

Preface

Use of the *global system for mobile communications* (GSM) continues to spread throughout the world. It works, it is efficient, and it is well liked. As is true of any mature but vital and growing system, the services and equipment based on the GSM specifications are still evolving to accommodate its new users and operating environments. The new services, improvements, applications, and products are the new flavors offered in the GSM ice cream stand of wireless telecommunications networks. New terminals feature increased standby and talk times while their sizes shrink and their prices fall. The combination of competitive pricing and access to a growing menu of services, which is attractive to a wider variety of users, marks the transition of GSM from a high-end offering to a *consumer* product orientation.

Interesting features that go far beyond the point-to-point voice conversation link typical of traditional wireless services are a reality in GSM networks. Sophisticated data services with access to the Internet, video connections, ISDN links, and supplementary services, which are expected in wireline digital networks, are becoming a reality in GSM-based networks.

Why have the authors of the previous work *An Introduction to GSM* (Artech House, 1995) chosen to write again on the same subject? Considering the metamorphosis just described, one answer is clear: GSM remains an evolving standard. Its use and applications are no longer

restricted to the initial aims of the early experimenters, the mothers and fathers of GSM. Another reason appears when we compare the coverage of our first book with this volume. *An Introduction to GSM* was meant to be—and was widely accepted as—a first confrontation with the subject. It focused on *what* GSM is rather than on *how* it works and *how* it can bring a growing catalog of services and applications to its users. The subject was treated so as to explain the system architecture and radio techniques used to convey information from one point to another. Some chapters on testing—still an important subject, especially because GSM is supposed to be an open standard—were added to enhance understanding, and further illustrate the techniques and processes. The first book, then, can be considered an illustrative brochure describing GSM to those considering its purchase and use. This volume is a logical extension of the earlier book; it is a user's manual for those who wish to exact efficiency and new features from GSM.

When *An Introduction to GSM* came to life, GSM services, as well as those of its *digital cellular system* (DCS) cousin, were struggling in their infancy. Networks were just starting to offer their services based on the status of the standards termed, at that time, *GSM Phase 1*. The situation has completely changed today. GSM has moved from the showroom to the customer's garage. Accessories have been added and copies have been made. Today we see three different standards based on the core GSM technology: GSM 900, DCS 1800 (GSM 1800), and PCS 1900 (now called GSM-NA). Today, network operators are introducing *GSM Phase II* services and products. Noting that GSM has found favor far beyond its original European roots, researchers and developers in the industry and standardization bodies are working on *GSM Phase 2+* services, features, and products. What are these new services, what do they offer, and how do they work?

The world has adopted GSM as the most widely deployed digital cellular standard with expanding interworking and roaming capabilities. With wider deployment comes greater variety. Since the publication of our first book, we have seen other systems employing different wireless access techniques adopt key GSM properties. The number of new applications, varieties, and flavors of GSM grows with its acceptance. As the world's dominant wireless protocol, the industry has accepted the responsibility of exploring ways in which GSM can interwork with other wireless access systems. Success in these efforts will yield a platform

capable of even greater capacity for the improved services and bandwidth allotted to carry them.

Still, GSM is not the only technology setting out to win the hearts and cash of those who want to use or offer digital wireless communications services. Competitive technologies such as *code division multiple access* (CDMA) are poised to take their share of the market as they offer their own set of applications. Whatever these systems may be—cellular radio, *personal communication systems* (PCS), *specialized mobile radio* (SMR), *wireless in the local loop* (WLL), cordless phones, or even satellite-based systems—GSM will thrive. The better these systems work together for the benefit of their users, the more all the providers, whatever technology they select, will win.

What are the important issues that drive the variations and added features? What are the trade-offs and compromises? What are the limitations? Where are the solutions? These matters are treated in the widely accepted style of the authors' first GSM volume. The answers are in the details. Subjects like digital baseband technology, new radio techniques and implementation schemes, and intelligent networks are shrouded in specialized language and mathematics. This increased specialization, which is not unique to mobile radio, frustrates managers, marketing specialists, and others taxed with the responsibility of financing and deploying GSM networks, and building the devices and the equipment on which these networks depend. Technical specialization tends to stifle effective communication among people. Just as with our first book, this one is written for those who must manage GSM projects and the growing variety of technical specialists needed to run them. Jargon and specialized mathematics are *avoided*, and new terms are explained as they are introduced. Your authors have worked diligently to explain obscure but important concepts, processes, and devices in clear language without the aid of sophisticated mathematics shorthand. Moreover, the explanations are animated with some of the excitement and passion of the scientists and engineers. The actual work must, however, be left to the technologists and the specialists, for it is only with the appropriate tools (mathematics, software, jargon, and experience) that the devices and features in the GSM networks can be manipulated efficiently and designed at a price such that many people can afford them. The treatments in this book, therefore, include appropriate references for each of the subjects covered. Some of the matters, particularly the radio techniques covered in the last

chapter, are so vast in their scope that small tutorials to carefully selected references are included. Just like our first book, this one is an initial confrontation, a guide, or an orientation for further reading. Students and engineers new to GSM and digital mobile radio will, therefore, find this book helpful.

Even as we finished the chapters, we knew there was still lots to tell about GSM. This book illuminates just another episode in its continuing story. The reader is invited to view this latest volume as a complement to *An Introduction to GSM*. Though some of the chapters make direct reference to the earlier book, anyone familiar with the fundamentals of GSM will be rewarded here.

This book has 11 chapters sorted into three parts. Part I has three chapters. The first chapter is a status report on where GSM is deployed in the world today and where it is likely to be accepted in the future. Some market sizes and other figures are offered. The confusion over the PCS and PCN designations is explored in the light of competing wireless systems. Chapter 2 traces the phased deployment of GSM. A means toward understanding current and future enhancements and system variations is possible when we understand how GSM adapted to conflicting national and regional requirements from its original, narrow European goals. Chapter 3 looks at the influence of new technologies, such as CDMA, other wireless services, such as TETRA, and certain social and economic realities, such as the North American market, on GSM as well as how GSM tempers those influences.

Part II consists of Chapters 4 through 10, which explain in detail the huge number of features and services of GSM. GSM introduces user services and improvements in phases. Chapter 4 starts by describing these services as it traces their phased introduction into the networks. Chapter 5 describes how teleservices and bearer services are handled in networks. Chapter 6 covers *short message service* (SMS), a service that is not found in wireline networks and a popular feature that removes so much of the intrusive nature of basic cellular service. Chapter 7 explores *supplementary services* (SS), which are those features common in many digital wireline networks that users find so helpful in their busy lives. Caller ID is an example. The subscriber identity module, also referred to as SIM card, which is viewed with growing interest and envy by proponents of some newer competing mobile radio technologies, is thoroughly explained in Chapter 8. Chapter 9 covers the latest features introduced into GSM, such

as the SIM application toolkit, CAMEL, and features introduced for railway applications. Chapter 10 brings us back to the network side, describing parameters stored in various switches or registers. This discussion reveals the mysteries of when and how the charging clock ticks and how calls are actually routed through the network.

Part III concludes the book with only one chapter, Chapter 11, which covers some salient technology issues. The emphasis is on the handsets. GSM handsets are the most visible part of the network, and their variety and high quality have played a major role in the acceptance of GSM in so many markets. The handset's ability to carry all the features described in Part II is seen as a miracle by many of the people who purchase these wireless wonders in all their colors and shapes.