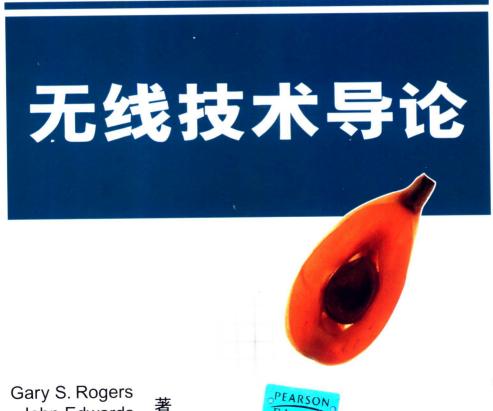


# AN INTRODUCTION TO WIRELESS TECHNOLOGY



John Edwards





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# 无线技术导论

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## An Introduction to Wireless Technology

# 无线技术导论

Gary S. Rogers
John Edwards
Macon State College

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## 出版说明

进入 21 世纪,世界各国的经济、科技以及综合国力的竞争将更加激烈。竞争的中心无疑是对人才的竞争。谁拥有大量高素质的人才,谁就能在竞争中取得优势。高等教育,作为培养高素质人才的事业,必然受到高度重视。目前我国高等教育的教材更新较慢,为了加快教材的更新频率,教育部正在大力促进我国高校采用国外原版教材。

清华大学出版社从1996年开始,与国外著名出版公司合作,影印出版了"大学计算机教育丛书(影印版)"等一系列引进图书,受到国内读者的欢迎和支持。跨入21世纪,我们本着为我国高等教育教材建设服务的初衷,在已有的基础上,进一步扩大选题内容,改变图书开本尺寸,一如既往地请有关专家挑选适用于我国高等本科及研究生计算机教育的国外经典教材或著名教材,组成本套"大学计算机教育国外著名教材系列(影印版)",以飨读者。深切期盼读者及时将使用本系列教材的效果和意见反馈给我们。更希望国内专家、教授积极向我们推荐国外计算机教育的优秀教材,以利我们把"大学计算机教育国外著名教材系列(影印版)"做得更好,更适合高校师生的需要。

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### PREFACE TO THE PREFACE

We believe this textbook covers all the primary areas in the wireless technology arena. It is the result of many years of research and work experience as well as years teaching college students all about the wonders of wireless technology.

We begin with a brief overview of networking. This not only sets the stage for later discussions on wireless, but also provides an opportunity for those students who do not already have a background in networking. The chapters that follow address the chief wireless technologies such as wireless application protocol, Bluetooth, cellular telephony, emergency services, wireless local area networks, satellite communications, global position system, and paging systems.

This text is well suited to Computer Information System (CIS) and Information Technology (IT) programs that emphasize a practical approach to this field. We have deliberately developed this book so that readers do not require any mathematical foundation. The concepts are presented thoroughly and clearly.

Being in the education field ourselves, we realize that instructor supplements are important. We never seem to have enough time, it seems! An extensive set of supplemental materials, including lecture notes, PowerPoint presentations, many review and test questions, hands-on exercises, and team exercises is found in the Instructor's Manual that accompanies this text.

#### **ACKNOWLEDGMENTS**

We would like to thank all those who have contributed to this book. Denise Edwards-Wilson, Rene Roberts, Karyn Morgan, David Williams and Terry Zimmerman worked tirelessly at creating vibrant and useful instructor supplements and figures. The many students in our wireless classes at Macon State College have contributed their sweat and expertise while we "tweaked" these wireless topics. The administration of the college, especially the President, David Bell, and our Division Chair, Bill Elieson, has

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Finally, our families have paid a toll in missed opportunities to go out together while we were laboring on this book.

> Gary S. Rogers John Edwards

### **ABOUT THE AUTHORS**

John Edwards has a Ed.D. degree from the University of Georgia and holds the rank of Associate Professor of Information Technology at Macon State College. He has 35 years experience installing and managing local and wide area networks in education and business, and has published twenty-seven technical articles in the field of computing. He is a principal in a firm which provides e-commerce consulting, network configuration, installation and management, and website development.

Gary S. Rogers has a Ph.D. degree from Walden University and holds the rank of Assistant Professor of Information Technology at Macon State College. He specializes in telecommunications, possessing more than 20 years experience in the computer networking field and many years designing and implementing wired and wireless networks. Dr. Rogers has designed and implemented computer networking systems in both the private and public sectors. He has authored many articles and technical presentations in the area of networking, network security, and telecommunications standards.

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# AN INTRODUCTION TO WIRELESS TECHNOLOGY

CHAPTER

# 1 Introduction to Networking

#### **OBJECTIVES**

After reading this chapter and completing the exercises, you will be able to:

- Understand the evolution, role, and current state of the Internet
- Understand the purpose, operation, and role of reference models in networking
- Identify essential network types, media, topologies, and connectivity devices
- Understand the increasing role of wireless networking

This chapter provides you with a solid foundation in networking basics, which will enable you to have a deeper appreciation and understanding of the more complex wireless discussions that follow in subsequent chapters.

#### **SEEKING ALTERNATIVES TO SNAIL MAIL**

AS THE ONGOING THREAT of anthrax injects fear and danger into the circulation of letters and packages, online delivery alternatives are getting a second look from businesses and government agencies seeking reliable and safe ways to communicate with customers and partners.

Some of the benefits of e-mail and secure online delivery services include cost savings and convenience, according to Dana Gardner, research director at Boston's Aberdeen Group.

"Now is the time to re-evaluate the benefits of securely delivered e-mail," Gardner says. "It is unfortunate that [the anthrax threat] needs to be a reason for people to reconsider or re-evaluate e-mail; it is a good [idea] on its own without these unfortunate circumstances."

And using e-mail for customer communications can help forge a digital bond with customers that will prove beneficial in the long run, Gardner adds.

"The benefit goes beyond cost savings and convenience," Gardner explains.

"The fact that [e-mail] is a two-way link and provides a directory entry that includes e-mail will benefit organizations in many ways down the line, particularly as Web services and context and collaboration become more prevalent."

The anthrax incidents, coupled with technology improvements in the past year and passage of the e-signature law, are expected to help speed the adoption of online-delivery services in enterprises, according to Sue Barsamian, senior vice president of marketing at Critical Path, a San Francisco-based messaging infrastructure provider.

"This is going to be a very strong catalyst for hastening the migration to secure online delivery service. The migration is inevitable because it is more cost effective than the physical delivery alternative," Barsamian says.

Critical Path's recently released Registered Mail Server, which enables businesses to deliver and receive documents via a secure Internet connection, aims to address the issue of integrating secure-message delivery with existing messaging systems, says Michael Serbinis, CTO and vice president of engineering at Critical Path.

"The stumbling block of most secure messaging is that it has not been integrated with e-mail and directory technology [for providing] security credentials," Serbinis says. "Registered Mail Server is an integrated platform, so secure messaging is just another type of messaging now available."

Another vendor, Digital Signature Trust, offers a secure document delivery system allowing users to send any size electronic document and track the delivery and receipt, says Greg Worch, senior vice president of Salt Lake City-based Digital Signature Trust.

Dubbed CertainSend, the system operates as simply as e-mail but allows businesses to guarantee the delivery of large documents that could otherwise overwhelm an e-mail connection, Worch adds, noting that the system uses TrustID digital certificates to guarantee identity and security.

"We can make any delivery legally binding," Worch explains. "[CertainSend] can deliver documents in business situations, whether it is a contract or sensitive data."

Online bill payment is also gathering momentum. According to Gardner, recent mail safety concerns are encouraging both billing companies and consumers to pursue electronic billing and payment channels more aggressively.

The Stamford, Connecticut-based research firm says its clients have reported a 20 percent increase in electronic bill presentment enrollment since the outset of the anthrax scare. Gardner also predicts that the number of American consumers viewing bills electronically will jump from 32 million at the end of 2001 to 64 million by year-end 2003.

Toronto-based messaging software vendor Metamail this month rolled out XML-based e-mail-client software designed to enhance Web-based electronic billing systems. The Metamail technology works with messaging systems, including Microsoft Outlook, Lotus Notes, Netscape, Eudora, and Novell Groupwise, to enable the secure online delivery of realistic-looking financial statements. To retrieve bills, users enter a password which allows them to view, pay, and print from within the messaging in-box, according to officials at Metamail.

With the dozens of online delivery systems nipping at its heels, the U.S. Postal Service has been steadily ramping up online services during the past five years. The recent safety concerns may provide the impetus to develop a national electronic postal service, says Bill Robertson, senior vice president of Boulder, Colorado-based NETdelivery, which provides the technology behind Canada's electronic postal service.

The anthrax threat "is having an untold impact on businesses and governments across the United States because of the interruptions of the mail distribution system, not to mention the terrible human toll," Robertson says.

As a result, Robertson says, "businesses and governments will be looking at alternative methods that might reduce the risks and provide a more uninterrupted flow of communication."

With the two-year-old success of the Canadian ePost as a model, and messaging technology capable of supporting billions of transactions per year, "There is no reason why a large scale national electronic post implementation could not be installed in the United States," Robertson adds.

Source: Moore, Cathlean. Retrieved November 21, 2001, staging.infoworld.com/articles.

#### **TECHNOLOGY AND CHANGE**

As you are undoubtedly aware, we live in the midst of an information revolution. This time can be challenging or even frightening. This change is evident in every sector of society, including the entertainment industry. In a 1998 science fiction series, *Babylon 5*, a notable character sums up our situation nicely: "The past tempts us, the present confuses us, and the future frightens us." (United Paramount Network. 1998. Babylon 5 TV series). Alternatively, as Alvin Toffler indicates in his *Third Wave*, this advent of technology and its associated information can be thought of as a third wave of information and is the dawn of a new civilization (Toffler 1991).

It is an event as profound as that first wave of change unleashed thousands of years ago by the invention of agriculture, or the earthshaking second wave of change touched off by the industrial revolution. Information technology forms the basis of this new age of civilization—the information age. Just as the industrial age caused mass movements of people from farm to factory, the information age has produced dramatic changes in the way we work and live (Toffler 1991). Certainly, major technological advances await us in this millennium, such as those in the biotechnology, cloning, and nanotechnology fields.

With this technology, however, comes something else—something perhaps as tangible as the technology itself—namely change. We live in a time of technological change, from the workplace to the home. On the work scene, this change even affects a tradition-ruled organization like the U.S. Congress. Members of Congress are so inundated with e-mail messages from constituents and special interest groups—80 million last year alone—that lawmakers routinely ignore most of them, according to a new study (Tech crisis 2001).

At home, how many would have seriously envisioned receiving 500+ TV channels from an 18-inch satellite dish located in the backyard? DishTV is a major player in this arena, using six satellites to transmit the TV channels and associated services such as Internet connectivity (Our Satellites 2001). It is clear that people, organizations, and society as a whole must learn to adapt to this change and learn from it.

#### THE DITERNET

Technological change has increased the rate at which computer networks and their accompanying applications are becoming not only accepted and prevalent but, in many cases, taken for granted. Many people in the United States are so accustomed to an electronic mail service that they would have difficulty living without it. Recent surveys indicate that electronic mail may soon become as important as the telephone.