Volume : 1 | Issue : 7 | July 2012 ISSN - 2250-1991

Research Paper Wireless Networks

"V2V Technology Broadcasting Applications In Vehicular Mobile Wimax Wireless Ad-Hoc Networks"

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ABSTRACT

Wireless communications are becoming the dominant form of transferring information, And the most active research field. In this dissertation, we will present one of the most applicable forms of Ad-Hoc networks; the Vehicular Ad-Hoc Networks (VANETs). VANET is the technology of building a robust Ad-Hoc network between mobile vehicles and each other, besides, between mobile vehicles and roadside units. The work begins with an introduction to VANET technology, its possible applications, unique characteristics and promising challenges. It also demystifies some excerpts from the IEEE 802.11 standard that are related to the operation in the Ad-Hoc mode and illustrates the main points of its amendment in vehicular environments. Reliable broadcasting of messages in self-organizing Ad-Hoc networks is a promising research field with hundreds of published papers. This work presents a comprehensive study of the Significant broadcasting protocols in VANET environments. The thesis contribution is a novel reliable broadcasting protocol that is especially designed for an optimum performance of public-safety related applications. There are four novel ideas presented in this thesis, namely choosing the nearest following node as the network probe node, headway-based segmentation, non-uniform segmentation and application adaptive. The integration of these ideas results in a protocol that possesses minimum latency, minimum probability of collision in the acknowledgment messages and unique robustness at different speeds and traffic volumes. The performance of the proposed protocol has been studied.

*Key Words :VANET/ VEHICULAR AD/ HOC NETWORK,

A Vehicular Ad-Hoc Network, or VANET is a technology that uses moving cars as nodes in a network to create a mobile network. VANET turns every participating car into a wireless router or node, allowing cars approximately 100 to 300 metres of each other to connect and, in turn, 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 internet is created. It is estimated that the first systems that will integrate this technology are police and fire vehicles to communicate with each other for safety purposes.

We can understand VANETs as subset of MANET and best example of VANET is Bus System of any University which are connected. These buses are moving in different parts of city to pick or drop students if they are connected, make a Ad hoc Network. Most of the concerns of interest to MANets are of interest in VANets, but the details differ. Rather than moving at random, vehicles tend to move in an organized fashion. The interactions with roadside equipment can likewise be characterized fairly accurately. And finally, most vehicles are restricted in their range of motion, for example by being constrained to follow a paved highway.

2. BASIC THEORY

Everything is becoming wireless. The fascination of mobility, accessibility and flexibility makes wireless technologies the dominant method of transferring all sorts of information. Satellite televisions, cellular phones and wireless Internet are well-known applications of wireless technologies. This work presents a promising wireless application and introduces a tiny contribution to its research community.

Wireless research field is growing faster than any other one. It serves a wide range of applications under different topologies every one of which comes with some new specialized protocols. In this research, we will present an introduction to a wireless technology that is expected to be adopted by both governments and manufacturers in the very near future. It directly affects car accidents (which is the first cause of death in the age group 1 - 44 years) and the sales of one of the largest markets. It is the technology of building a robust network between mobile vehicles; i.e. let vehicles talk to each other. This promising technology is literally called Vehicular Ad-Hoc Networks (VANETs). In this research, an introduction to the technology of VANETs will be presented as well as a new contribution with a novel broadcasting protocol.

]2.1 What is VANET?

3. LITERATURE SURVEY

This paper reviews the use of the 4th generation, 4G wireless technology in cars, public transport and emergency services. The article describes the standards for Mobile WiMAX (standard IEEE 802.16e-2005) and the 3rd Generation Partnership Project, the 3GPP Long Term Evolution (LTE). In a vehicle which applies the 4G wireless technology car solution concept, consumers would be able to access network- and cloud-based applications, putting on-demand entertainment, infotainment, diagnostics, and navigation. We discuss the advantages of introducing the solution concept «4G connected car» and the use of this technology in Russia. We have carried out experimental investigations. Our results show that the system operates up to the speed of the car of 140 km/h. The interactive system to send and receive signals works with data rates of 10 Mbps.

Fourth generation (4G) mobile systems and services will mainly be characterized by a horizontal communication model, where different access technologies such as cellular, cordless, wireless local area network (WLAN), short-range connectivity, and wired systems will be combined on a common platform to complement each other optimally for different service requirements and radio environments. To access different wireless networks, multimode user terminals are essential. The most promising way of implementing multimodal user terminals is to adopt the software radio approach. The current software radio technology does not meet the requirements of different wireless networks; because it is impossible to have just one antenna and one LNA (Low Noise Amplifier) to serve the wide range of frequency bands. The software radio devices, after scanning the available networks, will load the required software and reconfigure themselves for the selected network. Each downloading method has its own advantages and disadvantages with respect to speed, accuracy, resource usage, and convenience.

4.PROBLEM IDENTIFICATION

The problem of a new mobility model is treated with a random number generator to be used as the headway between vehicles of the same lane. The histogram of one of these variables is (at 2000 sample) indicating the flexibility of Matlab/ns2 environment in the simulation. This headway distribution is considered at a traffic volume of approximately 330 veh/h to be identical to the one used for the analytical analysis.

5. PROPOSED WORK

5.1 Work done so far

The next generation mobile communication systems will need to support multiple services ubiquitously in different types of environments, different levels of data rates, and different mobility and traffic management techniques. Multiple access technology is a key issue to efficiently share the available scarce bandwidth among a large number of users. The choice of multiple access technique could significantly enhance or lower the service quality delivered to end users. In this talk, major multiple access technologies in the first, second and third-generation wireless cellular systems are reviewed, and possible directions for the development of appropriate multiple access technologies for next-generation mobile networks, the so-called 4G or beyond 3G (B3G), are investigated.

Analogue first generation cellular communication systems made use of FDMA as a basic multiple access scheme. In digital 2G systems, TDMA is predominant. CDMA is the most commonly used form of multiple access for the third generation (3G) systems, in some cases complemented by a hybrid CDMA/TDMA scheme. To sustain a bi-directional communication between a mobile terminal and a base station, transmission resources must be provided both in the uplink and downlink directions through frequency-division duplex (FDD) or through time-division duplex (TDD). Both methods can be applied in conjunction with any of the above-described multiple access schemes. IG and 2G systems apply FDD. In IMT2000 (3G system), both FDD and TDD modes are supported, where TD-SCDMA is a Chinese self-developed 3G standard supporting TDD mode. The existing multiple access techniques used in 1G/2G/3G systems are basically suitable for voice communications but not for high-data-rate transmission and burst data traffic, which would be the dominant portion of the traffic load in 4G systems.

5.2 Work to be done

In this research, we introduced a novel broadcasting protocol in VANET environments with these new features.

The first protocol to use the concept of headway-based segmentation and to include Effects of human behaviours in its design with the headway model. Non-uniform segmentation achieving a unique a minimum slope linearly increasing Latency distribution. Unique robustness at different speeds and traffic volumes rooted to the headway Robustness at different traffic volume variations. For example the latency difference between the traffic volume of 330veh/h and 1300veh/h is in a range of 10μsec. Superior minimum latency for public safety applications.

5.3 Proposed Methodology

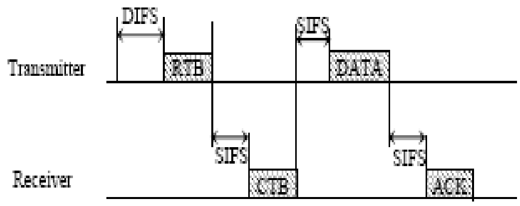
Latency is measured in the simulation program using four distinct delay sources,

1-Contention starting time: that is equal to DIFS + RTB transmission time.

2- Success broadcasting time: in case of a following node replied with a valid CTB Message, the time required for the rest of the broadcasting phase, equals to SIFS + CTB Transmission time + SIFS + message transmission time + SIFS + ACK transmission time.

3- Collision time: in case of a collision in the CTB packet, the time wasted will be equal to DIFS + RTB transmission time + SIFS + CTB transmission time + SIFS. Note that a collision destroys a complete phase.

4- Waiting time: the time taken by a node to decide either it will reply with a CTB message or not, each instance of this time equals to a single time slot.



Event (1) and (2) must happen once per any broadcasting phase, however, event (3) and (4) may happen with a variable number according to the protocol design and the network condition. There is a trade off between events (3) and (4) in all broadcasting protocols that depends on segmentation of the transmission area; increasing the number of segments leads to smaller number of vehicles in each segment, hence, decreases collision probability while increases waiting times, and vice versa. Assuming that both CWmin and CWmax equal to one (i.e. there is no contention or rand back off), collision probability is measured in the simulation program by dividing the number of broadcast phases that happen to have more than one node in the first non-empty segment by the total number of broadcast phases.

5.3.2 Algorithm of Vehicles

Upon receiving of an RTB message, other nodes proceed with the following algorithm,

1- Set the NAV to be SIFS+N+2 time-slots so that nodes will not start a new session until the end of the current broadcast.

2- Check the broadcasting mode field.

3- Compare the geographical coordinates of the transmitting vehicle with their own, and obtain its relative position. If the receiving vehicle is in the opposite driving direction or not in the message propagation direction, ignore the message and go to end. Otherwise, if the receiving vehicle is in the message propagation direction, continue.

4-Compute the headway in seconds (or distance in meter for mode 2) then determine its Segment number with reference to the operating mode.

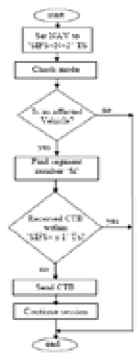


Fig.5.3.2 Actions of vehicles

5-Assuming that the segment number equals Si where (i <= N) and (i) is the segment number. Set the back-off counter to be equal to (i-1). So that, nodes wait for the SIFS then decrement the back-off counter by one in each time slot while listening to the channel for any valid CTB message, if locked with a valid CTB message then the node should exit the contention phase and listen for the incoming broadcast. The node that reaches zero initiates a CTB message including its MAC address and continues the session with the transmitting node. This completes the analytical analysis of the proposed protocol. Further investigate the protocol with some simulation programs.

5.4 Proposed Solution

The performance of almost all previously published protocols, changes drastically with changing the traffic volume. However, the proposed protocol possesses unique robustness at different traffic volumes. we will study the performance of the same protocol under different traffic volumes. The headway distribution at traffic volume of 330veh/h and 1300 veh/h (very low vs. very high) may taken. It could be seen that increasing the traffic volume results in increasing the ratio of short headways and decreasing that of long headways. Assuming a traffic volume of 1300 veh/h, we implemented the same simulation program with the same segmentation which was extracted for the best operation under 330 veh/h.

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