part

Internet Business Foundations

Many people have a cloudy understanding of the Internet. Technical network diagrams often use the symbol of a cloud to represent large portions of the Internet, rather than depicting all the switches, routers, signal boosters, and wiring that wind their way across the Net. This cloud is not meant to imply, however, that the Internet is elusive or hard to understand.

This part of the book will enable you to see through the clouds by defining what the Internet is, describing what you can do with it, and demonstrating how it has changed the world. Rather than just reading about Internet fundamentals, you step through hands-on exercises that reinforce the key concepts and provide you with real experience implementing best practices across a broad range of business and industry.

If you are working toward obtaining your Webmaster certification, completing this part of the book will prepare you to answer the questions in the first module of the CIW Foundations exam.

chapter 1

Understanding the Internet

"What do you want the Internet to be?"

—Nortel Networks TV advertisement

In this chapter, you will learn how to:

- Define the Internet, describe how large it is, and compare its explosive growth rate to the relatively slower pace of adoption of other communications media.
- Identify the most popular Internet services and clarify the relationship between the Internet and the World Wide Web.
- Describe underlying technological concepts that enable the Internet to work.
- Define how the Internet impacts everyday activities.
- Provide a brief history of the Internet, explaining how it grew from its humble origins into the worldwide network that we enjoy today.
- Describe efforts that are underway to improve the infrastructure of the Internet.

YOU may expect a book about Internet technologies to begin by defining a lot of technical terms. In order to understand the Internet, however, you need to know more than the meanings of terms. You need to know who is using the Internet, explain why it grew so fast, and understand how it has changed the world. This chapter introduces the Internet and defines the necessary terms in the broader context of who is using the Internet, what the Internet services mean to society, and why business will never be the same as it was prior to the commercialization of the Internet.

As you work your way through this chapter, I hope you will follow the suggested links and complete the Try This! exercises. Besides reinforcing the concepts that help you understand the Internet, these exercises take you online and bring the book to life. Please immerse yourself and enjoy this journey.

At the end of the chapter is a list of key terms and practice quizzes that will help students who are preparing to take the CIW Foundations exam. These are followed by lab projects that are situated in the workplace to help you apply these concepts to solving real-world problems.

Defining the Internet

The **Internet** is a worldwide connection of more than 171 million computers that use the Internet Protocol (IP) to communicate. The Internet Protocol was invented for the Advanced Research Projects Agency (ARPA) of the U.S. Department of Defense. The goal was to create a decentralized network that would continue to function if a bomb destroyed one or more of the network's nodes; information would get rerouted automatically so it could still reach its address. As a result of this bomb-proof design, any user on the Internet can communicate with any other user, regardless of their locations.

Figure 1-1 illustrates the web that is formed by the interconnections of computers on the Internet in the United States. Nearly 200 countries and territories around the world are similarly connected to the Internet, forming a worldwide telecommunications network.

FIGURE 1-1 *This image is a visualization study of traffic on the Internet. The traffic volume range is depicted from purple (zero bytes) to white (100 billion bytes). Move your eye along the white lines to get a sense of how very high-speed lines called the backbone carry Internet traffic to distribution points that route the packets toward their destinations.* ■

Source: "NSFNET T1 Backbone and Regional Networks." Rendered by Donna Cox and Robert Patterson, National Center for Supercomputing Applications/University of Illinois.

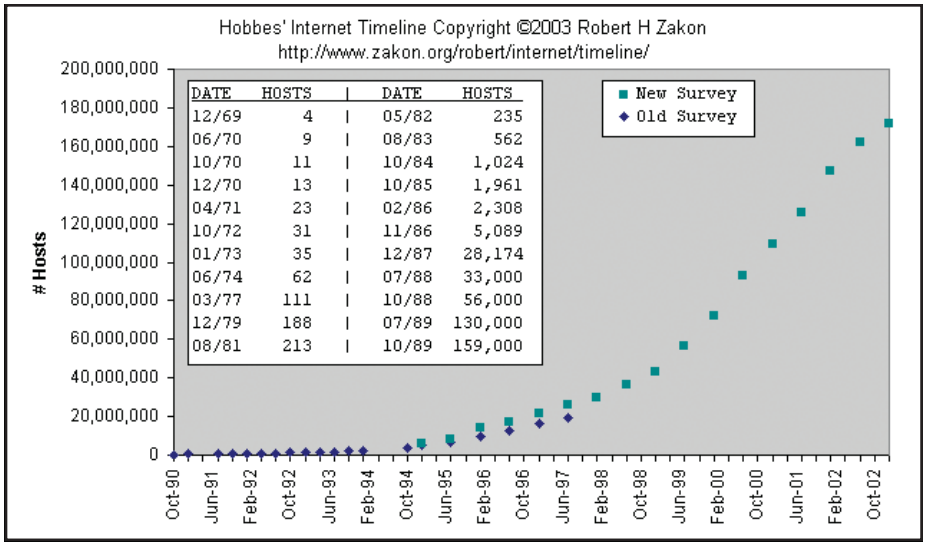
Who Is Using the Internet?

People from all walks of life are using the Internet. Business professionals, stockbrokers, government workers, politicians, doctors, teachers, researchers, students, monks, kids, elderly people, soldiers, parents, entertainers, police, social workers, pilots, waiters, disk jockeys, and movie stars—virtually everyone who wants to succeed in the information society is using the Internet.

According to the CIA's *World Factbook*, 604.1 million people were online worldwide in August 2003. To find out how many people are online today, follow this book's Web site links to the Internet usage surveys.

How Fast Is the Internet Growing?

Figure 1-2 shows how fast the Internet is growing. The number of pages on the Web has increased dramatically from about 300 million in 1998 to more than three billion in 2003. According to Nielsen Media Research, the number of people who are banking online nearly doubled, from 13 million in 2001 to 23.2 million in 2003. For more information, follow this book's Web site links to the Nielsen NetRatings and to Hobbes' Internet Timeline.



DATE	HOSTS	DATE	HOSTS
12/69	4	05/82	235
06/70	9	08/83	562
10/70	11	10/84	1,024
12/70	13	10/85	1,961
04/71	23	02/86	2,308
10/72	31	11/86	5,089
01/73	35	12/87	28,174
06/74	62	07/88	33,000
03/77	111	10/88	56,000
12/79	188	07/89	130,000
08/81	213	10/89	159,000

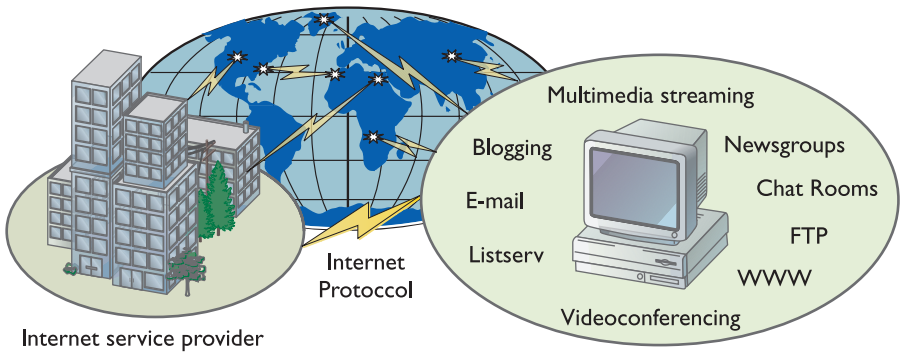
FIGURE 1-2 *Follow the dots on this growth chart to see how fast the Internet is growing. Notice how the shape of the growth curve is beginning to follow the proverbial S-curve, whereby innovations such as the Internet tend to grow slowly at first and then ramp up sharply. Then the curve begins to taper as the innovation achieves widespread adoption.*

Source: Hobbes' Internet Timeline at http://www.zakon.org/robert/internet/timeline/#Growth. Used by permission of Robert H. Zakon.

Identifying Eleven Popular Internet Services

What people do on the Internet is organized according to services defined by protocols that specify how information moves across the **Net**. The most popular services include electronic mail (e-mail), listserv, newsgroups, chat, videoconferencing, File Transfer Protocol (FTP), multimedia streaming, the World Wide Web, the Rich Site Summary (RSS), and blogging. Figure 1-3 shows that you have access to all these services when you are connected to the Internet.

FIGURE 1-3 *An Internet Protocol (IP) connection provides you with access to Internet services all over the world.*



1961

Leonard Kleinrock at MIT publishes the first paper on packet switching theory discussing communications using packets rather than circuits.

1965

First wide area network (WAN) is created by MIT researchers Lawrence G. Roberts and Thomas Merrill.

Ted Nelson first uses the term "hypertext."

First use of Moore's Law: Gordon Moore, at Fairchild, declares computing power will double every 18 months.

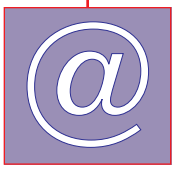
1969

A small group at Bell Labs begins to work on what eventually becomes UNIX.

ARPANET is created, the first step in the building of the Internet.

The network originally consists of four hosts.

1970



Ray Tomlinson of BBN creates and sends the first person-to-person e-mail over a network. He also designates the @ sign to separate the user name and the host in an e-mail address.

The Network Control Protocol (NCP) was created. NCP was the first standardized network protocol used by ARPANET.

Try This!

How Large Is the Internet?

Robert H. Zakon is an Internet evangelist who created and maintains a Web page called Hobbes' Internet Timeline. More than just a timeline, this page is full of charts and graphs that illustrate many different ways of measuring the size of the Internet. Perusing the facts and figures at this site is a good way to develop your perspective on the size and significance of the Net. To visit this site, follow these steps:

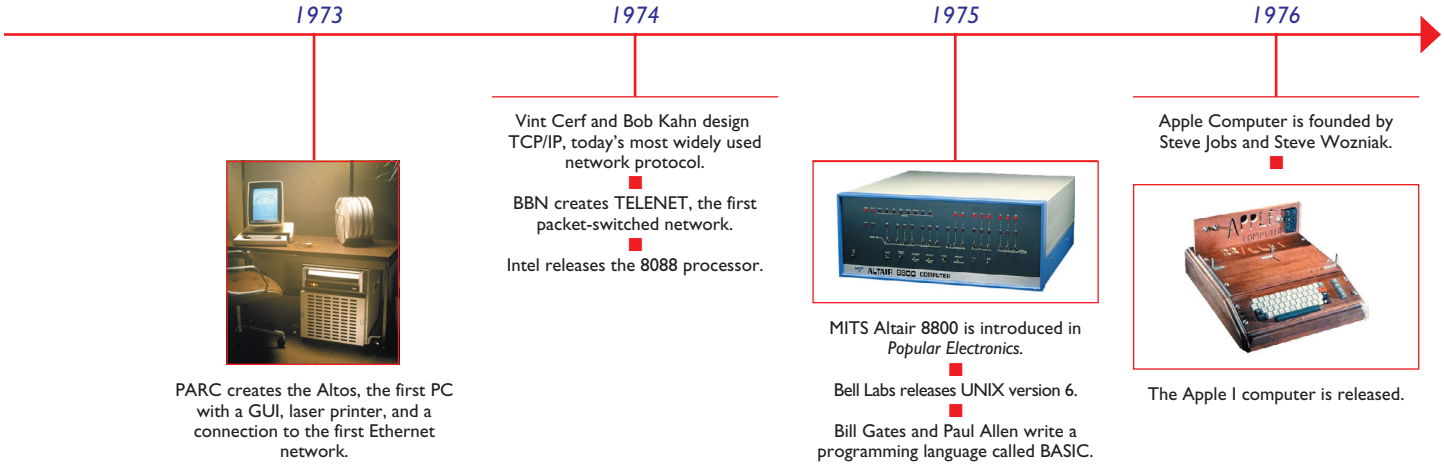
1. Launch your Web browser and type the following Web address into the browser's address field: www.zakon.org/robert/internet/timeline#growth
2. Press the ENTER key to open the site, and the page appears onscreen.

   Note: Another way to open the site is to pull down the browser's File menu, choose Open or Open Location, type the Web address, and click the button to open the page.

3. Scroll down a little until the Internet Hosts growth chart appears. Compare it to Figure 1-2, which pictures how the chart appeared when this book went to press.
4. Many other statistics about the Internet are on this page. Scroll up and down to peruse interesting facts and figures that appear onscreen.

Electronic Mail

The most often used Internet service is electronic mail, which is also known as **e-mail**. Every registered user on the Internet has an e-mail address. E-mail is a great way to communicate, because it avoids the delays caused by playing telephone tag. As depicted in Figure 1-4, mail queues up in your "inbox," and you read and respond to it at your convenience. Many users read their electronic mail several times a day. You will learn how to use advanced electronic mail features in Chapter 3.



Mail queues up in your inbox, where you click to select the message you want to read.

The preview pane displays the message currently selected in the Inbox.

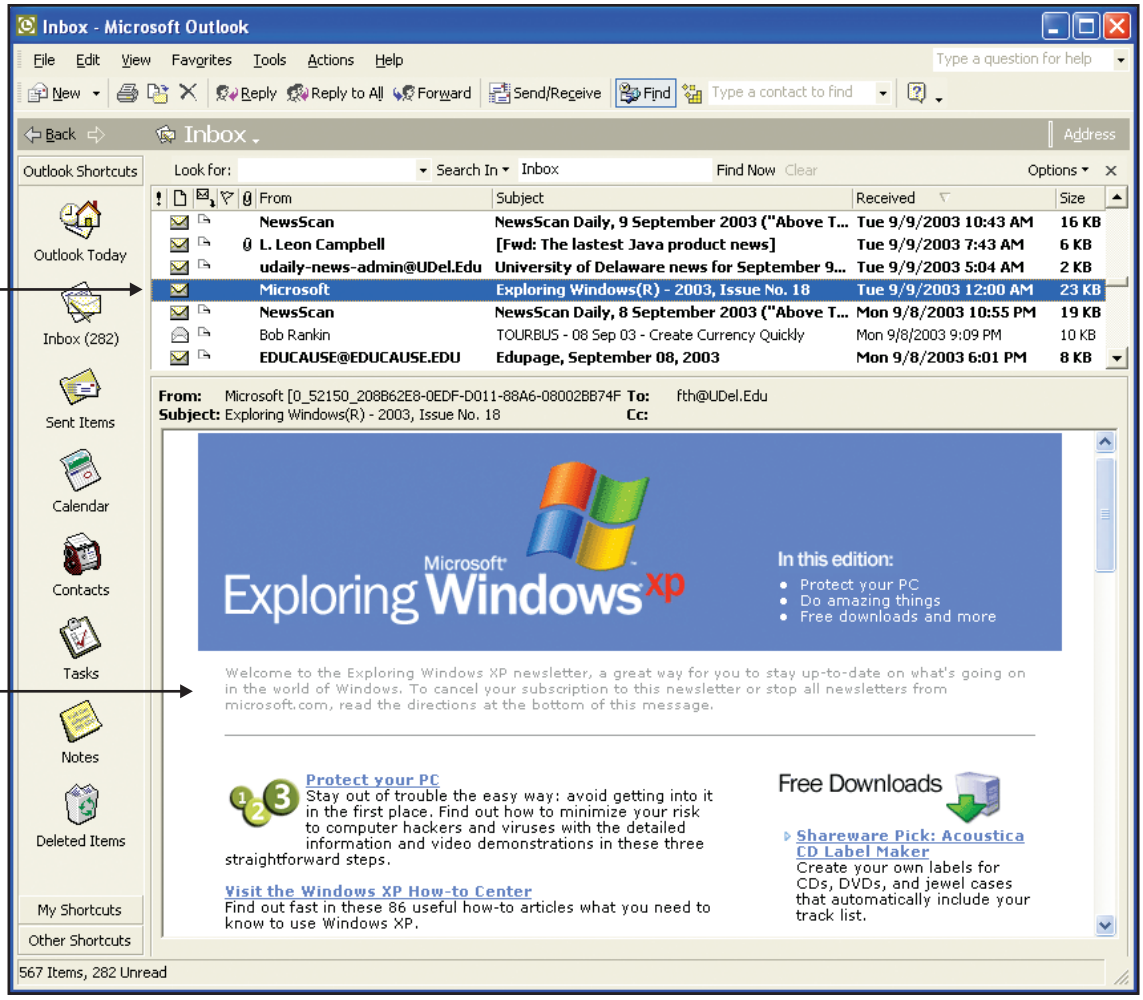


FIGURE 1-4 *E-mail clients, such as the Microsoft Outlook program shown here, display the incoming queue of e-mail messages in your inbox. When you click a message to select it, the client displays the message and provides you with options to reply, forward, file, or delete the message.* ■

1977

Apple II introduced at the West Coast Computer Faire. ■

Commodore PET is introduced. ■

Microsoft is founded by Bill Gates (bottom left) and Paul Allen (bottom right).

1978

Apple Computer introduces a 5.25-inch disk drive for the Apple II. ■

Berkeley Software Distribution (BSD) UNIX is developed at UC Berkeley. ■

Bell Labs releases UNIX version 7. ■

TCP is split into two protocols: TCP and IP.

1979

Novell Data Systems starts manufacturing computers and creating disk operating systems. ■

Jim Ellis and Tom Truscott develop the idea for Usenet, the first peer-to-peer networking program designed to exchange files between two computers. ■

There are over 100 hosts on the Internet.

1981

Adam Osborne introduces the Osborne 1. ■

IBM PC introduced—uses MS BASIC in ROM and PC DOS 1.0. ■

First time *Internet* is used to describe the ARPANET.

Listserv

Listserv stands for "list server" and is built on top of the e-mail protocol. Listservs work like electronic mailing lists, sending e-mail messages to people whose names are on the list. You join a listserv by e-mailing a message to it, saying you want to subscribe. Many listservs also let you subscribe by filling out a Web form at the listserv's Web site. After you subscribe, whenever someone sends e-mail to the listserv, you receive a copy in your e-mail. Likewise, when you send e-mail to the listserv, everyone on the listserv receives a copy of your message, as depicted in Figure 1-5. Thus listserv is a simple way for groups of people to communicate with one another through e-mail.

There are thousands of listservs on the Internet. Listservs are used, for example, to deliver many of the Internet's **e-zines** (electronic magazines) via e-mail. You will learn how to find out about listservs and join them in Chapter 3.

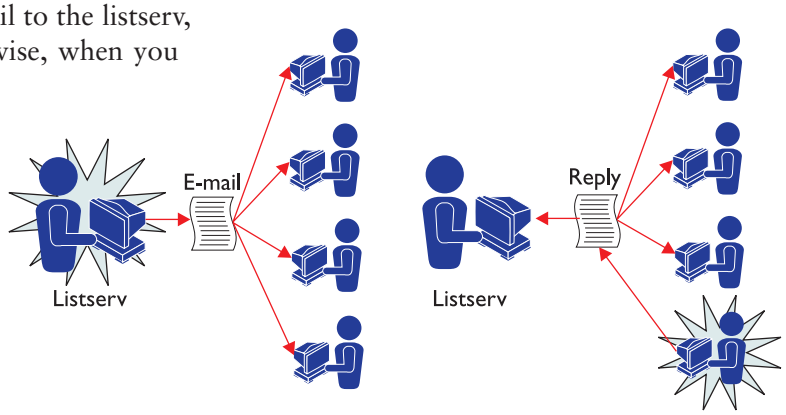
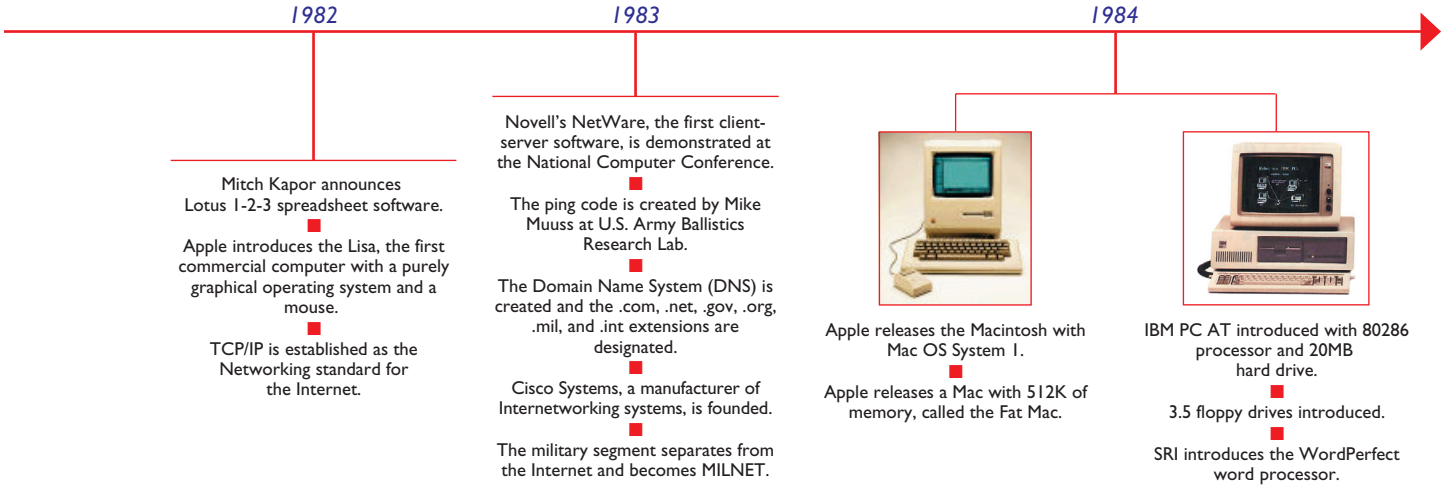


FIGURE 1-5 *Listservs distribute messages to people whose names are on an electronic mailing list. When you send a message to a listserv, everyone on the list receives a copy via e-mail.* ■

Newsgroups

A more highly organized way for groups of people to communicate is through **USENET**, which is an electronic bulletin-board service consisting of newsgroups, newsfeeds, and newsreaders. Once you subscribe to a newsgroup, you use a newsreader to access the group's newsfeed. Figure 1-6 shows how information in the newsfeed is organized according to topics. In addition to reading information on existing topics, you can add your own comments and create new topics, thereby participating in a virtual conference on the Internet.

Do not be confused by the use of the word *news* in the term *newsgroup*. Although some newsgroups are devoted to what is traditionally known as news, a newsgroup can contain discussions on any topic. In Chapter 3, you will learn how to find out what newsgroups exist and how to join them.



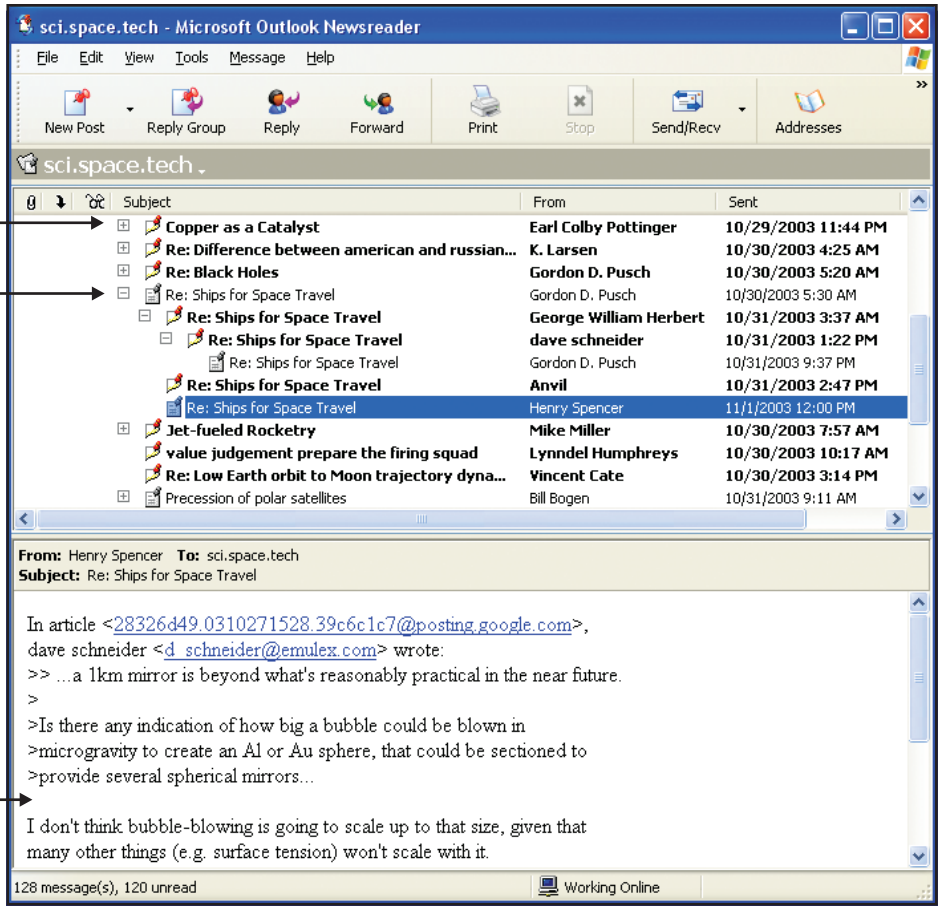
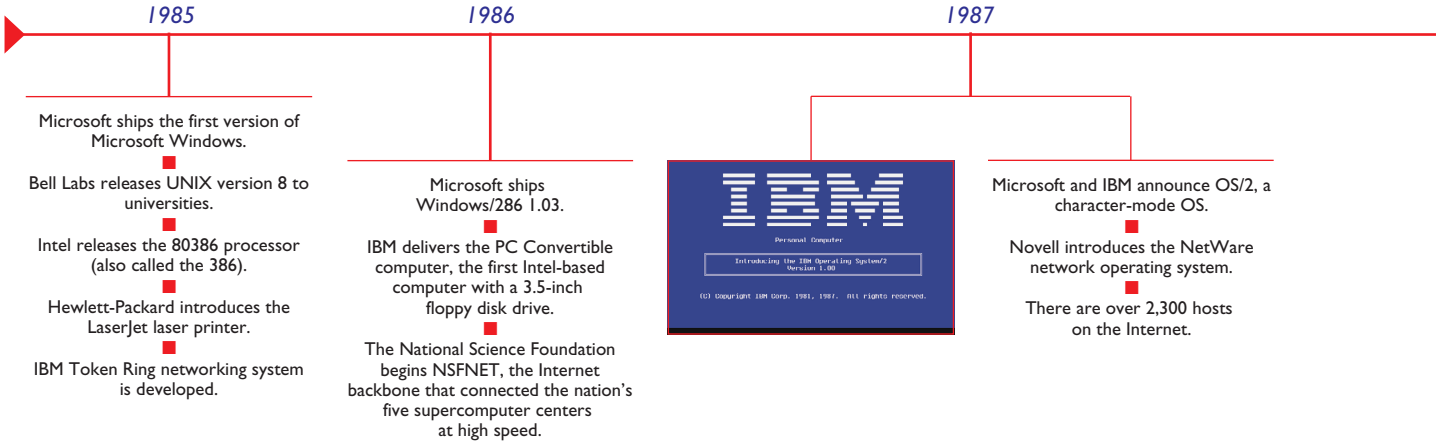


FIGURE 1-6 *USENET newsgroups organize information according to a hierarchy of topics. You navigate through the hierarchy via onscreen controls that enable you to scroll up or down and expand or contract the menu of messages to reveal something that interests you.* ■

Chat

A very popular form of real-time communications is **chat**, which enables people to converse with one another over the Internet. As you type a message on your computer keyboard, the people you are chatting with see what you type almost immediately, and you can simultaneously see what



they type in reply. Figure 1-7 shows a conversation in progress. Users with microphones and speakers can speak verbally to one another if their chat software supports audio.

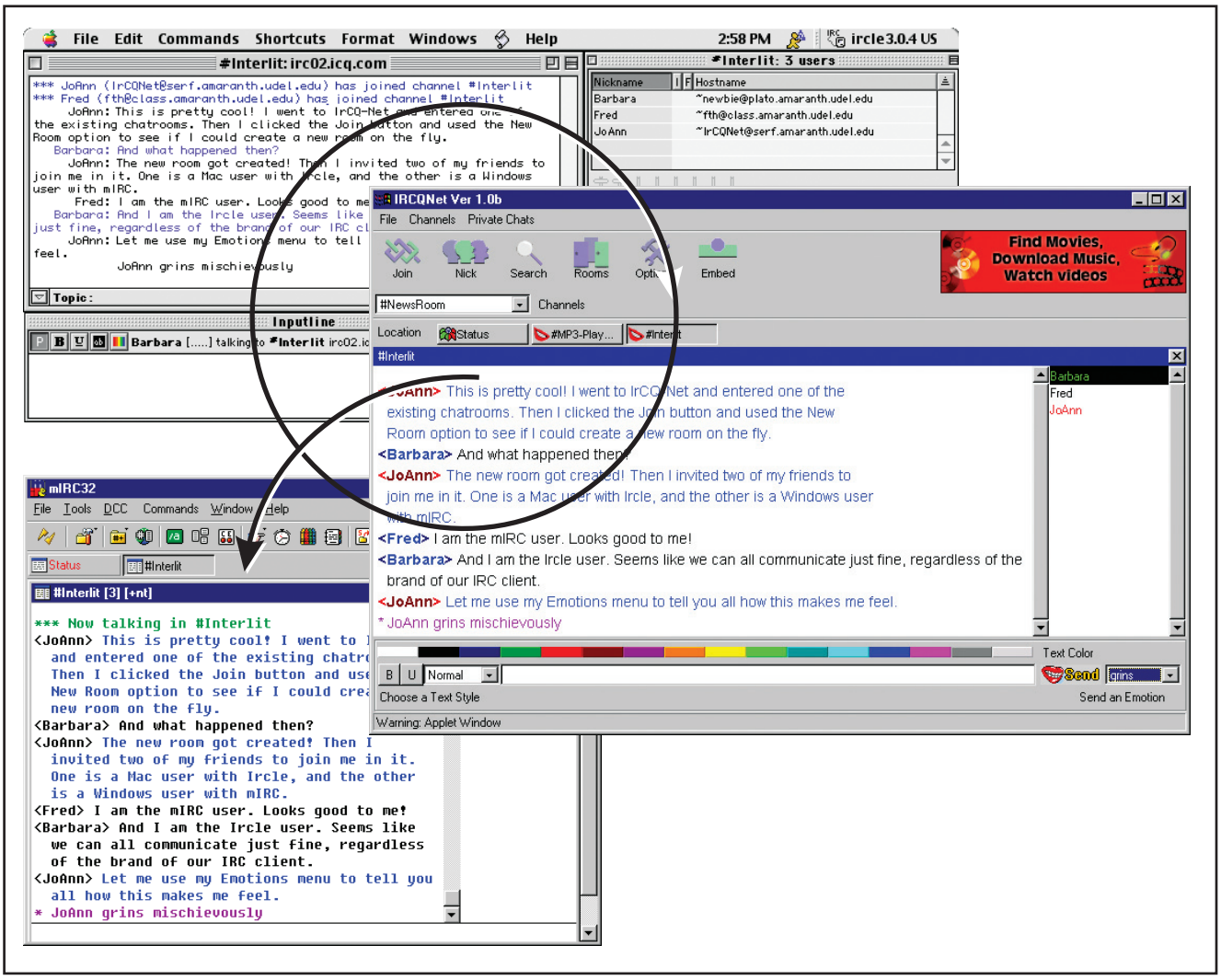


FIGURE 1-7 *Several different brands of clients support the Internet's chat protocol. Here you see a conversation in progress between three users who are using a Windows client, a Macintosh client, and a browser-based Java client.*

1989

- Intel releases the 80486 chip (also called the 486).
- Tim Berners-Lee develops HTML, the foundation for the World Wide Web.

1990

- Microsoft releases Windows 3.0.
- Motorola announces its 32-bit microprocessor, the 68040.
- The Internet Toaster is connected to the Internet—the first machine remotely operated by computer.
- World.std.com is the first commercial provider of dial-up Internet access.

1991

- Microsoft releases MS-DOS 5.0.
- Linus Benedict Torvalds creates a free version of UNIX for the Intel platform.
- Apple Computer launches the PowerBook series of portable computers.
- Macintosh System 7.0 released.
- Internet opened to commercial application.

1992

- Microsoft releases Windows 3.1, the first widely accepted version of Windows.
- Microsoft Windows for Workgroups 3.1 released.
- IBM releases OS/2 2.0, the first 32-bit OS for PCs.
- IBM introduces its ThinkPad laptop computer.

The conversations take place in virtual spaces called chat rooms or channels; each chat room or channel is a different conversation that is going on. There are thousands of chat rooms where you can join a conversation, or you can create your own chat room. In Chapter 3, you will learn how to find and enter existing chats or create your own free chat room.

You can click this arrow to change your status from online to offline in case you want to hide from your buddies.

FIGURE 1-8 *Buddies can IM each other through instant messaging.*

These users on your buddy list are online right now.

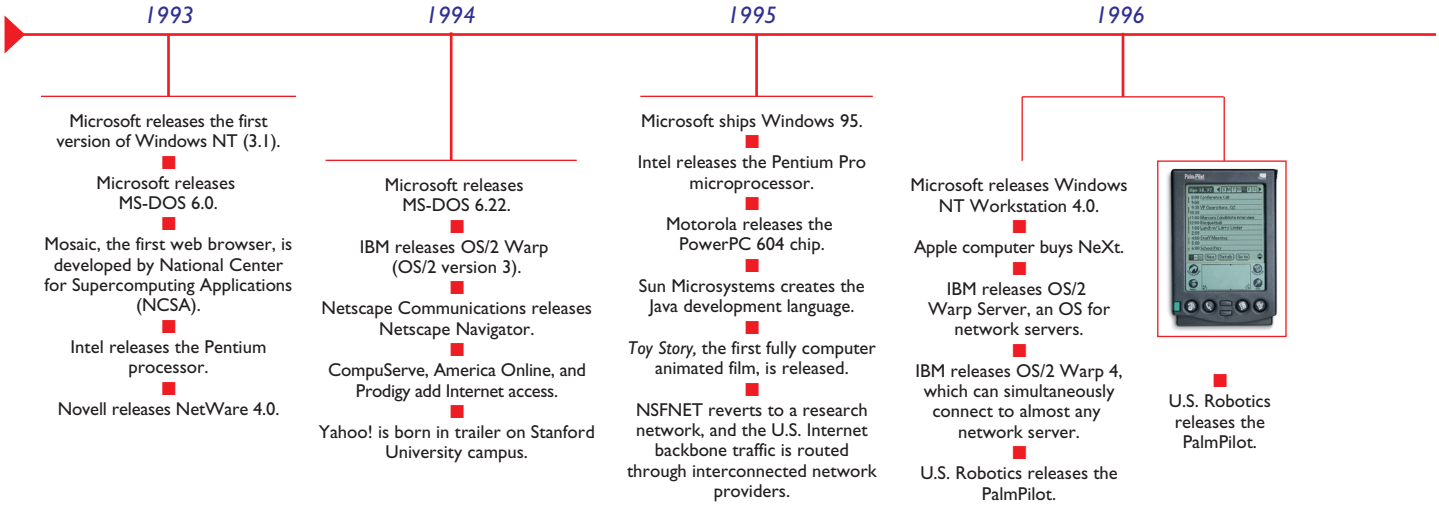
Instant Messaging

Most people have a circle of friends or working associates with whom they like to keep in close contact. A service called **instant messaging (IM)** enables you to do that. Figure 1-8 depicts how you can put your friends on a buddy list that identifies who is allowed to contact you. When someone on your buddy list asks to talk with you, an instant message appears on your screen, letting you know that someone wants to chat, something just happened that you wanted to know about, or an important message just arrived in your e-mail.

Instant messaging has become so popular that its acronym "IM" has become a verb, which is pronounced eye-emm. To IM someone means to send them an instant message over the Internet. Chapter 3 covers instant messaging in more detail.

Videoconferencing

Videoconferencing is the use of a video camera and a microphone to enable people conversing over the Internet to be able to see and hear each other. Because of the higher bandwidth or data rate required to transmit video over the Internet, videoconferencing has not yet become as popular as text-only chat. As data rates increase, however, more people will be able to participate in videoconferences. Chapter 2 explains your options for



connecting to the Internet at different data rates, and Chapter 3 describes the leading videoconferencing programs.

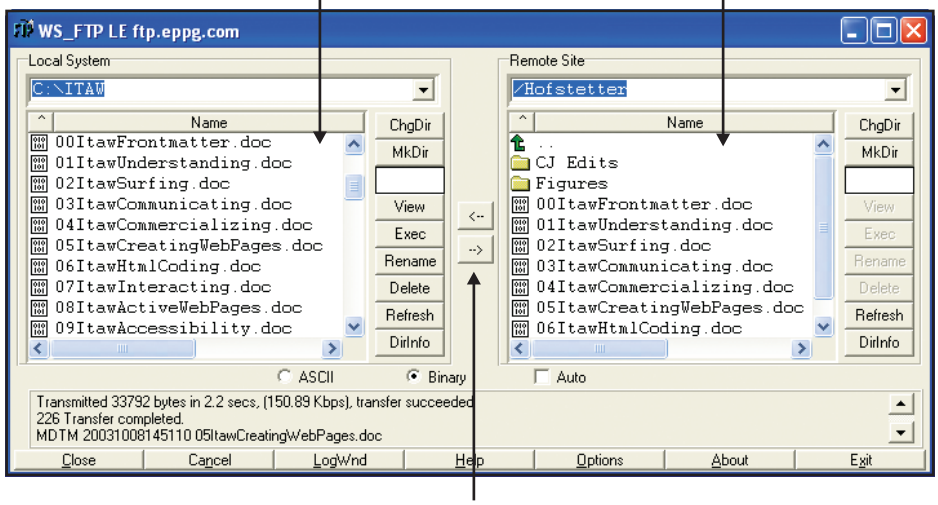
FTP

FTP stands for **File Transfer Protocol**. It is the standard method for transferring files over the Internet from one computer to another. "FTP" can be used as a verb as well as a noun. For example, if you want someone to send you a file, you can ask them to FTP it to you. FTP comes in handy, especially when files are too large to attach to an e-mail message.

Figure 1-9 shows I used FTP to transfer this book's chapters to McGraw-Hill for production and publication. You will learn how to use FTP in Chapter 7.

The right pane shows this book's folder on McGraw-Hill's FTP server.

The left pane shows the Word processor files on my computer.

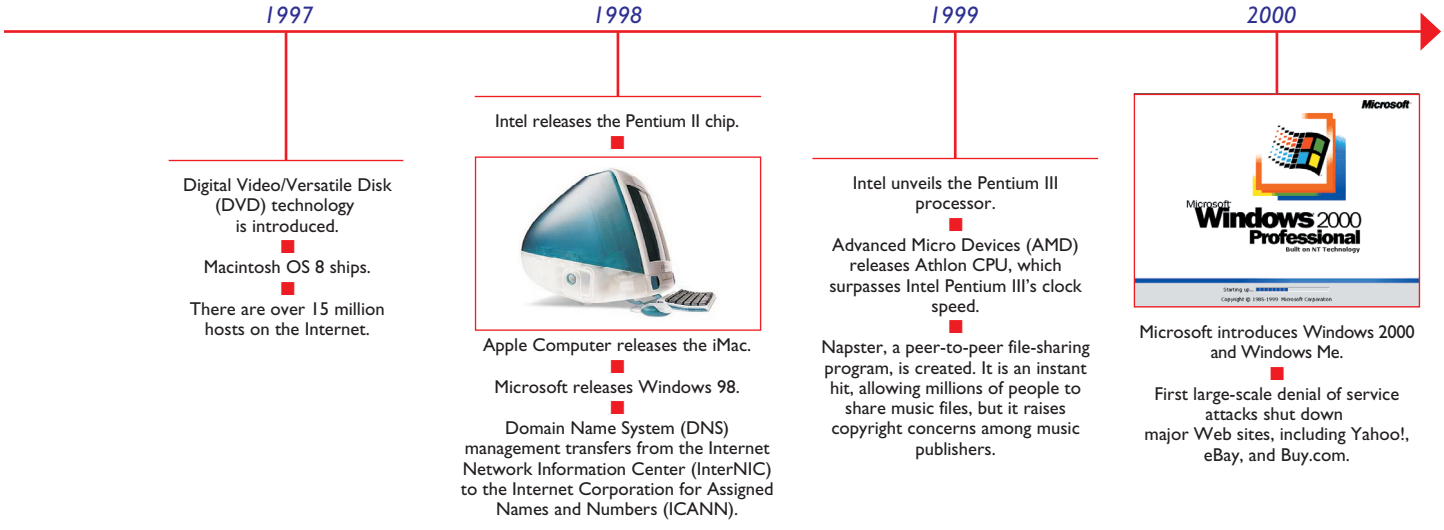


I click this button to FTP a file from my computer to McGraw-Hill.

FIGURE 1-9
FTP transfers files over the Internet from one computer to another.

Multimedia Streaming

Streaming is the digital transmission of multimedia content in real time over the Internet. Streaming enables a large multimedia file to begin playing as soon as your computer has received enough of the information to



begin playing it, without waiting until it all downloads. Instead of swamping your hard drive with all the data in the file, your computer stores in a memory buffer only the amount of data needed for the media to continue playing. Once played, the data is erased from the buffer. Thus broadcasters can use multimedia streaming to send out copyrighted material without fear that it will be reproduced.

Many radio stations, for example, use real-time streaming to broadcast shows live over the Internet. Television networks often archive important video streams after the broadcast, enabling you to access the broadcast stream later if you were unable to view the show live. The CNN Web site at www.cnn.com, for example, has links you can click to play video streams of the day's leading news broadcasts. Chapter 3 covers multimedia streaming and plugs you in to the key multimedia resources on the Internet.

World Wide Web

Invented by Tim Berners-Lee in 1989, the **World Wide Web** (WWW) is a networked hypertext system that allows documents to be shared over the Internet. Developed at the European Particle Physics Center (CERN) in Geneva, Switzerland, the Web's original purpose was to let researchers all over the world collaborate on the same documents without needing to travel anywhere physically.

The word **hypertext** was coined by Ted Nelson in 1965 and refers to text that has been linked. When you click a linked word, your computer launches the object of that link. The links give the text an added dimension, which is why it is called hyper.

When the Web was released in 1991, it was purely text-based. In 1993, the National Center for Supercomputer Applications (NCSA) released **Mosaic**, a graphical user interface that made the Web extremely easy to use. Thanks to Mosaic, Web pages could contain pictures, with links to audio and video as well. This led to the Web's becoming the most popular service on the Internet. As depicted in Figure 1-10, the Web enables you to follow links to documents and resources all over the world.

In 1994, Netscape Communications Corporation was started by some of Mosaic's developers, and over the next few years, a program called **Netscape Navigator** became the most popular Web browser. Microsoft

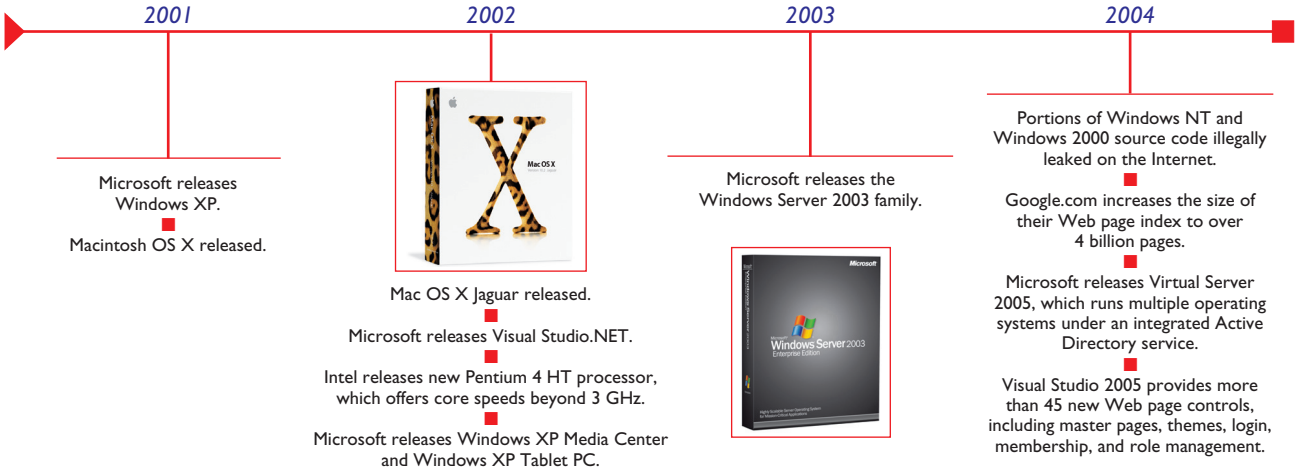


FIGURE 1-10
The World Wide Web is the most popular service on the Internet. The U.S. Department of State uses the Web to communicate all over the world via printed text, audio, and video.

also created a Web browser called Microsoft **Internet Explorer**, which now ships as part of Windows. The popularity of Netscape Navigator and Microsoft Internet Explorer diminished the need for Mosaic, and in 1997, the NCSA quietly discontinued work on it, opting instead to work on other advanced Internet technologies. In the meantime, Netscape and Microsoft grew their browsers into suites of programs that enable users to access almost all the Internet's services and resources without needing any other software.

You can learn more about the history of the Web by following this book's Web site links to the **W3C World Wide Web Consortium**, which coordinates the research and development of new standards and features for the Web. By following the links to Tim Berners-Lee, you can read papers about the past, present, and future of the Web written by the person credited with inventing the Web.

Inside Info

Visiting the W3C

The best way to find out the status of current issues and news related to the Web is to visit the World Wide Web Consortium (W3C) site at www.w3.org. The W3C site is organized according to working initiatives, called activities, that cover a broad range of exciting topics. The technologies that are emerging from the W3C will have a profound impact on the information society in the years ahead.

Rich Site Summary (RSS)

The World Wide Web has become so popular that it has spun off some Internet services of its own. One of these Web-inspired services is **Rich Site Summary (RSS)**, which is an XML format for syndicating the content of a Web site in a form that can be registered with an RSS publisher. Other sites can subscribe to the Web site in order to access the RSS feed and display its content onscreen. RSS has become a very popular format for distributing news headlines, project updates, and events listings. As illustrated in the example in Figure 1-11, users can quickly read the headlines and news summaries and click to follow links to more detailed information.

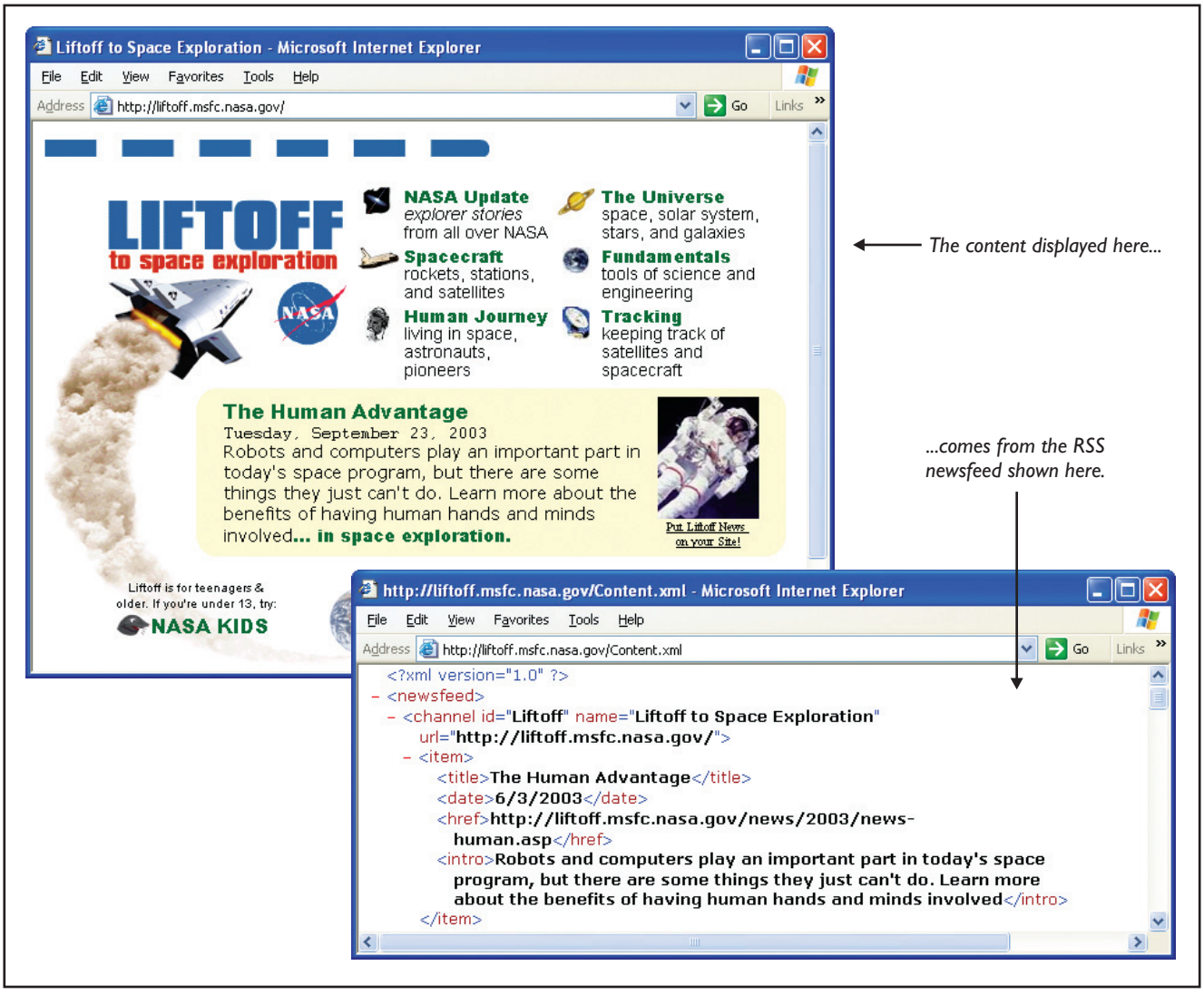


FIGURE 1-11 *NASA's Liftoff site at liftoff.msfc.nasa.gov uses an RSS feed to keep the site's news current.* ■

RSS is an example of how the eXtensible Markup Language (XML) can add functionality to the Web. You will learn more about this kind of markup in the XML section of Chapter 8. RSS is part of the Resource Description Framework (RDF) developed through the World Wide Web Consortium at www.w3.org/RDF. In addition to Rich Site Summary, the acronym RSS also stands for RDF Site Summary.

Blogging

As the Web becomes a mass market utility, new ways of using the Web are emerging to address the needs and preferences of the masses. One of the most popular ways of using the Web is blogging. The term **blog** is short for Web log, which is a Web-accessible log written by an individual who wants to chronicle activity related to a given topic that is often personal. "Blog" can be used as a noun to refer to what gets written or as a verb that means the act of writing these kinds of messages. Through blogging, people are essentially keeping their diaries online. The mass-market appeal of blogging teaches us that people like to make these kinds of diaries public. In response to this mass-market appeal, a wide range of blogging tools have arisen. At sites such as www.blogger.com, you can create your own public blogs. You can also license blogging tools for private use, such as to keep track of a worker's progress toward meeting a project milestone or target date. Figure 1-12 shows how the campaign to reelect President Bush used a blog to chronicle their activities. For a list of blog directories, go to Google or Yahoo! and search for "blog directory." For tools, search for "blog tools."

Cross Check

Matching Internet Services

Okay, now it's time to test your knowledge. See if you can match the Internet services on the left with their service descriptions on the right.

____ e-mail	**A.** Participate in an online conference consisting of hierarchically organized topics and subtopics.
____ listserv	**B.** Transfer a file from one computer to another.
____ instant messaging	**C.** Converse with one or more people in real time over the Internet.
____ USENET newsgroups	**D.** Web-accessible chronicle of activity related to a given topic that is often personal.
____ chat	**E.** A global hypertext system.
____ stream	**F.** An XML format for syndicating the content of a Web site in a form that can be registered with a publisher. Other sites can subscribe to the Web site in order to access the feed and display its content onscreen.
____ FTP	**G.** Send an e-mail message to a single address that routes the message to a list full of people.
____ World Wide Web	**H.** Send a message to an individual.
____ Rich Site Summary	**I.** Contact your buddies whenever they are online to chat or trade files.
____ blog	**J.** Watch a movie without first having to download it completely to your computer.

Click a topic to view messages in the Blog that deal with particular categories.

FIGURE 1-12 *When you visit a blog, you scroll down to peruse the entries, which appear in reverse chronological order. Pictured here is the official blog of the campaign to reelect President George W. Bush at www.georgewbush.com/blog. Democratic candidates Wesley Clark, Howard Dean, John Kerry, and Dennis Kucinich also used blogs in their campaigns.* ■

Describing the Infrastructure of the Internet

Several key concepts enable the Internet to work. These concepts include (1) client-server computing, which describes the roles that computers play in sending and receiving information over the Internet; (2) TCP/IP, which is the networking protocol that enables this communication to take place; (3) the domain name system (DNS), which provides a way of naming the computers on the Internet; (4) intranetworking, which is what enables a private network to hide from users on the public Internet; and

(5) extranetworking, which enables authorized users to access an intranet from outside its normal boundaries. Each of these concepts is discussed in turn in this section.

What Is Client-Server Computing?

Client-server computing is an important concept on the Internet. Think about what the Internet is: a worldwide connection of millions of computers. Think about what these computers do: they send and receive information. That is what client-server computing is all about. When a computer sends information, the computer is a server. When a computer receives information, the computer is a client. The term client-server computing refers to the manner in which computers exchange information by sending it (as servers) and receiving it (as clients).

In client-server networks, end-user workstations are called clients because they primarily receive information. For example, when you surf the World Wide Web with a browser such as Microsoft Internet Explorer, your computer is a client, because you are receiving information from other computers on the World Wide Web. The computers that are devoted primarily to sending information are called **servers**; computers devoted to serving Web pages are called Web servers.

Sometimes a server needs to obtain additional information in order to answer a request from a client. At the moment when the server requests information from another computer, the server becomes a client. When the server obtains the information it needs, it routes the information back to you, fulfilling its role as your server.

tip *You will encounter the terms* client *and* server *a lot. The key to understanding them is to remember that client means "receive" and server means "send." If you play tennis, this will be easy to remember, because when you serve a tennis ball, you send it—hopefully very fast—to your opponent!*

What Is TCP/IP?

On the Internet, information gets transmitted from place to place in logical units called **packets**. In order to send these **packets** to the right place in the correct order, two protocols are required. The first protocol, which is called TCP, handles the routing. The second protocol, which is called IP, governs the addressing. Because both protocols are needed to make the Internet work, the Internet is said to use the **TCP/IP** protocol suite. Let us take a closer look at what TCP and IP do.

TCP stands for the **Transmission Control Protocol**, which defines the rules and procedures for transmitting information across the Internet. The information gets transmitted in packets. If a message is too long to fit in one packet, the data gets divided into more than one packet. Each packet contains addressing that identifies which computer sent the packet and which computer will receive it. The packets also contain sequencing information that specifies the order in which they must be reassembled when the packets arrive at their destination.

IP stands for **Internet Protocol**, which defines the addressing system TCP uses to transmit packets over the Internet. Every computer on the Internet has a unique Internet Protocol (IP) address. Each packet of information that gets transmitted over the Internet contains the **IP address** of the computer that sent it and the IP address of the computer to which it is being sent. An IP address consists of four numbers separated by periods.

The numbers are 8-bit bytes that range in value from 0 to 255. The smallest address is 0.0.0.0 and the largest is 255.255.255.255. The number of IP addresses this scheme allows is 256^4, which is 4,294,967,296. This provides room for adding more computers as the network grows.

The format of an IP address that has four 8-bit bytes separated by periods is known as **dotted quad notation**. When the Internet was invented, people thought dotted quad notation would provide enough unique addresses for every computer to have its own IP address. The proliferation of computers all over the world, however, will eventually exceed this number. A new version of IP addressing, called IPv6, will have eight numbers instead of four, and each number will be a 16-bit value ranging from 0 to 65,535. The number of IP addresses this scheme allows is $65{,}536^8$, which is a huge number that provides thousands of addresses per square meter of the earth's surface. Why are so many new addresses being created when the world will most likely never have that many computers? One of the reasons is to permit computers to contain multiple interfaces, with each interface having a unique IPv6 address. As you will learn later in this chapter, IPv6 is being used in a new version of the Internet called Internet2.

note *Chapter 11 explains how TCP/IP makes the Internet work. The section entitled "Introduction to TCP/IP" will walk you through the TCP/IP protocol suite, and the section about "Internetworking" will explain the various kinds of servers and routers that use TCP/IP to power the internet.*

What Are Domains and Subdomains?

IP addresses can be hard to remember. For example, the Web server at the Library of Congress has the IP address 140.147.249.7. The National Aeronautics & Space Administration (NASA) is at 198.116.142.34. The Smithsonian is 160.111.252.106. If you had to remember numbers like these, the Internet would not be very user-friendly.

To make IP addresses easier for human beings to remember, a **domain name system (DNS)** was invented to permit the use of alphabetic characters instead of numbers. For example, instead of having to remember that the Library of Congress is at 140.147.249.7, you can use its domain name, www.loc.gov. NASA is www.nasa.gov, and the Smithsonian is www.si.edu. Thus DNS is a method of resolving names that humans understand into IP addresses that the network understands.

A complete DNS address is called a **fully qualified domain name (FQDN)**. Fully qualified domain names have the following format:

hostname.registered-domain-name.top-level-domain

In the United States, the **top-level domain (TLD)** normally consists of one of the following:

Code	Top-Level Domain Name	Code	Top-Level Domain Name
.aero	aerospace	.int	international treaty organizations
.biz	business	.mil	military
.com	commercial	.museum	museums
.coop	cooperatives	.name	individual's names
.edu	educational	.net	network support centers
.gov	government	.org	other organizations
.info	public use information	.pro	professionals

In the rest of the world, top-level domains are usually country codes, such as *fr* for France. The **domain** refers to the network to which a computer is connected, and the host name refers to the computer itself. For example, in the domain name www.louvre.fr, which is the World Wide Web server at the famous Louvre museum in Paris, the top-level domain *fr* indicates that the server is located in France, the domain *louvre* tells you that the server is on the Louvre's network, and the host name *www* identifies this computer as the Louvre's World Wide Web server.

Top-level domains can be further subdivided. In Canada, for example, the Humber College server is at www.humberc.on.ca. Notice that the top-level domain *ca,* which stands for Canada, has the second-level domain *on*, which stands for Ontario. This reflects the fact that Humber College is located in the province of Ontario in Canada. The format is

hostname.registered-domain-name.second-level-domain.top-level-domain

A domain can also be subdivided. In the FQDN of the Web server located at webs.oet.udel.edu, for example, the domain has two parts that reflect the division of the udel domain into **subdomains**. The subdomain *.oet* indicates that the server is located in the Office of Educational Technology, and *.udel* is the registered domain name that places the office at the University of Delaware. The format is

hostname.subdomain-name.registered-domain-name.top-level-domain

Regardless of how many periods are in an FQDN, everything after the host name is collectively referred to as the server's domain. Thus, if someone asks "What is the domain of the server at webs.oet.udel.edu," you would answer *oet.udel.edu*.

There are more than 200 registered country codes for use in top-level domains. Some common country codes you should recognize are as follows:

Code	Country	Code	Country
.au	Australia	.de	Germany
.ca	Canada	.fr	France
.ch	Switzerland	.us	United States
.cn	China	.mx	Mexico
.cz	Czech Republic	.uk	United Kingdom

The **Internet Corporation for Assigned Names and Numbers (ICANN)** is in charge of the assignment of domain names, IP address numbers, and protocol parameter and port numbers. ICANN has established a process for creating new top-level domain names. Several new names are being considered. You can find out the status by following this book's Web site link to ICANN.

Try This!

Register a Domain Name

Registering a domain name costs so little that many users are beginning to register their own domain names on the Internet. If your family name has not already been registered as a domain name, for example, you should consider grabbing it before someone else registers it. To find out whether you can register your family name and to find out how little it will cost to do so, follow these steps:

1. Browse to www.verisign.org. This brings you to the ICANN-accredited registrar for .com and .net domains. If you want to choose a different registrar, go to www.icann.org and follow the link to the registrar of your choice.
2. At the Verisign site, you'll find a domain registration blank into which you can type any name to find out whether it has been taken. Enter the domain you want to register, such as your last name, into this blank. It will not cost you anything to find out if the name is taken.
3. Check the boxes corresponding to your choice of top-level domains.
4. When you click the submit button, Verisign responds by telling you whether the name is taken. If the name is available, you will be offered an opportunity to register it.
5. If you want to reserve a domain name for future use, you can register the name without yet having an IP address to connect it to.

What Is an Intranet?

So far, this book has touted the public nature of the Internet. Certain kinds of businesses and government agencies, however, do not want their computers to be so publicly available. Instead of connecting their computers to the public Internet, institutions that want their computers kept private connect them to an intranet.

In order to understand the difference between the public Internet and a private intranet, you need to understand the meaning of the two Latin words *inter* and *intra*. The word *inter* means "between," and the word *intra* means "within." An **intranet**, therefore, is a network that uses the TCP/IP protocols to provide private services within an organization whose computers are not publicly accessible on the Internet.

An example of a corporation that has an intranet is JPMorgan Chase. The privacy of the financial information JPMorgan Chase deals with is so vital to their business that they run their own private intranet. Not connecting to the public Internet helps JPMorgan Chase protect its most sensitive computers from crackers (someone who maliciously tries to break into a computer system), viruses, and other kinds of information attacks. When I taught an online Internet technologies course at JPMorgan, for example, I had to travel physically to computers on the JPMorgan campus in order to grade student projects that had been created inside this private intranet. In Part III of this book, you will learn more about setting up an intranet and securing computers on the Internet.

What Is an Extranet?

Now it is time for another tiny Latin lesson: The Latin word *extra* means "outside" or "beyond." Thus, the term **extranet** refers to Internet resources such as Web sites that are beyond the public's reach and require authorized users to do something extra, such as type a logon name and password, in order to obtain access.

Imagine that you are the network administrator of an intranet that contains highly sensitive information. Suppose you need to provide dial-in access to high-ranking executives who need to connect to this intranet from remote locations when the executives travel to distant cities. You are worried that over the public-switched telephone network, a cracker could sniff the packets that are being transmitted through this extranet connection to your private intranet. What you can do in this case is require that authorized users have special client software that encodes the packets by using very strong encryption. By periodically changing the encryption method, you can make it practically impossible for unauthorized users to gain access to the intranet's private resources. In Part III of this book, you will learn the best-practice methods of properly securing an extranet.

Cross Check

Inter! Intra! Extra!

Keeping your Latin prefixes straight can help you understand the underlying concepts of the Internet. See if you can match the following terms to check your knowledge of network infrastructure:

____ Internet	**A.** Private network formed by running TCP/IP inside a firewall that prevents public access.
____ intranet	**B.** Access provided to a private network outside its normal boundaries; normally requires authentication.
____ extranet	**C.** Worldwide public network of computers running the TCP/IP protocol suite.

Changing the World via the Internet

If you had to summarize in one word how the Internet is changing the world, that word would be **convergence**. No matter how you want to encode your message—whether through text, image, video, audio, print, or speech—you can communicate it digitally over the Internet. Convergence is the process of unification that digitalization causes by enabling all the world's traditional ways of communicating to work over a common communications medium on the Internet. Digitalization is changing the kind of world we live in. It is becoming an instantaneously connected world, highly productive and without bounds.

Because the Net cannot see racial differences, age, gender, or physical handicaps, it does not discriminate. It does perhaps discriminate against the unconnected, because in an information society, to be cut off from the network is to be disenfranchised. **Digital divide** is a term used to refer to the barriers faced by the unconnected. To understand what needs to be done to achieve universal access, follow this book's Web site link to the Digital Divide.

Corporate Mergers and Alliances

Bane, Bradley, and Collis (1995:2) compare the forces of digitalization to the gravity of a wormhole in *Star Trek,* pulling recognizable industries

through it and merging them into newly converged companies. Indeed, these forces have caused an unprecedented number of mergers and alliances as corporations jockey for position in the converged world. Viacom's $48.9 billion buyout of CBS, for example, merged a movie studio, cable networks, the Blockbuster video chain, and the UPN and CBS television networks.

Why are media companies forming alliances with computer vendors? Because they want to grow their markets by offering digital information and entertainment services that can be displayed either on a TV set or on a computer screen. NBC partnered with Microsoft, for example, to create the MSNBC network at www.msnbc.com, which uses the brand power of a TV network to transition people to become online users. Motorola bought cable set-top box maker General Instrument for $11.4 billion, positioning Motorola to become a leading manufacturer of equipment for both cable TV and wireless Internet services. To set the stage for launching a new travel-oriented cable TV company, USA Networks purchased the travel Web site Expedia.com.

Telecommuting

For a large percentage of the population, the Internet is becoming the workplace. Because tens of millions of workers have Internet access at home, the home is a potential place to work online. As depicted in Figure 1-13, **telecommuting** is the act of working from home by using computers, dial-up modems or broadband network connections, and fax machines to perform work that formerly required a person to travel physically to work. According to TeleWork America (2000) survey results, there were 16.5 million **teleworkers** in the United States in the year 2000. Of workers not telecommuting, 39 percent expressed an interest in working from home, and 13 percent said the ability to telework would be an important decision in accepting another job. TWA estimates that by the year 2005, there will be 30 million teleworkers in the United States. Look to see these estimates reflected in the next U.S. Census, which tracks the number of Americans who are telecommuting.

By reducing the need for people to drive to work, telecommuting results in fewer automobiles on highways. In addition to relieving traffic congestion, this improves air quality by reducing the number of cars emitting pollutants. To hasten the adoption of telecommuting, the Environmental Protection Agency and the Department of Transportation have established a voluntary National Standard of Excellence for employer-provided commuter benefits that not only reduce pollution but also lower expenses and taxes for employers and employees alike. For more information, follow this book's Web site link to EPA telecommuting programs.

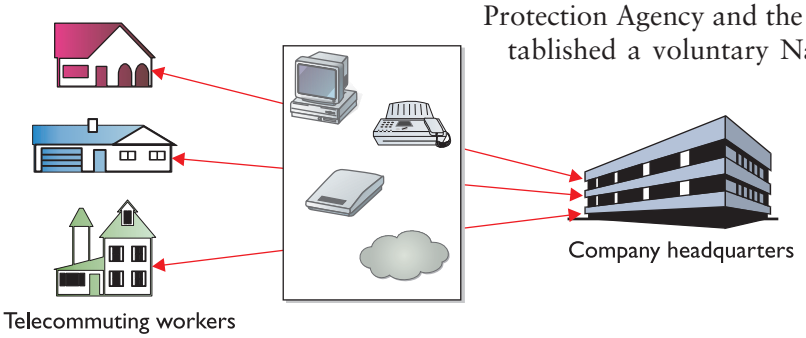


FIGURE 1-13 *Telecommuting is the act of working from home by using computers, dialup modems or broadband network connections, and fax machines.* ■

Business and Advertising

The Internet has become a mass-market utility, and businesses are using it to advertise and market their products. To attract users who will see their ads, commercial Web sites are offering an increasingly wide range of free Internet services. For example, to expand the popularity of its Web site, Yahoo! wanted to offer free Web space, so it bought the popular GeoCities community and Web-hosting site for $5 billion. As a result, you can go to www.yahoo.com and follow the link to GeoCities to get a free Web site. Other free services at Yahoo! include keeping your address book, photo album, and personal calendar, which can send you e-mail reminders as important dates approach.

If you follow the links to My Yahoo, you can set up a personal Yahoo! home page, including weather reports for your favorite cities, stock quotes for your stock portfolio, news reports from your favorite newsfeed, showtimes at local movie houses, and scores from your favorite sports teams. As if all this were not enough, you can also use Yahoo! to get driving instructions, search the yellow pages, go shopping, read and post classified ads, and get a personal Web-based e-mail account. By the time you read this, more free services will be at Yahoo!, all intended to make you spend more time there. Every time you use one of these services, you will see one or more ads. Thus, the frequency with which you visit the site increases the value of the commercial advertising you see there.

More pervasive forms of Internet advertising seek to capture your attention while you're browsing. So-called pop-under ads persist onscreen in their own windows after you close the Web site that created them. Saunders (2001) reports that pop-under ads can backfire, however, because consumers are quick to click to eliminate the unwanted window. Pop-up ads, on the other hand, are more than twice as likely to engage users in shopping, because these ads appear on top of the window the user is trying to look at. The user must move or close the pop-up ad in order to see what it is hiding. During the process of dismissing the pop-up, the user is likely to notice what is in it. Pop-under ads are not visible until the user closes the main window. Once the main window is gone, users are quick to delete a pop-under ad without paying much attention to it.

Online Shopping

The goal of all this advertising is not just to get you to see the ads; vendors also want you to purchase products over the Net, which is changing how the world shops. Instead of wearing yourself out trekking from store to store, trying to find the size and style you like, and then waiting in line to pay for it, teleshopping services let you shop from home. According to market research firm TNS Interactive (2001), 57 percent of adults in the United States shopped online in 2001, representing a 50-percent growth from the year before. The most popular items are books, clothes, and music. The most frequent reason given for not wanting to shop online

Inside Info

Car Buying and the Internet

In 2003, 49 percent of new car buyers reported that their buying decisions were influenced by the Internet, which affected significantly the make and model purchased. This was up 9 percent from the year before, when 40 percent of new car buyers felt this way. (J.D. Power and Associates, New Autoshopper.com Study, 2003)

is the fear of providing credit-card information over the Web. As the financial industry works to improve security, the number of online shoppers will continue to increase.

Follow this book's Web site links for evaluations and rankings of online shopping sites. To find out if there are any consumer complaints against your potential shopping sites, follow the link to the Better Business Bureau Online.

Online Banking and Investing

The Internet is changing the face of business. Online shopping and banking are creating a cashless society by eliminating the need for printed money. When this book went to press, more than 27 million Americans were paying their bills online.

tip *If you still write checks by hand, follow this book's Web site links to learn how you can pay bills online through AOL, Yahoo!, the U.S. Postal Service, American Express, or Citibank.*

During the past few years, online brokers have captured a third of the retail investor market. By following this book's Web site links, you can visit some of the more popular online brokerages, including Charles Schwab, E*trade, Fidelity, Ameritrade, Morgan Stanley Online, and Quick & Reilly. In addition to investing online, you can use the Web to help manage your portfolio. At Yahoo! Finance, for example, you can track the value of each stock or mutual fund in your portfolio. If a stock goes down in value, you can read news reports explaining why. Research informs you of recommended stocks, and profiles give insight into the nature of the business and financial summaries of the company.

At InfoBeat Finance, you can subscribe to news alerts for the companies in which you are invested. If late-breaking events affect the value of one of your investments, you receive an e-mail message informing you of the news, hours before it appears in the newspapers. To learn more about investing online, follow this book's Web site links to Yahoo! Finance, InfoBeat Finance, and the Gomez Scorecard site, where you will find ratings of online banks and brokerages and other consumer services.

Government and Politics

Government officials have turned increasingly to the Internet for solutions to problems inherent in governance. The Net makes services more widely available and enables municipalities to respond more quickly to emergencies and disasters. You can access a wealth of information by following this book's Web site links to the U.S. Government Consumer Information Center in Pueblo, Colorado. At the Internal Revenue Service Web site pictured in Figure 1-14, you can learn about the tax code, download tax forms, and file your income tax return over the Internet.

Videoconferencing and the Internet provide ways for politicians to reach, canvass, and broaden their constituencies. The Internet has become so important in getting elected to public office that almost every political candidate has a Web site. For example, Figures 1-15 and 1-16 show the Democratic and Republican Web sites, respectively. For an index of political candidate Web sites, follow this book's Web site links to Political Candidates.

FIGURE 1-14 *You can download tax forms at the Internal Revenue Service Web site.*

FIGURE 1-15 *The Democrats' Web site*

FIGURE 1-16 *The Republicans' Web site*

Information Warfare and Homeland Security

The United States relies heavily on the Internet. Perhaps even more devastating than a nuclear attack would be an electronic invasion of the computer networks without which this country would grind to a halt. Such a form of electronic attack is known as **information warfare**. To protect against a global large-scale attack on the Internet, the Pentagon has prepared a failsafe whereby the Department of Defense could disconnect its entire global network from the Internet if security threats arise that warrant so doing.

As President of the United States, George Bush Senior criticized the CIA for being so slow to issue reports that the White House learned more about world developments by watching commercial TV. The government now uses the Internet to provide officials with newsfeeds from online news services such as cnn.com and msnbc.com.

Especially challenging is the use of the Internet by terrorists who hide secret messages in graphics, video, or audio files. The process is called steganography, from the Greek word for hidden writing. A terrorist arrested for planning to blow up the U.S. Embassy in Paris, for example, communicated with the Al Qaeda terrorist organization through pictures posted on the Internet.

To intercept messages from terrorists and criminals, the FBI is using a system called **Carnivore** that can scan the Internet's e-mail traffic, looking for key words and phrases related to terrorist plots and criminal investigations. Messages containing suspicious content get routed to an FBI agent to investigate. The **USA Patriot Act**, signed into law in October 2001 in the aftermath of the 9/11 attacks on America, gives the federal government wide latitude in using Internet surveillance systems, including Carnivore and its successors. For more information about the use of information technologies in defense applications, follow this book's Web site links to Carnivore, the USA Patriot Act, and the Defense Advanced Research Projects Agency (DARPA).

Electronic Publishing

During the past decade, virtually every newspaper has created a Web site. By following this book's Web site link, you can peruse the Newslink index of more than 4,000 online newspapers, magazines, broadcasters, and news services. The Internet enables people to go online and quickly see headlines and search through articles printed in the newspapers. Most of the news services keep online archives of past stories, making the Web a valuable resource for searching past as well as current events. News programs broadcast by cable news services, such as CNN and MSNBC, often refer you to their Web sites for more in-depth coverage or to conduct public opinion polls. People who are online frequently can subscribe to a news service that e-mails you when important news breaks.

Electronic book (eBook) technology enables publishers to sell books in an electronic format. Consumers download the eBook into a portable reading device, such as a Palm Pilot or a PocketPC. Not only does the eBook become as portable as a printed book; it also overcomes one of the

greatest disadvantages of books printed on paper. How many times have you been frustrated by trying to find a quote or a passage you know you read in a certain book, but try as you might, you just cannot find it? The eBook solves this problem by rendering books in a full-text searchable format.

Besides purchasing eBooks from commercial publishers, you can also create eBooks of your own. If you have Microsoft Word, for example, you can create an eBook with the Microsoft Reader Add-In. The free service eBook Express enables you to create eBooks online from almost any text document. These books are formatted according to the Open eBook standard, which provides an industry-wide format for eBooks. The Open eBook standard is based on XML, which stands for eXtensible Markup Language. Electronic books contain hidden XML codes that enable eBook viewers to display the books and provide users with a rich set of reading features. The XML section of Chapter 8 takes you behind the scenes and shows you how the markup works. For more information about electronic books, follow this book's Web site links to Microsoft Reader, eBook Express, and Open eBook.

Television and Entertainment

The Internet is competing with television for people's free time. According to a Nielsen survey, the turn of the century marked the point at which more than half of U.S. households had obtained Internet access. Nearly 144 million people in the United States logged on to the Internet during July of 2000, for example. A survey of 3,000 households indicated that these users were spending an average of 10 hours a month online, up 26 percent from the year before (*Financial Times* 18 Aug 2000).

As you might expect, the Internet can also help you find what is worth viewing on television. At www.tvguide.com, for example, you will find the leading independent TV entertainment guide on the Internet. You can create and search free TV listings by day, time, program category, or specific channel up to seven days in advance, in either a traditional grid or a scroll-down list format. So-called top picks, movie picks, and sports picks recommend what is worth viewing on TV.

Microsoft's MSN TV (formerly called WebTV) is making substantial progress toward making television more interactive. Interactive TV merges the Internet and television so you can participate in your favorite shows. On *Wheel of Fortune* and *Jeopardy,* for example, you can play along and match wits with other contestants. While watching *Judge Judy,* you can vote in live polls taken during the show. Tens of thousands of people are participating. During a recent NFL football game, the referees made a disputed call. The announcers invited the TV audience to log on to the program's Web site and cast a vote either agreeing or disagreeing with the call. Within five minutes, more than 75,000 viewers had voted.

MSN TV receivers are sold at Wal-Mart, Best Buy, and Circuit City. For the latest information, follow this book's Web site links to MSN TV.

Teaching and Learning

The benefits of computer-based learning are well documented by Professor James Kulik (1985, 1986, 1991, 1994, 1998, and 2002) and his associates at the University of Michigan. During the past 25 years, Kulik has analyzed hundreds of controlled experiments on the effectiveness of computer-based learning. Overall, the findings indicate that average learning time has been reduced significantly (sometimes by as much as 80 percent) and achievement levels are more than a standard deviation higher (a full letter grade in school) than when computers are not used.

The Internet is enabling educators to make use of computer-based learning strategies online. By linking universities, colleges, schools, and homes into a worldwide network, the Internet is helping break down the distinctions between grade levels. The Internet is enabling students of all ages to collaborate on worldwide projects, share discoveries, and develop strategies for acquiring knowledge in a social context.

Providing this kind of environment for each student in a traditional classroom is difficult. Because there is only one teacher for many students, supporting each student's individual needs is physically impossible. The World Wide Web helps by providing students with an interconnected world of knowledge to explore. Screen capture and downloading enable students to collect what they discover and construct a framework for organizing and understanding. Because the learner is portrayed as an active processor who explores, discovers, reflects, and constructs knowledge, the trend to teaching from this perspective is known as the constructivist movement in education. As you work through this book, you will benefit from learning how to use the Internet this way in your own learning.

Tracing the History of the Internet

The Internet originated when the Advanced Research Projects Agency (ARPA) of the United States Department of Defense began a network called **ARPANET** in 1969. Its goal was to support military research about how to build a network that could continue to function in the midst of partial outages that could be caused by bomb attacks. Instead of giving the network the responsibility for routing the information, the computers on the network shared equally in the responsibility for ensuring that the communication was accomplished. The messages were divided into packets that wound their way through the network on an individual basis. Each packet contained some information and the address of the destination to which it was to be delivered. If one of the computers along the way stopped functioning, such as in a bomb attack, the packets would automatically find an alternate route to their destinations. Thus, every computer on the network was treated as a peer. That is why, to this day, no computer on the Internet is more important than any other, and no one computer is in charge.

During the 1970s, universities began using the Internet Protocol to connect their local networks to the ARPANET. Access to the Pentagon's computers on the ARPANET was tightly controlled, but university computers

were permitted to communicate freely with one another. Because the IP software was public-domain and the basic technology made joining the network relatively simple, the Internet became more diverse. Joining the Internet did not cost much, because each local network simply paid for its connection to the nearest node. As the network grew, it became more valuable as it embraced larger user populations, social groups, and resources. Diversity posed security risks, however, and in 1983 the military segment broke off and became **MILNET**.

In 1986, the National Science Foundation (NSF) began the **NSFNET**, a backbone that connected the nation's five supercomputer centers at high speed. NSF upgraded the network repeatedly, setting a blistering pace for technical advancement. In 1991, NSF lifted the restriction that prohibited commercial entities from using the backbone. By 1994, the NSFNET was carrying 10 trillion bytes of Internet traffic per month. In 1995, NSFNET reverted to a research network, and the U.S. Internet backbone traffic is now routed through interconnected network providers.

Prior to 1998, the U.S. government sponsored a company called Network Solutions to manage the domain name system (DNS) through an organization called the Internet Network Information Center (InterNIC). In 1998, the responsibility for managing the domain name system (DNS) was transferred from InterNIC to the Internet Corporation for Assigned Names and Numbers (ICANN), which is an international not-for-profit organization.

During the late 1990s, use of the Internet exploded as costs declined, access increased, and new companies such as amazon.com, ebay.com, and yahoo.com pioneered the commercial potential of the Internet. When this book went to press, online ad spending in the United States had grown to 9.5 billion dollars annually. By the time you read this, online business-to-business (B2B) activity is projected to top $6.3 trillion annually.

To support this kind of growth, attempts to expand and speed up the Internet continue. A consortium of research universities is working in partnership with industry and government to create an even faster network named Internet2. The White House has pledged financial support to help build it. To learn more, follow this book's Web site link to Internet2. For a complete chronology of the Internet, follow the link to the Hobbes' Internet Timeline.

Cross Check

Internet History Timeline

To check your knowledge of Internet history, match the following events to the dates when they happened.

____ 1969	**A.** NSFNET began a backbone to connect the nation's five supercomputer centers.
____ 1983	**B.** NSFNET reverted to a research network, and the backbone was routed through interconnected network providers.
____ 1986	**C.** Responsibility for managing the domain name system transferred from InterNIC to ICANN.
____ 1991	**D.** The military part of the Internet broke off and became MILNET.
____ 1995	**E.** NSF lifted the restriction that prohibited commercial entities from using the backbone.
____ 1998	**F.** The U.S. Department of Defense began a network called ARPANET.

Looking into the Future of the Internet

Because the Internet is the communications infrastructure of the twenty-first century, its future is vitally important. From a technological standpoint, this future promises to be bright indeed because of some exciting new technologies. Newly emerging technologies follow a cycle that includes (1) invention, (2) prototyping, (3) proof of concept, (4) productizing, and (5) manufacture. During the planning stage, users who communicate effectively with product planners can influence how the technologies emerge. In order to provide you with such an opportunity, this chapter concludes by looking into the future of the Internet.

Improving the Infrastructure

You have undoubtedly experienced some problems with the Internet's physical transport layer. Network delay is the most obvious problem. You click a hypertext trigger to go to a Web site, and you wait, and you wait, and you wait. Sometimes it seems that WWW stands for World Wide Wait. The delays can be particularly long if the transmission carries multimedia content.

Multimedia MBONE

Multicast backbone **MBONE** is a network of computers on the Internet specially designed for the transmission of simultaneous live video and audio broadcasts. In a traditional packet-switched network, if you send a video to four different people, four identical copies of the information are sent over the network. Multicasting the video over the MBONE sends only one copy of the message and replicates the information only at branch points in the network.

As the television, telephone, and computer industries continue to converge, real-time audio and video will grow in importance on the Internet. Look for IP multicasting on the MBONE to have a significant impact on the Web in the years ahead.

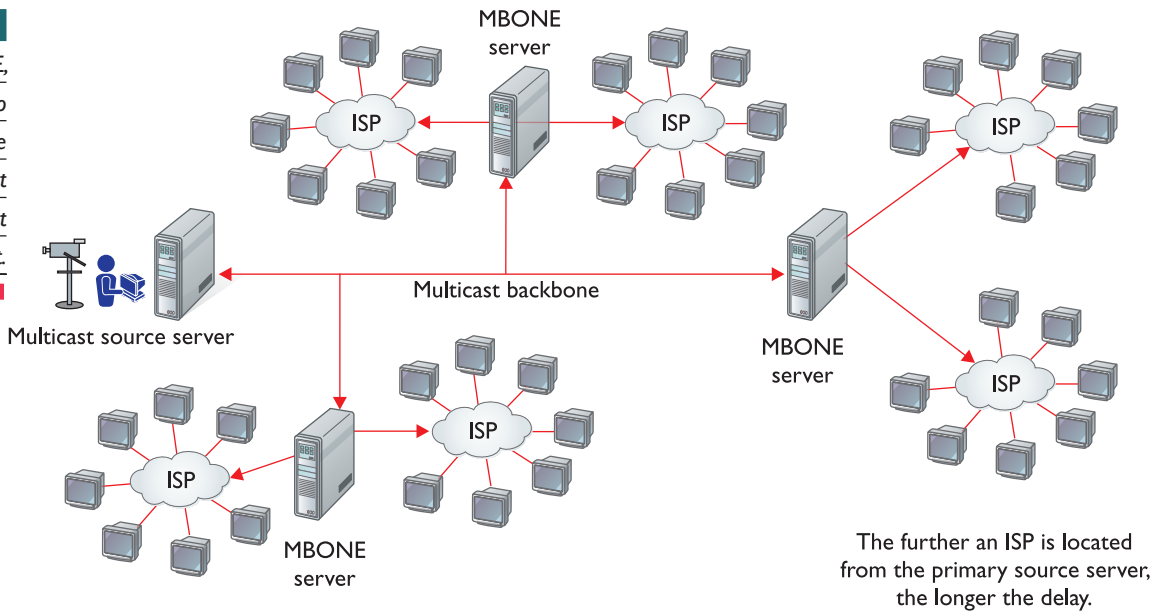


FIGURE 1-17
On the MBONE, audio and video streams propagate across the Internet from the server that initiates the broadcast.

Connecting to the MBONE requires your Internet service provider (ISP) to have special routing and switching equipment. Follow this book's Web site link to Multicasting and the MBONE for a technical description of how the MBONE works.

Streaming Media Networks

Streaming Media Network (SMN) vendors are applying MBONE concepts to bring uninterrupted audio and video streams to end-users. For example, iBeam is an SMN that uses satellites to feed streaming media directly to servers located at or near local ISPs. Akamai is another SMN that locates streaming media content on server farms that are physically closer to an ISP network than the streams would normally be on the public Internet. Akamai refers to these locations near the ISP as the "edge" of the Internet. Relative to the users connected to that local ISP, the local Akamai server is on their edge of the Internet. In Europe, an SMN named Servecast has built a similar edge-delivery network.

Figures 1-17 and 1-18 illustrate the difference between a typical MBONE multicast network and an edge-delivery system. In Figure 1-17, streams move across the MBONE and eventually reach their ISPs, who distribute them over the quintessential "last mile" to end-users. The further an ISP is from the primary server, the longer the delay. In Figure 1-18, edge servers mirror the content on the primary source server. Multimedia streams get delivered more efficiently because the edge servers are located physically closer to the ISPs. In many cases, SMNs locate their servers within the local ISP's server farm. To learn more about this emerging SMN technology, follow this book's Web site links to Streaming Media Networks.

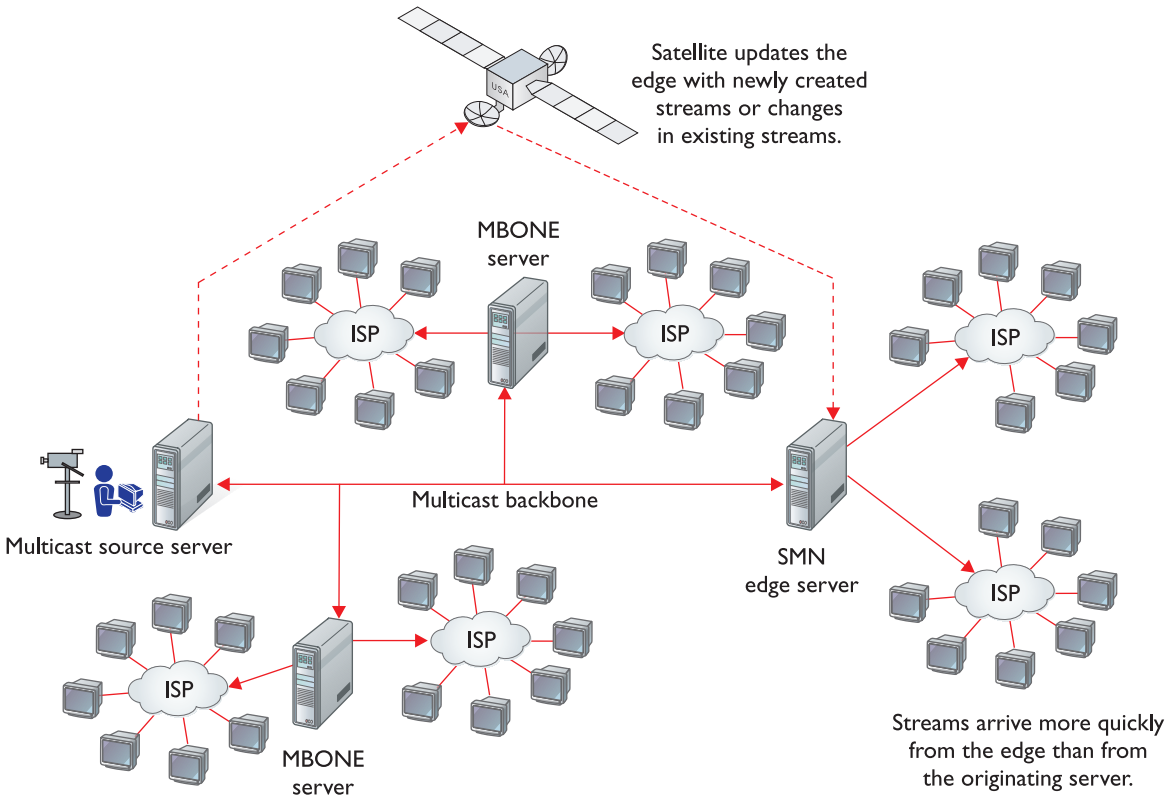


FIGURE 1-18 *Streaming Media Networks locate so-called edge servers that contain mirror copies of multimedia content; thus an ISP can get a stream started faster from the edge server than from the original source server of the webcast.*

Internet2

A consortium of more than 180 universities is leading a project called **Internet2**. The goal is to create a higher-speed version of the Internet that revolves around high-speed connection points called **gigapops**. Strategically placed throughout the network, gigapops guarantee high-speed bandwidth between universities, schools, and companies that are implementing the Internet2 standards.

Internet2 uses three protocols to provide high-speed transmission and guaranteed bandwidth:

- Resource Reservation Protocol (RSVP) permits users to reserve bandwidth from the workstation to the network host computer.
- Internet Protocol version 6 (**IPv6**) is a packet-delivery protocol that lets users assign priority to certain kinds of information. You may want your Web search traffic to have a higher priority than your e-mail traffic, for example, so your searches get completed faster.
- Multicast uses IP tunneling and multithreading to increase multimedia throughput.

The K20 project extends Internet2 participation to all levels of education, from K–12 (pre-college) to 16 (college) and 20 (doctoral level study)—hence the name, K20. To find the current status, follow this book's Web site link to Internet2.

FIGURE 1-19 *Motorola's MPX 200 Smartphone runs the Windows Mobile operating system, bringing the Internet literally into the palm of your hand.* ■

Wireless Communications

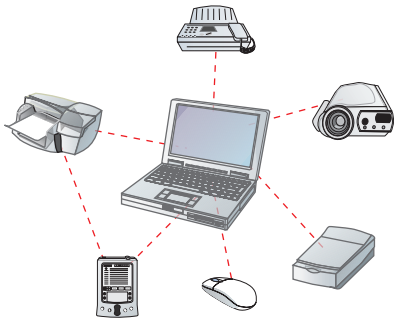
In the twentieth century, most Internet use occurred at the end of a wire or cable that connected the user's computer to the Internet. Today, emerging wireless technologies are enabling mobile users to remove the tether.

By the time you read this, for example, AT&T Wireless will be offering Internet service on the Motorola Smartphone pictured in Figure 1-19. In addition to letting you make ordinary phone calls, the Smartphone will provide you with access to e-mail and a mobile Web browser with which you can do online shopping; get news, weather, sports, and stock quotes; make flight reservations and check arrival times; and even trade online. ActiveSync software synchronizes your phone with personal information managers such as Microsoft Outlook or Lotus Notes. You can read e-mail via your wireless phone from AT&T WorldNet, AOL, or Yahoo! mail services. To learn more about the wireless phone's features, follow this book's Web site link to Smartphone. For more about new products that enable you to access the Internet without needing a conventional telephone line or network cable, follow this book's Web site links to Wireless Design and Development.

Bluetooth

Bluetooth is an emerging standard for high-speed wireless communications. All the major telecomm vendors and computer companies are supporting it, including Ericsson, IBM, Nokia, 3COM, Lucent, Microsoft, Motorola, Apple, Toshiba, Agilent, Tektronix, and Intel. Bluetooth enables the synchronization and exchange of information between mobile computers, telephones, portable handheld devices, and the Internet. Bluetooth transmits a short-range radio signal intended to replace the cables connecting electronic devices. It offers wireless connections to local area networks (LANs), the public switched telephone network, and the Internet.

Figure 1-20 depicts how a Bluetooth-enabled device such as a PC can communicate with up to seven other devices at once. Because Bluetooth communicates over radio frequencies (RF), it does not need the line-of-sight required by infrared devices. There are a wide array of applications in home automation, security systems, network access in public places, and wireless headsets. The Bluetooth specification is available royalty-free at www.bluetooth.com. To learn more, follow this book's Web site links to Bluetooth and the Bluetooth tutorial.



Bluetooth devices communicate via short-wave radio links called Piconet.

FIGURE 1-2 *Bluetooth-enabled devices can communicate with up to seven other devices at once.* ■

Wi-Fi

Wi-Fi is the industry trade name for products based on the IEEE 802.11 specification for wireless local area networking. The Wi-Fi Alliance is a nonprofit international association that formed in 1999 to certify interoperability of these products. When this book went to press, the Wi-Fi Alliance had 205 member companies from around the world, and 903 products had received Wi-Fi certification.

Wi-Fi networks operate over a radius of up to 300 feet, depending on local conditions and equipment. Wi-Fi access points are called HotSpots. When you bring a Wi-Fi equipped computer or PDA into the range of a HotSpot, you can tap into the network, which uses 128-bit encryption to keep your data secure. Unless you are at a FreeSpot, you must have a Wi-Fi provider account in order to connect. There is a FreeSpot directory that lists Wi-Fi HotSpots offering free wireless Internet access. FreeSpot locations include hotels, coffee shops, restaurants, shopping malls, airports, and downtown business districts. To learn more, follow this book's Web site links to Wi-Fi and the FreeSpot directory.

IP Telephony

Imagine making a long-distance telephone call from your PC without having to pay toll charges. Imagine a virtual help desk that brings a live person onscreen to help when you have trouble using your computer. Imagine being able to place a phone call to your computer and remote-control your PC via voice commands. Microsoft's Telephone Application Program Interface (TAPI) is enabling Windows users to do all these things and more by converging the public switched telephone network (PSTN) with

Internet Protocol (IP) telephony. IP telephony converges voice, video, and data into a common Internet protocol, effectively collapsing three networks into one. Using TAPI, a Web site can have a push-to-talk button that instantly establishes a **Voice-over IP (VoIP)** link between, for example, the user at a microphone-equipped PC and a customer service representative at a Web site.

TAPI is evolving as the technology progresses and Microsoft adds more features. For example, Microsoft is developing a telephone markup language that will enable Web pages to contain telephony tags. This will enable Web site developers to create pages to which users can dial up and talk over the phone. Speech recognition will be used to translate the user's voice into commands that the browser will use to surf the Web. Speech synthesis will render the Web's response as a voice the user will hear in reply. For more on the future of TAPI, follow this book's Web site link to Microsoft Internet Telephony. To learn more about the telephony markup language, follow the link to the World Wide Web Consortium's Voice Browser activity.

As Internet telephony services emerge, traditional long-distance telephone companies will see revenues begin to fall. To place an IP telephone call, you dial a local access number that brings up a second dial tone. Then you dial the long-distance number and key in a personal access code that charges you for the call. The savings can be substantial. According to an International Telecommunication Union survey, a one-minute call from the United States to Australia over a traditional phone line cost 17 cents as compared to only 8 cents through a Net-based service (*Hollywood Reporter 7 Mar 2001*). Sprint has begun a project that will replace its conventional telephone network with packet-switching technology over the next 12 to 15 years. Sprint's approach will enable a person to use the same phone number at multiple locations (*San Jose Mercury News 27 May 2003*). Follow this book's Web site links to visit IP telephony sites and learn more about their services.

Personal Digital Assistants

Personal digital assistants (PDAs) are portable, handheld computers that you can take with you to work, school, or anyplace where a PC might come in handy. You can easily synchronize a PDA with your personal computer and take almost any information with you, such as your address book, calendar, and key Web sites. If you have enough memory in your PDA, you can even download music and videos to view while you are away from your PC. There are two main families of PDAs: Windows CE and Palm. Both have taken on exciting new capabilities as PDA technology continues to emerge.

Windows CE

Windows CE is a compact modular version of the Microsoft Windows operating system designed for use on consumer electronic devices. If you know how to use Windows, you know how to use Windows CE. Consider, for example, the user interface on Toshiba's **PocketPC**. As illustrated in

Figure 1-21, you use the Windows Start button to choose programs, which include special pocket versions of Microsoft Office apps—MS Word, MS Excel, and MS Schedule—as well as e-mail, Pocket Windows Media, Pocket MS Reader, and the Pocket Internet Explorer Web browser. Instead of using a mouse, you choose things onscreen with a stylus via Microsoft's pen-computing interface.

One of the advantages of using Windows CE is that it contains modular versions of the Microsoft Windows application programming interfaces. Windows CE supports TAPI, for example, which was described in the section on Internet telephony. If you have a PDA that runs the Phone Edition of Windows CE, you can use that PDA to connect to the Internet. If your PDA and your cell phone both have Bluetooth, for example, your PDA can use your cell phone as a wireless modem to dial up to the Internet. To learn more about these emerging technologies, follow this book's Web site links to Windows CE and the PocketPC Web site.

note *PocketPC is the trade name for palm-sized PDAs based on the Windows CE operating system.*

Palm OS

Palm, Inc., has traditionally been the market leader in personal digital assistants, and Palm is continuing to innovate in order to stay ahead of its biggest competitor, the PocketPC family of products from Microsoft. Palm established its early lead by being first to market, in 1996, with an operating system developed specifically for a small device. Palm handhelds began as personal organizers designed to make people's lives easier through built-in programs, including a date book, an address book, a note-taker, and a to-do list. Today the Palm OS offers Internet connectivity enabling people to access all kinds of information, from stock quotes for investors to driving instructions for travelers. Figure 1-22 illustrates that the latest model has Wi-Fi connectivity built in.

When this book went to press, however, the Palm OS was losing market share. Palm's 70-percent market share in 2000 had slipped to about 40 percent in 2003. Windows enthusiasts feel that the PocketPC will begin to sell even better as larger memories and faster processors permit Windows CE to work more like the familiar desktop computer. This will not necessarily make PocketPCs outsell Palm de-

FIGURE 1-21 *Toshiba's PocketPC uses the Windows CE operating system. Notice the Windows Start button in the upper-left corner of the screen.* ■

FIGURE 1-22 *The Palm OS combines built-in personal productivity programs with Internet connectivity.* ■

vices, however, because the challenge is not so much trying to make Windows run on a PDA as it is figuring out what works best on a PDA. Look for exciting competition between the Pocket PC and the Palm OS in the years ahead. For the current status, follow this book's Web site links to Palm OS, PocketPC, and CNET's comparative reviews of the different brands of PDAs that are available today.

Artificial Intelligence

Artificial intelligence (AI) is for real—not just a theoretical science for researchers. As handheld technologies reduce the size of computers, for example, AI researchers are developing more effective ways for people to use them. Featured here are several AI technologies that promise to improve your use of the Internet in years to come.

Voice Recognition

Many people do not type very fast, and even fast typists wish for an easier way to enter information into a computer. Voice recognition is rapidly emerging as a solution to this problem. Apple Speech Recognition, for example, lets developers incorporate speech recognition into any Macintosh application. Among the first to take advantage of this new technology was the *Star Trek Omnipedia* CD-ROM from Imergy, a voice-activated guide to a galaxy of *Star Trek* facts, characters, and movies. Imergy was amazed at how accurate the recognition is, even for such phrases as "Denibian Slime Devil." Apple Speech Recognition enables application developers to define how many words are active and to build custom vocabularies or language models. Apple Speech Recognition is built into Mac OS X. To learn more, follow this book's Web site link to Apple Speech Recognition.

On the Windows platform, IBM's speech division is dueling with Dragon Systems, and all users will benefit from the resulting breakthroughs. The IBM product is ViaVoice, and the Dragon product is NaturallySpeaking. Both products can recognize tens of thousands of words, and they are trainable, meaning that you can teach them new words. Applications include voice-controlled Web surfing, legal dictation, environmental control systems, and word processing by persons with physical disabilities such as repetitive stress injuries. ViaVoice is also available in Macintosh and Linux versions. For more information, follow this book's Web site links to ViaVoice and NaturallySpeaking.

Text-to-Speech Conversion

In Chapter 3 you will learn about a virtual chat environment, which is called the Palace on the Internet. If you have a Macintosh, Apple's text-to-speech extension enables you to hear the conversations as well as see them onscreen in the cartoon talk balloons. Called PlainTalk, Apple's text-to-speech product can speak in Mexican Spanish as well as English.

On the Windows and Unix platforms, IBM has a product called DirectTalk that is a text-to-speech system for building interactive voice response systems. There is also a library of DirectTalk JavaBeans for use in

creating Java applications that can talk. Chant Corporation makes a SpeechKit consisting of speech-synthesis and text-to-speech components developers can use when developing Web sites with C/C++, Delphi, Java, JavaScript, VBScript, and Visual Basic. For more information about text-to-speech technology, follow this book's Web site links to PlainTalk, DirectTalk, and the Chant SpeechKit.

Foreign Language Translation

IBM's WebSphere Translation Server can translate Web pages, e-mail, and chat from English into a host of languages, including French, Italian, German, Spanish, Chinese, Japanese, and Korean. It can also translate into English from French, Italian, German, and Spanish. Translation speeds range from 200 to 500 words per second. Slot grammars are used to parse complex sentences that might fool less capable translation engines. Idiomatic expression-handling can be fine-tuned for specific domains and contexts.

Foreign language translation technology is used at the Google.com search engine, which has language tools that can translate English language Web pages into German, French, Italian, Portugese, or Spanish, and vice versa. In addition to these languages, the search site at AltaVista.com adds Chinese, Japanese, Korean, and Russian. To learn more, follow this book's Web site links to Google language tools, AltaVista translator, slot grammars, and the IBM WebSphere Translation Server.

mage Recognition

If you have ever tried to find a specific image in a database, you know how difficult it is to locate an image via keywords. Virage has developed software that can compare images with a visual template, which is how the human brain recognizes images. The Virage software reduces the image into a 1-kilobyte file called a feature vector, which is based on the placement, color, and texture of shapes in the image. You search for images by describing the visual properties of what you are seeking. Virage's product, which is called VIR, for Visual Image Recognition, is protected by U.S. Patent 5,893,095. The VIR Image Engine has been licensed for use in databases from Oracle, Informix, Sybase, Object Design, and Objectivity.

Try This!

Virage VIR Patent

You can read any patent by going to the U.S. Patent and Trademark Office at http://www.uspto.gov and following links to perform a patent search. To read the Visual Image Recognition (VIR) patent, follow these steps:

1. Use your Web browser to open the site www.uspto.gov.
2. Follow the link to perform a patent search.
3. Under issued patents, choose the option to search via patent number.
4. When the search form appears, type the following patent number into the blank: 5,893,095
5. Click the button to perform the search and view the patent.

Bots

Bots, short for robots, are software applications programmed to act as intelligent agents that go out on the network to find or do things for you. You tell a bot what you want, and it worms its way through the Internet, finding all the relevant information, digesting it, and reporting it to you succinctly.

Likening them to robotic librarians, Krol (1996: 418) refers to bots as "software worms that crawl from source to source, looking for answers to your question. As a knowbot looks, it may discover more sources. If it does, it checks the new sources too. When it has exhausted all sources, it comes crawling home with whatever it found."

This book's Web site links to several bot repositories. At FerretSoft, for example, you will find search utilities for locating Web pages, utilities, e-mail addresses, files, chat channels, phone numbers, and news. At BotSpot you will find bots that can help you shop, invest, learn, research, and game. StreetPrices, MSN eShop, Priceline, mySimon, and BottomDollar are online shopping sites that use agents to help you find the best prices. For books, an interesting bot is AddALL, because you can see it working for you when you click to compare prices. Also linked to this book's Web site are the Software Agents Group and the Multi-Agent Systems Laboratory.

Digital Television and Video

Computer technology is creating fundamental changes in the way televisions are made and videos are distributed. Almost everyone reading this book will be purchasing one of the new TVs during the next few years. Because the new TV signal is digital, computer data and Web pages can be transmitted along with the television broadcast to enhance the user experience. By the end of the decade, this convergence will enable most users to surf the Internet and watch TV on the same high-resolution display screen.

High-Definition Television (HDTV)

The new digital television signal is called **HDTV**, which stands for **high-definition television**. HDTV is intended to replace NTSC (National Television System Committee standard) as the television standard for the United States. HDTV is based on four technologies:

- MPEG digital video compression
- Transmission in packets that permit any combination of video, audio, and data
- Progressive scanning for computer interoperability up to 60 frames per second (fps) at 1920 x 1080 pixels
- CD-quality digital surround sound using Dolby AC-3 audio technology

During the 1990s, the major television studios began recording shows in HDTV so reruns can be broadcast in HDTV when the standard changes. To find out how many television stations are broadcasting in HDTV today, follow this book's Web site link to HDTV Group—Reception Maps.

How soon will your analog TV become obsolete? The FCC had planned to order all analog TV transmitters off the air in the year 2006, but Congress is lobbying to delay that until most Americans have either new HDTV sets or digital adapters for their analog sets. There is a lot of intrigue involved in the rollout of high-definition television. To find out the current status of HDTV, follow this book's Web site link to *Current* newspaper's briefing on digital television.

MPEG Digital Video

MPEG stands for **Motion Picture Experts Group**, which is the name of the ISO standards committee that created this digital video standard. MPEG compresses video by using a discrete cosine transform algorithm to eliminate redundant data in blocks of pixels on the screen. MPEG compresses the video further by recording only changes from frame to frame; this is known as *delta-frame encoding*. MPEG is emerging as the digital video standard for compact discs, DVD, cable TV, direct satellite broadcast, and high-definition television. MPEG is the standard for the DirecTV system. Direct satellite broadcasts have become so popular as an alternative to videotape that Blockbuster has begun selling DirecTV in its home video stores. For the DirecTV dealer nearest you, follow this book's Web site links to DirecTV.

MPEG is also being used to bring digital video to handheld wireless devices. The PocketTV movie player, for example, can play MPEG movies on certain models of Windows CE PocketPCs, including Casio's Cassiopeia, HP's Jornada, and Compaq's iPAQ line of pocket computers. Due to the present-day memory limitations of handheld computers, different versions of MPEG are being worked on to enable movies to play on devices that have different bandwidth and memory capabilities. A special version of MPEG is being created, for example, to permit video streaming over wireless connections to the Internet. For more information, follow this book's Web site links to MPEG and PocketTV.

MSN TV Internet Receiver

The MSN TV Internet Receiver is one of the hottest set-top boxes on the planet, and emerging technology promises to keep it that way. As illustrated in Figure 1-23, the MSN TV Internet Receiver is a device that essentially combines your telephone with the video signal on your TV or VCR. When you start up the MSN TV Internet Receiver, it dials up to your Internet service provider, and you see the Web pages on your TV screen. As depicted in Figure 1-24, a cleverly designed hand control lets you do one-thumb surfing on the Internet, but to take advantage of all the features, you need to use the wireless computer keyboard that comes as part of MSN TV.

FIGURE 1-23 *MSN TV connects your telephone to your TV for access to the World Wide Web and e-mail.* ■

In order to use the MSN TV receiver, you must subscribe to the MSN TV service. The MSN TV service provides access to MSN Messenger, MSN News, and Hotmail. Your mail messages can include pictures and audio clips, and you can build personal Web pages. There is a $10 per month discount if you already have an ISP; otherwise, you use MSN as your ISP.

Through products such as MSN TV, you can see how emerging technology is integrating the television, the telephone, and the computer into a networked supermedium. Withrow (1993) credits technology prophet George Gilder with coining the phrase **telecomputer** to describe such a device.

UltimateTV

Microsoft offers a more high-end service called UltimateTV. Through a DirecTV satellite dish, UltimateTV lets you record your favorite shows without a VCR, pause live television, create your own TV program line-up, and instantly replay anything you see on TV. Everything you watch is digitally recorded onto a digital video recorder that uses an internal hard drive to record up to 35 hours of your favorite shows. You can make your own slow-motion instant replays during sporting events. You can also participate in interactively enhanced TV programs such as *Who Wants to Be a Millionaire, Judge Judy, Wheel of Fortune,* and *Jeopardy!*

Microsoft is working actively to continue enhancing its digital television products. During the keynote at the 2002 Consumer Electronics Show, for example, Bill Gates used a PocketPC with a wireless connection to demonstrate how consumers will be able to set up TV recordings by using the UltimateTV Web site remotely. If UltimateTV subscribers get caught in traffic on the way home from the office, they will be able to record a show they might otherwise miss. To learn more about UltimateTV and how Microsoft plans to keep enhancing it, follow this book's Web site links to UltimateTV.

FIGURE 1-24 *MSN TV comes with a set-top box, a computer keyboard, and a universal remote that features "one-thumb" surfing.* ■

Digital Hubs

Start thinking of your home PC not so much as a personal computer but rather as a **digital hub** that will eventually coordinate all the electronic devices in your home. According to Forrester Research, 10 million U.S. homes will use digital hubs in 2003, and that number will grow to 25 million by 2006. Very aware of this trend, Microsoft created a digital hub version of Windows called Windows XP Media Center Edition, which a dozen leading brands are using as the operating system for their digital entertainment hubs. In the meantime, Apple

is working to position the Macintosh as the center of your home entertainment system. At the 2002 Consumer Electronics Show, Moxi Digital won best of show with a digital hub called the Moxi Media Server. Its inventor is Moxi founder Steve Perlman, who created WebTV back in the 1990s and sold it to Microsoft for $425 million in 1997. As digital hub technology evolves, it will be interesting to watch how the Moxi competes for market share with Windows Media Center PCs and the Macintosh.

Features that you will see emerging in digital hubs over the next few years will include the following:

- Wireless transmission of multimedia objects to devices located in various places in the house. This will enable you to play, for example, music stored on a PC in your study on the surround sound system in your family room.
- Distribution of video streams from the digital hub to receivers located in different parts of the house. While Dad watches *Monday Night Football,* Mom can watch *Absolutely Fabulous* and the kids can watch the Discovery Channel.
- Printing of photos taken by your digital camera without having to plug anything in.
- Downloading of music into your PDA or other portable listening device.
- Uploading of a movie from your camcorder to edit on the PC in your den and play on the HDTV set in the living room.
- Capturing of images from wireless cameras located about the house and out in the yard so you can see your house over the Web when you are not at home.
- Paging you if someone jumps or falls into your swimming pool when it is supposed to be closed.
- Remote control of all home appliances and electronic devices, both inside the house when you are home and via the wireless Web when you are away.

To quote the Apple digital hub Web site, these are the kinds of features that will "make your digital lifestyle possible." To learn more about digital hubs, follow this book's Web site links to Windows XP Media Center, Moxi, and Apple digital hubs.

Chapter 1 Review

Chapter Summary

After reading this chapter and completing the Try This! exercises, you should understand the following facts about the Internet:

Defining the Internet

- The Internet is a worldwide connection of more than 171 million computers that use the TCI/IP protocol suite to communicate.
- According to the CIA's *World Factbook,* 604.1 million people were online worldwide as of August 2003.
- The number of pages on the Web has increased dramatically from about 300 million in 1998 to more than three billion in 2003.
- Up-to-date Internet growth charts can be found online as part of Hobbes' Internet Timeline.
- Client-server computing refers to the manner in which computers exchange information by sending it (as servers) and receiving it (as clients).
- TCP/IP is the suite of wide area networking protocols that make the Internet work. TCP stands for the Transmission Control Protocol, which is in charge of routing packets of information across the Internet. Every computer on the Internet has a unique Internet Protocol (IP) address. Each packet of information that gets transmitted over the Internet contains the IP address of the computer that sent it and the IP address of the computer to which it is being sent. TCP ensures that the packets get routed to the proper destination and reassembled in the correct sequence.
- The domain name system (DNS) allows alphabetical names to substitute for numbers in IP addresses on the Internet; for example, the Library of Congress, which has the IP address 140.147.249.7, can also be addressed by its domain name, which is www.loc.gov.
- An intranet is a network that uses the TCP/IP protocols to provide private services within an organization whose computers are not publicly accessible on the Internet. An extranet refers to Internet resources, such as Web sites, that are beyond the public's reach and require authorized users to do something extra, such as type a logon name and password, in order to obtain access.

Identifying Eleven Popular Internet Services

- Electronic mail (e-mail) is a store-and-forward method of sending people messages over the Internet. Messages queue up in your Inbox, permitting you to read and respond to them at your convenience.
- Listserv, which stands for list server, is a mailing list service that enables users to send a message to a particular mailing list, which then e-mails a copy of the message to each member of the list.
- USENET is a distributed bulletin board system hosting more than 10,000 newsgroups. Once you subscribe to a newsgroup, you use a newsreader to access the group's newsfeed. In addition to reading information on existing topics, you can add your own comments and create new topics, thereby participating in a virtual conference on the Internet.
- Chat is a very popular form of real-time communication that enables people to converse with one another over the Internet. As you type a message on your computer keyboard, the people you are chatting with see what you type almost immediately, and you can simultaneously see what they type in reply. Users with microphones and speakers can speak verbally to one another if their chat room software supports audio.
- Instant messaging is a real-time communication protocol that lets you send and receive instant messages over the Internet. You put onto a buddy list the names of users who are permitted to contact you. Only the people on your buddy list can IM you.
- Videoconferencing is the use of real-time video and audio streaming to enable people conversing over the Internet to be able to see and hear each other.
- FTP, which stands for File Transfer Protocol, is the standard method for transferring files over the Internet from one computer to another.

- Multimedia streaming is the digital transmission of a real-time feed from an audio or video source, encoded in such a way that the media can begin playing steadily without making users wait for the entire file to download to their computers.
- The World Wide Web (WWW) is a networked hypertext system that allows multimedia documents to be shared over the Internet without requiring people to travel anywhere physically in order to obtain the information.
- Rich Site Summary (RSS) is an XML format for syndicating the content of a Web site in a form that can be registered with an RSS publisher to which other sites can subscribe in order to access the RSS feed and display its content onscreen.
- A Web log (blog) is a Web-accessible log written by an individual who wants to chronicle activity related to a given topic that is often personal.

Describing the Infrastructure of the Internet

- The term client-server computing refers to the manner in which computers exchange information by sending it (as servers) and receiving it (as clients).
- Transmission Control Protocol/Internet Protocol (TCP/IP) is the suite of protocols that enable the Internet to work.
- To make IP addresses easier for human beings to remember, a domain name system (DNS) was invented to permit the use of alphabetic characters instead of numbers. A complete DNS address is called a fully qualified domain name (FQDN).
- An intranet is a network that uses the TCP/IP protocols to provide private services within an organization whose computers are not publicly accessible on the Internet.
- The term extranet refers to Internet resources, such as Web sites, that are beyond the public's reach and require authorized users to do something extra, such as type a logon name and password, in order to obtain access.

Changing the World via the Internet

- Digitalization is the process of encoding messages into a digital format that can be transmitted over the Internet.
- Convergence is the process of unification that digitalization causes by enabling all the world's traditional ways of communicating to work over a common communications medium on the Internet.
- The forces of digitalization have caused an unprecedented number of mega-mergers in the communications field.
- The Internet is changing the face of business. Online shopping and banking are creating a cashless society by eliminating the need for printed money.
- Through telecommuting, a growing number of companies are permitting employees to work from home by using computers, dialup modems or broadband network connections, and fax machines to perform work that formerly required a person to travel physically to work.
- Government officials have turned increasingly to the Internet for solutions to problems inherent in governance. The Net makes services more widely available and enables municipalities to respond more quickly to emergencies and disasters.
- To intercept messages from terrorists and criminals, the FBI is using a system called Carnivore, which can scan the Internet's e-mail traffic, looking for key words and phrases related to terrorist plots and criminal investigations. The USA Patriot Act gives the federal government wide latitude in using Internet surveillance systems, including Carnivore and its successors.
- Electronic book (eBook) technology enables publishers to sell books in an electronic format that consumers can download into portable reading devices.
- The Internet is enabling educators to make use of computer-based learning strategies online. By linking universities, colleges, schools, and homes into a worldwide network, the Internet is helping to break down the distinctions between grade levels.
- The digital divide is the barrier that disenfranchises citizens who are not connected to the Internet and therefore cannot participate fully in the converged digital economy.

Tracing the History of the Internet

- The Internet originated when the Advanced Research Projects Agency (ARPA) of the United States Department of Defense began a network called ARPANET in 1969.

- ARPANET was the first network based on packets and packet switching. The packets contained IP addresses that enabled the information to get routed to their intended destination. If one of the computers on the network got wiped out in an attack, the packets would find their way by another route.
- During the 1970s, universities began using the Internet Protocol to connect their local networks to the ARPANET.
- In 1983, the military segment broke off and became MILNET.
- In 1986, the National Science Foundation (NSF) began the NSFNET, a backbone that connected the nation's five supercomputer centers at high speed.
- In 1991, NSF lifted the restriction that prohibited commercial entities from using the backbone. By 1994, the NSFNET was carrying 10 trillion bytes of Internet traffic per month.
- In 1995, NSFNET reverted to a research network, and the U.S. Internet backbone traffic was routed through interconnected network providers.
- In 1998, the responsibility for managing the domain name system (DNS) was transferred from the Internet Network Information Center (InterNIC) to the Internet Corporation for Assigned Names and Numbers (ICANN), which is an international not-for-profit organization.

Looking into the Future of the Internet

- The multicast backbone (MBONE) is a network of computers on the Internet specially designed for the transmission of simultaneous live video and audio broadcasts. Instead of sending multiple copies of these transmissions, multicasting sends only one copy of the message and replicates the information only at branch points in the network.
- A consortium of research universities is working in partnership with industry and government to create an even faster network named Internet2. The goal is to create a higher-speed version of the Internet that revolves around high-speed connection points called gigapops.
- Wi-Fi is the trade name for products based on the IEEE 802.11 specification for wireless local area networking. Wi-Fi networks operate over a radius of up to 300 feet, depending on local conditions and equipment. Wi-Fi access points are called HotSpots, which use 128-bit encryption to keep your data secure. A FreeSpot directory lists Wi-Fi HotSpots offering free wireless Internet access in selected hotels, coffee shops, restaurants, shopping malls, airports, and downtown business districts.
- Voice-over IP (VoIP) is converging the public switched telephone network (PSTN) with IP telephony. This enables a Web site to have a push-to-talk button that instantly establishes a VoIP link between, for example, the user at a microphone-equipped PC and a customer service representative at a Web site.
- Voice recognition promises to provide an easier way for people who do not type very fast to enter information into a computer. Text-to-speech extensions enable you to hear as well as see printed text onscreen.
- Bots, short for robots, are software applications programmed to act as intelligent agents that go out on the network to find or do things for you. You tell a bot what you want, and it worms its way through the Internet, finding all the relevant information, digesting it, and reporting it to you succinctly.
- During the coming decade, high-definition television (HDTV) will replace NTSC as the television standard for the United States. The signal is MPEG digital, transmitted in packets and displayed at up to 1920 x 1080 pixels of graphical resolution.
- Start thinking of your home PC not so much as a personal computer but rather as a digital hub that will eventually coordinate all the electronic devices in your home. According to Forrester Research, 25 million U.S. homes will be using digital hubs by 2006.

Key Terms

ARPANET *(30)*
blog *(17)*
Bluetooth *(35)*
bot *(40)*
Carnivore *(28)*
chat *(10)*
client-server computing *(19)*
convergence *(23)*
digital divide *(23)*
digital hub *(42)*
domain *(21)*
domain name system (DNS) *(20)*
dotted quad notation *(20)*
File Transfer Protocol (FTP) *(13)*
fully qualified domain name (FQDN) *(20)*
e-mail *(7)*
extranet *(23)*
e-zine *(9)*
gigapop *(34)*
high-definition television (HDTV) *(40)*
hypertext *(14)*
information warfare *(27)*
instant messaging (IM) *(12)*
Internet *(4)*
Internet2 *(34)*
Internet Corporation for Assigned Names and Numbers (ICANN) *(21)*
Internet Explorer *(15)*
Internet Protocol (IP) *(19)*
intranet *(22)*
IP address *(19)*
IPv6 *(34)*
listserv *(9)*
MILNET *(31)*
Mosaic *(14)*
Motion Picture Experts Group (MPEG) *(41)*
multicast backbone (MBONE) *(32)*
Net *(6)*
Netscape Navigator *(14)*
NSFNET *(31)*
packet *(19)*
Personal Digital Assistant (PDA) *(36)*
PocketPC *(36)*
Rich Site Summary (RSS) *(16)*
server *(19)*
streaming *(13)*
subdomain *(21)*
TCP/IP *(19)*
telecommuting *(24)*
telecomputer *(42)*
teleworker *(24)*
top-level domain (TLD) *(20)*
Transmission Control Protocol (TCP) *(19)*
USA Patriot Act *(28)*
USENET *(9)*
videoconferencing *(12)*
Voice-over IP (VoIP) *(36)*
Wi-Fi *(35)*
Windows CE *(36)*
World Wide Web (WWW) *(14)*
World Wide Web Consortium (W3C) *(15)*

Key Terms Quiz

1. The Internet protocol suite is called _____, which stands for _____ / _____ _____.
2. IP addresses that have four numbers separated by periods are said to have _____ notation.
3. FTP stands for _____.
4. The first popular Web browser, which was created by the National Center for Supercomputer Applications, was called _____.
5. W3C stands for _____.
6. In the Web address www.loc.gov, the top-level domain is _____.
7. In the Web address www.humberc.on.ca, the second-level domain is _____.
8. Using computers, dialup modems or broadband network connections, and fax machines to work from home is known as _____.
9. In the aftermath of the 9/11 attacks on America, the _____ was signed into law, giving the federal government wide latitude in using Internet surveillance systems.
10. _____ is the industry trade name for products based on the IEEE 802.11 specification for wireless local area networking.

Multiple-Choice Quiz

1. Which one of the following networks was invented first?
   a. Internet2
   b. MILNET
   c. ARPANET
   d. USENET
2. Which one of the following descriptions best fits the design of the Internet?
   a. Centrally controlled with a single point of failure
   b. Centrally controlled with no single point of failure
   c. Decentralized control with a single point of failure
   d. Decentralized control with no single point of failure
3. Text that has been linked such that when you click the text, you trigger the link is called
   a. Rich text
   b. Hypertext
   c. Clear text
   d. Active text
4. An IP address consists of how many numbers that are separated by periods?
   a. 2
   b. 3
   c. 4
   d. 5
5. Prior to 1998, the responsibility for managing the domain name system (DNS) was vested in an organization called
   a. InterNIC
   b. ICANN
   c. Interpol
   d. W3C
6. In 1998, the responsibility for managing the domain name system (DNS) was transferred to an organization called
   a. InterNIC
   b. ICANN
   c. Interpol
   d. W3C
7. The barriers faced by the unconnected are known as
   a. Viruses
   b. Firewalls
   c. The digital divide
   d. Wormholes
8. Web sites that are beyond the public's reach and require authorized users to do something extra, such as type a logon name and password, in order to obtain access are called
   a. Public domain
   b. ARPANETS
   c. TAPI
   d. Extranets
9. Wi-Fi access points that offer free wireless Internet access are called
   a. HotSpots
   b. FreeSpots
   c. BotSpots
   d. OpenSpots
10. Software applications programmed to act as intelligent agents that go out on the network to find or do things for you are called
    a. Librarians
    b. Bots
    c. Spies
    d. Scripts

Essay Quiz

1. How large is the Internet today? When this book went to press, just over 109 million computers were using the Internet Protocol (IP) to communicate. To find out how much the Internet has grown since then, follow the *Interlit* Web site links to one of the Internet surveys. Tell how large the Internet is today, and state which survey you used to obtain this data. Also tell which kind of data you think best measures how large the Internet is.
2. Follow this book's Web site links to Voice Recognition, and explore the material you find there. Then reflect on how voice recognition might help make computers easier to use. What ways can you think of? How would you use voice recognition in your daily life? List at least

three ways in which voice recognition could improve operations at your school or workplace.

3. Follow this book's Web site link to BotSpot and peruse the range of intelligent agents available there. Which one of the bots would be most useful to you in your daily life? Name the bot, describe what it does, and tell why it would be useful for you. In addition to naming the bot that would best serve you personally, tell whether you found any bots that would improve the efficiency of your school or workplace. Name the bots, describe what they do, and tell how they would make things better at work or school.
4. Go to your local computer store and ask to see demonstrations of a Pocket PC running Windows CE and a Palm device running the Palm OS. Compare the Windows CE to the Palm OS operating systems. Were you able to launch programs from the Windows Start button on the Pocket PC? Do you feel that is more intuitive for a Windows user than the custom interface on the Palm OS, or does the Palm interface work better for a handheld device? What was the nicest feature you found on the PocketPC? What did you find to be the best feature of the Palm OS? If you had to choose one over the other for use in your school or workplace, which family of PDAs would you recommend: one of the Pocket PCs based on the Windows CE or a Palm device running the Palm OS? Give at least three reasons why you chose this particular brand.
5. Go to your local computer store and ask for a demonstration of the Tablet PC. Use the pen to write a message onscreen. How well does the Tablet PC recognize your handwriting? Do you think it works well enough for use in your school or workplace? Give at least three reasons for or against using the Tablet PC in your school or workplace. Also tell what brand and model of Tablet PC you used for this exercise.

Lab Projects

• Lab Project 1-1: Planning Internet Services

Imagine that you are employed in a school or small company that is planning its information technology infrastructure. Your employer has asked you to consider the basic Internet services and plan how they can function in the workplace to improve productivity and communication on a daily basis. You will submit your plan in the form of a matrix. To create the matrix, follow these steps:

1. Use your word processor to make an outline of the basic functions of your school or business.
2. Consider how each function in the outline could make use of one or more of the basic Internet services you studied in this chapter.
3. Using the table feature of your word processor, create a matrix that lists the eleven basic Internet services across the top and the functions in your outline along the side.
4. In each cell of the matrix, put a check mark if the Internet service in that column can help achieve the task in that cell's row.

This matrix constitutes a functional analysis that will inform how and where your school or company would apply the different Internet services. Save the matrix on your hard drive. If your instructor has asked you to hand in the matrix, make sure you put your name at the top of the matrix; then save it on a disk or follow the other instructions you may have been given for submitting this assignment.

• Lab Project 1-2: Adopting a PDA Platform

As you learned in this chapter, the PDA market is divided into two camps: PocketPC and Palm. The operating systems are very different, as is the software needed to use these devices. Because of these differences, most schools or companies will probably choose to adopt one or the other instead of trying to support them both. Imagine that your superior has asked you to recommend which PDA platform your school or company should adopt. In developing this recommendation, consider these issues:

- The marketplace for PDAs is volatile. From 2000 to 2003, for example, Palm's market share dropped from more than 70 percent to about 40 percent of the market for personal digital assistants. Use the search engines at google.com or yahoo.com to find the latest reports on PDA market share.
- Consider the extent to which your coworkers use Windows. If they are diehard Windows users, for example, they may prefer the PocketPC platform. Macintosh users may prefer the Palm.
- Get personal experience with both operating systems before you make a recommendation. You can try them in the PDA departments at Circuit City, Best Buy, Staples, Office Depot, and many other retail stores.
- Functionality should be your guiding light in deciding on a PDA platform. Consider the applications available on the various brands, and match these applications to the daily tasks faced by your coworkers.

Use a word processor to write a brief essay telling what PDA you recommend and why. Report the brands of PDA you considered. Discuss the relative pluses and minuses of the PocketPC and Palm platforms as they relate to daily activities in your workplace. If it seems necessary to support both the PocketPC and the Palm, state the reasons for this. Also state what the current market share is for the Palm versus the PocketPC brands of PDA. If your instructor has asked you to hand in this assignment, make sure you put your name at the top of your PDA recommendation; then save it on a disk or follow the other instructions you may have been given for submitting this assignment.

Main text file is embedded
because of difficulty w/ keyword references.
PLS. always export the text after done with the chapter.
(File - Export Text ...)