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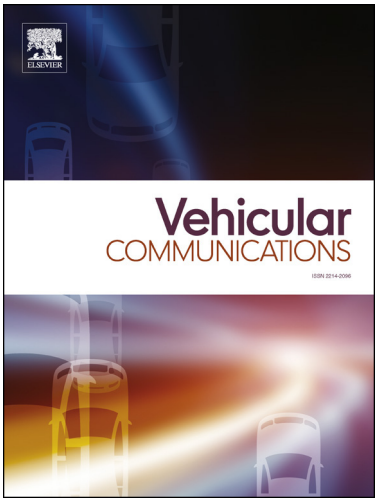

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ROBUST AND TRUST DYNAMIC MOBILE GATEWAY SELECTION IN HETEROGENEOUS VANET-UMTS NETWORK

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ABSTRACT

Vehicular ad-hoc network (VANET) technology is serving variable applications as it uses moving vehicles as nodes in a network to create communication independent of a central infrastructure. Various types of VANET problems have emerged because of the absence of a central infrastructure as well as the random movement of the vehicles. VANETs cannot cope with network segmentation because of frequently disconnected networks in sparse environments. Therefore, several solutions have been proposed in the literature, such as integrating the VANET with other infrastructure networks by static gateways that have been fixed along the road. However, protocols based on static gateways can provide connectivity only in areas where they are deployed. Thus, the distribution and requirement of static gateways are the main drawbacks of these protocols. In this paper, a new routing protocol for robust and trust mobile gateway selection (RTMGwS) has been proposed. RTMGwS protocol uses the characteristics of vehicle movements and variant routing parameters to select an optimal mobile gateway with high robust and trust connection to an infrastructure network. The protocol is designed to spread the advertisement messages by the mobile vehicle gateway over the integrated network architecture of VANET and universal mobile telecommunications system (VANET-UMTS) without flooding the network and seamless handovers. The proposed protocol has been validated using SUMO and NS2 simulators over highways environment. The simulation results show encouraging performance in terms of increasing the packet delivery ratio and overall throughput, reducing control packet overhead and minimizing connection delay.

Keywords: Vehicular ad-hoc network; mobile gateway selection; UMTS; VANET-UMTS; heterogeneous network

1. INTRODUCTION

Vehicular ad-hoc network (VANET) technology is one of the growing fields of research that integrates the potential of new generation wireless networks into vehicles [1]. VANET aims to serve different applications where it uses moving cars as nodes in a network to establish communication that is independent of a central infrastructure. VANET does not have a fixed infrastructure and centralized administration. Therefore, VANET has the key advantages of flexible network topology and lower cost of administration and maintenance [2, 3].

Routing in the VANET network is highly complex because of its highly volatile topology and mobility speed [4]. Several specialized routing protocols have been developed for VANET. The VANET protocols, with various techniques, improve network performance to a certain extent but still suffer from network partitioning because of high mobility [5]. This phenomenon has recently prompted researchers to switch their efforts in investing, studying, and developing new solutions to overcome the problem.

In the literature, heterogeneous wireless network is one of the interesting solutions that integrates the VANET with other infrastructure networks, such as cellular networks, WLAN, and the Internet [6]. The proposed protocols in heterogeneous vehicle to infrastructure (V2I) network make vehicular communication more reliable and minimize unwanted delays in different vehicular applications that the VANET does not provide [7]. A good example of a heterogeneous wireless network is the combination of IEEE 802.11p-based VANET and the universal mobile telecommunication system (UMTS) network that produces a more robust network with respect to coverage area and speed [8, 9]. By combining UMTS and VANET, a high data rate will be combined with wide-range communication. In the visualized VANET/3G network, one mobile vehicle can act as a mobile gateway to other vehicles to access the UMTS network in its nearness by receiving the data from