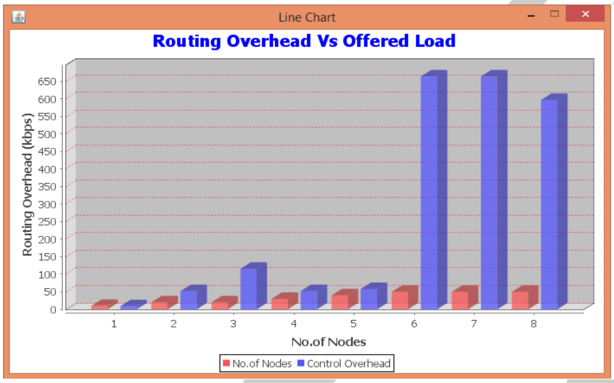


Figure 1.6 Control Overhead

## VI. Conclusion

In this paper we analyzed AODV for the performance metrics such as Packet Delivery Ratio and Control Overhead with increasing number of mobile nodes. As we increase the number of nodes, number of sent and delivered packets changes, hence the performance parameters changes. As a result, we conclude that AODV exhibits a better performance in terms of packet delivery fraction with increasing number of mobile nodes.

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