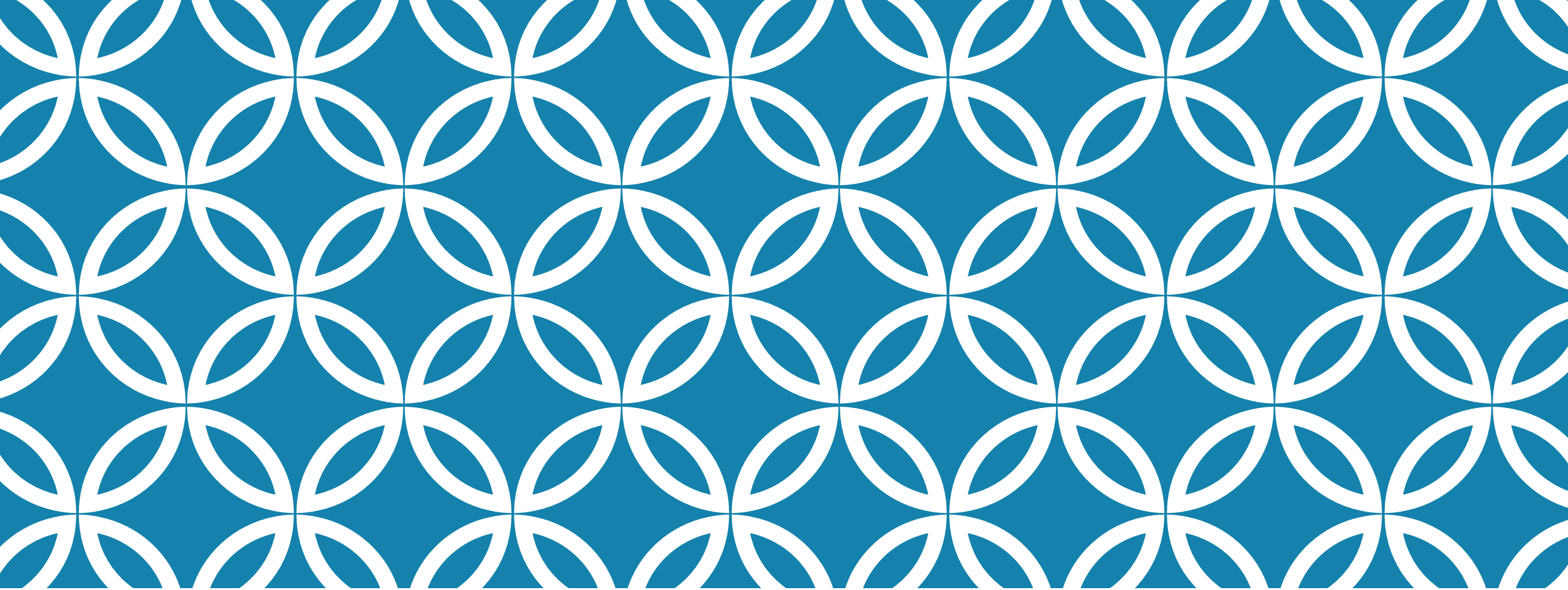


CHAPTER 7 TELECOMMUNICATIONS ,THE INTERNET AND WIRELESS TECHNOLOGY.(244)

NETWORKING AND COMMUNICATION TRENDS

Broadband.

What is a computer network?

NIC (Network Interface card)

The ***network operating system (NOS)*** routes and manages communications on the network and coordinates network resources.

It can reside on every computer in the network, or it can reside primarily on a dedicated server computer for all the applications on the network.

HUBS (sending pkts to all connected devices)

Router

NETWORK IN LARGE COMPANIES

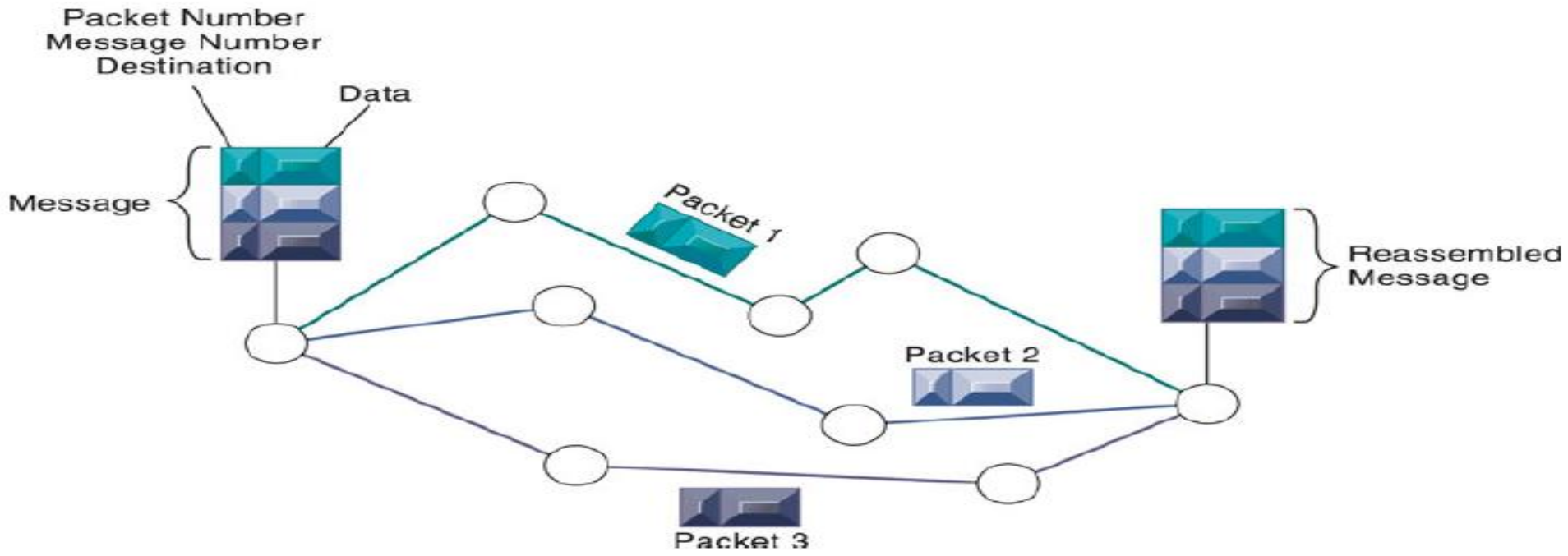
Wi-fi

KEY DIGITAL NETWORKING TECHNOLOGIES

Client/server computing.(distributed computing model)

Packet switching.

FIGURE 7-3 PACKED-SWITCHED NETWORKS AND PACKET COMMUNICATIONS



Data are grouped into small packets, which are transmitted independently over various communications channels and reassembled at their final destination.

What is protocol?

TCP/IT protocol?

Communication networks? (next slide)

-> signal verses analog

TYPES OF NETWORKS

-> LAN (upto 500 meters) an office/ floor of the building

->WAN

->MAN

-> Campus Area Network.(up to thousand meters: a college campus/corporate facility)

Peer to peer

Topology→ star/bus/ring

PHYSICAL TRANSMISSION MEDIA

Twisted wire

Coaxial cable

Fiber optics

Optical networks (**Optical networking** is a means of ***communication that uses signals encoded onto light to transmit information among various nodes of a telecommunications network***. They operate from the limited range of a local-area network (LAN) or over a wide-area network (WAN), which can cross metropolitan and regional areas all the way to national, international and transoceanic distances.)

WIRELESS TRANSMISSION MEDIA

Microwave systems: terrestrial and celestial

Microwave systems, both terrestrial and celestial, transmit high frequency radio signals through the atmosphere and are widely used for high-volume, long-distance, point-to-point communication.

Microwave signals

follow a straight line and do not bend with the curvature of the earth.

Therefore, long-distance terrestrial transmission systems require that transmission stations be positioned about 37 miles apart.

Long-distance transmission

is also possible by using communication satellites as relay stations for microwave signals transmitted from terrestrial stations.

TRANSMISSION SPEED

The number of cycles per second that can be sent through that medium is measured in ***hertz***—one hertz is equal to one cycle of the medium.

The range of frequencies that can be accommodated on a particular telecommunications channel is called its *bandwidth.*

THE GLOBAL INTERNET

An ***Internet service provider (ISP)*** is a commercial organization with a permanent connection to the Internet that sells temporary connections to retail subscribers.

EarthLink, NetZero, AT&T, and Time Warner are ISPs.

Individuals also connect to the Internet through their business firms, universities, or research centres that have designated Internet domains.

Digital subscriber line (DSL) technologies operate over existing telephone lines to carry voice, data, and video at transmission rates ranging from 385 Kbps all the way up to 9 Mbps.

Cable Internet connections provided by cable television vendors use digital cable coaxial lines to deliver high-speed Internet access to homes and businesses. They can provide high-speed access to the Internet of up to 15 Mbps.

In areas where DSL and cable services are unavailable, it is possible to access the Internet via satellite, although some satellite Internet connections have slower upload speeds than other broadband services.

T1 and T3 are international telephone standards for digital communication.. ***They are leased, dedicated lines suitable for businesses or government agencies requiring high-speed guaranteed service levels***

T1 lines offer guaranteed delivery at 1.54 Mbps, and T3 lines offer delivery at 45 Mbps. The Internet does not provide similar guaranteed service levels, but simply "best effort."

INTERNET ADDRESSING AND ARCHITECTURE

The Internet is based on the TCP/IP networking protocol suite described earlier in this chapter. Every computer on the Internet is assigned a unique **Internet Protocol (IP) address,** which currently is a 32-bit number represented by four strings of numbers ranging from 0 to 255 separated by periods. For instance, the IP address of www.microsoft.com is 207.46.250.119.

THE DOMAIN NAME SYSTEM

The **Domain Name System (DNS)** converts domain names to IP addresses. The **domain name** is the English-like name that corresponds to the unique 32-bit numeric IP address for each computer connected to the Internet.

DNS servers maintain a database containing IP addresses mapped to their corresponding domain names. To access a computer on the Internet, users need only specify its domain name.

***DNS has a hierarchical structure*:-**

At the top of the DNS hierarchy is the root domain.

The child domain of the root is called a top-level domain, and the child domain of a top-level domain is called is a second-level domain.

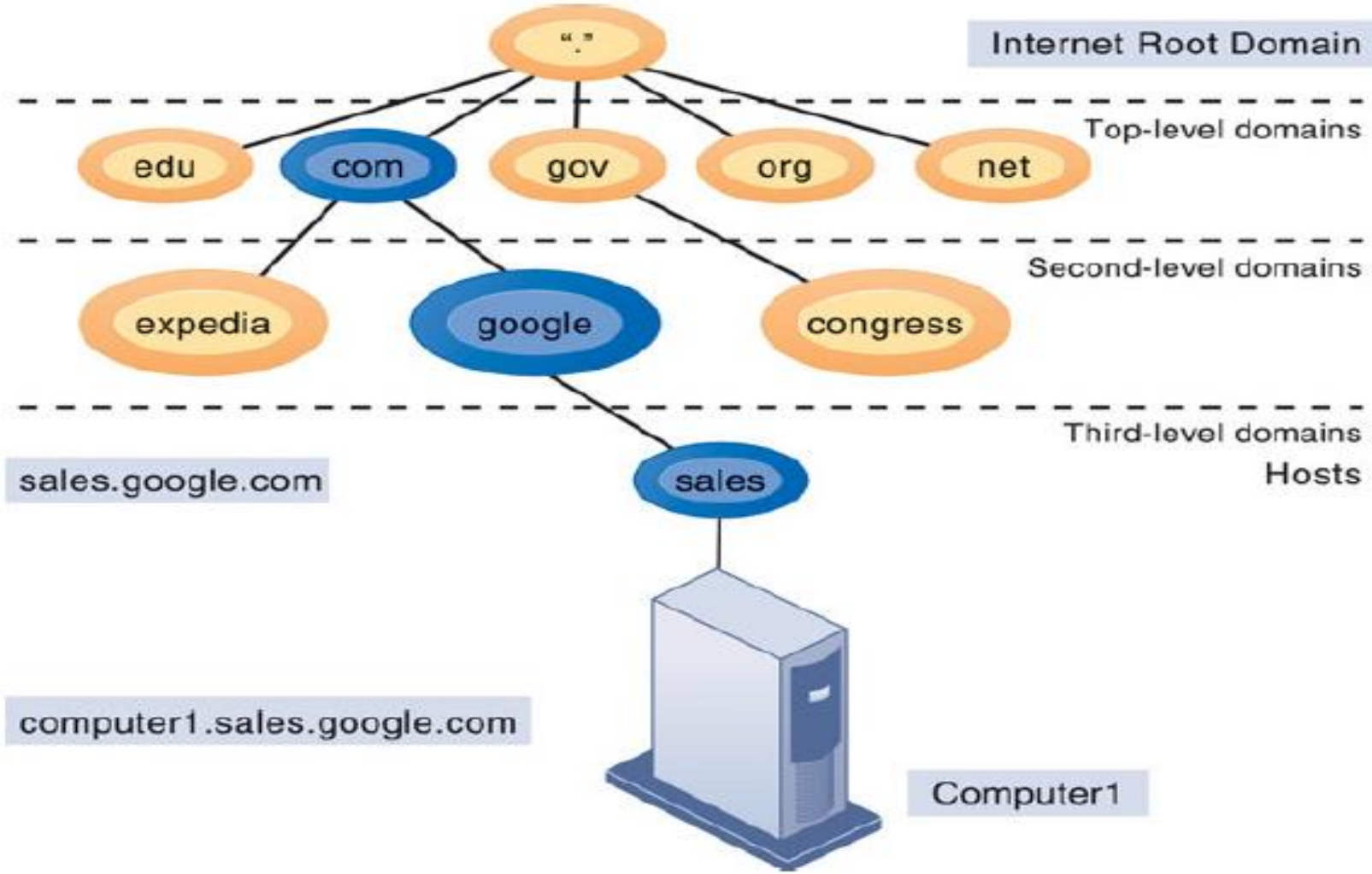
Top-level domains are two- and three-character names you are familiar with from surfing the Web, for example, .com, .edu, .gov, and the various country codes such as .ca for Canada or .it for Italy.

Second-level domains have two parts, designating a top-level name and a second-level name—such as buy.com, nyu.edu, or amazon.ca.

A host name at the bottom of the hierarchy designates a specific computer on either the Internet or a private network.

(In the future, this list will expand to include many more types of organizations and industries.)

FIGURE 7-8 THE DOMAIN NAME SYSTEM



Domain Name System is a hierarchical system with a root domain, top-level domains, second-level domains, and host computers at the third level.

.com	Commercial organizations/businesses
.edu	Educational institutions
.gov	U.S. government agencies
.mil	U.S. military
.net	Network computers
.org	Nonprofit organizations and foundations
.biz	Business firms
.info	Information providers

INTERNET ARCHITECTURE AND GOVERNANCE

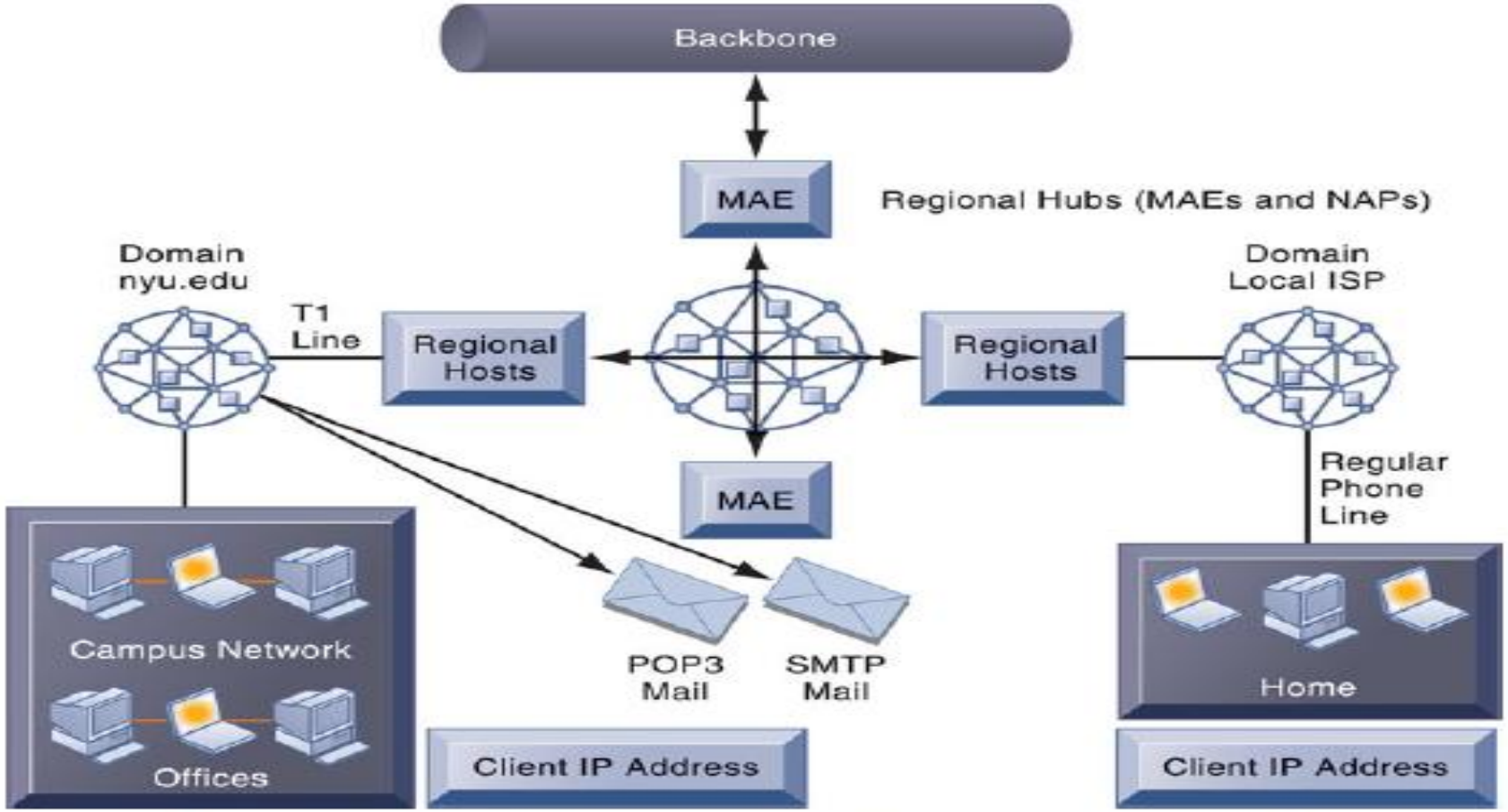
Internet data traffic is **carried over transcontinental high-speed backbone networks** that generally operate today in the range of 45 Mbps to 2.5 Gbps.

These trunk lines are typically owned by long-distance telephone companies (called *network service providers*) or by national governments.

Local connection lines are owned by regional telephone and cable television companies in the United States that connect retail users in homes and businesses to the Internet. **The regional networks lease access to ISPs, private companies, and government institutions.**

Each organization pays for its own networks and its own local Internet connection services, a part of which is paid to the long-distance trunk line owners. Individual Internet users pay ISPs for using their service, and they generally pay a flat subscription fee, no matter how much or how little they use the Internet.

FIGURE 7-9 INTERNET NETWORK ARCHITECTURE



The Internet backbone connects to regional networks, which in turn provide access to Internet service providers, large firms, and government institutions. Network access points (NAPs) and metropolitan-area exchanges (MAEs) are hubs where the backbone intersects regional and local networks and where backbone owners connect with one another.

THE FUTURE INTERNET: IPV6 AND INTERNET2

The Internet was not originally designed to handle the transmission of massive quantities of data and billions of users. Because many corporations and governments have been given large blocks of millions of IP addresses to accommodate current and future workforces, and because of sheer Internet population growth, the world will run out of available IP addresses using the existing addressing convention by 2012 or 2013.

Under development is a new version of the IP addressing schema called Internet Protocol version 6 (IPv6), which contains 128-bit addresses (2 to the power of 128), or more than a quadrillion possible unique addresses

Internet2 and Next-Generation Internet (NGI) are consortia representing 200 universities, private businesses, and government agencies in the United States that are working on a new, robust, high-bandwidth version of the Internet. They have established several new high-performance backbone networks with bandwidths reaching as much as 100 Gbps.

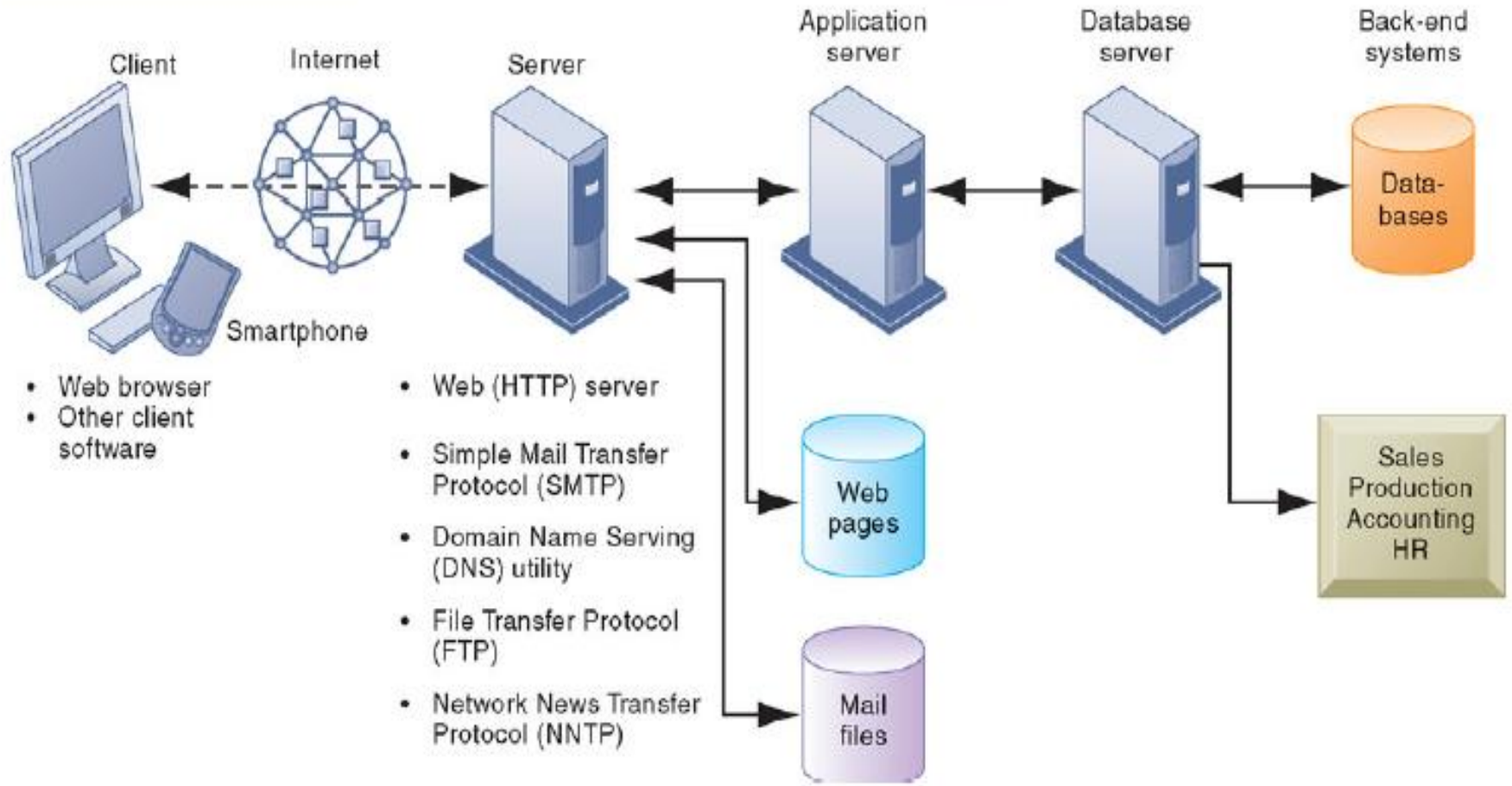
Internet2 research groups are developing and implementing new technologies for more effective routing practices; different levels of service, depending on the type and importance of the data being transmitted; and advanced applications for distributed computation, virtual laboratories, digital libraries, distributed learning, and teleimmersion.

These networks do not replace the public Internet, but they do provide test beds for leading-edge technology that may eventually migrate to the public Internet.

MAJOR INTERNET SERVICES

CAPABILITY	FUNCTIONS SUPPORTED
E-mail	Person-to-person messaging; document sharing
Chatting and instant messaging	Interactive conversations
Newsgroups	Discussion groups on electronic bulletin boards
Telnet	Logging on to one computer system and doing work on another
File Transfer Protocol (FTP)	Transferring files from computer to computer
World Wide Web	Retrieving, formatting, and displaying information (including text, audio, graphics, and video) using hypertext links

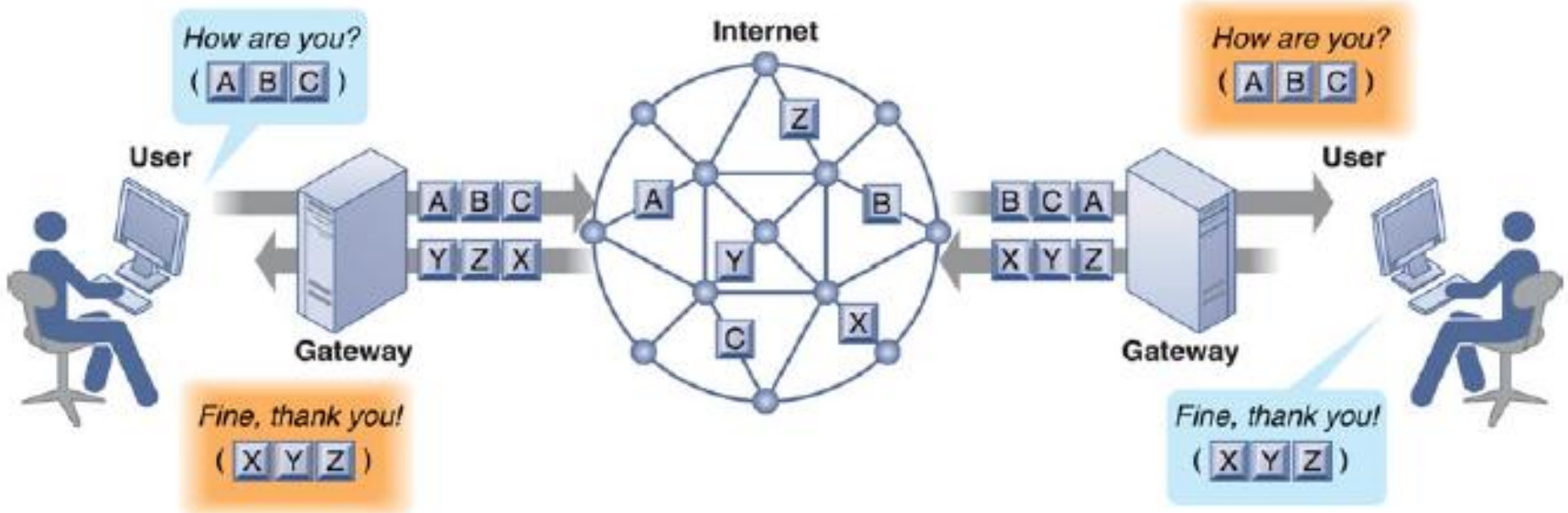
FIGURE 7-10 CLIENT/SERVER COMPUTING ON THE INTERNET



Client computers running Web browser and other software can access an array of services on servers over the Internet. These services may all run on a single server or on multiple specialized servers.

Voice over IP

FIGURE 7-11 HOW VOICE OVER IP WORKS



An VoIP phone call digitizes and breaks up a voice message into data packets that may travel along different routes before being reassembled at the final destination. A processor nearest the call's destination, called a gateway, arranges the packets in the proper order and directs them to the telephone number of the receiver or the IP address of the receiving computer.

The Internet has also become a popular platform for voice transmission and corporate networking.

Voice over IP (VoIP) technology **delivers voice information in digital form using packet switching, avoiding the tolls charged by local and long-distance telephone networks**.

Calls that would ordinarily be transmitted over public telephone networks travel over the corporate network based on the Internet Protocol, or the public Internet.

Voice calls can be made and received with a computer equipped with a microphone and speakers or with a VoIP-enabled telephone.

Skype offers free VoIP worldwide using a peer-to-peer network, and Google has its own free VoIP service.

Lowering long-distance costs and eliminating monthly fees for private lines, an IP network provides a single voice-data infrastructure for both telecommunications and computing services. Companies no longer have to maintain separate networks or provide support services and personnel for each different type of network.

UNIFIED COMMUNICATIONS

In the past, each of the firm's networks for **wired and wireless data, voice communications, and videoconferencing operated independently** of each other and had to be managed separately by the information systems department.

Now, however, firms are **able to merge these diffrenent communications modes into a single universally accessible service using unified communications technology**. **Unified communications** ***integrates disparate*** channels for voice communications, data communications, instant messaging, e-mail, and electronic conferencing into a single experience where users can seamlessly switch back and forth between different communication modes.

VIRTUAL PRIVATE NETWORKS

What if you had a marketing group charged with developing new products and services for your firm with members spread across the United States?

You

would want to be able to e-mail each other and communicate with the home

office without any chance that. ***outsiders could intercept the communications***

In the past, one answer to this problem was to work with large private networking firms who offered secure, private, dedicated networks to customers. But this was an expensive solution.

A much less-expensive solution is to create a virtual private network within the public Internet

SOLUTION: USE VPN

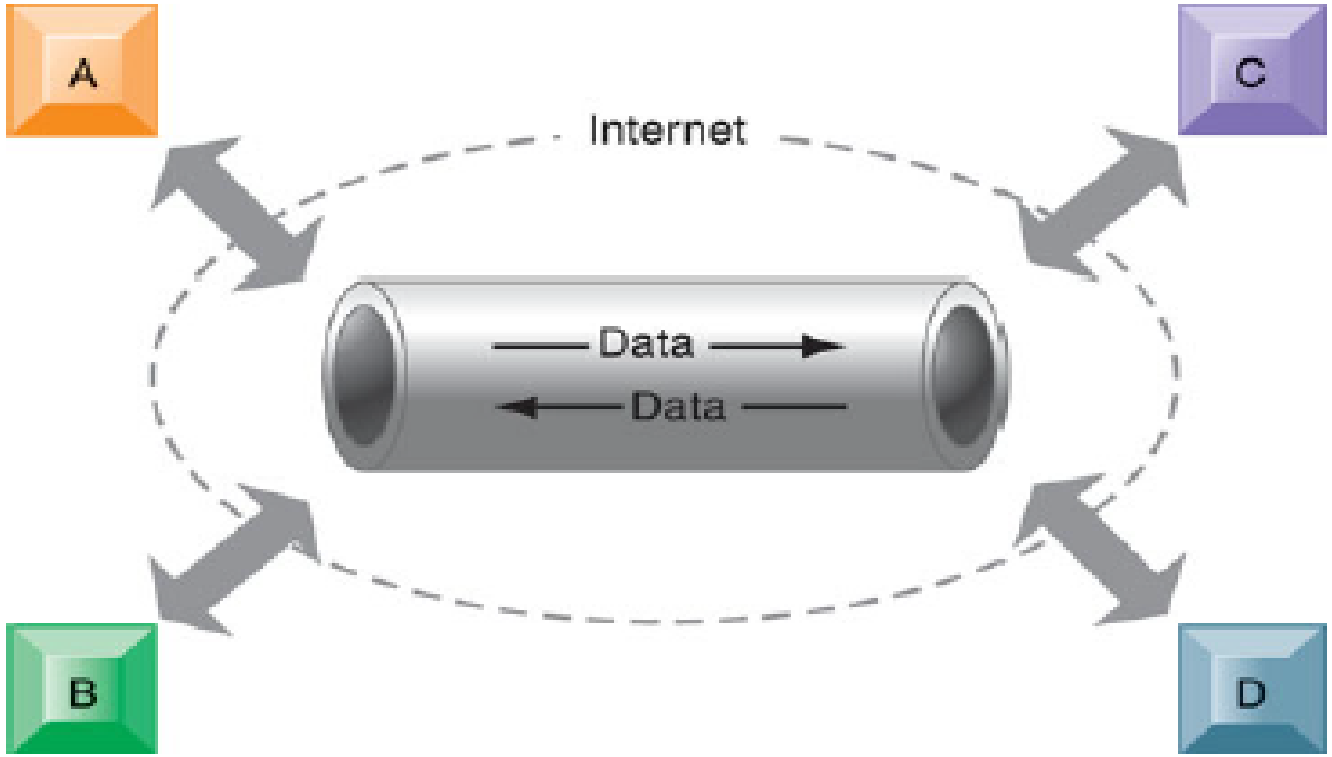
A **virtual private network (VPN)** is a secure, encrypted, private network that has been configured within a public network to take advantage of the economies of scale and management facilities of large networks, such as the Internet .

A VPN provides your firm with secure, encrypted communications at a much lower cost than the same capabilities offered by traditional non-Internet providers who use their private networks to secure communications.

VPNs also provide a network infrastructure for combining voice and data networks.

Several competing protocols are used to protect data transmitted over the public Internet, including *Point-to-Point Tunneling Protocol (PPTP*). In a process called tunneling, packets of data are encrypted and wrapped inside IP packets. By adding this wrapper around a network message to hide its content, business firms create a private connection that travels through the public Internet.

FIGURE 7-12 A VIRTUAL PRIVATE NETWORK USING THE INTERNET



This VPN is a private network of computers linked using a secure "tunnel" connection over the Internet. It protects data transmitted over the public Internet by encoding the data and "wrapping" them within the Internet Protocol (IP). By adding a wrapper around a network message to hide its content, organizations can create a private connection that travels through the public Internet.

WWW

HTML

HTTP

URL

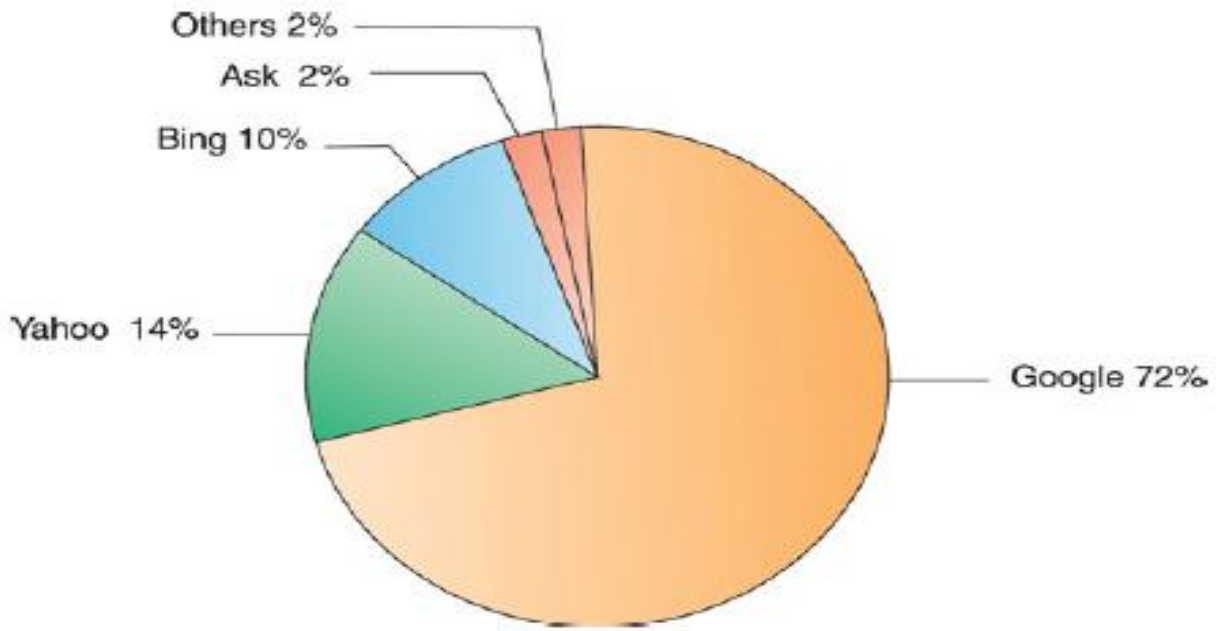
Web servers

Searching for information on the web:-

Search engines.

How Google works? (self study components): IMP.

FIGURE 7-14 TOP U.S. WEB SEARCH ENGINES



Google is the most popular search engine on the Web, handling 72 percent of all Web searches.

Sources: Based on data from SeoConsultants.com, August 28, 2010.

Intelligent Agent Shopping Bots describes the capabilities of software agents with built-in intelligence that **can gather or filter information and perform other tasks to assist users.**

Shopping bots use intelligent agent software for searching the Internet for shopping information. Shopping bots such as MySimon or Google Product Search can help people interested in making a purchase filter and retrieve information about products of interest, evaluate competing products according to criteria the users have established, and negotiate with vendors for price and delivery terms.

Many of these shopping agents search the Web for pricing and availability of products specified by the user and return a list of sites that sell the item along with pricing information and a purchase link.

DIFFERENCE BETWEEN WEB 1.0 AND WEB 2.0

Web 1.0 did not allow Web users to add or modify information contained in Web sites. Users only had the ability to use Web sites to gather information. The Web 2.0 environment allows Web site visitors to make contributions and changes to existing Web content and to interact with other members of those Web sites.

WEB 2.0

Today's Web sites don't just contain static content—they enable people to collaborate, share information, and create new services and content online.

These second-generation interactive Internet-based services are referred to as Web 2.0. If you have shared photos over the Internet at Flickr or another photo site, posted a video to YouTube, created a blog, used Wikipedia, or added a widget to your Facebook page, you've used some of these Web 2.0 services.

Web 2.0 has four defining features: interactivity, real-time user control, social participation (sharing), and user-generated content.

The technologies and services behind these features include cloud computing, software mashups and widgets, blogs, RSS, wikis, and social networks.

WIKI DEFINATIONS

Definition
Web widget
“ A web widget is a portable chunk of code that can be installed and executed within any separate HTML-based web page by an end user without requiring additional compilation.
They are akin to plugins or extensions in desktop applications. Other terms used to describe a Web Widget include Gadget, Badge, Module, Capsule, Snippet, Mini and Flake.” (Web widget, Wikipedia, retrieved 19:58, 14 May 2007 (MEST)).

Client-side web applications, or widgets, are typically self-contained applications for displaying and updating remote data, packaged in a way to allow a single download and installation on a client machine or mobile device

Mashup

“ These Web applications are a type of a situation application that yield a new utility by **seamlessly combining content from two or more sources or disparate components with new behavior to form a new, integrated Web application**. A mash-up is the application artifact resulting from the assembly of information-rich widgets

If you want know more then type “**top ten widget and mashup in web 2.0**” in google.

A **blog**, the popular term for a Weblog, is a personal Web site that typically **contains a series of chronological entries (newest to oldest) by its author, and links to related Web pages**. The blog may include a *blogroll* (a collection of links to other blogs) and *trackbacks* (a list of entries in other blogs that refer to a post on the first blog). Most blogs allow readers to post comments on the blog entries as well. The act of creating a blog is often referred to as "blogging." Blogs are either hosted by a third-party site such as Blogger.com, LiveJournal.com, TypePad.com, and Xanga.com, or prospective bloggers can download software such as Movable Type to create a blog that is housed by the user's ISP.

If you’re an avid blog reader, you might use RSS to keep up with your favourite blogs without constantly checking them for updates. **RSS, which stands for Rich Site Summary. RSS technology pulls specified content from Web sites and feeds it automatically to users’ computers, where it can be stored for later viewing.**

Wikis, in contrast, are collaborative Web sites where visitors can add, delete, or modify content on the site, including the work of previous authors. Wiki comes from the Hawaiian word for "quick." Wiki software typically provides a template that defines layout and elements common to all pages, displays user-editable software program code, and then renders the content into an HTML-based page for display in a Web browser. Some wiki software allows only basic text formatting, whereas other tools allow the use of tables, images, or even interactive elements, such as polls or games. Most wikis provide capabilities for monitoring the work of other users and correcting mistakes.

Social networking sites enable users to build communities of friends and professional colleagues. Members each typically create a "**profile**," a Web page for posting photos, videos, MP3 files, and text, and then share these profiles with others on the service identified as their "friends" or contacts. Social networking sites are highly interactive, offer real-time user control, rely on user-generated content, and are broadly based on social participation and sharing of content and opinions. Leading social networking sites include Facebook, MySpace (with 500 million and 180 million global members respectively in 2010), and LinkedIn (for professional contacts).

WEB 3.0: THE FUTURE WEB

Every day about 110 million Americans enter 500 million queries search engines. How many of these 500 million queries produce a meaningful result (a useful answer in the first three listings)? **Arguably, fewer than half.**

Google, Yahoo, Microsoft, and Amazon are all trying to increase the odds of people finding meaningful answers to search engine queries.

In other words, it's hit and miss.

To a large extent, the future of the Web involves developing techniques to make searching the 100 billion public Web pages more productive and meaningful for ordinary people.

"Web 1.0 solved the problem of obtaining access to information. Web 2.0 solved the problem of sharing that information with others, and building new Web experiences."

" Web 3.0 is the promise of a future Web where all this digital information, all these contacts, can be woven together into a single meaningful experience."

WEB 3.0:SEMANTIC WEB

"*Semantic" refers to meaning*.

Most of the Web's content today is designed *for humans to read and for computers to display,* not for computer programs to analyze and manipulate.

Search engines can discover when a particular term or keyword appears in a Web document, but they do not really understand its meaning or how it relates to other information on the Web.

You can check this out on Google by entering two searches. First, enter "Paris Hilton". Next, enter "Hilton in Paris". Because Google does not understand ordinary English, it has no idea that you are interested in the Hilton Hotel in Paris in the second search. Because it cannot understand the meaning of pages it has indexed,

"Google's search engine returns the most popular pages for those queries where "Hilton" and "Paris" appear on the pages."

First described in a 2001 *Scientific American* article, ***the Semantic Web is a collaborative effort led by the World Wide Web Consortium to add a layer of meaning atop the existing Web to reduce the amount of human involvement in searching for and processing Web information.***

Other complementary trends leading toward a future Web 3.0 include more widespread use of cloud computing and SaaS business models, ubiquitous connectivity among mobile platforms and Internet access devices, and the transformation of the Web from a network of different applications and content into a more seamless and interoperable whole. These more modest visions of the future Web 3.0 are more likely to be realized in the near term.

In a Semantic Web 3.0 environment, you would be able to **coordinate this change in plans with the schedules of your tennis buddies, the schedule of your movie friend**, and make a reservation at the restaurant all with a single set of commands issued as text or voice to your handheld smartphone.

Work proceeds slowly on making the Web a more intelligent experience, in large part because it is difficult to make machines, including software programs, that are truly intelligent like humans. But there are other views of the future Web. **Some see a 3-D Web where you can walk through pages in a 3-D environment.**

WIRELESS SENSOR NETWORKS

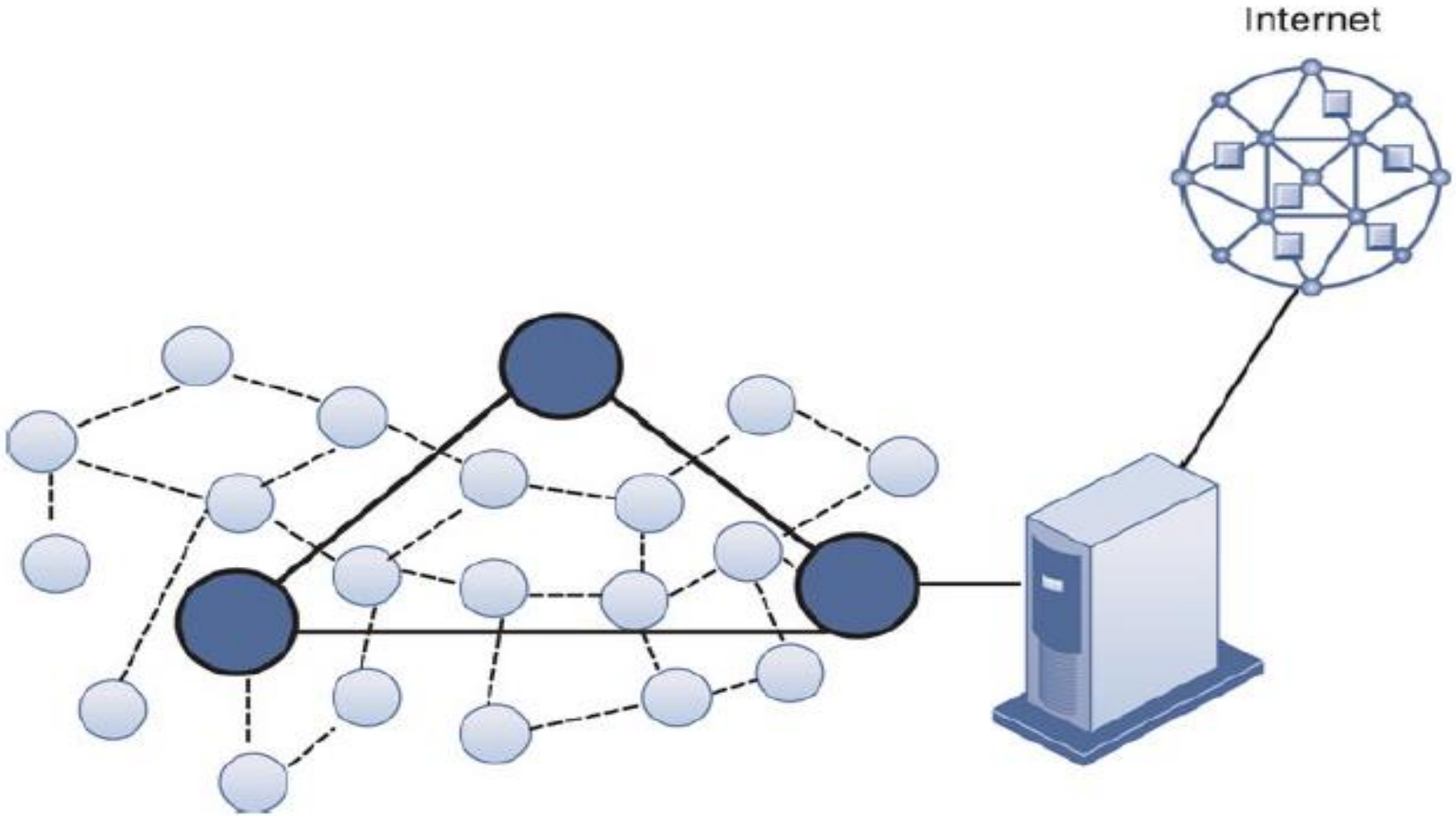
To **monitor building security or detect hazardous substances in the air, it might deploy a wireless sensor network.**

Wireless sensor networks (WSNs) are networks of interconnected wireless devices that are embedded into the physical environment to provide measurements of many points over large spaces.

These devices have **built-in processing, storage, and radio frequency sensors and antennas.**

They are linked into an interconnected network that ***routes the data they capture to a computer for analysis.***

These networks range from hundreds to thousands of nodes. Because wireless sensor devices are placed in the field for years at a time without any maintenance or human intervention, they ***must have very low power requirements and batteries capable of lasting for years.***



The small circles represent lower-level nodes and the larger circles represent high-end nodes. Lower-level nodes forward data to each other or to higher-level nodes, which transmit data more rapidly and speed up network performance.

WSN IN MIS + IT

Wireless sensor networks are valuable in areas such ***as monitoring environmental changes, monitoring traffic or military activity, protecting property, efficiently operating and managing machinery and vehicles, establishing security perimeters, monitoring supply chain management, or detecting chemical, biological, or radiological material***

RADIO FREQUENCY IDENTIFICATION (RFID)

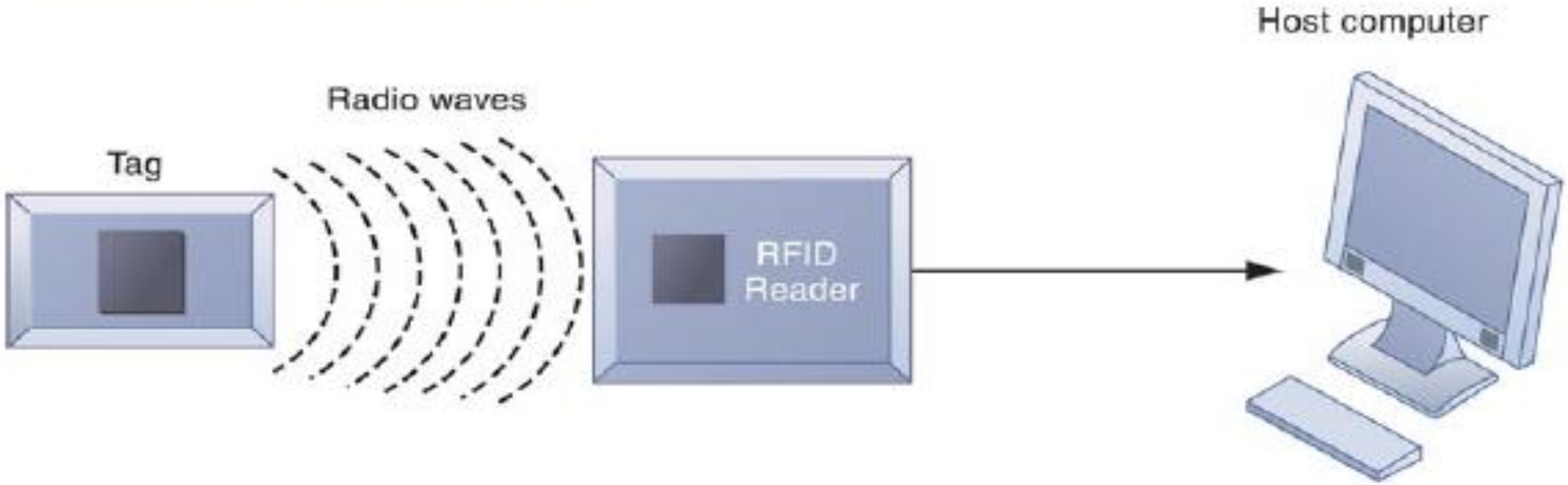
Radio frequency identification (RFID) systems provide a powerful technology for **tracking the movement of goods throughout the supply chain**. RFID systems use **tiny tags with embedded microchips containing data about an item and its location to transmit radio signals over a short distance to RFID readers**. The RFID readers then pass the data over a network to a computer for processing.

RFID tags do not need line-of-sight contact to be read

The **reader unit consists of an antenna and radio transmitter with a decoding capability attached to a stationary or handheld device**. The reader emits radio waves in ranges anywhere from 1 inch to 100 feet, depending on its power output, the radio frequency employed, and surrounding environmental conditions.

When **an RFID tag comes within the range of the reader, the tag is activated and starts sending data. The reader captures these data, decodes them, and sends them back over a wired or wireless network** to a host computer for further processing

FIGURE 7-17 HOW RFID WORKS



RFID uses low-powered radio transmitters to read data stored in a tag at distances ranging from 1 inch to 100 feet. The reader captures the data from the tag and sends them over a network to a host computer for processing.

WIRELESS COMPUTER NETWORKS AND INTERNET ACCESS

Cellular network standards and generations

Bluetooth(802.15/10 meters range/8 devices)

Wifi(802.11a/b/g/n)

Wi Max (good w.r.t to distance/bandwidth/perfomance)

Case study: Monitoring employees on n/w: unethical or good business. (IMP) and will be completed in TUT hours