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Comparative Analysis of GPSR and GPVR Protocol for Various Parameters in VANET with Power Control

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***Abstract*:** Vehicular Ad-Hoc Networks (VANETs) are deployed to make communication between vehicles possible using ad hoc wireless devices. Nowadays, these networks have become an emerging technology due to the variety of their applications in Intelligent Transportation Systems (ITS). By creating a vehicular network, each vehicle can exchange information to inform drivers in other vehicles about the current status of the traffic flow or the existence of a dangerous situation. They can also be used to improve traffic management conditions such as route optimization, flow congestion control and to provide on-board infotainment such as Internet access, the location of free parking places, video streaming sharing, etc. GPSR protocol utilized for wireless sensor networks in base paper. First of all various parameters must be take care for whom our research would revolve and then finding the demerit of existing protocol. By analyzing the problem of existed protocol a new protocol need to be designed. In our dissertation work GPVR (Greedy Perimeter Vector Routing) protocol is designed. After that various parameters like throughput, end to end delay, packet loss ratio and energy would be compared of both protocols that is existed one and proposed one. In our research work GPSR protocol is enhanced by using position vector calculation and simple redundancy elimination. After analyzing results of both protocols, finally we came to the conclusion that proposed protocol that is GPVR performs better. This research work carried out in NS2 software because it is peril and menacing free, In simulation various possibility can be made regarding smash of vehicles, in rural and urban area. So computer simulation is very crucial in VANET research. VANET Simulation extended into two parts that is traffic simulation and Network simulation

Keywords- *VANET, ITS, GPVR, GPSR, Throughput, Delay*

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I. INTRODUCTION

VANETs, which are made up of mobile nodes (vehicles), can be considered as a special case of MANETs. Both of them are distinguish by the activity and methodicalness of the nodes, but definitely some distinguish characteristics are there which differentiate them for example topologies used in system and network infrastructure components. Figure 1 shows the possible domains that a VANET network consists of. These include the Ad hoc, infrastructure and Internet domains [2]. This figure also shows the different forms of communication in such networks. First one known as inter-vehicle communication through which in ad hoc manner different vehicles can transmit information with each other. Second domain in which exchange of information among vehicle-to-roadside, the RSUs5 are used as access points to connect moving vehicles to the network infrastructure which is connected to the Internet [1] [5] and hybrid communication that combines between two types of previous communications. Moreover, a vehicle can communicate with the Internet directly through Hotspot devices installed along the road. The networks that interconnect vehicles on road are called Vehicular Ad hoc Networks (VANETs).

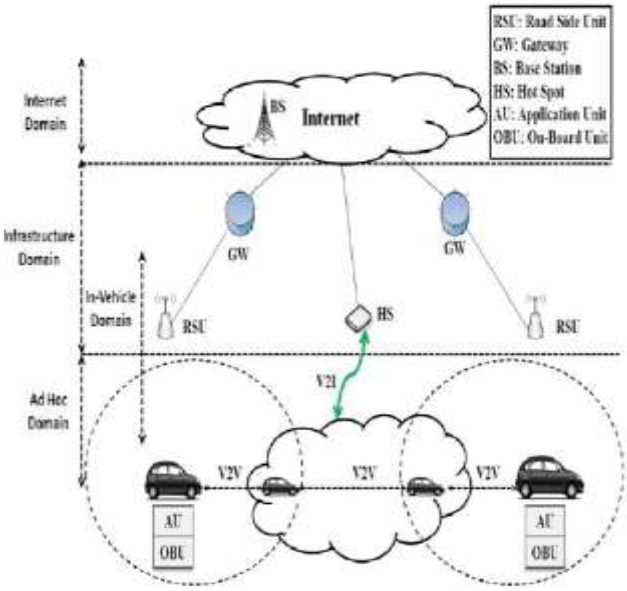

Figure l an overview of a VANET network

MANET consist nodes which are mobile in nature and also interconnect themselves in as decentralized way and also initiate multi-hop routes [4]. For example if moving nodes are considered as bus, cars, this is known as VANET". The main motive of current research in VANETs is to enhance vehicle protection with help of IVC [6]. So many different kinds of applications are provided by VANETs. Out of these application safety applications is one of important to make

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driving much safer, mobile commerce and other useful data that help drivers about congestion, driving hazards, accidents, traffic jams.

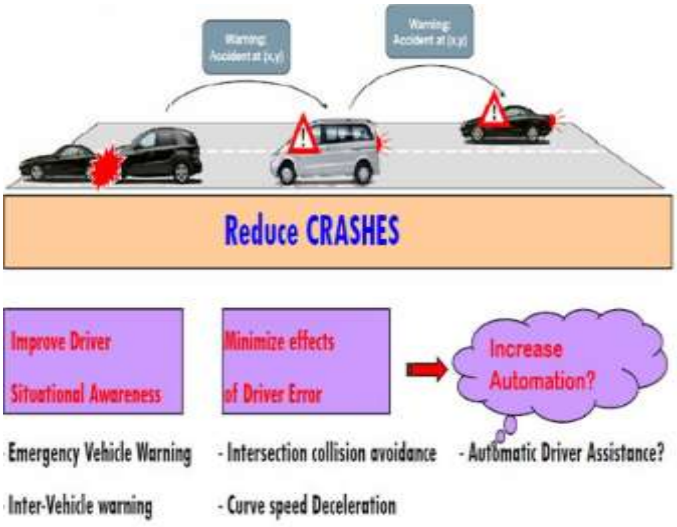

Figure 2 VANET Applications

VANETs have so many different features as compared to MANETs, First one in VANET nodes move at high velocity that why topology changes frequently. VANETs are also vulnerable to various attacks. Therefore, the security of VANETs is robust. In VANET huge majority of nodes are vehicles. Besides this there is much other organization that performs operations in these kinds of networks [12].

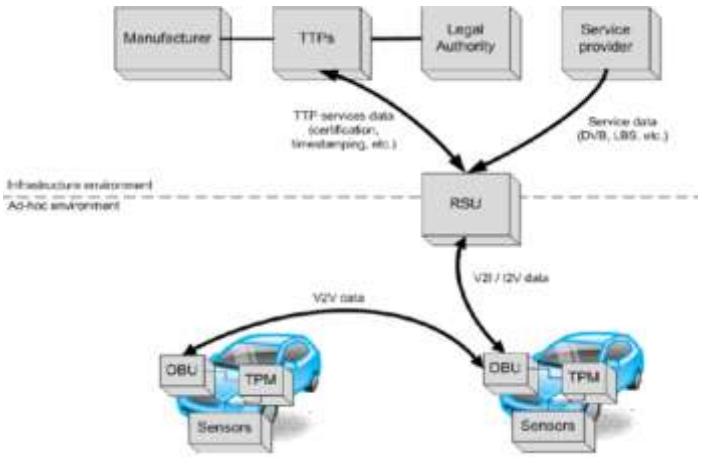

Figure 3 VANET Model

As shown above in VANET architecture **co**mmunicating nodes are of two type vehicles and base stations. Vehicles can be of two types private or public. On other hand base stations facility provided by government or any another private vendor As shown below in figure vehicles can transmit information each other and also with RSU interchangeably.

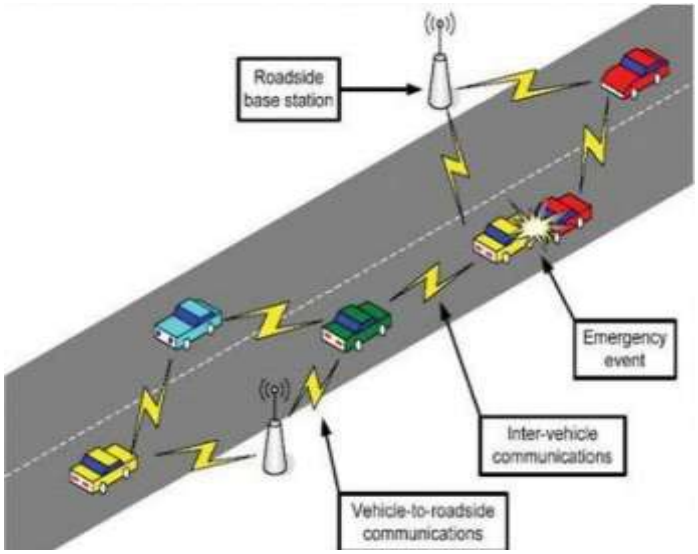

Figure 4 Schematic Representation of VANET

II. LITERATURE SURVEY

Recent advances in wireless communications and networks have given birth to a new type of mobile network known as a VANET to improve road safety and efficiency. VANET technology uses wireless LAN, ad hoc technology and moving cars as nodes to achieve intelligent inter-vehicle communications. VANETs are distinguished from other kinds of MANETs2 by high node mobility with constrained movements, ample energy and computing power and hybrid network architectures [10]. In the following, we detail their features and communication architectures as well as research and standardization activities in this field.

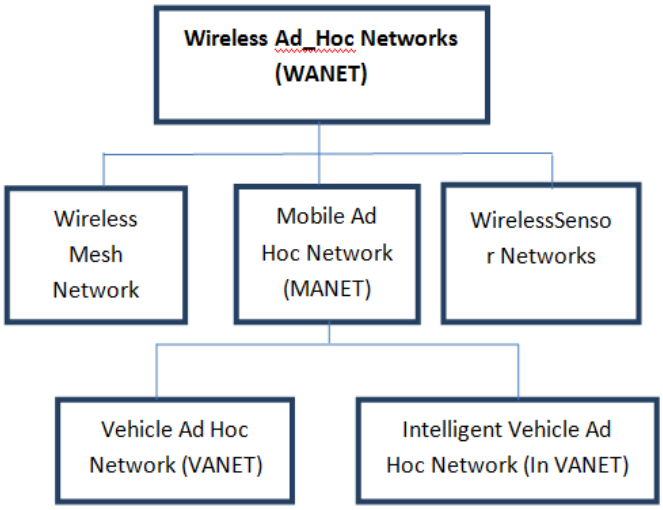

Figure 5 Flow Chart of evolution of VANET

In recent years, continuous progress in wireless communication has opened a new research field in computer networks. Now a day's wireless ad-hoc networking is an emerging research technology that needs attention of the industry people and the academicians [9]. A vehicular ad-hoc network uses vehicles as mobile nodes to create mobility in a

network. Simulation is the reproduction of the method of real-world practices. The computer simulation runs on a single or a network of computers to model and reproduce the behavior of a system. This is based upon the conceptual model to simulate the system. In VANET, vehicles can transmit information with each other and also with that unit which lies on road that is known as RSU. Protection is a very crucial concern for many VANET applications [3] [7]. There is a Sybil attack which is very harmful, against ad hoc networks in which attacker by wrong doing can claim huge identities. In these types of networks, data of the actual time position of nodes is a supposition fabricated by most protocols. This is a very sensible belief, that GPS receivers can be installed easily in vehicles [8]. Right now so many vehicles come into market with this latest technology. In this technique each RSU determine and stores various parameter value after getting the inspiration packets from vehicles which are located nearby to them [11].

III. METHODOLOGY

A. Base Work

Greedy Perimeter Stateless Routing (GPSR)

The Greedy Perimeter Stateless Routing is depending on exact positioning of the routers and every node has access to a location service and position coordinates must be known. GPSR makes greedy forwarding decisions which are based upon data of a router's immediate neighbours in the network topology. The best next hop is considered the neighbour node with the least distance from the destination. When the greedy forwarding is impossible, the algorithm recovers by routing around the perimeter of the region.

B. Proposed Work

Greedy Perimeter Coordinator Routing (GPVR)

Greedy Perimeter Vector Routing (GPCR) is a position-based routing protocol. The main plan of GPVR is to take advantage of the fact that streets and junctions form a natural planar graph, without any help of global information for example static street map. GPVR protocol having two parts: First one is restricted greedy forwarding procedure and second one is repair strategies which depend upon topology of actual-world streets and junctions and no requirement of any specific algorithm. As we know that junction are those points where execution of actual routing carried out. It must be kept in mind that packets which contain information must be forwarded to a node on a junction and not being forwarded across a junction. A coordinator broadcasts its role along with its position information. Assume for a very first step that every node knows whether it is located in the area of a junction or not.

Algorithm

l. Here create a road topology with the help of node in ns2.35.
2. Every node maintains a neighboring list based on the latest data collected after regular interval of time. Information messages are passed to each one-hop neighbor. If a node unable to get messages or data from one neighbor during time period, then that link will be considered as down.
3. For route estimation a graph $G(V, E)$ theory is used to consisting of a road intersections or junctions $v \in V$ and road segments $e \in E$ here every segments are connected with the intersections.

Optimal Route Selection:

Procedure l: route discovery

Input: ID of source node S and Destination node D

Outputs: optimal route from source to destination

Begin

if (ID D = ID N)

Forward packet to D;

Else

Determine the rectangle restricted searching area;

searching_area = [Xmin , Xmax , Xmin, Xmax];

broadcast RREQ to D in the searching_area;

Activate (BROADCAST_TIMER);

Calculate route probability of connectivity and packet delay;

if (p max – p other > E)

return route with the probability of connectivity pmax;

else

delete routes with the probability of connectivity p other < p max – p threshold;

return route with packet delay d min;

end if

end if

End of Route Discovery

Next-Hop selection

Procedure 2: Next-Hop selection

Inputs: positions and speed of the neighbours

Outputs: The optimal next-hop forwarding node

begin

do

if (D forwarding_road_segment = D current_road_segment)

else

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forward to the N intersection_node;

else

forward the packet directly to its farthest N neighboring_node;

while (forwarding node is not destination node);

forward packet to destination node;

end if

end if

end while

End of Next-hop Selection

IV. EXPERIMENTAL RESULT

Software NS-2: Network Simulator 2 toll is very an open source network simulation tool. NS2 tool is discrete, object oriented and event driven simulator and it is written in following two languages that is C++ and Otcl. Network simulator mainly used in network researches and its primary function is to simulate different types of wide area networks, wired network and wireless network. The performance of Energy Efficient based Cluster protocol in WSN is being estimated with the help of simulation on network simulator-2. Results will be determined with help of .awk script. Using the output we plotted the bar graphs of following parameters .The result is carried out by NS-2 Simulator using following Parameters.

(A) Throughput: The aggregate throughput is the total number of bytes received at the destination divided by the total time duration. This aggregates all the flows in the network.

(B) Packet Delivery Ratio: The packet delivery percentage represents the percentage of total sent packets from source nodes, which are successfully received at the destination nodes.

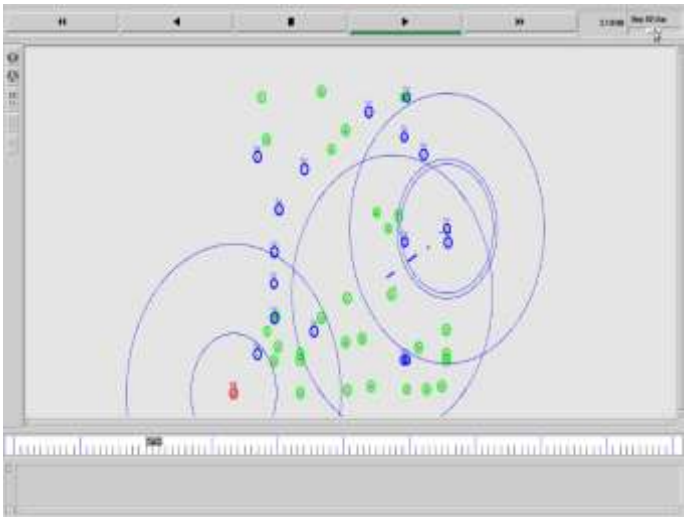

Figure 6 Starts of Communication and Cluster Head

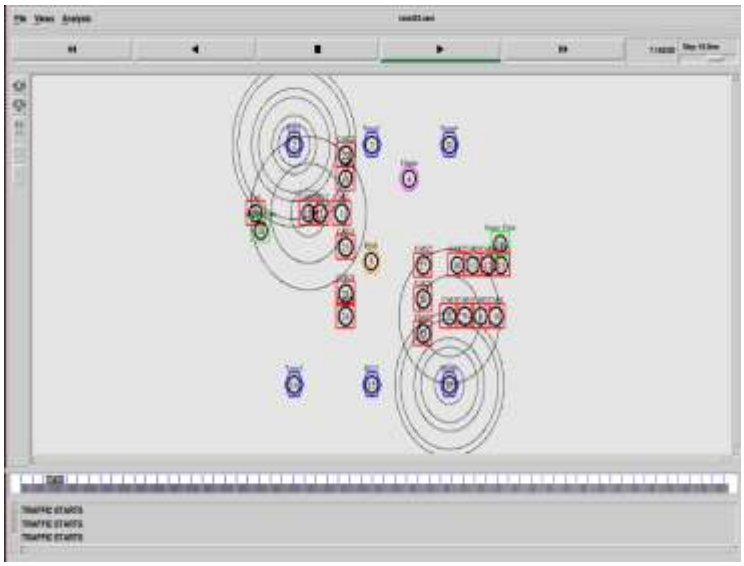

Figure 7 Producing Road Side Unit, Destination and Source point

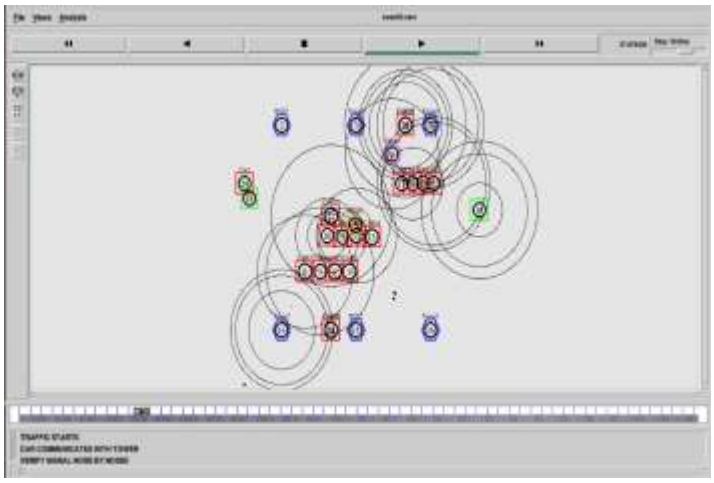

Figure 8 Start of Communication using CH in VANET

(C) Routing Overhead: The measure of routing packets (non-data) generated by the protocol.

(D). Average End to End Delay: The end-to-end delay is the averaged results of how long it takes a packet to go from the source to the destination.

For this a system is required with UBUNTU version l2.04 and CPU of INTEL (R) Core2 Duo l.80GHz with RAM 3GB

Table l: Configuration Parameters of in NS-2 Simulator

PARAMETERS	VALUES
OPERATING SYSTEM	Linux (UBUNTU l2.04)
NS-2 VERSION	NS-2.35 for IEEE 802.llExt
NO. OF VEHICIES	l0, 20, 30, 40,50

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NUMBER OF ROAD SEGMENTS	4
SPEED OF VEHICIES	20 m/s
RADIO PROPAGATION MODEl	Propagation/Two Way Ground
NETWORK INTERFACE TYPE	Physical/WirelessPhyExts
PACKET SIZE	5l2
TRAFFIC TYPE	UDP/CBR
SIMUlATION TIME	l00s
ANTENNA TYPE	Omni-Antenna
TRANSMISSION RANGE	l000*l000 m
ROUTING PROTOCOl (PROPOSED)	GPVR

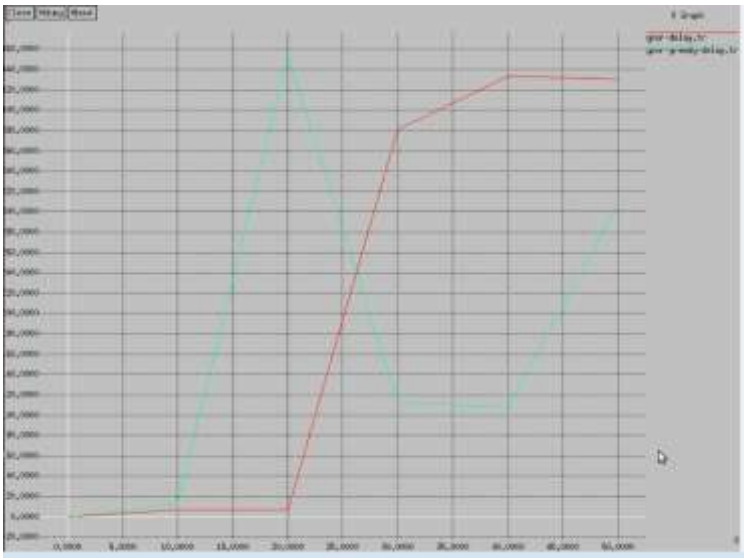

Figure l1 Comparison of Average Delay between GPSR &GPVR protocol

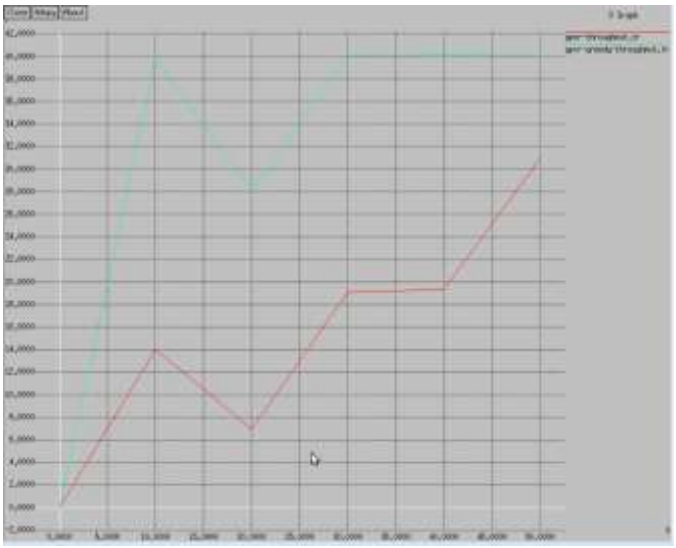

Figure 9 Comparison of Throughput between GPSR &GPVR protocol

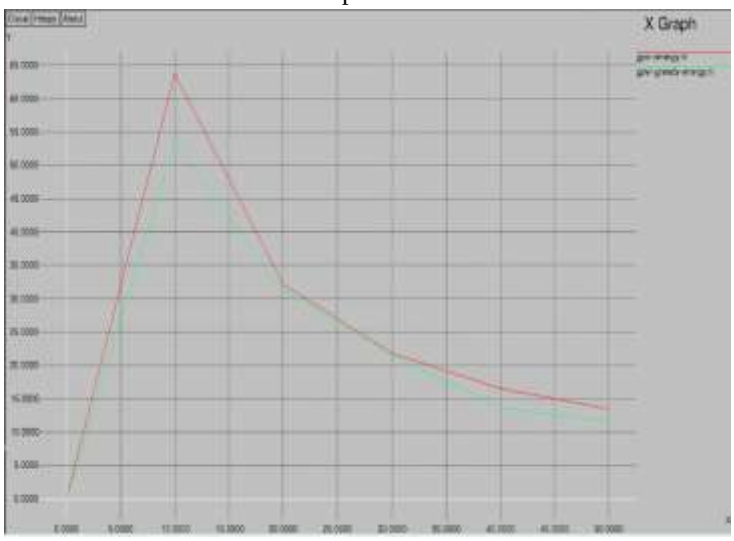

Figure 12 Comparison of Energy between GPSR &GPVR protocol

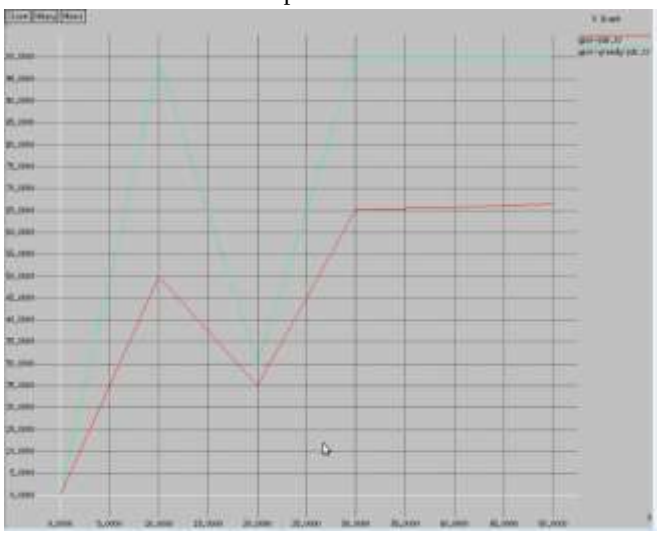

Figure 10 Comparison of PDR between GPSR &GPVR protocol

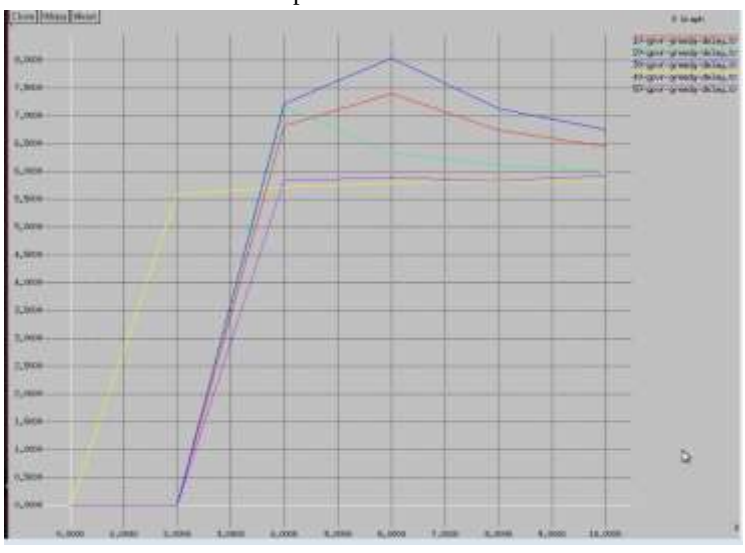

Figure l3 GPVR protocol End-to-End Delay of l0 to 50 Nodes

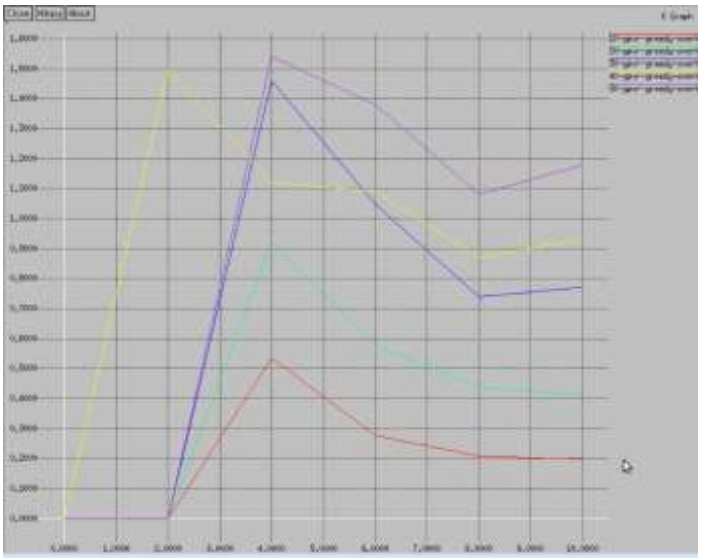

Figure l4 GPVR protocol Overhead of l0 to 50 Nodes

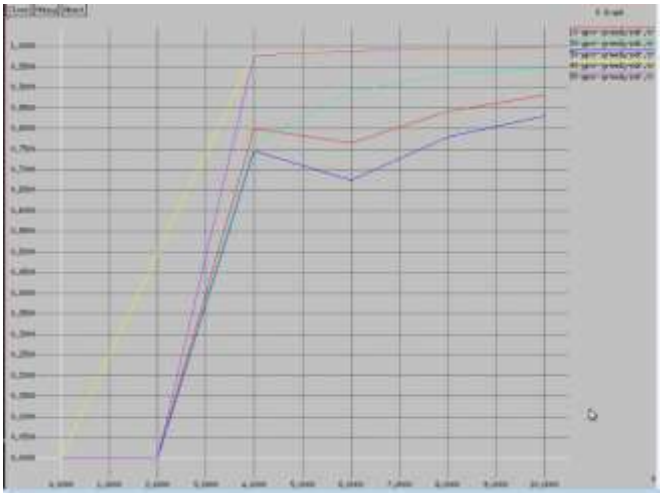

Figure l5 GPVR protocol Packet Delivery Ratio of l0 to 50 Nodes

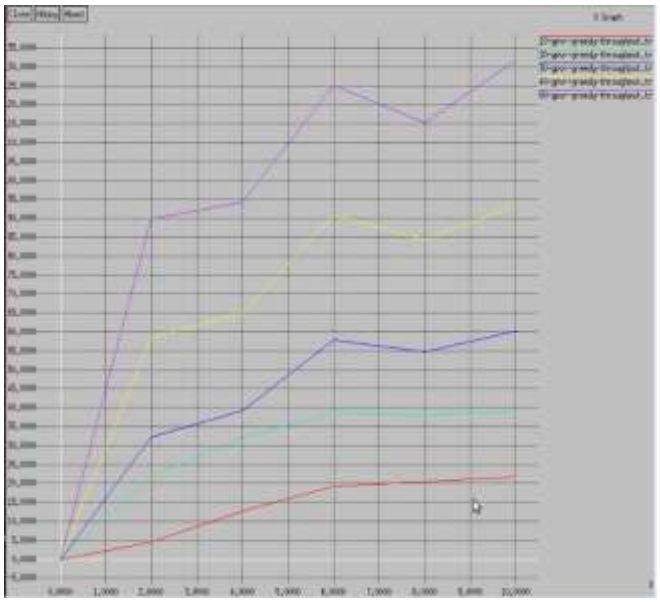

Figure l6 GPVR protocol Throughputs of l0 to 50 Nodes

V. CONCLUSION

Vehicular ad-hoc networks (VANET) are established to make communication between vehicles possible using ad hoc wireless devices. With pace of time, these networks have become a latest technology due to vast applications in different system like in intelligent transportation systems. VANET is special case of MANET. In our research work existed protocol that is GPSR and proposed protocol both are implanted successfully for different parameters for example end-to-end delay, throughput, packet delivery ratio and routing overhead for different node. In our work l0 to 50 nodes are examined and these parameters are calculated for both protocols. After carrying out simulated result in NS2 finally deep analysis carried out about these two protocols that are GPSR and GPVR which one is better. The performance has been evaluated based on parameters that aim to figure out the effects of routing protocols. Finally we came across a conclusion that GPVR protocol having very low routing overhead. Out of these GPVR protocol is far better than GPSR protocol. GPVR perform better in terms of mobility, traffic load and network size as compared to GPSR.

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