Chapter 3
V2V Influence on M2M and H2H Traffics During Emergency Scenarios:
Adaptive eNode-B for V2V Communications

Ahmad Hani El Fawal
ENSTA Bretagne, France

Ali Mansour
ENSTA Bretagne, France

Mohamad Najem
Beirut International University, Lebanon

ABSTRACT

This chapter envisions the challenges that will face the mobile operators such as sending vehicle-to-vehicle (V2V) payloads in form of synchronized storms, the fast saturation of the limited bandwidth of long-term evolution for machines (LTE-M) and narrow band-internet of things (NB-IoT) with the rise number of machine-to-machine (M2M) devices and V2V devices, V2V congestion overload problem in IoT environments specifically during disaster events. It extends a new solution proposed by the authors named Adaptive eNodeB (A-eNB) for both LTE-M and NB-IoT networks to deal with V2V excessive traffic. The A-eNB can solve gradually V2V overload problem, while keeping the human-to-human (H2H) traffic quality of service (QoS) not to be affected badly. It corroborates a new framework model proposed by the

DOI: 10.4018/978-1-5225-9019-4.ch003

authors called coexistence analyzer and network architecture for long-term evolution (CANAL) to study the impact on V2V, M2M, and H2H and mutual influences, based on continuous-time Markov chain (CTMC) to simulate, analyze, and measure radio access strategies.

INTRODUCTION

Generally, Intelligent Transportation System (ITS) traffic consists of a combination of Machine-to-Machine (M2M) and Human-to-Human (H2H) (Grigoreva, 2016). In the literature, M2M traffic is characterized with its low mobility and small data transmissions (M. Shafiq, December 2013) as defined in the 3rd Generation Partnership Project (3GPP) and the European Telecommunications Standards Institute (ETSI) (3GPP, TS 22.368, 2013). But the current and future ITS traffic differ significantly from M2M traffic and thus shall be treated separately. ETSI provides also a mapping of the Traffic Class IDentification (TCID) which classifies ITS different traffics while considering Vehicle-to-Vehicle (V2V) communications as one of the communication directions that rules any future ITS service (ETSI, TS 102 636-4-2, 2013).

V2V communications allow surrounding cars to exchange information by broadcasting, which requires vehicles to subscribe to a network operator and obtain authorization.

The traffic generated by vehicles should be carried by a ubiquitous, reliable and low latency networks. With reference to what the authors found in the literature, two main vehicular communication standards have been developed in recent years to enable information exchanges between vehicles, including the Dedicated Short Range Communications (DSRC) standards in the US (K. Abboud, 2016) and the ITS-G5 standards developed by ETSI (R. F. Atallah, 2015). Both standards are based on IEEE 802.11p for Vehicular Ad-hoc NETworks (VANETs). However, it has been recognized that vehicular communications based on IEEE 802.11p have several limitations such as supporting mobility and Quality of Service (QoS) provisioning (R. F. Atallah, 2015).

Alternatively, the fast commercialization of cellular systems, such as Long Term Evolution (LTE), has made them useful for vehicular communications. 3GPP has been developing standards for the cellular based V2V aiming to offer more effective solutions for vehicular communications. Compared with IEEE 802.11p, cellular based V2V can provide better QoS support,