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Improving Connectivity Between Vehicle and Road-Side-Unit

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Abstract— Vehicular Networks are receiving a lot of attention due to the wide variety of services they can provide. Their applications range from safety and crash avoidance to Internet access and multimedia. Vehicular ad hoc network (VANET) is an emerging wireless communications technology that is capable of enhancing driving safety and velocity by exchanging real-time transportation information. VANETs are formed spontaneously between moving vehicles on roads. The performance of this type of network is affected by characteristics of road's traffic. Connectivity in VANETs may degrade dramatically in sparse traffic and also high speed highways. Because of fast changing environment the network discontinuity occurs between vehicles & roadside units. A lot of work and research around the globe is being conducted to define the standards for vehicular communications. These include frequency allocation, standards for physical and link layers, routing algorithms, as well as security issues and new applications.

In this project we try to find ways to improve the connectivity between the vehicle & roadside units so that we can send the packets in minimum latency period and review the standardization work and researches related to vehicular networks and discuss the challenges facing future vehicular networks.

Index Terms— V-to-R communication, V-To-R connectivity, WiMax in Vanet, Vanet, Connectivity in vanet, connectivity issuies in vanet, improving connectivity in vanet, improving connectivity between vehicle and road side unit.

1 Introduction

Millions of people around the world die every year in car accidents and many more are injured. Implementations of safety information such as speed limits and road conditions are used in many parts of the world but still more work is required. The messages in V2R communications are first sent to a roadside unit, and then broadcast by the roadside unit to all vehicles in range. According to the enclosed information in messages, such as event ID, accident vehicle (source vehicle) ID, transmitter ID, and location information of the transmitter, receivers generate necessary warning instructions to avoid collisions. The enclosed location information of the transmitter can be used by the receiving vehicle to detect whether a message is from a vehicle 'in front' or 'from behind'. In general, the faster the warning messages are successfully received by the endangered vehicles, the higher the possibility for vehicle drivers to react. Therefore, it is very important to achieve high delivery ratio and low latency in delivering warning messages. However, due to packet collisions and the unreliability of the wireless channel in highway traffic scenarios, messages may not be correctly delivered in time. **In our Project we will discuss these points so to improve connectivity between vehicle and road side units**.

2 Earlier and Existing Systems

First application for vehicular communications was 'co-operative collision warning' which uses vehicle to vehicle communication. Other safety applications soon emerged as well as applications for more effcient use of the transportation network, less congestion and faster and safer routes for drivers. These applications cannot function effciently using only vehicle to vehicle communications therefore an infrastructure is needed in the form of RSU.

2.1 Dedicated Short Range Communications (DSRC)

Different frequencies for VANET were allocated in different parts of the world. In North America the Dedicated Short Range Communications (DSRC) band 902928 MHz was allocated.

1. It provided short range communications (30m).
2. Low data rates (500 kbps).
3. It is still used for some types of electronic toll collection systems.
4. Its performance is too limited.

2.2 Wireless Access in Vehicular Environment (WAVE)

Wireless Access Vehicular Environment facilitates the exchange of information among vehicles and other support system through internet wireless communication.

1. It is only a part of a group of standards of protocols of DSRC.
2. The research work in 802.11p from IEEE is called WAVE.
3. Uses a multiple channel concept.
4. Support the wireless communication at low latency
5. Frequencies not suitable for VANET.
6. Range higher than DSRC but not effcient for VANET.

2.3 Global Positioning System(GPS)

The Global Positioning System (GPS) is a space-based global navigation satellite system (GNSS) that provides location and time information in all weather, anywhere on or near the Earth, where there is an unobstructed line of sight to four or more GPS satellites.

1. A GPS receiver calculates its position by precisely timing the signals sent by GPS satellites high above the Earth.
2. Each satellite continually transmits messages that include
    - The time the message was transmitted
    - Precise orbital information (the ephemeris)
    - The general system health and rough orbits of all GPS satellites (the almanac).
3. The receiver uses the messages it receives to determine the transit time of each message and computes the distance to each satellite.
4. These distances along with the satellites' locations are used with the possible aid of trilateration, depending on which algorithm is used, to compute the position of the receiver.
5. This position is then displayed, perhaps with a moving map display or latitude and longitude; elevation information may be included.
6. Many GPS units show derived information such as direction and speed, calculated from position changes.

2.4 Infrastructure to Vehicle (One-Way)

1. This application supports the communication from roadside units (RSUs) to vehicles without a persistent communication link between vehicles and RSUs.
2. This application neither builds up a 2-way communication link nor does it receive or forward hazard warnings.
3. The RSU Sender shall package the data into a message & use a broadcast mechanism (broadcast, geocast) to send the message to all surrounding vehicles.
4. But as the communication is one way hence the Vehicles cannot forward these packets to the RSU or any other vehicles.

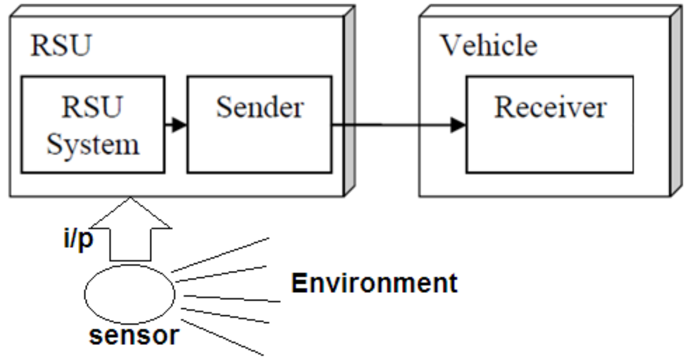
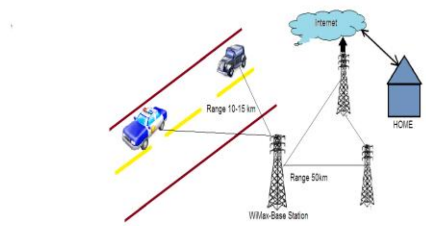


Fig 2.4.1 One-Way communication

3 Proposed System

As we know that Wave/Dsrc is already implemented for VANET. But WAVE gives very poor performance in fast changing environment. So when vehicle increases its velocity it gets the network discontinuity problem. This problem was occurred because of many factors but the main factor was Range. The Range of Wave is very less as mentioned in above section.

So in our system for improving connectivity we have focused on range. The main idea behind our project was any how increase the range so that we can improve the connectivity. For increasing the range we have choosen WiMax as our TECHNOLOGY.



WiMax stands for World Wide Interoperability for Microwave Access.

A single WiMAX tower can provide coverage to a very large area as compared to other technologies. Hence less no. of towers are required to connect. WiMax has high download speed up to 70 Mb/s.

In VANET wimax provides 50 km of range between two fixed units (towers are the fixed units) and it provides 15-20 km of range between fixed and mobile station (Vehicle is our mobile station).

PLATFORM: For implementing our system we have used QualNet network simulator as our platform. We have implemented our Vanet scenario in QualNet successfully and got satisfactory results.

Routing Algorithm: We have used AODV as our Routing algorithm.

There are two best protocols for vanet

1. DSR
2. AODV

We compared these two protocols and found that there is less packet loss in DSR compared to AODV. But the main goal of our

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system is to improving the connectivity and in AODV the latency time is very less compared to DSR, that's why we have choosen AODV as routing protocol for system.

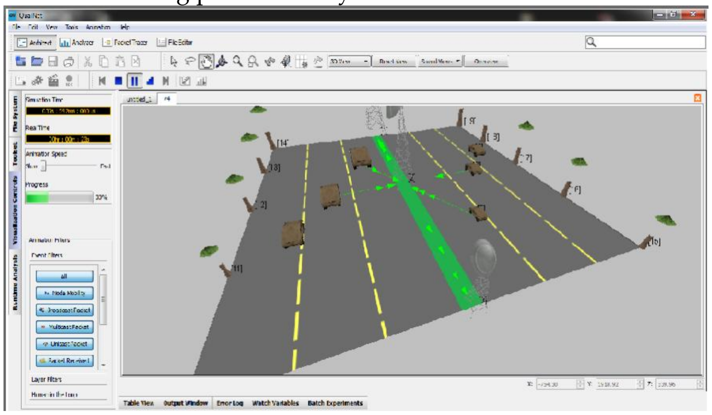

Fig 3.1: VANET scenario (proposed System) in QualNet

4 Conclusion

Through our Project Work we can conclude that:

1. Packet lost due to high velocityis reduced from 58% [DSRC] to 8%[WiMax] at a speed of 72kmph.
2. Latency time is reduced from 0.6635[DSRC] to 0.2216 at the speed of 72kmph.
3. Jitter has been reduced from 0.5033 sec to .2696 sec.
4. The appropriate routing algorithm suiting wimax scenario is AODV as compared to other existing routing protocols.
5. The range of the network has been tremendously increased from 1.8km [DSRC] to 50km [WiMax].

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6 References

[1] Saleh Youseff, Eitan Altman, et al Rachid El- Azouzi, Mahmood Fathy, Improving connectivity in vehicular ad hoc networks, Computer Communications 31 (2008) 16531659, pages 7, pg 1-7.

[2] Ghassan M. T. Abdalla, Mosa Ali AbuRghe_, et al Sidi Mohammed Senouci Current Trends in Vehicular Ad Hoc Networks,pages 9,pg 19

[3] Maxim Raya, Jean-Pierre Hubaux Securing vehicular ad hoc neworks, Journal of Computer Security 15 (2007) 3968, pages 39,pg 1-39.

[4] Kaveh Sha_ee, Victor C.M. Leung Connectivity-aware minimum-delay Geographic routing with vehicle tracking in VANETs, Ad Hoc Net works 9 (2011) 131141, pages 11, pg 1-11.

[5] Bruce (Xiubin) Wang, Teresa M. Adams, et al Wenlong Jin, Qiang Meng The process of information propagation in a tra_c stream with a general vehicle headway: A revisit,Transportation Research Part C 18 (2010) 367375, pages 9, pg 1-4.

[6] Kevin C. Lee, Uichin Lee, et al Mario Gerla Survey of Routing Proto cols in Vehicular Ad Hoc Networks, pages 28, pg 1-15.

[7] Jose Santa, Antonio F. Gomez- Skarmeta, et al Marc Sanchez-Artigas Architecture and evaluation of a uni_ed V2V and V2I communication system based on cellular networks, Computer Communications 31 (2008) 28502861, pages 12, pg 1-12. 66

[8] Jesus Tellez Isaac, Jose Sierra Camara, Sherali Zeadally, et al Joaquin Torres Marquez A secure vehicle-to-roadside communication payment protocol in vehicular ad hoc networks, Computer Commu nications 31 (2008) 24782484, pages 7, pg 1-7.

[9] AdrianE.CoronadoMondragon, ChandraS.Lalwani, et al Etienne CoronadoMondragon, Christian E.CoronadoMondragon Facilitating multimode allogistics and enabling information systems Connectivity through wireless vehicular neworks, Int. J.Production Economics 122(2009)229240, pages 12, pg 1-5.