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Performance Analysis of Reactive & Proactive Routing Protocols for Mobile ADHOC Network

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Abstract -In Mobile Ad Hoc networks (MANETs) the mobility of nodes results in frequent changes of network topology making routing in MANETs a challenging task. Some studies have been reported in the literature to evaluate the performance of the proposed routing algorithms. This paper evaluates the review of the performance of AODV and DSDV routing protocols in MANETs under CBR traffic with different network conditions. Review of these protocols show that in different conditions different protocols behave differently. Both of these protocols have been reviewed under different conditions.

***Keywords:** MANET, ns2, tcp, wireless, AODV, DSDV, DSR, OLSR*

I. Introduction

The mobile ad hoc network (MANET) allows a more flexible communication model than traditional wire line networks since the user is not limited to a fixed physical location [1]. It is a new special network that does not have any fixed wired communication infrastructure or other network equipments. With no pre-existing fixed infrastructure, MANETs are gaining increasing popularity because of their ease of deployment and usability anytime and anywhere. So they are viewed as suitable systems which can support some specific applications as virtual classrooms, military communications, emergency search and rescue operations, data acquisition in hostile environments, communications set up in exhibitions, conferences and meetings, in battle field among soldiers to coordinate defense or attack, at airport terminals for workers to share files etc.

Mobile Ad hoc Networks (MANETs) are future wireless networks consisting entirely of mobile nodes that communicate in the absence of any centralized support. Nodes in these networks will both generate user and application traffic and carry out network control and routing duties. Routing protocols in ad hoc networks has received wide interest in the past years due to the fact that existing internet routing protocols were designed to support fixed infrastructure and their properties are unsuitable for mobile ad hoc networks. The up to date standardized protocols are classified into reactive and proactive protocols. Reactive protocols, such as AODV [1] and DSR [2], find the route only when there is data to be transmitted and as a result, generate low control traffic and routing overhead. Proactive protocols like OLSR [3] and DSDV [6], on the other hand, find paths in advance for all source and destination pairs and periodically exchange Topology information to maintain them.

II. MOBILE ADHOC NETWORK

Due to the highly dynamic nature of mobile nodes and the absence of a central controller, traditional routing protocols used for a wired network cannot be applied directly to a MANET. Some of the considerations required in the design of MANET routing protocols include the mobility of nodes, unstable channel states and resource constraints such as power and bandwidth. In a MANET, the movement of nodes will cause communication between nodes to be disrupted from frequent path breaks and reconnections. Also, the broadcasting of radio channels can be highly unstable and the network layer has to interact with the MAC layer for available channels. In addition, power availability is often limited since the nodes are connected to batteries.There are many routing protocols as given in the Figure 1.

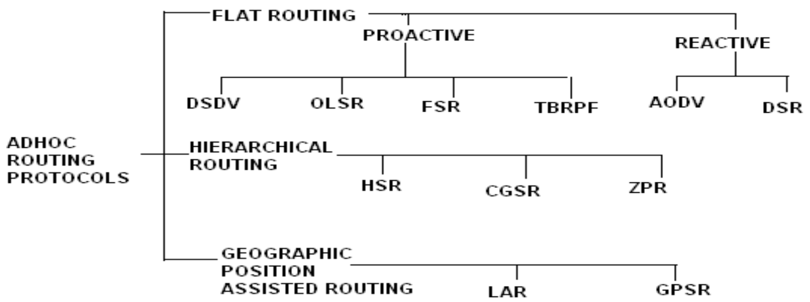

Figure 1: Routing Protocol

2.1 AODV

The Ad hoc On Demand Distance Vector (AODV) routing algorithm [1] is a routing protocol designed for adhoc mobile networks. AODV is capable of both unicast and multicast routing. It is an on demand algorithm, means that it builds routes between nodes only as desired by source nodes. It maintains these routes as long as they are used by the sources. When a source node desires a route to a destination for which it does not already have a route, it broadcasts a route request (RREQ) packet across the network. Nodes receiving this packet update their information for the source node and set up backwards pointers to the source node in the route tables. In addition to the source node's IP address, current sequence number, and broadcast ID, the RREQ also contains the most recent sequence number for the destination of which the source node is aware.

2.2 DSR

DSR [2] adopts a similar on-demand approach as AODV regarding the route discovery and maintenance processes. A key difference of DSR from AODV and other on demand protocols is the use of source routing, where the source node specifies the complete sequence of intermediate nodes for each data packet to reach its destination. The source-route information is carried by the header of the data packet. The advantage of source routing is that no additional mechanism is needed to detect routing loops. The obvious disadvantage is that data packets must carry source routes. The data structure DSR uses to store routing information is route cache, with each cache entry storing one specific route from the source to a destination. DSR makes very aggressive use of the source routing information.

2.3 DSDV

DSDV [6] is an enhancement to distance vector routing for ad-hoc networks. A sequence number is used to tag each route. A route with higher sequence number is more favorable than a route with lower sequence number. However, if two routes have the same sequence number, the route with fewer hops is more favorable. In case of route failure, its hop number is set to infinity and its sequence number is increased to an odd number where even numbers are reserved only to connected paths.

2.4 OLSR

Optimized Link State Protocol (OLSR) [3] is a proactive routing protocol, all nodes have route table that contains routing information of every node in the network. Thus the routes are always immediately available when needed. OLSR is an optimization version of a pure link state protocol. Hence the topological changes cause the flooding of the topological information to all available nodes in the network. OLSR protocol uses Multipoint Relays (MPR) to reduce the possible overhead in the network. The Fig. 3, illustrates the MPR utilization in packet transmission.

III. IMPLEMANTATION

Ad hoc wireless networks are decentralized in nature and hence routing is a central challenge in this type of network. Many routing protocols for ad hoc networks have been proposed to date. Among them, some are proactive, some are reactive and others are hybrid routing protocols. Many different ways are used by many peoples to show the difference between the performances of theses routing protocols. By simulation results

1. PERFORMANCE BASED WORK

A mobile ad hoc network (MANET) is a network consisting of a set of wireless mobile nodes that communicate with each other without centralized control or established infrastructure. The mobility model should represent the realistic behavior of each mobile node in the MANET. Routing protocols for ad hoc networks are typically evaluated using simulation.

2. SIMULATION AND RESULTS

(a) Simulation Environment: In our scenario we take 30 nodes .The simulation is done using NS-2, to analyze the performance of the network by varying the nodes mobility. The protocols parameters used to evaluate the performance are given below:

i) Total No. of Drop Packets: It is the difference between sending and received packets.
ii) Throughput: Throughput is the average rate of successful message delivery over a communication channel.
iii) End to end Delay: It can be defined as the time a packet takes to travel from source to destination.

(b) Simulation Parameters:

Table 1:
Simulation Parameters Considered

Parameters	**Values**
Simulator	NS-2.35
Mobility Model	Random Way Point
Antenna type	Omini Directional
Area of Map	500X500
PHY/MAC	IEEE 802.11
Routing Protocol	AODV,DSDV,DSR,OLSR

Network Traffic	TCP
Simulation Time	100sec
Antenna type	Omini

3.1 Simulation results of AODV

(a) Sent, received and dropped Packet: The graph shows the Simulation result between no. of sent, received and dropped packets with the simulation time in seconds.

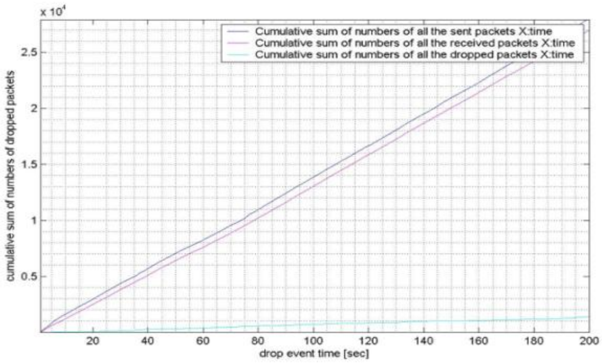

Fig.1 Simulation of sent, received and dropped packet in AODV

(b) End to end delay: The graph shows the Simulation result between end to end delays with respect to packet sent time at source node

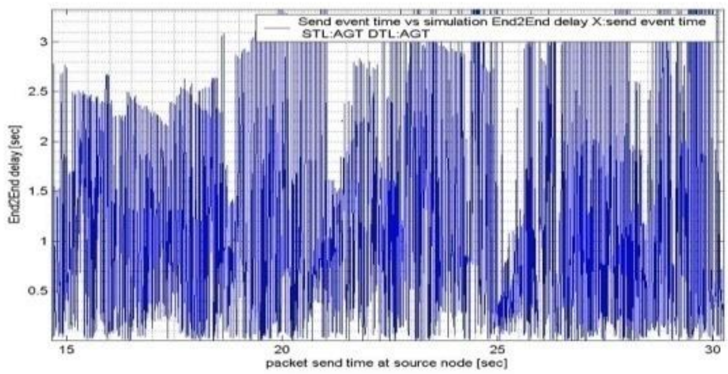

Fig .2 Simulation of End to End delay in AODV

3.2 Throughput

(a) Sending packets: The graph shows the Simulation result between of throughput of sending packets with respect to simulation time in seconds.

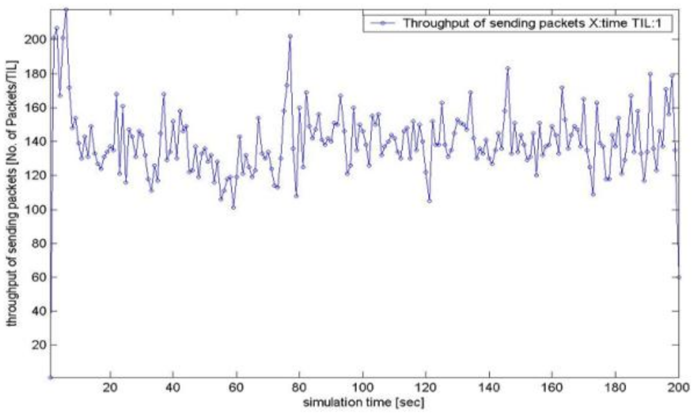

Fig .3 Throughput of Sent packets in AODV *(b) Receiving packets:* The graph shows the Simulation result between of throughput of receiving packets with respect to simulation time in seconds.

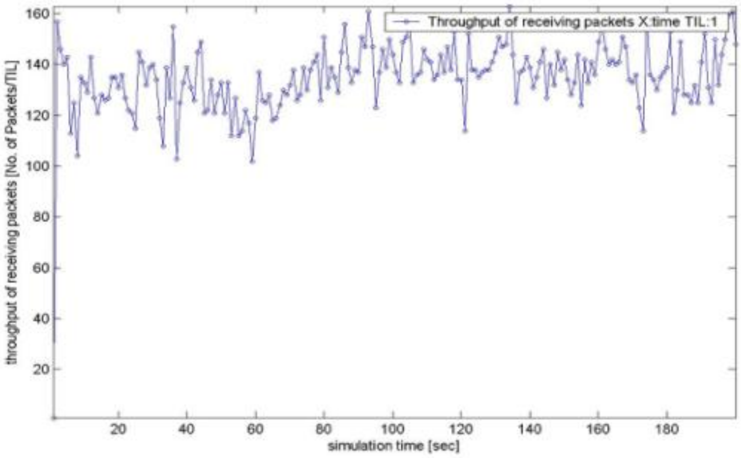

Fig .4 Throughput of Received packets in AODV

4.1 Simulation result of DSDV

(a) Sent, received and dropped Packet: The graph shows the Simulation result between no. of sent, received and dropped packets with the simulation time in seconds.

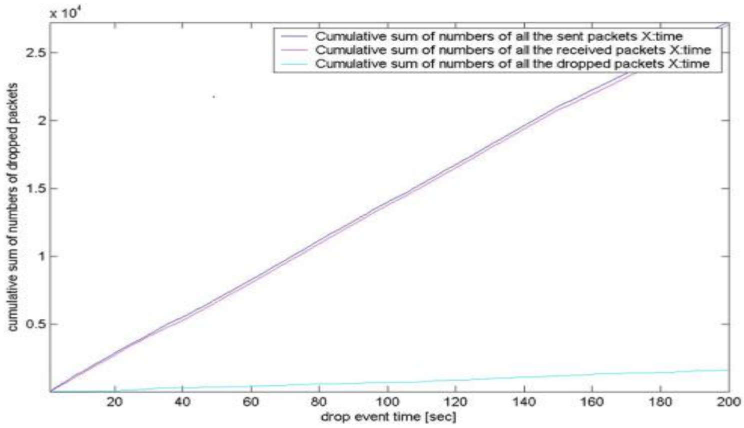

Fig.5 Simulation of sent, received and dropped packet in DSDV

(b) End to end delay: The graph shows the Simulation result between end to end delays with respect to packet sent time at source node.

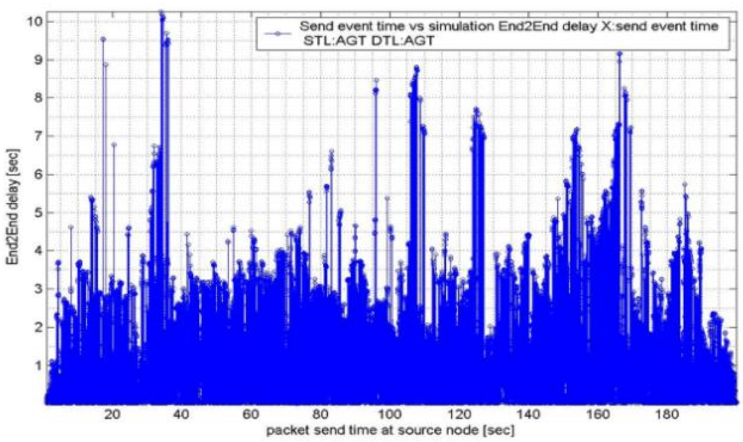

Fig .6 Simulation of End to End delay in DSDV

4.2 Throughput

(a)Sending packets: The graph shows the Simulation result between throughputs of sending packets with respect to simulation time in seconds.

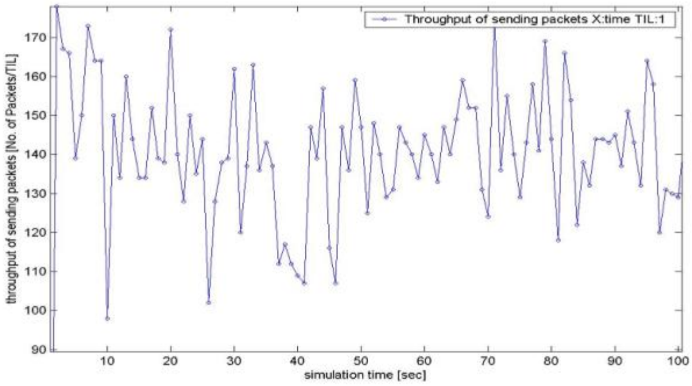

Fig. 7 Throughput of Sent packet in DSDV

(b) Receiving packets: The graph shows the Simulation result between of throughput of receiving packets with respect to simulation time in seconds.

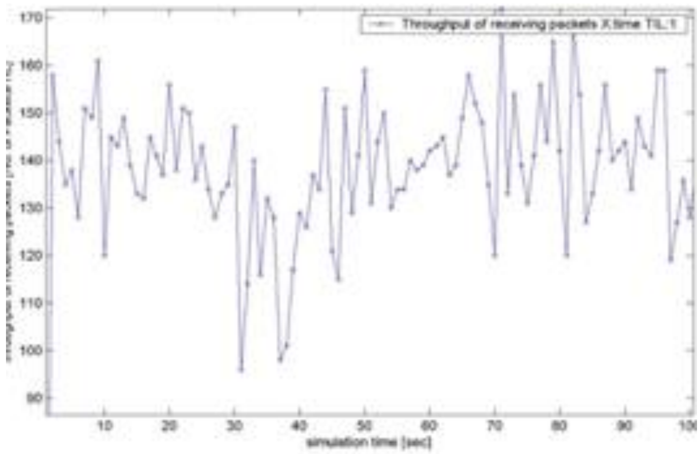

Fig. 8 Throughput of Received packet in DSDV

5. Comparison of Dropped Packets in AODV and DSDV:

Cumulative sum of all the Dropped Packets in AODV and DSDV are shown in Table 2 and Table 3. The average dropped packets for AODV are 673.8 and the average dropped packets for DSDV are 193.8 which conclude that the number of dropped packets is less in DSDV.

Table 2
Cumulative sum of all the Dropped Packets in AODV

Simulation time in sec	**cumulative sum of all the sent packet**	**Cumulative sum of all the received packet**	**Dropped packet (sent-received)**
10	1610	1190	420
20	2947	2497	450
30	4350	3825	525
40	5695	5100	595
50	7400	6410	990
60	8200	7550	650
70	9545	8855	690
80	11000	10200	800
90	12404	11600	804
100	13855	13041	814
Total Dropped Packets :			6738
Average Dropped Packets:			673.8

Table. 3
Cumulative sum of all the Dropped Packets in DSDV

Simulation time in sec	**cumulative sum of all the sent packet**	**Cumulative sum of all the received packet**	**Dropped packet (sent-received)**
10	116	1234	420
20	150	2705	450
30	125	4100	525
40	240	5270	595
50	230	6640	990
60	232	8020	650
70	190	9490	690
80	220	10930	800
90	225	12350	804
100	210	13740	814
Total Dropped Packets :			1938
Average Dropped Packets:			193.8

6. Comparison of Throughput of sent and received packets in AODV and DSDV: Cumulative sum of all the Dropped Packets in AODV and DSDV are shown in Table 4 and 5 which concludes that the throughput of DSDV is good.

Table. 4
Throughput of sent and received packets in AODV

Simulation time in sec	**Throughput of sent packet**	**Throughput of received packet**
10	139	133
20	137	131
30	144	140
40	152	138
50	136	132
60	119	118
70	134	131
80	160	151
90	140	137
100	146	137
Total	1407	1355
Average Throughput	140.7	135.5

Table.5 Throughput of sent and received packets in DSDV

Simulation time in sec	**Throughput of sent packet**	**Throughput of received packet**
10	98	120
20	172	156
30	162	147
40	109	129
50	147	159
60	145	142
70	124	120
80	144	142
90	145	144
100	129	128
Total	1519	1387
Average Throughput	151.9	138.7

7. Comparison of End to end delay in AODV and DSDV: Comparison End to end delays in AODV and DSDV is shown in Table 6 which concludes that the average of End to end delay in DSDV is lesser.

Table.6
Comparison End to end delays in AODV and DSDV

Simulation time in sec	**End to End delay in AODV**	**End to End delay in DSDV**
10	0.2	0.1
20	3.3	1.2
30	0.4	0.29
40	0.89	1.7
50	0.13	1.72
60	2.18	0.4
70	2.35	0.96
80	0.1	0.07
90	0.66	0.55
100	0.53	1.02
Total	10.74	8.01
Average End to end Delays	1.07	0.8

IV. CONCLUSION

In this, the performance of the network by varying the nodes mobility is analyzed, 30 nodes are taken and the simulation is done using NS-2 where in many simulations parameters are considered. Various protocol parameters i.e. Total No. of Dropped Packets, Throughput and End to end Delay are used to evaluate the performance. Simulation results are shown in graphical form. Also we compared Cumulative sum of all the Dropped Packets in AODV and DSDV. It is found that the average dropped packets for AODV are 673.8 and the average dropped packets for DSDV are 193.8 which conclude the number of dropped packets is less in DSDV. Cumulative sum of all the Dropped Packets in AODV and DSDV are also compared where the throughput of DSDV is found good. Also End to end delays in AODV and DSDV are compared which concludes that the average of End to end delay in DSDV is lesser.

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