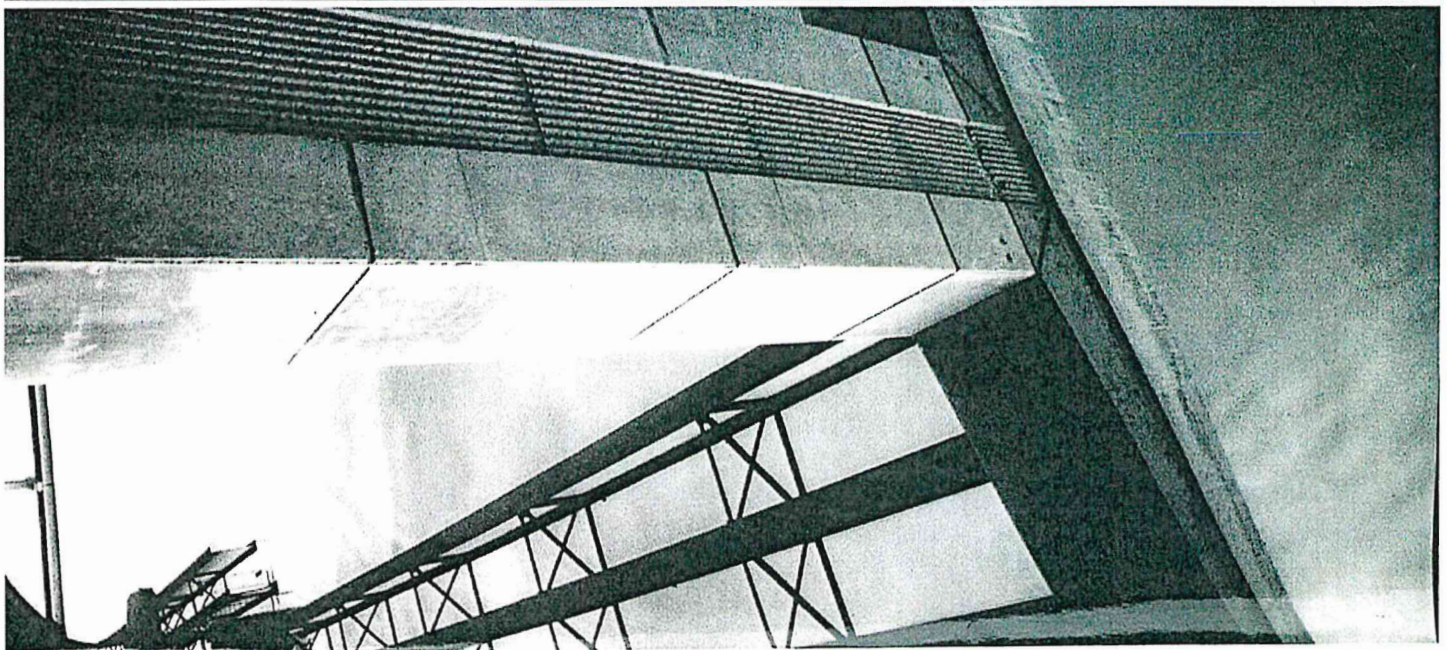


Jim Geier

Second
Edition

Wireless LANs

Implementing High Performance IEEE 802.11 Networks



Wireless LANs, Second Edition

Jim Geier

SAMS

201 West 103rd St., Indianapolis, Indiana, 46290 USA

Wireless LANs, Second Edition

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Wireless Networks— A First Look

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Wireless Network Configurations

CHAPTER

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Wireless LAN Architecture

Most wireless LANs operate over unlicensed frequencies at near-ethernet speeds using carrier sense protocols to share a radio wave or infrared light medium. The majority of these devices are capable of transmitting information up to 1,000 feet between computers within an open environment, and their cost per user ranges from \$100 to \$500. In addition, most wireless LAN products offer Simple Network Management Protocol (SNMP) to support network management through the use of SNMP-based management platforms and applications. Figure 2.1 illustrates the concept of a wireless local area network interfacing with a wired network.

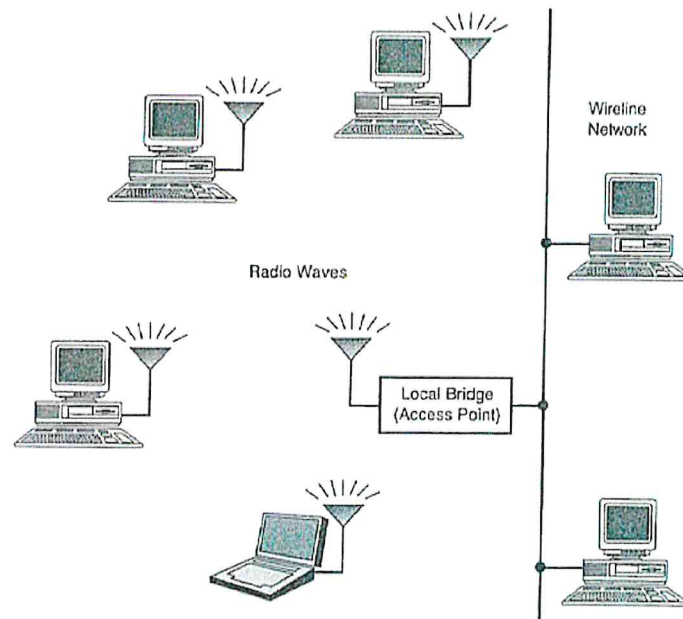


FIGURE 2.1

A wireless local area network provides connectivity over the airwaves within a local area, such as a building.

Wireless networks perform functions similar to their wired ethernet and token-ring counterparts. In general, networks perform the following functions to enable the transfer of information from source to destination:

1. The medium provides a bit pipe (a path for data to flow) for the transmission of data.
2. Medium access techniques facilitate the sharing of a common medium.

3. Synchronization and error control mechanisms ensure that each link transfers the data intact.
4. Routing mechanisms move the data from the originating source to the intended destination.
5. Connectivity software interfaces an appliance, such as a pen-based computer or bar code scanner, to application software hosted on a server.

Figure 2.2 illustrates the logical architecture of a wireless LAN.

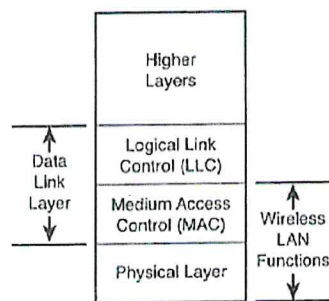


FIGURE 2.2

A wireless local area network provides functions related to the Medium Access Control (MAC) and Physical layers of a network's architecture.

Medium Access Control (MAC) Sublayer

Medium access control, which is a Data Link layer function in a radio-based wireless LAN, enables multiple appliances to share a common transmission medium via a carrier sense protocol similar to ethernet. This protocol enables a group of wireless computers to share the same frequency and space. A wireless LAN MAC provides reliable delivery of data over somewhat error-prone wireless media.

As an analogy, consider a room of people engaged in a single conversation in which each person can hear if someone speaks. This represents a fully connected bus topology where everyone communicates using the same frequency and space. To avoid having two people speak at the same time, you should wait until the other person has finished talking. Also, no one should speak unless the room is silent. This simple protocol ensures that only one person speaks at a time, offering a shared use of the communications medium. Wireless systems operate in a similar fashion, except the communications are by way of radio signals. Figure 2.3 illustrates the generic carrier sense protocol, commonly known as *Carrier Sense Multiple Access (CSMA)*.

- Handheld scanners and data collectors
- Handheld printers

NOTE

When evaluating appliances for use with a mobile application, be sure to consider the ergonomics of the unit. You certainly won't be able to realize any of the benefits of a wireless network if users don't use the system because of appliances that weigh too much or are difficult to use.

Network Software

A wireless network consists of software that resides on different parts of the network. A network operating system (NOS) such as Microsoft NT Server, hosted on a high-end PC, provides file, print, and application services. Many NOSs are server oriented, as shown in Figure 2.10, where the core application software and databases reside. In most cases, the appliances will interface via TCP/IP with application software or a database running on the NOS.

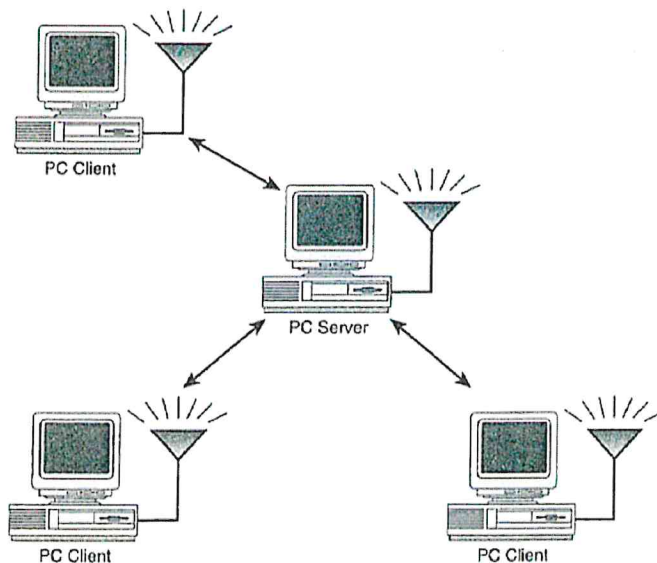


FIGURE 2.10

The server-based network operating system provides a centralized platform for applications and data storage for mobile users.

Client software, located on the end-user's appliance, directs the user's commands to the local appliance software or steers them out through the wireless network. The software residing on a wireless appliance is very similar to software that runs on a wired appliance. The main difference is that it is important to develop the wireless software to optimize the use of the wireless network's relatively small amount of bandwidth.

The software performing application functions can run on a server/host, the appliance, or a combination of both. In some cases, such as with applications running on an IBM mainframe, IBM AS/400, or a UNIX-based host, the wireless appliances may need to run terminal emulation. This makes the appliance act as a dumb terminal, simply interfacing the keyboard, screen, printer, and so on with the application running on the host. With client/server systems, the software on the appliance may perform part or all of the application's functionality and merely interface with a database located on a server, such as Microsoft NT Server.

NOTE

A wireless network appears to be transparent to application software and operating systems on the network. As a result, applications written for a wired network generally can run without changes over a wireless network.

In some cases, a gateway running middleware is necessary to provide an interface between the appliance and the application software running on the server. The appliances communicate with the host/server through the gateway. The gateway acts as a proxy for the various appliances. The advantages of using the gateway are as follows:

- **Better RF Throughput** With the presence of a transport and application gateway, the appliances communicate with the gateway by using a lightweight protocol that is wireless friendly, unlike TCP/IP.
- **Reliability** Since the gateway proxies all the appliances, any outages in communication due to the appliances roaming out of range are transparent to the host/server.
- **Longer Battery Life** When the appliances are idle, the network software does not have to send out keep-alive packets periodically to keep the connection to the host/server open. This will be done by the gateway.

Wireless Network Interface Card

Computers process information in digital form, with low direct current (DC) voltages representing data ones and zeros. These signals are optimum for transmission within the computer, not for transporting data through wired or wireless media. A wireless network interface couples the digital signal from the end-user appliance to the wireless medium, which is air, to

Wireless LANs provide unique benefits to many organizations, but with the increased popularity and acceptance of mobile communications—made most visible by the proliferation of mobile handheld devices—the need for support and tools for maintaining network integrity has also grown. The IEEE 802.11 standard provides the requisite structure for wireless network interoperability and stability.

Wireless LANs, Second Edition provides both a context for understanding how an enterprise can benefit from the application of wireless technology and the proven tools for efficiently implementing a wireless LAN. Readers can use the real-world solutions detailed throughout the book to model their own networks. Designers and implementers will learn the considerations that must be addressed at each stage of the process.

Jim Geier is an independent consultant, assisting firms with the development of wireless network products and integration of wireless networks into corporate information systems. Jim's 20 years of experience have dealt with the analysis, design, software development, installation, and support of numerous client/server and wireless network-based systems for retail, manufacturing, warehousing, healthcare, education, and airline industries throughout the world. Jim is the author of three other books: *Wireless LANs* (1999, MTP), *Wireless Networking Handbook* (1996, New Riders), and *Network Reengineering* (1996, McGraw-Hill), as well as numerous articles for publications such as *Network World* and *Communications System Design*. He was an active member of the IEEE 802.11 Working Group responsible for developing international standards for wireless LANs.

LEARN THE CONCEPTS...

Based on the most recent developments in the field, *Wireless LANs, Second Edition* gives information system managers, network engineers, designers, and architects vital up-to-date information on how to plan, configure, and install wireless networks, including

- Coverage of the latest applications, benefits, and implications of wireless LANs.
- Detailed explanations of the IEEE 802.11 protocol operation and frame types, including the newer IEEE 802.11a and IEEE 802.11b standards.
- Authoritative advice on how to define, design, and install wireless LANs for supporting high performance multimedia applications.
- Case studies that provide real-world insight into the best practices of deploying a wireless LAN.

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