ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 8, August 2015

Self-Organizing and Clustering Methods in VANETs

Bibin Varghese Kurien[1], Anees A S [2]

Assistant Professor, Dept. of ECE, CAARMEL Engineering College, Pathanamthitta, Kerala, India[1]

PG Student, Dept. of ECE, CAARMEL Engineering College, Pathanamthitta, Kerala, India[2]

ABSTRACT: VANETs is going be a very interesting research topic. With the increase of road traffic volume in major cities and towns of most of the countries experiencing congestion and accidents. Here we propose a multi-hop broadcasting protocol for message dissemination in Vehicular ad hoc networks (VANETs). VANET is not restricted up to Vehicle-to-Vehicle communication, it also takes advantages of road side units. Here we use either self-organising system range (SOSR) or cluster based communication. In self organizing system range, If the number of vehicles in a particular area is increasing, and if it causes difficulty for Road Side Units (RSU), itself rearranging its communication area. It reduces the communication range. Because of communication among vehicle, it doesn't causes any problem in the system. It actually improves the efficiency of the system. The next method is cluster based communication,[1] here the total area in the communication range is divided into different clusters. Clustering is based on the allocation of vehicles. Each cluster in the system have a temporary cluster head, and which is changes very fast. It enables a faster and more reliable message dissemination by shortening the channel access time and reducing the contention period jitter.

KEYWORDS: VANETs, Inter vehicle communications, Emergency Message, Road side units (RSU), On Board Unit (OBU), Dedicated Short Range Communication (DSRC),Self-organizing System Range(SOSR).

I.INTRODUCTION

The number of vehicles rapidly increased in several countries, the rate of growth of new roads is much lower than that of vehicles. For these reasons number of accidents will increase and also traffic congestion. It becomes more severe if an accident occurs. One possible solution for reduce these problems is to use wireless communication among vehicles.If the road information is available, we are able to predict the future position of vehicle[2]. Due to recent advances in wireless communication now a days, inter vehicle communication becomes a realistic solution.Nodes in the vehicular environment are much more dynamic because most vehicles are usually at very high speed and change their position constantly. The vehicular ad hoc network (VANET) is a kind of wireless ad hoc network which deploys the concept of continuous varying vehicular motion. Here, themoving vehicles act as nodes.The links between nodes connect and disconnect very often. Vehicular networks are composed of mobile nodes, vehicles equipped with On Board Units (OBU), and stationary nodes called Road Side Units (RSU) attached to infrastructure that will be deployed along the roads. Both OBU and RSU devices have wireless/wired communications capabilities.The system exploit the infrastructure of road side units (RSU) to efficiently and reliably route packet in VANETs. OBUs communicate with each other and with the RSUs in ad hoc manner.Vehicular Ad-hoc Networks are expected to implement a variety of wireless technologies such as Dedicated Short Range Communications (DSRC) which is a type of Wi-Fi. Other Wireless Technologies are Cellular, Satellite and Wi-MAX. Vehicular Ad-hoc Networks can be viewed as component of the Intelligent Transportation Systems (ITS).

Commonly intelligent transportation system applications are organized into safety, transport efficiency, information and entertainment applications[3]. VANET is emerging as ITS technology. It has high level of mobility, and time varying vehicle traffic density. There are three basic classes of multicast algorithms. First is, every node which is receiving a signal broadcast it into a number of neighbours. In second technique storing information about near vehicle in routing table. Updating this by sending periodic messages, and keep routing table updated. Third is create path on other hosts on demand. The networking in this system involves Multicast Group Manager (MGM), Border Gateway Router (BGR), and relay node (like On Board Unit and Road Side Unit (RSU))[4].Each vehicle can access the RSU in two ways, First is Direct delivery, which is happen when vehicle enters directly on a RSU's range. Second is multi-hop

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 8, August 2015

relaying,which is when the vehicle is out of RSU's transmission range.In future, the main research issue is designing an integrated system architecture that can make use of different technologies such as Wi-Fi and 4G[5].Performance of proposed system evaluated using the NS2 (Network Simulator 2) simulation platform.

II.RELATED WORK

Trinary Partitioned Black-Burst Based Broadcast Protocol: Existing work consists of trinary partitioned black-burst-based broadcast protocol (3P3B) ,it consists of two primary mechanisms. First, a mini distributed inter-frame space (DIFS) in a medium access control (MAC) sub-layer is introduced to give the time-critical emergency messages a higher access priority to the communication channel compared with other messages. Second, a trinary partitioning is designed to iteratively partition the communication range into small sectors. The trinary partitioning mechanism allows the farthest possible vehicle in the farthest sector from the sender node to perform forwarding to increase the dissemination speed by reducing the number of forwarding hops[6].

Binary-Partition-Assisted Broadcast Protocol:Binary partition assisted broadcast protocol (BPAB) aims to reduce and stabilize the broadcast delay. BPAB achieves a good message progress speed by selecting the farthest forwarder. This protocol deploys a combination of a binary partitioning and a novel contention mechanism. The binary partitioning scheme constantly divides the communication area into multiple partitions. The binary partition of this scheme stems from a similar concept compared with that of OB-VAN, but it introduces fewer time slots than OB-VAN during the selection of the next-hop forwarder. Only vehicles in the farthest partition contend with each other during the forwarding phase in this scheme. Thus, the collision rate is reduced, and the contention duration is stabilized. It is also shown that BPAB demonstrates a good performance in terms of the average dissemination speed compared with the other protocols, such as UMB and SB [7].

III.SYSTEM MODEL

The vehicle in the model is equipped with on board communication devices (On Board Units) and a data base unit, which contain control information. Here we use sensors for communication and sensors for GPS. Vehicles in the road can directly communicate themselves or through road side units.

Self-organizing System Range

In this system all the processes are done with the help of RSU. Routers in the RSU keep information about all vehicle in its range. If the number of vehicles increseing it is difficult for RSU to accommodate information about all vehicles, vehicles are dynamic and continuosely changing.To keep all these values is a complex task. RSU utilisze a large amount of power for monitoring and controlling all these dynamic vehicles. Sometimes it causes wrong signals to receiver. Only way to avoid this is to maintain number of vehicles least as possible. Hence such situations, RSU can automatically reduce its communication range to a convinient level.The number of vehicles in that particular situation is also reducing. Because of inter vehicular communication system is available,each vehicle have communication among others,so that each vehicle in a particular area maintain a contact with all others.If the number of vehicles in a particular area is large, then it is needed to reduce the strain of RSU and the better way is reducing the coverage area, so that reducing the power dissipation of the RSU's and improve efficiency.

In this figure a busy area,which having large number of vehicles.All the vehicles in the system is dynamic and always adding new vehicle into the system.Here initially we have communication range R1 to the RSU,which contain large number of vehicle.The system check the efficiency of RSU and if it is comparitively less and then going with the process above mentioned.It reduces communication range first into R2, number of vehicles in that particular range also decreses.if it is not enough to maintain a particular efficiency,it further reduces its comunication range to R3.Hence using intelligent self re-organization method,we can maintain the efficiency to a better level.If the Road Side Unit has enough capability to accommodate all these vehicles on the system then it is not necessary to reduce the communication range of the system.Antennas with special featers need to be installed here to done all these processes.

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 8, August 2015

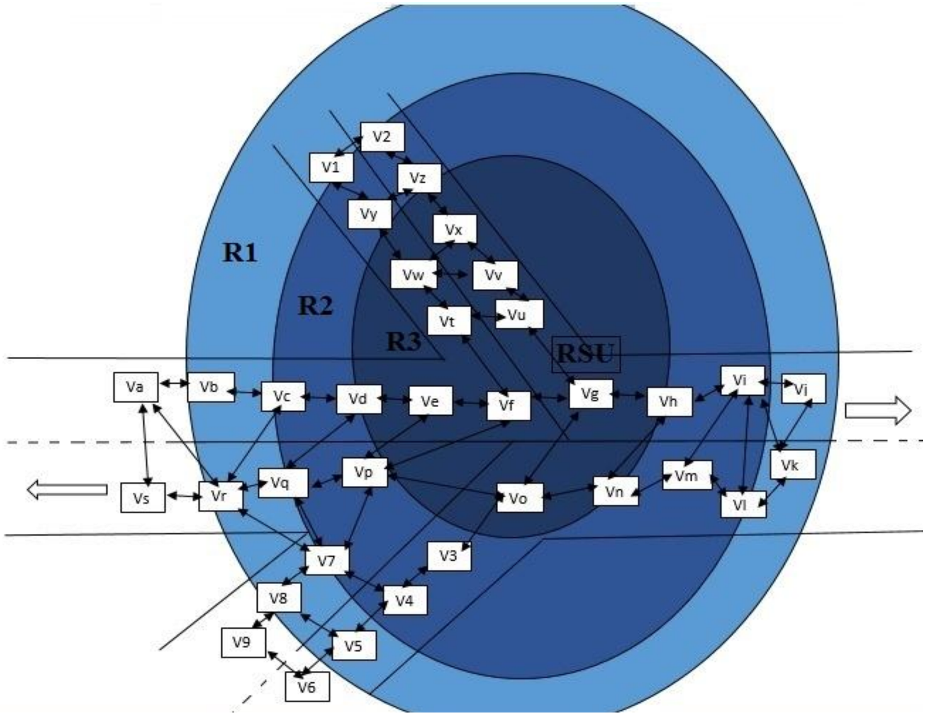

Fig.1 System model-self organizing system range

Cluster Based Communication

Here is an alternative method for self-organizing system range. Cluster is made up of collection of nodes, Characteristics of these nodes varies with respect to number of nodes present in each cluster. In this scenario nodes means number of vehicles participated in a particular cluster. Cluster identity can be used to distinguish between different clusters. Clustering is usually used in comparatively dense regions. The proposed system here consists of Road Side Unit (RSU) with its communication range. The communication range of this RSU is divided into multiple clusters. Clustering is done according to vehicle density. Any one of the vehicle in the cluster act as a cluster head. The decision of clustering is done by road side unit. Vehicle in each cluster is communicate with near vehicle and also to RSU. This RSU can capable of communicate with near RSU.

The Figure 2 shows cluster based communication. It is a highly dense region. Here it is difficult for RSU to control large number of vehicles. It takes a long time for communication, and also it provide less efficiency. So here the total area is divided into different clusters. Clusters is named c1,c2,c3,c4,c5, c6. Here each clusters having approximately equal size. Here the total number of vehicles in this system is divided into six regions. Each vehicle in the system can communicate themselves. Both directions in the road can also communicate with vehicles. In this figure there is no vehicle in cluster C2,so it is not necessary consider that cluster. The size and number of vehicles in each cluster is decided by total number of vehicles in the system and convenience in clustering. Each vehicle near the boundary of a cluster is called gateway node, and which have the capability to communicate with gateway node of near cluster. There are two types of messages safety messages and non-safety messages, using this clustering method emergency messages can be send easily with high priority. It uses the help of cluster head and gateway node.

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 8, August 2015

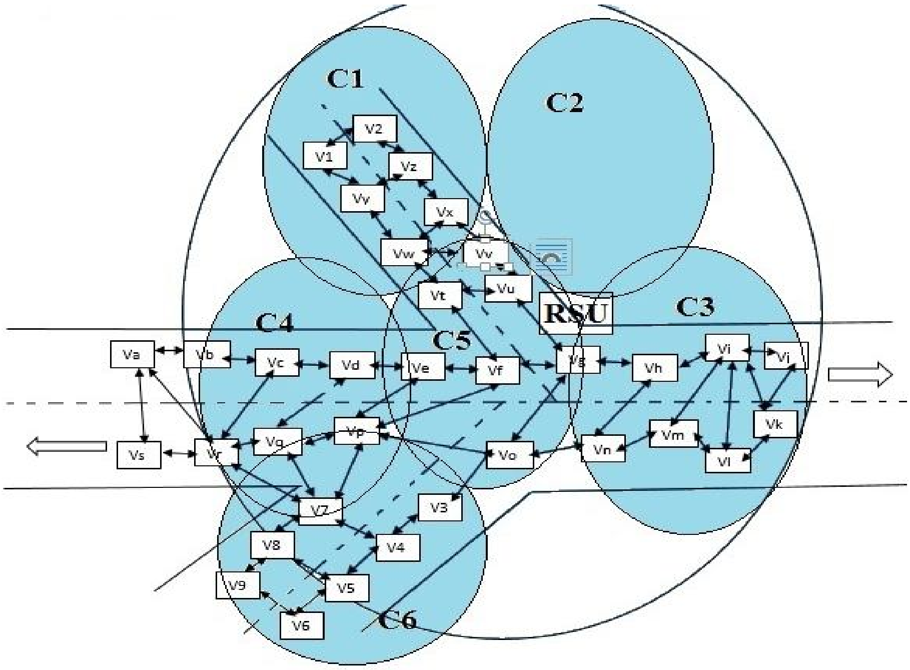

Fig.2 Cluster Based Communication

IV.DATA DISSEMINATION

Here network simulator 2 is used , nodes are deployed in the environment. Here each vehicle have an individual id and location, when an vehicle enters into RSU range its id and location is registered in RSU.RSU acts as an server to transfer the requested information to the requested vehicle. When a vehicle (Source node) “V1” request a packet to RSU it verify its id and location then transfer the packet to requested vehicle ie (Destination Node).In this model, when a vehicle “V1” request a data to Road Side Unit the RSU will verify its Id and location if the ID and location is registered in RSU it transfer the packet to the requested vehicle. The vehicle must be in the optimal location and it is fixed by the service provider when we design the node creation model is mainly used to reduce packet drops as well as to reduce delay while packet transfers.

V.COMMUNICATION STANDARDS FOR VANET

Dedicated Short Range Communication (DSRC)

It is developed by USA and is used in short to medium range communications service that is used for V2I and V2V communication.Allocated 750 MHz of spectrum i.e from 8.5 GHz to 9.25 GHz to be used by Dedicated Short Range Communication (DSRC). DSRC spectrum has 7 channels with each channel 100 Mhz wide. Out of 7 channels,[8].

Wireless Access in Vehicular Environment (WAVE) (IEEE 1609.11p)

In 2003, American Society for Testing and Materials (ASTM) sets ASTM-DSRC which was totally based on 802.11 MAC layer and IEEE 802.11a physical layer. The main problem with IEEE 802.11a with Data Rate of 54 Mbps is it suffers from multiple overheads. For this the DSRC is renamed to IEEE 802.11p Wireless Access in vehicular Environments (WAVE) by the ASTM 2313 working group. This works on MAC layer and physical layers. WAVE consists of Road Side Unit (RSU) and On-Board Unit (OBU).

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 8, August 2015

V.SIMULATION RESULTS

The performance of the proposed methods is evaluated via NS-2 simulations to generate vehicle mobility patterns, under different scenarios. In this proposed system operates by using vehicles to carry and forward messages from a source vehicle to carry and forward messages from a source vehicle to a nearby RSU or destination vehicle.

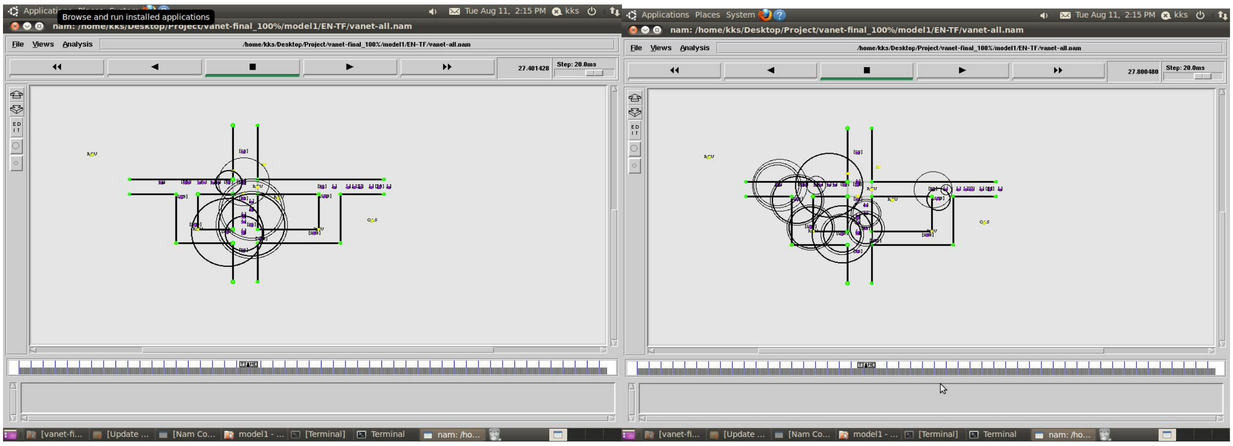

Fig.3(a),3(b) NAM Window : Different stages of communication

The above figures 3(a) and 3(b) shows mobility patterns of different vehicles and road side units. Circular representation denote communication range of each vehicle and RSU. All the circular range are interconnected so it can able to transfer information from one vehicle to another. From this information it can able to find easy path, which has less in traffic.

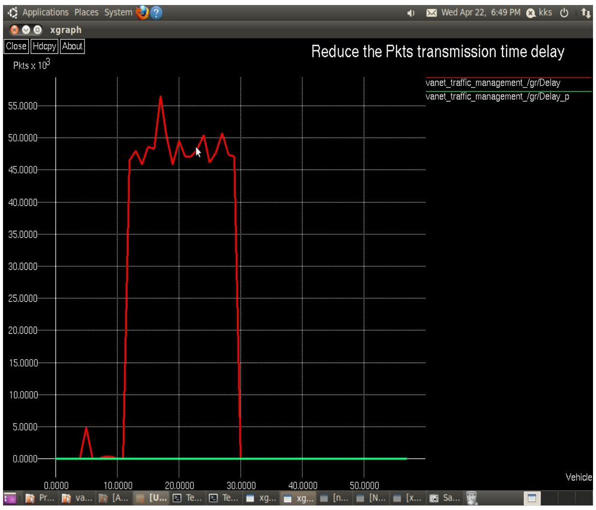

Fig.4 Comparison of Packet transmission Delay

In Fig.4it shows packet transmission delay in existing system and proposed system. From this new method packet transmission delay can be reduced to a large range and efficiency can increase significantly.

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 8, August 2015

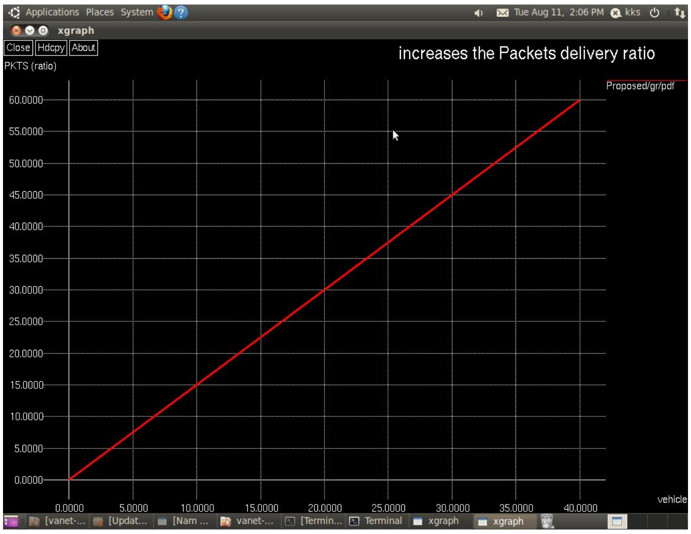

Fig.5 Packet Delivery Ratio

This Figure shows packet delivery ratio, which is increases with respect to number of vehicles. If the number of vehicles increases, the vehicle which participate in the communication can spread the message to the near one with its communication range. This process is proceeds like a chain reaction large number of vehicles get a single message.

VI.CONCLUSION

In this paper we have proposed a system for efficient communication in VANETs. Here we use a self-organizing system range and clustering technology. In this system that is able to share Infrastructure to Vehicle and Vehicle to Vehicle Communication with messagesvery accurately. So towards this goal the system i.e. Design and Implementation of inter infrastructure and vehicle to vehicle communication for traffic information sharing messages from a moving vehicle and vehicle to vehicle communication is easily possible. It is demonstrated through simulation results that the proposed system outperforms the benchmark protocols in terms of the average delay, average message dissemination speed, and average packet delivery ratio (PDR).Hence our proposed system conclude that for every vehicle it becomes very easier to deal with the traffic issues and many more accidental scenarios that come across due to the lack of real time road side issues.

REFERENCES

[1] Infrastructure based Authentication in VANETs, International Journal of Multimedia and Ubiquitous Engineering Vol. 6, No. 2, April, 2011.

[2] Efficient Way of Emergency Message Dissemination and Reliable Broadcast in Vehicular Ad-Hoc Network, ISSN (Print) : 2320 – 3765 ISSN (Online): 2278 – 8875.

[3] Vehicular Ad Hoc Networks: Architectures, Research Issues, Methodologies, Challenges, and Trends,Hindawi Publishing Corporation International Journal of Distributed Sensor Networks, Hindawi Publishing Corporation International Journal of Distributed Sensor Networks Article ID 745303..

[4] PAMTree: Partitioned Multicast Tree Protocol for Efficient Data Dissemination in a VANET Environment, Hindawi Publishing CorporationInternational Journal of Distributed Sensor Networks Volume 2015, Article ID 431492, 13 pages http://dx.doi.org/10.1155/2015/4314

[5] Prioritized Directional Broadcast Techniquefor Message Dissemination In Vanets, Journal Of Theoretical And Applied Information Technology10th October 2014. Vol. 68 No.1© 2005 - 2014 JATIT & LLS, ISSN: 1992-8645 Www.Jatit.Org E-ISSN: 1817-3195.

[6] Trinary Partitioned Black-Burst-Based Broadcast Protocol for Time-Critical Emergency Message Dissemination in VANETs ,Chakkaphongsuthaputchakun , IEEE Transaction on vehicular technology, Vol.63, No. 6, July 2014.

[7] On Roadside Unit Antenna Measurements for Vehicle-to-Infrastructure Communications, VeronikaShivaldova∗, Alexander Paier, Dieter Smely, Christoph F. Mecklenbr¨auker

[8] A Survey On Vehicular Ad-Hoc Network, Bhuvaneshwari.S1, Divya.G2, Kirithika.K.B3 and Nithya.S4, ISSN (Print) : 2320 – 3765ISSN (Online): 2278 – 8875.