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AN EXTENSIVE COMPARATIVE STUDY OF MANET ROUTING PROTOCOLS (AODV, DSR, DSDV)

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Abstract- A Mobile Ad-hoc Network (MANET) is having many wireless mobile nodes, among which the communication takes place without any master control. In MANET mobile nodes move arbitrary, it is a self organized, self configurable network without any infrastructure. Then packets are receives and relays as a router in mobile nodes. To make the MANET reliable it is necessary to use an efficient routing protocol and routing is a critical issue basically. From approx last 10 years, many routing protocols have been researched and their performance comparisons are analyzed by many researchers. Most Recent research on MANET The performance differentials analyzed by varying the network size , mobility of nodes independently , varying the number of connecting nodes at a time and varying pause time and using parameters like Throughput, Delay, maximum queue length Delivery Ratio and Packet Loss of different routing protocols. These simulations can be implemented by using the NS-2 network simulator, which is used to run simulations in ad hoc manner.

Keywords—MANET, DSDV, DSR, AODV, PDF.

I. INTRODUCTION

In areas in which there is small or negligible communication infrastructure or we can say the existing infrastructure is very costly or unaffordable or difficult to use, after these problems or bottlenecks also communication for wireless mobile users may be possible through the establishment of an Ad-hoc Network. In this type of a network, every mobile node behaves as a router as well as a host. Every time in this network transmission of packets from one mobile node to other mobile nodes may not be within direct sequence wireless transmission range of each other. Every node takes part in an ad hoc routing protocol which allows it to invent or establish "multi-hop" paths to any other node within the network. Sometimes the idea of ad hoc networking is also known as infrastructure less networking, since the mobile nodes in the network can easily change their positions or they can move freely in the network and they make routing among themselves with in their own network. Some general examples of the most uses of ad hoc networking include, students using laptop computers to take part in an impactful lecture and interactive presentations, entrepreneur sharing information during interactive meeting or live conferences and seminars, on the battlefield soldiers are relaying information related to situation for the awareness to take proper decision and precautions, and after earthquake emergency disaster relief and security coordinating efforts.[1]

AODV the ad-hoc on demand driven vector routing protocol joins mechanism of DSDV and DSR [1]. AODV serves the instant adaption to dynamic link conditions. It serves low processing speed and memory overhead.

In case of AODV utilization of network is low. Within the ad hoc network it determines one to one routes to destinations. All the times it ensures the loop freedom through the destination sequence numbers. It avoids the problems related with classical distance vector protocols. Along with any

route every destination creates the destination sequence number. Information related to destination it sends on demand or only to the requesting nodes. [7]

DSR dynamic source routing protocol generally it is known as reactive protocol. It finds and compares the proper route only when a packet requires being lead or forwarded to next host [8].In this every node can invent dynamically a source or base route to any destination in the network through multiple hops. There are two mechanism of DSR route maintenance and route discovery, generally both are working together to find and maintain the source routes to arbitrary destinations in the network.

DSDV bellman ford algorithm's modified algorithm is known as DSDV algorithm, which provides loop free routes. It is generally named as a distance vector proactive hop by hop routing protocol, requiring every node to broadcast routing updates periodically. Within a network, every node maintains a routing table which contains all possible destinations in that network and also the number of hops to each destination [7].

II. METHODOLOGY

There are mainly three techniques which are analytical modeling, simulation and measurement. In this paper we have chosen simulation for performance evaluation. In analytical modeling more assumptions are required and also it gives fewer details that are why simulation methods are used because it gives more details and requires fewer assumptions. Simulation is also selected because of its accuracy and less time utilization. By using simulation, in order to understand events , researchers can review a system in well-known conditions , in loop manner if necessary or required.[2]

A. Computer network simulator tools:

There are many simulators such as Network Simulator 2 (NS-2), OPNET Modeler, GloMoSim, OMNeT++ and etc.
In this review we select Network Simulation Tool (NS- 2). NS (version 2) is written in OTcl and C++ , developed at UC Barkley. It is basically an object-oriented, discrete event driven network simulator. For simulating local and wide area networks, NS-2 is prior useful. For the first time user it is quite difficult but with the help of manuals it can be easy to use when get to know the simulator. NS-2 is widely used to simulate the behavior of wired and wireless networks. It works on the packet level. It uses OTcl as scripting language. There are lot of documentations written by the developers to give the purpose of simulator as well as information to a new user , that is, how the simulator works, how to establish the network, how to get the information about components of network in simulator codes etc. These documentations are based on examples and also on researcher's experience.
A new user needs to set up the different components in the simulation environment. For e.g. event scheduler objects, libraries of network components and setup module libraries etc. The user writes his simulation as a OTcl script, measures the network components together to the complete simulation [3].

B. Simulation model:

We run the simulation in Network Simulator (NS-2). It accepts input as a scenario file that describes that how each node is moving and how much packet are organized by each node . It also tells the time by which the packet is originated and checks the time of each node when it moves. The detailed trace file created by each run is stored to disk and analyzed by using various scripts especially by file *tr that count how many packets are delivered successfully , the length of the path

taken by the packet as well as the additional information of each scripts executed. This data is further analyzed with AWK file and Microsoft Excel to produce the graphs.[3]
The simulation models are built using the Network Simulator tool (NS-2) version 2.34.

C. Simulation parameters :

Table 1.parameters of simulation

PARAMETERS	Value
Routing protocols	Aodv,dsdv,dsr
No. of nodes	100,150,200,250
No. of connections	25,50,75,100
Simulation time	900sec
Area	1500x500m
Simulation model	Two way ground
Mac type	802.11
Link layer type	LL
Interface type	Queue
Traffic type	TCP
Packet size	512kb
Queue length	50
Pause time	00 sec
mobility	20m/s

III. PERFORMANCE METRICS

In this paper considered packet delivery fraction (PDF) and throughput [4], average end to end delay [5],data packet loss[3].

a) ***Throughput:*** It is basically defines as ratio of the number of packets sent.[5]

$$\text{Average throughput} = \frac{\text{total received size}}{\text{elapsed time between sent and receive}} \quad (1)$$

b) ***Packet delivery ratio:*** The ratio of total number of packets successfully delivered to the destination to the total number of packets sent by the source is generally named as the packet delivery ratio .[5]

$$\text{Pkt delivery ratio} = \frac{\text{no.of packet received successfully}}{\text{no.of packets sent}} \quad (2)$$

c) ***Average end to end delay:*** It is the total time taken by all the packets to reach the destination .[5]

$$\text{Average end to end delay} = \frac{\text{sent time} - \text{receive time}}{\text{Receive time}} \quad (3)$$

d) ***Packet loss:*** Packet loss may occur at both the network layer and the MAC layer. In the thesis, packet loss mainly focuses on network layer. When a packet reaches at the network layer, if the valid path to the destination is there only then the packet is forwarded by the routing protocol. Otherwise, the packet is buffered until a route is available. If buffer is full when the packet needs to be buffered then it drops the packet and there is also an another case in which the packet drops that is when the time that the packet has been buffered exceeds the limit.[3]

$$\text{Packet loss} = \text{data agent sent} - \text{data agent receive} \quad (4)$$

IV. CONCLUSION

In this paper, the comparison of three routing protocols DSDV, AODV and DSR has been studied and the performance of routing protocols is totally based on the values of simulation parameters given in the table 1.

V. FUTURE SCOPE

For future one can make change in the simulation parameters to enhance the performance and Qos of the routing protocols. In the future scope, one can focus on more security issues. Comparison can be in better way if we change the parameters values like changing the number of connections, simulation time etc.

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