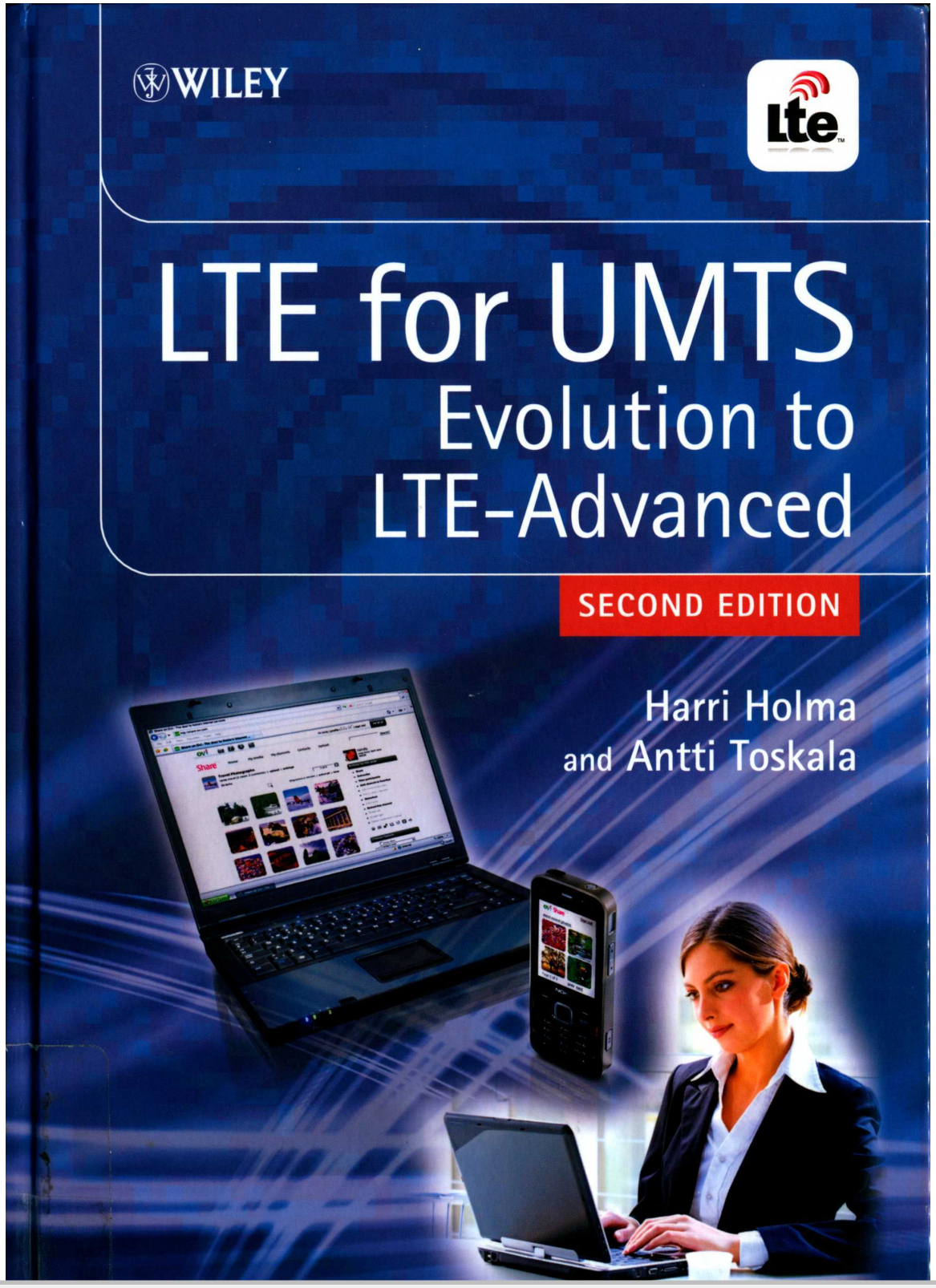

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LTE for UMTS

Evolution to LTE-Advanced
Second Edition

Edited by

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1

Introduction

Harry Holma and Antti Toskala

1.1 Mobile Voice Subscriber Growth

The number of mobile subscribers increased tremendously from 2000 to 2010. The first billion landmark was passed in 2002, the second billion in 2005, the third billion 2007, the fourth billion by the end of 2008 and the fifth billion in the middle of 2010. More than a million new subscribers per day have been added globally – that is more than ten subscribers on average every second. This growth is illustrated in Figure 1.1. Worldwide mobile phone penetration is 75%[1]. Voice communication has become mobile in a massive way and the mobile is the preferred method of voice communication, with mobile networks covering over 90% of the world's population. This growth has been fueled by low-cost mobile phones and efficient network coverage and capacity, which is enabled by standardized solutions, and by an open ecosystem leading to economies of scale. Mobile voice is not the privilege of the rich; it has become affordable for users with a very low income.

1.2 Mobile Data Usage Growth

Second-generation mobile networks – like the Global System for Mobile Communications (GSM) – were originally designed to carry voice traffic; data capability was added later. Data use has increased but the traffic volume in second-generation networks is clearly dominated by voice traffic. The introduction of third-generation networks with High Speed Downlink Packet Access (HSDPA) boosted data use considerably.

Data traffic volume has in many cases already exceeded voice traffic volume when voice traffic is converted into terabytes by assuming a voice data rate of 12 kbps. As an example, a European country with three operators (Finland) is illustrated in Figure 1.2. The HSDPA service was launched during 2007; data volume exceeded voice volume during 2008 and the data volume was already ten times that of voice by 2009. More than 90% of the bits in the radio network are caused by HSDPA connections and less than 10% by voice calls. High Speed Downlink Packet Access data growth is driven by

[1] The actual user penetration can be different since some users have multiple subscriptions and some subscriptions are shared by multiple users.

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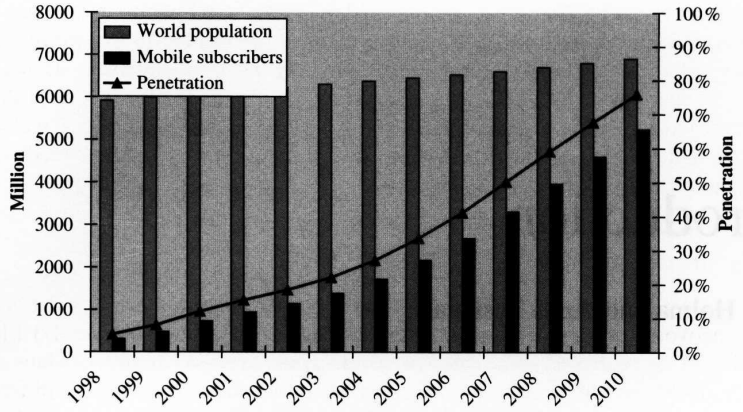

Figure 1.1 Growth of mobile subscribers

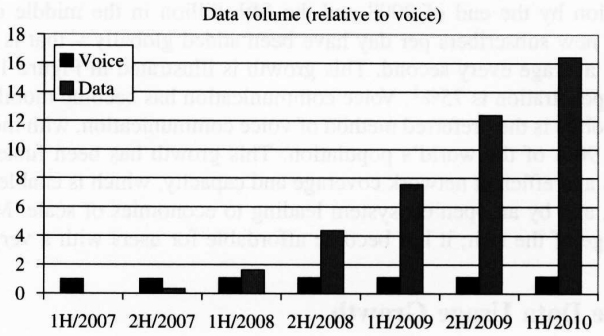

Figure 1.2 HSDPA data volume exceeds voice volume (voice traffic 2007 is scaled to one)

high-speed radio capability, flat-rate pricing schemes and simple device installation. In short, the introduction of HSDPA has turned mobile networks from voice-dominated to packet-data-dominated networks.

Data use is driven by a number of bandwidth-hungry laptop applications, including internet and intranet access, file sharing, streaming services to distribute video content and mobile TV, and interactive gaming. Service bundles of video, data and voice – known also as triple play – are also entering the mobile market, causing traditional fixed-line voice and broadband data services to be replaced by mobile services, both at home and in the office.

A typical voice subscriber uses 300 minutes per month, which is equal to approximately 30 megabytes of data with the voice data rate of 12.2 kbps. A broadband data user can easily consume more than 1000 megabytes (1 gigabyte) of data. The heavy broadband data use takes between ten and 100 times more capacity than voice usage, which sets high requirements for the capacity and efficiency of data networks.

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