

# 1 Executive Overview

*Cellular 2002* is the eighth annual edition of Micrologic Research's study of the cellular-telephone market. In the original editions, we attempted to cover the entire wireless-communications market, although the cellular markets were always the studies' focus. Now, the cellular market has grown so large that we devote this entire tome to it.

This chapter provides a quick look at some of the statistics that are discussed in detail in the remaining chapters. We also explain our methodology in preparing the report, and at the end of the chapter, you will find a brief history of wireless communications.

## 1.1 Methodology

In developing the numbers used to report the cellular shipments and forecasts for *Cellular2000*, Micrologic Research began by examining statistics on cellular subscribers as reported by several organizations including industry consortia, the International Telecommunications Union (ITU), and the United States Department of Commerce. The numbers from the different sources were compared, and when they could not be reconciled, as was frequently the case, we used all other resources at our disposal in an attempt to arrive at what we hope is close to the true number.

We solicited and received a great deal of industry input. We had personal interviews with dozens of industry executives and telephone conversations with hundreds more. We surfed Web pages, attended analysts' forums, and attended trade shows on two continents.

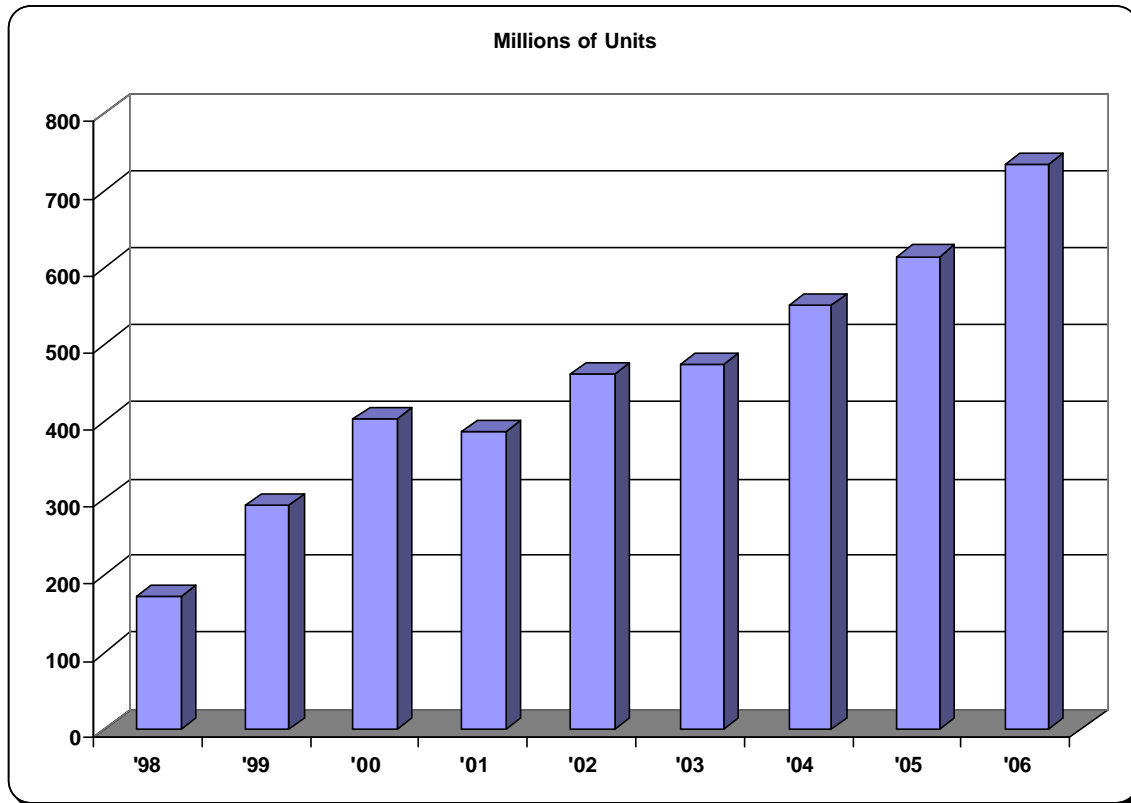
Once subscriber numbers were developed by year and by geographic region, it was a simple matter to calculate total subscriber growth per year. Translating subscriber growth into sales of cellular telephones was a much more difficult task. The first step was to divide subscriber growth into the growth in the number of subscribers using each of the cellular technologies or those who were using analog. In some cases, that was easy. A digital cellular subscriber in Western Europe is a GSM subscriber, and a digital cellular subscriber in South Korea is a cdmaOne subscriber. In countries where several cellular technologies compete, the task was more difficult. A new PCS subscriber in the U.S. could have signed up for cdmaOne, IS-136 TDMA, or GSM.

After growth in subscribers was calculated for each cellular technology, we prepared to calculate handset sales. We assumed that each new subscriber purchases a new handset. In addition, there is a certain amount of "churn." Subscribers switch from one service provider to another, and when they do, they often purchase a new telephone. Some subscribers replace their cellular telephones, because they want one that is lighter or has more features, and these replacement purchases normally make up a large portion of

the handset market. The year 2001 saw the normally large replacement market almost disappear.

We believe there were two reasons for the big drop in the replacement market. One was, of course, the economic downturn. The second is that cellular telephones have gotten to be so small and so light that there is little advantage to switching to a new model.

**1.2 The Cellular Telephone Market**



'98	'99	'00	'01	'02	'03	'04	'05	'06
173.6	291.7	403.4	386.8	462.7	475.9	551.4	615.1	734.5

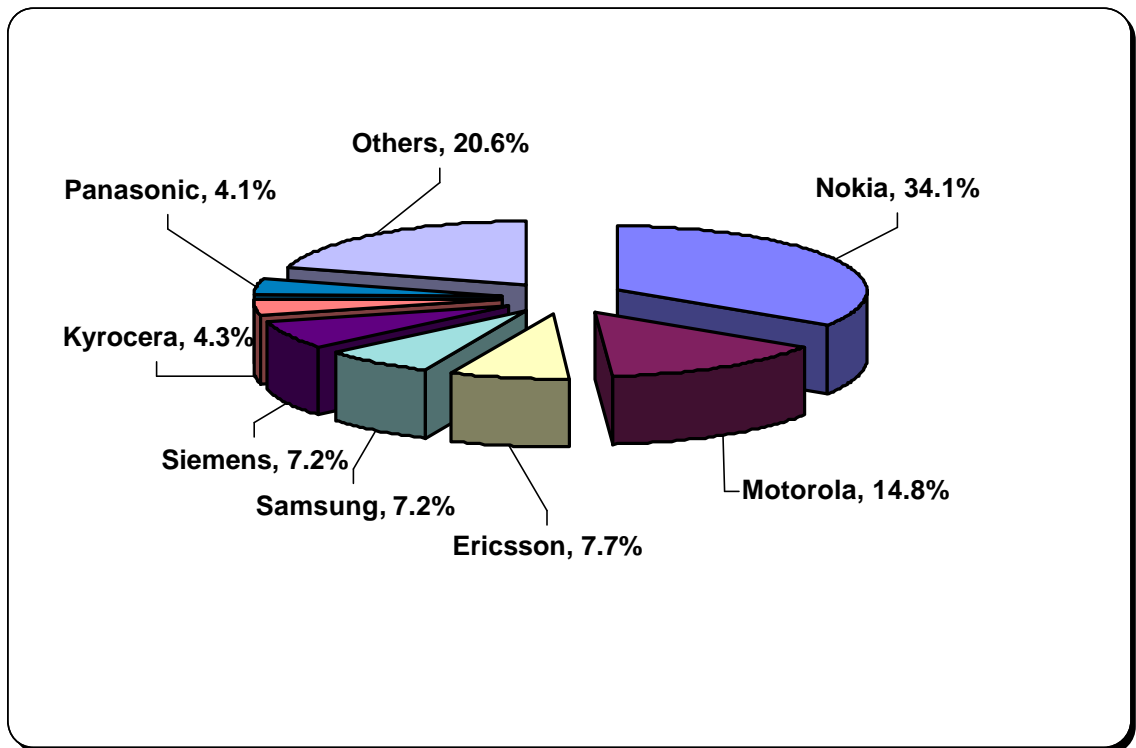
Source: Micrologic Research

**Figure 1—1 – Worldwide Cellular Handset Shipments**

The table in Figure 1-1 graphs Micrologic Research’s estimate of worldwide cellular telephone sales since 1998 and our forecast through the year 2006. For the first time in the history of the industry, handset sales were lower in 2001 than in the year before. However, we believe that several factors will cause handset sales to increase in 2002 including the continued pressure of

subscriber growth and the availability of faster data speeds. The new cdma2000 1xRTT technology began commercial service in South Korea in 2001 with data speeds of about 80 kilobits per second. The response has been enthusiastic. Those who wish to take advantage of higher 2.5G data speeds offered by GPRS and cdma2000 in 2002 will have to buy a new handset.

Figure 1-2 graphs Micrologic Research's estimate of the market share by supplier for the 2001 worldwide cellular telephone market. Nokia retained its number one ranking by shipping more than one-third of the handsets sold in 2001, and Motorola followed with a respectable 14.8-percent share of the market. Once-mighty Ericsson fell back into the pack with less than eight percent.

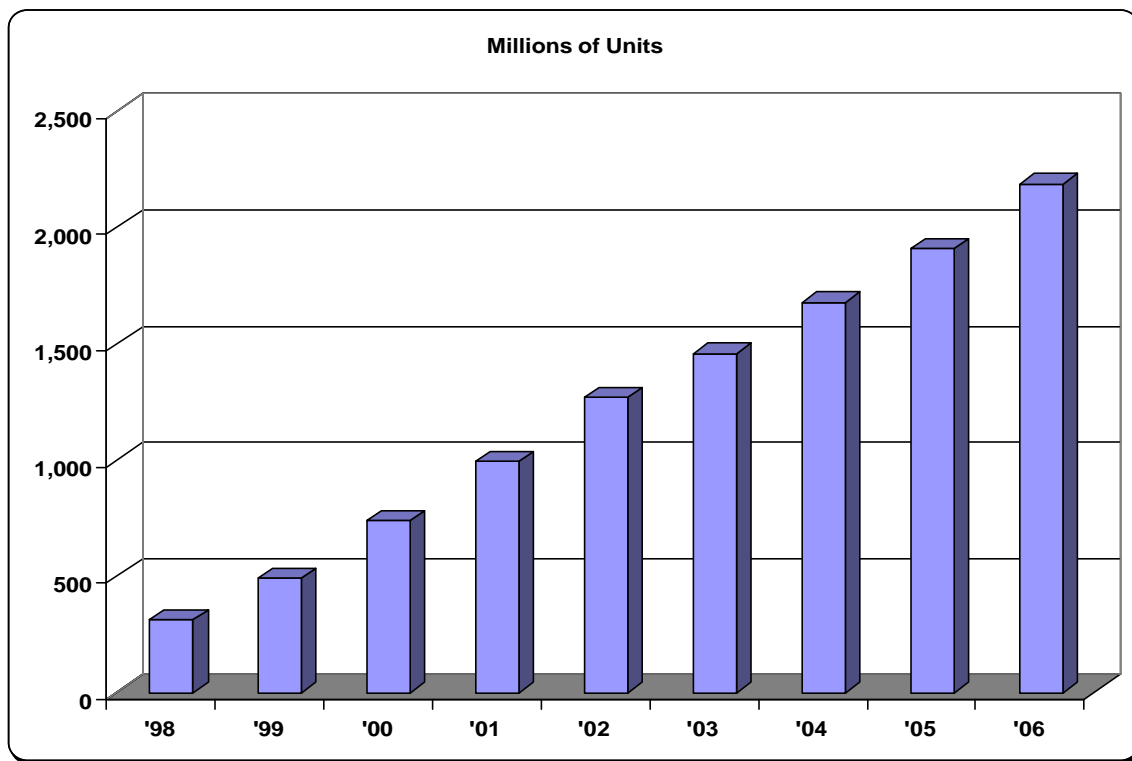


Source: Micrologic Research

**Figure 1—2 – 2001 Share of World Cellular Handset Market**

Figure 1-3 graphs worldwide cellular subscriber growth since 1998 and our forecast for subscriber growth through 2006. The graph reveals that even in

2001, when handset sales were in the doldrums, the number of cellular subscribers continued to grow. However, that growth has switched from relatively prosperous countries like those of Western Europe to countries with emerging economies such as China, India, Indonesia, and the countries of Latin America.

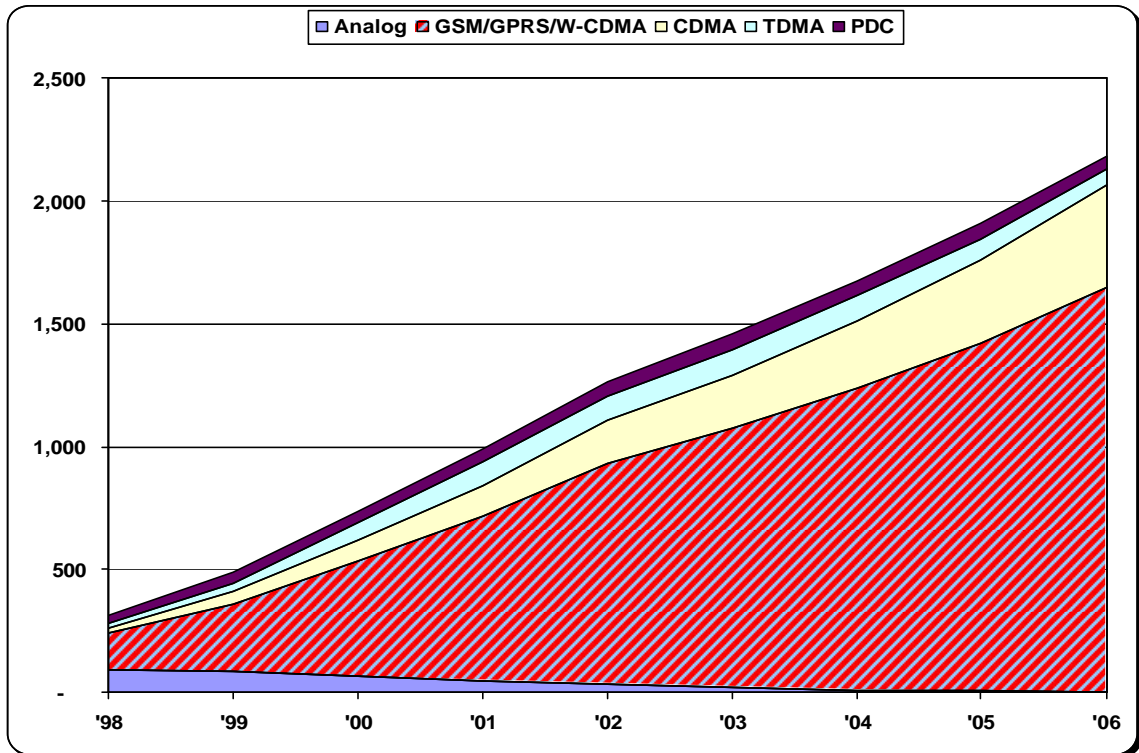


'98	'99	'00	'01	'02	'03	'04	'05	'06
313	490	740	995	1,267	1,456	1,674	1,906	2,185

Source: ITU & Micrologic Research

**Figure 1—3 - Worldwide Cellular Subscribers**

Figure 1-4 graphs worldwide subscriber growth by the cellular technology they use. Analog service is no longer economical and is rapidly disappearing. GSM is clearly the world's most-used cellular technology due to its almost universal use in Western Europe and its dominant position in China. CDMA continues its rapid growth in the Americas and Asia. The world's other two main digital cellular standards, IS-136 TDMA and Japan's Personal Digital Cellular (PDC) have no upgrade path and are expected to be phased out.



	'98	'99	'00	'01	'02	'03	'04	'05	'06
<b>Analog</b>	96	87	69	51	38	22	12	4	1
<b>GSM/GPRS/W-CDMA</b>	145	276	470	670	897	1,054	1,226	1,418	1,648
<b>cdmaOne/cdma2000</b>	23	50	82	123	171	217	278	339	417
<b>TDMA</b>	19	35	67	92	99	101	97	88	66
<b>PDC</b>	31	42	52	59	63	63	61	57	53
<b>Total</b>	313	490	740	995	1,267	1,456	1,674	1,906	2,185

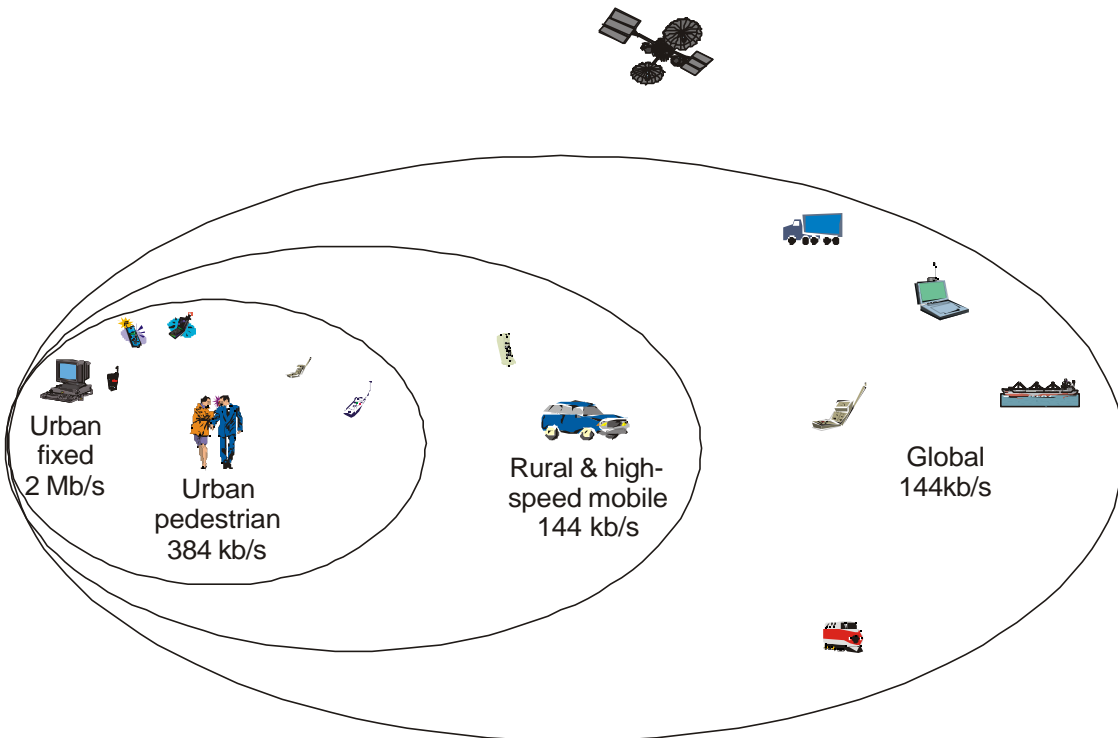
Source: ITU & Micrologic Research

**Figure 1—4 – Worldwide Cellular Subscribers by Air Interface**

### 1.3 Third-Generation Cellular

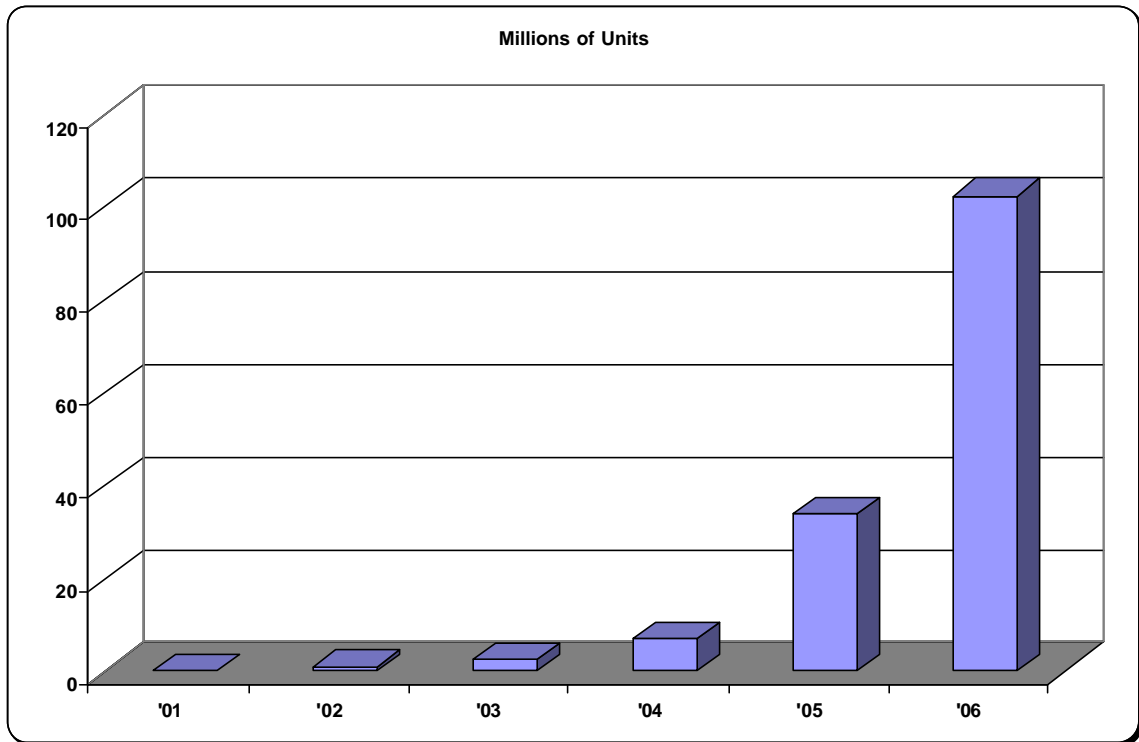
Many of the world's cellular telephone systems do not have sufficient capacity to support demand in urban areas. In Japan, the Personal Digital Cellular (PDC) technology has been running out of capacity in some cities, and the same is true of 900-MHz GSM in some European metropolitan areas. There is a feeling that any new cellular standard should not only provide more capacity but also make increased bandwidth available for such applications as wireless video and Internet Web browsing. Cellular with high-bandwidth capability is referred to as *third-generation* or *3G* cellular.

At least two 3G standards will probably be deployed: W-CDMA, which is known in Europe as the *Universal Mobile Telephone Service (UMTS)* and cdma2000, which is a step-by-step upgrade for cdmaOne networks. The future of China's TD-SCDMA technology is uncertain. Figure 1-5 shows the speeds that 3G cellular are someday expected to provide in different environments. Korea may become the first country to reach the two-megabit-per-second peak speed when it begins commercial cdma2000 1xEV-DO cellular service in the middle of this year.



**Figure 1—5 – 3G Will Supply Service from 144 kb/s to 2 Mb/s**

Figure 1-6 graphs Micrologic Research’s forecast for sales of 3G telephones using W-CDMA or UMTS technology. We believe that this technology will be slow to take off, because some of the technical and financial obstacles to its widespread use have not yet been solved. We expect the W-CMDA market to “take off” in the second half of the decade.



'01	'02	'03	'04	'05	'06
0.1	0.9	2.6	6.9	34.1	102.7

Source: Micrologic Research

**Figure 1—6 - Worldwide W-CDMA Handset Unit Shipments**

## 1.4 A (Very) Short History of Wireless Communications

The age of wireless communications should have begun in 1883 when Thomas Edison discovered that electrical signals could be detected at a distance, a phenomenon that is called the Edison effect. Edison received a patent for wireless telegraphy in 1885, but he was busy with other projects, so he chose not to pursue it. Edison sold the patent to Marconi, who developed the technology and sent the first wireless telegraph communication across the Atlantic in 1901.

In 1946, AT&T became the first company to provide mobile radiotelephone service, but ten years later AT&T sold its service licenses to Motorola.<sup>1</sup> However, AT&T continued its interest in mobile wireless communications, and in the early 1980s, analog cellular telephone systems were deployed in several countries. The first system was based on the Northern Mobile Telephone (NMT) technology and became operational in Saudi Arabia in July 1981. A second NMT system began operation in Sweden in October of the same year, and by 1982, NMT systems were being deployed throughout Scandinavia. The first NMT systems were deployed at 450 MHz and had 180 voice channels.

In the U.S., AT&T and Motorola introduced the AMPS mobile cellular telephone technology in the 800-MHz band. The U.S. Federal Communications Commission (FCC) issued cellular licenses in 1983, and the number of people using two-way wireless communications began to grow rapidly.

Until a few years ago, cellular telephone service was the only commercial system capable of providing two-way wireless communications to almost everyone who wanted it—or more accurately—to almost any one in the industrialized countries. Now it is possible to send and receive faxes, data, voice, and in some cases even video over wireless links in most major metropolitan areas in the industrialized world and in most major cities in developing countries. Wireless LANs are widely used for data-collection services, such as store and warehouse inventory, and they are being deployed in some offices. Wireless local loops promise to bring basic telephone services to large numbers of people in countries that have not been able to deploy an efficient wired telephone infrastructure. In several cities in the Western U.S., mobile users can connect to the Internet at high speeds using a wireless modem that communicates through a system of data-only microcells whose base stations are mounted in such places as the top of telephone poles.

Europe, once plagued by a number of incompatible analog cellular technologies, has established a pan-European digital cellular telephone system called Global System for Mobile Communications (GSM). This common

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<sup>1</sup> AT&T did not reappear as a mobile wireless communications service provider until it purchased McCaw Cellular in 1994.

standard allows Europeans to roam from country on the European continent—and even in many countries on other continents—and use the same GSM telephone that they use in their home cities.

In the United States, the Federal Communications Commission (FCC) decided not to impose a single digital cellular standard and elected to allow the market to decide which standard would be used. Consequently, three major digital cellular standards are used in the U.S., and the North American digital cellular market has become Balkanized.