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Performance Evalution Of Reactive & Proactive Routing Protocols For Vehicular Adhoc–Networks With Varying Speed Of Nodes

Piyush Chouhan[1], Shivani Shukla[2], Manish Sharma[3]
Student, SIMS, Asst. Professor, SIMS, Asst. Professor, SIMS

ABSTRACT-
Today the world is moving towards wireless system. Wireless networks are gaining popularity to its peak today, Vehicular ad-hoc networks (VANETs) are considered to be the special application of infrastructure-less wireless Mobile ad-hoc network (MANET*)*. In VANET networks, vehicles are used as nodes. The main concern for establishment of communication between vehicles is that very high speed as compared to other MANET Technologies as well as the Density in URBAN areas. In this paper Creation of VANET Scenario for NS-2 and then to analyze Different routing protocols with the use of various performance matrices Like Packet Delivery Ratio, End to End delay and Overall Throughput. This work firstly created scenario file for IEEE 802.11p standard which has to be used along with TCL Script than created a TCL script consist of various routing protocols which are AODV and DSR than a particular VANET scenario or topology it consist of 44 movable and static nodes with two ray ground model and various speed of i.e. 20m/sec, 40m/sec & 60m/sec, the total environment size taken is of 2 KM.
Keywords: VANET, AODV, DSR, Network Simulator-2.35 (NS-2.35)

I. INTRODUCTION

An ad hoc network is a group of wireless mobile host forming a temporary network without the aid of any demonstrated infrastructure or consolidates direction. In such a scenario, it may be required for one mobile host to enlist the aid of other hosts in forwarding a packet to its destination, due to the limited area of each mobile host's wireless transmissions [1]. Mobile ad hoc network (MANET) is the branch of the ad hoc network where as Vehicular ad hoc network is the sub branch of MANET.

A vehicular ad hoc network (VANET) is a technology which utilizes moving cars as nodes in a network to generate a mobile network. VANET revolve every participating car into a wireless router or node rather than moving in arbitrary fashion, vehicles tend to move in a coordinated fashion. VANET offers several benefits to management of any size.

The communication area which is related with the scope of this approach is a proceeding and stimulating application of an ad-hoc network where vehicles are separate as nodes. This area has certain guaranteed aspects and activities to be granted, which are largely related with the security, convenience and entertainment topics. Vehicular ad hoc networks (VANETs) represent a rapidly emerging and challenging class of mobile ad hoc networks (MANETs). In such networks, each node operates not only as a host but also as a router; promote packets for other mobile nodes [3]. Communication between vehicles by means of wireless technology has a large potential to improve traffic safety and travel comfort of drivers and passengers [4]. IEEE 802.11p standard is integrated in vehicular communication.

II. WIRELESS AD-HOC NETWORK

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

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

A. TYPES OF WIRELESS AD HOC NETWORKS

Wireless ad hoc networks can be classified by their application:

- Mobile ad-hoc networks (MANET).
- Wireless mesh networks (WMN).
- Wireless sensor networks (WSN)

III. VEHICULAR AD-HOC NETWORK (VANET)

Vehicular ad hoc networks (VANETs) represent a rapidly emerging and challenging class of mobile ad hoc networks (MANETs). In such networks, each node operates not only as a host but also as a router; promote packets for other mobile nodes [3]. Communication between vehicles by means of wireless technology has a large potential to improve traffic safety and travel comfort for drivers and passengers [4].

VANET, being an infrastructure-less networks, nodes will be expected to cooperate to perform essential networking tasks such as routing [5]. Vehicular ad-hoc network (VANET) is a technology that uses moving cars as nodes in a network to create a mobile network. VANET turns every perform car into a wireless router or node. VANET offers several prosperities to grouping of any size. While such a network does pose certain security concerns (for example, one cannot secure type an email while driving), this does not limit VANET's possible as a productivity tool. GPS and navigation systems can prosperity, as they can be unified with traffic reports to provide the fastest route to work [6]. In order to provide network-wide connectivity, nodes in a VANET are expected to route data packets on behalf of other nodes in the network that want to reach nodes out of their transmission range [5].

A. VANET AND SAFETY

A major intended uses for VANET regards safety. If a car spots an unsafe road situation, such as black ice, it transmits the report to cars behind it that might be heading in the direction of the danger. A major research area is how to govern such dispense of data. It should not be transmitted to cars that are driving away from the danger or to cars on the other side of town. This is the kind of problem that needs to be addressed when choosing the protocol that will be used. The protocol will need to invisibly protect the necessary data is transmitted but should also help prevent information overload [6].

IV. VANET ROUTING PROTOCOLS

Wireless protocol companies are analyzing with VANET. This includes all the IEEE protocols, Bluetooth, Integrated Resource Analyses (IRA) and Wi-Fi. There are also VANET analyzes using cellular and satellite technologies. Dedicated Short Range Communications (DSRC) is a protocol that has been specifically for use with VANET [13].

A. AD HOC ON DEMAND DISTANCE VECTOR (AODV)

A node running Ad-hoc on demand distance vector (AODV) initiates a route discovery process only when it has data packets to send and it does not know any route to the destination node that is route discovery AODV is on-demand [14].

During a route detection process, the source node broadcasts a route query packet to its neighbors. If any of the neighbors has a route to the destination it replies to the query with a route reply packet; otherwise, the neighbors rebroadcast the route inquiry packet. Finally some query packets reach the destination or nodes that know route to the destination. At that time, a reply packet is composed and transmitted tracing back the route traversed by the inquiry packet. To handle the case in which a route does not exist or the inquiry or reply packets are lost, the source node rebroadcasts the query packet if no reply is received by the source after a time-out [14].

A path maintenance process is used by AODV to monitor the operation of a route being used. If a source node receives the notification of broken link, it can re-initiate the route discovery processes to find a new route to the destination. If a destination or an intermediate node detects a broken link, it sends special messages to the affected source node [14].

AODV uses a routing table to specify distances to destinations. It uses string numbers maintained at each destination to determine the freshness of routing information and to prevent routing loops [15].

B. DYNAMIC SOURCE ROUTING (DSR)

The Dynamic Source Routing Protocol (DSR) is one of the most reliable and effective protocols in the VANET. DSR adopts a similar on-demand approach as AODV regarding the route discovery and maintenance processes. A fundamental difference of DSR from AODV and other on demand protocols is the use of source routing, where the source node indicates the complete sequence of intermediate nodes for each data packet to reach its destination. The source-route information is contained by the header of the data packet. The protection of source routing is that no additional mechanism is needed to detect routing curve. 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 exact route from the source to a destination. DSR makes very aggressive use of the source routing information [14].

V. IMPLEMENTATION AND RESULTS

In this paper implemented work i.e. Creation of VANET Scenario for NS-2 and then to analyze Different routing protocols with the use of various performance matrices Like Packet Delivery Ratio, End to End delay and Overall Throughput.

Simulation Parameters:-

Simulation TOOL	Network Simulator-2.35
IEEE Scenario	VANET(802.11p)
Mobility Model	Two Ray Ground
No. Of Nodes	44
Node Movement speed	20,40,60 m/sec.
Traffic Type	TCP
Antenna	Omni Directional Antenna
MAC Layer	IEEE 802.11p
Routing Protocols	AODV, DSR
Queue Limit	50 packets
Simulation Area(in meter)	2000*2000
Queue type	Droptail, CMUPriqueue
Channel	Wireless Channel
Simulation Time	10,20,30,40,50 sec.

Table-1 Simulation Scenario

Performance Matrices:-
For our work to be done successfully we have used VANET scenario with varying speed and time of 20, 40, 60 meter/sec and 10, 20, 30, 40, 50 seconds respectively under dynamic scenario using two routing protocols. We have reached to the results with the help of various performance matrices for now we have used following performance matrices.

- Packet Delivery Ratio
- End to End Delay
- Throughput

Packet Delivery Ratio:-
This is the fraction of the data packets generated by the CBR sources to those delivered to the destination. This evaluates the ability of the protocol to discover routes.

Packet Delivery Ratio in percent (%) for the speed of 20m/sec: Table-1 shows the PDR under routing protocols i.e. AODV and DSR for the mobility of 20m/sec.

	AODV	DSR
10sec	68.080	59.300
20sec	81.960	87.810
30sec	82.300	92.490
40sec	84.790	93.860
50sec	84.410	94.450

Table–2 Packet Delivery Ratio in percent (%) for the speed of 20m/sec

Packet Delivery Ratio in percent (%) for the speed of 40m/sec: Table-2 shows the PDR under routing protocols i.e. AODV and DSR for the mobility of 40m/sec.

	AODV	DSR
10sec	80.880	88.290
20sec	84.380	92.710
30sec	87.130	94.530
40sec	88.260	95.140
50sec	87.440	95.550

Table–3 Packet Delivery Ratio in percent (%) for the speed of 40m/sec

Packet Delivery Ratio in percent (%) for the speed of 60m/sec: Table-3 shows the PDR under routing protocols i.e. AODV and DSR for the mobility of 60m/sec.

	AODV	**DSR**
10sec	83.080	89.250
20sec	84.510	92.950
30sec	86.010	94.340
40sec	86.710	95.310
50sec	87.460	95.850

Table-4 Packet Delivery Ratio in percent (%) for the speed of 60m/sec

Analysis of Packet Delivery Ratio:-
From the above Table 2, 3, 4 it is clear that the packet delivery ratio which is having the unit in Percentage **(%)** the table which has been drawn for AODV and DSR protocols for the time of 10,20,30,40,50 seconds. We can analyze from above result that DSR routing protocol is much better for all the scenarios weather the movement of the nodes are slow or fast as compare to AODV protocol.

End to End Delay:-
This is the average delay between the sending of the data packet by the CBR source and its receipt at the corresponding CBR receiver. This includes all the

delays caused during route acquisition, buffering and processing at intermediate nodes.

End to End Delay in ms for the node mobility of 20m/sec: Table-4 shows the End to End Delay under various routing protocols i.e. AODV and DSR for the mobility of 20m/sec.

	AODV	DSR
10sec	180.848	513.575
20sec	242.749	476.694
30sec	243.851	480.152
40sec	243.686	459.282
50sec	244.279	451.569

Table–5 End to End Delay in ms for the node mobility of 20m/sec

End to End Delay in ms for the node mobility of 40m/sec: Table-5 shows the End to End Delay under routing protocols i.e. AODV and DSR for the mobility of 40m/sec.

	AODV	DSR
10sec	193.722	338.790
20sec	232.242	441.381
30sec	240.311	439.006
40sec	243.901	435.283
50sec	243.406	436.571

Table–6 End to End Delay in ms for the node mobility of 40m/sec

End to End Delay in ms for the node mobility of 60m/sec: Table-6 shows the End to End Delay under routing protocols i.e. AODV and DSR for the mobility of 60m/sec.

	AODV	DSR
10sec	284.052	408.612
20sec	246.470	433.004
30sec	287.652	433.619
40sec	292.389	442.214
50sec	306.110	445.160

Table–7 End to End Delay in ms for the node mobility of 60m/sec

Analysis of End to End Delay:-
End to End delay which is the extra time taken by the packet to reach towards its destination is analyzed in above table 5, 6, 7 it is quite clear that DSR protocol is having maximum end to end delay than protocol has minimum end to end delay for all the mobility cases of 20m/sec, 40m/sec & 60m/sec. But if we consider the timeliness property for the fast communication than the delay must be less.

Throughput:-
There are two representations of throughput; one is the amount of data transferred over the period of time expressed in kilobits per second (Kbps). The other is the packet delivery percentage obtained from a ratio of the number of data packets sent and the number of data packets received.

Overall Throughput for the node mobility of 20m/sec: Table-13 shows the Throughput under routing protocols i.e. AODV and DSR for the mobility of 20m/sec.

	AODV	DSR
10sec	217.890	106.730
20sec	458.550	387.010
30sec	534.390	477.950
40sec	592.160	543.100
50sec	627.490	580.640

Table-8 Overall Throughput for the node mobility of 20m/sec

Overall Throughput for the node mobility of 40m/sec: Table-14 shows the Throughput under routing protocols i.e. AODV and DSR for the mobility of 40m/sec.

	AODV	DSR
10sec	236.270	223.180
20sec	468.440	464.140
30sec	572.690	550.000
40sec	624.930	598.290
50sec	654.00	824.090

Table-9 Overall Throughput for the node mobility of 40m/sec

Overall Throughput for the node mobility of 60m/sec: Table-15 shows the Throughput under routing protocols i.e. AODV and DSR for the mobility of 60m/sec.

	AODV	DSR
10sec	241.950	226.900
20sec	439.940	491.000
30sec	519.770	571.470
40sec	561.620	608.990
50sec	574.450	628.270

Table-10 Overall Throughput for the node mobility of 60m/sec

Analysis of Throughput:-

Throughput which is the speed of data transfer from source to destination can be analyzed from above figures which implies that for high speed scenario throughput of DSR Routing protocol is better as compare to AODV but for moderate or slow speed scenario DSR does not have better throughput for those cases AODV protocol is having better throughput refer table 8, 9, 10.

VI. CONCLUSION

From all the above analysis done so far conclude that for different performance matrices different cases has been observed DSR routing protocol is having Very good PDR as compared with AODV. If conclude relatively as PDR is directly proportional to Throughput but inversely proportional to End to End Delay thus from this analysis it has been proved.

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