Unit 6: Wireless PAN Systems

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Objectives

After studying this unit, you will be able to:

- Discuss the basics of wireless PAN system
- Define about SOHO equipment's
- Explain the network technology in PAN system
- Understand the accessing Internet

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- Explain how to access PDAs
- Discuss about mobile phone accessing

Introduction

A wireless network enables people to communicate and access applications and information without wires. This provides freedom of movement and the ability to extend applications to different parts of a building, city, or nearly anywhere in the world. Wireless networks allow people to interact with e-mail or browse the Internet from a location that they prefer.

Many types of wireless communication systems exist, but a distinguishing attribute of a wireless network is that communication takes place between computer devices. These devices include personal digital assistants (PDAs), laptops, personal computers (PCs), servers, and printers. Computer devices have processors, memory, and a means of interfacing with a particular type of network. Traditional cell phones don't fall within the definition of a computer device; however, newer phones and even audio headsets are beginning to incorporate computing power and network adapters. Eventually, most electronics will offer wireless network connections.

As with networks based on wire, or optical fiber, wireless networks convey information between computer devices. The information can take the form of e-mail messages, web pages, database records, streaming video or voice. In most cases, wireless networks transfer data, such as e-mail messages and files, but advancements in the performance of wireless networks is enabling support for video and voice communications as well.

6.1 Basics of Wireless PAN Systems

Wireless PAN is based on the standard IEEE 802.15. The two kinds of wireless technologies used for WPAN are Bluetooth and Infrared Data Association.

A WPAN could serve to interconnect all the ordinary computing and communicating devices that many people have on their desk or carry with them today; or it could serve a more specialized purpose such as allowing the surgeon and other team members to communicate during an operation.

6.1.1 Synchronization

The definition of time synchronization does not necessarily mean that all clocks are perfectly matched across the network. This would be the strictest form of synchronization as well as the most difficult to implement. Precise clock synchronization is not always essential, so protocols from lenient to strict are available to meet one's needs.

There are three basic types of synchronization methods for wireless networks. The first is relative timing and is the simplest. It relies on the ordering of messages and events. The basic idea is to be able to determine if event 1 occurred before event 2. Comparing the local clocks to determine the order is all that is needed. Clock synchronization is not important.

The next method is relative timing in which the network clocks are independent of each other and the nodes keep track of drift and offset. Usually a node keeps information about its drift and offset in correspondence to neighboring nodes. The nodes have the ability to synchronize their local time with another nodes local time at any instant. Most synchronization protocols use this method.

The last method is global synchronization where there is a constant global timescale throughout the network. This is obviously the most complex and the toughest to implement. Very few synchronizing algorithms use this method particularly because this type of synchronization usually is not necessary.

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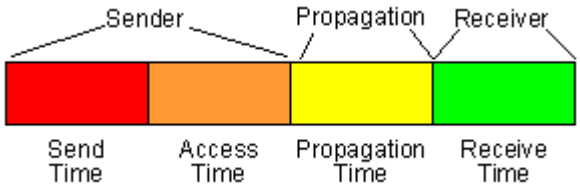
Figure 6.1: Breakdown of Packet Delay Components



Source: http://www.cse.wustl.edu/~jain/cse574-06/ftp/time_sync/

As shown in Figure 6.1, all the wireless synchronization schemes have four basic packet delay components: send time, access time, propagation time, and receive time. The send time is that of the sender constructing the time message to transmit on the network. The access time is that of the MAC layer delay in accessing the network. This could be waiting to transmit in a TDMA protocol. The time for the bits to by physically transmitted on the medium is considered the propagation time. Finally, the receive time is the receiving node processing the message and transferring it to the host. The major problem of time synchronization is not only that this packet delay exists, but also being able to predict the time spent on each can be difficult. Eliminating any of these will greatly increase the performance of the synchronization technique.

As illustrated there are many different variations of time synchronization or wireless networks. They range from very complex and difficult to implement to simpler and easy to implement. No matter the scheme used, all synchronization methods have the four basic components: send time, access time, propagation time, and receive time.

There are many synchronization protocols, many of which do not differ much from each other. As with any protocol, the basic idea is always there, but improving on the disadvantages is a constant evolution. Three protocols will be discussed at length: Reference Broadcast Synchronization (RBS), Timing-sync Protocol for Sensor Networks (TPSN), and Flooding Time Synchronization Protocol (FTSP). These three protocols are the major timing protocols currently in use for wireless networks. There are other synchronization protocols, but these three represent a good illustration of the different types of protocols. These three cover sender to receiver synchronization as well as receiver to receiver. Also, they cover single hop and multi hop synchronization schemes.

6.1.2 Streaming Multimedia

A wireless sensor network with multimedia capabilities typically consists of data sensor nodes, which sense, for instance, sound or motion, and video sensor nodes, which capture video of events of interest. In this survey, we focus on the video encoding at the video sensors and the real-time transport of the encoded video to a base station. Real-time video streams have stringent requirements for end-to-end delay and loss during network transport. In this survey, we categorize the requirements of multimedia traffic at each layer of the network protocol stack and further classify the mechanisms that have been proposed for multimedia streaming in wireless sensor networks at each layer of the stack. Specifically, we consider the mechanisms operating at the application, transport, network, and MAC layers. We also review existing cross-layer approaches and propose a few possible cross-layer solutions to optimize the performance of a given wireless sensor network for multimedia streaming applications.

6.1.3 Control

A Wireless PAN network does not use wires. They are more reliable as they have less number of cables.

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6.1.4 Internet Connections

A wireless PAN interface can be used to connect to the Internet. A user has the capability to stay within a range and use it without having to forcefully sit in front of the desk.

6.2 SOHO Equipments

Small office/home office (or single office/home office; SOHO) refers to the category of business or cottage industry that involves from 1 to 10 workers.

Before the 19th century, and the spread of the industrial revolution around the globe, nearly all offices were small offices and/or home offices, with only a few exceptions. Most businesses were small, and the paperwork that accompanied them was limited. The industrial revolution aggregated workers in factories, to mass-produce goods. In most circumstances, the so-called "white collar" counterpart—office work—was aggregated as well in large buildings, usually in cities or densely populated suburban areas.

Beginning in the mid-1980s, the advent of the personal computer and fax machine, plus breakthroughs in telecommunications, created opportunities for office workers to decentralize. Decentralization was also perceived as benefiting employers in terms of lower overheads and potentially greater productivity.

Many consultants and the members of such professions as lawyers, real estate agents, and surveyors in small and medium-size towns operate from home offices.

Several ranges of products, such as the armoire desk and all-in-one printer, are designed specifically for the SOHO market. A number of books and magazines have been published and marketed specifically at this type of office. These range from general advice texts to specific guidebooks on such challenges as setting up a small PBX for the office telephones.

Did u know? Technology has also created a demand for larger businesses to employ individuals who work from home. Sometimes these people remain as an independent businessperson, and sometimes they become employees of a larger company.

The small office home office has undergone a transformation since its advent as the internet has enabled anyone working from a home office to compete globally. Technology has made this possible through email, the World-Wide Web, e-commerce, videoconferencing, remote desktop software, webinar systems, and telephone connections by VOIP.

6.2.1 Designing a Small Home Office

This checklist is provided so you can successfully set up your home network using the Network Setup Wizard. The checklist is a guideline of the steps needed, in the order they should be completed. Once you complete a step, or if it does not apply to you, check it off and then go on to the next step.

1. Sketch out your network: draw a diagram of your house or office where each computer and printer is located. Or, you can create a table that lists the hardware on each computer.
2. Next to each computer, note the hardware, such as modems and network adapters, each computer has.
3. Choose your Internet Connection Sharing (ICS) host computer. It is recommended that this computer be running Windows XP Home Edition or Windows XP Professional and have a working Internet connection. Choosing your Internet Connection Sharing host computer

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4. Determine the type of network adapters you need for your home or small office network: Ethernet, home phoneline network adapter (HPNA), wireless, or IEEE 1394.
5. Make a list of hardware you need to purchase. This includes modems, network adapters, hubs, and cables. Buying the right hardware
6. Purchase the hardware.
7. Install the network adapters and modems to create your network connections on each computer.
8. Physically connect the computers together. Plug in the cables to hubs, phone jacks, and the computer. Connect your computers together
9. Turn on all computers and printers.
10. Make sure your ICS host computer has an active Internet connection. To establish your Internet connection, run the New Connection Wizard. Internet Connection Sharing;
11. Run the Windows XP fissional Network Setup Wizard on the ICS host computer.
12. Run the Network Setup Wizard on the other computers on your network.

6.2.2 Equipment Needed to Set Up a Small Office

There are currently two types of Wi-Fi components you'll need to build your home or office network: Wi-Fi radio (also known as client devices) devices (desktops, laptops, PDAs, etc.), and access points or gateways that act as base stations. A third type, Wi-Fi equipped peripherals, is emerging and will soon be commonplace. This group includes printers, scanners, cameras, video monitors, set-top boxes and other peripheral equipment.

Types of equipment covered in this document:

- PC Card Radio
- Mini-PCI Modules and Embedded Radios
- USB Adapters
- PCI and ISA Bus Adapters
- Compact Flash and Other Small-Client Formats
- Access Points and Gateways

6.3 Networking Technologies

Networking technology allow your computers to send information to each other. Some of the networking technologies include:

- Ethernet
- Phone line
- Wireless
- Mixing Media

6.3.1 Ethernet

Ethernet is a physical and data link layer technology for local area networks (LANs). Ethernet was invented by engineer Robert Metcalfe.

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When first widely deployed in the 1980s, Ethernet supported a maximum theoretical data rate of 10 megabits per second (Mbps). Later, so-called "Fast Ethernet" standards increased this maximum data rate to 100 Mbps. Today, Gigabit Ethernet technology further extends peak performance up to 1000 Mbps.

Higher level network protocols like Internet Protocol (IP) use Ethernet as their transmission medium. Data travels over Ethernet inside protocol units called frames.

The run length of individual Ethernet cables is limited to roughly 100 meters, but Ethernet networks can be easily extended to link entire schools or office buildings using network bridge devices.

6.3.2 Phone Line

Phone-line networking is one of several ways to connect the computers in your home. If your computers are in different rooms, then phone-line networking could be a good solution for you.

Phone-line networking is easy to install, inexpensive and fast, and it doesn't require any additional wiring.

Phone-line networking, most commonly referred to as HomePNA, is based on the specifications developed by the Home Phone Networking Alliance (HPNA). The HPNA is a consortium of key networking technology companies that created a phone-line standard for the networking industry. HPNA 1.0, the original version of the standard, operated at a rather slow 1 megabit per second (Mbps). The current specification, HPNA 3.0, is based on technology developed by Broadcom and Copper Solutions. It operates at 128 Mbps.

HomePNA has several distinct advantages:

- It's easy to install.
- It's inexpensive.
- It's standardized.
- It's reliable.
- It operates at a constant 128 Mbps, even when the phone is in use.
- It requires no additional networking equipment (such as hubs or routers).
- It supports up to 50 devices.
- It is fast enough for bandwidth-intensive applications, such as video.
- It is compatible with other networking technologies.
- It works on Macs and older PCs (in addition to Windows and Linux systems).

HomePNA does have some drawbacks, though. You need a phone jack close to each computer. Otherwise, you will have to run phone extension cords or install new wiring. There is a physical limit of 1,000 feet (304.8 m) of wiring between devices, and the overall area of coverage should not exceed 10,000 square feet (929 m2). Rarely (in fewer than 1 percent of U.S. homes), HomePNA will not work on the existing wiring. And while this author did not notice any interference with voice use, there have been reports of voices sounding "funny" or of a lot of noise on the phone once HomePNA is installed.

6.3.3 Wireless

Wireless is a term used to describe telecommunications in which electromagnetic waves (rather than some form of wire) carry the signal over part or all of the communication path. Some

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monitoring devices, such as intrusion alarms, employ acoustic waves at frequencies above the range of human hearing; these are also sometimes classified as wireless.

The wireless method of communication uses low-powered radio waves to transmit data between devices. High powered transmission sources usually require government licenses to broadcast on a specific wavelength. This platform has historically carried voice and has grown into a large industry, carrying many thousands of broadcasts around the world. Radio waves are now increasingly being used by unregulated computer users.

Humans communicate in order to share knowledge and experiences. Common forms of human communication include sign language, speaking, writing, gestures, and broadcasting. Communication can be interactive, transactive, intentional, or unintentional; it can also be verbal or nonverbal. In addition, communication can be intrapersonal or interpersonal.

We owe much to the Romans that in the field of communication it did not end with the Latin root communicare. They devised what might be described as the first real mail, or postal system, in order to centralize control of the empire from Rome. This allowed Rome to gather knowledge about events in its many widespread provinces.

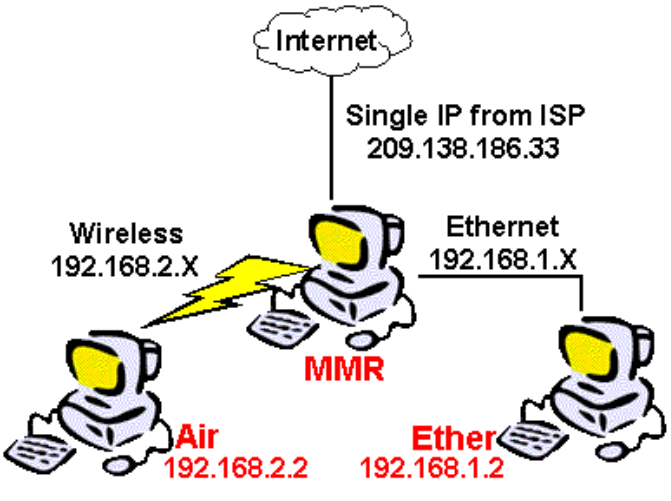
Did u know? The first wireless transmitters went on the air in the early 20th century using radiotelegraphy (Morse code). Later, as modulation made it possible to transmit voices and music via wireless, the medium came to be called "radio." With the advent of television, fax, data communication, and the effective use of a larger portion of the spectrum, the term "wireless" has been resurrected.

6.3.4 Mixing Media

The diagram below illustrates a simple example of a Mixed Media network. This network has only 3 computers:

- one with a Wireless network adapter;
- one with an Ethernet network adapter; and
- one with both Wireless and Ethernet adapters.

Figure 6.2: Mix Media Network



Source: http://www.practicallynetworked.com/networking/mmr_intro.htm

Notes

The computer that has both adapters also has an Internet connection. This connection can be via Dialup modem, cable modem, DSL, ISDN or any other method to connect to the Internet. This well-connected computer will be used as the MMR. The Mixed Media Router manages the data flow among the three networks that use different connection media, so that a single Internet connection will be shared among the computers in all the sub networks, and File and Printer sharing will work.

Self-assessment

Fill in the blanks:

1. Wireless PAN is based on the standard .....
2. global ..... is the most complex and the toughest to implement
3. A wireless ..... interface can be used to connect to the Internet
4. ..... is a physical and data link layer technology for local area networks (LANs).
5. Higher level network protocols like Internet Protocol (IP) use Ethernet as their .... medium.
6. The run length of individual Ethernet cables is limited to roughly ..... meters
7. ..... networking is easy to install, inexpensive and fast, and it doesn't require any additional wiring.
8. Phone-line networking, most commonly referred to as .....,
9. ..... is a term used to describe telecommunications in which electromagnetic waves (rather than some form of wire) carry the signal over part or all of the communication path
10. The wireless method of communication uses low-powered ..... to transmit data between devices.

6.4 Printing

Wireless printing is a cost-effective way to easily and flexibly produce barcodes wherever you are. Virtually any printing application can go wireless – especially situations where cabling is either inconvenient or impossible. Realize great benefits from wireless printing technology.

Notes Bluetooth wireless printing is a proprietary open wireless technology standard for exchanging data over short distances from fixed and mobile devices.

Wireless LAN 802.11b or 802.11g provides for secure data transfer of sensitive information.

Here are three ways to turn any printer into a wireless one.

1. ***Plug into a wireless print server:*** If your printer has a USB port, you can plug in a wireless print server, a small box into which you can connect your printer. The advantage of investing in a print server is that you don't have to connect the printer to a PC, which means you can use your laptop and print anywhere in your home. During the setup, you will have to plug the printer into the printer server, and connect that to the router using an Ethernet cable. Meanwhile, you'll have to install software on your computer and configure the connection, as you would when setting up a router.

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2. ***Share your printer with other PCs in your home or office:*** If you have several computers sharing a printer (say, in a small office or your family's home) a cost-effective way to make the printer wireless is by connecting it to a host computer, going into the Control Panel in Windows, and enabling the printer to be shared on the network. Although this solution is free, the downside is that if the host computer is powered down, other computers on the network can't use the printer.
3. ***Buy a Bluetooth adapter:*** Almost every manufacturer sells an optional Bluetooth adapter, although they won't necessarily work with the model you're using.

6.4.1 Benefits of Wireless Printing

The benefit of connecting via Bluetooth is that if you have a simpler phone without Wi-Fi, you can still send files and pictures to the printer via Bluetooth (most laptops nowadays have Bluetooth as well). The trade-off is that older Bluetooth products, that use Version 1.1 or 1.2, have a rated range of 10 meters (about 33 feet), which is shorter than your router or Wi-Fi–enabled notebook's range. (Bluetooth 2.0 and 2.1, however, have a rated range of 100 meters.) The longer the range, of course, the more options you have when it comes time to find homes for your printer and laptop.

6.4.2 Wi-Fi Protected Setup

Wireless networks have evolved over the years. It used to be a royal pain to set up security, hand out IP addresses and connect other Wi-Fi devices to the network.

Nowadays, however, the equipment is much easier to set up initially, and connecting all kinds of devices is a snap because of something called Wi-Fi Protected Setup (WPS). With WPS, it's really easy to add devices on the fly.

Many Wi-Fi connectable devices have WPS buttons on them these days, as do most D-Link routers. To see if yours does, just look for an icon featuring two opposite-facing arrows (see image on right). To add a WPS-enabled device to your network, simply press the WPS button on your router then press the WPS button on the device. They identify each other, and you're off and running.

There are other WPS connection methods, too, namely:

- PIN number
- USB drive set-up (code is transferred from the USB stick to the new device)
- "Near Field Communication" NFC (just position the device next to the other, and they identify each other)

6.4.3 Wireless Setup

To make a wireless setup:

1. Make sure your printer has wireless network adapters or a wireless router.
2. Power on the printer and wireless router.
3. Configure the printer to connect the wireless router. Enable the DHCP option on the printer. Obtain the IP address automatically. Configure the DHCP server of wireless router. Again, assign the IP address automatically.
4. Verify connectivity. Try doing some test prints. If it doesn't work, check the IP addresses.

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6.5 Accessing Internet

To access a wireless network, follow the steps below.

1. Connect to the Internet: The DSL or cable modem should be working as this sets up the wireless network.
2. Connect your Wireless Router: Setting up a wireless router is straightforward as long as you have a PC with a wireless network adapter, as well as an active high-speed Internet connection. You might also need a computer with a wired network adapter and router-specific setup software, which is typically included on a disc packaged with your router or available for download on the router manufacturer's support site.

Set Up Your Wireless Router on a Windows 7 PC

1. Connect the wireless router to your modem using an Ethernet cable.
2. Connect your wireless router to a power source. Wait about a minute, and then continue to the next step.
3. Click the network icon in the notification area; the icon should look like a series of vertical bars, or a tiny PC with a network adapter alongside it.
4. Select your wireless network from the list of available networks to complete the setup process. By default, your network name will be the name of your router manufacturer.

Set Up Your Router Using the Setup Software

1. Make sure that your wireless router is completely disconnected from the modem, the computer, and the power source.
2. On your PC, insert the disc that came with your router, or download and run the latest version of the router's software from the vendor website.
3. Follow the on-screen instructions. The setup routine will ask you to connect components (including your modem and PC) in a certain order, and it may request that you temporarily connect your wireless router to a computer via an ethernet cable. You will also create a wireless network name and password at this point. If something goes wrong, you may want to consider manually configuring your wireless router.

Manually Configure Your Router Without Setup Software

1. Connect your wireless router to the modem, using an ethernet cable.
2. Connect the wireless router to a power source. Wait about a minute to ensure that your router is fully operational.
3. Connect the wireless router to your computer using an ethernet cable.
4. Log in to your router's Web interface by opening a browser and entering the IP address of your router into the address bar. The IP address should be listed within your router's documentation; if you can't find it, most routers use a common IP address such as http://192.168.1.1, http://192.168.0.1, or http://192.168.2.1.
5. Enter the default username and password, which you should find within your router's documentation. Alternatively, visit Port Forward's Default Router Passwords page.
6. Use the Web interface to set up a network name and password.

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7. Disconnect your computer from the wireless router and then reconnect wirelessly.
8. Caution: Be sure to use a password to protect your wireless network. Unauthorized parties can easily connect to an unprotected network, stealing your bandwidth as well as your personal data.
9. Connecting Computers, Printers, and Other Devices to the Wireless Network
10. Sharing Files, Printers, and More: We can share files, printers, games, etc. after all the setup.

6.6 Accessing Personal Digital Assistant (PDAs)

A personal digital assistant (PDA) is a handheld computer. Personal digital assistants were designed to replace non-electronic day planners. Many PDAs can work as an address book, a calculator, a clock, and a calendar. Some also have games on them. Newer PDAs are now called smartphones and have Wi-Fi, touch screens, can read e-mail, record video, play music and make phone calls

6.7 Mobile Phones

A cellular network or mobile network is a radio network distributed over land areas called cells, each served by at least one fixed-location transceiver, known as a cell site or base station. In a cellular network, each cell uses a different set of frequencies from neighboring cells, to avoid interference and provide guaranteed bandwidth within each cell.

When joined together these cells provide radio coverage over a wide geographic area. This enables a large number of portable transceivers (e.g., mobile phones, pagers, etc.) to communicate with each other and with fixed transceivers and telephones anywhere in the network, via base stations, even if some of the transceivers are moving through more than one cell during transmission.

Cellular networks offer a number of advantages over alternative solutions:

- flexible enough to use the features and functions of almost all public and private networks
- increased capacity
- reduced power use
- larger coverage area
- reduced interference from other signals

An example of a simple non-telephone cellular system is an old taxi drivers' radio system, in which a taxi company has several transmitters based around a city that can communicate directly with each other.

Self-assessment

Fill in the blanks:

11. An example of a simple non-telephone cellular system is an old ..... radio system
12. In a ..... network, each cell uses a different set of frequencies from neighboring cells, to avoid interference and provide guaranteed bandwidth within each cell.
13. Personal digital assistants were designed to replace ..... day planners.
14. Wireless LAN 802.11b or 802.11g provides for secure data transfer of ..... information.

Notes

15. ..... wireless printing is a proprietary open wireless technology standard for exchanging data over short distances from fixed and mobile devices.

16. ..... printing is a cost-effective way to easily and flexibly produce barcodes wherever you are.

Case Study **Wireless Microphone**

A wireless microphone is a microphone without a physical cable connecting it directly to the sound recording or amplifying equipment with which it is associated. Also known as a radio microphone, it has a small, battery-powered radio transmitter in the microphone body, which transmits the audio signal from the microphone by radio waves to a nearby receiver unit, which recovers the audio. The other audio equipment is connected to the receiver unit by cable. Wireless microphones are widely used in the entertainment industry, television broadcasting, and public speaking to allow public speakers, interviewers, performers, and entertainers to move about freely while using a microphone to amplify their voices.

There are many different standards, frequencies and transmission technologies used to replace the microphone's cable connection and make it into a wireless microphone. They can transmit, for example, in radio waves using UHF or VHF frequencies, FM, AM, or various digital modulation schemes. Some low cost (or specialist) models use infrared light. Infrared microphones require a direct line of sight between the microphone and the receiver, while costlier radio frequency models do not.

Some models operate on a single fixed frequency, but the more advanced models operate on a user selectable frequency to avoid interference, and allow the use of several microphones at the same time.

Advantages and disadvantages

Wireless microphones awaiting pickup by performers in a musical.

The advantages are:

- Greater freedom of movement for the artist or speaker.

Contd...

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- Avoidance of cabling problems common with wired microphones, caused by constant moving and stressing the cables.
- Reduction of cable "trip hazards" in the performance space

The disadvantages are:

- Sometimes limited range (a wired balanced XLR microphone can run up to 300 ft or 100 meters). Some wireless systems have a shorter range, while more expensive models can exceed that distance.
- Possible interference with or, more often, from other radio equipment or other radio microphones, though models with many frequency-synthesized switch-selectable channels are now plentiful and cost effective.
- Operation time is limited relative to battery life; it is shorter than a normal condenser microphone due to greater drain on batteries from transmitting circuitry, and from circuitry giving extra features, if present.
- Noise or dead spots (places where it doesn't work, especially in non-diversity systems)
- Limited number of operating microphones at the same time and place, due to the limited number of radio channels (frequencies).

Techniques

The professional models transmit in VHF or UHF radio frequency and have 'true' diversity reception (two separate receiver modules each with its own antenna), which eliminates dead spots (caused by phase cancellation) and the effects caused by the reflection of the radio waves on walls and surfaces in general. (See antenna diversity).

Another technique used to improve the sound quality (actually, to improve the dynamic range), is companding. Nady Systems, Inc. was the first to offer this technology in wireless microphones in 1976, which was based on the patent obtained by company founder John Nady.

Some models have adjustable gain on the microphone itself, to be able to accommodate different level sources, such as loud instruments or quiet voices. Adjustable gain helps to avoid clipping.

Some models have adjustable squelch, which silences the output when the receiver does not get a strong or quality signal from the microphone, instead of reproducing noise. When squelch is adjusted, the threshold of the signal quality or level is adjusted.

Products

The original manufacturer of the wireless microphone was Vega Electronics Corporation. AKG Acoustics, Audio Ltd, Audio-Technica, Electro-Voice, Lectrosonics, MIPRO, Nady Systems, Inc, Samson Technologies, Sennheiser, Shure, Sony and Zaxcom are all major manufacturers of wireless microphone systems. They have made significant advances in dealing with many of the disadvantages listed above. For example, while there is a limited band in which the microphones may operate, several high-end systems can consist of over 100 different microphones operating simultaneously. However, the ability to have more microphones operating at the same time increases the cost due to component specifications, design and construction. That is one reason for such large price differences between different series of wireless systems.

Generally there are three wireless microphone types: handheld, plug-in and bodypack: Handheld looks like a 'normal' wired microphone, but may have a bigger body to accommodate the transmitter and battery pack.

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Plug-in, plug-on, slot-in, or cube-style transmitters attach to the bottom of a standard microphone, thus converting it to wireless operation (see below).

Bodypack is a small box housing the transmitter and battery pack, but not the microphone itself. It is attachable to belt or elsewhere and has a wire going to headset, lavalier microphone or a guitar.

Several manufacturers including Sennheiser, AKG, Nady Systems, Lectrosonics and Zaxcom offer a plug-in transmitter for existing wired microphones, which plugs into the XLR output of the microphone and transmits to the manufacturer's standard receiver. This offers many of the benefits of an integrated system, and also allows microphone types (of which there may be no wireless equivalent) to be used without a cable. For example a television, or film, sound production engineer may use a plug-in transmitter to enable wireless transmission of a highly directional rifle (or "shotgun") microphone, removing the safety hazard of a cable connection and permitting the production engineer greater freedom to follow the action. Plug-in transmitters also allow the conversion of vintage microphone types to cordless operation. This is useful where a vintage microphone is needed for visual or other artistic reasons, and the absence of cables allows for rapid scene changes and reducing trip hazards. In some cases these plug-in transmitters can also provide 48 volt phantom power allowing the use of condenser microphone types. DC-DC converter circuitry within the transmitter is used to multiply the battery supply, which may be three volts or less, up to the required 48 volts.

Receivers

Wireless microphone receiver racks backstage at a large televised music awards event

There are many types of receiver. True Diversity receivers have two radio modules and two antennas. Diversity receivers have one radio module and two antennas, although some times the second antenna may not be obviously visible. Non-diversity receivers have only one antenna.

Receivers are commonly housed in a half-rack configuration, so that two can be mounted together in a rack system (that is to say the receiver is enclosed in a box 1U high and half-width, so two receivers can be installed in 1U). For large complex multi-channel radio microphone systems, as used in broadcast television studios and musical theatre productions, modular receiver systems with several (commonly six or eight) true diversity receivers slotting into a rack mounted mainframe housing are available. Several mainframes may be used together in a rack to supply the number of receivers required. In some musical theatre productions, systems with forty or more radio microphones are not unusual.

Receivers specifically for use with video cameras are often mounted in a bodypack configuration, typically with a hotshoe mount to be fitted onto the hotshoe of the camcorder. Small true diversity receivers which slot into a special housing on many professional broadcast standard video cameras are produced by manufacturers including Sennheiser, Lectrosonics and Sony. For less demanding or more budget conscious video applications small non-diversity receivers are common. When used at relatively short operating distances from the transmitter this arrangement gives adequate and reliable performance.

Questions:

1. Study and analyse the case.
2. Write down the case facts.
3. What do you infer from it?

Source: http://en.wikipedia.org/wiki/Wireless_microphone

Notes

6.6 Summary

A wireless network enables people to communicate and access applications and information without wires.

Many types of wireless communication systems exist, but a distinguishing attribute of a wireless network is that communication takes place between computer devices.

As with networks based on wire, or optical fiber, wireless networks convey information between computer devices. The information can take the form of e-mail messages, web pages, database records, streaming video or voice.

A wireless sensor network with multimedia capabilities typically consists of data sensor nodes, which sense, for instance, sound or motion, and video sensor nodes, which capture video of events of interest.

A Wireless PAN network does not use wires. They are more reliable as they have less number of cables.

Ethernet is a physical and data link layer technology for local area networks (LANs). Ethernet was invented by engineer Robert Metcalfe.

Phone-line networking is easy to install, inexpensive and fast, and it doesn't require any additional wiring.

The wireless method of communication uses low-powered radio waves to transmit data between devices.

6.7 Keywords

Wireless sensor: network with multimedia capabilities typically consists of data sensor nodes, which sense, for instance, sound or motion, and video sensor nodes, which capture video of events of interest.

Small office/home office: (or single office/home office; SOHO) refers to the category of business or cottage industry that involves from 1 to 10 workers.

Ethernet: is a physical and data link layer technology for local area networks (LANs).

Phone-line networking: is one of several ways to connect the computers in your home.

Wireless: is a term used to describe telecommunications in which electromagnetic waves (rather than some form of wire) carry the signal over part or all of the communication path.

Wireless printing: is a cost-effective way to easily and flexibly produce barcodes wherever you are.

Personal digital assistant (PDA): is a handheld computer. Personal digital assistants were designed to replace non-electronic day planners.

Cellular network or mobile network: is a radio network distributed over land areas called cells, each served by at least one fixed-location transceiver, known as a cell site or base station.

6.8 Review Questions

1. What are the basic types of synchronization methods for wireless networks?
2. Explain SOHO equipment's.
3. Explain the procedure for designing a small home office .

Notes

4. What are the equipment needed to set up a small office?
5. Describe mix media network.
6. What are the three ways to turn any printer into a wireless one?
7. Discuss the benefits of wireless printing.
8. What are the advantages of cellular networks over alternative solutions?

Answers: Self-Assessment

1.	IEEE 802.15.	2.	Synchronization
3.	PAN	4.	Ethernet
5.	Transmission	6.	100
7.	Phone-line	8.	Home PNA
9.	Wireless	10.	radio waves
11.	taxi drivers'	12.	cellular
13.	non-electronic	14.	sensitive
15.	Bluetooth	16.	Wireless

6.9 Further Readings

Books

802.11 Wireless Networks: The Definitive Guide, Second Edition, Matthew Gast

Introduction to wireless networks, John Ross

Wireless Communications & Networking, Vijay Garg

Wireless Communications: Principles and Practice, Theodore S. Rappaport

Online links

http://www.mhprofessional.com/downloads/products/0071789111/0071789111_chap19.pdf

http://www.wi-fi.org/files/kc_25_Five%20Steps%20to%20Creating%20a%20Wireless%20Network.pdf

http://wordinfo.info/unit/4003/ip:1/il:W