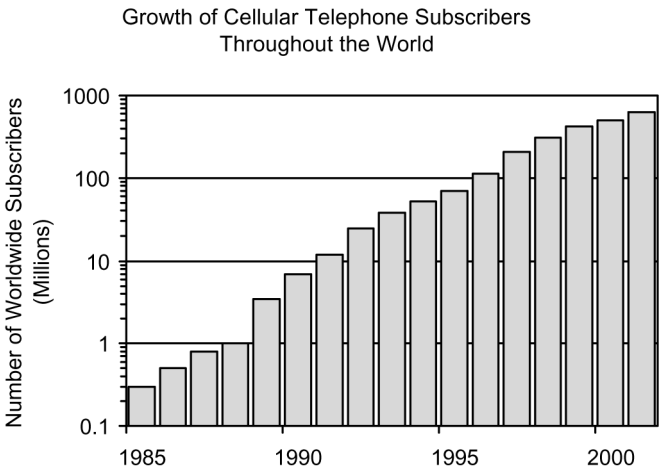

Figure 2.1 Growth of cellular and PCS telephone subscribers throughout the world.

dichotomy in the wireless market, since ad-hoc high data rate networks are being deployed by individuals within buildings without a license, whereas wireless carriers who own the spectrum licenses for mobile cellular telephone service have focused on providing outdoor voice coverage and have been slow to provide reliable in-building coverage and high data rate services to their cellular subscribers. While it is still too early to tell, it appears that the in-building wireless access market may become a huge battleground between licensed and unlicensed services, and this is prompting the architects of today's popular cellular standards to design for high data rate packet-based networking capabilities in the next generation of cellular technology.

This chapter highlights the key developments, technical details, and standards activities of the major modern wireless communications systems throughout the world. First, the state-of-the-art of the most popular cellular and PCS standards is presented, and the many competing evolutionary paths toward third generation (3G) mobile networks are described. Then, standards activities and recent developments in wireless fixed access techniques such as Local Multipoint Distribution Systems (LMDS) are presented. Finally, this chapter focuses on wireless systems and standards such as the worldwide wireless LAN (WLAN) movement and the Bluetooth standard that provide wireless connectivity across campuses to indoor users.

2.1 Second Generation (2G) Cellular Networks

Most of today's ubiquitous cellular networks use what is commonly called *second generation* or *2G* technologies which conform to the second generation cellular standards. Unlike first generation cellular systems that relied exclusively on FDMA/FDD and analog FM, second generation standards use digital modulation formats and TDMA/FDD and CDMA/FDD multiple access techniques.

The most popular second generation standards include three TDMA standards and one CDMA standard: (a) *Global System Mobile (GSM)*, which supports eight time slotted users for