Multimed Tools Appl
DOI 10.1007/s11042-013-1752-x

Adaptive multi-channel allocation for vehicular infrastructure mesh systems

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Abstract This paper focuses on a wireless solution for vehicular infrastructure systems. In order to achieve both low cost and high efficiency, infrastructures can be connected to each other in vehicular networks by a wireless link similar to a mesh router in wireless mesh networks (WMNs). However, the existing WMN solutions cannot appropriately support various vehicular applications that require high rate and low latency communications. Therefore, in this paper, we present the design and performance evaluation of an adaptive multi-channel allocation for vehicular infrastructure mesh systems (abbreviated AMCA). In order to meet both high rate and low latency communications, AMCA is designed to provide optimal channel assignment duration for each flow to efficiently utilize multiple non-overlapping channels. The performance evaluation of AMCA is conducted by the QualNet 5.0 simulator under various network scenarios to consider diverse network conditions. Simulation results show that AMCA can achieve higher network throughput and lower average packet delay than other well known wireless solutions.

Keywords Infrastructure communications · Multi-channel MAC · Vehicular network · Wireless mesh network

1 Introduction

Recently, the intelligent transportation system (ITS) has received considerable attention from both industry and academia, due to its potential significance in various applications such as road safety, traffic management, and on-road infotainment [2, 6]. The vehicular communication for general ITS service scenarios can be classified into two main approaches: vehicle-to-vehicle (V2V) communications and vehicle-to-infrastructure (V2I) communications. The former denotes the communication between vehicles without infrastructure, while in the latter type, vehicles can communicate with an infrastructure called roadside unit (RSU). In order to support V2V and V2I

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Published online: 21 November 2013