Performance Analysis of VANET Based Routing Protocol

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Abstract— The blessing to the automobile sector in recent time is Vehicular Ad-hoc Network (VANET). Vanet has helped the road traffic with massive level of improvement as because due to its development road accidents have been minimized and the acts of traffic management have also been reduced. This concept is inexpensive so this technology has been widely accepted. VANET takes all the information from the road and passes the information to the other vehicles in the neighboring cluster so to take precautionary measures for the road safety. Here we will discuss about a few typical protocols and will compare their performances to show which is the best one to be used in Vanet for road safety application.

Index Terms— VANET, Protocol, AODV, DSR, DYMO, Node, QualNet

1 Introduction

VANET stands for vehicular Ad hoc Network which is a subcategory of Mobile Ad-hoc network (MANET). Vehicle is being constitute with mobile node with great quality of security and intelligent transportation. In this technology the vehicles are allowed to communicate with the equipment on the roadside. It is being used to reduce the accidents in road. This technology collects all the information in the road and transfer it the nearby vehicle in the cluster so that the precautionary measures in the road can be taken.

The key component of VANET are also very challenging aspects for the research such as traffic monitoring, mobile communication, Utility for the public use. It is also being used to reduce the accidents in road. Within the last few days VANET has become quite interesting topic for research and by their distinctive features as mentioned above motivated me to select this topic. In the recent years Academic fields and industry fields are being attracted by VANET.

In the year 1991 S.Shaldover adopted the concept of automation in the roadways that is the use control and communication techniques to improve the road traffic in efficient and save manner and to also to make it environment friendly [I]. H.Kawashima in 1990 has presented the objectives of The Comprehensive Automobile Traffic Control System (CACS) which are still valid after more than 30 years such as reduction of the congestion of traffic ,fume reduction, accident prevention etc.[II]. In the year 2009 Manvi has done the performance analysis of Ad-hoc On-demand Distance Vector (AODV), Dynamic Source Routing (DSR) and SWARM algorithm [III]. adhoc traditional routing protocol such as DSR,Distance Sequenced Distance Vector(DSDV) and AODV is being presented by Xiong Wei for the scenerios in Highway[IV].

In this project with the help of Qualnet software we will initiate the performance analysis of AODV,DSR and DYMO routing protocol.

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2 Details of Software Used

The software used in this project is QualNet software which is network analyzer software. This software helps the researcher to analyze various protocol performance and also help the designer for model verification. This software also enables real time speed model developer.

3 Experimental Observation

From Figure 1 the scenerio taken in the software is a urban terrain environment. From the above figure we can see that the piece of land is covered with building, Offices trees etc. in it. In this terrain environment the vehicles are being operated with three different types of protocol support which in turn help in the analysis of the performance of the protocol. This scenario has its coordinate system as TERRAIN-SOUTH-WEST-CORNER (42.335900, -71.176831) TERRAIN-NORTH-EAST-CORNER (42.339596, -71.169698) and it as altitude of 1500 meter high above sea level. The area is covered with building and foliage. The height of building is about 35 feet and foliage height of foliage is also 35 feet. The density of the foliage is 0.0015 and for small area foliage density is 0.15. The weather mobility interval of the scenario is about 100 meter per seconds. The scenario is of a metropolitan area. The communication proximity of the area is 400. We have just changed the position of the nodes. Figure 1 represent the Node. In this project we have taken 9 nodes which are ground vehicle. Routing protocol AODV is applied from node 1 to node 3, routing protocol DSR is applied for node 4 to node 6, and routing protocol DYMO (Dynamic Manet on Demand Routing Protocol) is applied from node 7 to node 9. Each node have pause time for 30 seconds and

minimum speed is given is as 10 meter/second and maximum speed 80 meter/seconds. The simulation time is estimated as 3000 seconds. Each node in a triplet is connected with a wireless subnet from where we are connecting the routing protocol with the nodes.

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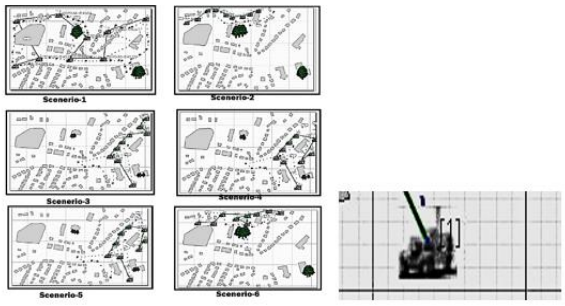

Fig. 1. Scenerio Design & Node Design

From the graph of figure 2 we can see that node 4 node 5and node 6 has received the large amount of data packets from the other nodes. Node 4 to node 6 consists of DSR protocol as they are connected with wireless subnet 192.08.00.02. So from the observation DSR is better than the other two protocol AODV and DYMO.

SNR (Signal to Noise ratio), is a measure of the strength of the desired signal relative to background noise (undesired signal). For correct detection SNR should be >= 60 dBm |Y (dBm) = Average signal power-Average Pathloss| Average Interference (I) = (Obtained from the software) [dBm]| SNR= (-y)-(-I) .If value of SNR is >=60 dBm then the graph is ok as we have considered in the project.

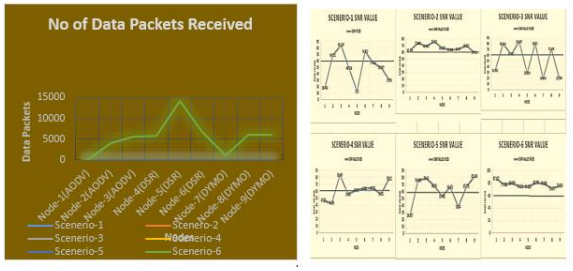

Fig. 2. Number of data packets received and Average SNR Value of different scenerio

4. Result

From the values of Table 1 we can observe that in most of the scenario number of data packets received by DSR protocol is greater than the other two protocol. So it can be said that in terms of number of data packets received DSR provides a very good result which is depicted in figure 3.

TABLE 1
No of Data Packets Received

Scenario	AODV Protocol	DSR Protocol	DYMO Protocol
1	7	2.83	5.33
2	3.83	3.33	3.33
3	2	17	0.66
4	5	17	0.66
5	5.16	17	2
6	3100	9333.33	4333.33

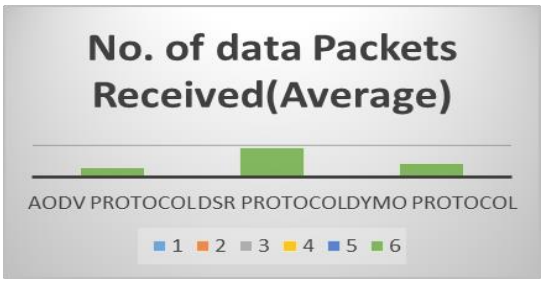

Fig. 3. Chart for Number of Data Packets Received

From the values of Table 2 the SNR values for DSR protocol is close to the reference SNR value 60 dBm which we have considered in the project. So it can be said that if any external unwanted noise increases DSR can work under that condition too.

TABLE 2
AVERAGE SNR VALUE

Scenario	AODV Protocol	DSR Protocol	DYMO Protocol	Reference value
1	57.635	45.649	46.076	60
2	68.823	68.827	64.882	60
3	58.492	64.488	37.254	60
4	57.935	60.651	66.683	60
5	60.641	62.911	62.807	60
6	81.621	76.511	75.461	60

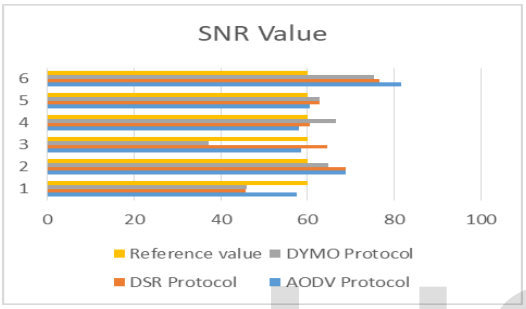

Fig. 4. Average SNR Chart for each Scenerio

The time taken for the receiving the signal depicted in Table 3 is much lesser in case of DSR protocol which indicates that the driver can get alert signal much faster than AODV and DYMO protocol.

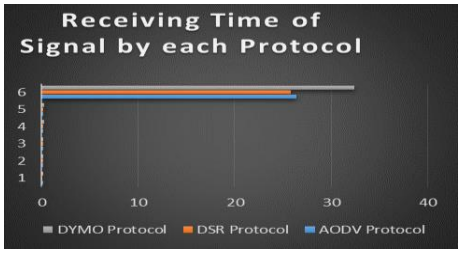

Fig. 5. Time Taken for Receiving Signal

TABLE 3
TIME TAKEN FOR RECEIVING THE SIGNAL

Scenario	AODV Protocol	DSR Protocol	DYMO Protocol
1	0.155	0.0662	0.1527
2	0.1584	0.111	0.161
3	0.109	0.107	0.128
4	0.1796	0.147	0.205
5	0.191	0.1506	0.207
6	26.43	25.768	32.392

4. CONCLUSION

The result indicates that DSR or Dynamic Source Routing Protocol gives a good result irrespective to the other two protocol considered in the project. Therefore it proves that routes are determined by each source to be used in selected destinations. VANET has become useful for event detection and monitoring due to the increase in the manufacturing of embedded cameras in the vehicle. The latest advancement of 5G technology has also brought new path in the VANET research.

5. ACKNOWLEDGEMENT

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