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To Analyze & Compare AODV, DSR and DSDV Routing Protocol for MANET.

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***Abstract* - Routing is a critical matter in MANET and hence the focus of this paper along with the performance analysis and comparison of routing protocols. A mobile ad hoc network (MANET) is mostly explained as a network that has many free or autonomous nodes, often collected of mobile devices or other mobile pieces that can arrange themselves in various ways and operate without network administration.In this paper, the performance analysis is carried out on Adhoc On-demand Distance Vector (AODV), Dynamic Source Routing (DSR) and Destination Sequenced Distance Vector (DSDV) protocols using NS2 simulator. The throughput, delay and packet loss are the three common measures used for the comparison of the performance of above protocols.**

***Keywords*:** MANET, AODV, DSR, DSDV

I. INTRODUCTION

Mobile Ad-hoc Network (MANET) is self configuring Network consisting of mobile nodes that are communicating through wireless links. There is a mutual engagement of a collection of mobile nodes without the required involvement of any centralized access point or existing infrastructure. The nodes move randomly; therefore, the network may practice unpredictable topology changes. It means that a formed network can be deformed on the fly due to mobility of nodes. Hence, it is shown that an ad-hoc wireless network is self organizing and adaptive. Due to less infrastructure and self organizing nature of ad-hoc networks, it has many applications in the area of commercial sector for emergency rescue operations and disaster relief efforts. In the field of military Battlefield, MANET also provides a solution to detect movement of enemies as well as for information exchange among military headquarters and so on [1]. Nowadays, it is an inexpensive alternative for data exchange among mutual mobile nodes. Due to the existing of mobility, the routing information will have to be changed to reflect changes in link connectivity. There are many possible paths from source to destination. The routing protocols find a route from source to destination and deliver the packet to right destination. There are many kinds of routing protocols in MANET. The Table-driven (Proactive) and On-demand (Reactive) routing protocols are two major categories of routing protocol [10].The combinations of proactive and reactive routing protocols are called the hybrid routing protocol. Table-driven multicast routing protocols try to maintain consistent up-to-date multicast routing information between multicast group members in the network. These protocols need each node to maintain one or more table(s) to store routing information. To maintain a consistent network view, updates to the routing information tables are driven either by events (but only if a change is recognized) or periodically. Source-Initiated On-Demand multicast routing protocols produce routes only when desired by the source node .When the source node needs multicast routes to a multicast group, it initiates a route discovery process within the network. Multicast routes and group membership are initiated, maintained, and updated on demand. A proper proactive multicast routing approach and a proper reactive multicast routing approach are located at different hierarchical levels.

In order to compare the protocols, selected the representative protocols from category; DSDV from proactive, AODV and DSR from the reactive using NS2 simulator. The performance metrics considered are throughput, delay, and packet loss.

The rest of paper is organized as follows: Section II. presents overview of MANET routing protocols. Section III. defines simulation environment. Section IV. shows simulation results and the discussion related to the results. Section V. shows analysis of results. Finally, conclusion is drawn in section VI.

II.MANET ROUTING PROTOCOLS

The first and second protocol is selected from reactive category namely AODV and DSR whereas the third protocol is selected from proactive namely DSDV.

Adhoc On-demand Distance Vector (AODV)

Ad hoc on demand distance vector (AODV) is pure reactive in nature and it includes the properties of both DSR and DSDV protocols.AODV algorithm is an improvement on DSDV in the sense that it reduces the number of broadcasts. AODV is hop by hop routing methodology, sequence numbers, periodic beacon messages from DSDV protocol. Like DSR, route is calculated on demand but unlike source routing. When a node needs to send a message to destination node, first it will check whether it has a valid path to the destination or not.If it has not valid path to the destination, then it broadcast a route request packet (RREQ) to its neighbors which then forwards the request to their neighbors and so-on, until either it reaches to the intermediate node which has a correct path for the destination node. AODV uses destination sequence numbers to ensure that it includes most current information and all paths are loop free. Once the route request has reached the destination or an intermediate node with a correct path, the destination/intermediate node responds by unicasting a route reply (RREP) message back to the neighbor node from which it first received the RREQ. The path maintenance process in AODV is implemented with the route error (RERR) message. Hello messages are used for periodic local broadcast to keep the local connectivity of the network.

Dynamic Source Routing (DSR)

DSR is a pure on demand routing protocol which is based on the concept of source routing. DSR protocol is collection of two important phases: route discovery and route maintenance. DSR does not hire any periodic routing advertisement packets, link status sensing or neighbor identification packets. Therefore, the routing packet overhead is reduce due of its on-demand nature. Every node maintains a route cache to store currently discovered paths. Whenever a route is needed for a specific destination then that specific node will consult route cache to determine whether it has already a route to the destination or not. If accessible route is not expired then that route will be used otherwise a route discovery process is started by broadcasting the route request packet (RREQ).When any of the nodes collect RREQ packet, the node will verify from their cache or from their neighbors whether it knows a route to the destination. If it does not, the node will add its personal address to the route record of the packet and forwards it to their neighbors. Otherwise; a route reply packet (RREP) is produced that is unicast back to the original source. Due to dynamic nature of the environment,any route can fail anytime. Therefore, the route maintenance process will constantly observer the network and informs the other nodes with the help of route error packets as well as route cache would be updated.

Destination Sequenced Distance Vector (DSDV)

DSDV is a hop-by-hop distance vector routing protocol involving each node to periodically broadcast routing updates based on the purpose of classical Bellman-Ford Routing algorithm. Each node maintains a routing table recording the "next hop" for each reachable destination, number of hops to reach destination and the sequence number allocated by destination node. The sequence number is used to distinguish stale routes from new ones and thus avoid loop formation. The stations periodically transmit their routing tables to their instant neighbors. A station also transmits its routing table if a important change has occurred in its table from the last update sent. So, the update is both time-driven and event-driven. The routing table improves can be sent in two ways: a "full dump" or an "incremental" update.

III. SIMULATION ENVIRONMENT

This section explained how to design and implement the comparison between the AODV, DSR and DSDV routing protocol using the throughput, delay and packet loss performance metrics with the help of NS2 simulator.

In simulation, first generate scenario file considering the area of 800mx800m. The Tcl code has been written to set up the network components which includes the parameters described in Table 1. For traffic model, cbrgen utility has been used which create CBR traffic source at a rate of 1 packet at 0.05 sec. connections between nodes. The Tcl file provides different trace files according to different MANETs routing protocols. In order to check the behavior of different protocols, the trace files have been parsed with the help of programs to extract the information needed to compute the performance metrics. After gaining the values of different performance metrics according to different routing protocols, XGraph utility is used to plot the graphs. Network Animator **(**NAM**)** is used to graphically see the simulation. The simulation parameters considered for the performance comparison of routing protocols are given below:

Parameters	**Values**
Network area	800*800 meter
No. of nodes	23
Simulation time	6.5 sec
Simulation kernel	Based on kernel type preference
Data rate(bps)	1 packet at 0.05 sec
Routing protocol	AODV,DSR,DSDV
Transmit power	2.4 GHZ
Parameters	Delay, Throughput & packet loss
Application traffic	CBR

Table 1. Simulation Parameters

The performance of the simulation is examined according to different performance metrics [7]. This quantative measurement is useful for obtaining the performance of network using different routing protocols. The following performance metrics are involved in this study:

(i)Throughput: It is the determine of how fast a node can actually sent the data across a network. So throughput is the average rate of successful message delivery over a communication channel.

(ii)Delay: It is amount of time taken by a packet to go from source to destination. This contains all possible delays generated by buffering during route discovery latency, queuing at the interface queue, retransmission delays at the MAC and propagation and transfer times.

(iii)Packet loss: It is the number of packets lost by routers at the network layer due to the ability of buffer or the packet buffering time exceeds the time limit.

IV. SIMULATION RESULTS

The main target of this paper is to evaluate the performance and behavior of each routing protocol with respect to the number of nodes using traffic application constant bit rate (CBR).

Software used for the performance analysis of taken protocol is based on NS-2. NS Simulator based on two languages: anobject oriented simulator, written in C++, and OTcl (an object oriented extension of Tcl) interpreter, use to execute users command scripts. NS2 is an object oriented simulator, written in C++, with an OTcl interpreter as a frontend. This means that most of the simulation scripts are created in Tcl (Tool Command

Language). If the components have to be developed for ns2, then both tcl and C++ have to be used. The results are based on evaluation metrics of delay, throughput and packet loss with NS2 simulator.

A. Delay

The Fig.1 (a), x-axis shows the time (minute/second) and y-axis shows the delay (sec).The value for AODV, DSR & DSDV is shown in graph using 23 nodes. In this case, AODV protocol performs better than DSR & DSDV protocols.

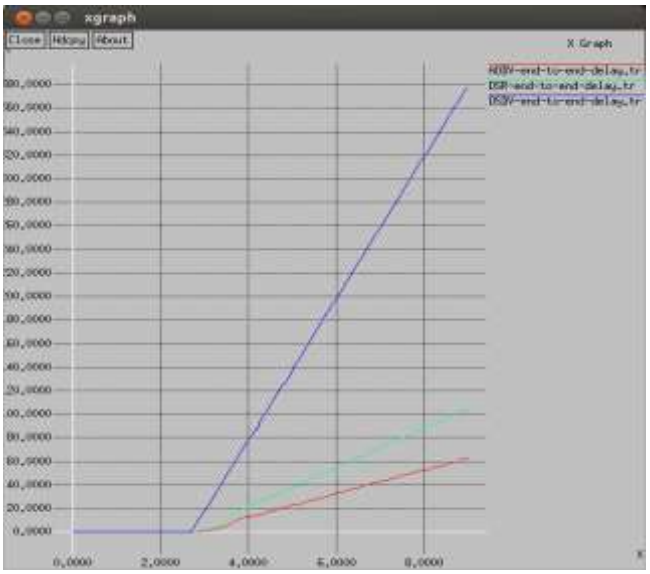

Fig 1(a): Comparison of AODV, DSR&DSDV protocol for delay using 23 nodes

B. Throughput

The Fig.2 (a), x-axis shows the time (minute/second) and y-axis shows the throughput (bits/second).The value for AODV, DSR & DSDV is shown in graph using 23 nodes. In this case AODV perform better than DSR &DSDV protocol.

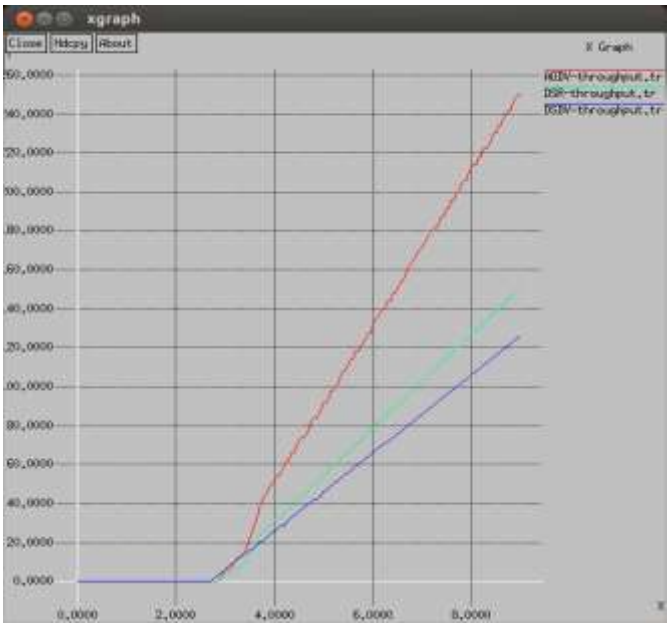

Fig 2(a): Comparison of protocol AODV,DSR&DSDV for throughput using 23 nodes

C. Packet Loss

The Fig.3 (a), x-axis shows the time (minute/second) and y-axis shows the packet loss (bits/sec).The value for AODV, DSR &DSDV is shown in graph using 23nodes. In this case AODV perform better than DSR &DSDV protocol.

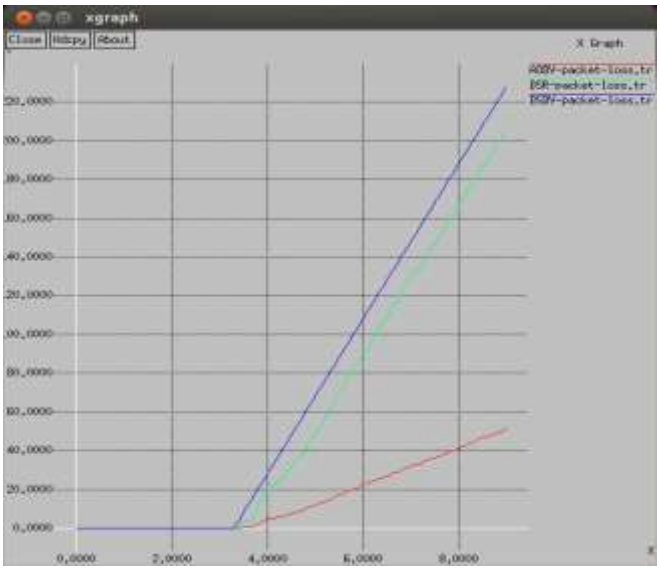

Fig 3(a): Comparison of AODV, DSR&DSDVprotocol for packet loss using 23 nodes

V. RESULT ANALYSIS

The result analysis of AODV,DSR and DSDV protocols is shown in this section with the help of the simulation outputs with respect to the three performance metrics. The aim of this comparative study of AODV,DSR and DSDV routing protocols is to analyze the presentation of protocols. AODV in our simulation experiments present the overall best performance. The result shown in table below.

Parameter	AODV	DSR	DSDV
Delay	60 packets	120 packets	180 packets
Throughput	250 packets	150 packets	120 packets
Packet loss	45 packets	180 packets	220 packets

Table 2.Results for 23 nodes

VI. CONCLUSION

The simulation study helps to understand the behavior of AODV, DSR and DSDV routing protocols setup over NS2 simulator using application traffic CBR analyzing their actions with respect to the parameters of quality of services. Analysis of

routing protocols using NS2 simulator shows that in 23 mobile nodes the AODV perform well than DSR &DSDV in delay, throughput and packet loss. So the overall analysis shows AODV best protocol in all results than DSR&DSDV in MANET.

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