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Vehicular Ad Hoc Network (VENET) with Adaptive Routing Protocol in Terms of Content-Based Services

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ABSTRACT: Vehicular Ad-Hoc Networks (VANETs) is an application of MANETs that allows for communication between road transport vehicles and promotes safety on roads. In VENET, vehicles are grouped together for cluster formation which will help in vehicle communication for important data transmission to prevent road incidents. Here, we make use of master-slave technology and redesign Media Access Control (MAC) operations to work on Physical Layer. By using Markov- chain expression and back- off time expression for better servility.

KEYWORDS: Dedicated Short-Range Communication, mobility, MAC layer, Road Side Unit.

I.INTRODUCTION

Vehicular ad hoc network (VENET) is supported by Intelligent Transportation System (ITS) technology, which help VENET to network to work like mobile network system and it is helpful to avoid critical situations happen in vehicles uses. VENET has created by applying Mobile Ad Hoc network technology- the spontaneous application of a wireless network for data transmission over vehicles for safety applications. VENET make use of infrastructure of Road Side Unit (RSDs) for better connectivity among vehicles and to provide better channel for data transmission.

Advances in ad hoc wireless technology give upward push to the emergence of vehicular ad hoc networks (VANETs). This field deals with the trouble of enabling interoperable networked wireless communications amongst vehicles, the infrastructure, and personal communication gadgets. numerous types of Wi-Fi communications technologies had been proposed for deploying VANETs. Wi-Fi (IEEE 802.11p based) technology are the most normally used for deploying VANETs. The vehicles are made to use Wi-Fi network interfaces which use either IEEE 802.11b or IEEE 802.11g standards for get access to media. But, these are well known purpose requirements and they do not fulfill properly the requirements of high dynamic networks together with VANETs. currently, DSRC (devoted quick-range Communication), called also IEEE 802.11p, has been proposed as the communications popular specially for VANETs.

II. PAPER ORGANIZATION

This paper is organized into eight parts. Part 1gives a general idea of VENET network. Part 3 is about literature survey. 4 describes the objective of the paper. Part 5 gives the scope of the work. Part 6 gives the methodology used to solve the problem. Part 7 gives derived results and followed by conclusion.

III. RELATED WORK

Gunter and Grobmann have found VENET network is able to provide support in many application related to vehicles like ABS (Anti-Lock Braking System) and ESP (Electronic Stability Program). These systems works when the vehicle is in dangerous situation, means goal is providing safety to vehicle for any bad incident to happen.

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VANETs are an application of Mobile Ad-Hoc Networks (MANETs). Sun defines a MANET as a collection of wireless nodes that can be dynamically set up anywhere and anytime without using any pre-existing network infrastructure. There are some special characteristics those should present in VENETs and they are:

- Every vehicle should register with VENET network.
- Every vehicle should be at certain speed as speed may vary based on the driver of the vehicle.
- Vehicle can provide resources like energy to antenna compare to mobile device.

According to Chen, the communication in VANETs can either be between vehicles as "one-hop" or vehicles can act as routers, retransmitting messages and communicating in a "multi-hop" method. This means that nodes can communicate directly with another vehicle or can pass messages through a series of vehicles. The type of communication will depend on the nature of the message. Chen also show the basic architecture of VENET network in figure 1.

D.Rajini Girinath proposes a new approach for cluster based routing algorithm for hybrid mobility model to regulating the vehicular traffic and static and dynamic source clustering based algorithm, through which we can understand the flow of packets for each vehicle circulates in the network and how the cluster head in cluster changes and defined to other vehicles.

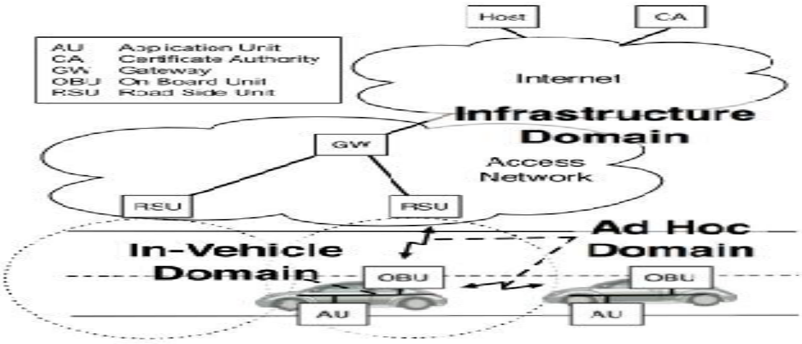

Figure.1. VANET system architecture.

Cándido Caballero-Gil, Pino Caballero-Gil, and JezabelMolina-Gil, have defined the complete format of packet which use for carrying the information, and complete lifecycle of clustering in VENET network along with message management algorithm which transmit from each vehicle at regular interval of time in the cluster network.

IV. OBJECTIVE

We want to ensure that our proposing technique is applicable to support adaptive potocol and provide inter-clustering applications in VENET network.

V. SCOPE OF THE WORK

In VENET network, we have only Intra-clustering communication with constant data rate but now, VENET network is applicable at adaptive data rate, which is based on bandwidth provided by the RNS. Not only this, VENET network communication had reached to Inter-clustering communication which is basically helpful for traffic conditions. Adaptive data rate will lead to more use of VENET network as it can transmit packet at higher speed and with almost full information.

VI. PROPOSED METHODOLOGY

In VENET network, vehicles are moving along highway in opposite direction of both of sides of highway. Now, the vehicle which near to RNS is choosen to cluster head. This cluster head will boardcast request messages to nearby vehicles. The vehicles will respond to this request message to connet to cluster of that particular cluster head. The same

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will happen if those vehicles are unable to connet to first cluster head will make its own cluster. In way group of cluster will form on highway.

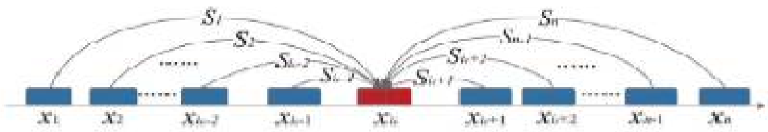

Figure.2.Basic model of clustering.

Now, those vehicles are conneted to cluster will provide its location, speed and distance to cluster head. At regular intervel of time, vehicles will provide all above three parameter to cluster head. The cluster head will change time to time based on the location of the vehicle near to RNS and ability to serve all other vehicles.
Overall Network Structure In our model, we evaluate a cluster of n vehicles driving in the same direction along an uninterrupted highway, as illustrated in Fig. 2. Our focus is on the characteristics of stable clusters of vehicles, where the speeds of the vehicles are similar for safety reason. A CH is around the middle of the cluster, and the other (n − 1) vehicles are the cluster members. Let xi and xic denote the positions of the i-th vehicle and the CH in the x-axis (i _ ic). si is the distance between the i-th vehicle and the CH, si = |xi − xi|. The set of distances between the CH and the members is denoted by S = {s1, s2, ・ ・ ・ , sn}. We consider that vehicles in a cluster travelling at the same speed during the time period of performance evaluation. This consideration is reasonable and practical, as it is necessary for keeping safe distances between vehicles. We also model a Poisson Point Process for vehicles driving along the highway. The distance between two adjacent vehicles then yields an exponential distribution with a coefficient of 1/β, where β is the average distance (m) of adjacent vehicles in the cluster, and 1/ β is the vehicle density. The vehicle density is the reciprocalof the average inter-vehicle distance.
PHY Decoding Failure :
Wireless PHY channel conditions can have strong influence on the system packet loss, even in collision-free cases. Even if capacity-achieving codes are employed at the transmitter, there is still a finite probability of packet error due to a channel outage effect. The channel outage effect refers to the fact that the current encoding rate is higher than the actual channel capacity. In this paper, we derive the packet error probability based on the outage probability of the vehicular channels, as this provides the lower bound of the packet error probability under an assumption of ideal coding and modulation. Fast fading effects are taken into account by incorporating a so-called block fading model.Specifically, a packet is divided into Lp blocks (or coherence periods). The channel coefficient remains constant over the lth coherence period (i = 1, ・ ・ ・ ,Lp) and is i.i.d. across different coherence periods. Without loss of generality, we assume that γ0 is the SNR threshold required for successful decoding at the CH. For the i-th vehicle, we let pPHYi,l denote the outage probability of γ < γ0 within any coherence period l. Consider that the relative speed between the vehicles is so low, and also the line-ofsight components are dominant in many highway environments. We ignore the fast fading effect on our analysis. Consider a Rayleigh fading channel. pPHYi,l can be given by

$$p_{i,l}^{PHY} = \Pr(\gamma < \gamma_0) = 1 - \exp\left(-\frac{\gamma_0}{\bar{\gamma}}\right).$$

Hence, there is a chance to packet loss during clustering even protocols of transmission are very good.
An adaptive route refers to an optimal and efficient routing path that is selected when routing priorities change or failures occur with routing devices, nodes or other network components. An adaptive route ensures continuous network connectivity and operations .Clustering is a natural phenomenon in mobile networks, defined by the constrained mobility of vehicles that must stay on the road and follow traffic rules. Long-lived links within a cluster can support node-centric services. On the other hand, the brief, unpredictable contacts between vehicles belonging to different clusters are more suitable for opportunistic content-centric services. To support these communication patterns we have designed a novel, completely distributed cluster management algorithm. The algorithm is shown as in the form of flow chart:

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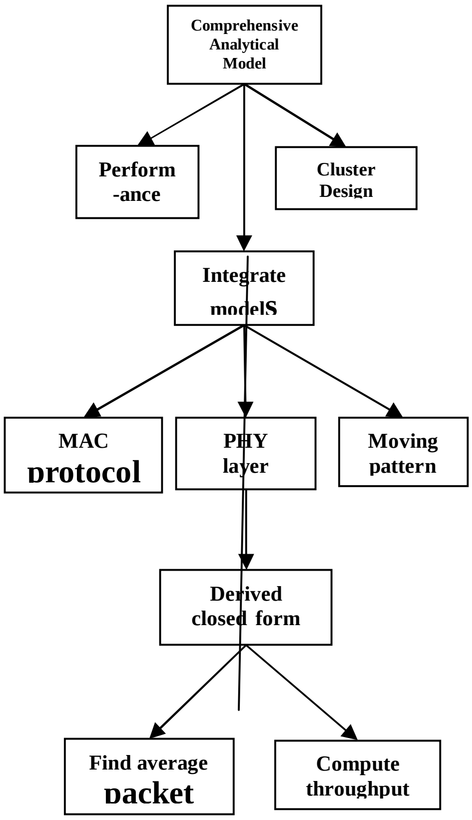

VII. SIMULATIONS AND DISCUSSIONS

The outcomes are acquired by simulating the code in NETWORK SIMULATOR with C language. The VENET network is now support adaptive data rate with help of RNS at constant distance along highway and due to this arrangements inter- clustering is possible with low band width but the difference in bandwidth is not much compare to earlier outcomes of VENET network.

There is chance that cluster head and vehicles which are the members of the cluster can transmit data packets at same period of time. So, this may led to loss of packet in the cluster which may be important for network in the case of emergency conditions. This is shown in below figure and showing packet loss in that crucial time in the cluster.

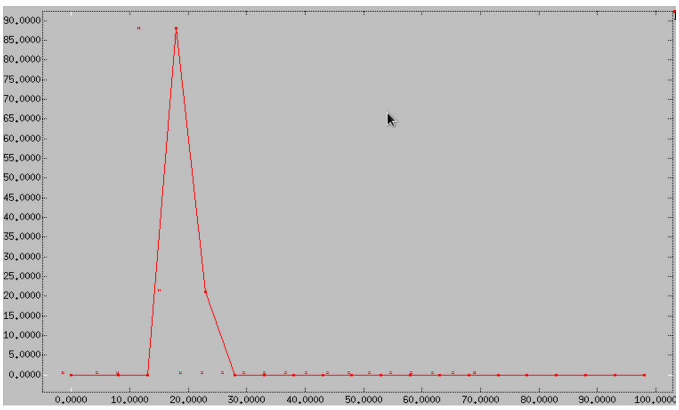

Figure4.Plot of loss of packet in cluster.

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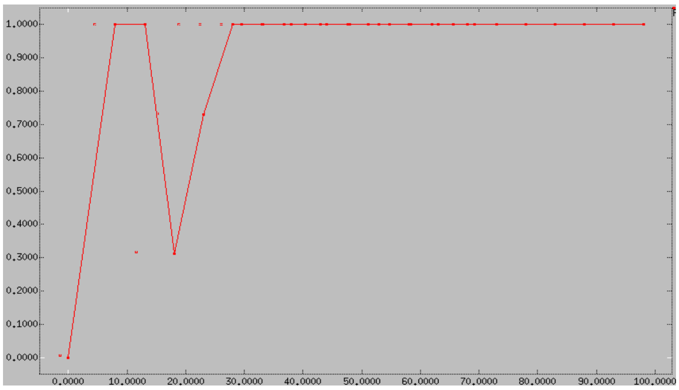

Figure5.Plot of packet delivery ratio

By figure 2, the observation is made is number of packets that should be delivered are got decreased when cluster head and the members of the cluster are transmitting data packets.
The another observation is that when the cluster head is only not transmitting, the number of packet delivered is high.

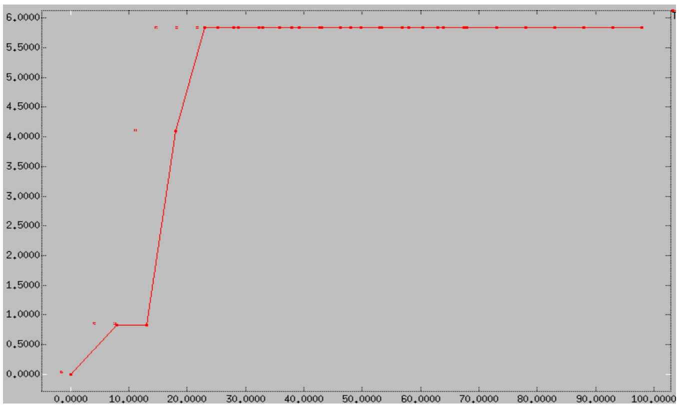

Figure6.Plot of throughput.

Earlier, the throughput was increasing and then decreasing for fixed number of vehicles on the one side of the road but, when the adaptive protocol is applied along with content-based method in VENET, the throughput increases at first then remain constant and again keep on increasing. Hence, we can say with adaptive protocol and inter-clustering methodology along with content-based method, the throughput has got increases and better ratio of packet delivery in VENET network has achieved.

VIII. CONCLUSION

In VENET we consider no packet loss but still there is packet loss during transmission due to range limitation or failure of the cluster head etc. thus, the packet may contain emergency information then, it may led to danger on the road. Hence, by using adaptive routing protocol and content-based technology with inter- clustering, we are able to pass the important massages in the cluster to the members of the cluster. And by using inter-clustering technique of VENET, we are able to alert all other vehicles on the road thorough two components of the network, first is cluster head and second is roadside unit. This provide us more safety in lesser time in real time in the case of vehicle environment.

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