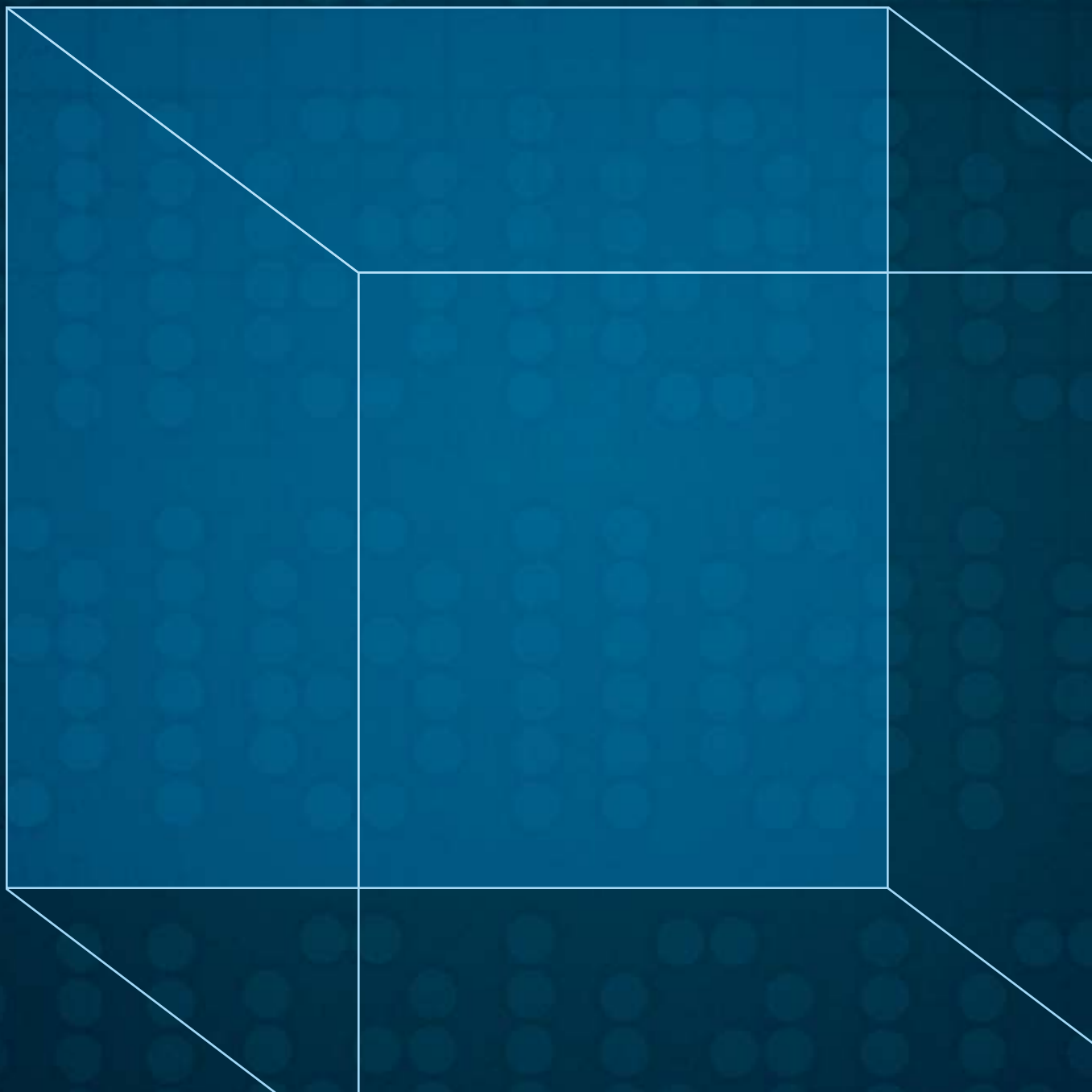
PEARSON NEW INTERNATIONAL EDITION

Computers Are Your Future
Complete

Catherine LaBerta

Twelfth Edition



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AC alternating current

ACCS Alternative Computer Control System

ACM Association for Computing Machinery

ADC analog-to-digital converter

ADSL asymmetric digital subscriber line

AES Advanced Encryption Standard

AFIS Automated Fingerprint Identification System

AGP accelerated graphics port

AIM AOL Instant Messenger

AJAX asynchronous JavaScript and XML

ALU arithmetic logic unit

ARPANET Advanced Research Projects Agency Network

ASCII American Standard Code for Information Interchange

ASIMO Advance Step in Innovative Mobility

ASIS&T American Society for Information Science and Technology

ASP application service provider

ATM asynchronous transfer mode

ATS application tracking system

AUP acceptable use policies

AVI Audio Video Interleave

AWC Association for Women in Computing

B2B business-to-business

B2C business-to-consumer

BCP business continuity plan

BD Blu-ray disc

BDA Blu-ray Disc Association

BD-R Blu-Ray disc-recordable

BD-RE Blu-Ray disc rewritable

BD-ROM Blu-Ray disc ROM

BIOS basic input/output system

BLOB binary large object

BMP Windows Bitmap

BMS Bristol-Myers Squibb

BOINC Berkeley Open Infrastructure for Network Computing

BPM business process management

BPR business process reengineering

Bps bits per second

BRB be right back

BSA Business Software Alliance

BVA Bionic Vision Australia

C2C consumer-to-consumer

CAD computer-aided design

CAN campus area network

CASE computer-aided software engineering

cat-5 category 5

cat-5e category 5 enhanced

cat-6 category 6

CAVE Cave Automated Virtual Environment

CBE computer-based education

CBT computer-based training

CCD charge-coupled device

CCIE Cisco Certified Internetwork Expert

CCNA Cisco Certified Network Associate

CCRC Crimes Against Children Research Center

CDMA code division multiple access

CD-R compact disc-recordable

CD-ROM compact disc ROM

CD-RW compact disc-rewritable

CES Consumer Electronics Show

CIO chief information officer

CIPA Children's Internet Protection Act

CIS computer information systems

CLA Novell Certified Linux Administrator

CMOS complementary metaloxide semiconductor

CO central office

CPSR Computer Professionals for Social Responsibility

CPU central processing unit

CRISP-DM CRoss Industry Standard Process for Data Mining

CRM customer relationship management

CRT cathode ray tube

CS computer science

CSO chief security officers

CSS cascading style sheets

DAC digital-to-analog converter

DARPA Defense Advance Projects Research Agency

DBMS database management system

DBS direct broadcast satellite

DC direct current

DDOS disturbed denial of service attack

DFD data flow diagram

DHS U.S. Department of Homeland Security

DIMM dual inline memory module

DLCI data link control/connection identifier

DLP digital light processing

DMA Direct Marketing Association

DNS domain name service

DoS denial of service attack

DSL digital subscriber line

DSS decision support system

DVD digital video disc

DVD-R digital video disc-recordable

DVD-ROM digital video disc-ROM

DVD-RW digital video disc-rewritable

DVI digital video interface port

DVR digital video recorder

EAI enterprise application integration

EB exabyte

EBCDIC Extended Binary Coded Decimal Interchange Code

ECMA European Computer Manufacturers Association

EDI electronic data exchange

EE electrical engineering

EEPROM electrically erasable programmable ROM

EFF Electronic Frontier Foundation

EIS executive information system

EMPT electromagnetic pulse transformer

EPA Environmental Protection Agency

EPROM electrically programmable ROM

EPS Encapsulated PostScript

ERD entity-relationship diagram

ERP enterprise resource planning

ES expert system

ESS executive support system

EU European Union

f2f face-to-face

FAQ frequently asked questions

FAT file allocation table

FBI Federal Bureau of Investigation

FCC Federal Communications Commission

FCRA Fair Credit Reporting Act

FDIC Federal Reserve System and Federal Deposit Insurance Corporation

FED field-emission display

FERPA Family Educational Rights and Privacy Act

FFIEC U.S. Federal Financial Institutions Examination Council

FiOS fiber-optic service

FOLED flexible OLED displays

fps frames per second

FPU floating point unit

FTC Federal Trade Commission

FTP File Transfer Protocol

FTTH fiber-to-the-home

GB gigabyte

Gbps gigabits per second

GHz gigahertz

GIF Graphics Interchange Format

gigaPOP gigabits per second point of presence

GMSC gateway mobile switching center

gMUD graphical MUD

GPL General Public License

GPS Global Positioning System

GUI graphical user interface

GUID global unique identifier

HAN home area network

HaaS Hardware-as-a-Service

HD high-definition video

HDMI high-definition multimedia interface

HDR high dynamic range

HDSL high bit-rate DSL

HDTV high-definition TV

HERF high-energy radio frequency

HHD hybrid hard drive

HIPAA Health Insurance Portability and Privacy Act

HMD head-mounted display

HP Hewlett-Packard

HTML Hypertext Markup Language

HTTP Hypertext Transfer Protocol

HTTPS Hypertext Transfer Protocol Secure

Hz hertz

IaaS Infrastructure-as-a-Service

IC integrated circuit

IC3 Internet Crime Complaint Center

ICANN Internet Corporation for Assigned Names and Numbers

ICC integrated circuit card

ICCP Institute for Certification of Computing Professionals

ICE Intercity Express

IDC International Data Corporation

IDE integrated development environment

IE Internet Explorer

IEEE Institute of Electrical and Electronics Engineers

IGDA International Game Developers Association

IIS Microsoft's Internet Information Services

IM instant messaging

IMDB Internet Movie Database

I/O input/output

IP Internet Protocol

IPI Institution for Policy Innovation

IR infrared

IRC Internet relay chat

IrDA infrared data association

IRQ interrupt request

IRS Internal Revenue Service

IRU indoor receive unit

IS information systems

ISA Industry standard architecture

ISDN Integrated Services Digital Network

ISO International Organization for Standardization

ISP Internet service provider

IT information technology

ITU indoor transmit unit

JAD joint application development

JPEG Joint Photographic Experts Group

JSON JavaScript Object Notation

KB kilobyte

Kbps kilobits per second or thousand bits per second

KMS knowledge management system

LAN local area network

LCD liquid crystal display

LED light-emitting diode

LOL laughing out loud

MAC media access control

MAN metropolitan area network

MB megabyte

Mbps megabits per second or million bits per second

MCITP Microsoft Certified IT Professional

MCSA Microsoft Certified Systems Administrator

MCSE Microsoft Certified Systems Engineer

MCTS Microsoft Certified Technology Specialist

MIDI Musical Instrument Digital Interface

MIS management information system

MMDS multichannel multipoint distribution service, sometimes called multipoint microwave distribution system

MMPORG massively multiplayer online role-playing game

MMS multimedia messaging service

MPEG Moving Picture Experts Group

MSC mobile switching center

MUD multiuser dungeon

N.O.C. Network Operations Centre

NAP network access point

NAS network attached storage

NET No Electronic Theft Act

NIC network interface card

NOS Network operating system

NSA National Security Agency

NSP network service provider

NTFS new technology file system

OCR optical character recognition

ODBMS object-oriented database management systems

ODC Open Database Connectivity

OLAP online analytical processing

OLPC One Laptop per Child initiative

OMR optical mark reader

OO object-oriented

OOP object-oriented programming

OS operating system

OSI open system interconnection

OSP online service provider

OSS operational support system

P2P peer-to-peer network

PaaS Platform-as-a-Service

PAN personal area network

PARC Xerox Palo Alto Research Center

PB petabyte

PBX private branch exchange

PC personal computer

PCI peripheral component interconnect

PCMCIA Personal Computer Memory Card International Association

PCS personal communication service

PDA personal digital assistant

PDL page-description language

PDLC program development life cycle

PDN public data network

PGP Pretty Good Privacy

PIM personal information manager

PIN personal identification number

PKI public key infrastructure

PNG portable network graphics

PnP plug-and-play

PoP point of presence

POP Post Office Protocol

POS point-of-sale

POST power-on self-test

POTS plain old telephone service

ppm pages per minute

Pro-IP Prioritizing Resources and Organization for Intellectual Property Act

PROM programmable ROM

PSTN public switched telephone network

PUE power usage effectiveness

RAD rapid application development

RAID redundant array of independent disks

RAM random access memory

RDBMS relational database management system

RF radio frequency

RFIC Radio Frequency Integrated Circuit

RFID radio frequency identification device

RFP request for proposal

RFQ request for quotation

RHCE Red Hat Certified Engineer

ROI region of interest or return on investment

RSI repetitive strain injuries

ROM read-only memory

RSS Really Simple Syndication (or Rich Site Summary)

RUN Responsible Use of the Network Working Group

SaaS Software-as-a-Service

SAN storage area network

SATA serial advance technology attachment

SATAIO Serial ATA International Organization

SCJD Sun Certified Java Developer

SCJP Sun Certified Java Programmer

SCSI small computer system interface ports

SD standard definition

SDH synchronous digital hierarchy

SDLC systems development life cycle

SDMC Standard Duplicating Machines Corporation

SDSL symmetrical digital subscriber line

SEC Securities and Exchange Commission

SET secure electronic transfer

SETI Search for Extraterrestrial Intelligence

SFA sales force automation

SIIA Software & Information Industry Association

SIMM single inline memory module

SLC subscriber loop carrier

SLR single-lens reflex digital camera

SMDS switched multimegabit data service

SMIL Synchronized Multimedia Integration Language

SMS short messaging service, better known as text messaging

SOHO small office–home office

SONET synchronous optical network

SOX Sarbanes-Oxley

SPOF single point of failure

SQL structured query language

SSCP Systems Security Certified Practitioner

SSD solid-state drive

STOP SOMA Terror Organization Portal

SVGA super video graphics array

SXGA super extended graphics array

SYN synchronization

TB terabyte

TCO total cost of ownership

TCP Transmission Control Protocol

TCP/IP Transmission Control Protocol/Internet Protocol

TDWI The Data Warehousing Institute

TFT active matrix (thin film transistor)

TLD top-level domain

TPS transaction processing system

UM exchange unified messaging

UML Unified Modeling Language

UPC Universal Product Code

UPS uninterruptable power supply

URL Uniform Resource Locator

USB universal serial bus

US-CERT United States Computer Emergency Readiness Team

USDA Department of Agriculture

UXGA ultra extended graphics array

UV ultraviolet

VAN value-added network

VAR value-added reseller

VB Visual Basic

VDSL very high bit-rate DSL

VGA video graphics array

VM Java virtual machine

VOD video-on-demand

VoIP Voice over Internet Protocol

VPN virtual private network

VR virtual reality

VRML Virtual Reality Modeling Language

W3C World Wide Web Consortium

WAN wide area network

WAP Wireless Application Protocol

WBT Web-based training

WEP Wired Equivalent Privacy

WiMAX worldwide interoperability for microwave access

WITI Women in Technology International

WMA Windows Media Audio

WML Wireless Markup Language

WOW World Organization of Webmasters

WPA WiFi Protected Access

WSXGA+ Widescreen Super Extended Graphics Array Plus

WUXGA Widescreen Ultra Extended Language

WXGA+ Widescreen Extended Graphics Array plus

WWW World Wide Web

XBRL Extensible Business Reporting Language

XGA Extended Graphics Array

XHTML Extensible Hypertext Markup Language

XML Extensible Markup Language

XP Extreme Programming

YB yottabyte

ZB zettabyte

Glossary

Glossary

1394 port An interface that offers high-speed connections for peripherals. It is ideal for real-time devices like digital video cameras. In an Apple computer, the 1394 port is called the FireWire port.

1G First generation of cellular technology, which used analog signals and allowed callers to make their own calls without operator assistance as they move seamlessly from cell to cell.

2G Second-generation cellular technology that quickly replaced most analog cellular services due to its use of digital signaling. Features of this generation were decreased signal interference, increased reception, better protection from eavesdropping, and increased security features that decreased cell phone fraud.

3G Third-generation cellular technology that offers faster data transmission; greater network capacity; more advanced network services; and transmission of voice, text, images, and video data.

4G Fourth-generation cellular technology, which is currently being rolled out, promises higher data transfer rates, as well as providing voice, data, and high-quality multimedia in real-time (streamed) format all the time from anywhere.

A

Accelerated Graphics Port (AGP) An interface, currently being phased out that is used to transfer graphics from the video card to the motherboard.

acceptable use policy A code of conduct created by colleges or employers that provides guidance for students and employees when dealing with ethical and legal dilemmas.

acceptance testing Testing in which users evaluate a system to see whether it meets their needs and functions correctly.

access time In secondary storage devices, the amount of time it takes a device to access information, from the request for the information to the delivery of that information.

account A record on multiuser systems that consists of a user's name, password, and storage space location, which is called the user's folder or user's directory. Accounts are usually set up and managed by a server/computer administrator.

active badge A small device, worn by an individual, that transmits a unique infrared signal every 5 to 10 seconds. Networked sensors detect these transmissions and the location of the badge—and hence the location of its wearer—allowing e-mail, phone calls, or messages to be forwarded.

active-matrix (thin film transistor [TFT]) A form of LCD display in which electric current drives the display by charging each pixel individually as needed.

ActiveX control A miniprogram that can be downloaded from a Web page and used to add functionality to a Web browser. ActiveX controls require Microsoft Windows and Microsoft Internet Explorer and are written in Visual Basic (VB).

Ada A programming language, named after Augusta Ada Byron, that incorporates modular programming principles. It was the required language for most U.S. Department of Defense projects until 1996 because of its suitability for the reliable control of real-time systems (such as missiles).

address bar (breadcrumb bar) Used for navigation, the address bar displays the route you've taken to get to the current location. It may or may not correspond with a file's path name.

ADSL (asymmetrical digital subscriber line) A transmission technology that separates an ordinary copper telephone line into three separate data channels with different capacities and speeds. The lowest capacity transmits analog voice for telephones; the second, medium capacity, uploads data to the network; and the third, highest capacity, downloads data from the network. This means that ADSL connections upload more slowly than they download.

adware Software similar to spyware, which is usually installed on your computer through the Internet without your knowledge or consent. Adware is created specifically by an advertising agency to collect information about Internet habits or encourage the purchase of a product. It is usually considered a nuisance rather than malicious.

aggregator A Web site that interacts with RSS feeds. It remembers your subscription list, checks each site on a regular basis, alerts you if new information has been published, and organizes the results for you. Many RSS aggregators are available through your browser and are either updated manually, such as the Drudge Report, or through the use of algorithms, as is the case with Google News.

Agile Refers to a group of software development methodologies based on an iterative project management process that aligns development with customer needs and company goals. It describes the development of solutions through collaboration between functional teams.

Agile software development See Agile.

AJAX Sometimes written as Ajax (shorthand for asynchronous JavaScript and XML). A group of interrelated Web development techniques used on the client-side to create interactive Web applications. AJAX is not a technology in itself, but a term that refers to the use of a group of technologies.

algorithm A series of steps that results in the solution to a problem.

all-in-one computer A compact version of a desktop computer, designed for individual use that combines the system unit and monitor into one component. Its smaller size suits cubicle layouts and apartments.

alphabetic check A data validation procedure that ensures that only alphabetic data (the letters of the alphabet) are entered into a database field.

analog signal Real-world signals, like sound and light, sent via continuous waves that vary in frequency and amplitude. It is the signal sent and received over phone lines.

analog-to-digital converter (ADC) A microchip that contains the circuitry to convert an analog signal into a digital signal.

Android An operating system developed by Google for mobile devices.

animation The technique involved in tricking the eye into seeing continuous motion, which makes static images appear to move.

anonymity The ability to convey a message without disclosing your name or identity.

anonymous FTP An Internet service that enables you to contact a distant computer system to which you have access rights, log on to its public directories, and transfer files from that computer to your own. These sites lack security and should never be used to send sensitive data.

antivirus software Software that protects a computer from computer viruses by using a pattern-matching technique that examines all of the files on a disk, looking for virus code signatures.

applet In Java, a miniprogram embedded in a Web document that, when downloaded, is executed by the browser. Most major browsers can execute Java applets.

application service provider (ASP) Provides software-based services and solutions to companies that want to outsource some or almost all of their information technology needs.

application software A set of integrated programs that can be thought of as sitting on top of the operating system and that direct the computer's hardware to perform a task for the user.

application testing One of two basic testing methodologies in which programs are tested individually and then together.

application tracking system (ATS) A computer program used as the first level of a job application screening to verify that a job applicant possesses the minimum criteria for a position. The program scans a submitted resume and is set to locate keywords. If a certain percentage of keywords in the resume match the preset scanned list of keywords, the application makes it to the next level.

application window The area on-screen that encloses and displays a launched application and work in progress.

application workspace The on-screen area that displays the document you are currently working on.

archive A single file that contains two or more files stored in a compressed format. An archive is handy for storage as well as file-exchange purposes because as many as several hundred separate files can be stored in a single, easily handled unit.

argument set In spreadsheet programs, such as Microsoft Excel, the part of a mathematical function that contains the parameters or variables that the function needs in order to perform the calculation. Usually the argument set is placed between parentheses.

arithmetic logic unit (ALU) The portion of the central processing unit that performs arithmetic operations, which return numeric values, and logical operations, which return a value of true or false.

arithmetic operation One of two groups of operations performed by the arithmetic logic unit (ALU). The arithmetic operations are addition, subtraction, multiplication, and division. An arithmetic operation returns the value of the operation.

artificial intelligence A computer science field that tries to improve computers by endowing them with some of the characteristics associated with human intelligence, such as the capability to understand natural language and to reason under conditions of uncertainty.

artificial system A system deliberately constructed by people to serve some purpose.

ASCII (American Standard Code for Information Interchange) A standard and widely used computer character set that makes use of seven bits and can represent 128 different characters. It is used on minicomputers, personal computers, and computers that make information available on the Internet.

aspect ratio A value that determines a monitor's quality and resolution; it is calculated by dividing a monitor's width by its height.

assembler A utility program that transforms source code written in assembly language into machine language, which is readable by a microprocessor.

assembly language A low-level, processor-dependent programming language, one level up from machine language, in which each program statement uses mnemonics and decimal values to create instructions that the microprocessor can carry out.

asynchronous communication Communication in which both parties are not necessarily online at the same time, for example, e-mail and text messaging.

attribute An element of an object's definition that describes that object's features.

Audio Video Interleave (AVI) A Microsoft-created specification for packaging audio and video data into a file. AVI makes no guarantee on the content of the package or the codec used to compress it.

authentication (login) The process that requests a user to enter a user name and password into a dialog box to verify that the user is indeed a person authorized to use the computer; also called login.

automation The replacement of human workers by machines and computer-guided robots.

AutoSave (AutoRecover) A software feature that backs up open documents at a default or user-specified interval; also called AutoRecover.

avatar A virtual representation of a player in a game or a person on a social networking site.

B

backbone In a wide area network (WAN), such as the Internet, a high-speed, high-capacity medium that transfers data over hundreds or thousands of miles. A variety of physical media are used for backbone services, including microwave relay, satellites, and dedicated telephone lines.

backdoor A method of bypassing normal authentication to secure access to a computer.

background application From the user's perspective, the application that appears inactive, as indicated by its appearance behind an active application on the desktop, when more than one application is running.

backup A copy of programs, data, and information created in one secondary storage medium that is duplicated to another.

backup procedure Procedures that protect against loss, change, or damage of an organization's data from natural or other disasters. This process usually involves making copies of data files and storing them in secure location.

backup software Programs that copy data from the computer's hard disk to backup devices, such as CDs or DVDs, an external hard drive, or an online storage location.

bad sector Areas of a hard disk that have become damaged and can no longer reliably hold data.

bandwidth The theoretical maximum amount of data that can be transmitted through a given communications channel, like a network, at one time (usually per second).

banner ad On a Web page, an ad that is not actually part of the Web page itself, but is supplied separately by an ad network based on analysis of cookies.

bar code reader A handheld or desktop-mounted device that scans bar codes and, with special software, converts the bar code into readable data.

BASIC An easy-to-use high-level programming language developed in the mid-1960s for instruction and still used in beginning programming classes and by many hobbyists to create simple programs.

batch processing An early transaction processing system whereby data was gathered and processed at periodic intervals, such as once a week.

baud The number of signaling elements per second. At slower rates, bauds and bps may be equal, but on higher speed transmissions, more than one bit can be encoded in each signaling element; thus a 4,800 baud may have a transmission rate of 9,600 bps.

BD-R An optical storage media that that can record high-definition video or PC data storage.

BD-RE An optical storage medium that can record and erase high-definition video or PC data storage.

BD-ROM A standard for storing read-only high-definition computer data on optical discs. It is a format used for video or data distribution.

beans The components of Javabean programming specifications.

beta version In software testing, a preliminary version of a program that is widely distributed before commercial release to users who test the program by operating it under realistic conditions.

binary digit The digits 0 and 1, which are used to represent the Off/On state of a computer switch, the smallest piece of data that a computer can process. In the Off state, current is not flowing through the switch and is represented by the digit 0. In the On state, current is flowing through the switch and is represented by the digit 1.

binary number Strings of binary digits, 0 and 1, which represent the pattern of Off/On current flowing through switches.

biometric authentication A method of authentication that requires a biological scan of some sort, such as a fingerprint, retinal scan, or voice recognition.

biometric input device A device that uses physical or chemical features of an individual's body to provide a unique method of identification.

BIOS (basic input/output system) A set of programs that are part of the system software, permanently encoded on the computer's ROM memory and executed when the system is powered on. They check and initialize such devices as the keyboard, display screens, and disk drives. Many modern systems have flash BIOS,

which is a type of BIOS that makes use of flash memory chips that can be updated by the user if needed.

bit Short for binary digit, a single circuit that either contains a current (represented by the digit 1) or does not contain current (represented by the digit 0). The digits 0 and 1 are the base unit of information in the binary number system. The lowest level of data in a database, the smallest unit of data a computer can store and understand.

bitmapped graphic (raster graphic) An image formed by a pattern of tiny dots, each of which corresponds to a pixel on the computer's display; also called raster graphic.

bitmapped image A representation of an image as a matrix of dots called picture elements (pixels).

blade server Stripped-down, energy-efficient, low-cost modular computers with server software installed.

BLOB (binary large object) A data type for very large objects up to several gigabytes in size, such as an entire spreadsheet file or a picture file.

block A unit of memory on a flash drive.

blog (Web log) Short for Web log. A Web site that contains an online personal journal with reflections, images, comments, and often hyperlinks provided by the writer.

Bluetooth A trademarked personal area network (PAN) technology, conceived by cell phone giant Ericsson and named after a 10th-century Viking. It uses short-range radio transmission technology to provide automatic and wireless communication among computers, mobile phones, printers, PDAs, and other devices located within 30 feet of each other.

Blu-ray Disc (BD) One of the newest forms of optical storage, Blu-ray technology was developed for the management of high-definition video and for storing large amounts of data.

Boolean data type A data type that, depending on the program, allows a yes or no, true or false, or 1 or 0 value.

Boolean search A database or Web search that uses the logical operators AND, OR, and NOT to specify the logical relationship among search words or phrases.

boot disk (emergency disk) A storage device, like a USB drive, CD, DVD, or network device that, in case of an emergency or boot failure, can load a reduced version of the operating system that can be used for troubleshooting purposes; also called an emergency disk.

booting The process of loading the operating system into RAM memory.

boot sector virus A computer virus that copies itself to the beginning tracks of a hard drive where code is stored that automatically executes every time you start the computer. Unlike file infectors, boot sector viruses don't require you to start a specific program to infect your computer; starting your system is sufficient.

Bootstrap Loader A program that locates and loads the operating system into RAM.

bot In a distributed denial of service (DDoS) attack, an automated program that connects the individual computers to the controller, usually a server with some type of real-time activity like Internet Relay Chat, that is under the power of a botnet controller; an abbreviation for robot.

bot herder An individual that controls a botnet.

botnet A set of computers infected with a malicious program that places the computers under the control of a bot herder. Such computers are typically used during a distributed denial of service (DDoS) attack.

bps rate The rate used to measure the exchange of data.

branch prediction A technique used by the central processing unit (CPU) to prevent a pipeline stall. The processor tries to predict what will happen with surprising accuracy.

broadband Refers to any transmission medium that carries several channels at once and thus transports high volumes of data at high speeds, typically greater than 1 Mbps.

browser cache A section of your hard drive in which Web pages visited for the first time are stored. If the user attempts to retrieve the page again, the browser does not go out on the Internet, but instead retrieves the page from the browser's cache. This eliminates excessive roundtrips to the server, brings the page up more quickly on the user's system, and greatly reduces Internet traffic.

buffer An area of RAM memory that temporarily holds data and instruction to make the processing of instructions more fluid.

bug Syntax and logical errors located in a computer program that can cause the program to perform erratically, produce incorrect results, or crash.

build-or-buy decision A decision project teams face when they must determine whether a new system should be developed in-house or purchased from an outside vendor.

business continuity plan (BCP) A comprehensive plan that focuses on long-term or continual problems that might impede success.

business process An activity that has an identifiable output and value to an organization's customers.

business process management (BPM) Evolved from BPR, BPM's goal is to improve existing processes and optimize assets by effectively and efficiently managing the entire life cycle of these business processes.

business process reengineering (BPR) The use of information technology to bring about major organizational changes and cost savings.

business services Services sold to enterprise and business organizations, usually on a subscription basis.

business unit A division of a company, product line, or special focus group whose actions can be planned independently of other business units of the company.

business-to-business e-commerce (B2B) The online exchange or trade of goods, services, or information in which one business provides another business with the materials, services, and/or supplies it needs to conduct its operations.

business-to-consumer e-commerce (B2C) The same experience as shopping at a physical store except the business supplies consumers with services, information, or products online.

bus topology The physical layout of a local area network in which the network cable is a single conduit that forms a bus, or line; every node, whether it is a computer or peripheral device, is attached to that bus. At the ends of the bus, connectors called terminators signify the end of the circuit.

byte A group of eight bits that represents a single character such as the essential numbers (0–9), the basic letters of the alphabet (uppercase and lowercase), and the most common punctuation symbols. Also a unit of capacity for storage devices.

C

C A high-level programming language developed by Bell Labs in the 1970s. C combines the virtues of high-level programming with the efficiency of assembly language but is somewhat difficult to learn.

C++ A flexible high-level programming language derived from C that supports object-oriented programming but does not require programmers to adhere to the object-oriented model.

cable modem A device that enables a computer to access the Internet by means of a cable TV connection. Cable modems enable two-way communications through the cable system and do not require a phone line. Cable modems enable Internet access speeds from 1.5 Mbps to 6 Mbps, although most users typically experience slower speeds due to network congestion.

cache memory A small unit of ultrafast memory built into or near the processor that stores frequently or recently accessed program instructions and data, increasing the computer's overall performance.

call center A centralized computer-based routing system used for the purpose of receiving and transmitting a large volume of requests by telephone.

campus area network (CAN) A network that includes several LANs housed in various locations on a college or business campus. Usually smaller than a WAN, CANs use devices such as switches, hubs, and routers to interconnect.

carpal tunnel syndrome A painful injury caused by repeated motions (such as mouse movements or keystrokes) that damage sensitive nerves in the hands, wrists, and arms. These injuries can become so serious that they may require surgery.

cascading style sheets (CSS) A language embedded within HTML and XHTML that defines the look and formatting of a Web page.

case control structure In structured programming, a variant of the selection control structure, such as an if statement, in which the condition is fundamental. Each branch leads to its own lengthy series of instructions.

Cat-5 (Category 5) Short for Category 5, it's the fifth generation of twisted-pair data communication cable. Cat-5 cable contains four pairs of copper wire and supports speeds up to 100 Mbps over a maximum distance of 100 m (328 feet).

Cat-5e (Category 5 enhanced) Short for Category 5 enhanced, it uses all four wire pairs, enabling speeds up to 1,000 Mbps (1 Gbps) over a short distance. This enhanced medium is backward compatible with ordinary Cat-5.

Cat-6 (Category 6) Short for Category 6, it is the sixth generation of twisted-pair cable and is backward compatible with Cat-5 and Cat-5e. It contains four pairs of copper wire like that of the previous generation, utilizes all four pairs, supports speeds up to 1 gigabit per second (Gbps), expands available bandwidth from 100 MHz for Cat-5e to 200MHz, and has superior immunity from external noise.

Cave Automated Virtual Environment (CAVE) A virtual reality environment, used primarily by gamers, that replaces headsets with 3D glasses and uses the walls, ceiling, and floor to display projected three-dimensional images.

CD drive A read-only storage device that reads data encoded on CD-ROM media discs and transfers the data to the computer's internal memory.

CD-R (compact disc–recordable) Optical storage media that is a "write-once" technology. The data cannot be erased or written over once it has been saved; they're relatively inexpensive.

CD-ROM (compact disc read-only memory) A standard for storing read-only computer data (it cannot be changed or erased) on optical compact discs (CDs), which can be read by CD-ROM drives and DVD-ROM drives. CD-ROM discs can hold up to 700 MB of data.

CD-RW (compact disc–rewritable) An optical storage media that allows data that has been saved to be erased or written over.

CD-RW drive (burner or CD burner) A compact disc–rewritable storage device that provides full read/write capabilities using erasable CD-RWs.

cell 1. In a spreadsheet, the intersection of a column and row. 2. In telecommunications, a limited geographical area in which a signal can be broadcast.

cell address The column letter and row number that identifies a cell usually in a table or spreadsheet.

cell site In a cellular telephone network, an area in which a transmitting station repeats the system's broadcast signals so that the signal remains strong even though the user may move from one cell site to another.

cellular telephone A radio-based wireless computing device that provides widespread coverage through the use of repeating transmitters placed in zones (called cells). The zones are close enough so that signal strength is maintained throughout the calling area.

centralized structure An infrastructure where technology management is centered in the IT department and everyone within the organization works with standardized technology solutions in their everyday work.

central processing unit (CPU; microprocessor or processor) A chip, located on the motherboard within the system unit, that is composed of the control unit and the arithmetic logic unit (ALU). It applies directions received from software to the input data and converts it into information.

certification A skills and knowledge assessment process organized by computer industry vendors (and sometimes by professional associations).

channel In Internet Relay Chat (IRC), a chat group in which as many as several dozen people carry on a text-based conversation on a specific topic. This is dated technology that has been replaced by instant messaging, blogging, wikis, and tweeting.

character The smallest unit of data that an individual can work with, made up of bytes that represent the letters, numbers, and symbols on keyboard keys or key combinations.

character code An algorithm that translates the numerical language of the computer into keyboard characters readable by humans.

character map A comparison chart or lookup table located in a computer's read-only memory (ROM) on the motherboard. The system uses this table to locate the key that was struck on the keyboard and then notifies the processor of the character corresponding to that matrix location.

charged-coupled device (CCD) A photosensitive computer chip that transforms light patterns into pixels (individual dots). A CCD consists of a grid made up of light-sensitive elements. Each element converts the incoming light into a voltage that is proportional to the light's brightness. The digital camera's picture quality is determined by how many elements the CCD has.

chart A graphical representation of numbers that makes it easier to interpret data.

check-screening system A system that reads a check's account number, accesses a database containing delinquent accounts, and compares the account numbers, allowing vendors to catch problematic transactions before they become losses.

chipset A collection of chips, located on the motherboard, that act like a traffic controller and work together to provide the switching circuitry needed by the microprocessor to move data throughout the computer via the microprocessor's system bus.

ciphertext The coded message that results from applying an encryption key to a message.

circuit switching One of two fundamental architectures for a wide area network (WAN), in which high-speed electronic switches create a direct connection between two communicating devices. The telephone system is a circuit-switching network.

class Blueprint or prototype from which objects are made.

clickstream The trail of Web links that you have followed to get to a particular site.

click wheel A variation of the touchpad that looks like a circle and uses a circular motion to move through song lists, movie lists, or photos. The click wheel is the method of navigation on the iPod and the iTouch.

client A desktop, notebook, workstation, terminal, or handheld device that is connected to a network and contains the software that enables it to send requests to a server.

client/server database system A system that incorporates a database server that is accessed through queries input through a user-friendly client program.

client/server network A network system in which individual users, called clients, are connected to each other through a central computer, called a server, which runs special software to enable the network connectivity.

clock speed The speed of the internal clock of a microprocessor that synchronizes and sets the pace of the computer's internal activities, including the movement from one stage of the machine cycle to another.

cloud computing A relatively new subscription-based or pay-per-use service that provides scalable resources and IT services over the Internet. Its power lies in the admission of users to a shared data center containing multi-tenancy applications.

cloud operating system A specially designed operating system created to run on a cloud provider's datacenter. The OS is delivered to subscribers over the Internet or other network. Windows Azure is a cloud operating system.

cluster On a magnetic disk, a storage unit that consists of two or more sectors.

CMOS (complementary metal-oxide semiconductor) Instructions located in read-only-memory (ROM) that control a variety of actions including starting the power-on self test and verifying that other components of the system are functioning correctly. The CMOS configuration should only be altered by an experienced user.

coaxial cable A broadband transmission medium that consists of a center copper wire surrounded by insulation, which is then surrounded by a layer of braided wire. Data travels through the center wire, and the braided wire provides a shield against electrical interference.

COBOL An early, high-level programming language primarily used for business applications.

code The written computer instructions that programmers create.

codec Short for compression/ decompression standard. A standard for compressing and decompressing video information to reduce the size of digitized multimedia files. Popular codecs include MPEG (an acronym for Motion Picture Experts Group), Apple's QuickTime, and Microsoft's AVI.

code of conduct A set of ethical principles often developed by a professional organization, such as the Association for Computing Machinery (ACM).

cold boot Starting a computer that is not already on.

cold site A disaster recovery site that becomes operational once a disaster has occurred. It is typically less expensive than a hot site.

collaboration software A collection of programs that help people share ideas, create documents, and conduct meetings, regardless of location or time zone, through the use of proprietary networks or the Internet.

collaboration tools Applications that help you work in partnership with team members online.

collision The corruption of network data that results when two or more computers transmit to the same network cable at exactly the same time. Networks have means of detecting and preventing collisions.

column In Microsoft Excel and Word, a block of data presented vertically on the screen.

command-line user interface A method of interacting with an operating system that requires the user to type, one line at a time, commands using keywords and specific syntax (rules for entering commands) that tell the OS what to do (such as *format* or *copy*) .

commerce The selling of goods and services with the expectation of making a reasonable profit.

commercial software Copyrighted software that must be purchased. The current trend is to make such software available as an online download or to give the potential customer a trial period. Once the trial period is over, the user can pay for the program directly on the Web site and download their official copy.

communications The high-speed electronic transfer of data or information within and between computers.

communications channel (link) The transmission media on which the message is sent from one location to the next; also referred to as the link).

communication device A hardware device that is capable of converting data into signals that can travel over a physical (wired) or wireless medium, and moving those signals into or out of the computer. These devices, which include modems, routers, switches, hubs, wireless access points, network interface cards, and other computers, also determine efficient data transfer pathways, boost signal strength, and facilitate overall digital communication.

communications device See communication device.

community cloud An extension of a private cloud in which organizations with similar missions share the infrastructure to reduce cost. This variation of the private cloud disperses cost while providing a high level of conformity and security by allowing access only to trusted users. Google's Gov Cloud is an example of a community cloud.

CompactFlash A popular flash memory storage device that can store up to 128 MB of digital camera images.

competitive advantage A condition that gives an organization a superior position over the companies it competes with.

compiler A program that translates source code in a third-generation programming language into instructions in (or close to) a specific computer's machine language

completeness check A data validation procedure that determines whether a required field has been left empty and, if so, prompts the user to fill in the needed data.

composite cloud Evolves when a primary cloud provider offers services that are distributed through another cloud provider.

computer An electronic device that receives data as input, processes that data based on a set of instructions, outputs the results of the processing for the user to review, and stores those results for later use.

computer-aided software engineering (CASE) Software that automates the often tedious task of documenting entity relationships and data flows in a complex new system. Such software includes project management features, data dictionaries, documentation support, and graphical output support; some even automatically generate prototype code.

computer-based training (CBT) A form of education that uses multimedia, animation, and programmed learning to teach new skills with a computer.

computer crime A computer-based activity that violates state, federal, or international laws.

computer ethics A branch of philosophy that deals with computer-related moral dilemmas and defines ethical principles, helping a user to make the morally correct decision in daily computer use.

computer forensics A branch of forensic science that deals with legal evidence found on computers. It is used to find and apprehend criminals.

computer literacy The ability to understand how to use a computer effectively.

computer science (CS) The study of storage, change, and transfer of information. It includes both the theoretical study of algorithms and the practical problems to which they can be applied.

computer security risk Any event, action, or situation—intentional or not—that could lead to the loss or destruction of computer systems or the data they contain.

computer system A collection of related computer components that have been designed to work together smoothly.

computer virus Hidden code that replicates itself by attaching to other programs, files, or e-mail messages, referred to as hosts, and usually carries out unwanted and sometimes dangerous operations.

congestion In a packet-switching network, a performance interruption that occurs when a segment of the network experiences an overload, too much traffic flooding the same network path.

connectivity The ability to link various media and devices, thereby enhancing communication and improving access to information.

connector A physical receptacle located on the system unit or an expansion card that is visible on the outside of the system unit and enables the connection of a cable to the computer's unit. A male connector contains extended pins or plugs that fit into the corresponding female connector.

consistency check A data validation procedure that examines the data typed into two different fields to determine whether they are identical entries.

consumer-oriented services One of two major categories of Software-as-a-Service (SaaS) that offers features like those supplied by Google Apps and Google Docs to the public, either on a subscription basis or, if supported by advertisement, for no cost.

consumer-to-consumer e-commerce (C2C) The online exchange or trade of goods, services, or information between individual consumers. Often C2C e-commerce involves the use of an intermediate site, such as the popular online auction destination eBay.

content The actual text, located between the tags of a markup language, that is to be displayed on a Web page.

content pane (file list) Displayed in the right pane of a Windows Explorer window. It shows the subfolders and files located within the selected folder

contention In a computer network, a problem that arises when two or more computers try to access the network at the same time. Contention can result in

collisions, which can destroy data or require frequent and costly retransmissions.

contention management In a computer network, the use of one of several techniques for managing contention and preventing collisions. A common contention-management technique is to abandon any data that could have been corrupted by a collision.

contextual tab In Microsoft Office applications, a tab that is displayed and provides additional options for editing a selected feature, for example, an image.

continuous backup Programs that automatically create a backup, or duplicate, when a change in a system or a data file occurs.

control module In a program design tool called a structure chart, the top module or box that oversees the transfer of control to the other modules.

control structure In structured programming, logical elements that are grouped in a block with an END statement and that specify how the instructions in a program are to be executed.

control unit The portion of the central processing unit (CPU) that, under the direction of an embedded program, switches from one stage of the machine cycle to the next and performs the action of that stage.

convergence The merging of disparate objects or ideas (and even people) into new combinations and efficiencies. Within the IT industry, convergence means two things: the combination of various industries (computers, consumer electronics, and telecommunications) and the coming together of products such as PCs and telephones.

cookie A text file that is deposited by a Web site on a Web user's computer system, without the user's knowledge or consent. Mostly used for legitimate purposes, such as implementing "shopping carts," they can also be used to gather data on Web users' browsing and shopping habits.

cooling fan A fan designed to keep the system unit cool. The fan often is part of the power supply, although many systems include auxiliary fans to provide additional cooling.

copy-protected software Computer programs that include some mechanism to prevent users from making or running unauthorized copies.

copyright infringement The act of plagiarizing, using material from a copyrighted source without permission.

copyright protection scheme A method software manufacturers are working to develop to thwart the illegal use of their programs.

corporate espionage The unauthorized accessing of corporate information, usually to the benefit of one of the corporation's competitors.

cost-benefit analysis An examination of the losses and gains related to a project.

cracker (black hat) A computer user obsessed with gaining entry into highly secure computer systems; also called a black hat.

cross-platform programming language A programming language that can create programs capable of running on many different types of computers supported by different operating systems.

cryptographer An individual who specializes in encoding information.

cryptography The study of transforming information into an encoded or scrambled format.

cursor (insertion point) A blinking vertical bar, a horizontal underline character, or a highlighted box located on the monitor that indicates the location in which keystrokes will appear when typed.

cursor-movement keys (arrow keys) A set of four keys clustered together to the left of the number pad that move the cursor up, down, left, or right. The numeric keypad can also move the cursor when in the appropriate mode.

customer relationship management (CRM) software Keeps track of an organization's interactions with its customers and focuses on recording and tracking efforts to retain those customers.

custom software Application software designed by a professional programmer or programming team to meet the specific needs of a company or organization. Custom software is usually very expensive.

cyberbullying A cybercrime that involves situations in which one or more individuals harass or threaten another individual who is less capable of defending himself or herself, using the Internet or other forms of digital technology. Cyberbullying can include sending threatening e-mail or text messages or assuming someone else's online identity for the purpose of humiliating or misrepresenting him or her.

cybercrime Crime carried out by means of the Internet.

cybergang A group of computer users obsessed with gaining entry into highly secure computer systems.

cyberlaw A new legal field designed to track developments in cybercrime and combat occurrences of such abuses.

cyberspace The reference to the intangible, nonphysical territory that the Internet encompasses.

cyberstalker A person engaging in a form of harassment in which an individual uses the Internet, social networking sites, e-mail, or other electronic communications to repeatedly harass or threaten and disrupt a victim's real life.

cyberstalking A form of harassment in which an individual uses the Internet, social networking sites, e-mail, or other electronic communications to repeatedly harass or threaten a person. Cyberstalking, like real-world stalking, is a repeated, unwanted, and disruptive break into the life-world of the victim.

D

dashboard An executive information system with a user interface, similar to an automobile's dashboard, that highlights important information through the use of graphics and gauges, providing decision makers with the input necessary to "drive" the business and make effective up-to-the-minute decisions.

data Raw facts, which can be made up of words, numbers, images, sounds, or a combination of these. The data from the input phase of the information processing cycle is passed to the processing phase.

database A collection of related data that is organized in a manner that makes the data easy to access, manage, update, group, and summarize.

database management system (DBMS) A database program that can join or connect several files or tables to manage, access, store, and edit data in a structured manner.

database program A software application that is used to create databases or to work with the data in existing databases.

database server software Software that runs on a network and responds to information requests from remote users.

data bus A set of parallel wires that acts as an electronic highway on which data travels between computer components. It is the medium by which the entire system communicates with the CPU.

data dependency A microprocessor performance problem in which the CPU is slowed in its functioning by the need to wait for the results of one set of instructions before moving on to process another set of instructions.

data dictionary A list of the tables the database contains along with details concerning each table, including field names, field lengths, data types, and validation settings.

data diddling A computer crime in which data is modified in accounts or databases to conceal theft or embezzlement.

data file (table) A collection of related records; also called a table.

data flow diagram (DFD) A diagram that uses a set of graphical symbols to show how data moves through the existing system.

data independence The separation of data in a database from an application so that changes in data do not require changes in the structure of forms, reports, or programs accessing the database.

data integrity The validity of the data contained in a database.

data maintenance Procedures for adding, updating, and deleting records for the purpose of keeping the database in optimal shape.

data mart A smaller-scale data warehouse project that supports one division rather than the entire organization.

data mining A data exploration and analysis technique that uncovers information through statistical analysis and modeling in an attempt to discover previously unknown patterns.

data redundancy Repetition of data characteristic of poorly designed systems, which can cause peculiar query and report results.

data security Ensures that the data stored in a database is not accessible to people who might misuse it, particularly when the collected data is sensitive.

data set The contents of a table in Access.

data transfer rate 1. In secondary storage devices, the maximum number of bits per second that can be sent from the hard disk to the computer. The rate is determined by the drive interface. 2. The speed, expressed in bits per second (bps), at which a modem can transfer, or is transferring, data over a telephone line.

data type In a computerized database, a data type is defined by the overall purpose of the database coupled with the specific data being entered.

data validation Procedures that define acceptable input ranges for each field in a record.

data warehouse A central location capable of storing all the information that a corporation possesses and making this data available for analysis.

dead link (broken link) On the World Wide Web, a hyperlink that refers to a resource (such as a sound or a Web page) that has been moved or deleted; also called a broken link.

debugging In programming, the process of finding and correcting errors, or bugs, in the source code of a computer program.

decision support system (DSS) A computer-based system that addresses the deficiencies of management information systems (MIS) by enabling managers to retrieve information that cannot be supplied by fixed, predefined MIS reports.

default In a computer program, the settings that are in effect unless a user deliberately overrides them.

default value An automatic entry placed into a field when no other value is provided.

deliverable An outcome or tangible output such as a report or another document.

denial of service attack (DoS) A form of network vandalism that attempts to make a service unavailable to other users, generally by flooding the service with meaningless data.

design template A professionally created slide design that can be applied to a presentation and provides coordinated background color, font type, and bullet style.

desktop The screen image that appears after an operating system finishes loading into memory (RAM) and displays pictures (icons) representing files, folders, and windows in the file system. The desktop image can change with the operating system and version, or can be customized by the user.

desktop computer A computer that consists of a system unit, an independent monitor, and a keyboard designed for an individual's use at a desk or fixed location.

details pane Displayed along the bottom of the right pane of a Windows Explorer window. It provides a thumbnail view and information about the selected file or folder; the details vary depending on the object that has been selected.

device driver A program written in assembly language that controls a device attached to a computer.

digital camera A camera that uses digital technology, instead of film, to take and store images in digital format and can input those images directly into your system through a USB or FireWire port.

digital cash system A method for using smart cards and prepaid amounts of electronically stored money to pay for small charges such as parking and tolls.

digital certificate A form of digital identification enabled by public key encryption that serves as a method of validating a user, server, or Web site. For a user, a digital certificate validates identity in a manner similar to showing a driver's license. For a server or Web site, a digital certificate validates that a Web server or Web site is authentic so that the user can feel secure in his or her interaction.

digital divide The age, race, and/or income disparity in computer ownership and Internet access.

digital piracy The unauthorized reproduction and distribution of computer-based media.

digital signal A signal used by digital equipment, like computers, sent via discontinuous pulses, in which the presence or absence of electronic pulses is represented by 1s and 0s.

digital signature A technique enabled by public key encryption that is used to guarantee that a message is authentic, not sent by a hacker, and has not been tampered with.

digital telephony Telephone systems using all-digital protocols and transmission, offering the advantage over analog telephony of noise-free transmission and high-quality audio.

digital video camera (camcorder) A camera that takes and stores videos in digital format, instead of analog, and can input those images directly into your system through a USB or FireWire port.

digital-to-analog converter (DAC) A microchip that contains the circuitry to convert a digital signal to analog.

digitization The transformation of data such as voice, text, graphics, audio, and video into digital form, thereby allowing various technologies to transmit computer data through telephone lines, cables, or air and space. Digitization also allows the data to be shared as files enabling convergence, something difficult to do with analog technologies.

direct broadcast satellite (DBS) A consumer satellite technology that uses an 18- or 21-inch reception dish to receive digital TV signals at microwave frequencies directly from geostationary satellites broadcast at a bandwidth of 12 Mbps. Increasingly, DBS operators offer Internet access as well as digital TV service, but at much lower bandwidth.

direct conversion (crash conversion or plunge) Stopping an old system and then starting the new system; sometimes called a crash conversion or plunge.

disaster recovery plan A written plan with detailed instructions specifying alternative computing facilities to be used for emergency processing until nonoperational computers can be repaired or replaced after a national disaster or national emergency.

disk cache A type of RAM, usually incorporated on the circuit board within the hard drive case, that stores some of the program instructions and data you are working with. When the CPU needs to get information, it looks in the disk cache first. If it doesn't find the information it needs, it retrieves the information from the hard disk.

disk cleanup utility A program that improves system performance and increases storage space by removing files that you no longer need.

disk defragmentation program A utility program used to reorganize data on the disk so that file pieces are reassembled as one chunk of disk space (decreasing disk search time); storage is made more efficient by clustering files into structures more efficiently searched; and the time needed to access files is decreased.

disk scanning program An error-checking program that can detect and resolve a number of physical and logical problems that may occur when your computer stores files on a disk.

distributed denial of service (DDoS) attack A computer attack on multiple systems by a hacker who bombards an Internet server with a huge number of requests so that the server becomes overloaded and unable to respond to requests from valid users.

distributed hypermedia system A network-based content development system in which individuals connected to the network can each make a small contribution by developing content related to their area of expertise. The Web is a distributed hypermedia system.

distributed structure A technology infrastructure where users are able to customize their technology tools to suit their individual needs and wants.

DLP projector (digital light-processing projector) An output device that projects a computer's display on a screen by projecting light into a chip made of millions of microscopic mirrors to produce a brilliant, sharp image.

document A file created with an application program, such as a word processing or spreadsheet program.

documentation 1. Tutorials, Read Me files, help files, and printed manuals that contain information the software manufacturer believes the user will find helpful. 2. The output of the fifth phase of the Program Development Life Cycle in which in-depth explanations of major program features, reference documentation of all program commands, and a thorough description of the error messages generated by the program are detailed.

domain name On the Internet, a readable computer address, **http://www.microsoft.com**, that gets translated into an IP address and identifies a computer on the network.

domain name registration On the Internet, a process by which individuals and companies can obtain a domain name (such as **www.c34.org)** and link this name to a specific Internet address (IP address).

Domain Name System (DNS) A system used by the Internet to link domain names with their numeric IP address. It functions like a telephone directory for the Internet.

dot-matrix printer (impact printer) Once the most popular type of printer, the dot-matrix printer creates characters by striking pins against an ink ribbon. Each pin makes a dot, and combinations of dots form characters and illustrations.

dot pitch (aperture grill) The distance between the dots (pixels) on a CRT monitor. The lower the dot pitch, the closer the dots are to each other and the sharper the image.

downloading The process of transferring a file from another computer to your computer by means of a computer network.

drill down A technique that enables managers to view information in a data warehouse and focus their attention on a specific data element by starting at the summary level of information and narrowing their search at each progressive level of data.

drive A storage device in which files and folders reside. Drives can be internal (located within the system unit, such as a hard drive) or external (attached to the system unit via a port).

drive activity light The light on the front panel of most computers that signals when the hard drive is accessing data.

drive bay A receptacle or opening into which a hard disk drive, CD or DVD drive, or portable drive can be installed. An internal bay is within the system unit and an external bay is accessed from outside the system unit.

drive imaging software Software that creates a mirror image of the entire hard disk, including the operating system and applications, as well as all files and data. In the event of a hard disk or computer system failure, the drive image can be used to restore the system.

drive letter A letter of the alphabet followed by a colon and a backslash character that identifies the storage devices active on a system.

driver A utility program that contains instructions to make a peripheral device addressable or usable by an operating system.

DSL (digital subscriber line or xDSL) A general term for several technologies that enable high-speed Internet access through twisted-pair telephone lines. Also called xDSL.

DSL modem Similar to a traditional telephone modem in that it modulates and demodulates analog and digital signals for transmission over communications channels, but it does so using signaling methods based on broadband technology for much higher transfer speeds.

dual inline memory module (DIMM) A RAM memory module that fits into special slots on the motherboard that has a 168-pin connector and a 64-bit data transfer rate.

dumpster diving A technique to obtain passwords in which intruders go through an organization's trash hoping to find documents that contain lists of user IDs and passwords.

DVD drive A read-only storage device that reads the data encoded on a DVD-ROM disc and transfers this data to a computer.

DVD+R A recordable format that enables the disc to be written to one time and read many times.

DVD+RW A recordable format that enables the disc to be rewritten to many times.

DVD-R Digital video disc, a recordable optical storage medium that, like CD-R discs, cannot be erased or written over once data has been saved; the disk can be written to only once but read from many times.

DVD-ROM (digital video [or versatile] disc read-only memory) A digital video optical disc format capable of storing up to 17 GB on a single disc, enough for a feature-length movie.

DVD-RW Digital video disc, a recordable optical storage medium on which you can write, erase, and read from many times.

DVI (digital visual interface) port An interface that allows LCD monitors to use digital signals instead of analog signals.

dye sublimation printer A type of thermal-wax transfer printer that uses a heat process to transfer an impression onto paper. Although thermal-transfer printers are the best color printers currently available, they are slow and very expensive.

dynamic A term used to describe Windows Explorer searches that are automatically updated every time you open up a saved search. New files that meet the search criteria are added and ones that no longer meet the criteria are removed.

E

EBCDIC (Extended Binary Coded Decimal Interchange Code) An eight-bit character code used by IBM mainframe computers and some midrange systems that uses a low-to-high code sequence for punctuation, lowercase letters, uppercase letters, and then numbers.

e-book Short for electronic book. A book-sized device that displays e-books. E-book readers may be devices that are built solely for reading e-books or they may be PDAs, handheld devices, or other computing devices that have a processor and display screen. The newest e-book readers are available in a larger size, increasing the ease of reading. Some even boast an auto-rotating screen with a text-to-speech mode.

e-book reader A dedicated reading device dedicated to downloading, displaying, and reading books obtained through an e-bookstore (an electronic book store accessed via the Internet).

e-business (electronic business) Use of the Internet to buy, sell, provide customer service, and collaborate with business partners.

ECMAScript A vendor-neutral standard created by the European Computer Manufacturers Association (ECMA) for what was originally Netscape's JavaScript. It is a client-side scripting language for Web publishing.

e-commerce (electronic commerce) The use of networks or the Internet to carry out business of any type.

economic feasibility The capability of a project being accomplished with available financial resources.

e-discovery (electronic discovery) The obligation of parties to a lawsuit to exchange documents that exist only in electronic form, including e-mails, voicemails, instant messages, e-calendars, audio files, data on handheld devices, graphics, photographs, spreadsheets, Web sites, drawings, and other types of digital data.

EEPROM Electrically erasable programmable read-only memory that can be rewritten many times while the chip is in the computer. EEPROM is erased one byte at a time, using an electric field instead of a UV light source, eliminating the need for an erasing window.

e-learning The use of computers and computer programs to replace teachers and the time–place specificity of learning.

electrical engineering (EE) An engineering discipline that has a strong focus on digital circuit design as well as cutting-edge communication technologies.

electronic data interchange (EDI) A set of standards that specifies how to transfer data and documents between enterprises using the Internet and other networks without human intervention.

electronic mailing list Lists of e-mail addresses that automatically broadcast messages to all individuals on the list.

Because the messages are transmitted as e-mail, only individuals who are subscribers to the mailing list receive and view the messages.

element In HTML, a distinctive component of a document's structure, such as a title, heading, or list. HTML divides elements into two categories: head elements (such as the document's title) and body elements (headings, paragraphs, links, and text).

e-mail (electronic mail) An Internet service requiring a software application that enables you to send and receive messages though the use of computer networks.

e-mail address A series of characters that provides a unique cyberspace identity for a particular recipient that follows the form myname@somedomain.com and precisely identifies the location of a person's electronic mailbox. On the Internet, e-mail addresses consist of a mailbox name (such as jsmith) followed by an "at" sign (@) and the computer's domain name (as in jsmith@fictitiousschool.edu).

e-mail attachment Any type of computer file—document, photo, audio, or video—that is included with an e-mail message.

embedded operating system Operating systems that are found on ROM chips in the portable or dedicated devices that we use today. They are usually compact and efficient. Embedded operating systems go without some of the features found in nonembedded operating systems.

embedded processor A processor designed and programmed to perform only the tasks intended to be done by the device the processor is implanted within.

emergency disk A storage device, like a USB drive, CD, DVD, or network device that, in case of an emergency or boot failure, can load a reduced version of the operating system that can be used for troubleshooting purposes; also called a boot disk.

employee monitoring When large employers routinely engage in observing employees' phone calls, e-mails, Web browsing habits, and computer files.

encryption A coding or scrambling process that renders a message unreadable by anyone except the intended recipient.

encryption key A formula that is used to make a plaintext message unreadable.

enhanced keyboard A keyboard containing additional keys, usually positioned above the row of function keys, that consist of media control buttons that adjust speaker volume and access the optical disc drive, and Internet controls that open e-mail, a browser, or a search window, with a single keystroke.

enterprise A business or organization, which can include universities, government agencies, and not-for-profit groups or charities.

enterprise application integration (EAI) A combination of processes, software, standards, and hardware that results in the integration of two or more enterprise systems, thus enabling multiple systems to operate as one and share data and business processes throughout an organization.

enterprise computing Information technology on a large scale, encompassing all aspects of technology and information resources, including problems or malfunctions, within an organization or a business. It also includes understanding the use of computers in the networks that span the organization as well as the software needed to processes and monitor activities involved in daily business operations.

enterprise data The centralized data shared throughout an organization

enterprise data center A secure common repository for enterprise data.

enterprise networking The technology infrastructure within an enterprise.

enterprise resource planning (ERP) software Software that brings together various enterprise functions, such as manufacturing, sales, marketing, and finance, into a single computer system.

enterprise server Powerful servers that are part of a networked system designed to connect hundreds of thousands of users at the same time. They are usually used in large corporations or government agencies, handle a high volume of data, can fill an entire wall of an average room, and cost from several thousand to millions of dollars.

enterprise software Software designed to solve problems at the enterprise level of an organization rather that at the departmental level.

enterprise system An information system that integrates an organization's information and applications across all of the organization's functional divisions.

entity-relationship diagram (ERD) A graphic that shows all of the organizations, departments, users, programs, and data that play a role in the system as well as the relationships among those entities.

EPROM Electrically programmable read-only memory is erasable PROM that can be reused many times. Erasure is accomplished using a UV (ultraviolet) light source that shines through a quartz erasing window in the EPROM package. It is used primarily by programmers in the program development process so that errors can be corrected.

ergonomics The field of study that is concerned with the fit between people, their equipment, and their work. It takes into account worker limitations and capabilities in attempting to ensure that the tasks, equipment, and overall environment suit each worker.

e-tailer A Web-based retailer.

Ethernet The most popular LAN standard for large and small businesses. According to International Data Corporation (IDC), approximately 85 percent of all installed networks use various versions of Ethernet.

ethical hacker (white hat) Hackers and crackers who have turned pro, offering their services to companies hoping to use hacker expertise to shore up their computer systems' defenses; also called a white hat.

ethical principle The standards that promote trust, fairness, good behavior, and kindness and are used to justify an act as morally right or morally wrong.

event-driven programming language A program design method in which the programming code is not written to execute in any specific sequence. Instead, it executes in response to user actions such as the clicking of the mouse.

evil twin A phony WiFi hot spot whose name makes users believe it is a legitimate spot. Typically situated in hotels and airports, an evil twin is usually connected to a fraudulent network.

e-waste Obsolete computer equipment.

exabyte A unit of measurement approximately equal to1 quintillion bytes.

exception report A report that alerts managers to unexpected developments (such as high demand for a new product).

exclusion operator In database and Internet searching, a symbol or a word that tells the software to exclude records or documents containing a certain word or phrase. It is usually denoted as a minus sign (–) in the search statement.

executable program A program that is ready to run and does not need to be altered in any way.

execution cycle (execute, store) In a machine cycle, a phase consisting of the execute and write-back (or store) operations.

executive information system (EIS, or executive support system [ESS]) A system that supports management's strategic-planning function; also known as an executive support system (ESS).

exiting Quitting or closing down an application or program.

expansion card (expansion board, adapter card, or adapter) A circuit board that fits into slots on the motherboard and is used to connect computers with various peripherals.

expansion slot Receptacles, usually located on the motherboard, that accept additional circuit boards or expansion cards.

expert system An information system that deals with detailed and in-depth knowledge in a specific area supplied by experts in that field and formulates a decision in the way that a human expert in the field might.

ExpressCard Also referred to as a PC card, a device approximately the size of a credit card that is usually used with notebook computers and that can be inserted or removed from PC card slots while the computer is running. ExpressCards can serve as modems, network adapters, or additional memory.

Extended ASCII A character coding system that uses eight bits and allows representation of 256 characters.

Extended Graphics Array (XGA) The resolution standard for most of today's monitors (1024 × 768).

Extensible Business Reporting Language (XBRL) A language used by businesses to publish and share financial information with each other and industry analysts across all computer platforms and the Internet.

Extensible Hypertext Markup Language (XHTML) A language that combines the flexibility of HTML with the extensibility of XML by allowing the user to define a tag for clarity across different browsers or create a new markup tag by simply defining it in an XHTML module and using it in a Web page as you would any other HTML tag. This feature makes a page truly compatible with all browsers.

Extensible Markup Language (XML) A language designed to reduce the complexity of HTML.

extension The second part of a file name added after the dot. It is supplied by an application to indicate that the file was created by that application and thus should be reopened with it.

extranets A network connected over the Internet in such a way that data traverses the Internet in encrypted form, safe from prying eyes.

F

Facebook Currently, the largest social networking site, allowing anyone over the age of 13, with a valid e-mail account and residing in a country where it has not been banned, to become a user. Facebook users often join groups set up by region, job, interest, or school and communicate with group members.

facsimile transmission (fax) The sending and receiving of printed pages between two locations using a telephone line and fax devices that digitize the page's image.

fair use An exception to copyright laws that justifies limited uses of copyrighted material without payment to or permission from the copyright holder. This exception limits the selection to no more than 5 percent of the original copyrighted work and only for the purposes of commentary, parody, news reporting, research, and education.

fat client A device that enables a user to connect to a network server but does most data processing in its own system, not on the server.

fault tolerance The ability of a device to keep working even if one or more components fail.

fax modem A modem that also functions as a fax machine, but unlike a traditional stand-alone fax machine, does everything in a digital way, providing the computer user with the capability of sending word-processing documents and other files as faxes.

fiber-optic cable A broadband transmission medium that consists of thin strands of glass or plastic that carry data by means of pulses of light. Fiber-optic cable carries data at transfer rates of 10 Gbps (gigabits per second) or more, without loss of signal strength and for longer distances than twisted-pair or coaxial cable.

fiber-optic service Fiber-optic lines that run directly to the home and provide users with incredibly fast Internet access, easily surpassing other methods.

field A single unit of relative information in a database. Each field has a specific, defined data type.

field name A descriptive label that helps to identify the type of content to be entered into a field.

file A named unit of related data stored in a computer system.

file compression utility A program that can reduce the size of a file by as much as 80 percent without harming the data, by substituting short codes for lengthy data patterns. The resulting smaller files can be shared more efficiently, particularly over the Internet. Prior to use, compressed files need to be decompressed and converted back to their lengthy form.

file infector A computer virus that attaches to a program file and, when that program is executed, spreads to other program files.

file management program A program that enables users to create, edit, and manage databases in which files or tables are independent of each other, with no link between the data stored in each.

file manager A program that helps you to organize and manage the data stored on your disk.

file name The name that the storage device uses to identify each unique file.

file server In client/server computing, a high-capacity, high-speed computer with a large hard disk set aside (dedicated) to make program and data files available to users on a network.

File Transfer Protocol (FTP) An Internet standard for the exchange of files between two computers connected to the Internet that is especially useful when the files are too large to send by e-mail. Although you can use special FTP client software, such as WS_FTP Home, you can also transfer files to and from an FTP server simply by using your browser or Windows Explorer.

filter In Microsoft Access, a simplified method of locating records that match criteria specified by the user.

firewall A program or device that permits an organization's internal computer users to access the Internet but places severe limits on the ability of outsiders to access internal data.

FireWire (1394 port) FireWire is Apple Computer's name for a 1394 input/output port, an interface that offers high-speed connections for peripherals. It is ideal for real-time devices like digital video cameras.

flame Messages sent through e-mail, chat rooms, instant messaging, and message boards that express an opinion without holding back any emotion and are frequently seen as being confrontational and argumentative.

flash drive A type of storage device that uses solid-state circuitry and has no moving parts, making it a solid-state drive. It retains the data stored in it even if disconnected from its source.

flash EPROM A type of PROM similar to EEPROM except that flash EPROMs are erased in blocks, whereas regular EEPROMs can be erased one byte at a time.

flash memory Nonvolatile memory found on flash drives and memory cards that can be electronically erased and reprogrammed.

flash memory card A wafer-thin, highly portable solid-state storage system that is capable of storing as much as 64 GB of data. Flash memory cards are used with smartphones, MP3 players, digital video cameras, and other portable digital devices.

flash memory reader A slot or compartment into which the flash memory card is inserted.

flat file The type of file generated by a file management program. Often called lists, they are independent structures having no relation between the fields in one flat file and fields in another.

flexible OLED display (FOLED display) An extremely thin, flexible, and lightweight output display that produces outstanding color, contrast, brightness, and viewing angles. OLED displays are emissive devices, meaning they emit light rather than modulate transmitted or reflected light.

floating point standard A notation standard, created by the Institute of Electrical and Electronics Engineers (IEEE) and used to represent numbers with fractional parts. There is no fixed number of digits before or after the decimal point, so the computer can work with very large and very small numbers.

flowchart In structured programming, a diagram that shows the logic of a program.

folder (directory) An organizational tool for grouping files that have something in common.

folder structure (directory structure) An organized set of folders in which to save your files.

footprint The amount of physical space used by a device.

foreground application From the user's perspective, the application that is active (in use), as indicated by its appearance as the topmost image seen on the desktop, when more than one application is running.

foreign key A field that is a primary key in another file.

forgery The making of Internet data appear to come from one place when it's really coming from another.

form In the Microsoft Access database management system, a template used to enter data into the database in place of the Table entry method.

form factor The specifications for mounting internal components such as the motherboard into the system unit.

formula A combination of numeric constants, cell references, arithmetic operators, and functions that are used to calculate a result.

Fortran Short for formula translator. An early third-generation language that enabled scientists and engineers to write simple programs for solving complex mathematical equations in an easy-to-use environment.

fragmented A disk that has been used to the point that it becomes a patchwork of files, with portions of files scattered here and there. This placement of sectors slows disk access because the system must look in several locations to find all of a file's segments.

frame In a video or animation, single still images that are flashed on-screen at a rapid rate.

frame rate In a video or animation, a measurement of the number of still images shown per second.

freeware Copyrighted software that can be freely copied but not sold for profit.

full backup The duplicating of all files and data on the entire hard disk as a precaution should the hard disk drive fail.

function In spreadsheet programs such as Microsoft Excel, one of the two basic types of formulas (along with mathematical expressions). A function begins with an equal sign but is then followed by a descriptive name that is predefined in the software (such as SUM to calculate the total of a set of values) and an argument set, which is placed within parentheses and designates the locations of the values that the function needs to utilize in its calculations.

function key A row of keys positioned along the top of the keyboard, labeled F1 through F12. The action performed by each key varies with the program in use.

functional division (functional area, functional unit) Parts of an organization that handle each of the organization's core functions, for example, accounting and finance, marketing and sales, human resources, and management.

functional language A language that reflects the way people think mathematically. It is useful in mathematical programs or programs that can express findings in mathematical form.

G

gadget An application that appears as an active icon in the Windows sidebar. Gadgets are selected or downloaded by the user and display photos and current weather conditions, control a multimedia player, or monitor the CPU's performance.

Gantt chart A type of bar chart that facilitates project management by indicating task due dates and project milestones.

General Public License (GPL) A free software license, devised by the Open Software Foundation (OSF), stipulating that anyone may freely copy, use, and modify the software. The modifications must be made available for all users, but no one can sell the software for profit.

general-purpose application A software program used by many people to accomplish frequently performed tasks such as writing (word processing), working with numbers (spreadsheets), and keeping track of information (databases).

gigabits per second (Gbps) A data transfer measurement equivalent to 1 billion bits per second.

gigabyte (GB) A unit of measurement approximately equal to 1 billion bits.

gigahertz (GHz) A unit used to measure a processor's speed in billions of cycles per second.

gigaPOP (gigabits per second point of presence) A point of presence (POP) that provides access to a backbone service capable of data transfer rates exceeding 1 Gbps (1 billion bits per second).

globalization Conducting business internationally or the process of making this happen.

globally unique identifier (GUID) An identification number that is generated by a hardware component or a program. The GUIDs can be read by Web servers or embedded in various documents, detecting which computer is accessing a site and inadvertently making it more difficult to use the Internet anonymously.

Google Docs A free Web-based service that allows project members to share and edit documents and spreadsheets online.

Google Groups A free service provided by Google to help users connect, share information, and communicate effectively over the Internet. Its current version allows group members to collaborate on shared Web pages; set group pictures, colors, and styles; upload and share individually created work; and learn more about other members in the group.

GPS (Global Positioning System) A satellite-based system consisting of a cluster of 27 Earth-orbiting satellites that enables portable GPS receivers to determine their location with an accuracy of 109 yards or less.

graphical MUD (gMUD) A multiuser dungeon (MUD) that uses 3D graphics instead of text to represent the interaction of characters and bring the virtual environment to life.

graphical user interface (GUI) The most popular method of interacting with a computer system. It uses graphics and the point-and-click technology of the mouse to make the operating system and programs easier to use.

grid A combination of several computers or virtual machines that are connected over a network to make them appear and function as one single computer.

grid computing Applying the abilities of many computers in a network to a single problem at the same time. This amount of concentrated power is usually directed at scientific or technical problems that require a high level of processing power and access to large amounts of data.

grounding bracelet A device that is worn around the wrist with the other end attached to a grounded object. It is worn to avoid discharging static electricity into a system under repair.

grounding strap See grounding bracelet.

group In Microsoft Office, a collection of buttons and commands that appear on tabs within the Ribbon.

groupware (teamware) Software that provides computerized support for the information needs of workgroups. Most groupware applications include e-mail, videoconferencing tools, group-scheduling systems, customizable electronic forms, real-time shared applications, and shared information databases. Also called teamware.

H

hacker Traditionally a computer hobbyist who enjoys pushing his or her computer capabilities to the limit, especially by using clever or novel approaches to solving problems.

hacker ethic An unwritten code of conduct subscribed to by hackers that forbids the destruction of data.

handheld computer A computer designed for individual use and portability, it usually fits in the palm of your hand or pocket of your jeans and makes use of a stylus or virtual keyboard.

hard business skill A process-related skill. In the IT world, this type of skill refers to the knowledge and technological expertise in such areas as networking, Web development, knowledge of UNIX and C++, and firewall administration.

hard copy Output viewed in printed form.

hard disk controller An electronic circuit board that provides an interface between the CPU and the hard disk's electronics. The controller may be located on the computer's motherboard, on an expansion card, or within the hard disk.

hard disk drive (hard drive) A secondary storage, random access, high-capacity, high-speed device, usually housed in the system unit, that consists of several rapidly rotating disks called platters on which programs, data, and processed results are stored. In almost all modern computers, the hard disk is by far the

easiest storage device to access and the most important storage medium.

hardware All the physical components that make up a computer system, including such items as circuit boards, disk drives, printers, and monitors.

Hardware-as-a-Service (HaaS) See Infrastructure-as-a-Service (IaaS).

HDSL (high bit-rate digital subscriber line) The most mature DSL technology, it is a form of SDSL that provides T1 connections over two or three twisted-pair copper lines. Unlike most other forms of DSL, HDSL is not a typical consumer service.

headset (head-mounted display) A wearable output device with twin LCD panels for creating the illusion that an individual is experiencing a three-dimensional, simulated environment.

heat sink A heat-dissipating component that drains heat from a chip. Heat sinks are usually used in combination with cooling fans.

hexadecimal (hex) number A number system, referred to as base-16, that uses the numbers 0 through 9 and the letters A through F to represent a binary string in a shorter, more compact form.

Hibernate mode Used primarily in notebooks to conserve battery life, this mode puts the documents and programs you have opened on your hard disk and then actually turns off your computer. When you restart your system, it is returned to the state prior to hibernation. All windows and programs that were open are restored automatically.

high-definition television (HDTV) A digital television standard found in such televisions as direct-view, plasma, rear screen, and front screen projection that have higher resolutions, typically (1920 × 1080) or better. HDTVs provide extremely high-quality video and audio, enabling the use of your HDTV as a computer monitor.

high-level language A programming language that eliminates the need for programmers to understand the intimate details of how the hardware, specifically the microprocessor, handles data.

History list In a Web browser, a window or list that shows all the Web sites that the browser has accessed during a given period, such as the last 30 days.

holographic storage A type of storage that uses two laser beams to create a pattern on photosensitive media, resulting in a three-dimensional image similar to the holograms you can buy in a novelty shop. This 3D approach will enable much higher-density storage capacities and is being promoted for its archiving capabilities.

home and educational program A general-purpose software program for personal finance, home design and landscaping, encyclopedias and other computerized reference information, and games.

home network (home area network or HAN) A personal and specific use of network technology that provides connectivity among users and devices located in or near one residence.

home page (index page) The start page that is automatically displayed when you enter a Web site through its top level; also called an index page.

honeypot A computer baited with fake data and purposely left vulnerable so as to study how intruders operate in order to prepare stronger defenses to thwart attacks.

host A networked computer that has two-way access to other computers; it can receive requests and reply to those requests.

host name The name of the group or institution operating a Web site. It is the first part of the domain portion of a URL. In the URL **www.microsoft.com/windows/default.aspx** the host portion is Microsoft.

hot site A disaster recovery site that is kept in a state of readiness at all times. For this reason, it is very expensive.

hot spot Usually a public location like an airport, college campus, or coffee shop that provides Internet access for devices fitted with wireless technology.

hot swapping Connecting and disconnecting peripheral devices while your computer is running.

HTML (Hypertext Markup Language) A markup language used for marking Web pages. It divides elements (or tags) into two categories: head elements (such as the documents title) and body elements (headings, paragraphs, links, and text). The agency responsible for standardizing HTML is the World Wide Web Consortium (W3C).

hub A simple, inexpensive broadcast device that joins multiple computers together in a single network but does not manage the traffic between the connections, which usually results in frequent collisions. It is used as the central wiring mechanism in a star topology network layout

hybrid cloud The combination of two or more clouds (private, community, or public) that are unique but are connected by common, standard technology that enables the sharing of applications and data. Its infrastructure can be located both on-site and off the premises, and it can be managed by both the organization and a cloud provider. Users can be trusted and untrusted.

hybrid hard drive (HHD) A hard drive that incorporates flash technology in its design to speed up the boot process.

hybrid network A network that is a combination of both wired and wireless technology.

Hybrid sleep This mode, a combination of Sleep and Hibernate mode, puts open documents and programs in both RAM and on your hard disk, and then places the system in a low-power state so you can quickly resume your work. If power is suddenly terminated, the Hibernate portion of this mode guarantees that your work can be restored. Hybrid sleep is usually turned on by default on most desktops.

hyperlink (link) In a hypertext system, an element in an electronic document that acts as the connector to another place in the same document or to an entirely different document. Typically, you click on the hyperlink to get to the related object. Hyperlinks are the most essential ingredient of the World Wide Web.

hyptertext A system in which objects (text, pictures, music, programs, and so on) can be creatively linked to each other.

Hypertext Markup Language (HTML) A language that uses a tag system of code to create Web pages. This language is interpreted by browsers, which display the page according to the directions specified by the HTML language. HTML includes capabilities that enable authors to insert hyperlinks, which, when clicked, display another HTML document. The agency responsible for standardizing HTML is the World Wide Web Consortium (W3C).

Hypertext Transfer Protocol (HTTP) The Internet standard that supports the exchange of information on the Web by the use of uniform resource locators (URLs).

I

icon A small image that represents a computer resource (such as a program, data file, or network connection).

identity theft A form of fraud in which a thief obtains someone's personal information and then uses this information to impersonate the owner and fraudulently obtain and use the owner's credit.

image editor A sophisticated version of a paint program that is used to edit and transform—but not create—complex bitmapped images, such as photographs. Free programs like Picasa and GIMP, designed for personal and home use, incorporate automated image-processing algorithms to add a variety of special effects, remove blemishes, crop portions, and adjust coloring to photographic images.

inclusion operator In database or Web searching, a symbol or keyword that instructs the search software to make sure that any retrieved records or documents contain a certain word or phrase; it usually is a plus sign (+) in the search statement.

incremental backup Backing up only those files that have been created or changed since the last backup occurred.

information Data that has been converted into a meaningful form.

information hiding (encapsulation) A modular programming approach that refers to the ability of a programmer to write the code of one module without

knowing or having to be concerned with the details of another module.

information kiosk An automated presentation system used for public information or employee training.

information overload A feeling of anxiety and incapacity experienced when people are presented with more information than they can handle.

information processing cycle A sequence of four operations: input, processing, output, and storage. These operations receive data, process it into information, allow it to be outputted for viewing, and save it for future use.

information system A purposefully designed system that includes the collection of people, hardware, software, data records, and activities that process the data and information in an organization.

information systems (IS) department The functional area within companies or universities responsible for managing information technology and systems.

information technology (IT) professional An individual who works with information technology in all its various forms (hardware, software, networks) and functions (management, development, maintenance).

information technology steering committee An organizational group, generally including representatives from senior management, information systems personnel, users, and middle managers, that reviews new project requests and decides which ones to address.

information warfare A military-like strategy that makes use of information technologies to corrupt or destroy an enemy's information and industrial infrastructure.

infrared A wireless data transmission medium, used in TV remote controls, that carries data via beams of light through the air. Transmitting and receiving devices must be in line of sight or the signal is lost.

Infrastructure-as-a-Service (IaaS) The category of cloud services that refers to the outsourcing of hardware, the equipment used to sustain the operations of a company or enterprise; also known as Hardware-as-a-Service (HaaS).

inheritance In object-oriented programming (OOP), the capacity of an object to pass its characteristics to a subclass or child.

inkjet printer A nonimpact printer, popular for home use, which sprays ionized ink from a series of small jets onto a sheet of paper, creating the desired character shapes. A typical inkjet printer provides a resolution of 300 dots per inch.

input The action of receiving data (raw facts) like a user's login ID number.

input device A hardware component that enables a user to enter data into a computer for processing. The most common input devices are the keyboard and mouse, but other devices include microphones, scanners, digital cameras, and camcorders.

input/output (I/O) bus An electrical pathway that connects the microprocessor to input and output devices via expansion slots.

installing To load and set up a program so that it is ready to function on a given computer system. The installation process may involve creating additional directories, making changes to system files, and other technical tasks. For this reason, most programs come with setup programs that handle the installation process automatically.

instant messaging (IM) A free, real-time method of interaction between computers that enables two or more parties to connect through the use of a buddy list that identifies and restricts the users a person wishes to communicate with.

instruction cycle (fetch, decode) In a machine cycle, a phase consisting of the fetch (retrieve) and decode (determine the action required) operations.

instruction set A list of instructions specific to a given brand and model of processor.

intangible benefit A benefit that is difficult or impossible to measure, such as improved employee morale and customer satisfaction.

integrated circuit (IC or chip) A circuit that carries an electrical current and contains millions of transistors.

integrated development environment (IDE) The sharing of solutions and integration of development tools used for building graphical user interfaces, editors to facilitate inserting and changing of code, and debuggers that make possible the detection and correction of errors.

integrated peripheral A device embedded within the system unit case, generally the power supply, cooling fans, memory, CD drive, DVD drive, and internal hard drive.

integrated program A single program that manages an entire business or set of related tasks. It combines the most commonly used functions of many productivity software programs, like word processing, database management, spreadsheet, accounting, and customer service into one application.

intelligent keyboard An onscreen keyboard to which software has been added that provides the user with such features as suggestions for misspelled words and grammar mistakes; magnification of the on-screen text being entered or modified; displaying an enlarged image of each key on the screen, providing visual confirmation of the keystroke; and allowing such features as cut, copy, and paste with the touch of the screen.

interface In programming, the means of exchanging messages between objects.

internal speaker One of the components inside a computer's system unit, typically useful for emitting beeps and other low-fidelity sounds.

internationalization (glocalization) The combination of globalization and localization. This means that a McDonald's in Singapore is almost the same as a McDonald's in Chicago except for some twists or changes to mesh with cultural differences.

Internet (Net) Thousands of privately and publicly owned computers and networks that grew and interlinked, over time, into one giant network. In short, the Internet is a network of networks.

Internet access provider Companies or businesses that provide access to the Internet free, for a fixed monthly charge, or an itemized per-use fee.

Internet address (IP address) A unique, 32-bit address assigned to every computer that is connected to the Internet. It is represented in four parts, which are separated by periods (such as 128.254.108.7).

Internet backbone The main high-speed routes for Internet data travel.

Internet hard drive Refers to storage space that a computer user pays a subscription fee to access on a remote server via the Internet for a specific period of time; also called remote storage.

Internet Protocol (IP) The lower layer of the TCP/IP suite of protocols that handles the address part of each packet so that it gets to the right recipient.

Internet Protocol address (IP address) A numerical identification and logical address that is assigned to devices participating in a computer network. The IP address consists of four groups of numbers, separated by periods. The value in each group ranges from 0 to 255. As an example, 64.12.245.203 is the IP address for the AOL Web site.

Internet relay chat (IRC) A real-time, Internet, text-based chat service, in which one can find "live" participants from the world over. Today it is mostly the province of specialized communities, such as gamers or programmers.

Internet service A set of standards (protocols) that define how two types of programs—a client, such as a Web browser that runs on the user's computer, and a server—can communicate with each other through the Internet. Examples of Internet services are e-mail, instant messaging, FTP, Usenet, IRC, and VoIP.

Internet service provider (ISP) A company that traditionally provided access to the Internet and no additional services. Today these providers have added features to make them a one-stop source for Internet services. There are both local and national ISPs, each having varied services and pricing, providing Internet access via telephone lines, cable, satellite, or fiber-optic technologies.

Internet telephony The use of the Internet (or of nonpublic networks based on Internet technology) for the transmission of real-time voice communication.

Internet TV The ability to view television shows, videos, and movies over the Internet, for no additional cost via download or streaming video. The benefit of this type of viewing over YouTube is that the content is provided by the original source, so copyright is not an issue; there is no limit on length; the user has a variety of selections from which to choose; and there is no time restriction on when the production needs to be watched.

interoperability The ability of the Internet to exchange data between computers regardless of the brand, model, or operating system the computers are running.

interpreter In programming, a translator program that converts one line of source code at a time into machine-readable code and executes the translated instruction. Interpreters are often used for learning and debugging.

interrupt A signal that informs the operating system that an event has occurred and is in need of immediate attention. For hardware, this can be the user pressing a key, the mouse moving to a new position, or a notice that a document is waiting to be printing.

interrupt handler (interrupt service routine) A miniprogram that immediately responds when an interrupt occurs; also called interrupt service routine

interrupt request (IRQ) The interrupting of an event by an interrupt signal.

interrupt vector table The location that holds the responses to multiple interrupts. The interrupts are processed by the operating system, starting with the ones in the table having the highest priority rating, to the one with the lowest.

intranet A password-protected network controlled by an enterprise and accessed only by employees or authorized users.

IP spoofing The sending of a message with an IP address disguised as an incoming message from a trusted source to a computer. It is an activity usually associated with hackers.

iPad A new, pad-sized portable handheld device for personal use that can download and read e-books, surf the Internet, play movies, view TV shows, make calls, instant/text message, take still photos or video, edit photos and videos, run off battery power for a full day, connect to a TV and play media, and sync its media with a computer.

iPhone OS An operating system developed by Apple for use in mobile devices, specifically the iPhone.

IrDA port A wireless communication device that uses infrared technology to transfer data from your PDA to your desktop or notebook computer or another PDA. The transmitting device must be in line of sight (usually within a few feet) of the port on the receiving device. IrDA ports offer data transfer rates of 4 Mbps.

ISDN (integrated services digital network) A standard for the delivery of digital telephone and data services to homes, schools, and offices using ordinary existing twisted-pair wiring, connections ranging from 56 to 128 Kbps (basic rate ISDN) or 1.5 Mbps (primary rate ISDN).

ISDN adapter (digital modem) An internal or external accessory that enables a computer to connect to remote computer networks or the Internet by means of ISDN lines. (Inaccurately called an ISDN modem.)

IT industry The industry that consists of organizations focused on the development and implementation of technology and applications.

J

Java A cross-platform programming language created by a consortium led by Sun Microsystems that enables programmers to write a program that will execute on any computer capable of running a Java interpreter. Java is an object-oriented programming (OOP) language similar to C++, except that it eliminates some features of C++ that programmers find tedious and time-consuming.

Java Virtual Machine (VM) A Java interpreter and runtime environment for Java applets and Java applications. This environment is called a virtual machine because, no matter what kind of computer it is running on, it creates a simulated computer that provides the correct platform for executing Java programs.

Javabeans Programming specifications created in Java that are used to create reusable, platform-independent Java components.

JavaScript Now known as ECMAScript. A client-side scripting language designed for writing scripts on Web pages.

joint application development (JAD) A program development method that uses a team approach and involves end users throughout the planning and development stages. The goal is to better design objects that suit end user needs.

joystick A pointing device used to move objects easily in any direction on-screen. It employs a vertical rod mounted on a base with one or two buttons. An input device commonly used for games.

JSON Short for JavaScript Object Notation, a text-based, human-readable technique for representing simple data structures and objects.

jukebox Enterprise storage units that use DVD and CD discs as the storage medium.

jump drive Another name for a USB flash drive.

K

kernel The central part of the operating system that controls the actions that the OS uses most frequently, for example starting applications and managing hardware devices and memory. When the system is booted (started) the computer copies the kernel along with other essential portions of the OS from the hard disk into the computer's RAM memory, where it remains the entire time the computer is powered on and functioning.

keyboard An input device that uses switches and circuits to translate keystrokes into a signal a computer can understand. It makes use of alphabetic, numeric, punctuation, function, arrow, and control keys.

key interception The act of stealing an encryption key.

keylogger Spyware that can record all the keystrokes you type—such as passwords, account numbers, or conversations—and relay them to others.

key matrix A grid of circuits located under the keys of a keypad. When a key is pressed, it completes a circuit on the matrix that provides the identity of the associated character to the system.

keypad A smaller and more compact keyboard, popular on smartphones, on which each key represents multiple letters. The user has to strike a key one to four times to get the desired character entered as input.

keyword Descriptive words matching the qualifications that an employer listed in a job posting. A potential employer will compare applicant skills with these keywords when reviewing resumes.

kilobits per second (Kbps) A data transfer rate of approximately a thousand bits of computer data per second.

kilobyte (KB) A unit of measurement for computer memory and disk capacity, equal to 1,024 bytes or characters.

Kindle 2 A portable reading device that allows the user to scroll though pages of a book, enlarge text size, purchase materials through an e-book store, and use the text-to-speech function.

Kindle DX The newest version of the Kindle portable reading device that boasts a larger display than the Kindle 2, better contrast, and a no-glare screen.

know-and-have authentication A type of computer security that requires using tokens, which are handheld electronic devices that generate a logon code.

knowledge base A database of knowledge designed to meet the complex storage and retrieval needs of computerized expert systems.

knowledge management system (KMS) A system that captures knowledge from books and experienced individuals and makes it available where it is needed.

L

label In Microsoft Excel, a text entry used to identify or group numeric entries.

labor dumping The flooding of a labor market with foreign workers.

land A flat reflective area on an optical disc that bounces the light back to a light-sensing device, corresponding to a 1 in the computer's binary number system.

laser printer A high-resolution nonimpact printer that uses an electrostatic reproductive technology similar to that used by copiers.

last-mile problem The problems associated with the inability of local area networks that support homes or businesses to access high bandwidth multimedia communications that can accommodate the information superhighway, along with the bottleneck of data on the last mile of twisted-pair phone lines connecting those homes and businesses.

last-mile technologies Digital telecommunications services and standards, such as coaxial cable and ISDN, that serve as interim solutions to the limitations associated with the twisted-pair analog phone wiring still common in many homes and businesses.

latency In a packet-switching network, the delay caused by the examining of a given packet by many routers.

launching Starting an application program.

LCD projector An output device that projects a computer's monitor display on a screen by passing light through three colored panels—red, green, and blue. LCD projectors produce sharp, accurate color images; however, they are subject to pixilation and low contrast.

leased line Sometimes called a dedicated line, leased lines are a connection set up by a telecommunication carrier and are usually a permanent fiber-optic or telephone connection that enables continuous, end-to-end communication between two points.

legacy technology Devices that were once used but are now viewed as obsolete.

Level 1 cache (primary cache) A unit of 4 KB to 16 KB of ultrafast memory included in the microprocessor chip that runs at approximately 10 nanoseconds (one-billionth of a second). This is the fastest memory and is used to store frequently accessed data and improve overall system performance.

Level 2 cache (secondary cache) A unit of up to 512 KB of ultrafast memory that can be located within the microprocessor, but further from the registers than Level 1 cache, or on a separate cache chip located on the motherboard very close to the microprocessor. It runs at 20 to 30 nanoseconds.

Level 3 cache A unit of memory found on some systems with newer microprocessors, like Intel's Xeon processor, that are embedded in some servers and workstations.It is located outside of the processor on a separate cache chip on the motherboard but positioned very close to the microprocessor.

libel The publication of a false statement, in written or faxed form, that injures someone's business or personal reputation.

library Enterprise storage units that use Blu-ray optical media for storage.

life cycle The stages through which systems pass: They are born, go through a process of maturation, live an adult life, and become obsolete to the point that they have to be modified or abandoned.

link rot The "out-of-datedness" that occurs in a search due to the amount of time it takes for spiders to accumulate data from the Web.

Linux A freeware operating system introduced by Linus Torvalds that is based on UNIX but is designed for personal computers. Linux is developed and maintained by volunteer programmers who have willingly donated their time to make sure that Linux's open source code is edited and revised to provide PC users with features similar to those found in commercial versions of UNIX.

liquid crystal display (LCD; flat-panel display) A flat-screen display that uses electrical current that controls the positioning of tiny crystals to either block or allow the current to pass through and form the viewable on-screen images and colors.

load To transfer something from a storage device, such as the hard disk, to RAM memory.

local area network (LAN) A network that uses cables, radio waves, or infrared signals to link computers or peripherals, such as printers, within a small geographic area, such as a building or a group of buildings. LANs are typically owned and managed by a single person or organization.

local exchange switch A telephone system device, based on digital technology and capable of handling thousands of calls, located in the local telephone company's central office.

local loop In the public switched telephone network (PSTN), the region serviced by a subscriber loop carrier (SLC) where analog connections from neighborhood distribution points are converted to digital signals.

location awareness (position awareness) A technology that uses GPS-enabled chips to pinpoint the location of a cell phone (and its user).

logic bomb Hidden computer code that sits dormant on a system until a certain event or set of circumstances triggers it into action. That action, or payload, is usually malicious and devastating to the individual or company under attack.

logic error In programming, a mistake made by the programmer in designing the program. Logic errors will not surface by themselves during program execution because they are not errors in the structure of the statements and commands. Such errors must located by the programmer through careful examination of the program output.

logical address A unique identifier assigned to a network node by the software in use.

Logical data type See Boolean data type.

logical operation One of two groups of operations performed by the arithmetic logic unit (ALU). An example of a logical operation is the comparison of data items to determine whether the first number is greater than the second. Logical operations return a value of true or false.

lossless compression In data compression, a method used to reduce the size of a file so it can be decompressed and restored to its original size without any flaws. Most lossless compression techniques reduce file size by replacing lengthy but frequently occurring data sequences with short codes. To decompress the file, the compression software reverses this process and restores the lengthy data sequences to their original form.

lossy compression In data compression, a method of reducing the size of multimedia files by eliminating information that is not normally perceived by human beings.

low-level language A language, like assembly or machine language, that is processor dependent and has a small or nonexistent amount of difference between the language and machine language; because of this, low-level languages are sometimes described as being "close to the hardware."

M

Mac OS An operating system released for the Apple Mac in 1984. It was the first OS to successful implement the GUI (graphical user interface).

Mac OS X Snow Leopard The current version of Mac OS X released in August 2009. It has a smaller footprint (taking up to 50 percent less storage space than the previous version) and includes a variety of useful features.

machine dependent (hardware dependent) The ability of a computer program to run only on a specific type or brand of computer equipment. With new antitheft features, it also refers to the link created between the program and system ID during the installation process. This link prevents the program from functioning on any other system.

machine language The native binary language consisting of 0s and 1s that is recognized and executed by a computer's central processing unit.

macro In a word processing or spreadsheet program, a saved sequence of commands or keyboard strokes that get recalled later with a single command or keyboard stroke.

macro virus A computer virus that uses the automatic execution capabilities of macros stored within productivity software, like word processing or spreadsheet programs, to spread itself to other files and, in many cases, cause harm to computer data.

magnetic storage device In computer storage systems, any storage device that retains data using a magnetically sensitive material, such as the magnetic coating found on floppy and hard disks.

magnetic stripe card reader A device that can detect and read information

stored on magnetic strips that are usually located on the back of credit cards, gift cards, and other cards of similar use.

mainframe (enterprise server) Powerful servers that are part of a networked system designed to handle hundreds of thousands of clients. They are usually used in large corporations or government agencies that handle a high volume of data and can fill an entire wall of an average room.

maintenance release A minor revision to a software program that corrects bugs or adds minor features. Indicated by a decimal in the version number.

malicious network A network, sometimes referred to as an "evil twin" and designed to gather sensitive data such as passwords and credit card numbers, set up by a hacker within the operating area of a legitimate hot spot.

malware Short for malicious software, it describes software designed to damage or infiltrate a computer system without the owner's consent or knowledge. This type of software can wreak havoc on a user's system by deleting files and directory entries; it can also act as spyware, gathering data from a user's system without the user knowing it.

management information system (MIS) A computer-based system that supports the information needs of various levels of management. See also management information systems (MIS).

management information systems (MIS) A program of study that emphasizes the practical application of information systems and technology to provide the skills businesses need to compete successfully. See also management information system (MIS).

markup language A set of codes, or elements, used to define the structure of text, such as a title, heading, or bulleted list, that a Web browser reads and interprets. HTML is a markup language.

mashup Two or more applications combined into one application, a trend helping in the development of Web 3.0.

massively multiplayer online role-playing game (MMORPG) An online game that permits increasingly larger numbers of players to interact with one another in virtual worlds. These virtual worlds are often hosted and maintained by the software publisher and encourage team building in order to progress to higher levels and continue to progress even when you are not actively playing the game.

Mathematica A single system that can handle all the various aspects of technical computing in a coherent and unified way. The key to this system was the invention of a new kind of symbolic computer language that could, for the first time, manipulate the very wide range of objects, using only a fairly small number of basic elements.

mathematical formula In spreadsheet programs such as Microsoft Excel, one of the two basic types of formulas (along with functions) that makes use of numeric constants, cell references, arithmetic operators, or functions and calculates a result by following the mathematical order of operations.

maximize To enlarge a window so that it fits the entire screen.

MDX query language A query language introduced by Microsoft in 1997, similar to SQL but with the added ability to access multiple dimensions. MDX has since become the de facto query standard for multidimensional databases.

media Technology used to present information including pictures, sound, and video.

media center PC An all-in-one entertainment device that provides easy access to photos, TV, movies, and the latest in online media, all from the comfort of the couch by using a remote control.

megabits per second (Mbps) A data transfer measurement equivalent to 1 million bits per second.

megabyte (MB) A unit of measurement approximately equal to 1 million bytes.

Memo data type A data type used for large units of text.

memory Chips or circuitry, located on the motherboard or within the CPU, that retain instructions and data to be accessed by the central processing unit (CPU).

memory address A number that enables memory locations to be found and accessed in random order.

memory footprint The amount of RAM a program uses while it operates.

memory module (memory card) A small circuit board that holds several memory chips and fits into special slots on the motherboard.

memory shaving A type of computer crime in which knowledgeable thieves remove some of a computer's RAM chips but leave enough to start the computer.

memory stick Another name for a USB flash drive.

menu-driven user interface A user interface that enables the user to avoid memorizing keywords (such as *copy* and *paste*) and syntax (a set of rules for entering commands) by displaying on-screen, text-based menus that show all the options available at a given point.

message board A method of communicating over the Internet that is similar to a newsgroup but is easier to use and does not require a newsreader. Many colleges and universities have switched to message boards for this reason.

method An element of an object's definition that describes that object's actions or behavior.

metropolitan area network (MAN) A network designed for a city or town. It is usually larger than a LAN but smaller than a WAN. Typically, a MAN is owned by a single government or organization.

MICR reader A device that reduces human data entry by scanning and automatically inputting characters printed with special magnetic ink. Such characters are often located on the bottom of checks and some billing statements so that when they are returned to the creator, the numbers are simply scanned by a MICR reader and inputted into the company's data system; short for magnetic-ink character recognition.

microbrowser A special Web browser that has all of the features of computer-based browsers but is simplified to meet handheld device limitations.

microcomputer Another word for personal computer.

microprocessor (processor) Another name for the central processing unit.

Microsoft Windows The most popular operating system, available in several iterations, and installed on almost all of the personal computers made today.

Microsoft Windows 7 The newest version of the Windows operating system released in 2009. It is more efficient than its predecessor, often performing better on the same hardware, and has resolved the compatibility issues that existed between applications. There are six versions and many new features, including jump list, snap, pin, and Windows Search.

Microsoft Windows Mobile The version of Windows operating system designed for smartphones and PDAs. It includes a simplified user interface and quicker synchronization of mobile devices with corresponding programs on the user's desktop computer.

Microsoft Windows Server 2008 A sophisticated operating system specifically designed to support client/server computing systems in a corporate environment.

Microsoft Windows Vista The version of Windows operating system released in 2007. Its main improvements included a slick new interface, mobile support, increased security features, improved search features and networking tools, integrated speech recognition capabilities, and new multimedia tools such as gadgets.

microwave An electromagnetic radio wave with a very short frequency that travels at speeds of 1 to 10 Mbps and is used to transmit data from a source to a receiving site.

middleware Software that does what its name implies: It sits "in the middle," making the connections among varied applications working on multiple networks being supported by different operating systems. Middleware is essential for scalability as well as interoperability in the cloud.

minicomputer (midrange server) Midsized servers approximately the size of one or several four-drawer file cabinets with the hardware and software to handle computing needs of 4 to 200 client computers in a smaller corporation or organization.

mini-keyboard A keyboard option available on many smartphones and portable devices that has a key for each letter of the alphabet. It is usually is hidden when the phone is held in a vertical position but slides out when the phone is turned horizontally.

minimize To reduce the size of a window so that it appears only as an icon or an item on the taskbar.

minitower case A smaller version of the tower case, used for less complex systems, with a smaller amount of internal room for components.

mnemonics In programming, an abbreviation or short word for an instruction.

mobile switching center (MSC) The part of a cellular network that handles communications within a group of cells. Each cell tower reports signal strength to the MSC, which then switches the signal to whatever cell tower will provide the clearest connection for the conversation.

modeling (what-if analysis) A method by which spreadsheet programs are able to predict future outcomes; also called what-if analysis.

modem Short for modulator/demodulator, a communications device that converts (modulates) data from one form into another, transmits the modulated data, and on the receiving end converts (demodulates) the data for use. It is hardware that enables the computer, a digital device, to access data through nondigital media, such as telephone lines, cable, satellite, and cellular connections.

modifier key A key, like Shift, Alt, or Ctrl, that is pressed to modify the meaning of the next key that is pressed.

modular programming A programming style that breaks down programs into independent modules, each of which accomplishes one function.

modulation protocol In modems, the communications standard or rules that govern how the modem translates between the computer's digital signals and the analog tones used to convey computer data over the Internet so that the message is received and understood by the destination modem regardless of the manufacturer.

module A collection of routines in a program; independently developed modules are combined to create the final program.

monitor (display) A screen that displays data and processed information. This type of output is not permanent.

motherboard The circuit board, located within the system unit, that contains the central processing unit, support chips, random access memory, and expansion slots. It provides the circuitry to connect the central processing unit(s) anchored on the motherboard and other system components.

mouse A palm-sized pointing device designed to move about on a clean, flat surface. As you move the mouse, its movements are mirrored by the on-screen pointer. Actions are initiated by using the mouse buttons.

MUD (multiuser dungeons or dimension) The early name for a genre of role-playing games in which multiple players could use their imaginations to construct a persona and build their environment. Players interacted in a text-based environment through text chatting.

multidimensional database A database structure that stores data in more than the two dimensions used by popular relational databases. Conceptually, multidimensional databases are depicted as a data cube to represent the dimensions of data available to the user. Multidimensional databases are becoming the choice for online analytical processing.

multifunction device A device that combines printing, scanning, faxing, and copying.

multimedia An application that involves two or more media, such as audio, graphics, or video. Multisensory stimulators that stimulate our senses of sight, sound, touch, smell, or taste.

multimedia and graphics software A general category of software programs for professional desktop publishing, image editing, three-dimensional rendering, and audio and video editing

multiplexing A technique that enables more than one signal to be conveyed on a physical transmission medium.

multitasking A process by which the CPU gives the user the illusion of performing instructions from multiple programs at once when in reality the CPU is rapidly switching between the programs and instructions.

multitasking operating system A descriptive phrase applied to personal computer operating systems that enable multiple applications to run at the same time.

multi-tenancy Refers to the ability of an application to be installed only once in a cloud, on the cloud's server, but to be shared and customized with individual options for each user.

N

name The first part of a file name.

nanosecond One-billionth of a second.

native application A program that is compatible with a given processor and therefore capable of running on that processor.

natural language In programming, a language that would provide instruction to a computer in normal human language, such as English or Japanese.

navigation pane The pane that appears on the left side of a Windows Explorer window. It allows a user to navigate directly to a specific folder listed in the content pane (file list), access a prior search that was saved by clicking on a desired folder, and add a shortcut to a frequently used folder by dragging the folder into the Favorite Links area of the navigation pane.

nesting A process of embedding control structures within one another.

netbook A handheld computing device with a relatively small hard drive that is used primarily for Web browsing, e-mail, and cloud computing.

netiquette A lengthy series of specific behavior guidelines, developed by Internet and computer users, that provide specific pointers on how to show respect for others—and for yourself—while you're online.

network A group of two or more computer systems linked together to exchange data and share resources, including expensive peripherals such as high-performance laser printers.

network access point (NAP) A special communications device that sends and receives data between computers that contain wireless adapters. 2. The location where equipment from one network service provider connects with equipment from another provider.

network administrator Computer professionals who install, maintain, and support computer networks, interact with users, handle security, and troubleshoot problems. Also called a network engineer.

network architecture The collection of protocol suites that specify how the network functions.

network attached storage (NAS) High-performance devices that offer little more than data and file sharing to clients and other servers on a network. An NAS is comprised primarily of hard drives or other media used for data storage and is attached directly to a network.

network interface card (NIC) An expansion board that fits into a computer's expansion slots, or an adapter built into the motherboard, that provides the electronic components to make the connection between a computer and a network. This can be either wired or wireless.

network layers Separate divisions within the network architecture with specific functions and protocols. Each layer's protocol precisely defines how that layer passes data to another layer. Because of this distinction between layers, it's possible to make changes within one layer without having to rebuild the entire network.

network operating system (NOS) An operating system designed to enable data transfer and application usage among computers and other devices connected to a local area network.

network service provider (NSP) A company or organization that maintains the Internet backbone.

network topology The physical layout of a network, which provides a solution to the problem of contention. Typical topologies include bus, star, and ring.

newsgroup In Usenet, a discussion group devoted to a single topic that typically requires participants to use a program called a news reader. Those reading the

discussion send reply messages to the author individually or post replies that can be read by the group as a whole.

node Any device connected to a network. A node can be any computer, peripheral (such as a printer or scanner), or communication device (such as a modem).

nonprocedural language A language not tied down to step-by-step procedures. In programming, a nonprocedural programming language does not force the programmer to consider the procedure that must be followed to obtain the desired result.

nonvolatile memory Memory, like ROM, that is not easily edited and keeps its content even when the system powers off. It's used primarily to hold programs essential to system start up.

notebook computer A computer, designed for individual use, approximately the size of a spiral bound notebook and popular with individuals that travel and students.

NTFS (new technology file system) A file allocation table that contains the name of each file and the file's exact location on the disk for Windows NT, 2000, XP, Vista, and Windows 7. It provides improved security and encryption ability.

numeric check A data validation procedure that ensures that only numbers are entered into a field.

O

object In object-oriented programming (OOP), a unit of computer information that defines a data element and is used to model real-world objects that you use every day. It consists of attributes and methods.

object code In programming, the instructions in (or close to) a specific computer's machine language that are created by a compiler from source code.

object-oriented database management system (ODBMS) The type of database structure, which suits multimedia applications, in which the retrieved object incorporates miniprograms that enable the object to perform tasks, such as display a graphic.

object-oriented programming (OOP) A programming technique based on defining data as objects. The user then assembles different sets of objects as needed to solve specific problems.

offshoring The transfer of labor from workers in one country to workers in other countries.

OLE Object data type A data type used for nontextual data like pictures, sounds, and videos.

OLED (organic light-emitting diode) display An emissive output device that displays images by emitting light rather than modulating transmitted or reflected light. These displays are extremely thin and lightweight, and produce outstanding color, contrast, brightness, and viewing angles.

onboard video Video circuitry that is built into the motherboard.

online analytical processing (OLAP) An application included in some decision support systems that provides decision support by enabling managers to import rich, up-to-the-minute data from transaction databases.

online (interactive) processing A transaction processing system in which you see the results of your commands on-screen so that you can correct errors and make necessary adjustments immediately, before completing an operation; also called interactive processing.

online service provider A for-profit firm that provides a proprietary network offering special services that are available only to subscribers. Members may participate in chat rooms and discussions and take advantage of fee-based content, such as magazines and newspapers.

online workshop A structured, interactive Web-based session that is assisted by an electronic meeting system, a set of tools that enable discussion, brainstorming, voting, and categorization.

Open Cloud Manifesto A document published in March 2009 to provided some guides and business practices for cloud providers in an attempt to guarantee subscribers the freedom of choice, flexibility, and openness they need in order to take full advantage of the benefits of cloud computing.

open source software Software whose source code (the code of the program itself) is available for all to see and use. Users of open source software are invited to scrutinize the source code for errors and to share their discoveries with the software's publisher. Linux is an open source operating system.

operating system (OS) The most important type of system software. It integrates and controls the computer's internal functions and provides the connectivity for the user to interact with the computer's hardware. Common operating systems include Microsoft Windows 7, Microsoft Vista, Microsoft Windows XP, Linux, and Mac OS X Snow Leopard.

operational decision A decision on a localized issue, such as inventory level, that requires immediate attention.

operational feasibility A project's capability of being accomplished with the organization's available resources.

operational support system (OSS) A suite of programs that supports an enterprise's network operations.

optical character recognition (OCR) Software that automatically decodes imaged content into text. Most scanners come with OCR software.

optical mark reader (OMR) A device that scans the magnetized marks from a no. 2 pencil, or other device that produces such marks, to determine which responses were made. The response is compared against a provided key with the correct answers. OMR devices facilitate the tabulation of responses to large surveys.

optical mouse A palm-sized pointing device that makes use of an LED (light-emitting diode) light, located on the underside of the mouse, and a small camera that takes continuous images of the changes in the surface under the mouse as it is moved. The differences are compared and the direction and speed of the mouse movement are recognized and the on-screen pointer shifted accordingly.

optical storage device A computer storage device that retains data in microscopic patterns, pits and lands, which are encoded on the surface of plastic discs and detected by a laser beam.

option Choices made by a user to specify how that user wants the program to operate.

output The display of the results (information) of the processing operation.

output device A monitor, printer, speaker, or other device that enables people to see, hear, and—with some newer inventions—feel the results of processing operations.

outsourcing The subcontracting of portions of a job to a third party to reduce cost, time, and energy consumption.

P

packaged software Aimed at a mass market that includes both home and business users, packaged software can be customized, but its appeal lies in the fact that is ready to use off the shelf. Synonymous with commercial off-the-shelf software (COTS) and shrink-wrapped software.

packet In a packet-switching network, a unit of data of a fixed size—not exceeding the network's maximum transmission unit (MTU) size—that has been prepared for network transmission. Each packet contains a header that indicates its origin and its destination.

packet switching One of two fundamental architectures for a wide area network (WAN); the other is a circuit-switching network. In a packet-switching network, such as the Internet, no effort is made to establish a single electrical circuit between two computing devices; instead, the sending computer divides a message into packets, each of which contains the address of the destination computer, and dumps them onto the network. They are intercepted by devices called routers, which send the packets in the appropriate direction. The receiving computer assembles the packets, puts them in order, and delivers the received message to the appropriate application. Packet-switching networks are highly reliable and efficient, but they are not suited to the delivery of real-time voice and video.

page In virtual memory, a unit of fixed size into which program instructions and data are divided.

paging Transferring of files from the hard disk to RAM and back, as needed.

Palm OS A mobile operating system initially developed in 1996 by Palm Inc. for personal digital assistants (PDAs). It's designed for use with a touch screen, uses graphical user interfaces and natural gestures, and comes with a suite of personal information management applications.

parallel conversion Running both the new and the old systems for a while to check that the new system produces answers at least as good as those of the old system.

parallel port Considered legacy technology, these ports were commonly used to connect a printer to a PC but have been replaced by USB and Ethernet ports.

parallel processing The use of more than one processor to run two or more portions of a program at the same time.

partition A section of a hard disk set aside as if it were a physically separate disk. Partitions are required if a system is going to give the user an option of running more than one operating system.

passive-matrix (dual scan) Technology that creates the content of a display or monitor by charging groups of pixels, either in a row or column, at once. The screen brightens and fades as the current moves from group to group. Appliances, toys, remote controls, and home medical products use this type of display.

path The sequence of directories that the user must follow to locate a file.

payload The actions, most often malicious and devastating, performed by rogue programs like spyware and viruses to the individual or company under attack.

PC card (PCMCIA card) A credit card–sized accessory, typically used to enhance the abilities of notebook computers, designed to fit into a compatible PC card slot located on or within the computer's case. Some PC cards are modems, others are network adapters, and still others provide additional memory or storage capacity.

PCI (peripheral component interconnect) bus An input/output bus that connects devices like hard drives and sound cards to the faster microprocessor system bus usually through expansion slots.

PCI Express An interface currently in use that transfers graphics from the video card to the motherboard. Most current video cards from manufacturers like ATI and NVIDIA use PCI Express.

PCI Express Base 2.1 The most current version of the PCI express interface.

PCS (personal communication service) A group of related digital cellular technologies that are rapidly replacing analog cellular services.

peer-to-peer (P2P) network A computer network design in which all the computers on the network are equals or peers. There is no file server. File sharing is decided by each computer user. A user may choose to share a few files, an entire directory, or even an entire disk. They also can choose to share peripherals, such as printers and scanners. P2P is best used for home networks or small businesses connecting fewer than ten computers and does not require a network operating system (NOS).

peripheral device Computer components located outside the system unit housing that are connected physically or wirelessly to the system unit and motherboard, such as keyboards, monitors, speakers, and external storage devices.

personal area network (PAN) A network created among an individual's own personal devices, usually within a range of 32 feet. Such networks involve wireless technology.

personal computer (PC or microcomputer) A computer designed to meet the computing needs of an individual or, when connected to a network, to be used by a contributor in a collaborative project. The two most commonly used types of personal computers are Apple's Macintosh, referred to as a Mac, and the more numerous IBM-compatible systems referred to as PCs.

personal computing Any situation or setup where one person controls and uses a computer or handheld device for personal or business activities.

personal digital assistant (PDA) A small handheld personal computing device that usually uses a stylus or virtual keyboard to interface with built-in software to manage contacts, use e-mail, and schedule appointments.

petabyte A unit of measurement approximately equal to 1 quadrillion bytes.

petaflop A unit of measurement for computer processing speed that is the equivalent of one quadrillion calculations per second, approximately 150,000 calculations for every human being on the planet per second.

phased conversion Implementing a new system over different time periods, one part at a time.

phishing Posing as a legitimate company in an e-mail or on a Web site in an attempt to learn personal information such as Social Security numbers, user names, passwords, and account numbers.

photo checkout system A system that accesses a database of customer photos and displays the customer's picture when a credit card is used.

photo-editing program A program that enables a person to enhance, edit, crop, or resize the images.

photo printer An inkjet or laser printer that makes use of special inks and good-quality photo paper to produce pictures that are as good as those generated by commercial photo processors. Many permit bypassing a computer and printing directly from a digital camera or memory card.

PHP A general purpose, server-side, open source, cross-platform scripting language used primarily to make dynamic Web sites.

phrase searching In database and Web searching, the placing of a phrase between quotation marks so the search retrieves only documents that contain the entire phrase.

physical address Also called the data link control address, data link control/connection identifier (DLCI), or media access control (MAC) address; a unique numeric identifier built into the hardware of a network node and used to identify the node.

picture messaging (MMS) A mobile service that allows you to send full-color pictures, backgrounds, and even picture caller IDs on your cell phone.

piggybacking The use of a network without permission.

pilot conversion One part of the organization converts to a new system while the rest of the organization continues to run the old system.

pipelining A processing technique used in CPUs built with superscalar architecture. It feeds a new instruction into the processor at every step of the processing cycle so that four or more instructions are worked on simultaneously, increasing the speed at which instructions are performed.

pit A microscopic indentation in the surface of an optical disc that scatters the laser's light so that the drive's light-sensing device receives no light from these areas and sends a signal to the computer that corresponds to a 0 in the computer's binary numbering system.

plagiarism The use of someone else's intellectual property, ideas, or written work, as one's own or without permission.

plaintext A readable message before it is encrypted.

platform The combination of microprocessor chip and operating system used by a distinct type of computer, such as a Mac or a PC.

Platform-as-a-Service (PaaS) The category of cloud services that permits subscribers to have remote access to application development, interface development, database development, storage, and testing to facilitate the creation and testing of subscriber-developed programs and interfaces, using a cloud provider's hardware and development environment.

platter The fixed, high-capacity, rapidly rotating, storage medium in a hard drive that is coated with a magnetically sensitive material. High-capacity hard drives typically have two or more platters.

plotter An output device that produces high-quality images by moving ink pens over the surface of the paper.

plug-and-play (PnP) Refers to a set of standards, jointly developed by Intel Corporation and Microsoft, which enable a computer to automatically detect the brand, model, and characteristics of a device when you plug it in and configure the system accordingly.

plug-in An additional software program, located on the user's computer, that is activated by a Web page to enhance the ability of the browser, usually to enable

multimedia features such as sound or video.

podcast A blend of the words *iPod* and *broadcast*. It has come to mean a program (of music or talk) that is made available in digital format for automatic download over the Internet. Such files contain audio, images, and videos and are released periodically by means of Web syndication.

podcatcher Applications, such as Apple Inc.'s iTunes or Nullsoft's Winamp, that can automatically identify and retrieve new files in a given series and make them available through a centrally maintained Web site.

pod slurping An activity in which employees use USB drives, iPods, or other removable storage media to create an unauthorized copy of confidential data.

point-and-shoot digital camera A camera that includes automatic focus, automatic exposure, built-in automatic electronic flash with red-eye reduction, and optical zoom lenses with digital enhancement. Sometimes called a compact camera.

pointer An on-screen symbol, usually an arrow, that shows the current location of on-the-screen activity.

pointing device An input device that allows you to control the movements of the on-screen pointer.

pointing stick A pointing device that looks like a pencil eraser located between the G, H, and B keys. It is pressure sensitive and is pressed and moved in various directions with the forefinger.

point of presence (POP) A wired or wireless access connection point in a wide area network. ISPs that provide connectivity to the largest WAN, the Internet, are likely to have POPs in many cities and towns; however, rural areas may not be so lucky.

pop-up A small window that suddenly appears ("pops up") in the foreground of the current window.

port An electronically defined pathway or interface for getting information into and out of the computer.

portable storage (removable storage) A popular, removable, compact storage device that is easy to carry around, simple to use, and can be quickly plugged into any computer with the correct connector. Examples are USB flash drives, also known as memory sticks, thumb drives, or jump drives.

portal A Web page that acts as a gateway to a lot of diverse sources and presents those sources in an organized way and enables a user to locate fast-breaking news, local weather, stock quotes, sports scores, and e-mail with the click of a mouse. Portal sites usually use indexes and lists of links to provide a jumping-off point for your search. Sites such as MSNBC, AOL, iGoogle, and Yahoo! are examples of portals.

positioning performance A measure of how much time elapses from the initiation of drive activity until the hard disk has positioned the read/write head so that it can begin transferring data.

POST (power-on self test) A program, stored in ROM memory, that conducts a series of tests during system startup after the BIOS instructions are loaded into memory. It checks the circuitry, making sure that the computer and circuitry are working correctly, and marks any RAM locations that are defective so that they do not get used.

postimplementation system review A process of ongoing evaluation that determines whether a system has met its goals.

power-on light The light, located on the front panel of most computers, that signals whether the power is on.

power-on self-test (POST) A series of tests conducted during a system boot, after the BIOS instructions are loaded into memory, to make sure that the computer and associated peripherals are operating correctly.

preemptive multitasking An environment in which programs that are running receive a recurring slice of time from the CPU. Depending on the operating system, the time slice may be the same for all programs or it may be adjustable to meet the various program and user demands. This method of multitasking ensures that all applications have fair access to the CPU and prevents one program from monopolizing it at the expense of the others.

primary key (key field) A field that contains a code, a number, a name, or some other piece of information that uniquely identifies a record; also called the key field.

printer An output device that produces a permanent version, or hard copy, of the contents on a computer's display screen.

privacy An individual's ability to restrict or eliminate the collection, use, and sale of confidential personal information.

private cloud Operated for a single organization and its authorized users. The infrastructure can exist on-site or off-site and is controlled by either the organization or a contracted third party.

private key A decryption key associated with a public key in a public key encryption scheme.

problem The underlying cause of a symptom.

procedural language A programming language that directs the computer to perform an action by grouping together instructions in a very specific step-by-step manner.

processing The actions performed on data (input) to convert it into information.

processing cycle (machine cycle) A four-step process performed in the central processing unit (CPU) that involves the fetch, decode, execute, and store operations.

productivity program A program that helps individuals work more efficiently and effectively on both personal and business-related documents. The value of a productivity program is that it performs its functions regardless of the subject matter. Productivity software includes word processors, spreadsheets, databases, presentation, project management, and a personal information management programs.

product registration key An alphanumeric code that is unique and specific to a particular copy of a program. It is necessary to enter this key after installation in order to validate authenticity and activate the program. The key may be necessary later to download upgrades, patches, or templates.

professional organization (professional association) An IT organization that can help you keep up with your area of interest as well as provide valuable career contacts.

professional workstation High-end desktop computers with system units equipped with more powerful CPUs, extra RAM, additional graphics power, and multitasking capabilities for handling technical or scientific applications that require exceptionally powerful processing and output capabilities.

profile A record of a specific user's preferences for the desktop theme, icons, and menu styles.

program A set of instructions that tells the hardware how to perform an operation on the inputted data.

program design The result of phase 2 of the program development life cycle (PDLC) in which a written plan that specifies the components that make the program work is created, reviewed, and discussed.

program development life cycle (PDLC) A six-phase, organized plan for breaking down the task of program development into manageable chunks, each of which must be successfully completed before programmers move on to the next phase.

program maintenance In phase 6 of the program development life cycle (PDLC), the process in which the programming team fixes program errors discovered by users.

program specification Part of the first phase of the program development life cycle (PDLC) in which the systems analyst precisely defines the input data, the processing that should occur, the output format, and the user interface.

programmer A trained expert who works individually or in a group to design, write, and test software applications for everything from word processing to virus protection.

programming The process used to create the software applications you use every day.

programming language An artificial language composed of a fixed vocabulary and a set of rules used to create instructions, commands, or statements for a computer to follow.

project dictionary A document that explains all the terminology relevant to a project.

project manager The individual responsible for guiding the project so it progresses according to plan. The project manager's responsibilities include disseminating information to all having an active role in the system development, identifying and managing project risk, ensuring that what was agreed to is delivered, keeping a pulse on the progress of the project, and determining whether the deliverables are acceptable.

project notebook A digital file maintained online, it is often used to store the documentation for a project, thus enabling everyone connected with the project to understand all the decisions that have been made.

project plan Identifies the project's goal and specifies all the activities that must be completed for the project to succeed.

project proposal A document that introduces the nature of the existing system's problem, explains the proposed solution and its benefits, details the proposed project plan, and concludes with a recommendation.

project team The liaison between the systems analyst and others involved in the project's design and implementation and the client's organization. The responsibilities of the project team include being actively involved in the development and review of the system design, assisting in the customizing of the design and providing direction on the system as it is being developed so that it best suits the needs of the organization, monitoring progress against the projected time line, sustaining momentum and company enthusiasm for the project, and answering questions for the system analyst and development team.

PROM Programmable read-only memory that can be written on only once, but requires a special writing device.

property A setting that provides information on a file such as its date of creation, size, and the date it was last modified.

proprietary file A file whose format is patented or copyright protected and controlled by a single company. The extent of restriction depends on the company and its policies.

protocol In data communications and networking, the standard or set of rules that enable network-connected devices to communicate with each other.

protocol stack In a computer network, a means of conceptualizing network architecture as vertical layers, connected by protocols that move the data down the stack from its initial level, or transmitting node, to the lowest, physical hardware level that sends it over the network. When the data arrives at its destination, it moves back up the stack through the layers in reverse order, eventually arriving at the receiving node.

protocol suite In a computer network, the collection of network protocols, or rules, that defines the network's functionality.

prototyping A process used in several systems development methodologies in which a developer creates a small scale mock-up of the system and presents it to the customer; also called rapid application development (RAD).

PS/2 port Considered legacy technology, these ports were typically used for mice and keyboards, but were not interchangeable. Today most mice and keyboards connect via USB connectors.

pseudocode In structured programming, a stylized form of writing used as an alternative to flowcharts to describe the logic of a program.

public cloud Available to the general public, large organizations, or a group of organizations, the public cloud offers the most risk because it is accessed by users that have not been authenticated or established as trusted. The infrastructure is owned and operated by a cloud provider and is located off site.

public domain software Noncopyrighted, free programs that can be used, copied, modified, or sold without restriction or acknowledging the source.

public key In public key cryptography, the encoding key, which you make public so that others can send you encrypted messages. The message can be encoded with the public key, but it cannot be decoded without the private key, which you alone possess.

public key encryption (asymmetric key encryption) A computer security process in which an encryption (or public) key and a decryption (or private) key are used to safeguard data and thus provide confidentiality. This system allows a digital signature to be verified by anyone who has access to the sender's public key, thereby proving that the sender is authentic and has access to the private key; also called asymmetric key encryption.

public key infrastructure (PKI) A uniform set of encryption standards that specifies how public key encryption, digital signatures, and digital certificates should be implemented in computer systems and on the Internet.

public switched telephone network (PSTN) The global telephone system, a massive network used for data as well as voice communications, comprising various transmission media ranging from twisted-pair wire to fiber-optic cable.

Q

query A specially phrased question used to locate data in a database. It can specify multiple criteria and designate the fields to be displayed.

query language A language, like SQL, designed to extract and edit information in a database.

Quick Access Toolbar Located above the Ribbon in the Windows environment. This customizable toolbar displays a series of buttons used to perform common tasks, such as saving a document and undoing or redoing the last action performed.

R

racetrack memory A type of memory under development that uses the spin of electrons to store information. This technology will greatly increase the speeds for transferring and retrieving data.

radio frequency identification (RFID) A tracking device, replacing bar codes, which does not require direct contact or line-of-sight scanning. Instead, an antenna using radio frequency waves transmits a signal that activates the transponder, or tag. When activated, the tag transmits data back to the antenna.

radio transmission Data in a variety of forms (music, voice conversations, and photos) travels through the air as radio frequency (RF) signals or radio waves via a transmitting device and a receiving device.

RAID (redundant array of independent disks) A group of two or more hard drives that contain the same data.

random access memory (RAM) Memory chips, located on the motherboard, which temporarily store the programs and data being used and accessed by the central processing unit through a high-speed data bus. RAM is also referred to as primary memory or temporary memory. The designation of temporary comes from the fact that the information located in this memory in not permanent and is lost when the computer is turned off.

random access storage device A storage device that can begin reading data without having to go through a lengthy linear search.

range In Microsoft Excel, a range consists of two or more contiguous cells and is identified by the addresses of first cell (the top left) and last cell (bottom right) separated by a colon. For example, the range from cell A1 to cell D5 would be represented as A1:D5.

range check A data validation procedure that verifies that the entered data fall within an acceptable range.

rapid application development (RAD) A program development method that is able to deliver systems very quickly. A programmer works with a library of prebuilt objects that have been created for a huge variety of applications.

ray tracing A 3D rendering technique in which color intensity on a graphic object is varied to simulate light falling on the object from multiple directions.

read/write head An electromagnet located within magnetic storage devices, such as a hard disk drive, that moves across the surface of a disk and records information by transforming electrical impulses into a varying magnetic field. When reading, the read/write head senses the recorded pattern and transforms this pattern into electrical impulses that are decoded into text characters.

read-only memory (ROM) Nonvolatile memory that does not lose its content

when power is shut off. It contains essential prerecorded computer start up instructions that cannot be erased or changed by the computer without user initiation.

Really Simple Syndication (RSS) A way to keep abreast of updates on news, weather, and sports in our fast-moving and informative world. Once a user sets up a connection to a Web site that has an RSS feed, he or she will receive constant updates over the Internet from that site without any further involvement.

receiving device A component of communication that accepts a transmission and responds.

record A group of one or more related fields.

register Temporary memory located in the microprocessor that is used to store values and external memory addresses while the processor performs arithmetic and logical operations on them.

registration fee The amount of money paid to an author of a piece of software to continue to use it beyond the duration of the evaluation period.

registry In Microsoft Windows, the name of the database in which configuration information about installed peripherals and software is stored.

relational database management system (RDBMS) A database system in which data in several tables is related by a common primary key, allowing the user to make connections between the tables.

remote storage Sometimes referred to as an Internet hard drive, this is a type of storage space on a server, accessible from the Internet, and usually requires the user to pay a subscription free.

repetition control structure In structured programming, a control structure that repeats the same instructions over and over. Two examples of repetition structures are DO-WHILE and DO-UNTIL; also called a looping or iteration control structure.

report A database feature that displays information from tables, queries, or a combination of both in a professionally styled manner.

report generator In programming, a programming language for printing database reports. It provides a user-friendly interface enabling a user to design and generate high-quality reports and graphs.

request for proposal (RFP) A request for a vendor to write a proposal for the design, installation, and configuration of an information system.

request for quotation (RFQ) A request for a vendor to quote a price for specific components of the information system.

requirements analysis A process to determine the requirements of a system by analyzing how the system will meet the needs of end users.

resolution Refers to the sharpness of an image and is controlled by the number of pixels on the screen. The higher the resolution number, the sharper the image.

restore down A mode that, if the window is full screen, will cause the window to revert to a smaller size.

return on investment (ROI) A system's overall financial yield at the end of its lifetime.

RFID reader A device used to detect radio signals being emitted from a radio frequency identification tag placed on an item.

Ribbon A band located across the top of the application window and below the title bar in Office 2007 and Office 2010 applications. It consists of tabs with icons assembled into groups based on their function. Each application has a Ribbon with tab options that match the activities performed by that application.

ring topology The physical layout of a local network in which all nodes are attached in a circle, without a central host computer. This topology, which is no longer used frequently, employs a unit of data called a *token* that travels around the ring. A node can transmit only when it possesses the token, thus avoiding collisions.

risk management The process of analyzing exposure to risk and determining how to best handle it within the tolerance level set by the enterprise.

ROM (read-only memory) The part of a computer's primary storage that contains essential computer start-up instructions and doesn't lose its contents when the power is turned off. Information in read-only memory cannot be erased by the computer without initiation by the user.

rootkit A malicious program that is disguised as a useful program that enables the attacker to gain administrator level access to a computer or network. The primary purpose of a rootkit is to allow an attacker repeated and undetected access to a compromised system.

router A complex device, or in some cases software, used to connect two or more networks. Routers have the capability to determine the best path to route data and locate alternative pathways so that the data reaches its destination.

routine A section of code that executes a specific task in a program; also referred to as a procedure, function, or subroutine.

row In Microsoft Excel and Word, a block of data presented horizontally across the screen.

RSS (Really Simple Syndication or Rich Site Summary) A technology that publishes content to you and lets you know when Web content has been updated or news events are taking place.

Ruby An open-source (free-of-charge), object-oriented programming language released in 1995 that is simple in appearance but complex inside. Its growth is attributed to the popularity of its software, a Web framework that allows applications that took months to create to be developed in days.

S

Safe Mode An operating mode in which Windows loads a minimal set of drivers that are known to function correctly. Within Safe Mode, the user can use the Control Panel to determine which devices are causing a configuration problem that may occur after adding a new peripheral device such as an external hard drive or new printer to the system.

salami shaving A computer crime in which a program is altered so that it transfers a small amount of money from a large number of accounts to make a large profit.

sales force automation (SFA) software Software that automates many of the business processes involved with sales, including processing and tracking orders, managing customers and other contacts, monitoring and controlling inventory, and analyzing sales forecasts.

Sarbanes-Oxley (SOX) An act administered by the Securities and Exchange Commission (SEC) that specifies the type of business records that need to be stored and how long they must be kept, but leaves the method of storage up to the business.

SATA (serial advance technology attachment) An interface developed by the Serial ATA International Organization (SATA IO) as a replacement for legacy ports that greatly increases the data transfer rate between the motherboard and storage devices like hard drives and optical drives. The user benefits from greater speed, simpler upgradable storage devices, and easier configuration.

satellite In data communications, a communication device placed in a geosynchronous (stationary) orbit that transmits data by sending and receiving microwave signals to and from Earth-based stations.

satellite radio A type of communications technology that broadcasts radio signals back and forth between satellites orbiting more than 22,000 miles above the Earth and radio receivers on Earth.

saving The process of transferring a file from the computer's temporary memory, or RAM, to a permanent storage device, such as a hard disk.

scalability The ability of a hardware or software system to continue functioning effectively as demands and use increase.

scanner A device that copies anything that is printed on a sheet of paper, including artwork, handwriting, and typed or printed documents, and converts the input into a graphical image for the computer. The scanner does not recognize or differentiate the type of material it is scanning and converts everything into a graphic bitmapped image.

scope The sum total of all project elements and features.

scope creep The uncontrolled changes or bumps that arise during a project that lead to increased costs and a longer development schedule.

script A program, written in a scripting language like VBScript or JavaScript, that controls any action or feedback on a Web page.

scripting language A language that enables users to create useful programs, called scripts, to control actions or feedback on a Web page. VBScript and JavaScript are examples of client-side scripting languages; their scripts run on a user's computer. Other scripting languages are server-side scripting languages that manipulate the data, usually in a database, on the server.

scroll arrows An arrow appearing within the scroll bar that enables the user to scroll up or down (or, in a horizontal scroll bar, left and right) by small increments.

scroll bar A vertical or horizontal bar that contains scroll arrows and a scroll box. The scroll bar enables the user to navigate though content, revealing hidden portions of a document in the application workspace.

SCSI (small computer system interface) port Considered legacy technology, a type of parallel interface that enabled users to connect up to 15 SCSI-compatible devices, such as printers, scanners, and digital cameras, in a daisy-chain series.

SDSL (symmetrical digital subscriber line) A transmission technology that splits the copper telephone line channels into three channels: telephone, upload, and download. The bandwidth is distributed equally among the channels. On SDSL connections, uploads and downloads occur at the same rate.

Search box A Windows Explorer input box that allows the user to locate files. Select one of the main folders and begin typing a search term in the search input box. As you are typing, Windows Explorer searches the contents of the folders and subfolders of your selected main folder and immediately filters the view to display any files that match your search input.

search engine Any program that locates needed information in a database, or on an Internet-accessible search service (such as Google or Ask) that enables you to search for information on the Internet.

search operator In a database or a Web search engine, a word or a symbol that enables you to specify your search with precision.

search utility A program that enables you to search an entire hard disk and any indexed network storage device for a file by querying single or multiple specifics about the file such as the name, date, and/or size.

secondary cache An additional location for memory storage located on the processor's architecture or very close to it, allowing for quick access; also known as L2 cache.

secondary storage (fixed storage) Hardware that retains the programs and data even when power is disrupted or turned off. Examples include hard disks, USB flash drives, CDs, and DVDs.

sector A pie-shaped wedge of the concentric tracks encoded on a disk during formatting (set up). Two or more sectors combine to form a cluster.

secure electronic transaction (SET) An online shopping security standard for merchants and customers that uses digital certificates.

seek time In a secondary storage device, the time it takes for the read/write head to locate the data on the disk before reading begins.

selection control structure In structured programming, a control structure that branches in different directions, depending on whether a condition is met. An efficient selection control statement is an IF-THEN-ELSE structure. This control is also called a conditional or branch control structure.

semiconductor The material that transistors are made out of that conducts electrical current or blocks the current's passage through the circuit.

sending device A component of communication that initiates a transmission.

sequence control structure In structured programming, a control structure in which instructions are executed in the order, or sequence, in which they appear.

serial port Considered legacy technology, it is an interface that was used with dial-up modems to achieve two-way communication. Although they are still in use on servers, many new computers no longer include serial ports, opting to use USB ports instead.

serialization The transmission of structured data over a network connection.

server A computer that ranges in size from a two-drawer file cabinet to a four-drawer file cabinet and is equipped with the hardware and software to manage network resources like files, e-mail, printers, and databases, and that makes the programs and data it manages available to people who are connected via a network.

server operating system An operating system used in client/server network environments.

setup program A program located in the computer system's BIOS that contains settings that control the computer's hardware.

sexting A combination of sex and texting. Sending sexually explicit messages or photos electronically, primarily between cell phones.

shareware Copyrighted programs that may be used or copied, without cost, during the specified trial period. Once the trial period has expired, a registration fee must be paid or the software must be deleted from your computer.

shill In an auction, an accomplice of the seller who drives up prices by bidding for an item that the accomplice has no intention of buying.

shoulder surfing The attempt by an individual to obtain information from your computer screen by looking over your shoulder.

sidebar An invisible vertical strip located on the right side of the desktop in a graphical user interface where the user can place and arrange applications referred to as gadgets.

signature capture system A system that captures a customer's digital signature by having the customer sign the receipt on a pressure-sensitive pad, using a special stylus.

single inline memory module (SIMM) A RAM memory module that fits into special slots on the motherboard; it preceded the dual inline memory modules in use today, used a 72-pin connector, and had a 32-bit data transfer rate.

single-lens reflex (SLR) digital camera A digital camera that uses a mechanical mirror system to direct light from the lens to an optical viewfinder on the back of the camera. Such cameras offer the features that professional photographers demand, such as interchangeable lenses, through-the-lens image previewing, and the ability to override the automatic focus and exposure settings.

single point of failure (SPOF) Any system component, such as hardware or software, that causes the entire system to malfunction when it fails.

single-tasking operating system An operating system that could run only one application at a time, which was often inconvenient. To switch between applications, you had to quit one application before you could start the second.

site license A contract with the software publisher that allows an organization to install copies of a program on a specified number of computers at a reduced price per unit.

Sleep mode A power-saving feature that transfers the current state of your computer to RAM, turns off all unneeded functions, and places the system in a low-power state. Returning from Sleep mode is faster than returning from Hibernate due to the state of the computer being held in RAM not stored on the hard drive.

slide In a presentation graphics program, the equivalent of a canvas, sized in proportion to a 35 mm slide, on which the user organizes text boxes and graphics to represent ideas or points.

smart card (chip card, integrated circuit card [ICC]) A credit card–sized device that combines flash memory with a tiny microprocessor, enabling the card to process as well as store information. It is viewed as a replacement for magnetic stripe cards, from which data is eventually lost.

smartphone Mobile devices that fit in the palm of your hand or pocket of your jeans. Designed primarily for use as a mobile phone but can be enabled with Web access. The added features and downloadable

applications for these devices are making the line between the smartphones and handheld computers more difficult to distinguish.

social network site Web sites like Facebook, MySpace, LinkedIn, or Twitter, where users join groups set up by region, job, school, or family and communicate through postings, instant messaging, and e-mail.

social networking A method of creating and expanding online communities. For example, sites such as Facebook, MySpace, and LinkedIn allow users to create online profiles, post images, and invite friends and acquaintances to join their network. Many view it as a substitute for e-mail.

soft business skill A people-related skill that in business is associated with human resources, communication, research skills, teamwork, project management, learning, personal development, and ethics.

soft copy Output displayed on a monitor or played through speakers.

soft keyboard (virtual keyboard, on-screen keyboard) Also known as a virtual or on-screen keyboard. A keyboard that appears on a touch-sensitive screen. Tapping the key on the screen with a stylus or finger is the same as pressing a key on a traditional keyboard.

software One of two basic components of a computer system (the other is hardware). It is a collection of programs, and associated documentation, that directs the operation of the computer to complete a desired end result. There are two categories of software: system software and application software.

software engineering An occupation that involves upgrading, managing, and modifying of computer programs.

software license An agreement included with most commercial software that defines what the user may and may not do with the software.

software piracy The unauthorized copying or distribution of copyrighted software, an act that is a federal offense in the United States.

software suite (office suite) A collection of individual, full-featured, stand-alone programs, usually possessing a similar interface and sharing a common command structure, that are bundled and sold together; sometimes called an office suite.

software upgrading The process of keeping a version of an application current with the marketplace, whether through patches, service releases, or new versions.

Software-as-a-Service (SaaS) 1. The most widely used and widely known form of cloud computing, it enables software to be deployed from a cloud provider, delivered over the Internet, and accessed by a subscriber through a browser.

2. Provides software-based services and solutions to companies that want to outsource some of their information technology needs.

solid-state drive (SSD) A drive with no moving parts; another name for a flash drive.

solid-state storage device A device that consists of nonvolatile memory chips, which retain the data stored in them even if disconnected from their source. Solid-state storage devices are small, lightweight, highly reliable, and portable. See flash drives.

SONET (synchronous optical network) A standard for high-performance networks using optical fiber with data transfer rates of 52 Mbps to higher levels of approximately 20 Gbps.

sound file A file containing digitized data in the form of digital audio waveforms (recorded live sounds or music), which are saved in one of several standardized sound formats. These formats specify how sounds should be digitally represented and generally include some type of data compression that reduces the size of the file. The file can be played back if a computer is equipped with multimedia.

source code Program instructions in their original form as written by the programmer. A source program is translated into machine instructions that the computer can execute.

spaghetti code In programming, source code that contains numerous GOTO statements and is consequently difficult to follow, messy in design, and prone to errors.

spam Unsolicited e-mail or newsgroup advertising.

sparklines In an Excel spreadsheet, tiny charts embedded into the background of a cell that help users visualize and detect trends in their data more easily.

spear phishing Behavior similar to phishing, in that it uses fake e-mails and social engineering to trick recipients into providing personal information to enable identity theft. Rather than being sent randomly, spear phishing attempts are targeted to specific people, such as senior executives or members of a particular organization.

specialized search engines Web location programs, like Infoplease, that index particular types of information, such as job advertisements, newspaper articles, or quotations.

speculative execution A technique used by advanced CPUs to prevent a pipeline stall. The processor executes and temporarily stores the next instruction in case it proves useful.

speech recognition (voice recognition) The conversion of spoken words into computer text. The spoken word is first digitized and then matched against a dictionary of coded voice waves. The matches are converted into text as if the words were typed on the keyboard.

spider A computer program used by search engines to roam the World Wide Web via the Internet, visit sites and databases, and keep the search engine's database of Web pages up to date. They obtain new pages, update known pages, and delete obsolete ones. Their findings are then integrated into the search engine's database.

spim A spam text message.

spimming Sending unsolicited messages (spam) as an instant message.

spyware Internet software that is installed on your computer without your knowledge or consent. It may monitor your computer or online activity, relay information about you to the spyware's source, or allow others to take control of your computer. Spyware usually enters your system through the Internet.

stand-alone operating system An operating system designed to be used by a single user on a desktop computer, notebook, or any portable computing device. The name *stand-alone* comes from the fact that it does not need to be connected to any other system or computer in order to run.

stand-alone program An application sold individually.

star topology The physical layout of a local network in which a central wiring device, which can be a hub, switch, or computer, manages the network. A new user is added by simply running a cable to the hub or switch and plugging the new user into a vacant connector.

status bar An area within a typical application's window that displays information about the application and the document.

storage (mass storage, auxiliary storage, secondary storage) The operation in which information generated during processing is stored for later use.

storage area network (SAN) A network of high-capacity storage devices that link all of the organization's servers so that any of the storage devices are accessible from any of the servers.

storage device A general term for hardware that holds programs and data.

strategic decision A decision by management concerning an organization's overall goals and direction.

streaming A transmission method that enables the ability to hear or see content while it is being downloaded from a Web site instead of waiting till the download is complete.

strong password A strong password should be difficult to guess; be at least 14 characters or more in length; include uppercase letters, lowercase letters, numbers, and special characters; not be a recognizable word or phrase; not be the name of anything or anyone close to you; and not be a recognizable string of numbers such as a Social Security number or birth date.

structural unemployment Unemployment caused by advancing technology that makes an entire job category obsolete.

structure chart (hierarchy chart) In structured programming, a program planning chart that shows the top-down design of the program and the relationship between program modules.

structured programming A set of quality standards that makes programs

more verbose but more readable, reliable, and maintainable. GOTO statements are forbidden, resulting in more logically developed code; also referred to as top-down program design.

structured query language (SQL) A language used to phrase simple or complex requests for data from a database.

stylus A device that looks like an ordinary pen except that the tip is dry and semi-blunt. It is commonly used as an alternative to fingers on touch-screen devices.

subclass In programming, a more specialized class than its parent or superclass.

subfolder A folder positioned within another folder that enables you to organize your files even further.

subject guide On the World Wide Web, a search site that contains hyperlinks classified by subjects in broad categories like business, news, or travel, and multiple levels of subcategories.

subnotebook A portable computer that omits some components, such as a DVD drive, and usually has a smaller screen and weighs less than a notebook. It is used by individuals that like full application features but not all the peripheral devices.

subscriber loop carrier (SLC) A small, waist-high, curbside installation of the public switched telephone network that transforms local home and business analog calls into digital signals and routes them through high-capacity cables to the local exchange switch.

summary report A report that provides managers with a quick overview of an organization's performance.

Super Extended Graphics Array (SXGA) A resolution of 1280 × 1024, typically found on standard 17- and 19-inch monitors.

supercomputer An ultrafast system, stored in a special secure room that has a controlled climate. It processes a few sets of instructions as fast as possible and is used primarily to handle large amounts of scientific data, often to search for underlying patterns. A supercomputer can be a single computer or a series of computers working in parallel as a single computer.

superscalar architecture The design of the fastest CPUs today that enables them to execute more than one instruction per clock cycle.

swap file A hard disk file that serves as a temporary storage space for pages, the bits and bytes that the operating system will access as the user works.

swindler An individual that perpetrates bogus work-at-home opportunities, illegal pyramid schemes, chain letters, risky business opportunities, bogus franchises, phony goods that won't be delivered, overpriced scholarship searches, and get-rich-quick scams.

switch A device that filters and forwards data between computers, printers, and other nodes on the same network, enabling them to talk to each other. It is more intelligent than a hub and actually inspects the source and destination of a data packet to facilitate its delivery, an activity that condenses bandwidth and improves network performance.

Symbian OS An open industry standard operating system for data-enabled mobile phones that powers devices at the lower end of the smartphone price spectrum.

symmetric key encryption An encryption technique that uses the same key for encryption and decryption.

symptom An unacceptable or undesirable result.

syn flooding A form of denial of service attack in which a hostile client repeatedly sends SYN (synchronization) packets to every port on the server, using fake IP addresses, which uses up all the available network connections and locks them up until they time out. This results in a denial of service.

Synchronized Multimedia Integration Language (SMIL) A simple multimedia scripting language designed for Web pages. SMIL enables Internet users to view multimedia without having to download plug-ins.

synchronous communication Communication in which both parties are online at the time and have a coherent conversation, as in instant messaging.

syntax The set of rules governing the structure of instructions, commands, and statements of a programming language.

syntax error In programming, a flaw in the structure of instructions, commands, and statements. Syntax errors must be eliminated before the program will run.

system A collection of components purposefully organized into a functioning whole to accomplish a goal.

system clock An electronic circuit in the computer that emits pulses at regular intervals, enabling the computer's internal components to operate in synchrony.

system requirements The minimum level of equipment that a program needs to run.

system software The collection of programs written and configured to provide the infrastructure, basic services, and hardware control that enables other programs to function smoothly. It includes the operating system and utility programs.

system unit The base unit of the computer made up of the plastic or metal enclosure, the motherboard, and the integrated peripherals. It provides a sturdy frame for mounting and protecting internal devices, connectors, and drives.

system utilities (utility programs) Programs that work in tandem with the operating system and are considered essential to the effective management of a computer system. They perform such functions as system backup, antivirus protection, file search and management, system scans, disk and file defragmentation, and file compression; also called utility programs.

systems analysis The field concerned with the planning, development, and implementation of artificial systems, including information systems.

systems analyst A problem-solving computer professional who works with users and management to determine an organization's information system needs.

systems development life cycle (SDLC) An approach or model used in the development of information systems. Its intent is to provide a structure or systematic guide to development with the goal of improving system quality.

systems engineering An interdisciplinary approach to creating and maintaining quality systems. Unlike other engineering disciplines that focus on technology, systems engineering looks at the whole picture, including the people and the organization.

T

T1 line A high-bandwidth telephone trunk line made of fiber-optic (or specially conditioned copper) cables that can handle 24 digitized voice channels or transferring computer data at a rate of up to 1.544 megabits per second (Mbps).

T2 line A high-bandwidth telephone trunk line made of fiber-optic cable that can handle up to 44.7 Mbps of computer data.

T3 line A high-bandwidth telephone trunk line made of fiber-optic cable that can handle up to 44.7 Mbps of computer data. T3 lines can cost approximately $3,000 per month. Internet service providers, financial institutions, and large corporations that move a large amount of data find these lines critical to their operations. One T3 line is equivalent to having 28 T1 lines.

tab A segment of the Ribbon that contains category titles of tasks you can accomplish within an application. Several advanced tabs, such as Add-Ins and Developer, which are not visible by default, can be turned on.

tabbed browsing A feature on most Internet browsers today that makes use of tabs located at the top of the browsers window, allowing the user to have several Web pages open at once and switch quickly between them. You can customize your home page by adding tabs for sites that you frequently access.

table A series of columns (fields) and rows (records) that compose the content of a data set.

tablet PC A type of notebook computer whose LCD screen swivels and can be made to lie flat over the keyboard, allowing the user to input data in handwritten form with a stylus. Recognition software converts it to digital text.

tactical decision A middle management decision about how to best organize resources to achieve a division's goals.

tag A marker that identifies various elements within markup language codes. Tags usually come in pairs. The actual text to be displayed is enclosed by an opening tag and a closing tag.

tailgating The entry of someone into a restricted area that requires authorization, by simply sticking close behind the approved individual. Tailgating was once associated only with the physical entry into a restricted zone, but it can also be extended to electronic entry and occurs when a user does not log out of a system and another user sits down and begins to work under the guise of the authorized user instead of logging out and re-logging in as him- or herself.

tailor-made application A piece of software designed for specialized fields or the consumer market, such as a program to handle the billing needs of medical offices, manage restaurants, and track occupational injuries.

tangible benefit A material benefit, such as increased sales, faster response time, and decreased complaints, that can be easily assessed.

TCP/IP (Transmission Control Protocol/Internet Protocol) The standard suite of methods used to package and transmit information on the Internet. TCP/IP employs a two-layer communication design. The TCP layer, Transmission Control Protocol, manages the assembling of a message or file into smaller packets that are transmitted over the Internet and received by a TCP layer on the destination computer that reassembles the packets into the original message. The lower layer, the Internet Protocol, handles the address part of each packet so that it gets to the right destination.

technical feasibility A project's capability of being accomplished with existing, proven technology.

technical skill A practice in businesses that is about working with specific tools. In the IT field, technical skills include such skills as knowledge and experience in networking, Microsoft Windows products, UNIX, C++, and Internet-related technologies.

telecommuting (teleworking) Using telecommunications and computer equipment to work from home while still being connected to the office; also called teleworking.

teleconferencing When two or more people, separated by distance, use telecommunications and computer equipment to conduct business activities.

telehealth An expansion of telemedicine that extends services beyond the remedial level to the preventive side of medicine. Such services include the use of e-mail to communicate with patients and telecommunication links to pharmacies for fast and accurate processing of prescriptions.

telemedicine The use of computers and medical expertise to provide the equivalent of the long-distance house call.

terabyte (TB) A unit of measurement approximately equal to 1 trillion bytes.

terminal An input/output device made up of a keyboard and video display, used as an inexpensive means to connect to a server.

terminator A special connector that signifies the end of a circuit in the bus topology.

text messaging (SMS) A mobile service, similar to using your phone for instant messaging or as a receiver and transmitter for brief e-mail messages.

texting A quick communication that might include text, images, video, and/or sound content that is generally delivered using a cell phone.

thermal-transfer printer A printer that uses a heat process to transfer colored dyes or inks to the paper's surface. Although thermal-transfer printers are the best color printers currently available, they are very expensive.

thin client A device that enables a user to connect to a network server and relies on that server for most of its processing ability.

thrashing The excessive transfer of files from the hard disk to RAM and back (paging).

thread In Usenet, a series of articles that offer a continuing commentary on the same specific subject.

throughput The actual amount of data that can be sent through a specific transmission medium at one time (usually per second). Throughput is almost always lower than bandwidth, especially with wireless communications.

thumb drive Another name for a USB flash drive.

thumbscrew Small screws that are usually attached to the plug and are used to secure the plug to the system unit or expansion card extender to prevent an accidental disconnect.

time bomb A hidden piece of computer code set to go off on some date and time in the future, usually causing a malicious act to occur to the system. Time bombs are less sophisticated than logic bombs, because they are not programmed to be activated by a specific trigger.

time-limited trial version A commercial program offered over the Internet that can be used on a trial basis for a period of time, after which the software is unusable.

title bar In a graphical user interface (GUI), the top bar of an application window. The title bar typically contains the name of the application, the name of the document, and window controls.

toggle key A key on a keyboard that has two states: on and off. When pressed, the function is turned on, and when pressed again, the function is turned off. The Caps Lock key is an example of a toggle key.

token A special unit of data that travels around the ring in a ring topology layout of a network. A node can transmit only when it possesses the token, thus preventing collisions.

top-down program design Sometimes used to describe structured programming. A design strategy that starts by focusing on the main goal that the program is trying to achieve and then breaks up the program into manageable components.

top-level domain (TLD) name The last part of the domain portion of a URL. For computers located in the United States, it indicates the type of organization in which the computer is located, such as commercial businesses (.com), educational institutions (.edu), and government agencies (.gov).

top-level folder The folder at the beginning of the folder structure; in a path, it is directly after the drive letter indicator. It is the starting point of an organization strategy to place files with common or related content in the same location.

touch screen A touch-sensitive display that enables users to input choices by touching a region of the screen.

touchpad (trackpad) A stationary, pressure-sensitive, pointing device that provides a small, flat surface on which you slide your finger, using the same movements as you would with a mouse. An area is set aside along the right and bottom edges of the pad to accommodate vertical or horizontal scroll operations. Commands are issued through one of the touchpad keys located near the edge of the pad or by tapping on the pad's surface.

tower case A tall and deep vertical system unit container designed to sit on the floor next to a desk and to easily accommodate add-on components.

track One of several concentric circular bands on computer disks where data is recorded. Tracks are created during formatting (set up) and are divided into sectors.

trackball A stationary pointing device that contains a movable ball held in a cradle. The on-screen cursor is moved by rotating the ball with the fingers or palm. From one to three keys can be located in various positions, depending on the unit, to perform the equivalent of mouse actions like a click and right-click.

trade show Typically, an annual meeting in which computer product manufacturers, designers, and dealers display their products.

traditional organizational structure The subdivision of the functions of an organization into units such as finance, human resources, and production/operations.

training seminar A computer-related training session, typically presented by the developer of a new hardware or software product or by a company specializing in training IT professionals in a new technology.

transaction processing system (TPS or operational system or data processing system) A system for handling an organization's day-to-day accounting needs by keeping a verifiable record of every transaction involving money, including

purchases, sales, and payroll payments; also called an operational system or a data processing system.

transfer performance A measure of how quickly read/write heads are able to transfer data from a hard disk to RAM.

transistor An electronic switch (or gate) that controls the flow of electrical signals through the circuit. Due to their small size, reduced power consumption, and lower heat output, transistors replaced vacuum tubes in the second generation of computers.

transition In a presentation graphics program, it is the visual movement and effects that appear as one slide exits the presentation and another enters.

Transmission Control Protocol (TCP) Part of the TCP/IP suite of protocols that regulate packaging and transmitting information over the Internet. TCP is the higher layer of the standard of transmission that permits two Internet-connected computers to establish a reliable connection. It is responsible for managing the assembling of a message or file into smaller packets that are transmitted over the Internet and received by a TCP layer on the destination computer that reassembles the packets into the original message.

trap door In computer security, a security hole created on purpose that can be exploited at a later time.

travel mouse A pointing device half the size of a normal mouse, but with all the same capabilities.

Trojan horse A rogue program that contains instructions to perform a malicious task that is disguised as a useful program.

truncation In using a search engine, the action of inserting wildcard symbols such as ? and *, also called truncation symbols, to search for various word endings and spellings simultaneously.

tweet A posting on a Twitter account that cannot exceed 140 characters.

twisted-pair An inexpensive copper cable used for telephone and data communications. The term *twisted-pair* refers to the interweaving of the paired wires, a practice that reduces interference from electrical fields.

Twitter A free, real-time social messaging utility that allows postings of up to 140 characters.

U

ubiquitous computing A scenario for future computing that foresees an emerging trend in which individuals no longer interact with one computer at a time but instead interact with multiple devices connected through an omnipresent network, enabling technology to become virtually embedded and invisible in every aspect of our lives.

Unicode A character coding system that uses 16 bits and can represent over 65,000 characters and symbolize all the world's written languages. The first 128 codes in the Unicode system represent the same characters as the first 128 in the ASCII system.

Unified Modeling Language (UML) An open method used to illustrate and document the components of an object-oriented software system under development.

uninstalling The act of removing a program from a computer system by using a special utility.

uninterruptible power supply (UPS) A device that provides power to a computer system for a short time if electrical power is lost.

UNIX An operating system developed by Bell Laboratories in 1969. It was the first operating system written in the C language. It is a free OS installed primarily on workstations and features preemptive multitasking.

upgrade The process of keeping current with the latest tools. Upgrading carries with it the risks of a reduced comfort level among users and a temporary reduction in employee productivity during the adjustment period.

uploading Transferring a file from your computer to another computer by means of a computer network.

URL (Uniform Resource Locator) On the World Wide Web, a string of characters that precisely identifies an Internet resource's type and location. For example, the fictitious URL http://www.wolverine.virginia.edu/~toros/winerefs/merlot.html identifies a World Wide Web document (http://), indicates the domain name of the computer on which it is stored (www.wolverine.virginia.edu), fully describes the document's location in the directory structure (~toros/winerefs/), and includes the document's name and extension (merlot.html).

USB dongle A device that is inserted into a USB port and adds additional features to the base system, such as enabling network connectivity, increasing RAM memory, and permitting Bluetooth communication.

USB flash drive An average user's choice of portable storage that is about the size of an adult's thumb and can hold up to 64 GB of data; also referred to as a flash drive or solid-state drive.

USB hub A device that plugs into an existing USB port and contains four or more additional ports.

USB (universal serial bus) port An external bus architecture designed to replace older parallel and serial ports that became popular in 1998 with the release of the iMac. It connects keyboards, mice, digital cameras, and many other peripheral devices. A single USB port can connect up to 127 peripheral devices, eliminating the need for special ports that work only with specific devices.

USB wireless network adapter A communication device that plugs into a USB port and usually provides an intuitive graphical user interface (GUI) for easy configuration. It supports data encryption for secure wireless communication and is perfect for the traveler and notebook user.

Usenet A worldwide computer-based discussion system that uses the Internet and other networks for transmission media. Discussion is channeled into thousands of topically named newsgroups, which contain original contributions called articles, as well as commentaries on these articles called follow-up posts. As follow-up posts continue to appear on a given subject, a thread of discussion emerges.

user interface The part of the operating system that the user sees, interacts with, and uses to communicate with programs.

utility programs Programs that work in tandem with the operating system and are considered essential to the effective management of a computer system. They perform such functions as system backup, antivirus protection, file search and management, system scans, disk and file defragmentation, and file compression; also called system utilities.

V

vacation hacking Usually occurs in hotels and airports, where an unsuspected traveler accesses a rogue WiFi access point, called an evil twin, on a fraudulent network. The information the traveler enters is not reaching the desired destination but is being captured by criminals running the fraudulent network.

validate After purchasing a software program, it is the process of providing a special code or product key before you can use it. Validation proves that you are using a legal copy, not a pirated version.

value-added network (VAN) A public data network offered by a service provider that an enterprise uses for EDI or other services.

value-added reseller (VAR) An independent company that combines and installs equipment and software from several sources.

variant A copy of a self-modifying virus. Each new copy is slightly different from the previous one, making it difficult to protect your computer.

VBScript A client-side scripting language used to write short programs (scripts) that can be embedded in Web pages.

VDSL (very high bit-rate digital subscriber line) The next generation of DSL transmission technology providing super-accelerated rates of 52 Mbps for downloads and 12 Mbps for uploads. It will provide services like HDTV and Video-on-Demand along with Internet access.

vector graphic An image composed of distinct objects, such as lines, shapes, or any element created by a mathematical equation. Thus, the final image is described by a complex mathematical formula that can be edited quite easily to accommodate a change in size, location, or shape.

vendor A company that sells goods or services. In this context, it refers to a company that develops software and sells it to other firms.

VGA (video graphics array) connector A 15-pin male connector that works with standard monitor cables. VGA connectors transmit analog video signals and are used for legacy technology cathode ray tube (CRT) monitors.

video card Video circuitry that fits into an expansion bus and determines the quality of the display and resolution of your monitor.

video editor A program that enables you to modify digitized videos by cutting segments, resequencing frames, adding transitions, and compressing a file, as well as determining a video's frame rate and saving the digitized video file in several video file formats.

Video Graphics Array (VGA) The lowest resolution standard for color graphics displays (640 × 480).

videoconferencing (Web conferencing) The use of digital video technology to transmit sound and video images to facilitate online, virtual meetings through which two or more people can have a face-to-face meeting even though they're geographically separated; also called Web conferencing.

virtualization The process of running multiple virtual machines on one physical machine, which means that the applications and infrastructure are separate, a feature critical to the category of cloud service referred to as Infrastructure-as-a-Service (IaaS).

virtual laser keyboard A keyboard image generated by a device about the size of a small cellular phone that displays a light projection of a full-sized computer keyboard on almost any surface. Its adaptable technology studies the user's finger movements to interpret and record keystrokes.

virtual machine Not an actual physical machine, but a software-created segment of a hard drive that contains its own operating system and applications, which makes it behave as a separate physical machine in the eyes of the user.

virtual memory A term used to refer to a portion of the hard drive that the operating system treats as a portion of RAM when RAM is full.

virtual private network (VPN) A network that operates as a private network over a public network, usually the Internet, using exclusive leased lines, that makes data accessible to authorized users in remote locations through the use of secure, encrypted connections and special software.

Visual Basic (VB) An event-driven programming language that responds to user actions, like the click of a mouse. It was developed by Microsoft and based on the BASIC programming language. Visual Basic, which was one of the world's most widely used program development packages, has been largely replaced by Visual Basic.NET.

Visual Basic .NET (VB .NET) Microsoft's next evolution of Visual Basic (VB), released in 2001, which uses an object-oriented language.

VISUAL STUDIO .NET A suite of products that contains Visual Basic .NET, which enables programmers to work with complex objects; Visual C++, which is based upon C++; and Visual C# (pronounced "C sharp").

vlog (video log) Short for video log. A series of personal reflective videos that are usually created simply by talking to a webcam and uploading the video. Many vloggers post their vlogs on YouTube.

vodcast (video podcast) Short for video podcast. A term used for the online delivery of video clips on demand.

VoIP (Voice over Internet Protocol) A type of Internet telephony that uses the Internet for real-time voice communication.

volatile memory Storage that is very fast but that is erased when the power goes off. RAM is volatile memory.

W

WAP (Wireless Application Protocol) A standard that specifies how users can access the Web securely using pagers, smartphones, PDAs, and other wireless handheld devices.

wardriving A process in which an individual drives around with a wireless device, such as a notebook or smartphone, to look for wireless networks to break into.

warm boot (restart) Restarting a computer that is already on.

waterfall model A systems development method that builds correction pathways into the process so that analysts can return to a previous phase.

Web 1.0 A set of techniques that were used in the early years of the Web for developing static Web pages that included no interactivity other than hyperlinks.

Web 2.0 A set of techniques currently in use that collectively provides an upgraded presentation and usefulness for the World Wide Web. It provides even more opportunities for individuals to collaborate, interact with one another, and create new content by using applications such as blogs, wikis, and podcasts.

Web 3.0 The future generation of the Web. Many experts believe that the Web 3.0 browser will act like a personal assistant, learning what you are interested in as you browse.

Web-based language A language that tells a browser how to interpret text and objects, as compared to a programming language that tells a computer (specifically the microprocessor) what to do and how to do it. Markup and scripting languages are examples.

Web-based training (WBT) Computer-based training implemented over the Internet.

Web beacon A transparent graphic image, usually no larger than 1 pixel × 1 pixel, that is placed on a Web site or in an e-mail and used to monitor the behavior of the user visiting the Web site or sending the e-mail. One common use is to alert a sender when a message has been opened.

Web browser A program on the user's computer that displays a Web document by interpreting the HTML or XHTML format, enabling the user to view Web pages and activate hyperlinks embedded within those pages.

webcam An inexpensive camera attached to the computer, can be used to hold live chat sessions and make video phone calls. In most newer systems, a Webcam is standard equipment.

Web conference A conference format in which an individual usually sits at his or her own computer and is connected to and interacts with other participants via the Internet.

Web crawler A simple automated program that scans the Web for specific data and inserts it into a designated database.

Web–database integration A name for techniques that make information stored in databases available through Internet connections.

Web-enabled device Any device that can connect to the Internet and display and respond to the codes in markup languages, such as HTML (Hypertext Markup Language) or XML (Extensible Markup Language). Web-enabled devices include PDAs, smartphones, and notebook PCs.

Web-hosted technology A new wave of office suites that, for application software, provides the capability to upload files to an online site so the documents can be viewed and edited from another location. This technology makes file sharing and collaboration easier. Windows Office Live and Google Docs are two examples of online services that offer these capabilities.

webinar Refers to a Web conference that is typically one-way—from speaker to audience, with limited attendee participation. There may be some attendee polling and a question-and-answer segment at the end, but that is usually the extent of audience participation.

Web interview An interview conducted through the use of a webcam and the Internet.

Web mining The integration of traditional data mining methods with information gathered over the Web.

Web page A document or resource on a Web site, transported over the Internet, created using the established standards, and made viewable to a user through a program called a browser.

Web portal (portal) Web sites that provide multiple online services.

Web server A computer on the Web running server software that accepts inputted information and makes that information available to an Internet user when requested.

Web site A collection of related Web pages.

WEP (Wired Equivalent Privacy) One of the earliest security methods for wireless networks, WEP has several well-known weaknesses, but it may be the only option for some devices or older equipment.

wheel mouse A type of mouse that has a rotating wheel that is used to scroll text vertically within a document or on a Web page.

white formatting The typing of keywords in the footer or margin of a resume and then changing the font color to white. This makes the words invisible to the human eye, but the application tracking system will detect them, not reject the resume, and will successfully move the resume to the next level of screening.

whiteboard A separate area of a videoconferencing screen that enables participants to create a shared workspace. Participants can write or draw in this space as if they were using a chalkboard in a meeting.

wide area network (WAN) A network that uses long-distance transmission media, including microwave relay, satellites, and phone lines, to link computers separated by a few miles or several thousand miles. A WAN is a geographically dispersed collection of LANs. The Internet is the largest WAN. A WAN is not owned by a single organization; it has a collective ownership or management, like the Internet.

Widescreen Extended Graphics Array plus (WXGA+) A resolution of 1440 × 900, typically found in 19-inch monitors.

Widescreen Super Extended Graphics Array plus (WSXGA+) A resolution of 1680 × 1050, typically found in 20-inch monitors.

Widescreen Ultra Extended Graphics Array (WUXGA) A resolution of 1920 × 1200, typically found in 24-inch monitors.

WiFi A wireless LAN standard used for home networks that offers Ethernet speeds through the use of radio signals instead of wires.

wiki A collection of Web pages designed to let anyone with access contribute or modify content. Wikis are often used to create collaborative or community Web sites.

wildcard (truncation symbol) A symbol that stands for any character or any group of characters. Common wildcards are the ? for a single character and * for multiple characters; also called a truncation symbol.

WiMAX A wireless up-and-coming digital communication system designed to deliver high-speed access over long distances, either point to point (both sender and receiver are stationary) or through mobile access (sender or receiver is moving).

window border A thick line that encloses the window and can be manipulated to resize the window larger or smaller.

window control buttons In a graphical user interface (GUI), a group of window management tools, located on the right side of the title bar, that enable the user to minimize, maximize, restore, or close the window.

Windows CE One of the early embedded operating systems, first introduced in 1996, with upgrades made available in 1997. It is used by consumer electronic devices like handheld PCs, video game players, and digital cameras, and by industrial products like barcode readers. Its primary features include a low overhead device driver and a built-in power manager.

Windows Update A free operating system update service designed to keep your Windows operating system up to date with fixes (service patches) or protections against external environment changes.

wireless access point (AP or WAP) A node on a network that acts as a receiver and transmitter of wireless radio signals between other nodes on a network. A WAP can also act as a bridge connecting wireless clients to a wired network.

wireless Internet service provider An Internet access provider that can be a local or national company that provides wireless Internet access to computers and other mobile devices, such as notebooks and smartphones. Some familiar providers are AT&T, T-Mobile, and Verizon Wireless.

wireless keyboard A keyboard that connects to the computer through infrared (IR), radio frequency (RF), or Bluetooth connections instead of a cable.

wireless LAN A local area network that connects its nodes though the use of radio signals spread over a seemingly random series of frequencies for greater security.

wireless memory card A card that has all the storage features of a regular flash memory card and combines it with wireless circuitry. It can connect with your PC via a wireless network or send pictures directly from your digital camera to your favorite online photo site.

wireless mouse (cordless mouse) A mouse with no cord that transmits infrared or radio signals (RF) to a base station receiver. Wireless mice eliminate the cord tangling associated with the corded variety. The infrared type requires line of sight to the receiver, whereas the RF variety uses radio waves that transmit in a wider pattern.

wireless PC card adapter A device, approximately the size of a credit card, that is inserted into a slot on the side of most notebooks and netbooks. It has a built-in WiFi antenna that provides wireless capability and LED lights that indicate whether the computer is connected.

wiring closet A central location that extends through all floors of the building in which the appropriate wiring is housed to support most types of data transfer that the individuals or companies that occupy the building might want to access.

WML (Wireless Markup Language) A specialized form of XML that enables developers to create pages specifically for wireless devices.

word size The maximum number of bits the central processing unit (CPU) can work with at once.

workbook In a spreadsheet program such as Microsoft Excel, a file that can contain two or more spreadsheets, each of which has its own tab in the workbook.

workflow automation The process of sending documents and data to the next person who needs to see them.

workgroup computing A situation in which all of the members of a *workgroup*—a collection of individuals working together on a task—have specific hardware, software, and networking equipment that enables them to connect, communicate, and collaborate.

worksheet In a spreadsheet program such as Microsoft Excel, a single tab of a workbook.

World Wide Web (Web or WWW) The portion of the Internet that contains billions of documents. The Web uses the Internet as its transport mechanism but is a separate entity. The Web is an information resource that enables millions of Internet users to research products, get medical advice, read about current events, and much more.

World Wide Web Consortium (W3C) An international consortium in which member organizations, a full-time staff, and the public work together to develop Web standards. W3C's mission is to lead the World Wide Web to its full potential by developing protocols and guidelines that ensure long-term growth for the Web.

worm A program resembling a computer virus that can spread over networks without the user executing an infected file.

WPA (WiFi Protected Access) A security method for wireless networks that was developed to provide stronger security than WEP.

WPA2 A security method for wireless networks that improves on WPA's abilities. WPA2 provides confidentiality and data integrity and is far superior to WEP, because it uses AES (Advanced Encryption Standard) to provide government-grade security.

X

X.25 A packet-switching network protocol optimized for use on noisy analog telephone lines.

xD Picture Card A type of flash memory card used in digital cameras. It is available in capacities of 64 MB to 32 GB of digital data.

XHTML (eXtensible Hypertext Markup Language) A newer version of HTML, it uses XML to produce Web pages that are easily accessible by PDAs, notebooks, and desktops. See Extensible Hypertext Markup Language.

XML (eXtensible Markup Language) A set of rules for creating markup languages that enables programmers to capture specific types of data by creating their own elements. It is used for sharing data and complex forms and objects in a Web-based environment. See Extensible Markup Language.

Y

Yes/No data type See Boolean data type.

yottabyte A unit of measurement approximately equal to 1 septillion bytes.

Z

Zero configuration (Zeroconf) A method for networking devices via an Ethernet cable that does not require configuration and administration.

zettabyte A unit of measurement approximately equal to 1 sextillion bytes.

zombie A single computer commandeered during a denial of service (DoS) attack.

Computers and You

Computers and You

Chapter Objectives

1. Define the word *computer* and name the four basic operations that a computer performs.
2. Describe the two main components of a computer system: hardware and software.
3. Provide examples of hardware devices that handle input, processing, output, and storage tasks.
4. Give an example of the information processing cycle in action.
5. Discuss the two major categories and the various types of computers.
6. Explain the advantages and disadvantages of computer use.
7. Recognize the ethical and societal impacts of computer use.
8. Discuss how computers affect employment.
9. List ways to be a responsible computer user.

So you have a cell phone in your hand and an iPod in your pocket and consider yourself a technologically savvy individual. But have you taken the time to look back and understand how the developments in technology have affected your family, friends, and way of life? Likewise, do you daydream of a future where you and your family members use communication devices with embedded translation capabilities, visit virtual reality vacation centers, and use solar- and wind-powered phone chargers?

The more you work with computers, the deeper and richer your understanding of computers and technology will become; eventually you will grow to be confident in your abilities. As your confidence and knowledge expand, you will become more adept in your use of computers and better prepared for the changes computer technology brings. No one is insulated from the impact that computers have or will continue to have on daily life.

This text provides information and insight into technology—its uses, assets, and drawbacks—related careers, and the knowledge and skill set required to make informed decisions about technology in all areas of your life. When you understand these concepts, you'll be better able to

- Decide whether to purchase new equipment or upgrade specific components.
- Judge the likely impact of computer innovations on your personal and business activities.
- Be aware of the different types of computing systems, their capabilities, and the businesses that they best compliment.
- Select the best applications for the information that you are processing or presenting.
- Keep abreast with and maintain a balance between the increase in mobile and portable computing and your privacy.
- Make career choices that use the technology skills you have acquired.
- Sort through the difficult ethical, moral, and societal challenges that computer use brings. ■

Computers: Yesterday, Today, and Tomorrow

Computers have become so integral to our daily lives that it's difficult to think of a time without them. There are millions of individuals that wake up and turn on their computer every day in hundreds of cities across all nations. This increase in computer popularity has also caused an increase in its diversity of applications. Think about it, how many technology based applications or devices do you use in one day? How many of these applications or devices did not exist 10 years ago? How many will be extinct 10 years from now? Look over the list of computer applications and devices below; how many have you used or encountered?

- Word-processor—an application that automatically checks spelling and grammar in a document
- Internet—a connected system of computers that enables users to obtain information quicker than from a library and perform such communication activities as video conferencing
- Online Banking—the ability to use the Internet to open a new account, transfer your own money from one account to another, or pay a mortgage, all from the comfort of your own home
- Online classes—classes offered using applications such as Blackboard and Angel via the Internet that enable students and teachers to communicate outside of the physical classroom
- GPS systems—computing devices that are either portable or embedded within the dashboard of many vehicles and provide driving directions from your current location to the entered destination as well as help you locate restaurants, gas stations, and fast food chains, even the phone number for your favorite pizza place
- ATM machines—devices that can connect to the database of banking institutions to allow a customer to withdraw and deposit funds without entering the brick and mortar structure of the bank itself
- Mobile phones—the telecommunication favorites of most individuals today, replacing landline twisted pair technology and offering additional features such as calculators, calendars, and even Internet connectivity
- Weather prediction—the use of supercomputers and satellite connections to determine weather patterns and predict the location and strength of a weather event

I am sure that you can add a few additional devices and applications to this list that you use personally on a daily basis. But you get the point.

> "The real power of the use of computers . . . **relate** the tasks, **understand** the technology used to perform them, use that technology to collect information, **share** that information with others locally and globally, and then singularly or collectively **use** the information to make decisions."

Computers are used at home, at work, and in school; they're embedded into our cars, phones, and cameras. You use them daily to perform the tasks listed above; but your future isn't about just performing single, unrelated tasks. The real power of the use of computers comes when you begin to relate the tasks, understand the technology used to perform them, use that technology to collect information, share that information with others locally and globally, and then singularly or collectively use the information to make decisions. Let's look back at the events that led up to our current technology state and then forward to the preparation you will need in order to capitalize on future technological advancements.

A Brief Look Back

A look at the past can help clarify the present and direct the future. Think about the changes that have occurred as a result of technological innovation during the past several decades. When nations were

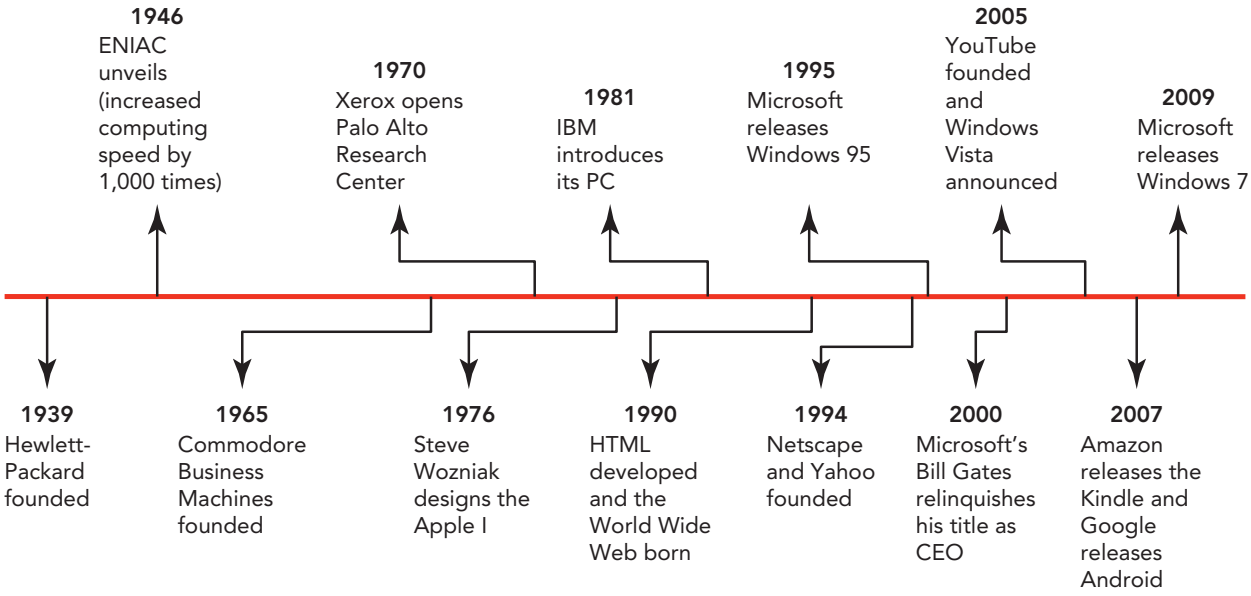


FIGURE 1 This timeline focuses on a few of the critical events that occurred in the computer development lifecycle and provided the foundation for the devices that we use today.

attempting something as complex as sending a person to the moon, there were no telephone answering machines, no cell phones, no handheld calculators, and no personal computers. People wrote letters by hand or with a typewriter, kept track of numbers and data in ledgers, and communicated in person or over the telephone. Those telephones were physically connected: Cordless handsets didn't come onto the market until the late 1970s, and cell phones followed in the 1980s.

In the 1980s only the U.S. government, colleges, and universities were able to access the Internet (including e-mail); cell phones were just coming into use; and fax machines were the fastest way for most businesses to share documents across distances. The World Wide Web would not become viable until 1993. Today millions of people use the Internet daily in both their professional and personal lives. Cell phones and personal digital assistants seem to be a necessary part of everyday life; GPS units guide travelers to their destinations; and retail e-commerce, which didn't begin until 1995 and had sales of $ 32.0 billion in the third quarter of 2009, is projected to grow to $203 billion by 2013.

For a look back in time, view Figure 1, a compressed computer history timeline, or go to **www.computerhope.com/history/** for a year-by-year breakdown of computer developments and advances. For those interested in the development of the Apple, you can view a timeline at **http://en.wikipedia.org/wiki/History_of_Apple** that displays the progress of Apple from 1976 to the present.

FIGURE 2 Computers were once considered tools for programmers and technical developers. Today they, and the devices they are embedded within, are part of most jobs and our daily life.

A Glance at the Present

Today it's becoming difficult to find an activity that doesn't involve computers, technology, and sharing information (Figure 2). It would be advantageous to learn all you can about computers and become comfortable with application programs, the Internet, and the World Wide Web. You'll need computer and Internet skills to succeed in almost any occupational area. Studies consistently show that workers with such skills are in demand and earn salaries significantly above the median personal

FIGURE 3 Salaries of Workers in Computer and Computer-Related Jobs

Categories	Salary Ranges		
	High ($/yr.)	Low ($/yr.)	Average ($/yr.)
Computer operations	$220,000	$23,000	$59,000
Database systems	$120,000	$30,000	$67,000
E-commerce/Internet	$175,000	$37,000	$79,000
Executive level	$250,000	$69,000	$118,000
Hardware	$100,000	$30,000	$56,000
Help desk	$110,000	$23,000	$44,000
Networking	$333,000	$22,000	$69,000
New media	$65,000	$32,000	$43,000
Project management	$130,000	$34,000	$83,000
Technical writing	$77,000	$45,000	$59,000
UNIX	$108,000	$50,000	$79,000
Windows development	$101,000	$40,000	$69,000
Wireless systems	$95,000	$46,000	$66,000

This is a selection of common job types; the original survey had 2,145 positions listed.
Average salary of all positions in the original survey: $70,000 per year.

income level of approximately $30,000 (Figure 3). Check out **www.cis.udel.edu/jobs/market** for information about the future of the computer science job market and links to related sites. Another site, **www.ticker.computerjobs.com/content/ticker.aspx**, lists computer-related jobs and their average salaries.

An Insight into the Future

Isolated skills won't be enough to keep you connected or job-ready in the future. To be a fully functioning member of the computerized world of tomorrow, you need to understand the concepts that underlie computer and Internet technologies, such as the distinction between hardware and software, and how to manage the excessive amount of files that are created each day, insure the privacy of data as it makes its way across a variety of new technologies, and perform a continual evaluation of your skills to determine the need for re-education and fine tuning.

As computers and the Internet play an increasingly direct and noticeable role in our personal lives, understanding the difference between their appropriate and inappropriate use becomes increasingly difficult. Should you shop on the Internet on company or school time? Are the photos you share with friends on social networking sites like Facebook or MySpace going to turn up when you least expect or cause an employer to disqualify your application because of your Web content? Is your credit card information, Social Security number, or personal communication safe from intrusion or misuse? In the past the only way to shop during work or school was to leave the premises; employers had to call a reference to find personal information about an applicant; and the only time you needed to worry about losing your personal information was if your wallet or mail had been stolen!

You also need to know enough to the correct types of technology to use in your personal and professional lives (Figure 4). Use the questions below as a starting point to evaluate your technology needs.

- How much power and speed do you need for everyday tasks?
- What will a more powerful and faster computer, smartphone, or iPad enable you to do better?
- What types of technology tools do you need (as opposed to want)?
- Will you need advanced training?

The more you understand about computers and become familiar with how they work, the less mysterious they seem and the easier they are to use. Like driving a car or riding a bike, the more you practice and

use the equipment, the more comfortable you will be and the better able you will be to adjust to future models and variations. Let's start by describing the machine that's at the center of what you need to know.

Computer Fundamentals

Learning computer and Internet concepts is partly about learning new terms and the connection between them. So let's start with the most basic terms.

Understanding the Computer: Basic Definitions

A **computer** is an electronic device that performs four basic operations: input, processing, output, and storage (Figure 5). Together these four operations are called the **information processing cycle**.

- **Input** is the action of receiving data—raw facts like a user's login ID number.
- **Processing** is the manipulation done on the input by a program (instructions), to convert the input (data) into information (data converted into a meaningful form). An example of processing could be aligning a letter's return address in a Word document, averaging a column of grades by following a formula that has been entered in an Excel worksheet, or searching a database to confirm a login ID number.
- **Output** is the actual displaying of the information, the processed data. This would be displaying the shifted return address in the Word document, placing the average below the column of grades in the Excel worksheet, or confirming the entry of a valid ID.
- **Storage** is saving the information for later use.

Because these operations depend on one another, the information processing cycle (sometimes abbreviated as the IPOS cycle) is always performed in this sequence.

You'll often hear the term *computer system,* which is normally shortened to *system.* This term is more inclusive than *computer.* A **computer system** is a collection of related components that have been designed to work together to meet the needs of the user. These components can be placed in two major categories: hardware and software. A computer system's **hardware** includes all the physical components of the computer and its related devices. The components include the **system unit**: the base unit of the computer made up of the plastic or metal enclosure, the motherboard, and the integrated peripherals. The **motherboard** is the circuit board that connects the central processing unit(s) anchored on the board and other system components. **Integrated peripherals** are the devices embedded

FIGURE 4 Being familiar with the latest technology tools will help you become more confident in your abilities to select the correct technology based on need and usability, not advertising hype.

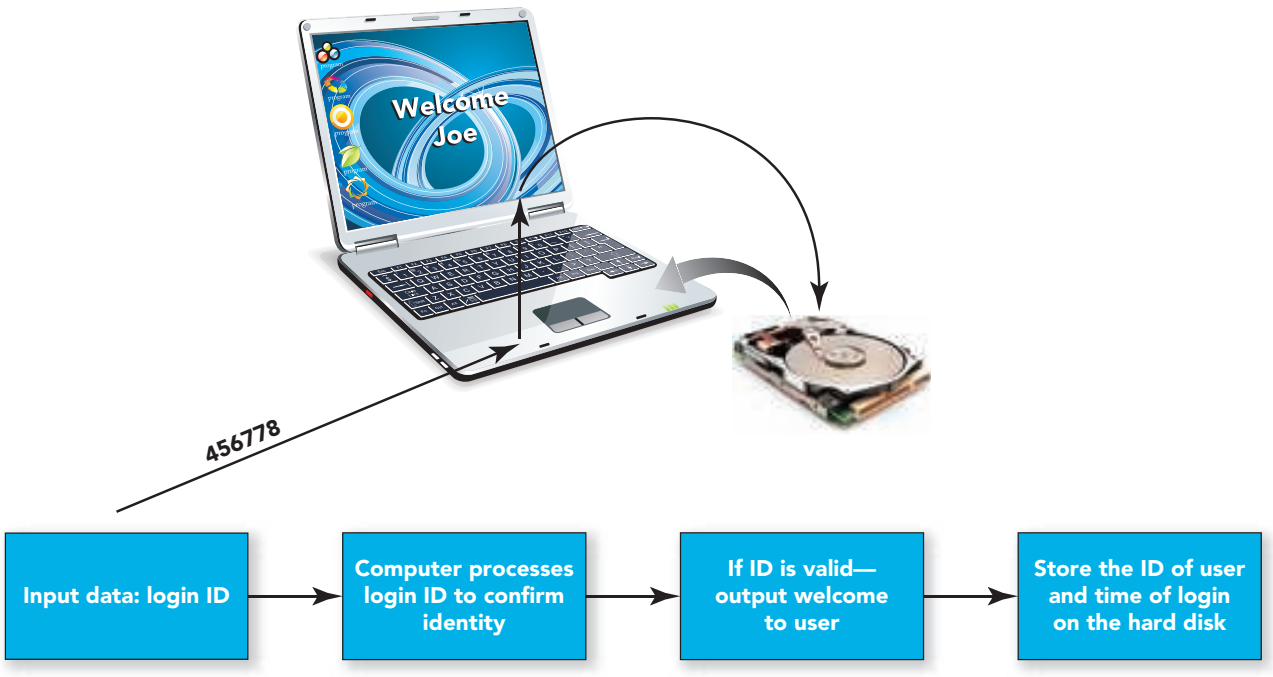


FIGURE 5 The information processing cycle is the path data takes from input through output.

within the system unit case and generally include the power supply, cooling fans, memory, CD drive, DVD drive, and internal hard drive. Besides the system unit, the hardware also includes the **peripheral devices**: components located outside the system unit housing that are connected physically or wirelessly to the system unit and motherboard. Examples include keyboards, mice, monitors, speakers, external webcams, external modems, and external storage devices (Figure 6).

A computer system's hardware needs programs to function. A **program** is a set of instructions that tells the hardware how to perform an operation on the input data in the processing phase of the information processing cycle. **Software**, a more inclusive term, is the collection of programs, and the associated documentation, that directs the operation of the computer to complete a desired end result. Software can be divided into two categories: system software and application software.

System software is the collection of programs written and configured to provide the infrastructure, basic services, and hardware control that let other programs function properly. The most important and well-recognized type of system software is the computer's **operating system (OS)**, which integrates and controls the computer's internal functions and provides the connectivity for the user to interact with the computer's hardware. Common operating systems include Microsoft Windows 7, Microsoft Vista, Microsoft Windows XP, Linux, and Mac OS X Snow Leopard. Consumers may get frustrated with the frequency with which new versions of operating systems are released, but operating systems are actually updated to improve performance and accommodate new hardware devices. The most current operating systems are Windows 7, released by Microsoft in July 2009, and Mac OS X Snow Leopard, released by Apple in August 2009. Besides operating systems, other examples of system software include system utility programs that aid in system maintenance, such as backup programs, cleanup tools, and antivirus software.

Application software can be thought of as sitting on top of the operating system. The programs that are integrated to create application software provide instructions that direct the computer's hardware to perform a task for the user. For example the programs to spell check, grammar check, locate synonyms, and insert a header or footer are combined with many other such programs to create a word processing application. Typical examples of application software include word processing, spreadsheet, database, presentation, e-mail, Web browser, and communication software.

FIGURE 6 Get to know your system. A typical computer system includes these hardware components.

To better understand how computer system components are interrelated, you might compare a computer system to an aquarium. The computer hardware is like the fish tank, the operating system is like the water, and the software applications are like the fish (Figure 7). You wouldn't put fish in an empty aquarium. Fish can't survive without water, just as software applications can't function without an operating system to support them. And without the water and fish, an aquarium is an empty box—just as computer hardware isn't much use without an operating system and applications.

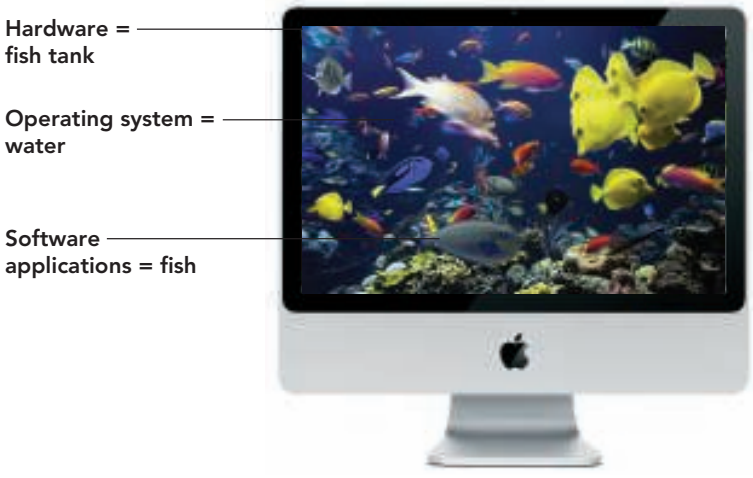
Now that we know the basic terms, let's take a closer look at the operations in the information processing cycle (input, processing, output, and storage) and at the hardware devices involved in each step.

Input: Getting Data into the Computer

During input, the computer receives data. The term **data** refers to raw facts, which can be made up of words, numbers, images, sounds, or a combination of these.

Input devices enable you to enter data into the computer for processing. The most common input devices are the keyboard and mouse (Figure 8). Microphones, scanners, and devices such as digital cameras and camcorders offer other ways of getting different types of data into the computer.

FIGURE 7 A computer system can be compared to an aquarium.



Processing: Transforming Data into Information

Processing transforms data into information. **Information** is data that has been consolidated and organized in a way that people can use. During processing, the computer's processing circuitry (Figure 9), called the **central processing unit (CPU)** or **microprocessor** (or just **processor** for short), is directed by the software in use to perform operations on the input data. The CPU is located within the system unit and is a component on the motherboard.

FIGURE 9 The CPU (microprocessor or processor) is the component on the motherboard that performs operations on the data to convert it to information.

Even though the CPU is often referred to as the "brain" of the computer, computers don't really think. They are capable of performing only repetitive processing actions organized into an **algorithm**—a series of steps that results in the solution to a problem. After an algorithm is tested for accuracy, it is coded into a language that the computer hardware understands and becomes the program or software that the system uses to solve that problem.

Because the CPU needs to juggle multiple input and output requests at the same time, it uses high-speed memory chips to store program instructions and data so it can move between requests quickly. Memory is essential to the smooth operation of the CPU. A typical computer contains several types of memory on the motherboard; the most important of these is **random access memory (RAM)**, which temporarily stores the programs and data with which the CPU is interacting. RAM is also referred to as primary memory or temporary memory. The second name comes from the fact that it does not retain any content when power is interrupted or turned off.

FIGURE 8 Because the mouse and keyboard are the two most common input devices, several variations are available.

Output: Displaying Information

Output commonly is dispensed through **output devices**, like monitors, printers, and speakers that enable people to see, hear, and—with some newer inventions—feel the results of processing operations (Figure 10).

Storage: Holding Programs and Data for Future Use

The storage operation makes use of **storage devices**, hardware that retains the programs and data even when power is disrupted or turned off. Storage devices, also referred to as **secondary storage**, can be both integrated and external peripherals (see Figure 11), depending on whether the information being stored is to remain within the current system or must be portable and transferable to another system, notebook, or computing device. The internal hard disk holds all the programs, system and application

FIGURE 10 Most users view the output of computer-related work either on the monitor screen or hard copy that has been printed.

Internal hard drive

External hard drive

FIGURE 11 Hard drives can store very large quantities of data, making them the media of choice for activities that generate large files like movies, pictures, and backups.

software, and data that are intended to remain within that computer system. This storage device is usually an integrated peripheral that is mounted inside the system unit's enclosure and not visible to the user. However, for individuals who require a lot of graphic and multimedia data to be portable, or those that want to back up critical data, hard disks can also be purchased as nonintegrated peripherals and connected to the system unit through USB cables. These external storage devices can be colorful, fit into an average sized eyeglass case, and are economical, costing approximately $100 for 500GB of storage. For some, data portability is necessary. Due to smaller file sizes, an external hard drive may not always be needed. For this type of convenience, individuals usually make use of CDs, DVDs, media cards, or USB flash drives (Figure 12).

These portable devices have replaced the floppy disk drive and zip drive that might be found in some older systems. Devices like these, now obsolete, are often referred to as **legacy technology**. The popular **USB flash drive** is the average user's choice of portable storage today. It is about the size of an adult's thumb; can hold up to 64 GB of data (approximately 180 CDs), although a larger 256 GB one is available only in the United Kingdom and Europe; uses solid-state technology; conveniently plugs into a computer's USB port; and is easy to use, rewritable, and inexpensive. If you have never used a flash drive, go to **http://usb-flash-drive-review.toptenreviews.com/usb-flash-drive-c180-video-1.html** and view the very brief and easy-to-understand video. Visit **www1.pacific.edu/comp25/reading/1-InfoProcessingCycle.html** to find out more about the information processing cycle.

Communications: Moving Data

Communications, the high-speed movement of data or information within and between computers, has become more important due to our increasingly global and mobile society. Such needs as getting data from your computer to the server hosting your Web site or from a school computer to the one at your house have taken communications technology from the back office and communications department at work to your own desk at home. To communicate, computers have to be connected to a network by a **communications device**, which is a hardware component that moves data into and out of a computer. Two or more connected computers are called a **network**. The primary reason to create a network is to share data, information, input/output devices, and other resources. If sharing is easy, individuals will collaborate more, distribute information more freely, increase their knowledge,

FIGURE 12 Popular external inexpensive storage devices include CD and DVD drives, media card readers that are used with flash memory cards, and flash drives that connect though a USB port.

CD & DVD drives

Media card reader

Flash drive

expand their scope of reasoning, become more global, and make better individual and group decisions.

Most computers are equipped with a **modem** (short for modulator/demodulator), a communications device that converts data from one form into another. It enables the computer, a digital device, to access data through nondigital media, such as telephone lines, cable, satellite, and cellular connections. Many computers have internal modems that can be used for dial-up Internet access over a standard telephone line. External modems are used for high-speed access to the Internet via cable, DSL, or satellite.

Another important component, a **network interface card (NIC)**, is a hardware element located in the system unit that houses the electronic components used to connect a computer to a network. Many computers already have a NIC integrated into the motherboard, but external NICs can be plugged into a USB port or inserted into a specially designed slot. NICs can connect to wired or wireless networks.

Now that you have had a brief introduction to hardware and software and know their purpose and location in a typical computer system, let's look at an example of how the computer uses the basic functions of input, processing, output, and storage.

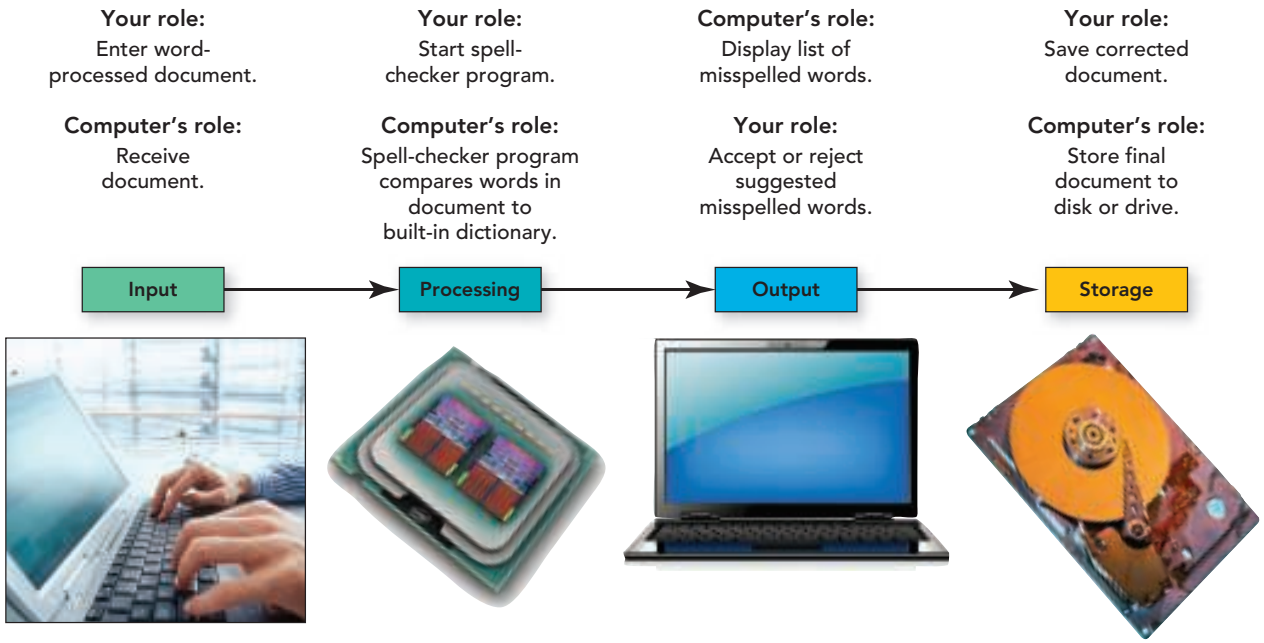
The Information Processing Cycle in Action

Even if you haven't wondered what goes on behind the scenes when you use a computer, the following example illustrates your role and the computer's role in each step of the information-processing cycle (Figure 13):

- *Input:* You're writing a research paper for a class. You know it has misspellings and grammatical errors, but you keep typing because you can run your word processing program's spell-checker at any time to help correct the errors. In this example, your entire word-processed document is the input.
- *Processing:* A spell checker is a program that uses the computer's ability to quickly perform simple processing operations to construct a list of all of the words in your document. It then compares yours words against a huge list of correctly spelled words. If you've used a word that isn't in this internal dictionary, the program puts that word into a list of apparent misspellings.

  Note that the computer isn't really "checking spelling" when it performs this operation. The computer can't check your spelling because it doesn't possess the intelligence to do so. All it can do is tell you which words you've used do not appear in the dictionary

FIGURE 13 The Information Processing Cycle in Action



list. Ultimately, only you can decide whether a given word is misspelled.

- *Output:* The result of the processing operation is a list of apparent misspellings. The word *apparent* is important here because the program doesn't actually know whether a word is misspelled. It can tell you only that a word isn't in its massive, built-in dictionary. But many correctly spelled words, such as proper nouns and technical terms, aren't likely to be found in the computer's dictionary. For this reason, the program won't make any changes without asking you to confirm them.
- *Storage:* After you've corrected the spelling in your document, you save or store the revised document to the integrated hard disk or an external portable storage device.

In summary, computers transform data (here a document full of misspellings) into information (a document that is free of misspellings).

Up to this point, we've been talking about computers in a general sense. Let's be more specific and examine the various types of computers, their components, and the tasks that they are built to perform.

"Computers for **individuals** are designed for one **user** at a time . . . . computers for **organizations** are design to meet the needs of **many** people concurrently."

Types of Computers

Computers come in all sizes, from large to small. For discussion, it is convenient to divide them into two categories: computers for individuals and computers for organizations. Computers for individuals are designed for one user at a time. They process and store smaller amounts of data and programs, such as a research paper, household budget, or a personal Web page. In contrast, computers for organizations are designed to meet the needs of many people concurrently. They process and store large amounts of data and more complex programs, such as the database of all students on campus or a school's entire Web site. Computers are further subcategorized by power (their processing speed) and purpose (the tasks they perform).

Computers for Individuals

A **personal computer (PC)**, also called a **microcomputer**, is designed to meet the computing needs of an individual or, when connected to a network, can be used by a contributor in a collaborative project. The two most commonly used types of personal computers are Apple's Macintosh (Mac) systems and the more numerous IBM-compatible systems, which are made by manufacturers such as Dell, Gateway, Sony, Hewlett-Packard (HP), and many others. These PCs are called *IBM-compatible* because the first such computer was made by IBM. The acronym *PC*, although originally used to refer to all personal computers, has become more closely aligned with IBM-compatible personal computers, while Apple has coined the term *Mac*. Although PC sales have exceeded those of the Mac, the Mac has a loyal following and has been increasing in popularity. Statistics on the use of the Safari browser, used primarily on Apple systems, indicate a continuous increase in its use from 2007 to 2009. Apple advocates point to this statistic as an indication of an increase in Apple system sales. Go to **www.w3schools.com/browsers/browsers_stats.asp** and decide for yourself.

Personal computers are subcategorized by size, power, and function. They include the larger units like the **desktop** and **all-in-one computer** systems down to the more portable styles like the **notebook**, **subnotebook**, and **tablet PC**. The table in Figure 14 displays such features as size, use, and price of these popular categories of computers used by individuals.

With the trend to smaller size, wireless connectivity, and a greater focus on communication, many individuals are finding a less powerful, less expensive device is meeting their needs. These devices include **netbooks**, **handheld computers**, **personal digital assistants (PDAs)**, **smartphones**, the **iPad**, and dedicated devices like the **Kindle DX**, an **e-book reader**. For the consumer, it is becoming harder to make choices because every manufacturer offers new features or applications. Figure 15 categorizes handheld computing devices, outlines their features, and gives an approximate price range.

FIGURE 14 Computers for Individual Use

Category	Size	Application	Cost	Image
Desktop Manufacturers: Dell, Gateway, Sony, Hewlett-Packard, Apple	Consists of a system unit approximately the size of a printer with an independent monitor and keyboard.	Home or office environment	$300 to $5,000 depending on customized features	
All-in-one Manufacturers: Apple iMac (trend leader), Lenovo, Hewlett-Packard, Dell, Sony	Combines the system unit and monitor into one.	Home or office environment, good for small cubicles or apartments	$300 to $5,000 depending on customized features	
Notebook (laptop) Manufacturers: Dell, Sony, Gateway	The size of a spiral bound notebook. Fits into a briefcase or backpack.	Designed for portability, popular with students and business people that travel.	$300 to $5,000	
Subnotebook Manufacturers: Apple, Dell, Sony, and Asus	Omits components as CDs or DVDs, weigh 3 pounds or less, approximately 1 inch thick but still runs a full operating system	Used by individuals that like full application features but not all the peripherals devices.	$200 to $500	
Tablet PC (convertible notebook) Manufacturers: Hewlett-Packard, Fujitsu, Lenovo, Dell	The size of a notebook with a screen that swivels and lies flat over the keyboard. A stylus can be used to handwrite input that is then converted to digital text by handwriting recognition software.	Designed for portability, and ease of note taking. Used by sales persons and others that need to input data quickly.	$300 to $5,000	

FIGURE 15 Handheld Computers for Individual Use

Category	Size	Application	Cost	Image
Netbook Manufacturer: Acer, Asus, Dell, HP, and Lenovo	Between 5 and 15 inches in size and weighs 2 to 3 pounds	Primary use is Web browsing and e-mail. Because netbooks usually do not have large hard drives, they are great for cloud computing, an online service that provides applications and document storage remotely instead of on the user's hard drive.	$150 to $400	
iPad Manufacturer: Apple	Dimensions are 7.47 inches wide by 9.56 inches high and a depth of 0.5 inches, weight is 1.5 to 1.6 pounds	The iPad can download and read e-books; surf the Internet; play movies, TV shows, and other media; make calls; send instant messages/texts; take still photos or video; edit photos and videos; run off battery power for a full day; connect to a TV and play media; and sync its media with a computer.	$500	
Handheld computers or personal digital assistants Manufacturers: Asus, Dell, HP, Palm, and Sony	Fits in the palm of your hand or the pocket of your jeans	Designed for portability, these devices usually use a stylus or virtual keyboard, one that appears on the touch screen, to manage contacts, use e-mail, and schedule appointments.	$200 to $400	
Smartphone Manufacturers: Apple iPhone, BlackBerry Curve, HP iPAQ, Motorola Droid, Palm Pre, and Treo Pro	Fits in the palm of your hand or the pocket of your jeans	Designed to use as a mobile phone with Web access. With the added features and downloadable applications, the line between the smartphone and handheld computers has become blurred.	$100 to $300	
Dedicated Devices Example: Kindle DX Reader by Amazon, the Nook by Barnes and Noble, and the Sony Reader	Dimensions are approximately 7.2 inches wide by 10.4 inches high, depth of 0.4 inches, and weight of 1.1 pounds	Dedicated to a specific activity. The Kindle DX Reader is an e-book reader (electronic book reader) designed to download, display, and read books obtained through an e-bookstore (an electronic book store accessed via the Internet where books are purchased online and downloaded to a Kindle reader, smartphone, iPad, netbook or other connected device for the purchaser to read).	$299 to $400	

ETHICS

Smartphones are becoming popular and powerful communication tools, containing more information than just the phone numbers of the owner's friends and family. A user can send text messages, take pictures, access e-mail, and surf the Web. Additionally it is possible to store the passwords to access bank accounts and private networks. Yes, a phone has become a lifeline of connectivity.

Have you ever found a cell phone that someone had misplaced or left at the checkout of the grocery store? If you ever did find one, what would you do? With the price of a cell phone between $100 and $300, would you surrender it to the store manager? If the phone does not have a lockout code or pad sequence, would you try to call a number in the contact list and try to locate the user? Is even looking in the contact list a violation of the owner's privacy? Would you take it to the provider in hopes that they return it to the owner?

There is really no actual set of rules for this event. However consider the disruption your life would suffer if your smartphone was suddenly missing in action. How helpless would you feel after you misplaced it? How grateful would you be to the individual who returned it?

Computers for Organizations

Organizations or corporations usually need computing systems that are capable of performing transactions faster than those done on a computer designed for individual or small business use. Additionally, these larger entities need more storage capacity for databases and files that contain customer and employee information.

FIGURE 16 Workstations can be mistaken for a desktop due to their similar size; however, the engineering and mathematical applications that they are designed to handle require high-end components that usually place it in the $2,000 to several thousand dollar price range.

Professional workstations (Figure 16) are high-end desktop computers with system units designed for technical or scientific applications, requiring exceptionally powerful processing and output capabilities. Used by engineers, architects, circuit designers, financial analysts, game developers, and other professionals, they are often connected to a network and are equipped with more powerful CPUs, extra RAM, additional graphics power, and multitasking capabilities. For these reasons they are more expensive than desktop PCs. Manufacturers include HP, Dell, and Lenovo.

Servers (Figure 17) are computers that range in size from a personal computer to a four-drawer file cabinet.

FIGURE 17 Servers contain software that enables them to provide services to users connected to the server through a network. Depending on the configuration, they can range in cost from a couple of thousand to tens of thousands of dollars.

They are equipped with the hardware and software to make programs and data available to people who are connected via a network. They are not designed for individual use and are typically centralized or operated from one location. Users connect to a network on **clients**, which can be desktops, notebooks, workstations, or **terminals** (primarily input/output devices consisting of keyboards and video displays, used as an inexpensive means to connect to a server). A **fat client** accesses the server but does most data processing in its own system; a **thin client** relies on the server for its processing ability. This use of client computers and a centralized server is called a **client/server network**. Servers play an important role in today's businesses and can be as small as a personal computer or as large as a computer that runs a banking institution with millions of clients. These larger units are typically housed in a secure, temperature-regulated environment to protect them from deliberate or accidental damage. The top three server manufacturers are HP, Dell, and IBM.

FIGURE 18 Minicomputers or midrange servers like the IBM AS/400 (iSeries) and HP 300 Alpha family have a wide price range. Although units start as low as $25,000, they can easily exceed $500,000.

Minicomputers or **midrange servers** (Figure 18) are midsized servers approximately the size of one or several four-drawer file cabinets with the hardware and software to handle the computing needs of 4 to approximately 200 client computers in a smaller corporation or organization. In size and capability, minicomputers fall between workstations and mainframes; but as these markets have evolved and workstations have become more powerful and mainframes less expensive, the demand for minicomputers has decreased. Minicomputers are manufactured by IBM and HP.

Mainframes or **enterprise servers** (Figure 19) are powerful servers that are part of a networked system designed to handle hundreds of thousands of clients at the same time. They are usually used in large corporations or government agencies that handle a high volume of data and can fill an entire wall of an average room. For example, an airline might use a mainframe to handle airline reservations, or a bank might manage customer accounts on such a system. Mainframes are usually stored in special secure rooms that have a controlled climate. They are manufactured by firms such as IBM, Fujitsu, and Amdahl.

FIGURE 19 Mainframes or enterprise servers connect thousands of clients concurrently, are used by large organizations and government agencies, and can cost from several thousand to millions of dollars.

Supercomputers (Figure 20) are ultrafast systems that process large amounts of scientific data, often to search for underlying patterns. A supercomputer can be a single computer or a series of computers working in parallel as a single computer. Like mainframes, they are stored in special, secure rooms that have a controlled climate. The main difference between a supercomputer and a mainframe is that a supercomputer focuses on performing a few sets of instruction as fast as possible, whereas a mainframe executes many instructions concurrently.

FIGURE 20
Supercomputers can perform mathematical calculations at lightning speed and are used in such fields as weather prediction and space travel. The price of these room-sized systems usually runs several million dollars.

The TOP500 list (**www.top500.org**) tracks the most powerful computer systems worldwide. As of November 2009, ORNL's Jaguar, located at the Department of Energy's Oak Ridge Leadership Computing Facility, recorded a 1.75 petaflops per second performance speed. Jaguar surpassed the prior leader, IBM Roadrunner, located at the Department of Energy's Los Alamos National Laboratory, which recorded a 1.04 petaflops per second performance speed. One **petaflop** is the equivalent of one quadrillion calculations per second. In a more understandable comparison, that is the same as 150,000 calculations for every human being on the planet per second.

Visit **www.unm.edu/~tbeach/terms/types.html** to learn more about the various types of computers. Now that you know about the variety of computers available, let's look at how their use affects you as an individual and society in general.

Computers, Society, and You

Computers help us be more productive and creative, reducing the amount of time spent on tedious tasks. A good example of this is using a word processing program to create a term paper. The program being used provides spelling and grammar assistance, often automatically, as well as formatting suggestions and easy options to include graphics. Without a computer, the student would need dictionaries and encyclopedias, not to mention style guides and other special resources, along with extra time to gather and go through all of these sources.

Computers let us collect, organize, evaluate, and communicate information. Although computers are merely tools, requiring humans to write the programs and set up the data, we can use them for a variety of common activities to ease our daily lives. Rather than going to the mall to buy the latest movie on DVD, you can now purchase it or even view it online. To organize your music or movie collection before computers, you would have had to physically sort through and arrange it on your shelf. A computer makes it possible to organize your entire collection and sort it in a variety of ways, including by title, artist, release date, or genre, making it simple to reorganize and update your collection. And there's no need to wait for movie reviews to come out in the newspaper—just go online to find the latest reviews from critics and other moviegoers, or watch the trailer yourself. You can select your favorite movie, use your smartphone to locate a nearby theater, make dinner reservations before the show, and even display driving directions. To invite or inform family and friends of your plans, simply use a digital method of social networking and post the information to your Facebook page, blog, Web page, or send out a tweet. The amount of time we save during a day by using computers or computer-related devices is phenomenal.

A computer, with the appropriate software, can perform various tasks on all types of data. That is a major reason for the remarkable penetration of computers into almost every occupational area and into 80 percent of U.S. households in 2008 (a significant increase from 49 percent in 2001 and 2002). So, four out of every five households in the United States have a computer. Although computers seem to be everywhere, computers and the Internet aren't readily accessible in some segments of society. Computers and the Internet possess the ability to cut across all educational, racial, and economic boundaries; but there are still inequities.

The Digital Divide

The more educated you are and the more income you make, the more likely you are to own a computer and have Internet access. Figure 21 displays the results of the Nielsen report comparing income and home Internet access though the third quarter of 2008. The chart clearly highlights the income discrepancy with respect to Internet connectivity. This same report also identified the East South Central region (Alabama, Mississippi, Tennessee, and Kentucky) of the United States as the geographic region with the highest number of households (26%) having no Internet access. Further, a study by Pew Internet and American Life Project in December 2008 showed that approximately one-third of people in the United States have a bachelor's degree, and 95 percent of college-educated individuals use the Internet; but only 53 percent of people with a high school education do.

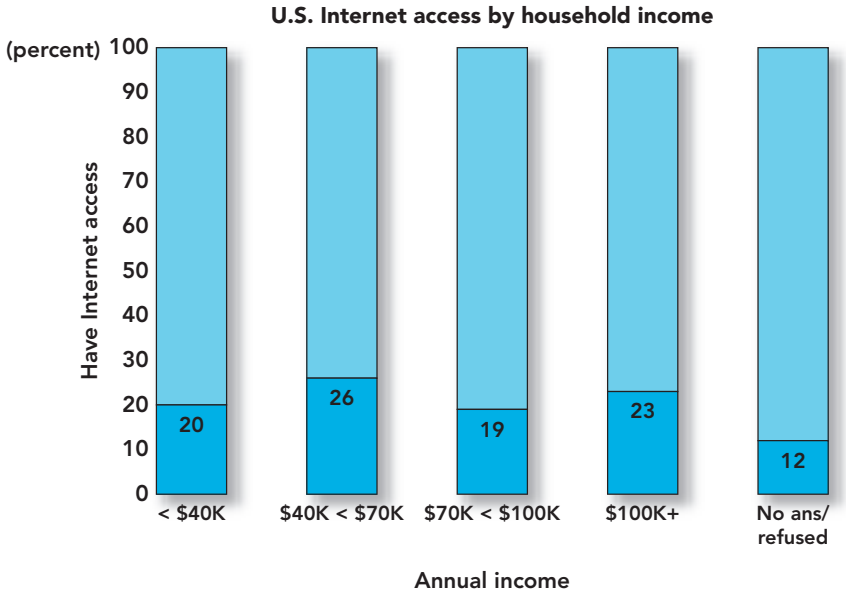
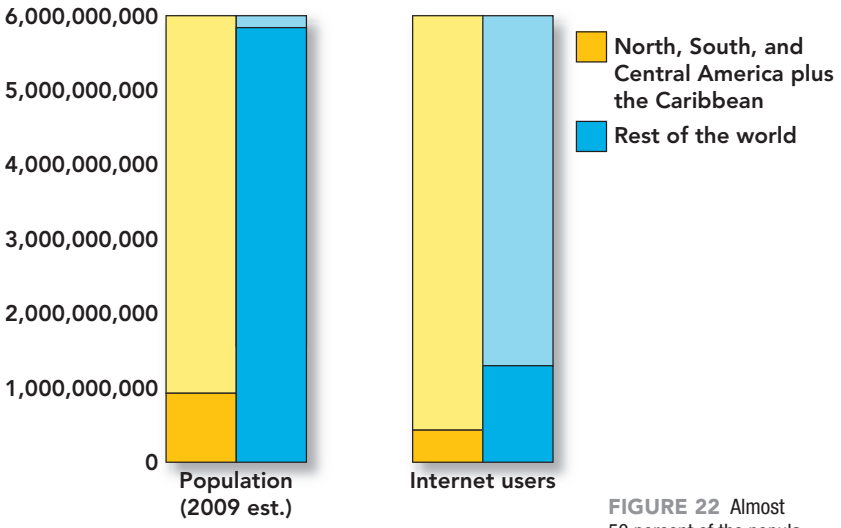


FIGURE 21 The digital divide is often thought of as the difference in computer and Internet use between the have and have-not nations. This Nelson report actually highlights the digital divide that exists over Internet use within the United States.

Age, race, and income are also factors in U.S. computer use. The December 2009 Pew Internet and American Life Project indicated that only 38 percent of adults 65 and older use the Internet, compared with 70 percent of 50- to 64-year-olds, 81 percent of 30- to 49-year-olds, and 93 percent of 18- to 29-year-olds. Another Pew report in the same year substantiated that 80 percent of whites, 72 percent of African Americans, and only 61 percent of the Hispanics have Internet use. This disparity in computer ownership and Internet access, known as the **digital divide**, isn't limited to the United States. Similar statistics exist for other countries, indicating that this is a global problem. Studies of the expansion or reduction of the digital divide are contradictory; however, government and educational programs are working to bridge this gap by attempting to provide computer access for all (Figure 22).



Source of data: Internet World Stats

FIGURE 22 Almost 50 percent of the populations of North America, South America, Central America, and the Caribbean have Internet connectivity, while only 20 percent of the rest of the world enjoys that technology.

Social Networking

Some of the uses of computers, such as social networking, seem to be more for communication or entertainment than for information or learning. It would be a mistake to dismiss these types of sites or applications as child's play. Results from statistics provided by a Forrester Research Report can be seen in Figure 23. These summarizations substantiate that the contact between adults on these sites and the amount of information being shared daily is real, on the rise, and reaching a population demographic that is staggering. One of the most basic forms of this interaction is **instant messaging (IM)**, a free, real-time connection between two or more parties that uses a buddy list to identify and restrict the contacts a person wishes to communicate with.

The use of online **social network sites** such as Facebook, MySpace, LinkedIn, and Twitter is increasing rapidly. These are sites that individuals are invited or allowed to join and support such tools as instant messaging and e-mail among members. **Facebook**, the largest of

FIGURE 23 The Use of Social Network Sites by Adults

Statistics	Related Sites
A third of adults post at least once a week to a social site.	A social site can be Facebook, MySpace, Twitter, as well as eHarmony, Match.com, and Yahoo singles.
A quarter of adults publish a blog and upload video/audio they created.	The most recognized video broadcasting site is YouTube. Blogs created by individuals contain entries that resemble journal entries.
Nearly 60% of adults maintain a profile on a social networking site.	The most popular social networking sites are Facebook and Twitter.
Approximately 70% read blogs, tweets, and watch UGC (user-generated content) videos.	Blogs can be located on almost any Web page and on any topic. Radio and TV stations as well as political sites are popular for hosting blogs to collect opinions. UGC videos can be posted on individually created Web pages or, for viewing by a larger audience, YouTube.

FIGURE 24 Making the Social Network Work for Businesses

Action	Purpose
Encourage supervisors and colleagues to investigate the Web presence of competitors.	To size up the competition, their manner of presentation on a social network site, the type of offers and interaction they provide for the customer.
Sharpen leadership knowledge of some of the high profile sites and learn the language of their users. Create a page in Facebook or become a follower of a favorite coach or actor on Twitter.	To get the feel of the social environment and learn its language, and interface. Being comfortable is a prerequisite for launching a business site.
Poll customers and analyze their responses. Use a variety of options to connect with target audiences or promote different product lines.	To determine the type of customer involved in the social networking world. This will determine the tone the business decides to project on its page and the type of offers that are posted.
Once the decision is made to create a Web presence for the business, assign the task of maintaining it to an individual that understands the technology. Old or inaccurate information will have a negative effect on business.	To maintain consistency and currency of layout, design, and content in order make the customer comfortable.

such social networking sites, allows anyone over the age of 13 with a valid e-mail account, residing in a country where it has not been banned, to become a Facebook user. Often users will join groups set up by region, job, interest, or school and communicate with group members. Adult Internet users who have profiles on online social network sites have more than quadrupled in the past four years—from 8 percent in 2005 to 35 percent in 2008, according to the Pew Internet and American Life Project December 2008 report. Mark Brooks, a social network and online dating analyst, suggests that these sites are locations where individuals are looking for friends. Sites dedicated to matchmaking offer more anonymity, but social networking sites offer an environment that allows someone to look at a friend's postings, follow their social interaction with others, and allow for a more insightful view of a members personality and behavior.

Twitter, the newest phenomenon, is a free, real-time social messaging utility that allows postings of up to 140 characters. The exchanges are short and usually in a question-and-answer mode. People need merely look up the Twitter accounts of their friends and indicate that they want to become a follower and view their Twitter posts, which are called **tweets**.

From a business point of view, using these social networking sites can enable a business to reach individuals standard advertising media might miss and provide much more exposure than any commercial or single Web site posting. Most organizations and companies are looking to increase their Web presence. What better way than to use a social networking site? The suggestions in Figure 24 offer a starting point to evaluate the Web presence of a business and the target population it is trying to reach. It also provides suggestions on making necessary adjustments. For many businesses, it might be time to make the jump to a more dynamic Web presence that includes social networking sites. When each Twitter account holder has an average following of 126 users, the amount of information that is dispersed in seconds through this portal alone is phenomenal. Think about how quickly a happy customer can spread the word.

Collaborative Work

Computers also help us work, teach, and learn together. Computers facilitate collaboration with others to solve problems. For instance, computers are increasingly part of law enforcement activities. They facilitate quick and efficient communication between jurisdictions, enable law enforcement officials to browse criminal databases like the Automated Fingerprint Identification System (AFIS) (Figure 25), and allow pertinent data to be shared nationally and globally. Additionally, as cybercrime becomes a bigger concern, police are using the Internet and **computer forensics**, a branch of forensic science that deals with legal evidence

found on computers, to find and apprehend these criminals.

Collaboration software, the collection of programs that help people share ideas, create documents, and conduct meetings, regardless of location or time zone, are making their move into the academic and business worlds. Whether you're an employee of a multinational firm developing a new product with a group of colleagues located halfway around the globe or a student enrolled in a distance learning course, computers and their facilitation of collaboration play a big part in making these tasks possible.

The need to stay connected to complete group projects and research has caused a rise in the use of online applications that advance collaboration. **Google Docs**, a free Web-based word processor and spreadsheet, allows project members to share and edit documents online. A **wiki** is a collection of Web pages designed to let anyone with access contribute or modify content. Wikis are often used to create collaborative or community Web sites. The collaborative encyclopedia Wikipedia is one of the best-known wikis. **Google Groups** is a free service provided by Google to help users connect, share information, and communicate effectively over the Internet. Its current version allows group members to collaborate on shared Web pages; set group pictures, colors, and styles; upload and share individually created work; and learn more about other members in the group. After the project is finalized, you can use your own computer to print, store, and present the finished product.

Even though computers offer us many advantages and communication options, the responsible computer user should also be aware of the disadvantages of computer use.

FIGURE 25 The ability to convert a fingerprint into a digital image and send it over the Internet to other law enforcement agencies enables comparisons to be made quicker and a suspect apprehended faster.

Advantages and Disadvantages of Using Computers

It seems that for every positive effect an invention provides there is a negative effect. That is also true for computers. A computer system provides certain advantages to its users, such as speed, memory for work in progress, storage for access later, hardware reliability, and accuracy. However, with these advantages come some disadvantages (Figure 26), including information overload, the expense of computer equipment, data inaccuracy, and an increasing dependence on unreliable software.

Speed is one of the greatest advantages of a computer. It can perform, in a minute, calculations or tasks that would take a human days. In fact, people are generating so much information via computers today that they often succumb to **information overload**: a feeling of anxiety and incapacity experienced when people are presented with more information than they can handle. According to research from the firm Basex, which chose information overload as its 2008 problem of the year, constant e-mail messages, phone calls, text messages, and tweets across the U.S. workforce resulted in $650 billion of lost productivity in a single year. That is an estimate of up to eight hours a week per worker. Some see this connectivity as an annoyance. However, young people do not seem as irritated at the multitasking demands of technology. They listen to music while reading, IM friends while typing a paper, tweet constantly, and do not seem annoyed. It remains to be seen whether this ability to handle information overload will produce a future workforce that is better able to handle an overfilled Inbox.

FIGURE 26 Advantages and Disadvantages of Computer Use

Advantages	Disadvantages
Speed	Information overload
Memory	Cost
Storage	Data inaccuracy
Hardware reliability and accuracy	Software unreliability

Cost is another drawback that must be weighed against computer performance. A computer's performance is enhanced by the amount of random access memory the system possesses. Random access memory (RAM) is high-speed, temporary memory that holds all programs and data currently in use; in other words, it holds our work in progress. The processor accesses programs and data in RAM quickly. The faster the processor receives the data, the faster it returns results. Once we are done with it, the information in RAM must be placed on a storage device so we can retrieve it later. Depending on the quantity of data you process and the number of files you save, you may need to purchase additional RAM and storage devices.

Purchasing more RAM or additional storage can be costly. Most computers are equipped with just enough RAM and storage to hold an average amount of programs and data. If you use many high-end applications, you may experience a slowdown when moving between graphics, see a pause in a long video, or receive a message that one of your storage units is full. If that happens, you need to investigate the reason for the slowdown and may need to purchase more RAM or storage. High-end users or intense gamers may also find that when new applications are installed on an older machine, the computer might not have enough CPU power to keep up with the new software speed and graphics. This might require upgrading the CPU or purchasing a new system. Investigate the benefits and drawbacks of either decision on a case-by-case basis.

Hardware reliability and accuracy are two more advantages of computers. Computers show up at school or work every day and almost always respond when turned on. If given a calculation to do several times, they consistently output the same result. A computer can transcribe your speech with an accuracy of 95 percent or more, which is better than most people's typing accuracy. In fact, almost all "computer errors" are actually caused by flaws in software or errors in the data supplied by people. Some more interactive programs allow the user to correct an error and save the correction. This enables the program to automatically fix future occurrences of that error.

Along with computers' strengths and weaknesses, consider some additional points in your quest to become a responsible user.

Courtrooms of the Future

Are you familiar with the sayings: "Seeing is believing," and "A picture is worth a thousand words"? If these words of wisdom are placed in the content of a courtroom, they gain even more strength. Now, add the ability to use technology to magnify voices, provide testimony from a witness confined to a hospital bed via webcam, obtain a translator through videoconferencing, and reproduce the scene and figures to provide a reenactment of the event digitally. Yes, it sounds like an episode from your favorite crime investigation show. But this is no television episode. With jurors traditionally having information organized for them in bulleted lists, slide shows, and presented in visual images, the atmosphere of the conventional courtroom, which is based on oral delivery and inaccurate sequencing of information, can be confusing. In the future, expect more visual aids in the courtroom to help jurors organize the data. Headsets will be provided so that jurors may replay parts of the testimony, or they may put on 3D goggles to review a video clip or simulation or revisit the actual scene of the crime. From any angle, this will look like a TV episode of today. Attorneys of the future will have to combine their legal and technical skills to not only present the information, but also present it in a manner that best suits their objective.

Become Comfortable with Hardware

Some people feel threatened by computers because they fear that computers are too complicated. But without humans, computers have no intelligence at all. They process simple repetitive operations. Remember, without a person and a program to tell it what to do, the computer is no more frightening—or useful—than an empty fish tank.

One way to get comfortable with your computer is to learn how to care for it. Read any instructions that accompany your purchase and remember that dust,

moisture, static electricity, and magnetic interference may affect your system's performance. Additionally, keeping cords and devices in places that do not interfere with the traffic pattern of the room will avoid unnecessary accidents and make your work environment safe and comfortable. Does your work area look like the one in Figure 27?

To maintain a safe working environment for you and your hardware, heed the following advice:

- Use a surge protector and avoid plugging too many devices into the same electrical outlet.
- Place computer equipment in a secure position so it won't fall or cause accidents.
- Leave plenty of space around computer equipment for sufficient air circulation to prevent overheating.
- Make sure computer cables, cords, and wires are fastened securely and not strung haphazardly or left lying where you could trip over them or where they could cause a fire.
- Keep the computer area free of food and liquids, as one spill can cause the loss of weeks of work.

FIGURE 27 A messy computer environment is an unsafe and unproductive one.

Now that you know how to create a safe computing environment, it is equally important to understand how to avoid eye, back, and wrist strain that can occur from long periods of use. Healthy computing habits combined with ergonomic devices and proper positioning and arrangement of equipment and lighting can make all the difference in your computing environment and physical health.

Ergonomics is the field of study that is concerned with the fit between people, their equipment, and their work. It takes into account worker limitations and capabilities in attempting to ensure that the tasks, equipment, and overall environment suit each worker (Figure 28). The most common injuries related to prolonged computer use occur to the wrist and back. Prolonged keyboard use can cause **carpal tunnel syndrome** (also known as cumulative trauma disorder or repetitive strain injury), which is caused by repeated motions that damage sensitive nerves in the hands, wrists, and arms. Sometimes these injuries are so serious that they require surgery. To help prevent these problems, ergonomic keyboards, such as the Microsoft Natural Keyboard, have been designed to keep your wrists flat, reducing (but not eliminating) your chance of an injury (Figure 29). Because of the back strain sitting at a computer causes, many hotel chains try to attract business travelers by promoting their ergonomic desk chairs

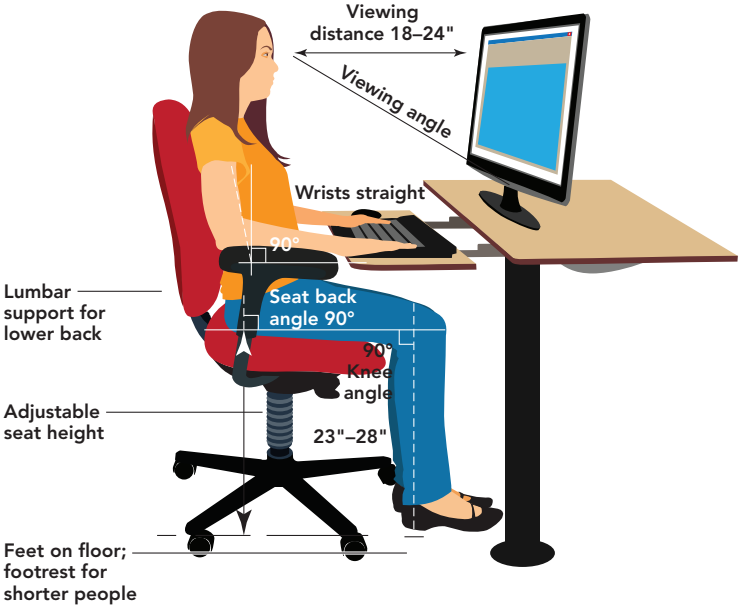


FIGURE 28 Keys to an Ergonomically Correct Work Station

FIGURE 29 A typist using an ergonomic keyboard is taking an extra precaution and also using wrist guards designed to reduce the damage to nerves in the wrist, arms, and hands.

(Figure 30) along with high-speed Internet access. Go to **http://ergo.human.cornell.edu** to view a list of links that include videos and worksheets that provide information to help you make healthy ergonomic decisions.

In addition to using properly designed equipment, you can promote a safe and comfortable computer environment by following the tips below.

- Position the top of your monitor at eye level.
- Tilt the monitor back 10 to 20 degrees and keep it no closer than 20 inches from your eyes.
- Try to keep your wrists flat; use a wrist rest if necessary.
- Rest your eyes frequently by focusing on an object 20 or more feet away.
- Stand and stretch periodically.

If you purchase devices that fit your body, treat the physical components of your computer with respect, and monitor your work health habits, you will get the most return for your money and promote a healthy work and life style. For guidance, a workspace planner is provided at **www.ergotron.com/tabid/305/language/en-US/default.aspx**.

FIGURE 30 The multi-positioning chair, made from breathable fabric, and a well-positioned head rest should help alleviate neck and lower back stress.

Recognize the Risks of Using Flawed Software

Computer hardware can be amazingly reliable, but software is another matter. Most programs contain some errors or **bugs**, as they are called. Many programs contain millions of lines of code (Figure 31). In general, each line of program code tells the computer to perform an action, such as adding two numbers or comparing them.

Consider this: The program that allows you to withdraw cash from an ATM contains only 90,000 lines of code. But when you file your taxes, the Internal Revenue Service (IRS) program that calculates your refund contains 1,000 times that—100 million lines of code!

With so many lines of code, bugs are inevitable—and they are almost impossible to eradicate completely. On average, commercial programs contain between 1 and 7 errors for every 1,000 lines of code. This means that an ATM is likely to have approximately 360 errors in its code, and the IRS program code might have over 400 hundred thousand errors. Fortunately, most errors simply cause programs to run slowly or to perform unnecessary tasks; but some errors cause miscalculations or other inconveniences, such as your computer becoming nonresponsive. According to IBM's annual X-Force and Trend Risk Report for 2009, the overall number of bugs in software decreased, but bugs in document readers and multimedia applications saw a 50 percent increase.

These are ample reasons why it's not a good idea to put off writing a paper, especially if you plan to embed a multimedia component, until the night before your assignment is due. Bugs in a word processing program aren't usually life threatening, but computers are increasingly being used in mission-critical and safety-critical systems. Mission-critical systems are essential to

FIGURE 31 Code Length for Key Programs

Program	Lines of Programming Code
Bank ATM	90,000
Air traffic control	900,000
Microsoft Windows 2000	35 million
Microsoft Windows Vista	50 million
Microsoft Office XP	35 million (estimated)
Internal Revenue Service (IRS)	100 million (all programs)

an organization's viability, such as a company's computerized cash register system. If the system goes down, the organization can't function—and the result is often an expensive fiasco. A safety-critical system is one on which human lives depend, such as an air traffic control system or a computerized signaling system used by high-speed commuter trains (Figure 32). When these systems fail, human lives are at stake. Safety-critical systems are designed to much higher quality standards and have backup systems that kick in if the main computer goes down. For a specific case, do an Internet search on "F-22 software problems."

FIGURE 32 Subway and train systems, like the Intercity Express (ICE) in Cologne, Germany, along with air traffic control, defense, and security systems are run by safety-critical software. Code for such systems must be of the highest standards and bug-free.

Take Ethics Seriously

One disturbing thing about computers is what some people do with them. *Ethics* is the behavior associated with your moral beliefs. You have learned what is right and wrong from your parents, teachers, and spiritual leaders. By this stage of your life, you should know which behaviors fall into which category. However, people's use of computers and the Internet has created ethical situations that we might not have otherwise encountered. **Computer ethics**, a branch of philosophy that continues to evolve, deals with computer-related moral dilemmas and defines ethical principles for computer use.

How many people do you know who have "borrowed" software, downloaded movies from the Web, shared music files with friends, or illegally burned copies of music CDs? If you ask around, you'll find that you're surrounded by people who don't think it's wrong to steal digital data. They view **digital piracy**, the unauthorized reproduction and distribution of computer-based media, differently from photocopying a book or taking a DVD from a store without paying. In reality, these forms of theft are similar. Current statistics show that global losses due to digital piracy amount to more than $40 billion annually, with a 30 percent decrease in sales in the music industry alone from 2004 to 2009. This is not just a loss of products, but jobs, retail business, and collected tax dollars. The Business Software Alliance reports that reducing U.S. piracy rates by just 10 percent over the next four years could create more than 32,000 new jobs, generate $6.7 billion in tax revenues, and result in $40 billion in economic growth. The Anti-Counterfeiting Trade Agreement is an international assault on software piracy and trademark violations. The chief players in this agreement include the United States, South Korea, Japan, Australia, Canada, and members of the European Union. With the Internet rapidly becoming the leader in dispersing all forms of media, governments cannot ignore piracy.

Responsible computing requires that you understand the advantages and disadvantages of using a computer as well as the potential harm from computer misuse. There are daily reports about the misuse of computerized data. Names and e-mail addresses are distributed freely without permission or regard for privacy. Viruses are launched against unsuspecting victims. Credit card information is stolen and fraudulently used. Children and women are stalked. Pornography abounds. Illegitimate copies of software are installed every day. Research papers are bought and sold over the Internet. Homework assignments are copied and then modified to look like original work. The Internet is a hotbed of illicit and sometimes illegal content. Computers are very powerful tools. They can magnify many positive aspects of our lives but can also highlight negative aspects, including unethical behavior.

Societal Impacts of Computer Use

Computers and the Internet are here to stay, and they have improved the quality of our lives and society as a whole. Almost everyone has been affected by computers and the Internet. Although most people are able-bodied, consider the effect of technologies that support and provide opportunities to the disabled and the disadvantaged (Figure 33).

With the integration of individuals with special needs into the regular classrooms and workforce environments, schools and employers must provide computer access and the devices needed to facilitate that access for special needs students and employees. Here are just some of the developments to provide adaptive technologies.

- Your school must, in order to meet the requirements of the Americans with Disabilities Act of 1990, provide computer access to people with disabilities. Special speech recognition software is needed to help people with vision impairments use computers. Input and output devices designed for the physically disabled can be installed, or existing devices can be modified, to accommodate users with hearing or motor impairments.
- Amazon released its **Kindle 2** in 2009. This e-book reader allows the user to scroll though pages of a book, enlarge text size, purchase materials through an e-book store, and make use of the text-to-speech function. This text-to-speech feature initially caused some copyright issues as books that are read usually receive additional royalties. Amazon tried to recall the Kindle 2, but protests from individuals and agencies that represent the disabled were effective and royalty agreements were worked out.
- Other computer controlled devices that help those with physical disabilities lead more independent lives include treadmills, muscle stimulators, and video game therapy.
- The blue-sky research division of the Defense Advance Projects Research Agency (DARPA) is developing a "neurally" controlled artificial limb that will restore full motor and sensory capability to people who have had their arms amputated. This prosthesis will be controlled, feel, look, and perform like a natural arm.

FIGURE 33 Continued innovation in computers, software, and related technologies help individuals with myriad disabilities. Shown here, the Alternative Computer Control System (ACCS) manufactured by Gravitonus is designed to provide computer access for severely motor-impaired individuals.

Students can use computers to take advantage of inexpensive training and learning opportunities.

- **E-learning** is the use of computers and computer programs to replace teachers and the time–place specificity of learning.
- Libraries have improved their computer-related resources, and most have Internet connectivity.
- Online classes make use of specially developed software to provide an interface for students to interact with the instructor in a secure and private environment from the comfort of their own homes.
- Internet cafés and workforce agencies provide access to the Internet for social purposes or to enable access to research and employment sites.
- You can find online training, templates for all types of documents, and instruction on how to do just about anything.

The Effect of Computers on Employment

Although computers are creating new job opportunities, they're also shifting labor demand toward skilled workers—particularly those who are computer proficient. As a result, these skilled workers are in greater demand and earn higher wages.