System Software
Objectives

- List the two major components of system software.
- Explain why a computer needs an operating system.
- List the five basic functions of an operating system.
- Explain what happens when you turn on a computer.
Objectives

- List the three major types of user interfaces.
- Discuss the strengths and weaknesses of the most popular operating systems.
- List the seven system utilities that are considered essential.
- Discuss data backup procedures.
Objectives

- Understand troubleshooting techniques and determine probable solutions to any operating system problems you may encounter.
System Software

- **System software** consists of all the programs that enable the computer and its peripheral devices to function smoothly.

- System software is divided into two main categories:
  - The operating system
  - System utilities (utility programs)
The Operating System

- The **operation system (OS)** is a set of programs that coordinates:
  - Hardware functions
  - Interaction between application software and computer hardware
The Operating System

- Five basic functions
  - Starts the computer
  - Manages applications
  - Manages memory
  - Handles input and output device messages
  - Provides a user interface for communication
The Operating System

- Starting the computer
  - Loads the OS into RAM
  - Called *booting*
    - Cold boot
    - Warm boot
  - Involves six steps
The Operating System

1. BIOS is loaded
2. Power-on self-test (POST) is completed
3. Operating system is loaded
4. System configuration is accomplished
5. System utilities are loaded
6. User is authenticated
The Operating System

- Function 1: Starting the computer
  - Step 1: Load **BIOS (Basic Input/Output System)** instructions into memory to allow computer to:
    - Accept keyboard input.
    - Show information on the monitor.
The Operating System

- Function 1: Starting the computer
  - Step 2: Conduct the **power-on self-test (POST)** to confirm that both the computer and its peripheral devices are working properly. If any part of the POST fails:
    - A beep will sound.
    - An error message will appear on the monitor.
    - The computer will stop.
The Operating System

- Function 1: Starting the computer
  - Step 3: Load the operating system.
    - BIOS looks for the operating system.
    - BIOS loads into memory the **kernel**, the central part of the operating system.
    - The operating system loads the system configuration information.
The Operating System

- Function 1: Starting the computer
  - Step 4: Check the system configuration.
    - The registry, a database, stores information about software and peripherals choices.
    - The OS checks the configuration for drivers, utility programs containing instructions for the proper functioning of peripheral devices.
    - The OS installs and loads needed drivers.
The Operating System

- Function 1: Starting the computer
  - Step 5: Load system utilities, such as:
    - Antivirus software
    - Speaker volume control
  - Step 6: Authenticate users.
    - If necessary, enter an authentication/login, a user name and password.
Function 2: Managing applications

- **Multitasking operating systems** permit more than one application to run at the same time.
  - The **foreground application** is the active one.
  - **Background applications** appear inactive.
- **Preemptive multitasking** ensures that all applications have fair access to the CPU.
The Operating System
Function 3: Managing memory

- A buffer, an area that holds data and instructions temporarily, makes programs run faster.
- RAM memory functions as the buffer.
- The OS gives each program a portion of RAM memory and keeps them from interfering with each other.
Function 3: Managing memory

Virtual memory uses a portion of the hard disk to extend RAM.

- **Pages** are units of fixed size and contain program instructions and data.
- When RAM is full, copies of pages are temporarily stored in a swap file, a special hard disk file.
- Transferring files between RAM and the hard disk is called **paging**.
Function 3: Managing memory

Adding more RAM is often the best way to improve computer performance because:

- Paging slows the computer.
- Accessing data from the hard disk is slower than accessing it from RAM.
The Operating System
The Operating System

- **Function 4: Handling input and output**
  - Device drivers enable communication between the computer and the devices.
  - **Interrupts**, signals created by input and output devices, notify the OS when actions are taken.
The Operating System

■ Function 4: Handling input and output

Driver details are shown on the Driver tab of the Properties dialog box.

Double-click on the name of a device to open its Properties dialog box.
The Operating System

Function 5: Providing the user interface

- The **user interface** allows the user to:
  - Start application programs
  - Manage storage devices
  - Safely shut down the computer
The Operating System

Function 5: Providing the user interface

- Graphical user interface
- Menu-driven user interface
- Command-line user interface

Examples of (a) graphical, (b) menu-driven, and (c) command-line user interfaces
Function 5: Providing the user interface

The **graphical user interface (GUI)** uses **icons**, which are small images that:

- Represent computer resources used to initiate actions
- Appear on the **desktop**, the work area created after the OS loads into memory
The Operating System

Function 5: Providing the user interface

- The **menu-driven user interface**:
  - Provides text-based menus
  - Displays available user options

- The **command-line user interface**:
  - Requires the user to type commands to instruct the OS to perform the desired actions
Exploring Popular Operating Systems

<table>
<thead>
<tr>
<th>Operating Systems</th>
<th>Market Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Windows XP</td>
<td>60.55%</td>
</tr>
<tr>
<td>Windows Vista</td>
<td>22.64%</td>
</tr>
<tr>
<td>Mac OSX</td>
<td>7.11%</td>
</tr>
<tr>
<td>Linux</td>
<td>1.97%</td>
</tr>
<tr>
<td>Windows 7</td>
<td>1.69%</td>
</tr>
<tr>
<td>Windows 2000</td>
<td>0.78%</td>
</tr>
<tr>
<td>Windows 2003</td>
<td>0.65%</td>
</tr>
<tr>
<td>iPhone OSX</td>
<td>0.40%</td>
</tr>
<tr>
<td>Windows 98</td>
<td>0.13%</td>
</tr>
<tr>
<td>WAP</td>
<td>0.07%</td>
</tr>
</tbody>
</table>
Exploring Popular Operating Systems

- Microsoft Windows
  - The most popular operating system
  - Several iterations
Exploring Popular Operating Systems

- Microsoft Windows

- **Windows 7** is the latest version.
### Microsoft Windows 7

<table>
<thead>
<tr>
<th>Feature</th>
<th>Versions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improved desktop navigation including Windows Touch, a feature that enables touch screen input</td>
<td>Home Premium: X, Professional: X, Ultimate: X</td>
</tr>
<tr>
<td>Starts programs faster; finds documents quicker</td>
<td>Home Premium: X, Professional: X, Ultimate: X</td>
</tr>
<tr>
<td>Web experiences are faster, easier, and safer</td>
<td>Home Premium: X, Professional: X, Ultimate: X</td>
</tr>
<tr>
<td>Watch, pause, and re-wind TV on your PC</td>
<td>Home Premium: X, Professional: X, Ultimate: X</td>
</tr>
</tbody>
</table>
### Microsoft Windows 7 cont’d

<table>
<thead>
<tr>
<th>Feature</th>
<th>Versions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create a home network with HomeGroup</td>
<td>Home Premium: X</td>
</tr>
<tr>
<td></td>
<td>Professional: X</td>
</tr>
<tr>
<td></td>
<td>Ultimate: X</td>
</tr>
<tr>
<td>Run Windows XP productivity programs in XP Mode</td>
<td>Home Premium: X</td>
</tr>
<tr>
<td></td>
<td>Professional: X</td>
</tr>
<tr>
<td></td>
<td>Ultimate: X</td>
</tr>
<tr>
<td>Connect to company networks easier and with more security with</td>
<td>Home Premium: X</td>
</tr>
<tr>
<td>Domain Join</td>
<td>Professional: X</td>
</tr>
<tr>
<td></td>
<td>Ultimate: X</td>
</tr>
<tr>
<td>Back up to a home or business network</td>
<td>Home Premium: X</td>
</tr>
<tr>
<td></td>
<td>Professional: X</td>
</tr>
<tr>
<td></td>
<td>Ultimate: X</td>
</tr>
<tr>
<td>Protect data on your PC and portable storage devices against loss or</td>
<td>Home Premium: X</td>
</tr>
<tr>
<td></td>
<td>Ultimate: X</td>
</tr>
<tr>
<td>Work in the language of your choice and switch between any of 35</td>
<td>Home Premium: X</td>
</tr>
<tr>
<td>languages</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Professional: X</td>
</tr>
<tr>
<td></td>
<td>Ultimate: X</td>
</tr>
</tbody>
</table>
Exploring Popular Operating Systems

- **Microsoft Windows Vista**
  - Has translucent windows, three-dimensional animation, and live taskbar thumbnails
  - Supports tablet PCs and other mobile devices
  - Has new and improved features such as:
    - Search
    - Networking tools
    - Integrated speech recognition
    - **Gadgets**—applications that appear as icons
Exploring Popular Operating Systems

- **Microsoft Windows Server 2008**
  - Used in corporate environments to support client/server systems
  - Benefits include:
    - Security
    - Web server
    - Administration
    - Virtualization
Exploring Popular Operating Systems

- **Microsoft Windows Mobile**
  - Designed for smartphones and PDAs
  - Includes simplified versions of Windows programs
  - Supports synchronizing with corresponding programs on desktop computers
Exploring Popular Operating Systems

- **Mac OS**
  - Used on Macintosh personal computers
  - Stable and simple to use
  - Latest version is *Mac OS X Snow Leopard*

- **UNIX**
  - Features preemptive multitasking
  - Has many versions that are not compatible
  - Hard to use
Exploring Popular Operating Systems

- **Linux**
  - Is **open source software**, meaning the source code is available to users
  - Powerful and free
  - Gaining acceptance for Web servers

- **Embedded operating systems**
  - Used in cell phones, kitchen appliances, etc.
  - Include Windows CE and Symbian OS
Exploring Popular Operating Systems

- **MS-DOS (DOS)**
  - Short for *Microsoft disk operating system*
  - A command-line user interface OS

- **PC versus Mac versus Linux**
  - A **platform** is the chip and operating system.
  - PCs dominate.
System Utilities: Housekeeping Tools

- **System utilities (utility programs)**
  - Software programs that are essential to effective management of the computer system
  - Perform tasks such as:
    - Backing up files
    - Providing antivirus protection
    - Compressing files
Backup software copies data found on the hard disk to a backup device.

- **Full backups** include all files and data.
- **Incremental backups** include only those files changed or added since the previous backup.

- **Drive imaging software** creates a mirror image of the entire hard drive.
System Utilities: Housekeeping Tools

- **Antivirus software** protects the computer from viruses.
- Popular antivirus programs:
  - Norton AntiVirus
  - McAfee VirusScan Plus
  - AVG
System Utilities: Housekeeping Tools

- Searching for and managing files
  - **File manager** is the utility software that organizes and manages data.
    - Copy files
    - Determine how and where files are stored
    - Delete files
  - A **search utility** enables you to locate files.
System Utilities: Housekeeping Tools

- Scanning and defragmenting disks
  - **Disk scanning programs** find and resolve disk file storage problems.
  - **Disk cleanup utilities** remove unnecessary files to save space.
  - **Disk defragmentation programs** reorganize stored data in a more efficient manner.
System Utilities: Housekeeping Tools

- File compression utilities
  - Decrease the size of files, resulting in faster downloads
  - Create **archives** by storing files in a special format
System Utilities: Housekeeping Tools

- **Systems Update**
  - **Windows Update** for Windows 7 and Vista automatically downloads and installs updates.
  - It includes service packs, version upgrades, and security updates.
System Utilities: Housekeeping Tools

- Troubleshooting
  - Keep a **boot disk (emergency disk)** to load the operating system during times of emergency.
  - Use the Windows Help and Support utility.
  - Shut down the system properly.
    - Use correct procedure; don’t just turn the power off.
    - Put in **sleep** mode, a lower-power state, as an alternative.
System software is made up of two main parts: the operating system and system utilities.

Computers need software to work. The operating system coordinates the functions of hardware and supports the application software.
Summary

The operating system has five functions: starting the computer, managing applications, managing memory, handling messages from input and output devices, and providing an interface for communication.
Summary

- A six-step process occurs each time you start or restart a computer.
- There are three types of user interfaces: graphical user interfaces (GUIs), menu-driven user interfaces, and command-line user interfaces.
Summary

- For personal computers, Microsoft Windows and Mac OS X are the two major operating systems.
- The seven essential system utilities are backup software, antivirus software, file managers, search tools, file compression utilities, disk scanning programs, and disk defragmentation programs.
Summary

- Backup procedures should include a full backup, followed by periodic incremental backups.
- Troubleshooting skills are required when you use a computer. Do only what you feel comfortable doing, then enlist the help of a professional.