Performance Analysis of Reactive & Proactive Routing Protocols for Vehicular Ad-Hoc Networks

[1]Anjali Bhatt, [2]Mr. Prashant Bhati

[12]Asst. Prof. Dept of E&C, PCST, Patel College of science and technology, Indore

***Abstract*: Today the world is moving towards wireless system. Wireless networks are gaining popularity to its peak today, as the users want wireless connectivity irrespective of their geographic position. Vehicular ad-hoc networks (VANETs) are considered to be the special application of infrastructure-less wireless Mobile ad-hoc network (MANET). In these networks, vehicles are used as nodes. The thesis works is based on comparison between Ad hoc on demand Distance Vector routing protocol (AODV) and Destination sequenced distance vector routing (DSDV) in VANET on the basis of packet delivery ratio and average delay. Researchers are continuously publishing papers on performance work on VANET hence we worked on the issue. The tools which we used for the work of performance are TRACEGRAPH and NETWORK SIMULATOR (NS2).**

***Keywords*: VANETS, MANETs, Ad- hoc Network, NS-2.34, Trace graph.**

1. INTRODUCTION

A Vehicular Ad-Hoc Network or VANET is a technology that uses moving cars as nodes in a network to create a mobile network. VANET turns every participating car into a wireless router or node. Most of the concerns of interest to MANETs are of interest in VANETs, but the details differ. Rather than moving at random, vehicles tend to move in an organized fashion. VANET offers several benefits to organizations of any size [1].The communication area which is related with the scope of this proposal is an emerging and exciting application of an ad-hoc network where vehicles are severing as nodes. This area has certain promised aspects and activities to be offered, which are broadly related with the safety, convenience, and entertainment topics.[2][3]

1.1 Problem Statement:

It is sometimes not possible for vehicles to establish direct link between one another with the help of single hop, which is related with the specified area of coverage because of the varying velocities of vehicles and abrupt moves of paths without any notification, This proposal is highlighting the importance of routing protocols in VANET environments under different conditions and to observe and analyze their effects accordingly by mean of rigorous simulation test cases and comparative analyses.

2. WIRELESS Ad-Hoc NETWORK

2.1 Wireless Ad-hoc Network:

A wireless ad-hoc network is a decentralized type of wireless network. The network is ad hoc because it does not rely on a pre-existing infrastructure, such as routers in wired networks or access points in managed (infrastructure) wireless networks. Instead, each node participates in routing by forwarding data for other nodes, and so the determination of which nodes forward data is made dynamically based on the network connectivity. In addition to the classic routing, ad hoc networks can use flooding for forwarding the data.

An ad hoc network typically refers to any set of networks where all devices have equal status on a network and are free to associate with any other ad hoc network devices in link range. Very often, ad hoc network refers to a mode of operation of IEEE 802.11 wireless networks.

3. VANET

A Vehicular Ad-Hoc Network or VANET is a technology that uses moving cars as nodes in a network to create a mobile network. VANET turns every participating car into a wireless router or node. VANET offers several benefits to organizations of any size. While such a network does pose certain safety concerns (for example, one cannot safely type an email while driving), this does not limit VANET's potential as a productivity tool. GPS and navigation systems can benefit, as they can be integrated with traffic reports to provide the fastest route to work. A computer can turn a traffic jam into a productive work time by having his email downloaded and read to him by the on-board computer, or if traffic slows to a halt, read it himself. It would also allow for free, VoIP services such as Google Talk or Skype between employees, lowering telecommunications costs. Future applications could involve cruise control making automatic adjustments to maintain safe distances between vehicles or alerting the driver of emergency vehicles in the area. To support message differentiation in VANET, IEEE 802.11e standard is incorporated in vehicular communication [4].

3.1 VANET Routing Protocols:

All of the standard wireless protocol companies are experimenting with VANET. This includes all the IEEE protocols, Bluetooth, Integrated Resource Analyses (IRA) and Wi-Fi. There also are VANET experiments using cellular and satellite technologies. Dedicated Short Range Communications (DSRC) is a protocol that has been specifically for use with VANET. DSRC has several advantages: it already is operating at 5.9 GHz, it is easy to individualize and it is oriented to the idea of transmitting along a street grid framework--as opposed to the Omni directional transmission, which is standard for most wireless protocols [5].

4. AODV

Ad hoc On-Demand Distance Vector (AODV) Routing is a routing protocol for mobile ad hoc networks (MANETs) and other wireless ad-hoc networks. It is jointly developed in Nokia Research Center, University of California, Santa Barbara and University of Cincinnati by C. Perkins, E. Belding-Royer and S. Das. It is a reactive routing protocol, meaning that it establishes a route to a destination only on demand. In contrast, the most common routing protocols of the Internet are proactive, meaning they find routing paths independently of the usage of the paths. AODV is, as the name indicates, a distance-vector routing protocol. AODV avoids the counting-to-infinity problem of other distance-vector protocols by using sequence numbers on route updates, a technique pioneered by DSDV. AODV is capable of both unicast and multicast routing [6].

4.1 Working:

In AODV, the network is silent until a connection is needed. At that point the network node that needs a connection broadcasts a request for connection. Other AODV nodes forward this message, and record the node that they heard it from, creating an explosion of temporary routes back to the needy node. When a node receives such a message and already has a route to the desired node, it sent a message backwards through a temporary route to the requesting node. The needy node then begins using the route that has the least number of hops through other nodes. Unused entries in the routing tables are recycled after a time. When a link fails, a routing error is passed back to a transmitting node, and the process repeats. Much of the complexity of the protocol is to lower the number of messages to conserve the capacity of the network. For example, each request for a route has a sequence number. Nodes use this sequence number so that they do not repeat route requests that they have already passed on. Another such feature is that the route requests have a "time to live" number that limits how many times they can be retransmitted. Another such feature is that if a route request fails, another route request may not be sent until twice as much time has passed as the timeout of the previous route request. The advantage of AODV is that it creates no extra traffic for communication along existing links. Also, distance vector routing is simple, and doesn't require much memory or calculation. However AODV requires more time to establish a connection, and the initial communication to establish a route is heavier than some other approaches.

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5. SIMULATION AND RESULT

5.1 Simulation Enjoinment: 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 senting 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.

5.2 Simulation Parameter:

Table 1: Simulation Parameters Considered

Parameters	Values
Simulator	NS-2.34
Mobility Model	Random Way Point
Antenna type	Omini
Area of Map	500X500
PHY/MAC	IEEE 802.11p
Routing Protocol	AODV,DSDV
Network Traffic	TCP,UDP
Simulation Time	300sec
Antenna type	Omini

5.3 Simulation results of AODV:

5.3.1) 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.

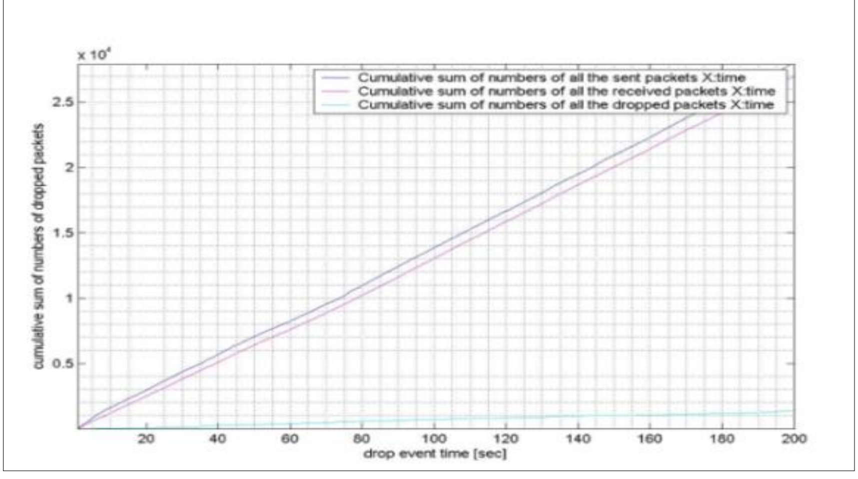

Fig. 1 Simulation of sent, received and dropped packet in AODV

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

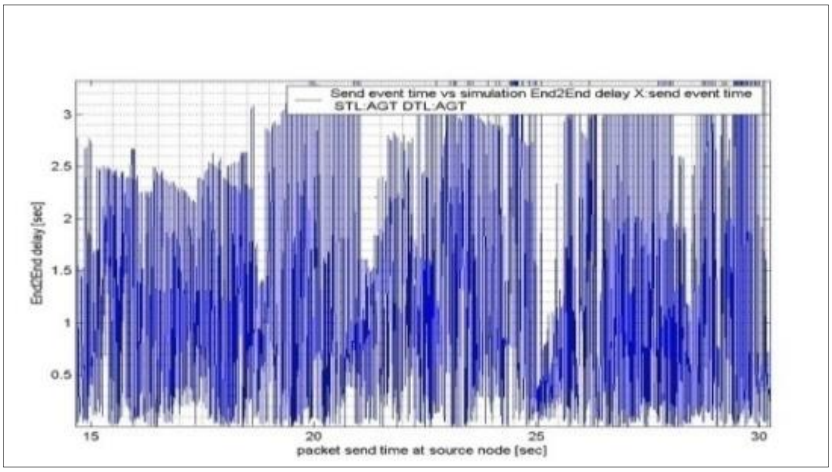

Fig. 2 Simulation of End to End delay in AODV

5.3.3) Throughput of

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

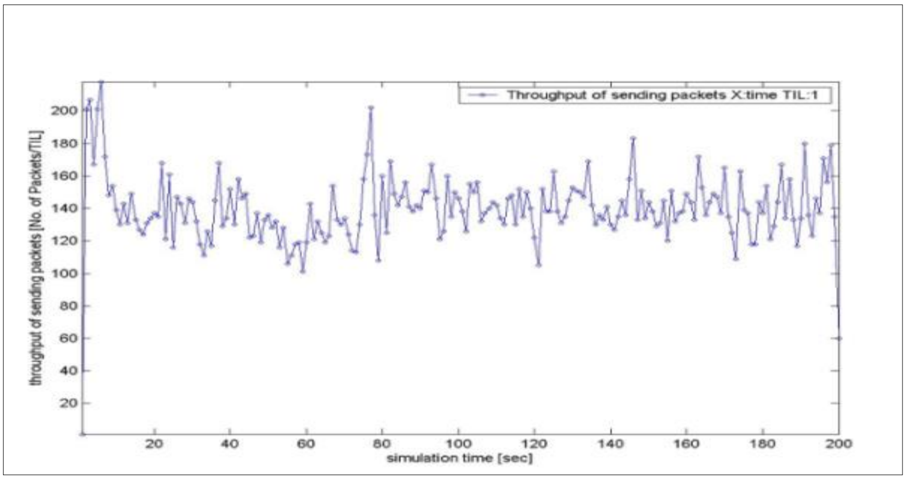

Fig. 3 Throughput of Sent packet in AODV

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

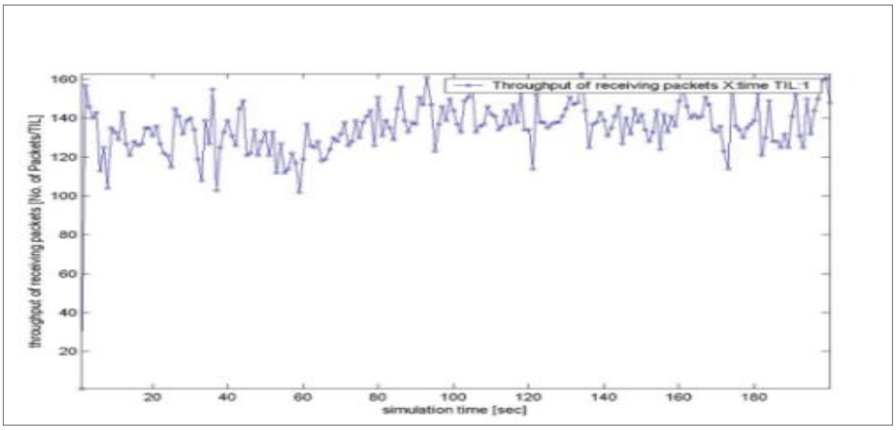

Fig. 4 Throughput of Received packet in AODV

5.4 Simulation result of DSDV

5.4.1) 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.

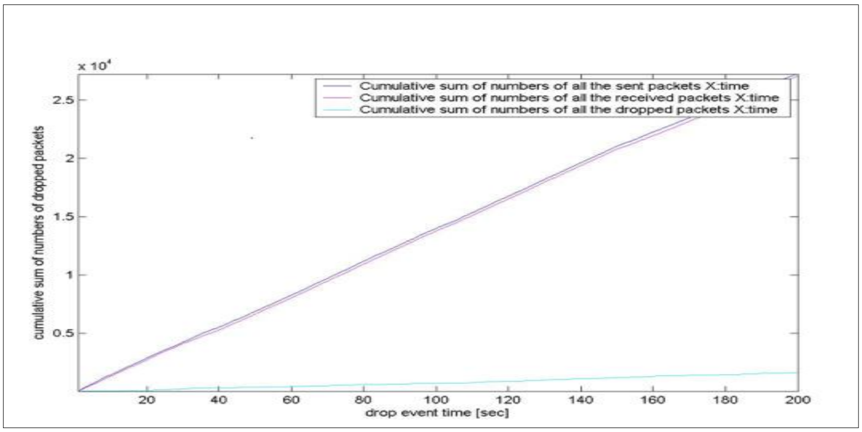

Fig. 5 Simulation of sent, received and dropped packet in DSDV

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

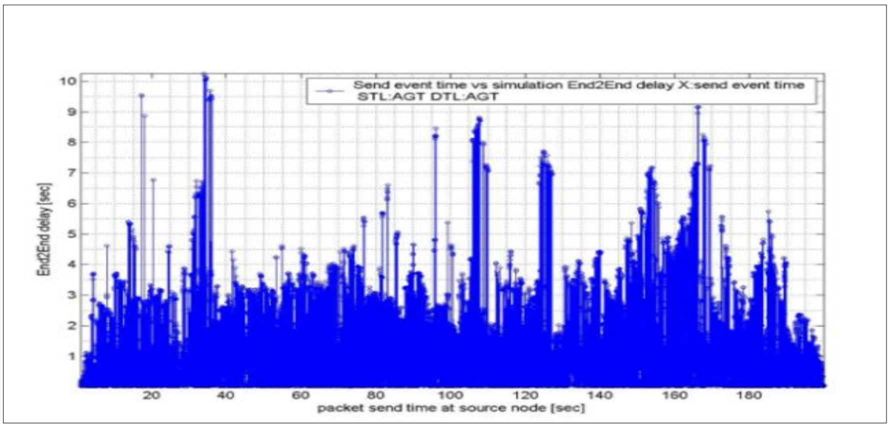

Fig. 6 Simulation of End to End delay in DSSDV

5.4.3) Throughput of

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

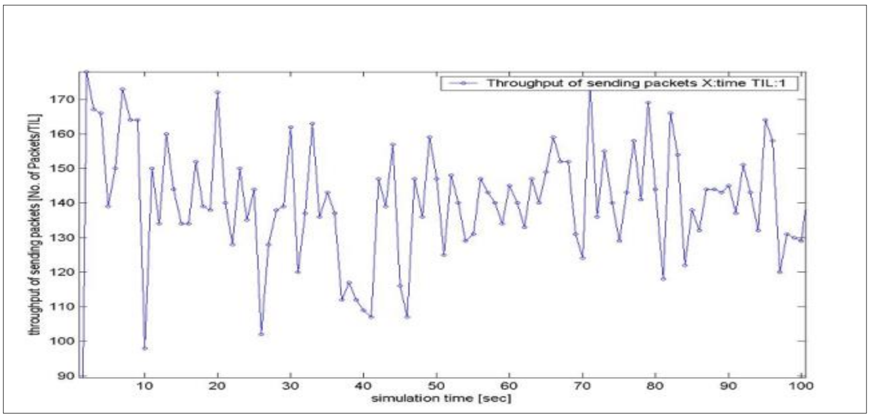

Fig. 7 Throughput of Sent packet in DSDV

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

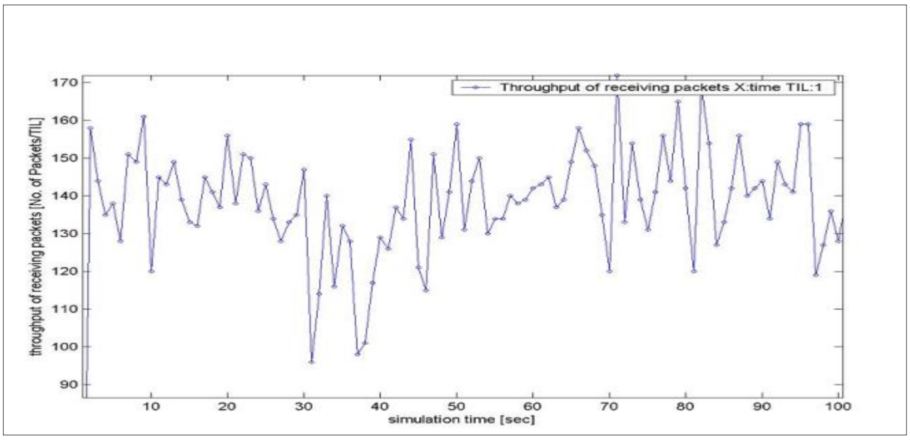

Fig. 8 Throughput of Received packet in DSDV

6. CONCLUSION

6.1 Comparison of Dropped Packets in AODV and 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	-	-	6738

AVERAGE=TOTAL DROPED PACKET/10

6738/10 = 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	1400	1234	116
20	2855	2705	150
30	4225	4100	125
40	5510	5270	240
50	6870	6640	230
60	8252	8020	232
70	9680	9490	190
80	11150	10930	220
90	12575	12350	225
100	13950	13740	210
Total	-	-	1938

AVERAGE=TOTAL DROPED PACKET/10

1938/10 = 193.8

Table 2 and 3 conclusion shows that the number of dropped packets is less in DSDV.

6.2 Comparison of Throughput of sent and received packets in AODV and DSDV

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=TOTAL/10
SENT = (1407/10) =140.7
RECEIVED= (1355/10) =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=TOTAL/10
SENT= (1519/10) =151.9
RECEIVED= (1387/10) =138.7

Table 4 and 5 conclusion shows that the throughput of DSDV is good.

6.3 Comparison of End to end delay in AODV and DSDV

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

Simulation time in sec	End to End delay in AODV	End o End delay in DSDV
10	0.2	o.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=TOTAL/10
AODV= (10.74/10)=1.07
DSDV= (8.01/10)=0.8

Table 6 conclusion shows that the average of End to end delay in DSDV is lesser.

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