**Chapter 8 Objectives**

- Describe the two types of software
- Understand the startup process for a personal computer
- Describe the term user interface
- Explain features common to most operating systems
- Know the difference between stand-alone operating systems and network operating systems
- Identify various stand-alone operating systems
- Identify various network operating systems
- Recognize devices that use embedded operating systems
- Discuss the purpose of the following utilities: file viewer, file compression, diagnostic, installer, disk scanner, disk defragmenter, backup, and screen saver

**System Software**

**What is software?**
- The series of computer-language coded instructions that tells the computer how to perform tasks
- Two types of software
  - Application software
  - System software

**What is system software?**
- Consists of the programs that control the operations of the computer and its devices
- Serves as the interface between the user, the application software, and the computer’s hardware
- Two types are operating systems and utility programs

**Operating Systems**

**What is an operating system (OS)?**
- A set of programs containing instructions that coordinate all the activities among computer hardware resources
- Required for a computer to work
- Sometimes called the software platform or platform

**What are the functions of an operating system?**
- Start up the computer
- Administer security
- Control a network
- Monitor performance and provide housekeeping services
- Access the Web
- Schedule jobs and configure devices
- Provide user interface
- Manage memory
Operating Systems

Where is the operating system located?
- Resides on computer’s hard disk in most cases
- May reside on a ROM chip on handheld computers

What is the kernel?
- The core of an operating system
  - Manages memory and devices
  - Maintains the computer’s clocks
  - Starts applications
  - Assigns the computer’s resources, such as devices, programs, data, and information
  - Each time you boot a computer, the kernel and other frequently used operating system instructions are loaded
  - Loading a file means the file is copied from the hard disk to the computer’s memory

What is booting?
- The process of starting or restarting a computer
  - Cold boot: Process of turning on a computer after it has been powered off completely
  - Warm boot: Process of restarting a computer that is already powered on
    - Also called a warm start

What is a cross-platform application?
- One that runs identically on multiple operating systems
- Often have multiple versions, each corresponding to a different operating system

What messages display on the screen when you boot the computer?
- BIOS version and copyright notice
- Total amount of memory
- Devices detected and loaded
- Message
- Sound card and CD-ROM drivers loaded

How does a personal computer boot up?
- Step 1: The power supply sends a signal to components in the system unit
- Step 2: The processor looks for the BIOS processor

Operating System Functions

nonresident
- Instructions remain on the hard disk until they are needed
- Other parts of the operating system are nonresident

memory resident
- Remains in memory while the computer is running
- The kernel is memory resident

Various operating systems often are not compatible with each other.

Fig. 8-2

various operating systems often are not compatible with each other.

Fig. 8-3

various operating systems often are not compatible with each other.

Fig. 8-4

various operating systems often are not compatible with each other.
Step 3: The BIOS performs the POST, which checks components such as the mouse, keyboard connectors, and expansion cards.

Step 4: The results of the POST are compared with data in the CMOS chip.

Step 5: The BIOS looks for the system files in drive A (floppy disk drive) and then drive C (hard disk).

Step 6: The boot program loads the kernel of the operating system into RAM from storage (hard disk). The operating system in memory takes control of the computer.

Step 7: The operating system loads configuration information and displays the desktop on the screen. The operating system executes programs in the StartUp folder.

What is a boot drive?
- The drive from which your personal computer boots (starts)
- In most cases, drive C (the hard disk) is the boot drive.
Step 1: Click the Start button on the taskbar, point to Programs on the Start menu, point to Accessories on the Programs submenu, point to System Tools on the Accessories submenu, and then point to Backup.

Step 2: Click Backup on the System Tools submenu to open the Backup window. Point to the Emergency Repair Disk button.

Step 3: Click the Emergency Repair Disk button to create the emergency repair disk. Follow the on-screen instructions.

- A floppy disk, Zip® disk, or CD-ROM that contains system files that will start the computer
- Used when a hard disk becomes damaged and the computer cannot boot
- Also called a boot disk or a rescue disk

What is an emergency repair disk?

What is a user interface?

- Controls how you enter data and instructions and how information displays on the screen
- Command-line interface user interface (CLI)
  - You type keywords or special keys on the keyboard to enter commands

- Graphical user interface (GUI)
  - Allows you to use menus and visual images to issue commands

What is multitasking?

- Menu: a set of commands from which you can choose
- Icon: a small image that represents a program, an instruction, a file, or some other object
- Web pages can be delivered or pushed automatically to your screen

What are features of a graphical user interface?

- Operating systems vary in capabilities
  - Number of users
  - Number of programs running at the same time
  - Number of processors
  - Management of programs directly affects user productivity

How does an operating system manage programs?

- Single user/single tasking operating system
  - Allows only one user to run one program at a time
  - Early systems were single user

- Multiuser operating system enables two or more users to run a program simultaneously

- Multiprocessor Operating system can support two or more processors running programs at the same time

- Fault-tolerant computer
  - Continues to operate even if one or its components fails
  - Computer has duplicate components such as processors, memory, and disk drives

What are other program management features of operating systems?

What is multitasking?

- Allows a single user to work on two or more applications that reside in memory at the same time
- The foreground contains the active application: the one you currently are using
- The other programs that are running but are not in use, are in the background

- The set of commands you use to interact with the computer is called the command language

- Menu: a set of commands from which you can choose
- Icon: a small image that represents a program, an instruction, a file, or some other object
- Web pages can be delivered or pushed automatically to your screen

- Web pages pushed onto the desktop

- Foreground application

- Background applications listed on the toolbar

- Icons function as Web links

- Web pages pushed onto the desktop

- Commands entered by user
**Operating System Functions**

**What is memory management?**
- Optimizes the use of random access memory (RAM)

- Allocates, or assigns, data and instructions to an area of memory while they are being processed
- Monitors the contents of memory
- Clears items from memory when the processor no longer requires them

**Operating System Functions**

**What is virtual memory (VM) management?**
- The operating system allocates a portion of a storage medium, usually the hard disk, to function as additional RAM

**Operating System Functions**

**What are some virtual memory terms?**
- Swap file: Area of the hard disk used for virtual memory
- Paging: The technique of swapping items between memory and storage
- Threshing: When an operating system spends much of its time paging, instead of executing application software

**Operating System Functions**

**What is spooling?**
- Print jobs are sent to a buffer instead of sending them immediately to the printer
- Multiple print jobs line up in a queue within the buffer
- A program, called a print spooler, intercepts print jobs from the operating system and places them in the queue

**Operating System Functions**

**What is a device driver?**
- A small program that tells the operating system how to communicate with a device
- Also called a driver
- Each device on a computer requires its own specific driver
Step 1: Open the Control Panel window. Point to the Add/Remove Hardware icon.

Step 2: Start the Add/Remove Hardware Wizard by double-clicking the Add/Remove Hardware icon. Follow the on-screen instructions.

Step 3: The Add/Remove Hardware Wizard searches for Plug and Play devices on your system. If it finds any such devices, it installs them.

Step 4: If the Add/Remove Hardware Wizard cannot find any Plug and Play devices, you can select the type of device you want to install.

Step 5: Next you select the manufacturer and model you want to install. You may be requested to insert the floppy disk, DVD-ROM, or floppy disk that contains necessary driver files to complete the installation of the device.

Operating System Functions
How do you install a device driver?

Operating System Functions
What is Plug and Play?
- The computer can recognize a new device and assist you in its installation by loading the necessary drivers automatically and checking for conflicts with other devices.
- Supported by most devices and operating systems today.

Operating System Functions
What is an interrupt request (IRQ)?
- A communications line between a device and the processors.
- Most computers have 16 IRQs, numbered 0 through 15.
- IRQs are assigned during installation.

Operating System Functions
How does the operating system help access the Web?
- Typically provide a means to establish Web connections.
- Some include a Web browser and an e-mail program.

Operating System Functions
How does an operating system monitor performance?
- Provides a program that assesses and reports information about various system resources and devices.

Operating System Functions
How does an operating system manage files?
- Contains a program called a file manager.
- Performs functions related to storage and file management.
What are some file manager functions?
- organizing, copying, renaming, deleting, moving, and sorting files
- displaying a list of files on a storage medium
- checking the amount of used or free space on a storage medium
- creating shortcuts: an icon on the desktop that runs a program when you click it

What is formatting?
- The process of preparing a disk for reading and writing
- Most floppy and hard disk manufacturers preformat their disks
- Various operating systems format disks differently

What is a file allocation table (FAT)?
- A table of information that the operating system uses to locate files on a disk
- Defined during the formatting process
- Lists all files, file types, and locations
- Reformatting a disk usually erases only the file allocation table and leaves the actual files on the disk

What is a network operating system?
- An operating system that supports a network
- Also called a network OS or NOS
- A network is a collection of computers and devices connected together via communications media and devices

What are features of a network operating system?
- The server is the computer that controls access to the network and provides a centralized storage area
- The other computers on the network are called clients
- Organizes and coordinates how multiple users access and share resources on the network
- Resources include programs, files, and devices such as printers and drives
- Network administrator uses the network OS to add and remove users, computers, and other devices to and from the network

How do operating systems administer security?
- Most multiuser operating systems allow each user to log on
- Process of entering a user name and a password
- User name: A unique combination of characters that identifies a specific user; also called a user ID
- Password: A combination of characters associated with the user name that allows access to certain computer resources
- A combination of characters associated with the user name that allows access to certain computer resources
How does a network administrator use the network OS?
- Establish permissions to resources
- Define who can access certain resources
- Define when they can access those resources
- Assign passwords to files and commands to restrict access to only authorized users

Active Directory (AD)
A feature of Windows 2000 Server that allows network administrators to manage all network information including users, devices, settings, and connections from a central environment

Types of Operating Systems
What are some characteristics of operating systems?
- device-dependent
  - One that runs only on a specific type of computer
- proprietary software
  - Privately owned and limited to a specific vendor or computer model
- downward-compatible
  - Recognizes and works with application software written for an earlier version of the operating system
- upward-compatible
  - Written for an earlier version of the operating system, but also runs with the new version

Types of Operating Systems
What are three categories of operating systems?

Types of Operating Systems
What is a stand-alone operating system?
- A complete operating system that works on a desktop or notebook computer
- Some, called client operating systems, also work in conjunction with a network operating system

Types of Operating Systems
What is Windows?
- Developed by Microsoft to meet the need for an operating system that had a GUI

Stand-Alone Operating Systems
What is DOS (Disk Operating System)?
- Refers to several single user operating systems developed in the early 1980s for personal computers
- Two more widely used versions were PC-DOS and MS-DOS, both developed by Microsoft
- Used a command line interface and added a menu-driven interface in later versions

Stand-Alone Operating Systems
What is Windows?
- Windows 3.x
  - Refers to three early versions of Microsoft Windows that were operating environments with DOS
  - A GUI that works in combination with an operating system to simplify its use
- Windows 95
  - A true multitasking operating system with downward compatibility for DOS and Windows 3.x
- Windows NT Workstation
  - A client operating system that could connect to a Windows NT server
  - Used a Windows 95 interface
Stand-Alone Operating Systems

What are features of Windows 98?
- Upgrade to Windows 95
- More integrated with the Internet
- Included Internet Explorer, a popular Web browser
- A file manager, Windows Explorer, had a Web browser look and feel
- An Active Desktop™ interface allowing icons and file names to work similar to Web links

Stand-Alone Operating Systems

Supported the Universal Serial Bus (USB)

What is Windows 2000 Professional?
- Upgrade to the Windows NT Workstation operating system
- Complete multitasking client operating system that has a GUI

Stand-Alone Operating Systems

What are features of most Windows operating systems?
- Active Desktop™
- Taskbar/toolbars
- Registry Checker
- Increased speed
- FAT32
- Windows Explorer has a Web browser look and feel
- Tune-Up Wizard
- Multiple display support
- Hardware support
- Accessibility Settings Wizard
- Universal Serial Bus

Stand-Alone Operating Systems

What is Windows Millennium Edition (ME)?
- An operating system that has features specifically for the home users
- Also called Windows Me
- Includes multimedia features

Stand-Alone Operating Systems

What is Mac OS?
- A multitasking operating system available only for computers manufactured by Apple
- Apple’s Macintosh operating system was the first commercially successful GUI
- Mac OS is the current version

Stand-Alone Operating Systems

What is OS/2 Warp?
- IBM’s GUI multitasking client operating system
- Supports networking, the Internet, Java, and speech recognition
- Runs programs written specifically for OS/2, as well as most programs written for DOS and Windows
**Company on the Cutting Edge**

Apple Computer, Inc.

- Formed by Steven Jobs and Stephen Wozniak in 1976
- Began with the Apple I circuit board developed in Jobs' garage
- The Apple II product line generated more than $1 billion in annual sales from 1977 until 1993
- The current high-performance Power Macintosh line was introduced in 1994, followed by the iBook, the PowerMac G4, and the Mac OS X

**Network Operating Systems**

What is a network operating system?

- An operating system that supports a network
- Typically resides on a server
- Client computers on the network rely on the server(s) for resources

What is Novell’s Netware?

- A widely used network operating system designed for client/server networks
- Has a server portion that resides on the network server and a client portion that resides on each client computer connected to the network

What is Windows 2000 Server?

- Family of three products
  - Windows 2000 Server: operating system for the typical business network
  - Windows 2000 Advanced Server: designed for e-commerce applications
  - Windows 2000 Datacenter Server: best for demanding, large-scale applications such as data warehousing

What Is OS/2 Warp Server for E-business?

- IBM’s network operating system design for all sizes of business
- Includes Netscape as its Web browser and e-mail program

What is UNIX?

- A multitasking operating system developed in the early 1970s by scientists at Bell Laboratories
- Lacks interoperability across multiple platforms
- Several versions exist, each slightly different
- Command-line interface
Product on the Cutting Edge

Operating system created by Linus Torvalds
- A free program offered as alternative to Microsoft Windows and Apple Mac OS
- Linux' GNU General Public License allows anyone to obtain and modify the source code and then redistribute the revised product
- A large, friendly community of users distribute the operating system and provide an extensive number of user groups, mailing lists, newsletters, and forums

What is Linux?
- A popular, free, multitasking UNIX-type operating system
- Also includes many programming languages
- Open-source software
  - Code is available to the public
  - Some versions are command-line and others are GUI

Network Operating Systems

What is Solaris™?
- A version of UNIX
- Developed by Sun Microsystems
- A network operating system designed specifically for e-commerce applications
- Can manage high-traffic accounts
- Incorporate security necessary for Web transactions
- Client computers use a version called CDE (Common Desktop Environment)

Technology Trailblazer

Linus Torvalds
- Creator and lead technical developer of the free operating system Linux
- A native of Finland
- Credits the high level of technology and superior educational system of Finland for giving him the advantages of being able to concentrate on his brainstorm instead of worrying about economic issues

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Embedded Operating Systems

What is an embedded operating system?
- The operating system on most handheld computers and small devices
- Resides on a ROM chip

What is Windows CE?
- A scaled-down Windows operating system designed for use on wireless communications devices and smaller computers
  - Handheld computers
  - In-vehicle devices
  - Web-enabled devices

Embedded Operating Systems

What is Windows CE?
- A scaled-down Windows operating system designed for use on wireless communications devices and smaller computers
  - Handheld computers
  - In-vehicle devices
  - Web-enabled devices
- Supports color, sound, multitasking, e-mail, and Internet capabilities
- Incorporates many elements of the Windows GUI
- Provides for scaled-down versions of applications
Embedded Operating Systems

What is an Auto PC?
- A device mounted onto a vehicle’s dashboard that is powered by Windows CE
- Directed through voice commands
- Provides information to the driver such as driving directions, traffic conditions, weather, and stock quotes, access and listen to e-mail
- Acts as a radio or an audio CD
- Shares information with a handheld or notebook computer

What is Pocket PC OS®?
- A scaled-down operating system developed by Microsoft
- Works on a specific type of handheld computer, called a Pocket PC
- Allows access to all the basic PIM functions
- Provides Web access
- Supports handwriting recognition
- Allows document creation

What is Palm OS?
- Used in handheld computers
  - Palm from Palm, Inc.
  - Visor from Handspring®
- Manages data and synchronizes this information with a desktop computer
- Some access the Internet

Utility Programs

What is a utility program?
- A type of system software that performs a specific task
- Usually related to managing a computer, its devices or its programs
- Also called a utility
- Most operating system include several utility programs
- You can also buy stand-alone utilities

McAfee and Norton offer utility suites and Web-based utility services

Utility Programs

What is a file viewer?
- Allows you to display and copy the contents of a file
- Windows Explorer has a view called Imaging Preview

utility suites
Combine several utility programs into a single package

Web-based utility service
Pay an annual fee that allows you to access and use a vendor’s utility programs on the Web

Imaging Preview

Utility Programs

What is a file compression utility?
- Shrinks the size of a file
- Takes up less storage space than the original file
- Sometimes called zipped files and usually have a .zip extension
- You must uncompress a compressed file to use it
- Two popular utilities are PKZIP™ and WinZip®
What is a diagnostic utility?
- Compiles technical information about your computer's hardware and certain system software programs
- Prepares a report outlining any identified problems
- Windows includes the utility Dr. Watson

What is an uninstaller?
- Removes an application, as well as any associated entries in the system files
- The operating system records information it uses to run the software in the system files, when an application is installed
- The uninstaller removes this information

What is a disk scanner?
- Detects and corrects both physical and logical problems on a hard disk or floppy disk
  - A physical problem is one with the media
  - A logical problem is one with the data
- Searches for and removes unnecessary files
- Windows includes two disk scanners

What is a disk defragmenter?
- A utility that reorganizes the files and unused space on a computer's hard disk
- Allows the operating system to access data more quickly and programs to run faster
- When the contents of a file are scattered across two or more noncontiguous sectors the file is fragmented
- Defragmenting the disk means reorganizing it so the files are stored in contiguous sectors
- Windows includes Disk Defragmenter

What is a backup utility?
- Allows you to copy, or backup, selected files on your entire hard disk onto another disk or tape
- Backup utility monitors progress of the backup process
- Many will compress files during the process
- A restore program reverses the process and returns backed up files to their original forms

What is a screen saver?
- A utility that causes a monitor's screen to display a moving image or blank screen if no keyboard or mouse activity occurs for a specified time period
- Originally developed to prevent ghosting, in which images could be permanently etched on a monitor's screen; no longer a problem for modern monitors
- Popular for security, business, or entertainment purposes
Phillip Katz
- Developed PKZIP, a data compression utility
- His innovative PKZIP shareware cornered the data compression market
- PKWARE has steady annual sales of $5 million

Summary of Operating Systems and Utility Programs
- System software
- Operating systems
- Operating system functions
- Types of operating systems
- Stand-alone operating systems
- Network operating systems
- Embedded operating systems
- Utility programs

Chapter 8 Complete