

## ANALYSIS OF THE IMPACT OF MOBILITY ON AODV

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**Abstract :** Ad hoc On-demand Distance Vector protocol has been designed for wireless mobile ad hoc networks. Wireless Mobile Ad Hoc network is a collection of geographically distributed nodes. These network nodes can perform transaction using wireless links and they don't need any fixed infrastructure. In wireless mobile ad hoc network node perform task of host and router both. Because of the nodes have mobility feature so the environment of network is very much dynamic in nature, hence nodes in network are mobile in nature, they can move randomly so they can affect the topology of network and made frequent change in it in randomize mode of time. Routing protocol for this type of network should be capable to respond to the frequent changes in the network topology. This paper consists of analysis of impact of mobility of ad hoc network on the AODV protocol. This study is based on simulation and experiment which has been conducted in famous network simulator NS2.

**Keywords :** AODV, Routing, Simulation, NS2, Wireless Ad Hoc Networks.

### INTRODUCTION

Ad hoc On-demand Distance Vector is a reactive or on-demand protocol designed for mobile ad hoc networks<sup>[3,4]</sup>. It responds instantly to changing link conditions and link failure. The nodes in AODV protocol based network make those particular routes invalid if they find any link failure due to mobility. AODV does not maintain frequent routes from source to destinations. Loop freedom is a good feature of AODV which specified by the use of specific number known as destination sequence numbers. It helps nodes to utilize the most recent and updated route from source to the destination. In AODV protocol routing table details contains the destination address and the address of next hop also the count of nodes necessary to reach from source node to the destination node. It stores the most recent destination sequence number in table which is associated with destination and also time span of the specify route to destination. The routing table specific entry will be discarding when it is not used during the time span.

### AODV OPERATIONS

The basic operation of AODV can be divided

into three phase's route discovery, route maintenance and hello messages<sup>[12]</sup>. The AODV defines three types of messages which are Route Request (RREQ), Route Reply (RREP) and Route Error (RRER). The AODV Protocol does not perform any action until the source node in network has to communicate with any other destination node and it needs valid routes to from source to destination. Whenever a node requires a route to a particular destination node, it is responsible to broadcasts a special message known as route request RREQ message to search a valid route to specific destination in network. When this RREQ reaches the destination it will result a valid route or if an intermediate node get this message and has a updated latest valid route to the required destination then also the result is valid route for communication<sup>[5,8]</sup>. After getting RREQ message, the receiving node unicasting the route reply RREP message back to the source node using reverse link of the path from which it get RREQ and send to source node. Simultaneously a process monitors the link status of all active routes and monitored network for any link failure. Whenever in this route any link breaks, a special message known as route error message RRER message is propagated

through the route to make notification to the linked nodes regarding the failure of link between nodes. RREP message is necessary to indicate that which destinations nodes are now not reachable to the breakage of link between nodes. In network every node maintains a special list known as 'precursor list' which consist of IP address for all neighbors which are hopefully can be to use it as a next hop towards each destination node in network. AODV protocol has a special mechanism known as "Local Repair" by using this technique the upstream node with broken link to destination try to repair the broken link itself locally and try to avoid sending route error message RERR in network. The node, which initiating the process of local repair technique, utilizes the process of route discovery phase for this task. If this node does not receive any route reply message RREP then it transmits a route error message RERR for that particular destination in network. The process of local repair technique may create in long path from source to the destinations due to local repair.

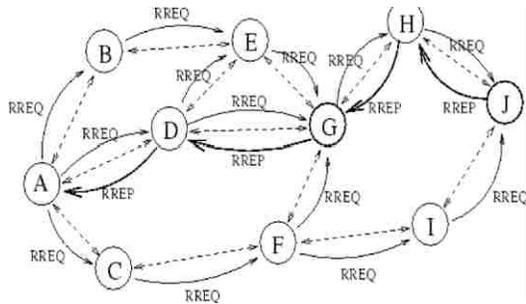


Figure 1. AODV Protocol Operations

## RELATED WORK

An routing protocol of ad hoc networks is a good research topic and it is currently an open area. So many routing protocols proposed by the standard network communities are till now have no agreement on a solution provision due to relevance of wireless or wired networks. The researcher Asma Ahmed<sup>[3]</sup> discussed on various routing protocols and made comparison between routing protocols. She prepared a comparative output of the properties of all type of protocol. The researcher Md. Anisur

Rahman<sup>[6]</sup> shows that working differentials can test using changing network load and node mobility also network size. The researcher Samyak Shah<sup>[7]</sup> check by comparing the capability of protocols DSDV protocol, AODV protocol and DSR protocols of manet with the use of network simulations. The researcher Furqan Haq<sup>[9]</sup> proposed a comparing of emulated test bed and result of simulation of NS2 simulator and GloMoSim. They use OLSR protocol. The researcher Kapang Lego<sup>[12]</sup> has done evaluation using simulation for comparison of various performance matrices on various scenarios for manet. In all the papers some of papers discussed the actual simulation results and also changing of found results between various network simulators. On the base of the output of the all research, there is a need for deep and correct planned network simulation and emulation test experiments has been think to required. To identify the surity of the output it is necessary to completw detailed simulation.

## SIMULATION ANDEVALUATION

The simulation model used in this paper is based on network simulator-2, which is used for protocol evaluation in experiment. The instructions of simulator can be utilize to specify the topology of the network and to specify the mode of node motion, also to configure the source of service and the receiver, to generate the data trace file<sup>[11]</sup>. NS2 provides good support for network simulation of routing and also multicast routing protocols for wired and wireless networks. NS2 is combination of two simulation tools which are the network simulator (NS) which contains various commonly used IP protocols and the network animator (nam) tool is utilize to actually visualize the network simulations.

## TRAFFIC MODEL

In this work we have used CBR continuous bit rate traffic sources for network simulation. In the pair of network made by source and destination nodes commonly distributed as randomly and also 512-byte data packets is used by us for analysis of task in experiment. The pairs count made for source and destination and

also the sending rate of packet of node pairs are time to time changed by us to varying the load proposed for the network.

**MOBILITY MODEL**

The mobility model<sup>[1][10]</sup> uses by us is the random waypoint model in a specified area of rectangular field which is configurations as 500 multiply be 500 area with the 100 nodes. In network communication every data packet starts its route from a specific random source location to a random node destination by a specified and randomly communication network speed. When it is reached to destination, then again an another random node destination is specified. In the network simulation time is varied which responsible to effects the relative speeds of the nodes in network. Node mobility in network is same and traffic scenarios which are used by the protocols to get good output of experiments.

**SIMULATION MODEL**

Network Simulator NS2<sup>[7]</sup>, is an effective and simple event driven simulation software which is useful in testing of the implementation of logically networks and also make shorten the burden of actual network implementation. NS2 provides various capabilities to effective simulation of wired and wireless network and also support most of protocols. We have perform a simulation to evaluate the performance of Mobile Ad Hoc Network routing protocols AODV based network throughput with various parameters<sup>[10][11]</sup>.

- Radio Model - Two Way Ground
- Traffic Source - CBR
- Packet Size - 512 Bytes
- Network Speed - 10 m/s
- Area - 500X500
- Number of Nodes 100
- MAC - Mac/802\_11
- Simulation Time 20, 40, 60, 80 & 100

To achieve our goal and aim we actually need to investigate that how AODV protocol behaves when load of nodes increases with mobility of nodes. In this work the simulation has been done by network simulator 2.34.

**PERFORMANCE MATRICES**

Some important matrices we have evaluated for the analysis of manet routing protocol in different network scenario and different experimental setups in network simulator<sup>[11]</sup>.

**NETWORK THROUGHPUT**

The network throughput is performance metrics which is a ratio of the total amount of data reaches to a specific receiver node from a sender node to the time which it takes. In the specific communication networks the network throughput is the average rate of a perfect message delivery in a particular transmission channel in simulated network. This data may be passed on a particular physical link or can be the logical link, or it can be pass through the specific particular network node in simulated network. The network throughput is generally calculated in the form of bits per second.

Table 1. Network Throughput

Network Throughput		
Simulation Time	Static / Vector	Mobile / Random
20	1689.44	1587.50
40	1657.42	1353.31
60	1678.31	1009.13
80	1709.01	795.06
100	1725.93	631.00

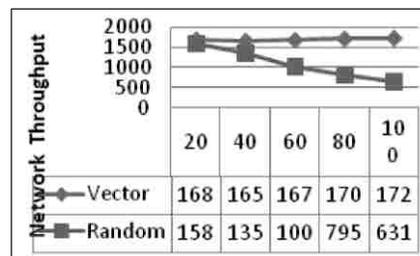


Figure 1. Average Network Throughput

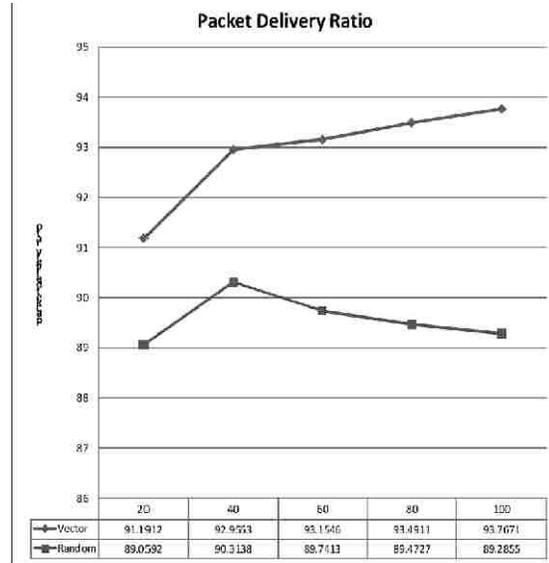
Based on simulation results, the throughput value of network based on static vector nodes and AODV based network in different simulation time initially low as 1689.44 but it increases as simulation time increases as on 100 simulation time it reach on 1725.93 whereas, the throughput value of network based on mobile random nodes and AODV based network in different simulation time initially 1587.50 but it decrease as simulation time increase as on 100 simulation time it reach on 631.00 which shows that in mobility environment AODV based network cannot provide good network throughput.

**PACKET DELIVERY RATIO**

In network the packet delivery ratio is the ratio between lot of received packets by the destination node and the number of the data packets sent by the source node in network. It is the ratio between the number of packets actually transmitted by a network traffic source and the number of packets received by a network traffic sink. Packet delivery ratio can measures the loss rate as seen by transport protocols and as like, it characterizes the correctness and the efficiency of ad hoc network routing protocols. The high packet delivering ratio is very much desirable in any of the network. The packet ratio of the originated applications of the data packets of each of the protocol is able to deliver at varying time in network.

**Table 2. Packet Delivery Ratio**

Packet Delivery Ratio		
Simulation Time	Static / Vector	Mobile / Random
20	91.1912	89.0592
40	92.9553	90.3138
60	93.1546	89.7413
80	93.4911	89.4727
100	93.7671	89.2855



**Figure 3. Packet delivery Ratio**

Based on simulation results, the packet delivery ratio of network based on static vector nodes and AODV based network in different simulation time initially low as 91.1912 but it increases as simulation time increases as on 100 simulation time it reach on 93.7671 whereas, the packet delivery ratio of network based on mobile random nodes and AODV based network in different simulation time initially 89.0592, it first increase to 90.3138 in 40 simulation time but it again decrease as simulation time increase as on 100 simulation time and again it reach on 89.2855 which shows that AODV based network can provide good packet delivery ratio in static random nodes based network.

**CONCLUSION**

It has been concluded by different simulation and evaluation that the throughput value of network based on static vector nodes and AODV based network in different simulation time initially low increases as simulation time increases in network based on mobile random nodes and AODV based network in different simulation time initially high but it decrease as simulation time increase simulation time, which shows that in static vector environment AODV based network can provide good network throughput. The packet delivery ratio of network based on static vector nodes and

AODV based network in different simulation time initially low but increases as simulation time increases, whereas the packet delivery ratio of network based on mobile random nodes and AODV based network in different simulation time initially low then increase in 40 simulation time but it again decrease as simulation time increase as on 100 simulation time which shows that AODV based network can provide good packet delivery ratio in static random nodes based network.

### FUTURE WORK

In the future, we like to perform extensive complex simulations to gain a more in-depth analysis of the wireless mobile ad hoc routing protocols. Also try to enhance some new feature in protocol. We like to introduce new protocol, not only for the various routing protocols but for more and more vast areas of wireless networking and various important concepts in computer network and communications.

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