IARJSET
ISSN (Online) 2393-8021
ISSN (Print) 2394-1588
International Advanced Research Journal in Science, Engineering and Technology
ISO 3297:2007 Certified
Vol. 5, Issue 6, June 2018

An Enhanced Approach for Minimizing Duplication in VANET Using Multipath Routing Protocol with Cognitive Network

Kamaljot Kaur[1], Harpreet Kaur[2]

Student, LLRIET, Moga[1]

Assistant Professor, LLRIET, Moga[2]

Abstract: VANET is the field of communication that has been used for ITS. In this vehicles have been used for auto driven system. VANET communication is based on various routing protocols that have been used for end to end communication. On the basis of these routing protocols path for data transmission has been established. Data in VANET must be transmitted in particular interval of time so that better performance can be achieved through VANET. In this paper a novel approach has been developed that is cooperative with multipath routing protocol so that better establishment can be done. In this process spectrum sensing has been used for sensing of idle channels from radio band. In this process of multipath routing packet loss has been measured and that is compared with threshold value. On the basis of threshold value a decision has been developed to utilize spectrum sensing. Proposed approaches provide better results as compare to existing approaches.

Keywords: VANET, ITS, AOMDV, Spectrum Sensing and CSMA.

1. INTRODUCTION

1.1 VANET

A VANET uses cars as mobile nodes in a MANET to create a mobile network. A VANET turns turn participating car into a wireless router or node which allowing cars 100 to 300 meters of each other to connect and create a network with a wide range. As cars fall out of the signal range and drop out of the network, other cars can join in, connecting vehicles to one another so that a mobile network is created. It is estimated that the first systems that will be this technology are police and fire vehicles to communicate with each other for the purpose of security.

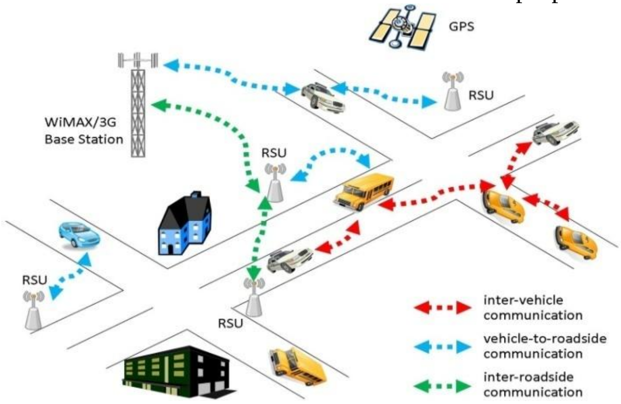

Figure 1: Architecture of VANET

1.2 Types of Communication in VANET'S

There are three types of Communications in VANET'S and are described below

1.2.1 Inter-vehicle communication

The inter-vehicle communication configuration uses multi-hop multicast/broadcast to transmit traffic related information over multiple hops to a group of receivers. In intelligent transportation systems, vehicles need only be concerned with activity on the road ahead and not behind (an example of this would be for emergency message dissemination about an imminent collision or dynamic route scheduling). There are two types of message forwarding in inter-vehicle communications: native broadcasting and intelligent broadcasting.

 DOI 10.17148/IARJSET.2018.565

1.2.2 Vehicle-To-Roadside Communication

Vehicle-to-roadside communication configuration represents single hop broadcast where the roadside unit sends a broadcast message to all equipped vehicles in the vicinity [5]. Vehicle-to-roadside communication configuration provides a high bandwidth link between vehicles and roadside units.

1.2.3 Routing-Based Communication

The routing-based communication configuration is a multi-hop uncast where a message is propagated in a multihop fashion until the vehicle carrying the desired data is reached.

1.3 APPLICATION OF VANET

According to the DSRC, there are over one hundred recommended applications of VANETs. These applications are of two categories, safety and non-safety related. Moreover, they can be categorized into OBU-to-OBU or OBU-to-RSU applications [12].

i. Co-operative Collision Warning: Co-operative collision warning is an OBU-to-OBU safety application, that is, in case of any abrupt change in speed or driving direction, the vehicle is considered abnormal and broadcasts a warning message to warn all of the following vehicles of the probable danger.

ii. Lane Change Warning: Lane-change warning is an OBU-to-OBU safety application, that is, a vehicle driver can warn other vehicles of his intention to change the travel lane and to book an empty room in the approaching lane. Again, this application depends on broadcasting.

iii. Intersection Collision Warning: Intersection collision warning is an OBU-to-RSU safety application. At intersections, a centralized node warns approaching vehicles of possible accidents and assists them determining the suitable approaching speed. This application uses only broadcast messages.

Iv. Approaching Emergency vehicle: Approaching emergency vehicle is an OBU-to-OBU public-safety application, that is, high speed emergency vehicles (ambulance or police car) can warn other vehicles to clear their lane. Again, this application depends on broadcasting.

v. Rollover Warning: Rollover warning is an OBU-to-RSU safety application. A RSU localized at critical curves can broadcast information about curve angle and road condition, so that, approaching vehicles can determine the maximum possible approaching speed before rollover.

vi. Work Zone Warning: Work zone warning is an OBU-to-RSU safety application. A RSU is mounted in work zones to warn incoming vehicles of the probable danger and warn them to decrease the speed and change the driving lane.

vii. Coupling/Decoupling: Coupling/decoupling system is an OBU-to-OBU non-safety application that is designed to link multiple buses or trucks into a train to minimize the headway distance and traveling time and to decrease rear end crashes. In August 2003, California PATH project practically tested this application on a three bus platoon.

1.4 Cognitive Radio

A cognitive radio is an intelligent radio that can be programmed and configured dynamically. Its transceiver is designed to use the best wireless channels in its vicinity. Such a radio automatically detects available channels in wireless spectrum, then accordingly changes its transmission or reception parameters to allow more concurrent wireless communications in a given spectrum band at one location. This process is a form of dynamic spectrum management. In response to the operator's commands, the cognitive engine is capable of configuring radio-system parameters. These parameters include "waveform, protocol, operating frequency, and networking". These parameters are used to communication to cognitive radio. This functions as an autonomous unit in the communications environment, exchanging information about the environment with the networks it accesses and other cognitive radios (CRs). NS2 is the network simulator tool which used for implementation of the proposed problem. To choose NS2 because of users just need to replace their own Routing and MAC algorithms according to NS-2 protocol design requirements with the existing one in the CRCN.

1.5 Spectrum Sensing

The important requirement of cognitive radio network is to sense the spectrum hole. Cognitive radio has an important property that it detects the unused spectrum and shares it without harmful interference to other users. It determines which portion of the spectrum is available and detects the presence of licensed users when a user operates in licensed band. The spectrum sensing enables the cognitive radio to detect the spectrum holes. Spectrum sensing techniques can be classified as frequency domain approach and time domain approach. In frequency domain method estimation is carried out directly from signal so this is also known as direct method. In time domain approach, estimation is performed using autocorrelation of the signal.

2. REVIEW OF LITERATURE

Chen et al (2007) analyzed a completely revised architecture and design for these two modules. The resulting PHY is a full featured generic module able to support any single channel frame-based Communications. The key features include cumulative SINR computation, preamble and PLCP header processing and capture, and frame body capture. The MAC accurately models the basic IEEE 802.11 CSMA/CA mechanism, as required for credible simulation studies. The newly designed MAC models transmission and reception coordination, back off management and channel state monitoring in a structured and modular manner. In turn, the contributions of this paper make extending the MAC for protocol researches much easier and provide for a significantly higher level of simulation accuracy.

Fu et al (2008) surveyed Multi-core processors are anticipated to become a major development platform for real-time systems. However, existing power management algorithms are not designed to sufficiently utilize the features available in many multi-core processors, such as shared L2 caches and per-core DVFS, to effectively minimize processor energy consumption while providing real-time guarantees. In this paper, we propose a two-level utilization control solution for energy efficiency in multi-core real-time systems. At the core level, our solution addresses two optimization objectives: controlling the CPU utilization of each core to its desired schedulable bound and minimizing the core energy consumption by adopting per-core DVFS and dynamic L2 cache partitioning to adapt both the CPU frequency-dependent and independent portions of the task execution times of the core. Since traditional control theory cannot handle multiple optimization objectives, a novel utilization controller is designed based on advanced multi-objective model predictive control theory.

Batty et al (2009) described that with the widespread adoption of Wireless technology, Wi-Fi Access Points are deployed more and more inside buildings as well as public areas. As part of the Technology Enhanced Campus (TEC) project, this paper presents two algorithms that are used to determine Wi-Fi location and zone recognition around the University campus. Using the signal strength and the MAC address of the nearby Access Points, the first algorithm is based on selecting the maximum strength MAC address and the second upon selecting the minimum dot product distance between the measured MAC address vector and a set of stored vectors. The Verona diagrams obtained from the metrics arising from both algorithms are studied. Using test cases, results of experiments carried out to find the closest fits of vector Verona diagrams to the physical infrastructures and buildings are discussed.

Tsukamotoet al (2009) analyzed that with the use of dynamic spectrum access techniques has a great potential in future inter-vehicle communications, while it must cope with (i) temporal and spatial spectrum utilization changes introduced by the primary and secondary users (environmental changes); and (ii) topology changes due to movement of vehicles (spatial movement). In the present paper, along this line, dynamic per-hop channel switching in multi-hop vehicular ad hoc networking is investigated.

Pagadarai et al (2009) presented quantitative and qualitative results obtained as a result of a TV spectrum measurement campaign. We used these measurements to characterize vacant TV channels a along major interstate highway (I-90) in the state of Massachusetts, USA. By characterizing the availability of vacant TV channels in the 470-806 MHz frequency range, we show the trends in the availability of vacant channels from a vehicular dynamic spectrum access perspective. We also describe the design constraints imposed on a point-to-multipoint communications based architecture in such a setting.

3. METHDOLOGY

VANET is the extension of MANET that has been used for simulation of vehicles on the real traffic environment. In the processing of VANET various phases has been used for development of VANET as well as data transmission in VANET.

3.1 Steps Followed

This work will be done by using network simulator NS2. This work will be completed in three phases which are given below.

Step I: In first phase ad-hoc network will be created by initializing number of nodes and then cognitive network will be implemented in which spectrum sensing is done. Spectrum sensing is done to know about the free bands so that they can be utilizing to send emergency messages.

Step II: In second phase bandwidth of channel will be increased so as to avoid congestion and avoid loss of important data. In this phase transmission range to nodes will also be calculated.

IARJSET
ISSN (Online) 2393-8021
ISSN (Print) 2394-1588
International Advanced Research Journal in Science, Engineering and Technology
ISO 3297:2007 Certified
Vol. 5, Issue 6, June 2018

Step III: In third phase priority will be given to vehicles. High priority will be given to those vehicles which will be close to their destination or can be said that which will be in transmission range.

VANET deals with communication of vehicles on the roads for movements of the vehicles. In the proposed work VANET scenario has been developed by initializing simulation parameters for VANET. In the simulation setup of VANET different approaches have been defined that number of lanes, vehicles, MAC type, routing protocol. In the processing of VANET nodes have been initialized and transmit information to RSU available in the network. Road Side unit available in the network utilize different information from the vehicles and transmit information to different vehicles that are in communication range of the system.
VANET is the extension of MANET that has been used for simulation of vehicles on the real traffic environment. In the processing of VANET various phases has been used for development of VANET as well as data transmission in VANET.

3.2 Phases of proposed work

There are some phases of proposed work which are described as follows:

3.2.1 VANET initialization

In this phase VANET scenario has been developed for the nodes that have been used for simulation in the simulation environment. Nodes characteristics, area of simulation number of RSU and number of vehicles have been defined. OBU has been enabled on the vehicles that has been used for location tracing and contain transmitter, GPS and Receiver.

3.2.2 Routing Protocol

Routing protocol is set of rules that have been used for simulation process over the network. In this process various nodes have been used for data transmission to destination. The routing protocol has been used that is multipath routing protocol. Protocol transmit RREQ from source to destination and the nodes that arte intermediate receives request and reply back about the various possible paths for data transmission. All the possible paths have been used for data transmission on the basis of shortest path data has been transmitted.

3.2.3 Cognitive Radio Network

Cognitive radio network is a tool or advancement in technique that can be used for data transmission over the network. In the process CRN spectrum sensing has been done to check channel availability over the network so that data can be transmitted using vacant channel. Multipath routing protocol that has been used in the network having various possible paths if the path that has been used in the network having packet loss greater than a particular threshold value then spectrum sensing has been done and data has been transmitted using cognitive radio channel. **3.3.3 Flow Chart**

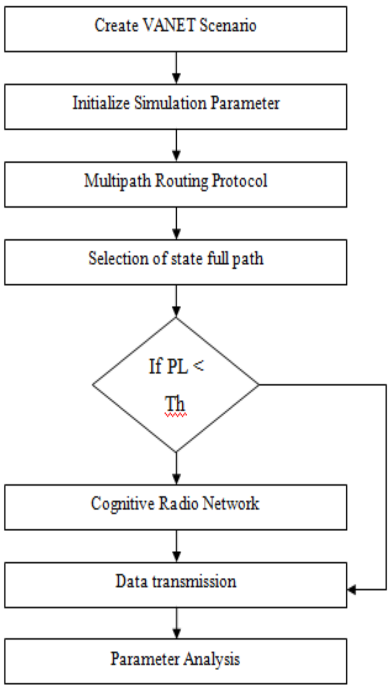

Figure 2: Flow Chart of Proposed Work

IARJSET
ISSN (Online) 2393-8021
ISSN (Print) 2394-1588
International Advanced Research Journal in Science, Engineering and Technology
ISO 3297:2007 Certified
Vol. 5, Issue 6, June 2018

Figure 2 represents various steps that must be followed by the user for evaluation of different VANET scenario over the network. To achieve desired objectives various steps must be followed in the VANET.

4. RESULTS

In the present study, various simulations have performed for getting the results. NS2 simulator runs several times to get the results. In this research work VANET scenario has started by defining traffic simulation number of vehicles in the direction opposite to the direction of their mobility. In running simulation various communications among different vehicles and roadside unit took place using GPSR protocol for the communication process. So, cognitive radio bandwidth is used for the transmission of packets from vehicle to vehicle and vehicle to RSU and RSU to vehicle by sensing channel. The channel is free that can be allocated for communication.

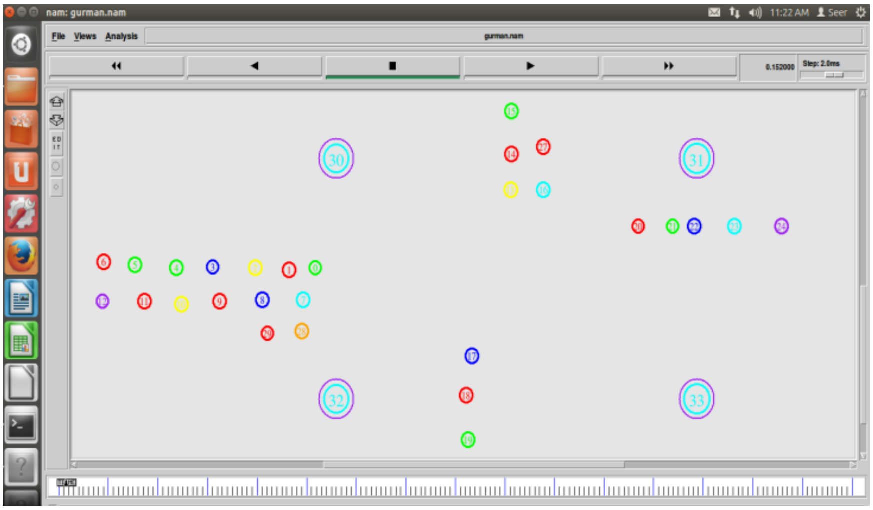

Figure 3: Node Representation

The figure 3 depicts behavior of nodes as vehicles. They are assumed to be in four different lanes and lane that is moving from left to right is assumed as a high density road. Node number 30, 31, 32, 33 acts as RSUs which communicate with vehicles.

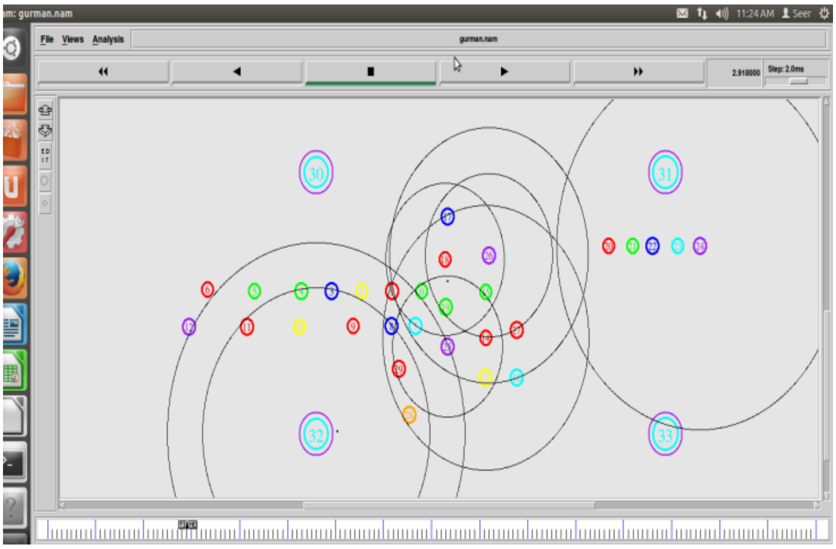

Figure 4: Movement of Nodes

Figure 4 shows that nodes of upper lane and lower lane crossed because of their green lights and nodes of left lane and right lane have stopped due to their red light.

 DOI 10.17148/IARJSET.2018.565

IARJSET

ISSN (Online) 2393-8021
ISSN (Print) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

ISO 3297:2007 Certified

Vol. 5, Issue 6, June 2018

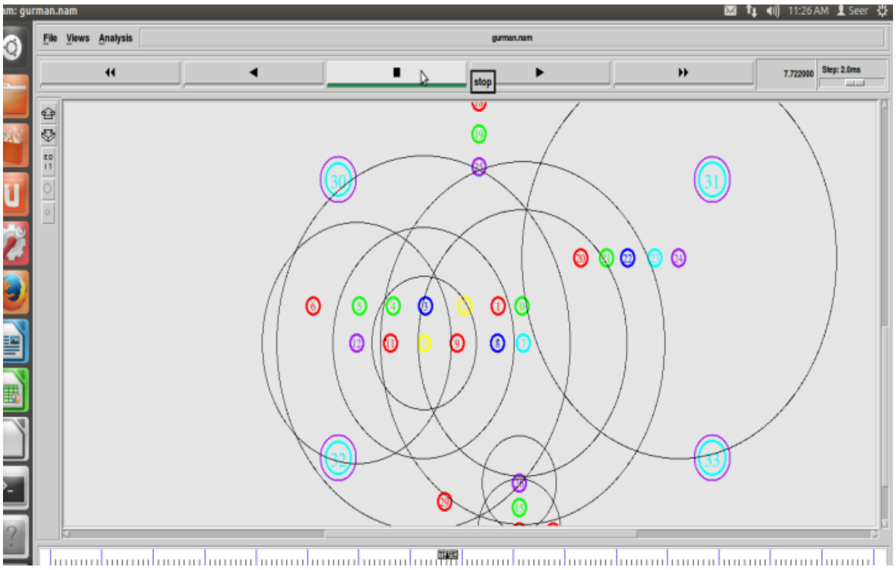

Figure 5: Movement of Nodes of Other Lane

Now in the case of figure 5, nodes of upper lane and lower lane have crossed and its turn to move nodes of right and left lane and side by they communicate with each other and RSUs.

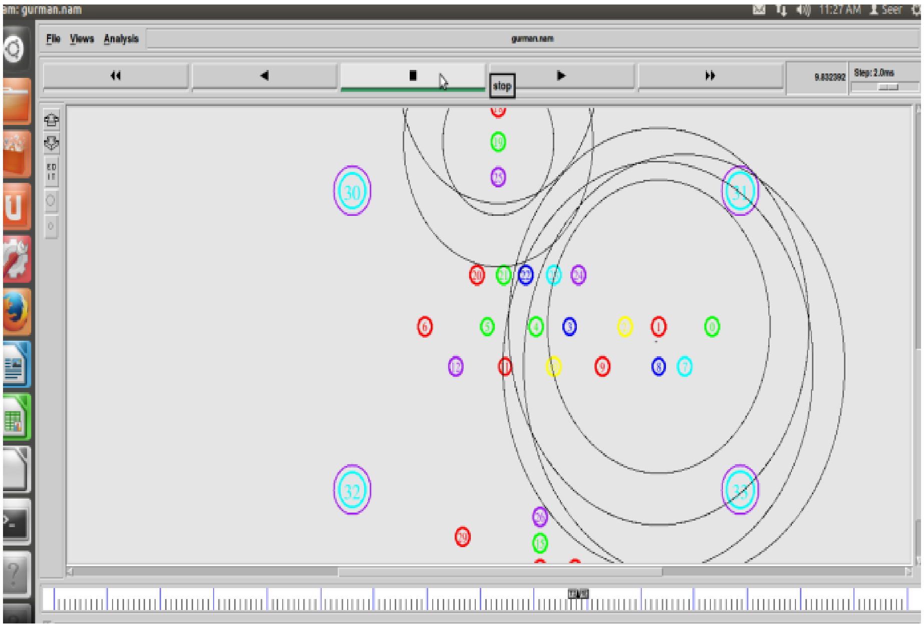

Figure6: Node Communications with RSU

The figure 6 particularly shows that nodes of left lane which are now moving towards right now start communicate with their new RSU that is node number 31 and 33. In the graphs, x- axis (horizontal direction) represents the time in seconds and the y- axis (vertical direction) shows that number of bytes transferred in a particular time.

Figure 7 shows the ratio of all the received data packets at the destination to the number of data packets sent by all the sources. It is calculated by dividing the number of packet received by destination through the no. of packet originated from the source.

PDR = (P r / P s) * 100

 DOI 10.17148/IARJSET.2018.565

IARJSET
ISSN (Online) 2393-8021
ISSN (Print) 2394-1588
International Advanced Research Journal in Science, Engineering and Technology
ISO 3297:2007 Certified
Vol. 5, Issue 6, June 2018

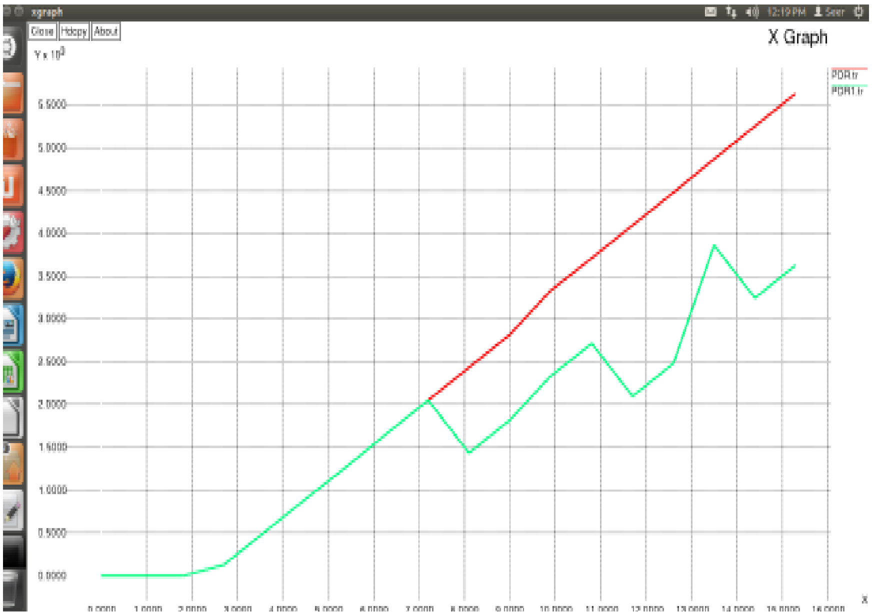

Figure 7: Comparison Of Packet Delivery Ratio In DUPE And Proposed Method.

Graph in figure 2 shows the packet delivery ratio for network which shows that firstly when nodes just start communicate their PDR is idle then as they communicate this ratio goes on. On the other hand PDR for existing work is represented by green line which is less as compare to this research.

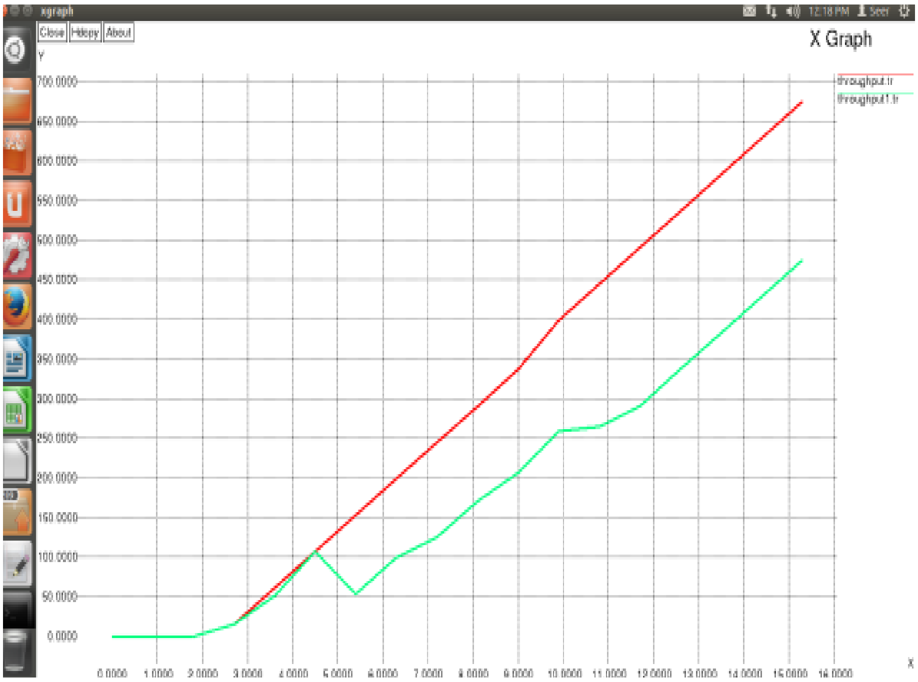

Figure 8: Comparison of Throughput for packet delivery in DUPE and proposed method

Figure 8 shows the average at which data packet is delivered successfully from one node to another over a communication network. It is usually measured in bits per second.

Throughput = (no of delivered packets * packet size) / total duration of simulation.

Throughput is a total number of successful bytes received per unit time. So, figure 3 shows the calculated throughput for the nodes. In this graph red line represents current work and green line is for existing work which is very less as compare to this work.

IARJSET
ISSN (Online) 2393-8021
ISSN (Print) 2394-1588
International Advanced Research Journal in Science, Engineering and Technology
ISO 3297:2007 Certified
Vol. 5, Issue 6, June 2018

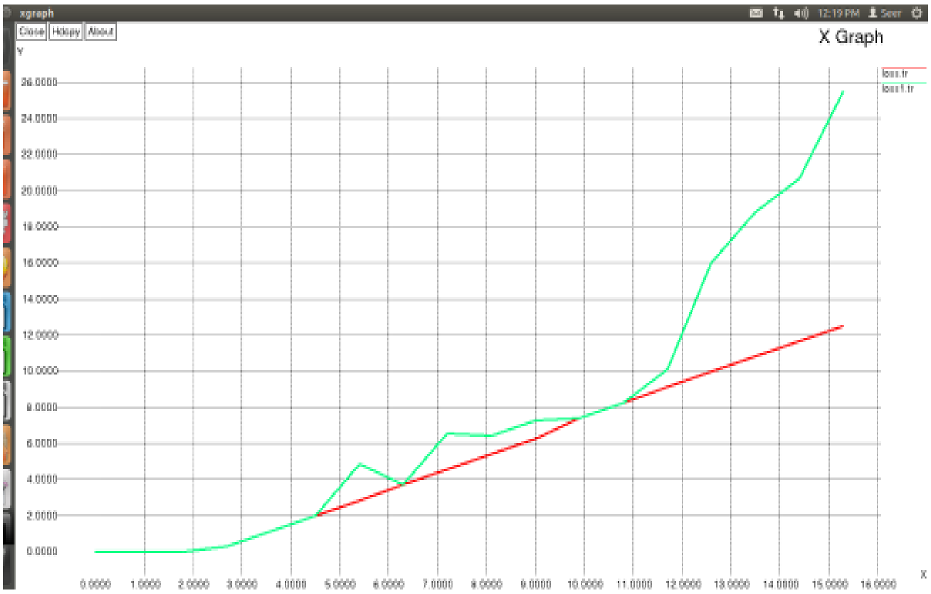

Figure 9: Comparison of Packet Loss in GPSR and Proposed Solution

Figure 9 shows Packet loss occurs when one or more packets of data travelling across a computer network fail to reach their destination. Packet loss is typically caused by network congestion. Packet loss is measured as a percentage of packets lost with respect to packets sent. Loss is defined as the difference between total numbers of bytes sent and total number of bytes received. Figure 4 shows that there is very less loss which shows that network is performing well. But on the other hand loss for existing work which is represented by green line is much more as compare to existing one.

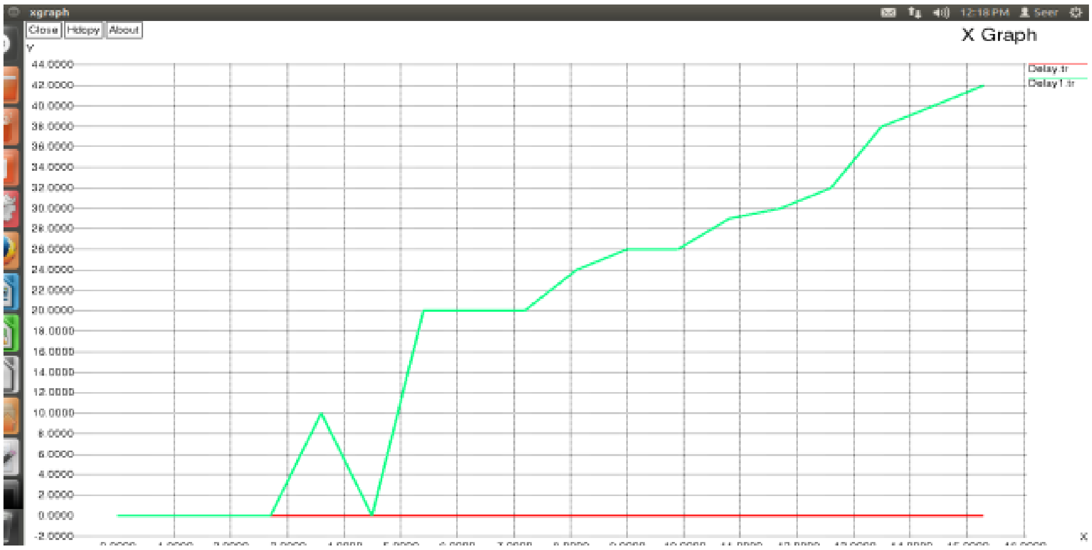

Figure 10: Comparison of Delay Time In DUPE and Proposed Solution

Figure 10 includes all possible delays caused by buffering during route discovery, latency, and retransmission by intermediate nodes, processing delay and propagation delay. It is calculated as

D = (T r - T s)

Where, T r is receive time and T s is sent time of the packet. Delay is the time taken by bytes to reach its destination. Graph in picture shows that delay for this network is very less which means network performance is good but for existing work (represented by green line) delay is very high as compare to current work.

i. **Bytes:** bytes represents amount of data that has been transmitted from source to destination. These bytes are used for computation of throughput, packet delivery ratio and packet loss of the system.
ii. **Time:** time is the parameter that has been used for evaluation of different values at particular interval of time. Time denotes simulation of the purposed system from staring to end. Time has been measured in micro seconds.

5. CONCLUSION & FUTURE SCOPE

Conclusion: VANET is vehicular Ad-hoc network which is used for intelligent transport system for the drivers the ad-hoc network is used to transmit various types of message over the network. The main issue of road density is due to high load on road message communication get overhead due to less amount of network bandwidth to overcome this issue cognitive radio bandwidth can be utilize for data transmission by channel sensing and message can be transmit through cognitive radio channels. GPRS, AODV, DSR, PUMA these are various routing protocol utilizes for message transmission. Based on the real time road density vehicle establish reliable route for the communication on packet delivery. In the proposed work VANET has been utilized for transmission of safety message over the network by using CRCN. In the proposed work vehicle to vehicle & roadside unit to vehicle & roadside unit to roadside unit communication takes place. Cognitive radio utilized channel sensing for availability of vacant channel of radio network. In the proposed work neighbor nodes information has been used for selection of route of message transmission. In the proposed work safety message has been transmitted by using cognitive radio primary channel that assumed message delivery within time. Various parameters i.e. end to end delay, Packet Delivery Ratio, Throughput has been measured. On the basis of theses parameters one can conclude that Hybrid Approach provides much better results.

Future Scope: Though this thesis has been successful in overcoming the limitations of existing routing approaches and improved the performance of routing in VANET environment, it does not take other areas of VANET into account. The subject not yet saturated and a lot of future research works can be pursued in the following areas.

REFRENCES

[1] Jain, J., and Chahal, N., (2016), "A review on VANET, Types, Characteristics and various approaches," International journal of Engineering Sciences & Research Technology (IJESRT) pp. 239-245.
[2] Kabir, H., (2013), "Research Issue on Vehicular Ad Hoc Network,"International journal of Engineering Trends and Technology (IJETT), Volume 6, pp. 174-179.
[3] Varshney, N., (2014) "Security protocol for VANET by using digital certification to provide security with low bandwidth," International Conf. on Communications and Signal Processing (ICCSP), pp 768 – 772.
[4] Gadpaile, A., and Mhatre, K., (2015), "Data aggregation in VANET for Different Network Topology," (IJTRN), Volume 3, Issue 4, pp. 560-562.
[5] Zeadally, S., and Hunt, R., and Chen, Y., (2010), "Vehicular ad hoc Network VANET: Status, results and challenges," Springer Science + Business Media.
[6] Lathar, A., and Singh, R., (2015), "Enhancing VANET Safety message transmission using cognitive Radio in high Traffic," (IJARCCE), Volume 4, Issue 10, pp. 578-581.
[7] Liang, W., and Li, Z., and Wang, S., (2014), "Vehicular Ad Hoc Network: Architecture, Research Issues Methodologies, Challenges and Trends," (IJDSSN), Volume 20.
[8] Kabir, H., (2013), "Research Issue on Vehicular Ad Hoc Network," International journal of Engineering Trends and Technology (IJETT), Volume 6, pp. 174-179.
[9] Navmov, V., (2007), "Connectivity aware routing (CAR) in vehicular ad hoc network in Process," (IEEE), pp. 919-927.
[10] Navmov, V., (2008), "VANET routing on city roads using real-time vehicular traffic information," (IEEE), Volume 58.
[11] Kim, W., (2011), "Co-Route: A new cognitive any path vehicular Routing Protocol," (IEEE), Conf. on Vehicular Technology Conference (VTC Spring).
[12] Kaur, M., and Kumar, P., and Gang, R., (2016), "Location Base Techniques for Efficient Transmission under DDOS attack in VANET," (IJCSMC), Volume 5, Issue 7, pp. 74-84.
[13] Pan, H., He, C., Ajmal, F., Chen, H., & Chen, G. (2014). Pulse-width modulation control strategy for high efficiency LLC resonant converter with light load applications. IET Power Electronics, 7(11), 2887-2894.
[14] Ravi, K., & Praveen, K. (2014, April). AODV routing in VANET for message authentication using ECDSA. In Communications and Signal Processing (ICCSP), 2014 International Conference on (pp. 1389-1393). IEEE.
[15] Sun, H. (2011, July). Knowledge for Software Quality Control and Measurement. In Business Computing and Global Informatization (BCGIN), 2011 International Conference on(pp. 468-470). IEEE.
[16] Tsukamoto, K., Omori, Y., Altintas, O., Tsuru, M., & Oie, Y. (2009, September). On spatially-aware channel selection in dynamic spectrum access
[17] Yu, H., Yoo, J., & Ahn, S. (2013, July). A VANET routing based on the real-time road vehicle density in the city environment. In Ubiquitous and Future Networks (ICUFN), 2013 Fifth International Conference on (pp. 333-337). IEEE.
[18] Zheng, C., Liu, R. P., Yang, X., Collings, I. B., Zhou, Z., & Dutkiewicz, E. (2011, May). Maximum flow-segment based channel assignment and routing in cognitive radio networks. In Vehicular Technology Conference (VTC Spring), 2011 IEEE 73rd (pp. 1-6). IEEE.