# Simulative Analysis of AODV Routing Protocol Of MANET Using OPNET Modeler 14.0

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**Abstract** - *Mobile Ad-hoc Network (MANET) is considered as a new paradigm of multi-hop wireless network created by group of mobile nodes for wireless communication. Due to dynamic changes in the network topology of MANET it's routing is considered a challenging task. In this paper, the performance of most popular AODV reactive routing protocol is evaluated. This paper describes the whole network strategy with performance metrics which are to be used in the OPNET simulation for the analysis. The performance metrics used are throughput, packet queue size, transmitted packet rate and received packet rate and the simulator tool used is OPNET Modeler 14.0.*

*Key Words: Ad-hoc , MANET, Routing Protocols, AODV, DSR, OPNET Modeler 14.0.*

## 1. INTRODUCTION

An adhoc network is the cooperative engagement of a collection of mobile nodes without the required intervention of any centralized access point or existing infrastructure.

Wireless networks can be classified into infrastructure networks and infrastructure-less networks [2]. Mobile adhoc network (MANET) is a collection of self- reliant mobile routers or nodes which can communicate to each other via some wireless network (or radio links). In MANET, two nodes can communicate directly but if these nodes are beyond the network range then they need some intermediate nodes to deliver the packet to the designated node. As the nodes are mobile so the network topology **changes dynamically and due to this reason MANET can't** be pre-deployed.

Features of MANET:

1. Infrastructureless: no need to setup any infrastructure for their deployment.
2. Rapidly deployed: can be deployed any time and any where easily.
3. Flexible: network can be extended or reduced to anywhere.

4. Distributed: routing traffic can be distributed to underutilized nodes for load balancing.
5. Self-configuring: no need of network administrator to maintain routing tables.

In this paper, the most popular AODV and DSR MANET routing protocols are evaluated on four parameters: throughput, packet queue size, transmitted and received packet rate.

The paper is organized as follows: Section II provides a brief description of reactive routing protocols, section III discusses the simulation tool and performance metrics, section IV describes the simulation experiment , section V provides future work to be done using above metrics and finally section VI gives the acknowledgment.

## 2. BRIEF DESCRIPTION OF REACTIVE ROUTING PROTOCOLS

### A. DSR:

DSR is Dynamic Source Routing Protocol of MANET. It discover the routes when necessary and then maintains them. Source routing is a routing technique in which the sender of a packet has full information of the complete sequence of nodes through which the packet has to pass, **the sender explicitly add this route in the packet's header, identifying each forwarding "hop" by the address of the** next node to which to transmit the packet on its way to the destination host [2]. DSR works in two phases: route **discovery and route mechanism. It doesn't send periodic** beacons for route maintenance. It uses route cache instead of routing tables.

### B. AODV:

AODV is an adhoc on demand distance vector reactive routing protocol and it is the on demand extension of DSDV proactive routing protocol of MANET. Though AODV is a reactive routing protocol but it also uses features of

proactive protocols. AODV adopts the mechanism of route request reply packets from DSR reactive routing protocol and hop by hop counting, sequence numbers and periodic beacons from DSDV proactive routing protocol. AODV also works in two phases: route discovery and route mechanism. It uses routing tables for storing routing information to each node. It uses three types of commands for routing: RREQ, RERR, RREP. RREQ for initializing route discovery, RERR for route repairing and RREP for acknowledging RREQ by destination to  source. It is better in high mobility but consumes more battery due to sending  route maintenance beacons. This also increases the routing overhead.

## 3. SIMULATION TOOL AND PERFORMANCE METRICS

The simulator tool used for the performance analysis of aodv routing protocol is Optimized Network Engineering Tools 14.0. OPNET Modeler enables users to create customized models and to simulate various network scenarios [14]. OPNET is a simulator built on top of Discrete Event System (DES). It is a very powerful software to simulate heterogeneous network with various protocols [6]. Its high level user interface is built of C and C + + source code with huge library of OPNET function.

Table -1: Simulation Parameters

| Performance metrics | Description | Units |
|---|---|---|
| Throughput | Represents the total number of bits forwarded from WLAN layer to higher layers in all WLAN nodes in the network. | Bits per sec |
| Transmitted packet rate | It is the routing traffic(packets) sent in the total simulation duration | Packet per sec |
| Received packet rate | It is the routing traffic(packets) received in the total duration | Packet per sec |
| Packet queue size | Represents the size of packet queue in number of packets at any time during the simulation. | Packets per unit time |

Table-2 Simulation Environment

| Attributes | Value |
|---|---|
| Simulator | OPNET MODELER 14.0 |
| Simulation time | 10 min |
| No. of nodes | 50 |
| Environment size | 200*200m |
| Traffic type | FTP |
| Technology(model family) | Wimax |

## 4. SIMULATION EXPERIMENT

In this practical the nodes are configured to AODV protocol. All nodes in the network are configured to manage FTP traffic. In this simulation environment all the 50 nodes are the wireless_LAN fixed nodes attached with a wireless_LAN server . Profile configuration , application configuration and receiver group configuration(Rx group configuration) are used for passing traffic.

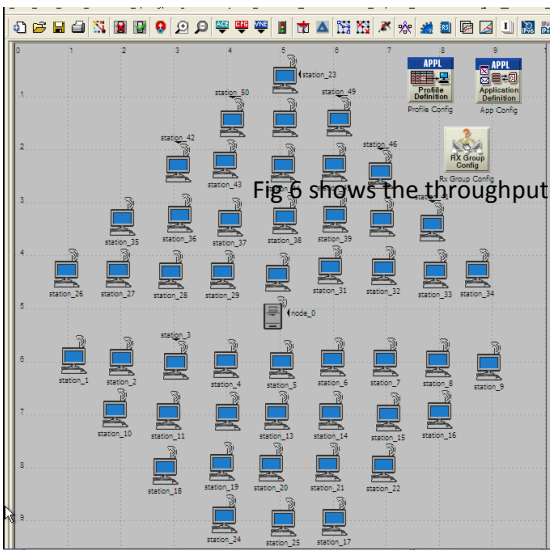Fig-1 shows the scenario of 50 nodes over the network area 200*200 m



Fig -1: Simulation Environment

Fig-2 shows the transmitted packet rate in terms of AODV routing traffic sent in packets/sec in the entire network for 50 nodes.
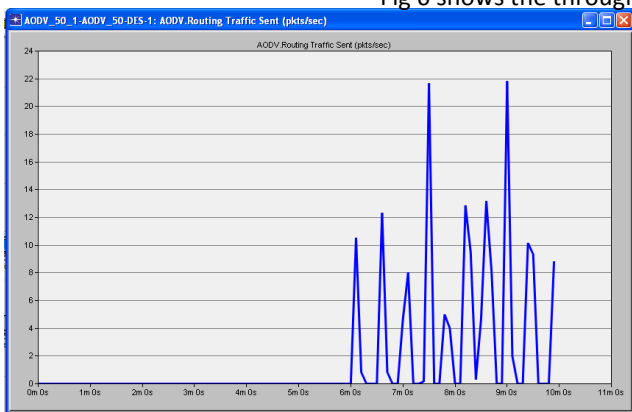


Fig- 2: Transmitted packet rate

Fig-3 shows the received packet rate in terms of AODV routing traffic received in packets/sec in the entire network for 50 nodes.
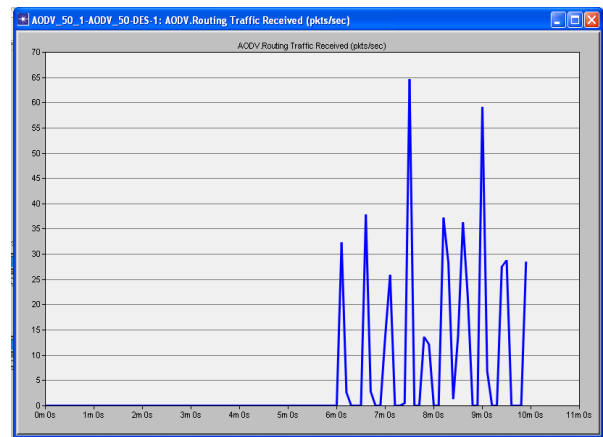


Fig -3: Received Packet Rate

Fig-4 shows the throughput of wireless LAN server used in AODV protocol in bits per sec.
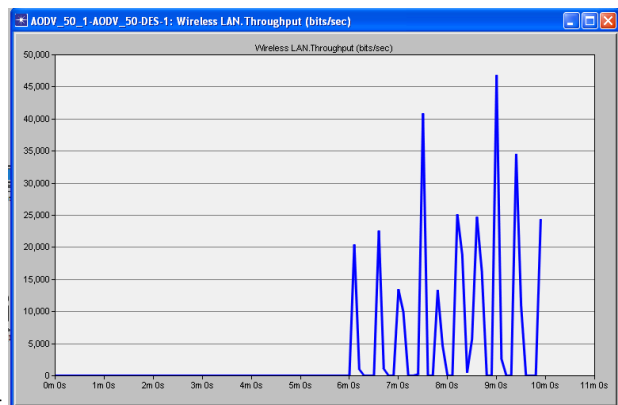


Fig-4: Throughput

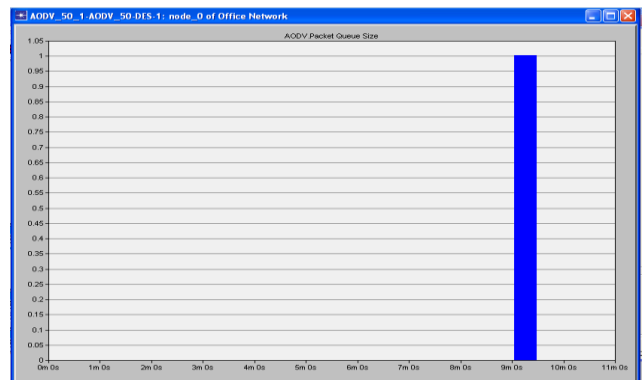Fig-5 shows the packet queue size of AODV routing protocol.



Fig- 5: Packet queue size

## 5. FUTURE WORK

This paper represents the simulation done for AODV reactive routing protocol. In future, the work will be carried on the similar simulation environment for DSR reactive routing protocol of the MANET for its performance analysis and their comparison will be done.

## ACKNOWLEDGMENT

## REFERENCES

[1]  C-K Toh , Ad Hoc Mobile Wireless Networks Protocols and Systems, First Edition, Prentice Hall Inc, USA, 2002.

[2]  Mamoun Hussein Mamoun, Important Characteristic of Differences between DSR and AODV Routing Protocol, MCN 2007 Conference, November 7-10, 2007.

[3]  Nor Surayati Mohamad Usop, Azizol Abdullah,Ahmad Faisal Amri Abidin, Performance Evaluation of AODV, DSDV & DSR Routing Protocol in Grid Environment, IJCSNS International Journal of Computer Science and Network Security, VOL.9 No.7, July 2009.

[4]  Singh Annapurna and Mishra Shailendra, Performance Analysis of Reactive Routing Protocols in Mobile Adhoc Networks, IJCSNS International Journal of Computer Science and Network Security, VOL.10 No.8, August 2010

[5]  Akshai Aggarwal, Savita Gandhi, Nirbhay Chaubey, Performance Analysis Of AODV,DSDV and DSR in MANETS, International Journal of Distributed and Parallel Systems (IJDPS) Vol.2, No.6, November 2011.

[6]  Jagdeep Singh, Dr.Rajiv Mahajan, Performance Analysis Of AODV And OLSR Using OPNET, International Journal of Computer Trends and Technology (IJCTT) – volume 5 number 3 –Nov 2013.

[7]  Yashi Rajvanshi, Seema Rahul, Sanjay Kumar Maurya, Sandip Vijay, Comparative Study Of Different Parameters Of Manet Routing Protocol For Different Buffer Size , Conference On Advances In Communication And Control Systems 2013.

[8]  Nisha Mannan, Shipra Khurana, Mamta Rani, Comparative Analysis Of Reactive Routing Protocols In Mobile Ad-Hoc Networks , International Journal of Computer Science Trends and Technology (IJCST) – Volume 2 Issue 3, May-Jun 2014.

[9]  Sandeep Sandhu, Anirudh Menon, Parikshit Sinha, Nirav Afinwale, Performance and Analysis of Routing Protocols with TCP Traffic in Mobile Ad Hoc Network, (IJCSIT) International Journal of Computer Science and Information Technologies, Vol. 5 (3) , 3145 – 3148, 2014.

[10]  Prachi Mishra, Neelesh Gupta, Performance Evaluation of AODV and DSR Protocols in MANET, International Journal Of Engineering And Computer Science ISSN:2319-7242 Volume 4 Issue 2, , Page No. 10313-10320, February 2015.

[11]  C Krishna Chaitanya Reddy, L Jagadeesh Naik, Performance Evaluation of Energy Efficient Routing Protocols in MANETS, International Journal of Engineering Research and Applications (IJERA) ISSN: 2248-9622 NATIONAL CONFERENCE on Developments, Advances & Trends in Engineering Science ,January 2015.

[12]  Rakesh Kumar Jha, Pooja Kharga, A Comparative Performance Analysis of Routing Protocols in MANET using NS3 Simulator , I.J. Computer Network and Information Security, 4, 62-68,2015.

[13]  Dependra Dhakal, Kiran Gautam, Bishal Pradhan, Ashis Pradhan, Performance Comparision of AODV and DSR Routing Protocols using Real Time Test-Bed , International Journal of Computer Applications (0975 – 8887) Volume 112 – No. 2, February 2015.

[14]  WiMAX tutorial [Online]. Available: http://searchmobilecomputing.techtarget.com/tutori al/ WiMAX-tutorial.