PERFORMANCE EVALUATION AND IMPROVEMENT OF PERFORMANCE OF ROUTING PROTOCOL OF VANET

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ABSTRACT

In enormous and medium measured urban areas, transports have the accompanying elements: thickness directions, customary courses, predicable versatility, and so forth. In the multi-AP street organize, every transport knows other's predefined plans and settled courses.. In this paper, we try to performance enhancement of data delivery through improving the throughput and packet deliveryy ratio and reducing the Packet loss ratio and Normalize Routing Load by creating realist scenario in VANETsim simulator. And also evaluate our performance with existing routing protocol.

Keywords: *VANET, RSU, OBU, V2V, V2I, OLSR and I2V.*

1. INTRODUCTION

Over the last few decades due to the increasing number of life lost in the road accidents, "Vehicular Ad hoc Networks i.e. VANETs", arises as the most exciting topic in the research area. It is the coming up as reliable network for the drivers as well as passengers to provide security. In present day, it is a main feature of the" intelligent transport system (ITS)".

A VANET is an uncommon instance of a "Mobile Ad hoc Network i.e. MANET" on that vehicles are furnished with remote and handling capacities can make an unconstrained system when moving individually on the road. Direct remote correspondence from "vehicle to vehicle i.e.V2V" make it conceivable to trade information even where there is no correspondence infrastructure , such as base stations of mobile phones or get to purposes of remote systems

VANET is established by defined the standard802.11p or 802.16 (WiMax) by IEEE. A Dedicated Short Range Communication (DSRC) is the main part of WAVE that is known as 802.11p provides short range communication with low latency .It is operating on 5.9GHz band .USA has allocated 75MHz of spectrum in the 5.9GHz band and Europe has allocated 30 MHz of spectrum in the 5.9GHz band for DSRC to be used by Intelligent Transportation Systems (ITS).

Vehicular specially appointed systems are in charge of the correspondence between moving vehicles in a specific situation. A vehicle can communicate with another vehicle straightforwardly which called Vehicle to Vehicle (V2V) is correspondence, or a vehicle can impart to an infrastructure, for example, a Road Side Unit (RSU), known as Vehicle-to-Infrastructure (V2I).

This paper explores the design and analysis of a real network using VANETsim simulator, focusing on the improvement of throughput and packet delay ratio. These two are the major performance evaluation matrices of the network. . So, the analysis of these evaluation matrices has been done in the paper. The simulated throughput,packet loss ratio , normalize routing load and packet delivery ratio is then compared to the existing Optimize Link State routing (OLSR) Protocol to evaluate the performance of our real time network results The performance evaluation of VANET is done using the VANETsim.

2. ROUTING PROTOCOLS

Lots of research and studies have been done in the direction of providing a best routing protocol to the VANET.As the different researcher focuses on different routing protocol for different network such as single ad hoc routing protocol, position based routing protocol, topology based routing protocol etc. to provide a best solution of the challenges face by the VANET environment. This leads to the study of these all routing protocol based on network type in comparative manner. So, according to this routing protocol of VANET can be classified in five main categories [6].That are

A. Topology based routing protocol
B. Position based routing protocol,
C. Cluster based routing protocol
D. Geo cast routing protocol
E. Broadcast routing protocol.

A. Topology based routing protocol

These routing protocols utilize the route information that resides in network to forward the packet to the destination. These can be classified into two types [7]:

A.1. Proactive routing protocol

These protocols are table driven protocol, this means that it create, manipulate the table at each node by updated information. VANET needs to manage more than one able to transmit the information to the destination node [7].These protocol use the shortest path algorithm to find out the path to the destination. It usually uses "Link State Strategy" and "Distance Vector Strategy" to find out the route [8].
Various routing protocol is designed that is based on the proactive ad hoc routing protocol. Some of them are "FSR i.e. Fisheye state routing", "DSDV i.e. Destination-Sequenced Distance-Vector Routing ", "OLSR i.e. Optimized Link State Routing Protocol", "CGSR i.e. Cluster head Gateway Switch Routing","WRP i.e. Wireless Routing protocol" "TBRPF i.e. Topology Dissemination Based on Reverse Path Forwarding" .

A.2. Reactive routing protocol

Reactive routing protocol is on-demand routing protocol.It decreases the load of the network by making a route only when it is needed. When the packets are overflow in the network it creates a phase of route discovery and complete it when founded the route [7].It also include various routing protocols such as "AODV i.e. Ad Hoc on Demand Distance Vector" ,"PGB i.e. Preferred Group Broadcasting" ,"DSR i.e. Dynamic Source Routing" ,. "TORA i.e. Temporally Ordered Routing Algorithm.

A.3. Hybrid routing protocol

Hybrid routing protocol introduce as the combination of both these protocol and provide the better facility than these protocols[9].In this section only two protocols included first is "ZRP i.e. Zone routing protocol" and second is "HARP i.e. Hybrid Ad Hoc Routing Protocol" .

B. Position based routing protocol

Position based routing protocol is also known as Geographic based routing protocol deliver a packet based on the geographic position instead of network address. These protocol depend on the "Geographic Position System i.e. GPS" to find the location of its neighbor. It is considered as more stable than Topology based routing protocol due to its no need of route discovery; table management and knowledge of topology change [8].These are further classified as non-delay tolerant network, delay tolerant network and hybrid.

B.1. Non- Delay Tolerant Network

In this type of routing protocol, there is need to connect the nodes continuously. This can be further divides as Becon, Non Becon and Hybrid.Becon . And Becon is subdivided as Non-Overlay, and Overlay This protocol attract the attention of many researchers so as to improve its efficiency many protocols is designed such as GPSR : Greedy Perimeter Stateless Routing, "PRB-DV i.e. Position-Based Routing with Distance Vector Recovery" , "GRANT i.e. Greedy Routing with Abstract Neighbor Table" , "GPCR i.e. Greedy Perimeter Coordinator Routing" ,"GpsrJ+", "CAR i.e.Connectivity Aware Routing Protocols, "GSR i.e. Geographic Source Routing" ,"ASTAR i.e. Anchor-Based Street and Traffic Aware Routing,"STBR i.e. Street Topology Based Routing", "GyTAR i.e Greedy Traffic Aware Routing protocol, "LOUVRE i.e.Landmark Overlays for Urban Vehicular Routing Environments, "DIR i.e. Diagonal-IntersectionBased Routing Protocol", "ROMSG i.e. Receive on Most Stable Group-Path", "AMAR i.e. Adaptive movement aware routing protocol" ,"EBGR i.e. Edge node based greedy routing protocol" , "B-MFR i.e. Border-node based most forward within radius routing protocol" , "ARBR i.e. The Associativity-Based Routing" [36] , "MORA i.e.Movement-Based Routing" ,"VGPR i.e. Vertex-Based predictive Greedy Routing",; "MIBR: Mobile Infrastructure Based VANET Routing" ,; "DTSG Dynamic TimeStable Geocast Routing" ,"TOGO i.e. Topology-assist Geo-Opportunistic Routing", "CBF i.e.Contention-Based Forwarding".

B.2. Delay tolerant network

In this type of routing protocol, there is no need to connect the nodes continuously. It included protocols are "VADD i.e. Vehicle-Assisted Data Delivery" and "GeOpps i.e. Geographical Opportunistic Routing"

B.3. Hybrid Position Based Protocol

In order to rectify the problem of Non–delay tolerance and delay tolerance protocol, Hybrid Position Based Protocol introduces as the combination of both these protocol and provide as facility of partial connectivity [9].It includes only one protocol that is GeoDTN+Nav

C. Cluster Based Routing Protocol

A new routing concept that is known as Cluster Based Routing is introduce in the direction of reducing the traffic ,congestion and overheads of routing. In this cluster refers to the small vehicle‟s group that forms a network. In this protocol, one head knows as cluster head leads the main role and broadcast the packets to each node of the cluster for which it refers to. The designed routing algorithm decides the cluster‟s size and depends on the number of nodes and nodes geographical position [10].
The various protocols that are designed in this section are "CBDRP i.e. Cluster-Based Directional Routing Protocol", "TIBCRPH i.e. Traffic Infrastructure Based Cluster Routing Protocol with Handoff", "LORA-CBF i.e. Location Routing Algorithm with Cluster Based Flooding"," COIN i.e. Clustering for Open IVC Network", "HCB i.e. Hierarchical Cluster Based Routing", "CBLR i.e. Cluster Based Location Routing", "CBR i.e. Cluster Based Routing".

D. Geo Cast Routing Protocol

This protocol is based on location. In this protocol, every node communicates to only that node which is its defined geographical region and it is called to as Zone Of Relevance. Sender node does not have capability to send the message beyond the relevance zone. Each node delivers the packet to all other nodes that are within a specified geographical region which is said to be as zone of relevance [9].
The various protocols that are designed in this section are "IVG i.e. Inter-Vehicle Geocast", "DG-CASTOR i.e. Direction-based GeoCast Routing Protocol for query dissemination in VANET", "DRG i.e. Distributed Robust Geocast", "ROVER i.e. Robust Vehicular Routing", "DTSG i.e. Dynamic Time-Stable Geocast Routing".

E. Broadcast Routing Protocol

These routing protocols [9] are utilized where there is eed to exchange the messages which are related to safety. The broadcast routing protocol uses the flooding method to rebroadcast the message by each node to another node. This ensures the message arrival at the destination node. The disadvantage of this protocol is its high cost. It is more suitable for low number of nodes because for high number of nodes it causes collision in the network.
The various protocols that are designed in this section are "BROADCOMM", "UMB i.e. Urban Multihop Broadcast Protocol", "V-TRADE i.e. Vector Based Tracing Detection", "DV-CAST i.e. Distributed vehicular broadcast protocol", "EAEP i.e. Edge-aware epidemic protocol", "SRB i.e. Secure Ring Broadcasting", "PBSB i.e. Parameter less broadcasting in static to highly mobile wireless ad Hoc".

3. EXISTING WORK

In paper [11] author used NS2.35 simulator and examine the three protocol that are DSDV, AODV and LSGR in term of delay, PDR, with throughput and NRL and shows that LSGR achieve lower delay, best PDR, best throughput among the three protocols and in case of NRL ,DSDV gives best result .
In paper [12] author present that map variation of selected urban can affect the network performance. In his paper author compare three protocols that are OLSR, AODV and GPSR in term of DBL and show that GBSR perform better among the three protocols and provide stable performance with lowest delay.
In paper [13] author show the comparison between two "location-based routing protocols" that are SIFT (Simple Forwarding over Trajectory) and DREAM(Distance Routing Effect Algorithm for Mobility), in a realistic urban mobility model for VANETS (Vehicular Ad hoc NETworks). Author also describe that "Classical ad-hoc routing schemes" is not suited properly in VANETS because they are not efficient for the mobility handicaps. "Position-based techniques" gives better result in dynamic scenarios, but in VANET scenario, they cannot guarantee to work efficiently. "Trajectory-based protocols" gives best result in VANET because of spatial-awareness. In his paper author shows that SIFT achieve better result than DREAM in term of delivery ratio, control overhead, delivery delay, and route length.
In paper [14] author demonstrate performance evaluation AOMDV routing protocol in two different traffic pattern Constant Bit Rate (CBR) & transmission Control Protocol (TCP) using Network Simulator 2 (NS2) in the wireless channel of VANET environment. Author tries to ignore traffic jam on the basis of variable time duration such as day or night and to efficiently give best route to the vehicle used for emergency services like Ambulance, Fire Brigade, Police vehicle, etc. Author also tries to improve the AODM by taking different parameters into consideration.
In paper [15], author combines TraCI that is a tool of SUMO, with NS3 and compare the performance of four different "topology based routing protocols" that are AODV, DSR, TORA and DSDV. By changing node mobility and node density author find out the result in term of Packet Drop Ratio, Average Delay and Normalized Routing Load. Author evaluate that there are DSDV's is better than the AODV, TORA and DSV in case of Average delay but perform poor in case of Packet Drop Ratio and Normalized Routing Load. AODV perform better than others in case of node density and TORA is well suited for low nodes density and high dynamic network.
In paper [16] author evaluate the performance of Ad-hoc On-Demand (AODV), Dynamic Source Routing (DSR) and Destination-Sequenced Distance Vector (DSDV) routing for the performance metric such as of Packet Delivery Ratio, Average End to End Delay, Latency and Throughput using Matlab simulator and demonstrate that the AODV is better than DSR and DSDV.
In paper [17], author evaluates the performance of Non-DTN that are GPSR, GPSR+AGF, GSR, and GPSRJ+. The main reason of this protocol is these are the basic of many new introduced routing protocols. Author used Veins which is middleware of SUMO and OMNeT++ simulator and simulate that GPSR+AGF and GPSRJ+ achieve better Packet Delivery Ratio in all condition, GSR show low Average Delay than other protocols, GPSR, GPSR+AGF, GPSRJ+, and GSR show nearly similar results in case of Traffic Control Overhead and GPSRJ+ demonstrate best result in term of Average Hop Count.

4. PROPOSED METHODOLOGY

In our proposed methodology we try to establish a network that is able for better information transmission through minimizing delay and increasing the thoughput of the network
In our paper, by using VANETsim simulator we establish a real scenario of VANET and wok on it.In this, we try make real condition of road and vehicle scenario .Then we put the active wireless and known vehicles on it.After

that we create unique messages and transmit it in the network and get the number of failed message and ecieved messages from total number of transmitted messages.Through it, we analyse the throughput, packet loss and packet delay ratio to better the VANET scenario. We also include the speed of the vehicle,distance travelled by the vehicles and travelling time.

- **Throughput = (Total Successful Packets Recieved * 100) / Total Simulation Time**
- **Packet Delivery Ratio = (Total Number Of Received Packets*100) / Total Number of Sent Packets**
- **Packet Loss = Total Number of Sent Packets – Total Number Of Received Packets**
- **Packet Loss Ratio = (Total Number Of Loss Packets*100) / Total Number of Sent Packets**
- **Normalize Routing Load = Total Number Of Sent Packets/ Total Number of Received Packets**

5. SIMULATION MODEL

The simulation of VANET network is done using VANETsim simulator which is an open source simulator with the environment of jdk. It is light in weight, free available as "GNU GPLv3", discrete event traffic and communications simulator that, mainly target on the VANET"s security concepts. It focuses the application layer's simulation to achieve maximum performance. It provides us various features that make it different from other simulators such as:

- To the best of our insight, VANETsim is the main test system particularly intended to examine assaults on security and protection and additionally countermeasures on the application layer. New assaults and countermeasures can be coordinated effortlessly on the grounds that the API gives abnormal state access to every applicable data structures.
- The consisted "Scenario Creator" able us to perform repeatable experiments with changeable parameters and that can debug on one click.
- It gives a nearby guess of this present reality with a specific end goal to acquire reasonable outcomes. It utilizes a smaller scale movement display that recreates driving choices of individual autos and permits bringing in street systems from OpenStreetMap (http://www.openstreetmap.org).
- It allow us to control at high level with realistic simulations, artificial scenarios (e. g., with simple graphs as road networks) can be constructed to validate the results.
- It gives us facility to perform realistic experiments with greater than 16,000 vehicles and also able to create long road networks on off-the-shelf desktop hardware. [18].

6. SIMULATION PARAMETER AND RESULT

- Figure 1 gives the throughput information that is analysis by our find out result and shows that our proposed results are better than OLSR as it exhibits higher throughput than OLSR for different no of vehicles.
- Figure 2 gives the Packet delivery Ratio information that is analysis by our find out result and shows that our proposed results are better than OLSR as it exhibits higher PDR than OLSR for different no of vehicles.
- Figure 3 gives the Packet Loss Ratio information that is analysis by our find out result and shows that our proposed results are better than OLSR as it exhibits lower Packet Loss Ratio than OLSR for different no of vehicles.

- Figure 4 gives the Normalize Routing Load information that is analysis by our find out result and shows that our proposed results are better than OLSR as it exhibits lower Normalize Routing Load than OLSR for different no of vehicles.

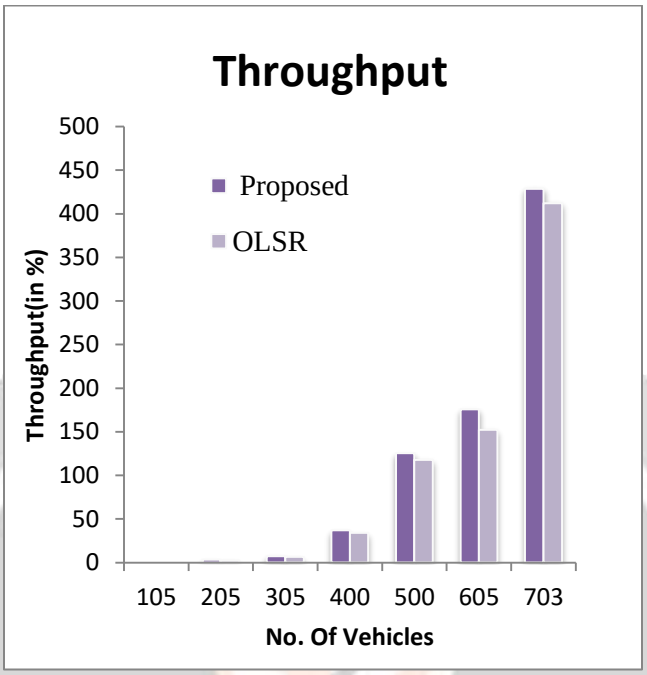

Figure 1:- Simulation Result : Throughput

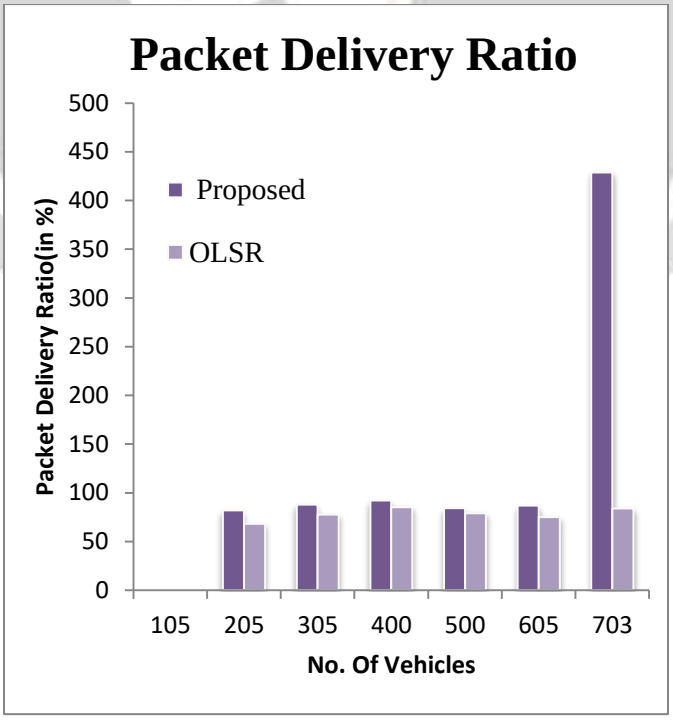

Figure 2:- Simulation Result : Packet Delivery Ratio

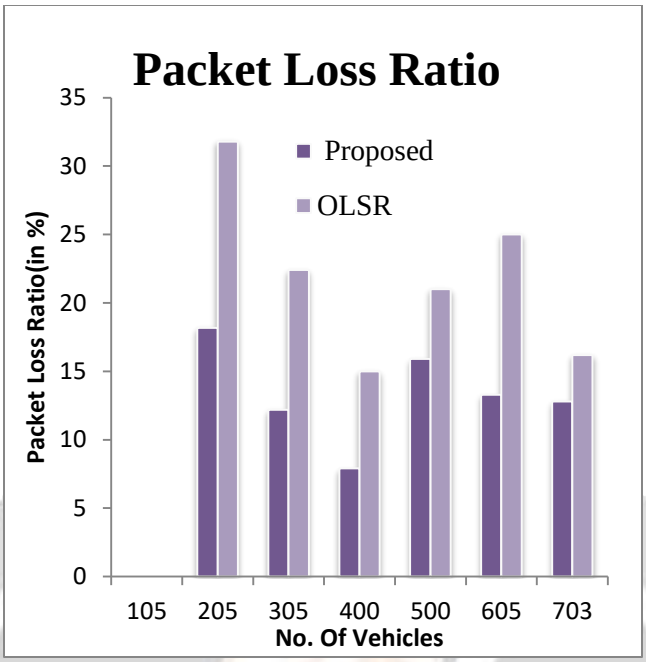

Figure 3:- Simulation Result : Packet Loss Ratio

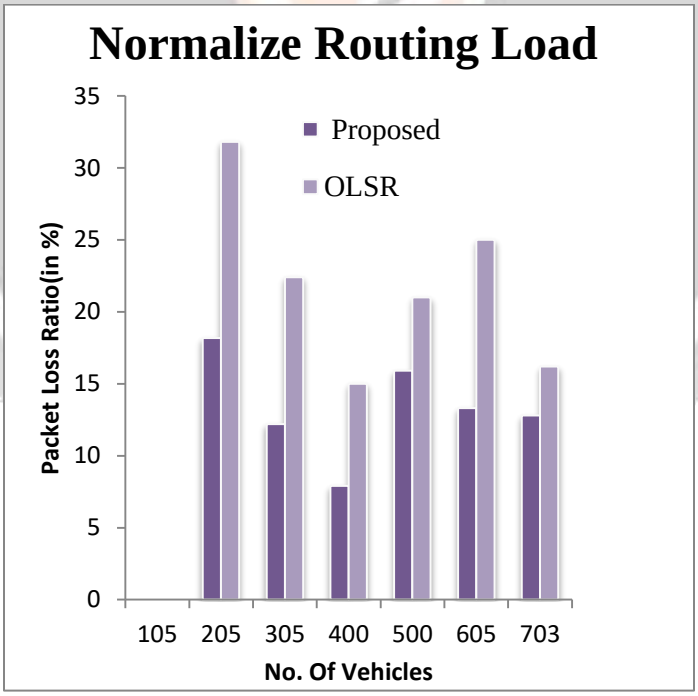

Figure 3:- Simulation Result : Normalize Routing Load

Parameter	Value
Network Simulator	**VANETsim**
Number Of Nodes	**50**
Dimension Of Simulated Area	**1000*1000**
Routing Protocol	**OLSR**
Simulation Time (sec)	**600**
Maximum Speed(m/s)	**Random**
Transport Protocol	**UDP**
Application Type	**CBR**
Packet Size (bytes)	**512**

Table 1: Simulation Parameter

7. CONCLUSION

Due to the increasing death rate in the vehicular road accidents because of the poor data exchange inreal time ,it is necessary to improve the performance of the network by maximize the throughput and packet delivery ratio and decrease the packet loss ratio and normalize routing load in VANET environment.For,this we work on this direction and by utilizing some of the parameters we get sucees of doing this and also to minimize the packet delay in the network.

To ensure our simulatrd result we compare it with the existing protocol that is OLSR and prove that our proposed result is better than OLSR .

VANET is the better choice to decreases the road accidents done by the vehicle. The simulation is predicted only for 50 nodes and comparison is done only with the single existing protocol i.e. OLSR. So this work can be extended for more number of nodes by establishing a best algorithm that give more better results for VANET environment.

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