Chapter 6
WiMAX Networks: Performance and Measurements

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ABSTRACT

The term WiMAX is an abbreviation of Worldwide Interoperability for Microwave Access and it is defined in IEEE, as the 802.16 family of standards. Unlike other legacy Point-to-Multipoint wireless technologies, WiMAX is able to offer higher transmission rates, quality of service assurance and hence it can be compared to other wireline technologies. Additionally, WiMAX is proven to be useful for telemedicine purposes (live surgeries and medical examinations, medical conferences etc.), especially in distant areas. WiMAX is based on two major standards; one is the IEEE802.16d that was developed specifically for fixed wireless communications and is dedicated mainly in LOS environments and can be used in many cases, where fixed infrastructure is not available. On the other hand, 802.16e can be used in cases

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of both fixed and moving subscribers, while providing better coverage, performance and even higher transmission rates. This chapter describes the major capabilities of the WiMAX standard and presents the performance of WiMAX networks based on measurements taken during laboratory and field tests.

INTRODUCTION

Broadband communications can be considered one of the most significant steps in modern communications systems. The requirement for new services like video conferencing, fast Internet and Voice over IP (VoIP), has set new standards for both fixed and wireless technologies. WiMAX is a wireless technology that aims at providing broadband services to wireless users similar to those of xDSL technologies. WiMAX is required to cover the needs of both broadband and wireless markets, both of which are the major markets in communications while high potentials for the future are also foreseen.

WiMAX is a point to multipoint wireless technology introduced by the Institute of Electrical and Electronics Engineers (IEEE) and it is described in the 802.16 framework of specifications. The first official meeting of the 802.16 group, took place in 1999 but the form of the technology was quite different than the one defined in latest standards. Since its first steps, WiMAX technology has gone through four development phases. The first phase was a narrowband version which was followed by the broadband edition for line-of-sight (LOS) conditions only. The third phase enhanced WiMAX for operation in non line-of-sight link conditions (NLOS) while the latest stage is the one that is described in the current standards of 802.16 group.

The latest standard of WiMAX is the 802.16e-2005 with a major emphasis in introducing mobility of users for speeds up to 120 km/h with full handover support between base stations. The transmission characteristics and handover times are within the required limits in order to support real time applications such as VoIP, video streaming and online gaming. The support of the aforementioned applications is a real challenge for all wireless technologies especially in meeting the high requirements and the quality of service that is necessary for delivering the above services. Those transmission characteristics can be achieved by means of offering the required Quality of Service (QoS) mechanisms that will assure prioritization in services that are sensitive to delays (e.g. VoIP) over other types of services that are not delay sensitive or are not real-time (e.g. file transfer).

Figure 1. Global growth trend for mobile, internet and broadband markets (taken from ITU)

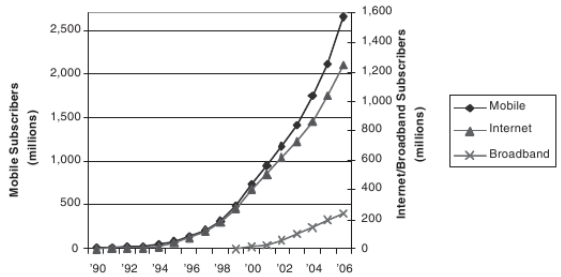
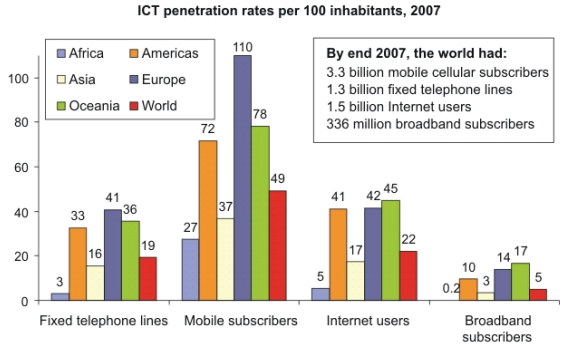


Figure 2. Communications market statistics for 2007 (taken from ITU)



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