Chapter 6
Proactive Decision Making for ITS Communication

Rodrigo Silva
IMT Atlantique, France

Christophe Couturier

https://orcid.org/0000-0003-2841-1090
IMT Atlantique, France

Thierry Ernst
YoGoKo, France

Jean-Marie Bonnin
IRISA, France

ABSTRACT

Demand from different actors for extended connectivity where vehicles can exchange data with other vehicles, roadside infrastructure, and traffic control centers have pushed vehicle manufacturers to invest in embedded solutions, which paves the way towards cooperative intelligent transportation systems (C-ITS). Cooperative vehicles enable the development of an ecosystem of services around them. Due to the heterogeneousness of such services and their specific requirements, as well as the need for network resources optimization for ubiquitous connectivity, it is necessary to combine existing wireless technologies, providing applications with a communication architecture that hides such underlying access technologies specificities. Due to vehicles' high velocity, their connectivity context can change frequently. In such scenario, it is necessary to take into account the short-term prevision about network environment; enabling vehicles proactively manage their communications. This chapter discusses about the use of near future information to proactive decision-making process.

DOI: 10.4018/978-1-5225-9019-4.ch006

INTRODUCTION

The number of vehicles is growing fast around the world. In 2010 there were more than 1 billion in operation worldwide, and total new vehicles sales suggests that there could be up to 2 billion vehicles by 2035 (Sousanis, 2016).

Such growth has a great impact on the quality of human life. Space is becoming insufficient to accommodate all vehicles. The road traffic is increasing, as well as traffic jams and the number of traffic accidents. Despite the wide variety of countermeasures applied by governments over the world, such as laws to regulate road traffic, or automotive systems to help drivers in the driving process, the transportation system still needs improvements. The traffic remains chaotic and the number of deaths and injuries on roadways remains high.

This context requires a smarter use of transportation systems. For this, vehicles need to increase their environment awareness, which can be achieved by enabling vehicles to communicate locally between themselves and the roadside infrastructure (Vehicle-to-Vehicle (V2X)). After large pilot deployments, the European Commission is preparing a Delegated Act to bootstrap mass deployment, whereas some vehicle manufacturers are already starting to equip new series of vehicles (Toyota and GM with DSRC and Volkswagen with ITS-G5).

Connectivity and vehicle-to-everything (V2X) communications enable vehicles to communicate with a wide variety of devices. This paves the way towards Cooperative Intelligent Transportation Systems (C-ITS), where vehicles, the roadside infrastructure, the urban infrastructure and control centers make decisions together for a smarter and more efficient use of the road. Besides the requirements for smarter use of transportation systems, other actors have always pushed the need for better connection. Original equipment manufacturers (OEMs) have requested for over-the-air (OTA) updates, enabling securely managing all in-vehicle software components (including firmware, applications, and configurations) anywhere and at any time. Demand for navigation services improvements, e.g., improving maps quality by using high definition maps. New demand for infotainment services, for example, saving driver profile on the cloud and applying it to any vehicle he/she drives, i.e., personalized infotainment pre-sets like ambient temperature, seat and mirror positioning, and favorite radio channels.