International Journal of Scientific Engineering and Technology (ISSN : 2277-1581)
Volume No.3 Issue No.5, pp : 698-702 1 May 2014

Efficiently Design For Cross Layer Optimization Using Handover Scheme in Vehicle Adhoc Networks

B.Saranya, V.Sakthika, R.Vijiyalatha, M. New Begin, S.Raj Anand
Dept Of MCA, Vel Tech Multitech Dr. Rangarajan Dr. Sakunthala Engineering College,Chennai, Avadi

saranstays@gmail.com, sakthikavedh@gmail.com, rvijiyalatha@gmail.com, newbegin_m@yahoo.com, rajsra_mca@rediffmail.com

Abstract- In the world of internet and more use of wireless technology, there is increasing claim for internet in vehicles. Due to this purpose VANET is playing an important part in inter-vehicular as well as infrastructure based communication in Intelligent Transport Systems (ITS). These systems are aimed at addressing critical issues like passenger safety and traffic congestion, while integrating information and communication technologies into transportation infrastructure on vehicles. They are built on top of self-organizing networks, known as a vehicular Ad hoc Networks (VANET), composed of mobile vehicles connected by wireless links. . In high speed roadways WiMAX Mobile Multihop Relay (MMR) is playing an important part in VANET for vehicles. We can have certain vehicles as Relay Vehicles (RV's) which can provide internet access to oncoming vehicles or other passenger vehicles. Since we do not know how far a RV is or when it is going to arrive, we require a fast handover technology so that a lot of contrary due to delay can be reduced. In this paper we are going to analyze the connectivity of Dense and Sparse network using Cross Layer vehicular Handover Scheme in VANETS, also we are going to tell some main issues over security among the inter-vehicular communication and synchronization between RV's. So, we can optimize the connectivity in cross layer vehicular ADHOC networks.

Keywords: Cross layer, VANET, Dense network, Sparse Network.

I. Introduction

To provide internet to the vehicle by using inter-vehicle or infrastructure communication, We make use of vehicle Ad hoc network (VANET)[ii][iii].In VANET, vehicle is a mobile node with high speed mobility in highways. So there is a requirement of fast switching techniques in the roadways. We have existing system which uses Mobile Multihop Relay technique for communication. In some communication, we use RV to broadcast a neighbor advertisement message (MOB_NBR_ADV) to one of the vehicle in its communication range for every 30 seconds. So, the RV tries to find a network and provide communication for a vehicle initially entering the network and thus there is a handover of message between RV and the disconnected vehicle (DV).The key idea of VFHS is to utilize oncoming side vehicles (OSVs) to accumulate physical and MAC layers information of passing through RVs and broadcast the information to vehicles that are temporarily disconnected, referred to as disconnected vehicles (DVs), [i]. There are several issues in cross layer design, which we are going to analyze with dense and sparse network.

II. Related Works

The cross layer scheme for vehicular ADHOC network is designed for reducing handover latency in WiMAX. There were three things that are taken in to consideration in cross layer design namely, Improving Scanning Latency [iv][v], Inter cell Handover Limitation[vi]and Cross Layer Design[vii].This model contains three kinds of vehicles, according to their capability:

Relay Vehicle (RV) An RV is a large vehicle that can provide the capability of relay and mobile management of the MMR WiMAX network to its neighboring vehicles. RV together with vehicles in its transmission range forms a cluster network. The transmission range is denoted in by circles [i]. Disconnected Vehicle (DV) A DV is a small vehicle that is outside of the coverage of any RV, and needs to transmit packets [i].

Oncoming Side Vehicle (OSV) An OSV is a small vehicle driving on the oncoming direction, and has no packets to transmit. The OSV can accumulate the physical layer information of the RV located in the opposite direction (oncoming RV), and provide this information to DVs with the cross-layer network topology message (NTM) for facilitating fast handover. The OSV uses a set of specific channels to broadcast NTM to DVs [i].

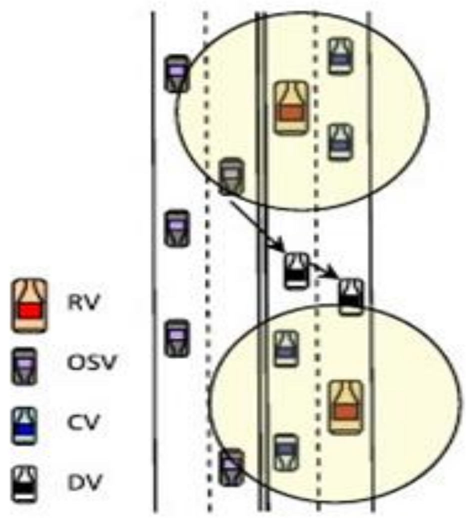

Figure 1 Basic Model in VANETs

Besides vehicles on the road, a number of MR-BSs provide WiMAX multi relay transmission environment are deployed at the roadside. There was prediction based pre-coordination mechanism (PCM that was presented to achieve faster handover scheme in WiMAX networks by improving scanning latency.

In the progress there were many techniques adopted to establish a connection between the vehicles. This connectivity was the main issue as the mobility of the vehicle was very fast, so that a method was developed which is known as fast handover scheme.

The cross layer scenario explains the optimization of MAC and physical layer using a explicit cross layer design [vii]. The NTM [i] carries the information of physical and MAC layers. In this OSV acquires position of the RV's and OSV gives its information to the NTM and broadcasts it to DV's. So, the time of scanning procedure is reduced in cross layer design which is proposed earlier.

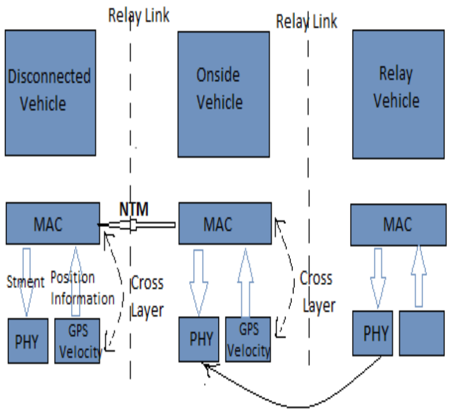

Figure 2 Cross layering by sending information to MAC layer

Still there may be a problem in broadcasting or transferring the message from RV to DV, because considers the extreme traffic situations such as dense traffic density, sparse traffic density. So, we are analyzing the case of dense and sparse network in cross layer design and hence we can have some interesting cases of network connectivity in vehicular ADHOC network.

2.1 Traffic Scenarios Analysis

Well here we are going to discuss many real time scenarios for the VANETs. In real scenario we have two ways and one way. So for both of these cases we have different possibilities. In any of those we can have dense and sparse network. Here we are discussing about three major criteria in dense and sparse network in two ways. The three cases can be explained as follows:

In a two way scenario there are three possibilities i.e. when traffic is dense or when it is sparse or there is not at all any oncoming vehicle. These scenarios are explained below:

2.1.1 Two-Way Scenario

CASE 1: This is almost the case of dense network in which there is a possibility of more Relay Vehicle, Onside Vehicle and Disconnected Vehicles are present. Here, Relay Vehicle transfers its physical and MAC layer information to the onside vehicles. Then, these onside vehicles carry the information and give it to the disconnected vehicles, which will get the connection from the relay vehicle when it enters the broadcast area. As the network is dense there would not be any loss of information.

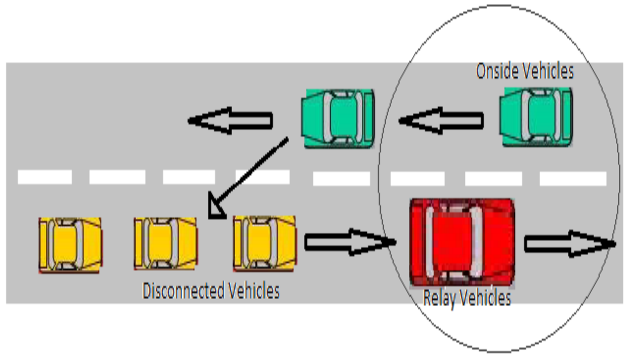

Figure 3 Two-way scenario

CASE 2: This is one of the possible cases of sparse network. Here, there is a Relay Vehicle and Onside Vehicle. So that information is transferred from relay vehicle to onside vehicle. But, as this is sparse network we are considering there is less number of onside and disconnected vehicles. So, the information carried by the onside vehicles will be lost in the way before it reaches the disconnected vehicle.

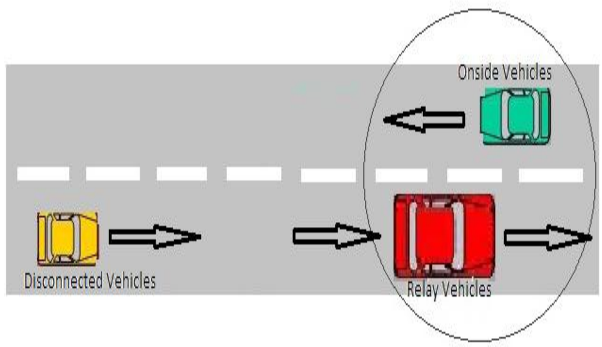

Figure 4 Two-way scenario on traffic

CASE 3: This is the extreme scenario of sparse network. Here, there may be a Relay Vehicle and Disconnected Vehicle. But there is no Onside Vehicle to carry the information and transfer it to DV's. So the DV's cannot get any relay until it enters the broadcast area. This is the worst case of sparse network where the DV's will never get connectivity as the vehicle density is too low.

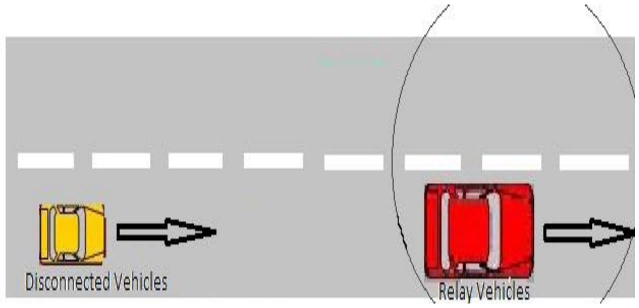

Figure 5 Two-way scenario in DV

2.1.2 One-Way Scenario

For one-way case is totally different now we are going to discuss VANETs cross layering design for this. The cross-layer is a layer that can communicate with another layer .It is based on a fast handover scheme in which we make use of an oncoming vehicle to give prior information to disconnected vehicles. But this model suffers from a disadvantage. It is not applicable in places where there is no two way movement of vehicles. It supports only two way vehicular movement.

Dense Traffic: For one way scenario in dense network, the communication between the two relay vehicles will be easier and so there is no possibility of getting disconnected.

Sparse Traffic: For one way scenario in sparse network, the density of vehicles will be less and so the communication between two relay vehicles may not be possible sometime. So, the continuity in connection is not attained here.

III. Synchronized Mechanism

Here we assume that all the vehicles are equipped with sensors, GPS system, receivers and transmitters. In our system, we propose a solution to this problem. We allow synchronization between two relay vehicles so that there is no disconnectivity in the network. Moreover, relay vehicles can send details to connected vehicles about next relay vehicle. This approach would give time to all those vehicles that need to handover and reconfigure themselves. This synchronization is provided by the base station and by maintaining a synchronization bit. This will continuously check its corresponding relay vehicle and set its bit . Its sets its bit to 1 if vehicle is synchronized else 0 i.e., reset as given in Figure 3. Base station continuously sends information to all relay vehicles about their speed and positions, by which each relay vehicle can synchronize itself with respect to other relay vehicles. This approach increases the throughput of network due to increase in the number of vehicles. Communication speed also increases. This setup is also applicable for a sparse network and it is found to be efficient as there is no dis-connectivity in the network. Hence all vehicles can make use of the nearest relay vehicle and handover when required (when a vehicle crosses one relay vehicle and leaves the one from which it was connected to).

3.1 SNTI Format

There are following fields required for SNTI. These set of fields allows relay vehicles to get themselves synchronized so that handover becomes much easier.

BSID (Base Station ID): Each RV is connected to a base station from which it gets internet connection. To know which base station a RV is communicating we use Base station ID to identify base station.

RVID (Relay Vehicle ID) Every RV has its own ID which unifies it.

HC (Hop Count) This is hop count which denotes number of base stations hopped till now.

DIRECTION Shows the direction in which vehicle is moving.

POSITION Gives the location of it based on the GPS. This is used to synchronize the other RV's.

RV VELOCITY Gives velocity with which a RV is moving. TS (Time stamp): It's the time stamp which gives maximum limit for carrying this information.

RV # PHY INFORMATION Contains the physical information of RV to which handover is going to take place.

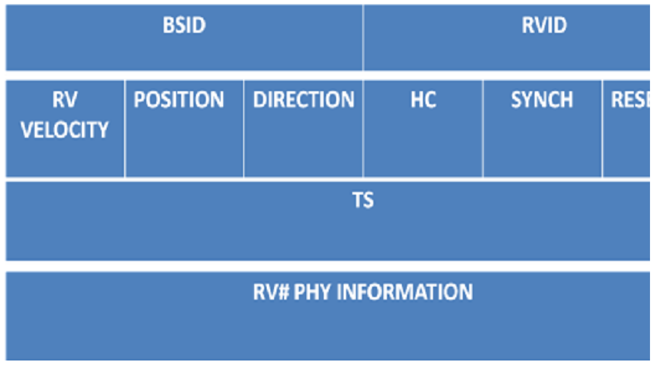

Figure 6 SNTI format

3.2 Synchronized Algorithm:

When there is connectivity of network is crucial we require synchronization between all the RVs connected to a base station. For this we assume that there are enough RVs for proper coverage of whole area. In this scenario it is necessary that there must be proper communication between RVs. For this, it uses following algorithm. All RVs in contact with each other set its synch bit to 1. When any of the RV due to any reason slows down or speed up there is possibility of disconnectivity. So at that time that RV sends information in form of SNTI to BS. BS Station sends SNTI to both the adjacent RVs. Based on this synchronization takes place and connectivity is sustained.

3.2.1 Algorithm Sensing

Input:

Sensors: Gets information whether connected to Adjacent RV or not

Output:

Connected or disconnected

```
Sensor=0;
While(sensor==sense)do
{
 Sensor=sensor+1;
 If(sensor==1) Then
 Return connect;
Call Synch;
Measured Velocity by  Handover SNTI
 Else
 Return disconnect
 }
Endif
End while
```

3.2.2 Algorithm Synch

Input:

SNTI: SNTI of RV getting synchronization problem.

RVcur: Current Relay Vehicle

RVadj: Adjacent Relay Vehicle

BS: Base Station

Output:

Synchronization among RVs

```
While(sensor!= sensing)do
{
  BS=BS+SNTI
  If(RVcur<RVadj) Then
  Return speedupRVcur
  Else
  return slowdown RVcur.vel
}
Endif
Endwhile
```

3.3 Handover Algorithm:

In this model, RV is going to handover physical layer information to a CV. So, in this a CV requests for a handover to connect to adjacent RV as its signal starts becoming low. A RV then based on CV velocity asks base station SNTI for next RV where handover will take place. A base station collects SNTI from RV# and sends it to current RV. After getting this SNTI RV sends this to CV so that it can reconfigure its MAC and Physical layer based on information given by SNTI.

3.3.1 Algorithm CV Request:

Input:

Sn: It gives signal strength to CV.

Velocity: Velocity of RV and CV.

Output:

None.

```
While (CVvel!= RVvel)
{
  If (sn<Rthreshold) Then
  next RV;
}
End if
End while
```

3.3.2 Algorithm: Handover SNTI

Input:Position: Location of CV.

Velocity: Velocity of CV.

Output: SNTI: RV’s physical information

```
If(CVvel<RVvel)Then
{
 Req←PreRV;
 return(info←SNTI.phyinfo)
Check the CV Request.
return(info←SNTI.phyinfo)
}
Endif
```

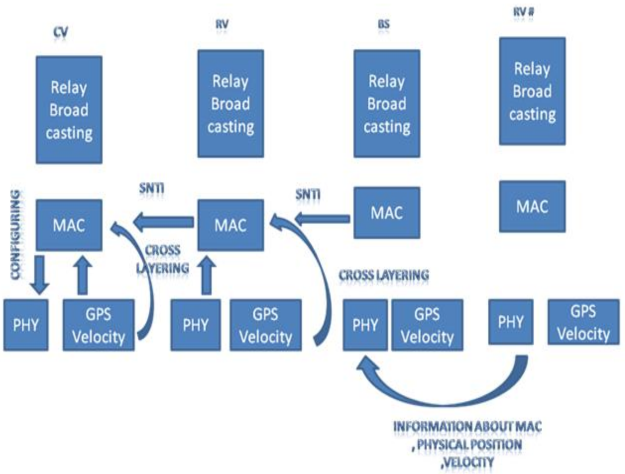

Figure 7 Cross Layer Design Scenario

IV. Results and Discussion

Now that whole model is understood. We can proceed with the analysis of this system. Here the arrival for CVs is taken in Poisson distribution λ. Also the service of each CV can be denoted by μ. Each RV in the network is considered as a server. Also each CV can also play a role of server since this is ADHOC network. So as the number of vehicle increases in this network connectivity is also increased. The results are shown for a sparse network. In which synchronization of RVs and cross-layering of physical and MAC layer is shown below.

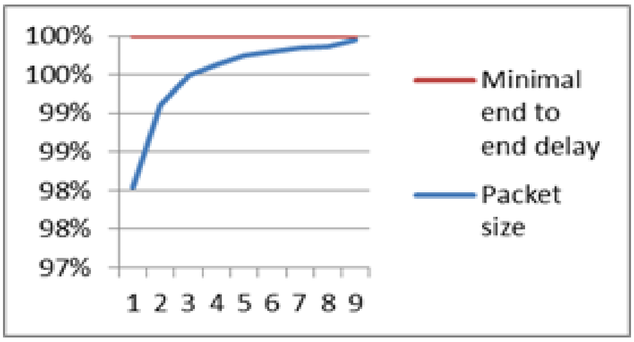

Figure 8 Packet size Vs End to end delay

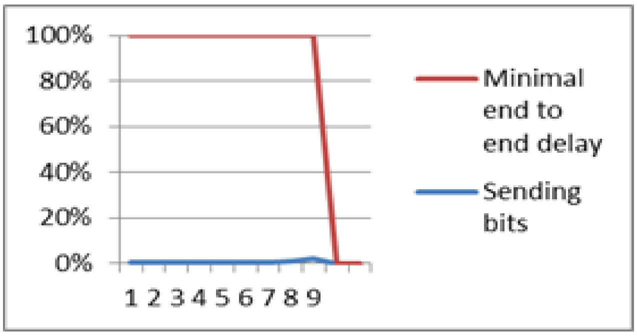

Figure 9 Throughput of sending bits Vs Minimal End to End delay

4.2 Chart Analysis for Adhoc Network

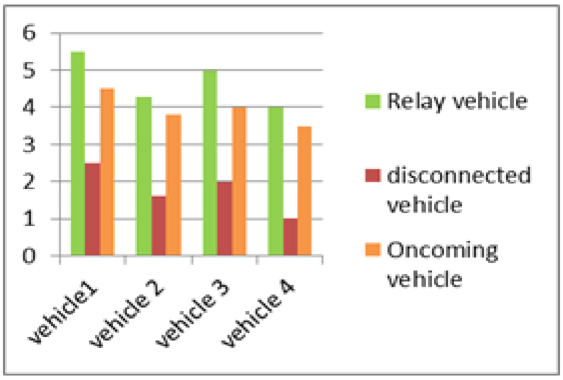

Figure 10 analysis of adhoc network

The analysis of the chart is represented the vehicle in the formation of relay vehicle, disconnected vehicle, oncoming vehicle. The relay vehicle present in the network coverage area. The disconnected vehicle does not present in network coverage area. The oncoming vehicle used to pass information about connection of disconnected vehicle.

V. Conclusion:

In old system one way network was not possible but it was efficient for a two-way network. Also for a sparse traffic the connectivity is not attained. But in the proposed system even during sparse traffic there is substantial amount connectivity of vehicles. So far studies are done to provide an competent connectivity of VANETS using cross-layering. Since security is not taken under contemplation, security of the VANETs will be discussed in the future work.

6. References

i. *Kuan-Lin Chiu, Ren-Hung Hwang and Yuh-Shyan Chen, Cross Layer Design Vehicle-Aided Scheme in VANETs journal Wirel. Commun.Mob. Comput. Published online in Wiley InterScience Vol 1, P.P 1.13, 2009*

ii. *Saleet H, Basir O. Location-based message aggregation in vehicular ad hoc networks. In Proceedings of IEEE Globecom Workshops, 26 Vol 30,P.P 1-7, 2007.*

iii. *Jerbi M, and Senouci SM. Characterizing multi-hop communication in vehicular networks.In Proceedings of IEEE WirelessCommunications and Networking Conference, Vol 3, P.P-3309-3313,2008.*

iv. *Chen J, Wang CC, and Lee JD. Pre-coordination mechanism Q5 for fast handover in WiMAX networks. In Proceedings of 2nd International Conference on Wireless Broadband and Ultra Wideband Communications AusWireless, Vol 1,P.P 15-21,2007.*

v. *Boone P, Barbeau M, and Kranakis E. Strategies for fast scanning and handovers in WiMAX/802.16. In Proceedings of Second International Conference on Accessing Networks and Workshops Access Nets'07,Vol 1,P.P 1-7, 2007.*

vi. *Park JH, Han KY, and Cho DH. Reducing inter-cell handover events based on cell ID information in multi-hop relay systems. In Proceedings of IEEE 65th VTC2007-Spring Vehicular Technology Conference,Vol 1, P.P 743-747,2007.*

vii. *Srivastava V, and Motani M. Cross-layer design: a survey and the roads ahead.IEEE Communications Magazine,Vol 1,P.P 112-119, 2005.*

viii. *B. Jarupan, E. Ekici, A survey of cross-layer design for VANETs, Ad Hoc Network,Vol 9, P.P 966-983,2011.*