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BROADBAND TELECOMMUNICATIONS HANDBOOK

SECOND EDITION

- VPNs
- 3G Wireless
- GPRS
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REGIS J. "BUD" BATES

Broadband Telecommunications Handbook

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Benchmarks in GSM

Table 21-1 shows many of the important events in the rollout of the GSM system; other events were introduced, but had less significant impact on the overall systems.

Commercial service was introduced in mid-1991. By 1993, 36 GSM networks were already operating in 22 countries. Today, you can be instantly reached on your mobile phone in over 171 countries worldwide and on 400 networks (operators). As of May 2001, over 550 million people were subscribers to mobile telecommunications. GSM truly stands for Global System for Mobile telecommunications. Roaming is the ability to use your GSM phone number in another GSM network. You can roam to another region or

Table 21-1

Major events
in GSM

Year	Events
1982	CEPT establishes a GSM group in order to develop the standards for a pan-European cellular mobile system.
1985	A list of recommendations to be generated by the group is accepted.
1986	Field tests are performed to test the different radio techniques proposed for the air interface.
1987	<i>Time Division Multiple Access</i> (TDMA) is chosen as the access method (with <i>Frequency Division Multiple Access</i> [FDMA]). The initial <i>Memorandum of Understanding</i> (MoU) is signed by telecommunication operators representing 12 countries.
1988	GSM system is validated.
1989	The responsibility of the GSM specifications is passed to the <i>European Telecommunications Standards Institute</i> (ETSI).
1990	Phase 1 of the GSM specifications is delivered.
1991	Commercial launch of the GSM service occurs.
1992	The addition of the countries that signed the GSM Memorandum of Understanding takes place. Coverage spreads to larger cities and airports.
1993	Coverage of main roads' GSM services starts outside Europe.
1995	Phase 2 of the GSM specifications occurs. Coverage is extended to rural areas.

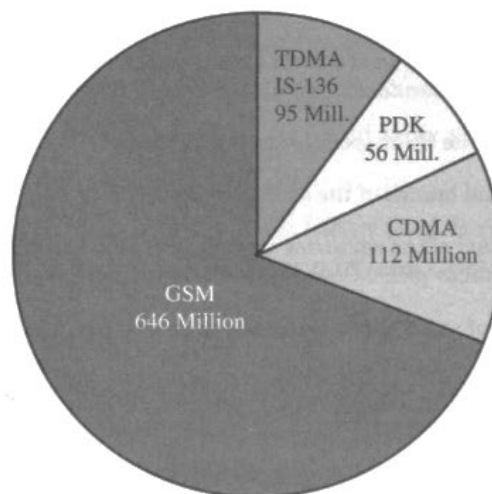
country and use the services of any network operator in that region that has a roaming agreement with the GSM network operator in your home region/country. A roaming agreement is a business agreement between two network operators to transfer items, such as call charges and subscription information, back and forth as their subscribers roam into each other's areas.

GSM Metrics

The GSM standard is the most widely accepted standard and is implemented globally, owning a market share of 69 percent of the world's digital cellular subscribers. *Time Division Multiple Access* (TDMA), with a market share close to 10 percent, is available mainly in North America and South America. GSM, which uses a TDMA access, and North American TDMA are two of the world's leading digital network standards. Unfortunately, it is currently technically impossible for users of either standard to make or receive calls in areas where only the other standard is available. Once interoperability is in place, users of GSM and TDMA handsets will be able to roam on the other network type—subject to the agreements between mobile operators. This will make roaming possible across much of the world because GSM and TDMA networks cover large sections of the global population and together account for 79 percent of all mobile subscribers, as shown in Figure 21-1.

Figure 21-1
Market penetrations
of GSM and TDMA

As of December, 2001

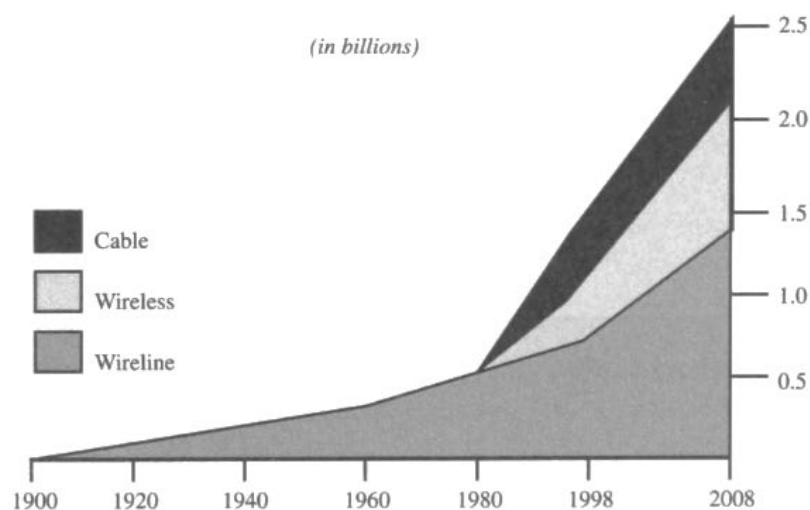


With the simultaneous gate-opening effects of technological innovation and industry deregulation, the demand for communications and available solutions is exploding. This demand is being fueled by the needs of people and businesses. The most visible evidence of the boom is within Internet traffic and e-commerce or m-commerce. However, it is less appreciated that an unprecedented demand exists from worldwide telephone subscribers. It took a century to get 700 million phone lines installed. Another 700 million will be deployed in the next 15 to 20 years—and that could prove to be a conservative estimate. Although the majority of the new deployments will be wireless phones—700 million of them over the next 10 years—demand for wireline communications is also exploding, driven in part by the need to access the Internet.

This explosion in demand is reflective of the dependence that people have on rapid, reliable communications to keep up with the fast pace of business. The success of the *Global System for Mobile Communications* (GSM), the ubiquitous presence it has garnered, the emerging Internet, and the overall growth of data traffic in general all point to a significant business opportunity for GSM operators. The number of subscribers to the Internet worldwide is growing exponentially, as seen in Figure 24-1, and the growth has been dramatic. The following statistics from the middle of 2001 add some credibility to the overall concept of a data-centric community that is also mobile:

- Number of Internet users—400 million
- Number of wireless users—700 million

Figure 24-1
The number of
telephone and
Internet users



By the year 2005, we can expect that more than 1 billion people will be mobile wireless users on a worldwide basis, and by 2006, more than 1 billion people will be Internet users. We are adding over 100 million new Internet users per year. This growth is unheralded in the past century of the telecommunications industry. The phenomenal growth in wireline Internet subscribers points to the possibility of wireless operators capturing some of this market. This assumes that they can offer comparable price-performance capabilities. The factors that we can consider in the process are

- Wireless users are ideal target subscribers for Internet providers.
- Internet users are ideal target subscribers for GSM operators.

Several movements in the Internet community will also force changes. The demographics of the user will change dramatically as the world expands its wireless and Internet presence. The average user will be looking for developments in the new Internet that will provide a broader band communications speed, the capability of using a network-enabled appliance, and a full network capable of sourcing all the needs and applications through high-end portals that can offer the goods and services needed. Instant information for a mobile workforce is paramount.

In addition to customer demand, this revolution is greatly accelerated by technology disruptions. Three technologies are at the fundamental science level. One is summarized in the well-known Moore's Law, which states that the capacity of an individual chip will double once every 18 to 24 months. Therefore, silicon is covering the globe. That phenomenon has been going on for three decades now and will be adding as much capacity in the next two years as has been created in the history of the semiconductor business. Nevertheless, the capacity is finally just getting to the point where it's interesting. Two other technologies, although less well known, are changing just as rapidly, if not more so:

- In optical, in the core of the network, *dense wavelength division multiplexing* (DWDM), using multiple colors of light to send multiple data streams down the same optical fiber, is disrupting the rapid growth of *Wave Division Multiplexing* (WDM), further pushing the envelope.
- Wireless capacity is also exploding, enabling higher bandwidth for voice/data without fiber (45 Mbps—up to 2.5 Gbps with certain wireless tools and 10 Gbps are being discussed as a reality over the next decade).

Combined, these advances are making converged networks possible and inevitable, as well as important to plan for in business. Companies that