

Preface

The European Union directive 2010/40/EU defines the intelligent transport system (ITS) as a system with advanced applications which aims to improve transport management by increasing the coordination and flow of information between on-road vehicles. The application of information and communications technologies (ICT) in the transport sector has a key role in improving efficiency, safety, public security, and management of a transportation system. Keeping in view the contribution made by ICT in realizing many aspects of ITS, this book explores the networks which enable data exchange between vehicles.

There are two candidate technologies that make a strong case for application in vehicular environments. The 802.11 WLANs have traditionally been considered due to the massive deployment of their access points (APs) across most of the cities. IEEE has also based its standard for vehicular communication, the 802.11p WAVE, on the legacy of 802.11 WLAN. The fact that WLANs allow quick commencement of data exchange between vehicles makes them an ideal choice for exchanging time-critical information. On the other hand, the recent advances in cellular technology have also introduced an ad hoc mode where the mobile devices can exchange data largely independent of the network infrastructure. The so-called device-to-device communication has recently attracted attention. However, its use in vehicular environments still requires considerable research and development. Since 802.11 WLAN is a more mature technology, we keep it in our focus in the rest of this book while also exploring the present state of the art of the cellular technology.

This book comprises of nine chapters. Basic concepts pertinent to IEEE 802.11 networks, vehicular communications, and challenges associated with 802.11-based vehicular communications have been discussed in Chap. 1. Chapter 2 provides a detailed review of the previous research done in vehicular communications. More specifically, the works pertinent to disruption-tolerant networking and handover latency have been reviewed. It also introduces some recent IEEE standards that are relevant in vehicular communication. Chapter 3 discusses the measurement results on parameters such as the signal strength and the data rates supported by the indoor APs in vehicular environments. Chapters 4, 5, and 6 focus upon the analytical modeling of the disruption-tolerant vehicular networks. Starting with a two-state

model in Chap. 4, this book presents a more complete Markov model in Chap. 5. Chapter 6 contains the application of the proposed model to quantify the benefits of using inter-operator roaming. Chapter 7 discusses the issues related with handovers in the vehicular context. Latency evaluations are provided at the beginning of the chapter followed by a description of the proposed channel scanning scheme to reduce scanning phase delay.

Chapter 8 outlines the recent advances in cellular technology. The concept of fifth generation (5G) of cellular networks is rapidly gaining momentum and is set to challenge the ad hoc mode of Wi-Fi. The so-called device-to-device (D2D) communication under the wider larger 5G umbrella can provide rapid infrastructure-free data exchange—a feature which makes it a competitor of using WLANs in vehicular environments. The concluding remarks and future works are covered in Chap. 9, while the references and appendices are given at the end of this book.

This book is written for both mature and early-stage researchers including postgraduate and doctoral students. Researchers from other fields interested in vehicular communications can also find this book interesting and informative. The detailed discussion on the prevailing research trends provided here will be useful for postgraduate and postdoctoral researchers. This book would also be helpful as a secondary source for courses related to wireless networking.

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