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Effect of FTP and FTP Generic Traffic Generator on the Performance of MANET Routing Protocols

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Abstract: A Mobile Ad-Hoc Network (MANET) is a collection of wireless mobile nodes that communicates with each other without using any existing infrastructure, access point or centralized administration. In this paper, an attempt has been made to evaluate the performance of two well known routing protocols AODV, DSR with two traffic Generators FTP and FTP/GENERIC by using two performance metrics such as packet delivery ratio, average throughput. The Performance evaluation has been done by using simulation tool GloMoSim (Global Mobile information systems Simulation) which is the main simulator.

Keywords: MANET, AODV, DSR, FTP, FTP/GENERIC, GloMoSim.

I. Introduction

Wireless Network refers to any type of computer network that is not connected by cables of any kind. Wireless network is a growing new technology that will allow users to access services and information electronically, irrespective of their geographic position. Wireless Networks can be mainly classified in two types: Infrastructure Network and Ad hoc (Infrastructure less) Networks. Infrastructure network consist of wired and fixed gateways. A mobile host communicates with a bridge in the network (called base station) within its Communicate radius. While it is communicating, the mobile unit can move geographically. When it goes out of Range of one base station, it connects with new base station and start communicating through it. This is called handoff [1]. In this approach the base station are fixed. Infrastructure less (ad hoc) networks are collection of wireless mobile hosts forming a temporary network without the aid of any centralized administration or stand-alone infrastructure. Ad-hoc network are basically peer-to- peer self organizing and self configuring multi-hop mobile wireless network where the structure of the network changes dynamically [1].

II. Mobile Ad-Hoc Network (Manet)

A Mobile Ad-hoc Network (MANET) is a self-configurable, Infrastructure less, autonomous and self-healing system of nodes using wireless links [2]. Each device in a MANET is free to move independently in any direction, and will therefore change its links to other devices frequently. Mobile Ad hoc Networks (MANETs) is a collection of wireless nodes which are connected without any infrastructure or any centralized control. In MANET each node can be used as either as endpoint or as a router to forward packet to next node [3].

Fig. 1 Ad-Hoc Wireless Networks

Figure 1 shows a simple Mobile Ad-hoc Network with eight nodes, which are connected to each other by wireless links. These nodes will find route to other nodes by request / response packets and maintain these routes according to topology

changes. MANET nodes are laptop, personal computer, personal digital assistants, mobile phones MP3 Players and these can be located in airplanes, trains, ships, cars offices and homes [2].

III. Routing In Manet

Routing can be defined as the process of information exchange from one node to the other node in a network. . A routing protocol is needed because it has to pass several hops (multi-hop) to ensure that a packet reaches the destination [10]. Routing protocols for mobile ad-hoc networks can be classified into three major categorizes, based on the routing information update mechanism Shown in Figure 2. They are: Table Driven routing Protocols (Proactive), On Demand routing Protocols (Reactive) and Hybrid routing protocols [10].

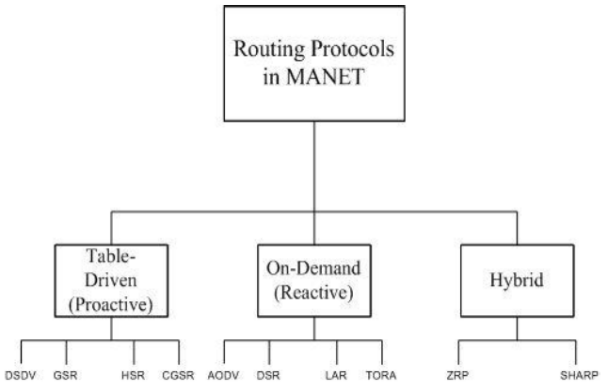

Fig. 2 MANET Routing Protocols

A. Proactive Routing Protocol: A proactive routing protocol is also called "table-driven" routing protocol. Using a proactive routing protocol, nodes in a mobile ad hoc network continuously evaluate routes to all reachable nodes an)d attempt to maintain consistent, up-to-date routing information. Destination Sequenced Distance Vector Routing (DSDV), Global State Routing (GSR), Hierarchical State Routing (HSR) and Cluster head Gateway Switch Routing (CGSR) are example of proactive routing protocol [4].

B. Reactive Routing Protocols: Reactive routing protocols for mobile ad hoc networks are also called "on demand" routing protocols. In a reactive routing protocol, routing paths are searched only when needed. When a source node requires a route to a destination, it initiates a route discovery process within the network. Examples of Proactive Routing Protocols are Dynamic Source Routing (DSR), Ad hoc On-demand Distance Vector routing (AODV), TORA and LAR [4].

C. Hybrid Routing Protocol: Hybrid routing protocols try to maximize the benefit of proactive routing and reactive routing by utilizing proactive routing in small networks (in order to reduce delay), and reactive routing in large-scale networks (in order to reduce control overhead) [10].

IV. Ad Hoc On-Demand Distance Vector (Aodv)

AODV is an on-demand routing protocol used in ad hoc networks. This algorithm, like any other on-demand routing protocol, facilitates a smooth adaptation to changes in the link conditions. In the case a link fails, notifications are sent only to the affected nodes. This information enables the affected nodes invalidate all the routes through the failed link. It has low memory overhead, builds unicast routes from source to the destination and network utilization is minimal. It uses Destination Sequence Numbers (DSN) to avoid counting to infinity. This is one of the distinguishing features of this algorithm [7].

V. Dynamic Source Routing

DSR is a reactive routing protocol for ad hoc wireless networks. It also has on-demand characteristics like AODV but it's not table-driven. It is based on source routing. The node wishing to send a packet specifies the route for that packet. The whole path information for the packet traversing the network from its source to the destination is set in the packet by the sender. This type of routing is different from table-driven and link-state routing by the way routing decisions are made. In source routing, routing decisions are made by the source node. The source node collects the addresses of all the intermediate nodes between itself and the intended destination when discovering routes. During the process of route discovery the path information collected by the source node is cached by all the nodes involved in this process. The intermediate nodes use this information to relay packets. The information in the packet traversing the network includes the IP addresses of all the nodes it will use to reach its destination. DSR uses a flow id to facilitate hop-by-hop forwarding of packets [6].

VI. Simulation Environment And Performance Evolution Setup

A. Simulation Model: Simulation is a fundamental tool in the development of MANET protocols, because the difficulty to deploy and debug them in real networks. The simulation software used the GloMoSim (Global Mobile information systems Simulation). Global Mobile Information System Simulator is a popular network simulation tool, which is

frequently used in the study of the behavior of large-scale hybrid networks that include wireless, wired, and satellite based communications are becoming common in both in military and commercial situations.

B. **Simulation Parameter:** The parameters used for carrying out simulation are summarized in the Table 1.

Table 1 Simulation Parameter

Parameter	Value
Simulation Time(sec)	800
Area	2000*2000
MAC Protocol	802.11
Routing Protocol	AODV,DSR
Mobility Model	Random Way Point
Propagation Model	2-Ray Ground
Nodes Density	25,50,75,100,125,150,175,200
Traffic Source	FTP,FTP Generic
Seed[st.pt]	20
Transmission Range	300m
Node Placement	Random

C. ***Mobility Model:*** The mobility model plays a very important role in determining the protocol performance in mobile Ad Hoc Network. To evaluate the performance of protocol in MANET, the protocol should be tested under realistic conditions such as – transmission range, data traffic, movement of mobile users (nodes) etc. There have been a wide variety of mobility models (MM) proposed and it is expected the MM should attempt to mimic the movement of real mobile nodes, the changes in speed and direction must occur in reasonable time slots [6].

1) Random Waypoint Mobility Model: We used the Random Waypoint Mobility Model for our examinations, which is by far the most often used model. It was first used by Johnson and Maltz in the evaluation of Dynamic Source Routing , and was later refined by the same research group .In this model, a mobile node moves from its current location to a randomly chosen new location**.** Within the simulation area, using a random speed uniformly distributed between [vmin, vmax]. vmin refers to the minimum speed of the simulation, vmax to the maximum speed[5].

D. Performance Metrics: Different performance metrics are used in the evaluation of routing protocols. They represent different characteristics of the overall network performance. In this report, we evaluate two metrics used in our comparisons to study their effect on the overall network performance. There are two main factors over which the performance of the AODV and DSR will be analyzed that are Packet Delivery Ratio and Throughput.

1) Packet Delivery Ratio (PDR): Packet Delivery Ratio (PDR) is the ratio between the number of packets transmitted by a traffic source and the number of packets received by a traffic sink. It measures the loss rate as seen by transport protocols and as such, it characterizes both the correctness and efficiency of ad hoc routing protocols [10]. It represents the maximum throughput that the network can achieve. A high packet delivery ratio is desired in a network.

PDR= Total Number of packets Sent / Total Number of packets Received

2) Average Throughput: Average Throughput is the ratio of number of packets sent and total number of packets. It describes the average rate of successful message delivery over a communication channel. Throughput measures the efficiency of the system. It is a good channel capacity of network connections and rated in terms of bits per second (bit/s).

Average Throughput = packets received/ the amount of forwarded packets over certain time interval.

V. Results And Discussion

Here we present a comparative analysis of the performance metrics of both the on-demand routing protocols AODV and DSR with both FTP and FTP Generic traffic sources for different node density (25, 50, and 75,100,125,150,175,200).

A. Results for FTP Traffic Generators:

1) PDR with Varying Node Density**:** The performance of the routing protocols in terms of packet delivery ratio is examined with respect to Node Density. The simulation results are shown in the Table 2.

Table 2. PDR with Varying Node Density

Node Density	AODV	DSR
25	0.994530	0.997351
50	0.995053	0.996315
75	0.997083	0.993228
100	0.995801	0.994521
125	0.995107	0.988347
150	0.997772	0.946871
175	0.997735	0.901269
200	0.994996	0.897289

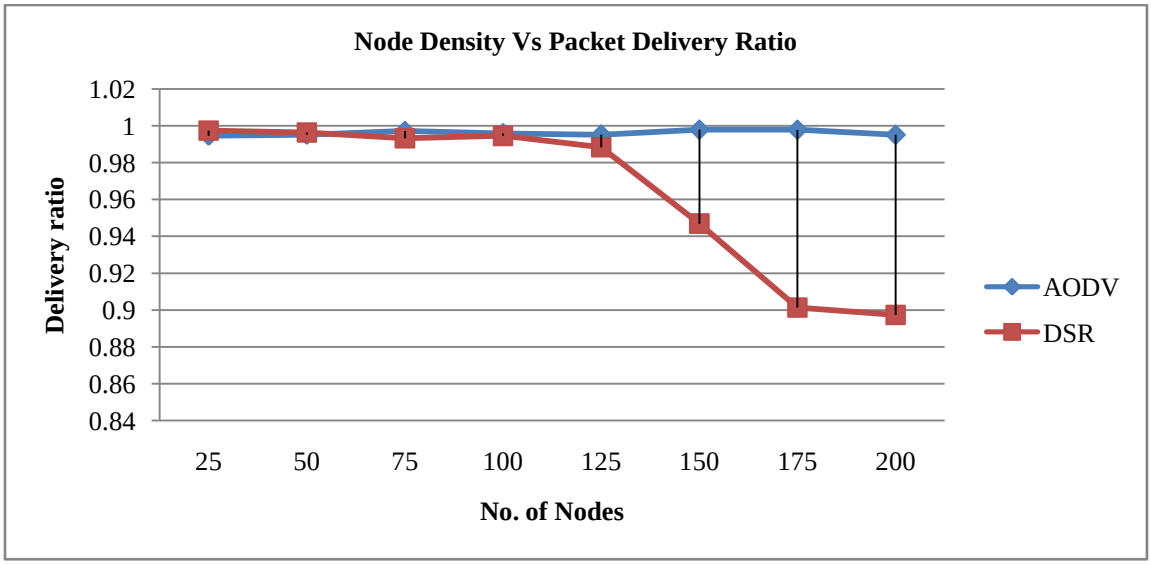

Fig. 3 PDR with Varying Node Density

AODV gives constant delivery ratio when node density is increased while DSR is same up to 125 Node Density but when the Nodes density is increased and then there is decrease in DSR Delivery Ratio .shown in figure 3.

2) Average Throughput with Varying Node Density: The performance of the routing protocols in terms of Average Throughput is examined with respect to Node Density. The simulation results are shown in the Table 4.

Table 4 Average Throughput with Varying Node Density

Density Node	AODV	DSR
25	73311.2	43249.5
50	49106.5	47498
75	38224.6	10524
100	41661.5	67574.3
125	29122.5	13511.3
150	78500.9	8137.6
175	102618	28922
200	44628.9	18604.8

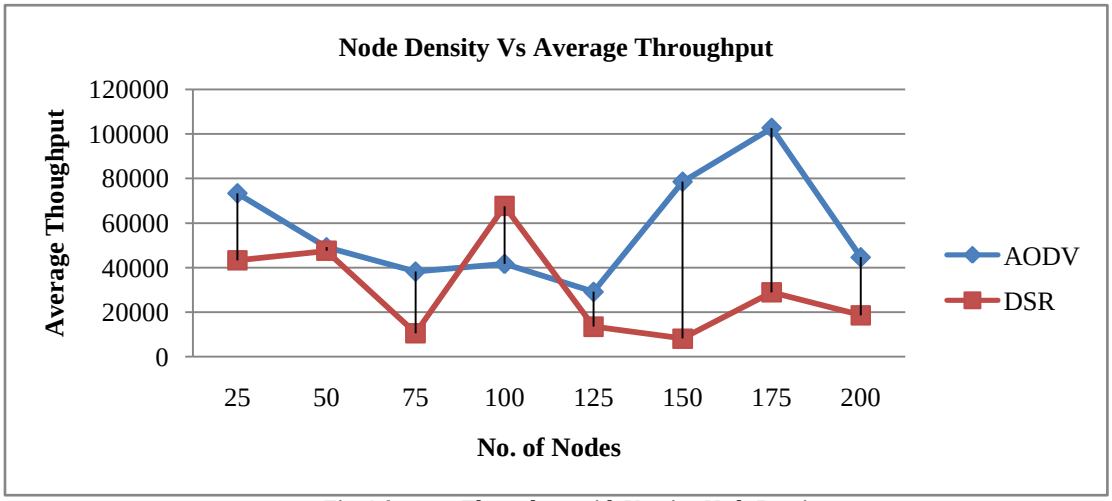

Fig. 4 Average Throughput with Varying Node Density

Shown in Figure 4 There are random changes in Average Throughput in AODV and DSR but when node density is 125 then Throughput increases heavily changes in both AODV and DSR as AODV increases the Throughput but at other side DSR decreases the Throughput.

B. Results for FTP/Generic Traffic Generators

***1) PDR with Varying Node Density*:**The performance of the routing protocols in terms of packet delivery ratio is examined with respect to Node Density. The simulation results are shown in the Table 5.

Table 5 PDR with Varying Node Density

Node Density	AODV	DSR
25	0.992275	0.993036
50	0.993465	0.994481
75	0.995180	0.991682
100	0.996827	0.989900
125	0.996344	0.758904
150	0.996916	0.985299
175	0.997928	0.882220
200	0.998185	0.974616

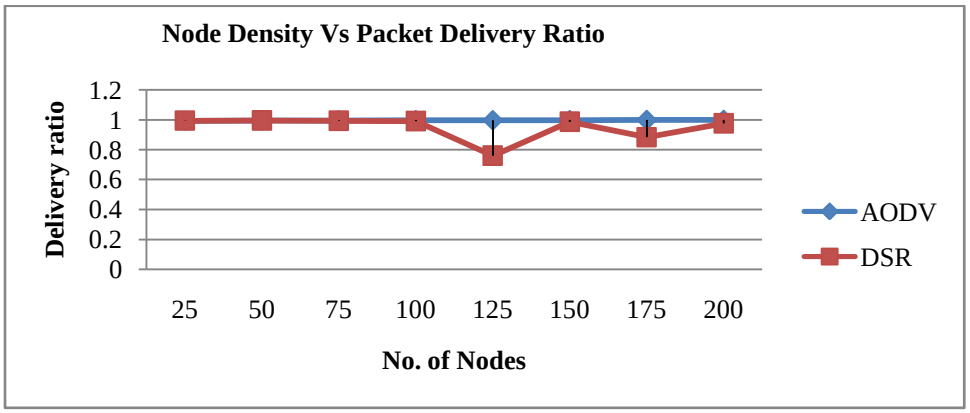

Fig. 5 PDR with Varying Node Density

Both AODV and DSR delivery ratio is closed with respect to node density but at the node density 125 and 175 the delivery ratio is decrease in the DSR .Both AODV and DSR give better performance according to the node density shown in figure 5.

2) Average Throughput with Varying Node Density: The performance of the routing protocols in terms of Average Throughput is examined with respect to Node Density. The simulation results are shown in the Table 6.

Table 6 Average Throughput with Varying Node Density

No. of Node	AODV	DSR
25	19180.8	25212.2
50	24774	57725
75	28614	15715
100	42558.6	15136.2
125	41988.5	710.5
150	41504.2	9699
175	64924.3	999
200	60508.1	7522.75

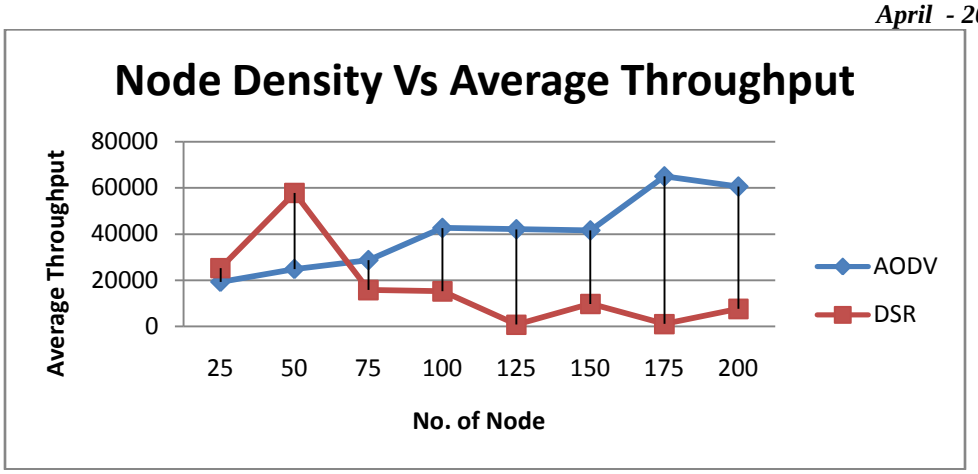

Fig. 6 Average Throughput with Varying Node Density

Shown in Figure 6 there are random changes in average throughput in AODV and DSR.AODV has low average throughput as well as node density is increased but on the other hand DSR has changes the average throughput at every node density.

VI. Conclusion

Here AODV, DSR routing protocols are studied .The performance evaluation parameter for these protocols are PDR and Throughput.

A. ***Conclusion for FTP Traffic:*** Various numbers of nodes, it is observed that Packet Delivery Ratio of AODV is very high and it's constant up to end of simulation. DSR perform good at starting but its performance goes down after no. of nodes 125. Average Throughput of AODV is better than DSR.

B. Conclusion for FTP/Generic**:** Various numbers of nodes, it is observed that Packet Delivery Ratio of AODV is very high and it's constant up to end of simulation. PDR of AODV is approximately 100 %. DSR perform good at starting but its performance goes down and up after no. of nodes 125. Average Throughput of DSR is little better than AODV.

So, conclusion is that if the MANET has to be setup for a large network and high node speed then AODV should be prefer due to high Packet Delivery Ratio and high Throughput with FTP Generic traffic pattern.

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