

Preface

This book attempts to provide an extensive overview on Long-Term Evolution (LTE) networks. *Understanding LTE and its Performance* is purposely written to appeal to a broad audience and to be of value to anyone who is interested in 3GPP LTE or wireless broadband networks more generally. The aim of this book is to offer comprehensive coverage of current state-of-the-art theoretical and technological aspects of broadband mobile and wireless networks focusing on LTE. The presentation starts from basic principles and proceeds smoothly to most advanced topics. Provided schemes are developed and oriented in the context of very actual closed standards, the 3 GPP LTE.

Organization of the Book

The book is organized into 3 parts with a total of 14 chapters. Part I provides an introduction to broadband wireless and LTE. In Part II, most important features of LTE are introduced in order to understand principles over which the LTE is built. Finally, Part III introduces performance study of LTE network regarding different layers of networking, starting from lower layer till higher layer. In Part I, Chapter 1 tries to describe a comprehensive and a summarized overview of the different mobile broadband wireless technologies introduced by 3GPP and 3GPP2 organization without forgetting standards proposed by IEEE community. A brief history of precedent standard by these communities as the path of mobile broadband wireless evolution is described. As well, Chapter 1 describes LTE technology and its related features and recalls the difference between LTE and LTE-Advanced as a step toward fourth-generation wireless network. The book enlightens especially details about LTE release 8 which is the basic specification of LTE 3GPP. Chapters 2, 3, and 4 describe the main functionalities of LTE based on different network layers point of view starting first by higher layers and then by lower layers. The higher layer is represented by the reference model of LTE architecture, by describing the functional entities that are composing the architecture. Then Chapter 3 details the role of link layer and its interaction with higher and lower layers, link layer sub-layers, and their responsibilities in terms of scheduling, power consumption, ciphering, etc.,

are introduced. Lastly, physical layer is described with its powerful characteristics: OFDAM, MIMO, different modulation and coding, etc., in Chapter 4.

In Part II, LTE salient features are introduced and classified into four main parts: Quality of service, mobility, femtocell, and interworking. Chapter 5 starts by describing the mechanism of quality of service, the data service flows, rule of charging, bearer principles. Chapter 6 describes mobility features including basic mobility architecture, handover, and location management. Chapter 7 describes the convergence of LTE toward fourth-generation mobile wireless network in terms of interworking. Different types of interworking architectures with different technologies are described in this chapter, showing that LTE is a technology that is not isolated and can be integrated with any IP-based technology. Chapter 8 presents a key characteristic of LTE by introducing femtocell principles, architectures, and benefits.

Part III presents some performance studies in different level of conception. Chapters 9 and 10 describe how resources are allocated in LTE based on OFDM modulation. Then two algorithms are proposed and simulated for LTE networks. Chapter 11 presents a cross-layer resource allocation involving MAC and PHY layer for guaranteeing higher layer quality of service as well as lower layer quality of service. Chapter 12 describes the cell interference in LTE multi-cellular system and proposes a method to overcome the interference while keeping a good quality of service assurance for different data service flows. Chapter 13 studies the performance of an interworking architecture as a case study between LTE and mobile WiMAX technology. New architecture and handover decision function are proposed and studied by means of simulation programs. Finally, Chapter 14 highlights a new and original method to integrate LTE femtocell with RFID and wireless sensor networks in order to improve mobility management and enhance network experience when handover occurs.

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