

Analysing Performance Of AODV In MANET : A SURVEY

Neerja Khatri
M.TECH STUDENT
K.I.E.T GHB

Arvind Kumar
DEPT. COMPUTER SCIENCE
K.I.E.T GHB

Abstract — This paper is a survey of evaluating performance of AODV protocol in MANET with different network parameters using network simulator. Our basic goal is to present vast information related to AODV protocol and modifications done to it to improve its performance. In addition, in evaluating performance of AODV protocol in mobile ad-hoc network, mobility models play a vital role. We also present a brief overview of mobility models in evaluating performance of AODV. Lastly, we illustrate about network simulator that is used in analyzing performance of AODV.

Keywords : MANET ; AODV ; Network simulator

I. INTRODUCTION

Mobile ad-hoc network is a network which does not require any fixed infrastructure, consists of mobile nodes which communicate via wireless links. Each node in manet acts as router as well as host. The nodes in manet are free to move independently.

Manet have several salient characteristics

1. Dynamic topologies
2. Bandwidth constrained
3. Limited physical security
4. Energy-constrained operation. [1]

Each device in manet is free to move in any direction and will therefore change its topology frequently. Ad-hoc routing protocols control how nodes decide which way to route packets. Ad-hoc routing protocols can be divided into two main categories i.e. proactive and reactive. AODV is one of the reactive routing protocols. This paper is a survey work that includes proposed modification and related work done to enhance the performance of AODV with different network parameters such as packet delivery fraction, average end to end delay, throughput, routing load. To evaluate performance of routing protocol, mobility models play a significant role.

In Section II, we discuss a brief overview of AODV protocol. Section III presents related work done in AODV protocol. Section IV gives overview of mobility models. Section V describes about network simulator. Section VI finally concludes the paper.

II . 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 failures.

III . RELATED WORK

In recent years, a number of studies have been done regarding AODV protocol.

In [3] paper, authors modify AODV by including source route accumulation feature and thereby reducing routing load of AODV and thus named AODV with path accumulation AODV-PA. 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. Authors of [4] present an Energy Mean Value algorithm to maximize network lifetime. In [5] paper, 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. Authors of [6] have evaluated performance of AODV for varying mobility models. The paper compares performance of AODV with four mobility models and suggest that AODV protocol with reference point group mobility model has best performance. In [7], performance of ad-hoc routing protocols (aodv, dsdv, dsr) is evaluated using common mobility models. Author has analyzed performance of different protocols with different models. LIU Jian and LI Fang-min in [8] presented AODV with reliable delivery (AODV-RD). This protocol is based on link failure prediction in order to reduce required time interval after primary route break. In [9] paper compares different entity mobility models and analyses the effect of mobility model on the performance of manet routing protocol. Authors of [10] have analyzed performance comparison of different mobility models and conclusion is made that mobility model should be selected based on application scenario. Several simulation based performance comparison have been done. In [11] [12] performance of routing protocols using ns-2.34 is compared. Much research work has been done in manet routing protocols with different mobility models. Authors in [13] present a comparison of different routing protocols with three mobility models and discussed the effect of mobility pattern on routing performance. The work done helps us to understand that node mobility pattern has significant impact on performance of routing protocols. Guanghui Li and Jianming Chen in [14] introduced a modified protocol AODVUU to overcome drawbacks of routing overhead and average end to end delay in AODV protocol.

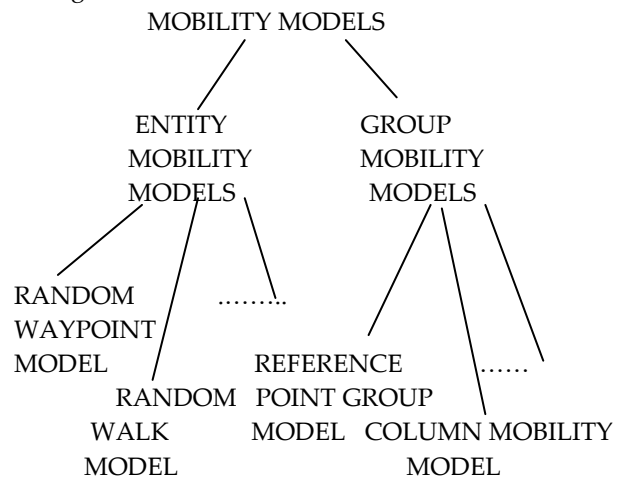
IV.OVERVIEW OF MOBILITY MODELS

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.[9]

Basically mobility models can be categorized into two types Entity mobility models and Group mobility models. 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:



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, $[speedmin; speedmax]$ and $[0;2\pi]$ 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 MN which moves according to this model reaches a simulation boundary, it "bounces" off the simulation

border with an angle determined by the incoming direction.[15]

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].Then the node travels towards the new destination at the selected speed .Upon arrival, the node pauses sometime before starting the process again.[9]

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 .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.[10]

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.The new reference point for a given MN is defined as new-reference point = old-reference point+advance-vector where advance-vector is predefined offset that moves the reference grid.[15]

A lot of research work has been done in analyzing impact of mobility models on the performance of AODV protocol.

V . NETWORK SIMULATOR

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.[16]

NS-2 includes a tool for viewing simulation results called network animator (NAM). It is a Tcl/TK based animation tool for viewing network simulation traces .

VI . CONCLUSION

In this paper we have provided a vast 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 have also analyzed different mobility models used to evaluate performance of AODV. We observe that large number of studies have been done in this field , a better understanding of a routing protocol , network parameter as well as mobility model can enhance the performance of routing protocol.

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