

# A Survey on Performance Analysis of AODV in MANETS

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**Abstract:-** Mobile Ad-Hoc Network (MANET) is a temporary network built up to satisfy momentarily certain condition. This paper gives an introduction to one of the MANET reactive routing protocol AODV i.e. Adhoc on demand distance vector routing protocol. It also includes general working of AODV protocol .It also includes survey of performance of AODV protocol depending on different input parameters. This paper also present NS2 simulator being used in simulating it's performance.

**Keywords:** MANET, AODV, NS2.

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## 1.Introduction

A MANET is a collection of mobile nodes that can communicate with each other without the use of predefined infrastructure or centralized administration. Due to self-organize and rapidly deploy capability, MANET can be applied to different applications including battlefield communications, emergency relief scenarios, law enforcement, public meeting, virtual class room and other security-sensitive computing environments. There are 15 major issues and sub-issues involving in MANET such as routing, multicasting/broadcasting, location service, clustering, mobility management, TCP/UDP, IP addressing, multiple access, radio interface, bandwidth management, power management, security, fault tolerance, QoS/multimedia, and standards/products. The routing protocol is required whenever the source needs to transmit and delivers the packets to the destination. Many routing protocols have been proposed for mobile ad hoc network. This paper is survey work done that include proposed modifications and related work done regarding AODV performance. Section 2 gives an overview of an AODV protocol .Section 3 describes working and performance of AODV protocol. Section 4 gives an introduction to NS2 simulator .Section 5 gives an overview of different mobility models. Section 6 gives simulation results and finally Section 7 concludes the paper.

## 2.Overview of AODV

Ad-hoc routing protocols are mainly categorized into two groups proactive and reactive routing protocol. Proactive protocols are the one which maintain up-to date routing

information about the network whereas reactive protocols discover route on demand when packet is to be sent. Ad-hoc on demand vector routing protocol is one of the reactive protocol.AODV uses broadcast route discovery mechanism .It relies on dynamically establishing route table entries at intermediate nodes. To maintain the most recent routing information between the nodes, it uses the Concept of destination sequence number [2]. AODV protocol works in two steps

1. Path Discovery
2. Path Maintenance

Path discovery process is the first step , whenever a source node wants to send packet to another node, path discovery process is initiated .The source node initiates path discovery by broadcasting route request RREQ packet to its neighbor . Each neighbor either satisfies RREQ by sending route reply RREP back to the source or rebroadcasts RREQ to its neighbor after increasing hop-count. If a node cannot satisfy RREQ, it implements reverse path as well as forward path set up. As the RREQ travels from source to destination reverse path is set up automatically and when the RREP travels back to the source, each node along the path sets up a forward pointer to the node from which RREP came [2]. Second step is the Path maintenance process in which hello messages are used to ensure symmetric links as well as to detect link failure.

## 3.Related work

In recent years, a number of studies have been done regarding AODV protocol. Modification of AODV is done by including source route accumulation feature and thereby reducing routing load of AODV and thus named AODV with path accumulation AODV-PA [3]. In mobile ad-hoc network, limited energy of batteries is the biggest restriction. Much research has been done to improve energy efficiency of the protocol. There is an modification of AODV to present an Energy Mean Value algorithm to maximize network lifetime [4]. A novel routing protocol named AOZDV is proposed (Ad-hoc on demand zone and distance vector routing). This protocol enhances AODV with Zone routing protocol [5].

Performance of AODV can be evaluated for varying mobility models [6].The paper compares performance of AODV with four mobility models and suggest that AODV protocol with reference point group mobility model has best performance..Performance of ad-hoc routing protocols (aodv, dsdv, dsr) is evaluated using common mobility models[7].Performance analysis of different protocols with different models is also done.There is an modification of AODV to provide reliable delivery (AODV-RD)[8]. This protocol is based on link failure prediction in order to reduce required time interval after primary route break. Different entity mobility models can be compared and the effect of mobility model on the performance of manet routing

protocol can be analysed[9]. After comparing different mobility models and conclusion is made that mobility model should be selected based on application scenario[10]. Several simulation based performance comparison have been done. Performance of routing protocols using ns-2.34 is compared[11][12]. Much research work has been done in Manet routing protocols with different mobility models. Comparison of different routing protocols with three mobility models is made and the effect of mobility pattern on routing performance is also discussed [13]. The work done helps us to understand that node mobility pattern has significant impact on performance of routing protocols. A new modified protocol AODVUU is also introduced to overcome drawbacks of routing overhead and average end to end delay in AODV[14].

#### 4 . Network Simulator (NS2)

Network simulator is a discrete event simulator that is focused on modeling network protocols. It is a software program that imitates working of computer network. Its basic goal is to support networking research, protocol design and protocol comparison. It is used to create

Simulation environment to develop and analyze proposed protocol. It is based on two languages C++ and OTcl. OTcl is an extension to Tcl/TK for object oriented programming. It is used to build network structure and topology. C++ is used for detailed simulation of protocol .C++ is fast to run but slower to code and change. OTcl is easy to code but runs slowly. NS-2 includes a tool for viewing simulation result called network animator (NAM) [15]. It is a Tcl/TK based animation tool for viewing network simulation traces.

#### 5. Overview of mobility models

Mobility models play a significant role in evaluating performance of routing protocols. Mobility model is the foundation of simulation study on various protocols in manet. Many mobility models have been proposed in literature. Basically mobility models can be categorized into two types Entity mobility models and Group mobility models[9] . Models in which movement of mobile nodes is independent of each other are entity mobility models, whereas those in which mobile node movements are dependent on each other are group mobility model [15]. Further these models can be divided into various sub – categories:

##### MOBILITY MODELS

##### ENTITY GROUP MOBILITY MODELS

##### RANDOM MODEL

##### WAYPOINT MODEL

##### REFERENCE RANDOM POINT MODEL

##### GROUP WALK MODEL

##### COLUMN MOBILITY MODEL

Different types of entity mobility models are Random Walk Mobility Model , Random Waypoint Mobility Model ,Random Direction Mobility Model ,Gauss Markov Mobility Model ,Markov Random Path Model ,City Section Mobility Model, Boundless Simulation Area Mobility

Model and different types of group mobility models are Reference Point Group Mobility Model , Group Force Mobility Model, Column Mobility Model, Manhattan model, Pursue Mobility model.

#### 1. Random Walk Mobility Model

It is a simple mobility model based on random directions and speed. In this mobility model, an MN moves from its current location to a new location by randomly choosing a direction and speed in which to travel. The new speed and direction are both chosen from pre-defined ranges, [ $speed_{min}$ ;  $speed_{max}$ ] and [0;2] respectively. Each movement in the Random Walk Mobility Model occurs in either a constant time interval  $t$  or a constant distance traveled  $d$ , at the end of which a new direction and speed are calculated. If an mobile node (MN) which moves according to this model reaches a simulation boundary, it “bounces” off the simulation.

#### 2. Random Waypoint Mobility Model

It is a model that includes pause times between changes in destination and speed. In this model , a node’s pattern of moving as follows: the node begins by staying in one location for a certain period of time. Once this time expires , the node randomly choose a destination in the simulation area and also randomly choose a speed between [ $minspeed, maxspeed$ ] [9]. Then the node travels towards the new destination at the selected speed .Upon arrival, the node pauses sometime before starting the process again

#### 3. Reference Point Group Mobility Model

It is a group mobility model where group movements are based upon the path traveled by logical center. In this model , there is random selection of a leader for the group .[10]This group leader is used to set the speed ,position and direction of the group. All the nodes in the group follow this leader and it selects a random destination and moves towards the destination at a given speed.

#### 4. Column Mobility Model

It is a group mobility model that represents a set of MNs that move around a given line (or column),which is moving in a forward direction. For the implementation of this model, an initial reference grid is defined. Each MN is then placed in relation to its reference point in the reference grid, the MN is then allowed to move randomly around its reference point via an entity mobility model.[ 15] A lot of research work has been done in analyzing impact of mobility models on the performance of AODV protocol protocol with RERR message the end of which a new direction and speed are calculated. If an MN which moves according to this model reaches a simulation boundary, it “bounces” off the simulation.

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Environment size	500 * 500
Traffic type	Constant Bit rate
Maximum speed	5m/s
Packet size	512bytes

Simulation results are explained as under:

**Packet Delivery Ratio:**

Packet delivery ratio is the ratio of number of packets received at the destination nodes to the number of packets sent from the source nodes (Gupta et al, 2010). The performance is better when packet delivery ratio is high.

**Network Life Time:**

Network life time is the time when a node finished its own battery for the first time. The performance is better when network life time is high.

**System Life Time:**

System life time is the time when 20% of nodes finish their own battery. The performance is better when system life time is high.

**End-to-End Delay:**

End-to-end delay is the average time delay for data packets from the source node to the destination node (Gupta et al, 2010). To find out the end-to-end delay the difference of packet sent and received time was stored and then dividing the total time difference over the total number of packet received gave the average end-to-end delay for the received packets. The performance is better when packet end-to-end delay is low.

**Routing Overhead:**

Routing overhead is the total number of control or routing (RTR) packets generated by routing protocol during the simulation. All packets sent or forwarded at network layer is consider routing overhead. The performance is better when routing overhead is low.

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## 6. Simulation Environment

Simulations are performed using Network Simulator [16]. This simulation focuses on the mobility of the source node and intermediate node which may result link failure. It is able to reinitiate the Route Discovery Protocol (RDP) if a source node moves. It will find a new route to the destination by updating the path. A Local Repair Procedure is used to update the path in case intermediate node link breaks. Thus, resolving link failure in AODV. Simulation shows the behavior and performance improvement in AODV based on the evaluation metrics [16]. The simulations use 5 different movement patterns (pause time 0, 20, 40, 100 seconds) and 4 different traffic patterns (5, 10, 15, and 20 sources). The following four important performance metrics are considered for evaluation:

**Node mobility** -Node mobility indicates the mobility speed of nodes. When the node mobility is very less the packet delivery ratio is very high.

**Packet Delivery Ratio (PDR)** -PDR is used to measure the reliability. It is defined as a percentage of data packets delivered to that of no. of data packets sent for that node. The Average PDR is calculated by considering all the nodes in the network.

Simulation table:

Parameters	Value
Protocol	AODV
Simulation time	100s
No of nodes	10
Pause time	0,10,20,40

## 7. Conclusion

In this paper we have provided brief information regarding AODV protocol and its various modifications. The work done in this survey research aims to develop a good understanding of AODV protocol and improvements done to it to enhance its performance. We observe that large number of studies have been done in this field, a better understanding of a routing protocol, network parameter can enhance the performance of AODV protocol.

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