Performance Evaluation of AODV Routing Protocol

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Abstract— **Mobile Ad Hoc Network (MANET) is a combination of multi-hop wireless mobile nodes that communicate with each other without fixed infrastructure. Due to the mobility of nature, the nodes can move freely in multiple directions. For any Mobile Ad Hoc Network, a routing protocol is an essential factor. Creating a correct and efficient route between a source node and a destination node is the main goal of any routing protocol. Several routing protocols exist in MANET. An efficient protocol will make MANETs reliable. In this research we have evaluated Ad-hoc On-demand Distance Vector (AODV) routing protocol. We have used FTP traffic over the network designed. NS2 simulator is used to model and simulate the result. We have examined delay, network load, packet delivery ratio (PDR), route discovery time, packet dropped and throughput of the network as performance metrics.**

Keywords:- MANET, AODV, Delay, PDR, Network Load, Throughput.

I. INTRODUCTION

A collection of wireless mobile nodes is known as Mobile ad hoc network (MANET). MANET is a self-configuring network. A wireless node serves as a router by playing the role of intermediate node. At the same time it can act as sender and receiver. The network topology can change any time. It can forward data packets to its neighbors and also can receive data packets from another node or sender when it is required. It does not depend on any pre-existing network infrastructures. That's why this network is known as Ad hoc. MANET has a lots of advantages than the traditional network. Because traditional network needs wired connection between nodes and they have no dynamic topology. But MANET allows wireless connection based network system. The best advantages of MANET is that it provides dynamic topology. So if a node dynamically changes its network it can readjust with the new network. It does not require any central administration..Fig.1 shows MANET architecture.

The main goal is to design such adaptive routing algorithm, minimizes the processing time for packets to reach desired receiver and prevent the network from congestion.
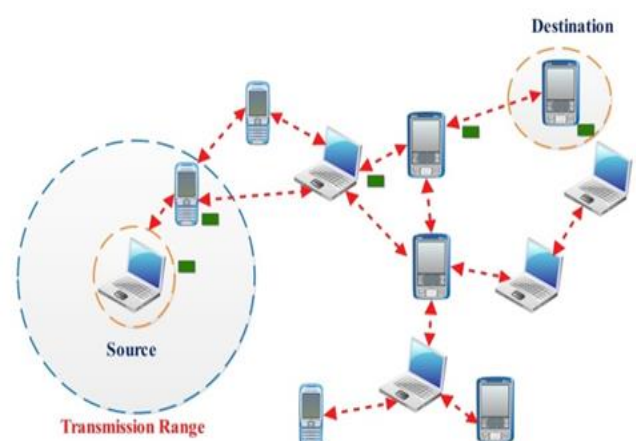

Fig.1. Architecture of a mobile ad hoc network

Performance evaluation of AODV routing protocol has done in this research. We have experimented the performance of AODV by performance parameters of delay, network load, packet delivery ratio, packets dropped, route discovery time and throughput. We have used NS2 as network simulator.

II. AODV ROUTING PROTOCOL

AODV is used to create dynamic multihop routing between source and destinations in an Ad hoc network. It permits sender to find routes quickly. AODV protocols are classified into two categories. If there have no direct path to destination, the route discovery state is started. Route discovery process are done in two steps route request (RREQ) and route reply (RREP).

Advanced Uses of AODV:
• Destination sequence numbers are used. Routes are made on demand
• It provides lower delay for connection setup.
• Unnecessary overhead does not occur here, because the hello message are limited.

Limitations of AODV: The range of the network grows dynamically as long as performance metrics is also change. It is difficult to maintain all the change and performance requirements at any time.

III. METHODOLOGY

We have discussed the performance of AODV routing protocol along with different parameters that are considered as performance metrics to implement the result below.

A. Network setup

We have used NS2 simulator to execute the AODV routing protocol performance with different parameter.. We have created a wireless network with 20 numbers of nodes. We have used TCP as source agent and TCP sink as destination agent. FTP application is created to the nodes. The network scenario generated by NS2 simulator is given below.
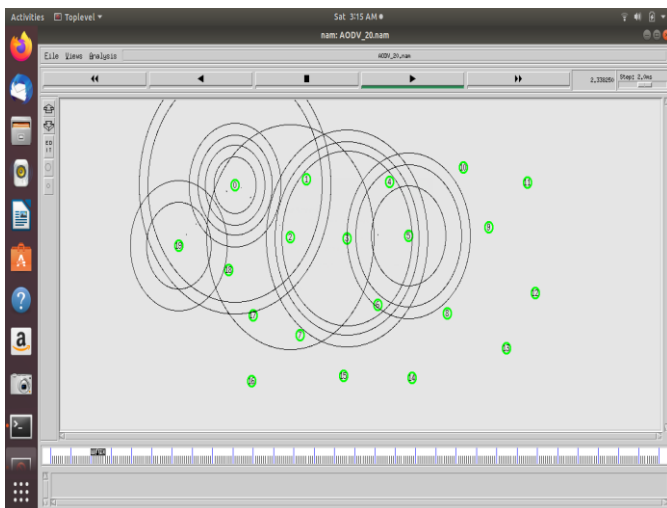

Fig.2. Animation of the network

B. MANET Performance Metrices

We have used the following network performance parameters in our research work.

Delay: It means the total time required for a packet to be transmitted from its source to destination node through the network.

Throughput: Total number of packets transmitted per second through a communication medium or system. It can also be measured as the amount of packets successfully delivered per second taken away source to terminus node in the network.

Network Load: It defines the consumption of link capacity across mobile nodes through the network. That means the number of data traffic transmitting through the link per second.

Packet delivery ratio: It means the ratio between the numbers of packets successfully received by the total number of packets sent by sender.

Route discovery time: The time required to find a path to transmit packets to its specific destination.

Data packet dropped: It means the number of packets fails to reach intended destination.

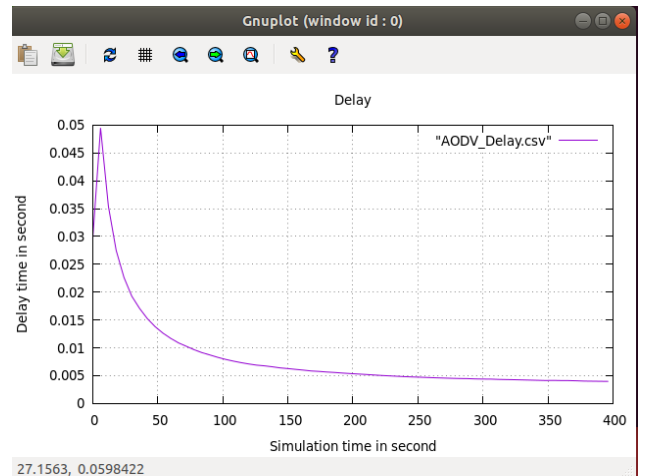## IV. RESULT AND DISCUSSION

A. Delay:

Fig.3. AODV delay

From figurer.3 we have found that initially or at the starting of the network delay is high. It is reduced and goes to a stable state after certain time. At the starting point the network doesn't have established connection to send data through source to its destination. Nodes have to search a route for packet transmission and delay occurs. But when routs are established after some interval it requires less route discovery time which reduced delay.
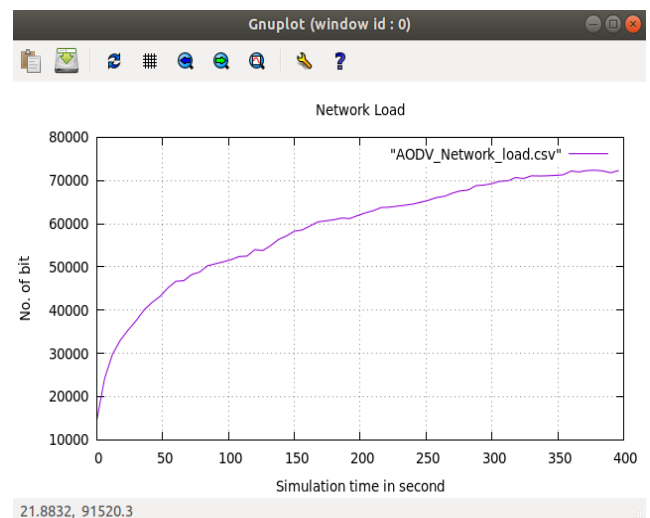
B. Network load:

Fig.4. AODV Network load

From above figure (Fig 4) it is seen that the network load increases with the increasing of simulation time. As the network creates more established route for packet transmission with the increasing of simulation time, more packets are transmitted which increases the network load.

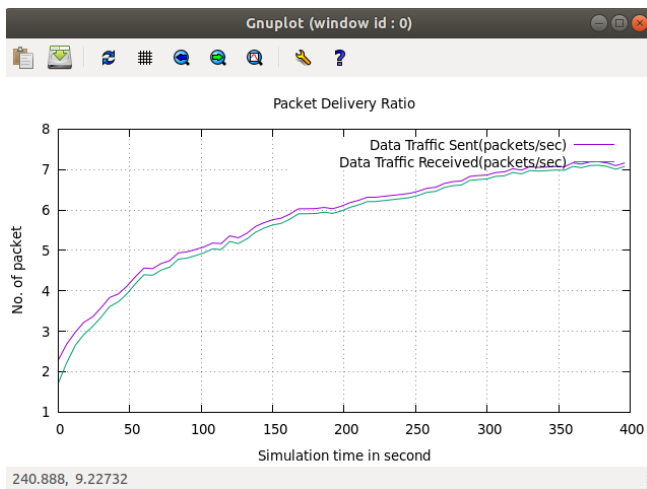## C. Packet Delivery Ratio (PDR):

Fig.5. AODV Packet delivery Ratio

From figure.5 we have found that total 388.463 packets are sent through the network whereas a total of 378.99 packets are received by the network. So PDR of the network is 0.9756.
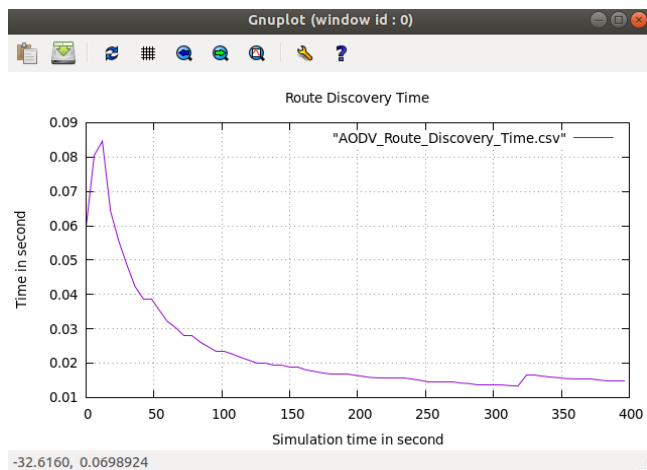
D. Route Discovery Time:

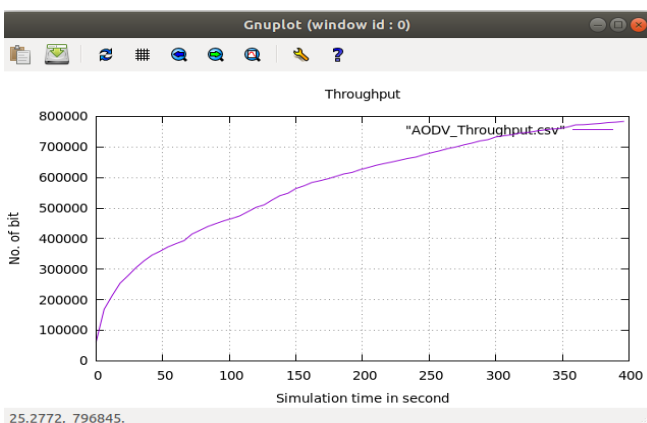Fig.6. AODV Route Discovery Time

E. Throughput:

Fig.7. AODV Throughput

From fig.7 we can say that throughput of the network increases with the increasing of network simulation time. The average throughput of this network is 64766 bits per second.
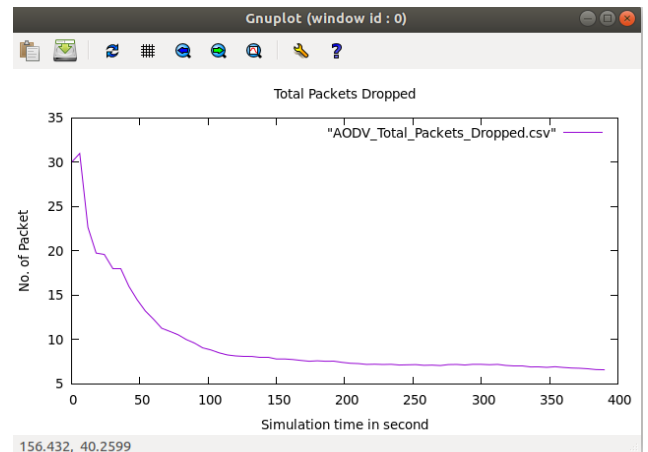
F. Data packets dropped:

Fig.8. AODV packet drop

From fig.8 we have found that there are huge packets drop at the starting of the network due to lack of established route through which packet will be transmitted from sender to receiver. When the network reach to a stable state packet drop reduce.

V. CONCLUSION

In this research we have analyzed the AODV routing protocol performance. We have applied FTP traffic in our design network. We know that data packets are transmitted throughout the network according to routing protocol. That's why it is a challenging work to choose an ideal protocol for the particular network. In future we will be continuing our research work to evaluate the performance of MANET other routing protocols along with Ftp traffic.

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