International Journal of Innovative Research in Technology and Management (IJIRTM), Volume-3, Issue-2, 2019
ISSN: 2581-3404 (Online)

Broadcast Scheme in Vehicular Ad-hoc Network: A Review

Mukesh lodhi[1], Prof. Jitendra Mishra[2]
[1]**M. Tech Scholar, Department of EC, PIES, Bhopal (India)**
[2]**Head & Professor, Department of EC, PIES, Bhopal (India)**
[1]**mukeshlodhi02@gmail.com**, [2]**jitendra.mishra260@gmail.com**

ABSTRACT
Vehicular ad hoc networks (VANETs) are an important communication paradigm in modern-day mobile computing for exchanging live messages regarding traffic congestion, weather conditions, road conditions, and targeted location-based advertisements to improve the driving comfort. In such environments, security and intelligent decision making are two important challenges needed to be addressed. In this paper we present the survey for the vehicular ad-hoc network for the broadcasting of any message and enhancing the security system.

Keywords: Wireless Broadcast, Intelligent Transportation Systems, Vehicular Ad-hoc Network, on-Board Unit.

INTRODUCTION
The continuing increase in road traffic accidents throughout the world has motivated the development of Intelligent Transportation Systems (ITS) and other applications to improve road safety and driving comfort. A communication network, called a Vehicular Ad-hoc Network (VANET), in which the vehicles are equipped with wireless devices has been developed to make these applications feasible. In a VANET, communications can be either Vehicle-to-Vehicle (V2V) or Vehicle-to-Infrastructure (V2I). Based on these two types of communications, a VANET can support a wide range of applications for safety (such as dangerous situation detection), for infotainment (such as Internet access and data exchange) and for traffic management (such as vehicle traffic optimization) [8].

The Vehicular Ad-hoc Network (VANET), a variant of the Mobile Ad-hoc Network (MANET), is a continuously self-configuring, infrastructure-less network which has emerged as a result of advances in wireless communications and networking technologies over the last few years [2]. Mobile nodes in VANETs are vehicles equipped with On-Board Units (OBUs), which are wireless communication devices. OBUs enable vehicles in VANETs to exchange traffic messages with nearby mobile nodes.

In urban VANETs, safety related applications usually operate based on wireless broadcast since warning messages (e.g., accident, blocked street, traffic congestion, etc.) need to be delivered to all nearby related vehicles. In addition, due to the limited transmission range of an On-Board Unit (OBU) in vehicles, multi-hop transmissions of warning messages are usually employed because such kind of alert information is indispensable to assist remote drivers to make early driving decisions. For example, in case of traffic accidents or jams, a remote driver expects to get knowledge of such events as early as possible, and then chooses an alternate driving route to avoid traffic jams in the urban transportation environment [3].

Two types of communications are performed in VANETs. The first type is the Vehicle to Vehicle (V2V) communication in which the moving vehicles can communicate with each other and the second type is the Vehicle to RSU (V2R) communication in which the moving vehicles can communicate with the RSUs which are located aside the roads. The V2V and V2R communications are carried out using the Dedicated Short Range Communications (DSRC) standard through an open wireless channel. Each RSU and OBU uses a DSRC radio, based on IEEE 802.11p radio technology to access the wireless channel along with a directional or a unidirectional antenna. If an RSU wants to transmit a message to a specific location, a unidirectional antenna is used. Since, V2V and V2R communications are performed through an open wireless channel, these communications are vulnerable to various kinds of attacks such as interference, eavesdropping, jamming, etc. [11].

The rest of this paper is organized as follows in the first section we describe an introduction of about the vehicular ad-hoc network and broadcast scheme. In section II we discuss about the Vanet applications, In section III we discuss about the Multiple channel access control. In section IV we discuss about the rich literature survey, finally in section V we conclude the about our paper.

II VANET APPLICATION

The concept of equipping future vehicles with sets of wireless sensors, on-board units, Global Positioning System (GPS)or Differential Global Positioning System (DGPS)receivers and network interfaces presents an ample opportunity to achieve intelligent transportation systems with wireless-enabled vehicles capable of sending and receiving kinematic data on the road. VANET is the bedrock upon which vehicles will be able to gather, process and distribute information both for safety-related and non-safety-related purposes on our motorways. Extensive areas of potential VANET applications have been listed and evaluated by several researchers through different projects and consortia. Typically, these applications are classified into either safety-related or non-safety-related applications.

Safety-related VANET applications

Safety-related VANET applications are classified into three basic categories, namely: driver assistance (co-operative collision avoidance, road navigation and lane changing), alert information (work zone and speed limit alert information) and warning alert (road obstacle, post-crash and other life-threatening traffic condition warning).The vehicular safety communications consortium has listed eight (8) potential safety-related applications [7]: pre-crash sensing, curve speed, lane-change, traffic signal violation, emergency electronic brake light and co-operative forward collision alert, stop sign movement and left turn assistant. Safety-related messages from these applications normally require direct communication owing to their stringent delay requirement. For instance, in the case of a sudden hard breaking or accident, the vehicles following those ones involved in accident as well as those in opposite direction will be sent a notification message.

Major road safety applications are the primary measures taken to reduce (or eliminate) the probability of traffic accidents and loss of life in our motorways. Some of the traffic accidents that occur annually across the world are as a result of intersection, rear-end, head-on and lateral mobile vehicle collisions. The necessary precautionary measures (or traffic warning systems) required for the effective implementation and deployment of this road safety applications with their required use-case, mode of communication, minimum transmission frequency and acceptable latency are summarized in Table II. These active road safety-related applications offer assistance to drivers through the provision of time-sensitive, life-saving traffic information which enables drivers to avoid collisions with other mobile vehicles on the road. This is achieved through the timely and reliable exchange of safety-related kinematic information amongst vehicles through V2V communication system as well as amongst vehicles and other road infrastructures through V2I communication, which is processed to predict traffic accidents and collisions.

Non-safety-related VANET applications

The non-safety-related applications of VANETs are also referred to as comfort or commercial applications. Typically, these applications aim to improve traffic efficiency, passenger comfort and commercial platforms in terms of advertisements and electronic toll collection (ETC). These applications include provision of weather information, current traffic and the ability to locate various Points of Interest (PoI) such as nearest parking lots, gas stations, shopping malls, hotels, fast food restaurants, etc. The owners of these aforementioned businesses can install some stationary gateways to transmit marketing adverts for the mobile customers travelling via the VANET enabled vehicles. The compelling argument in allowing comfort and commercial VANET applications is that of distraction and interference with safety-related applications thereby defeating the aim of improving safety and traffic efficiency in our motorways. Consequently, a possible solution would be achieved by using separate physical network channels for safety and non-safety applications or by applying traffic prioritization where safety-related messages are accorded higher priority than non-safety-related messages.

III MULTIPLE CHANNEL ACCESS CONTROL

Since the maximum throughput of a single channel scheme is limited by the bandwidth of that channel, using more channels appropriately can potentially increase the throughput and reduce the delay. Data transmission on different channels does not interfere with each other, so that multiple transmissions can take place in the neighborhood simultaneously. Therefore, the WAVE standard adopts a multichannel concept for the design of MAC protocols. The multichannel MAC protocols are essential to not only ensure the reliable transmission of safety messages with low latency, but also provide the maximal throughput for non-safety applications in a distributed manner. In particular, vehicles rely on the channel coordinative strategy (defined by the MAC protocol) to cooperate the medium access behaviors between the CCH and the SCH. In addition, the MAC protocol should have a smart approach to allocating multiple channel resource for non-safety applications.

IV RELATED WORK

[1] In this paper they propose an efficient receiver-oriented broadcast scheme in which the receiving vehicles' probability of forwarding is modeled by the symmetric volunteer's dilemma game. Based on this game, the vehicles that receive the broadcast message are players. At least one of the players should pay a cost and be a volunteer to rebroadcast the message, and then all will benefit from this volunteering. Utilizing fuzzy logic techniques and considering information from the network layer about local density and probability of transmission, the contention window size at the MAC layer will be adjusted. They develop ns-3 simulations to evaluate the performance of the proposed volunteer's dilemma inspired broadcast (VDIB) scheme in terms of reachability, number of rebroadcasts per covered vehicle, number of bytes sent per covered vehicle, and per-hop delay.

[2] They propose a CPPA scheme for VANETs that does not use bilinear paring and we demonstrate that it could support both the mutual authentication and the privacy protection simultaneously. Their proposed CPPA scheme retains most of the benefits obtained with the previously proposed CPPA schemes. Moreover, the proposed CPPA scheme yields a better performance in terms of computation cost and communication cost making it be suitable for use by the VANET safety-related applications.

[3] In this paper, they propose an urban multi-hop broadcast protocol (UMBP) to disseminate emergency messages. To lower emergency message transmission delay and reduce message redundancy, UMBP includes a novel forwarding node selection scheme that utilizes iterative partition, mini-slot, and black-burst to quickly select remote neighboring nodes, and a single forwarding node is successfully chosen by the asynchronous contention among them. Then, bidirectional broadcast, multi-directional broadcast, and directional broadcast are designed according to the positions of the emergency message senders. Specifically, at the first hop, bidirectional broadcast or multi-directional broadcast conducts the forwarding node selection scheme in different directions simultaneously, and a single forwarding node is successfully chosen in each direction.

[4] In this paper they propose a protocol which can store the data in VANETs by transferring data to a new carrier (vehicle) before the current data carrier is moving out of a specified region. For the next data carrier node selection, the protocol employs fuzzy logic to evaluate instant reward by taking into account multiple metrics specifically throughput, vehicle velocity, and bandwidth efficiency. In addition, a reinforcement learning-based algorithm is used to consider the future reward of a decision. For the data collection, the protocol uses a cluster-based forwarding approach to improve the efficiency of wireless resource utilization. They use theoretical analysis and computer simulations to evaluate the proposed protocol.

[5] In this paper they focus on a comprehensive survey of VANET MAC schemes by integrating various related issues and challenges. Their analysis not only deepens the understanding of MAC techniques in VANETs but also presents the key ideas and potential directions for future research in this area. In order to significantly improve the communication performance of VANETs, more research efforts on MAC techniques must be made for optimizing multichannel coordination and allocation approaches, enhancing the Quality of Service (QoS) capability, and combating the hidden terminal problem, broadcast storm problem and even ACK (acknowledgment) explosion problem.

[6] In this work they propose a novel solution to this problem, which we refer to as Speed Adaptive Probabilistic Flooding (SAPF). The scheme employs probabilistic flooding to mitigate the effects of the broadcast storm problem, typical when using blind flooding, and its unique feature is that the rebroadcast probability is regulated adaptively based on the vehicle speed in order to account for varying traffic densities within the transportation network. The motivation behind this choice is the identification of the existence of phase transition phenomena in probabilistic flooding in VANETs which dictate a critical probability being affected by the varying vehicle traffic density, and shown to be linearly related to the vehicle speed (a locally measurable quantity).

[7] Many key important topics in vehicular communication are currently under intensive research and discussion. These topical issues include potential modification, refinement, enhancement and implementation of IEEE 802.11p, wireless access in vehicular environment standard (WAVE), allocation of protected frequency band for mobile vehicular safety communication, integration (or unification) of different wireless technologies, congestion control, data security and transport, reliability in V2V communication and so on. The final step would be the harmonization of these promising solutions with other emerging worldwide vehicular communication projects and standards.

[8] In this paper, they proposed a centralized TDMA based MAC protocol, named CTMAC in which an RSU is used as a local channel coordinator for the vehicles within its communication range. The ways that slots are allocated and reused between the RSU’s coverage areas are designed to avoid collisions caused by the interference problem between vehicles in the overlapping regions. The simulation results show that, compared to VeMAC and ADHOC MAC protocols, CTMAC has succeeded to provide a smaller rate of access and merging collisions as well as the overhead required to create and maintain the TDMA schedules.

[9] In this paper, a latency and coverage optimized data collection (LCODC) scheme is proposed to collect data on smart cities through opportunistic routing. Compared with other schemes, the efficiency of data collection is improved since the data flow in LCODC scheme consists of not only vehicle to device transmission (V2D), but also vehicle to vehicle transmission (V2V). Besides, through data mining on patterns hidden in the smart city, waste and redundancy in the utilization of public resources are mitigated, leading to the easy implementation of our scheme.

[10] In this paper, they analyze two classes of forwarding approaches: (i) a minimalist, provider-blind forwarding strategy, only aimed at keeping packet redundancy on the broadcast wireless medium under control, without any knowledge about the neighborhood and the identity of the content sources; and (ii) a provider-aware strategy, which leverages soft state information about the content sources, piggybacked in Interest and Data packets and locally kept by nodes, to facilitate content retrieval. Performance evaluation is carried by means of ndnSIM, the official NDN simulator, that is overhauled for use in realistic wireless ad-hoc environments. Results collected under variable traffic loads and topologies provide insights into the behaviour of both forwarding approaches and help to derive a set of recommendations that are crucial to the successful design of a forwarding strategy for named data ad-hoc wireless networking.

[11] In this paper, a trusted authority (TA) is designed to provide a variety of online premium services to customers through VANETs. Therefore, it is important to maintain the confidentiality and authentication of messages exchanged between the TA and the VANET nodes. Hence, they address the security problem by focusing on the scenario where the TA classifies the users into primary, secondary, and unauthorized users. In this paper, first, they present a dual authentication scheme to provide a high level of security in the vehicle side to effectively prevent the unauthorized vehicles entering into the VANET. Second, they propose a dual group key management scheme to efficiently distribute a group key to a group of users and to update such group keys during the users' join and leave operations. The major advantage of the proposed dual key management is that adding/revoking users in the VANET group can be performed in a computationally efficient manner by updating a small amount of information.

V CONCLUSIONS AND FUTURE SCOPE

In recent years, a novel type of wireless access called wireless access for vehicular environment (WAVE) has been proposed, which is dedicated to vehicle-to-vehicle and vehicle-to road side communications. Also dedicated short-range communication (DSRC) has been standardized to support both public safety applications and private applications in VANETs. In VANETs with high-speed vehicles and frequent topology changes, broadcast has been proved an effective message delivery mode. In this paper we present the literature survey for the vehicular ad-hoc network for the key management and security issues.

REFERENCES:-

[1] Elnaz Limouchi, Imad Mahgoub, "Volunteers Dilemma Game Inspired Broadcast Scheme for Vehicular Ad Hoc Networks", IEEE TRANSACTIONS ON INTELLIGENT TRANSPORTATION SYSTEMS, 2019, PP 1-12.

[2] Debiao He, Sherali Zeadally, Baowen Xu, Xinyi Huang, "An Efficient Identity-Based Conditional Privacy-Preserving Authentication Scheme for Vehicular Ad Hoc Networks", IEEE TRANSACTIONS ON INFORMATION FORENSICS AND SECURITY, VOL. 10, NO. 12, DECEMBER 2015, pp 2681-2691.

[3] Yuanguo Bi, Hangguan Shan, Xuemin (Sherman) Shen, Ning Wang, and Hai Zhao, "A Multi-Hop Broadcast Protocol for Emergency Message Dissemination in Urban Vehicular Ad Hoc Networks", IEEE TRANSACTIONS ON INTELLIGENT TRANSPORTATION SYSTEMS, VOL. 17, NO. 3, MARCH 2016, pp 736-750.

[4] Celimuge Wu, Tsutomu Yoshinaga, Yusheng Ji, Tutomu Murase, Yan Zhang, "A Reinforcement Learning-based Data Storage Scheme for Vehicular Ad Hoc Networks", IEEE TRANSACTIONS ON VEHICULAR TECHNOLOGY, 2016, pp 1-13.

[5] Supeng Leng, Huirong Fu, Qing Wang, Yan Zhang, "Medium access control in vehicular ad hoc networks", WIRELESS COMMUNICATIONS AND MOBILE

COMPUTING Wirel. Commun. Mob. Comput. 2011, pp 796–812.

[6] Yiannos Mylonas, Marios Lestas, Andreas Pitsillides, Petros Ioannou, Vicky Papadopoulou, "Speed Adaptive Probabilistic Flooding for Vehicular Ad-Hoc Networks", IEEE 2014, pp 1-15.

[7] Elias C. Eze, Sijing Zhang, Enjie Liu, Joy C. Eze, "Advances in Vehicular Ad-Hoc Networks (VANETs): Challenges and Road-map for Future Development", 2015, pp 1-17.

[8] Mohamed Hadded, Paul Muhlethaler, Anis Laouiti, Leila Saidane. A Centralized TDMA based Scheduling Algorithm for Real-Time Communications in Vehicular Ad Hoc Networks. SoftCom 2016, pp 1-8.

[9] Yixuan Xu, Xi Chen, Anfeng Liu, Chunhua Hu, "A Latency and Coverage Optimized Data Collection Scheme for Smart Cities Based on Vehicular Ad-Hoc Networks", Sensors 2017, pp 1-27.

[10] Marica Amadeo, Claudia Campolo, Antonella Molinaro, "Forwarding Strategies in Named Data Wireless Ad hoc Networks: Design and Evaluation", 2014, pp 1-28.

[11] Pandi Vijayakumar, Maria Azees, Arputharaj Kannan, and Lazarus Jegatha Deborah, "Dual Authentication and Key Management Techniques for Secure Data Transmission in Vehicular Ad Hoc Networks", IEEE TRANSACTIONS ON INTELLIGENT TRANSPORTATION SYSTEMS, IEEE 2015, pp 1-14.

[12] Baozhu Li, Gordon J. Sutton, Bo Hu, Ren Ping Liu, and Shanzhi Chen, "Modeling and QoS Analysis of the IEEE 802.11p Broadcast Scheme in Vehicular Ad Hoc Networks", JOURNAL OF COMMUNICATIONS AND NETWORKS, VOL. 19, NO. 2, APRIL 2017, pp 169-180.

Mukesh Lodhi received his Bachelor`s degree in Electronics & comunication from SCE&T, Bhopal, M.P., in 2013. Currently he is pursuing Master of Technology Degree in Electronics & Comunication (Digital communication) from PIES, (RGPV), Bhopal, Madhya Pradesh India. His research area include Ad-hoc Netwrok and Wireless sesnor networks.

Mr. Jitendra Kumar Mishra he is Associate Professor and Head of the Department of Electronics and communication in PIES, Bhopal (RGPV). His received Master of Technology and Bachelor's of engineering respectively in Digital communication from BUIT, Bhopal and from RGPV, Bhopal. He has more than 10 years of teaching experience and publish 30+ papers in International journals, conferences etc. His area of Interests are Antenna & Wave Propagation, Digital Signal Processing, Ad-hoc network, Wireless Communication, Image Processing etc.