System Software
System Software

Click the X to close a window.

Click this icon to maximize a window.

Click the – icon to minimize a window.

A few windows containing applications cannot be resized, for example, the calculator.

Grab the corner of most windows that are not maximized with the mouse to resize them.
System Software

• System software
  o Consists of all the programs that enable the computer and its peripheral devices to function smoothly
  o Divided into two main categories:
    • The operating system
    • System utilities (utility programs)
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

• **Operation system (OS)**
  - Set of programs that coordinates:
    - Interactions of hardware components to each other
    - Interaction between application software and computer hardware
The Operating System

• **Starting the computer**
  - Booting—loading the OS into RAM
    • Cold boot: Starting computer when it has not yet been turned on
    • Warm boot: Restarting a computer that is already on
The Operating System

The Six Steps of Booting a 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

**Step 1: Activate the BIOS and Setup Program**

- **BIOS (Basic Input/Output System)** instructions provide the computer with descriptions of the internal equipment
  - Bios is encoded on ROM (read-only memory)
  - Does not control external devices
- Adjustable energy settings
- Setup program
  - Includes settings that control computer hardware
  - Do not alter—making incorrect changes to a BIOS device will cause the system not to boot
The Operating System

• **Step 2: Initiate the Power-On Self-Test**
  
  o **Power-on self-test (POST)**—to confirm that both the computer and its peripheral devices are working properly
  
  o If the POST fails:
    • A beep will sound.
    • An error message will appear on the monitor.
    • The computer will stop.
The Operating System

- **Step 3: Load the Operating System**
  - **BIOS**
    - Looks for the operating system
    - Loads the **kernel** into memory—the central part of the operating system
  - The operating system loads the *system configuration information.*
The Operating System

• Step 4: Configure the System
  o Operating system
    • Checks the registry
      o Database that stores information about software and peripherals choices, for configuration information
    • Checks the configuration for drivers
      o Utility programs containing instructions for the proper functioning of peripheral devices.
  • Automatically detects plug-and-play (PnP) devices
  • Checks for conflicts between devices
  • Installs and loads needed drivers
The Operating System

• **Step 5: Load System Utilities**
  - Antivirus software
  - Speaker volume control
  - Power management options
The Operating System

• **Step 6: Authenticate a User**
  - Verifies authorized users
    - Enter an **authentication/login** user name and password
  - Profile—a record of a specific user’s preferences for the desktop theme, icons, and menu styles
  - Account—for multiuser computer systems each user has an account
    - Consists of user name, password, and storage space
    - Created by server/computer administrator
The Operating System

• **Managing applications**
  - **Single-tasking operating systems**—run only one application at a time
  - **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 all applications have fair access to the CPU
The Operating System

The Word document is active and in the foreground.

The Excel document is inactive and in the background.

An icon appears on the taskbar for each open application.
The Operating System

• Managing memory
  o Buffer
    • Area that holds data and instructions temporarily
    • Makes programs run faster
  o RAM memory functions as the buffer.
  o OS gives each program a portion of RAM memory and keeps them from interfering with each other.
The Operating System

- **Managing memory (con’t.)**
  - **Virtual memory**—uses portion of hard disk to extend RAM
  - **Pages**—units of fixed size, 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—**paging**
  - Excessive paging—**thrashing**
The Operating System

- Managing memory (con’t.)
  - Adding more RAM—best way to improve computer performance:
    - Paging slows computer.
    - Accessing data from hard disk is slower than accessing from RAM.
  - Windows Vista and Windows 7 come with Windows ReadyBoost
    - Allows allocation of space on removable memory devices such as USBs that can be used to increase the size of RAM
    - Better performance than hard disk virtual memory because accessing files on flash memory is quicker than accessing the hard drive
The Operating System

• **Coordinating tasks**
  - Device drivers—enable communication between computer and devices
  - **Interrupts**—signals created by input and output devices
    - Notify the OS when actions are taken
  - **Interrupt handlers** (also called *interrupt service routines*)—miniprograms that immediately respond when an interrupt occurs
  - **Interrupt vector table**—holds responses from multiple interrupts in RAM, where the OS processes them in highest to lowest priority order
  - **Interrupt request (IRQ)**—actual interrupting of an event by an interrupt signal
The Operating System

• Providing the user interface
  o Allows the user to:
    • Start application programs
    • Manage storage devices
    • Safely shut down the computer
The Operating System

- **Types of user interfaces**
  - Graphical user interface (GUI)
  - Menu-driven user interface
  - Command-line user interface
• **Types of user interfaces (con’t.)**
  
  o **Graphical user interface (GUI)**
    
    • Uses **icons**—small images that:
      
      o Represent computer resources used to initiate actions
      
      o Appear on the **desktop**
        
        • Work area created after the OS loads into memory
      
    o **Sidebar**—invisible 1-inch vertical strip on the right side of the desktop, holds user designated gadgets
      
    • Programs you open will appear in the center of the desktop.
The Operating System
The Operating System

- Windows 7 is the most recent Microsoft OS
The Operating System

• **Types of user interfaces (con’t.)**
  o **Menu-driven user interface**
    • Provides text-based menus
    • Displays available user options
  o **Command-line user interface**
    • Requires the user to type commands to instruct the OS to perform the desired actions
    • Uses complicated rules of syntax
• **Three categories of operating systems**
  o *Stand-alone operating systems*—used by single users
  o *Server operating systems*—used in client/server network environments
  o *Embedded operating systems*—found on ROM chips in portable or dedicated devices
# Exploring Popular Operating Systems

<table>
<thead>
<tr>
<th>Category</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stand-alone</td>
<td>DOS—developed for original IBM PC</td>
</tr>
<tr>
<td></td>
<td>Windows 3.X, Windows 95, Windows 98,</td>
</tr>
<tr>
<td></td>
<td>Windows 2000 Professional, Windows ME,</td>
</tr>
<tr>
<td></td>
<td>Windows XP, Windows Vista, Windows 7</td>
</tr>
<tr>
<td></td>
<td>MAC OS X</td>
</tr>
<tr>
<td></td>
<td>UNIX</td>
</tr>
<tr>
<td></td>
<td>Linux</td>
</tr>
<tr>
<td>Server</td>
<td>Windows NT Server, Windows 2000 Server,</td>
</tr>
<tr>
<td></td>
<td>UNIX</td>
</tr>
<tr>
<td></td>
<td>Linux</td>
</tr>
<tr>
<td></td>
<td>Novell Netware</td>
</tr>
<tr>
<td></td>
<td>Solaris</td>
</tr>
<tr>
<td></td>
<td>Red Hat Enterprise Server</td>
</tr>
<tr>
<td>Embedded</td>
<td>Windows CE (variations are Windows Mobile,</td>
</tr>
<tr>
<td></td>
<td>Pocket PC)</td>
</tr>
<tr>
<td></td>
<td>iPhone OS</td>
</tr>
<tr>
<td></td>
<td>Palm OS</td>
</tr>
<tr>
<td></td>
<td>BlackBerry OS</td>
</tr>
<tr>
<td></td>
<td>Embedded Linux</td>
</tr>
<tr>
<td></td>
<td>Google Android</td>
</tr>
<tr>
<td></td>
<td>Symbian OS</td>
</tr>
</tbody>
</table>
Stand-Alone Operating Systems

• Windows Operating Systems Timeline

- 1983
  Windows announced November 10, 1983

- 1990
  Windows 3.0 announced May 22, cost $149.95

- 1992
  Windows 3.1, released in April, sold over 1 million copies in the first 2 months

- 1993
  Windows NT 3.1 released July 27

- 1995
  Windows 95, released August 24, 1995, sold over 1 million copies in 4 days

- 1996
  Windows CE 1.0 released in November

- 2000
  January 4th
  Bill Gates announced that the next version of Windows CE would be called Pocket PC
  Windows 2000 released in February

- 2001
  Windows XP released October 25

- 2003
  Windows Server 2003 released March 28

- 2005
  Windows XP Professional x64 edition released April 24

- 2007
  Windows Vista and Office 2007 released January 30

- 2009
  Windows 7 released October 22
## Stand-Alone Operating Systems

<table>
<thead>
<tr>
<th>Edition</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Windows 7 Starter</td>
<td>Designed for small notebook computers, this edition was originally known as “the one that would not let you run more than three applications at a time.” The decision on the limit of three was reversed, and the final version can run just about any Windows task. When multitasking, it is recommended that you avoid high-resource tasks like watching a DVD. This edition must be preinstalled on notebooks and is not available for individual purchase.</td>
</tr>
<tr>
<td>Windows 7 Home Basic</td>
<td>This is the other “nonpremium” edition available only in emerging markets (not in the United States, Canada, Europe, and other developed nations). It is more graphically interesting than Starter but lacks premium features like Windows Media Center.</td>
</tr>
<tr>
<td>Windows 7 Home Premium</td>
<td>This is the entry-level edition for most average consumers. It has the full Aero interface (translucent design, subtle animation, and additional colors) and Windows Media Center.</td>
</tr>
<tr>
<td>Windows 7 Professional</td>
<td>This is the preferred edition for businesses and advanced home users. It builds on Home Premium and runs a remote desktop server, encrypts files, and makes network folders available offline.</td>
</tr>
<tr>
<td>Windows 7 Enterprise</td>
<td>Enterprise and Ultimate editions have most of the same features, but the Enterprise edition is geared to enterprise users and is available through volume licensing.</td>
</tr>
<tr>
<td>Windows 7 Ultimate</td>
<td>The Ultimate edition is for the high-end user, gamer, and multimedia professionals. It includes BitLocker disk encryption, which now works on USB flash drives.</td>
</tr>
</tbody>
</table>
Stand-Alone Operating Systems

• **Microsoft Windows 7**
  o Six versions
    • Starter
    • Home Basic
    • Home Premium
    • Professional
    • Enterprise
    • Ultimate
  o More efficient than previous versions
  o Compatibility issues resolved
  o New features
    • Jump list
    • Pin
    • Snap
    • Windows Search
Stand-Alone Operating Systems

• Microsoft Windows Vista
  o Five versions
    • Basic
    • Home Premium
    • Business
    • Ultimate
    • Enterprise
  o Replaced Windows XP
  o Supports tablet PCs and other mobile devices
  o New and improved features, such as:
    • Search
    • Networking tools
    • Integrated speech recognition
    • Gadgets—applications that appear as icons
Stand-Alone Operating Systems

- **Mac OS**
  - Used on Macintosh personal computers
  - Stable, simple to use
  - **Example:**
    - Mac OS X Snow Leopard
Stand-Alone Operating Systems

The menu bar contains commands and tasks for the current application.

The System Preferences panel is similar to the Windows Control Panel.

The Dock, similar to the Windows taskbar, provides access to frequently used applications and those currently in use.

The dashboard icon is used to access widgets, similar to the gadgets stored on the sidebar in Windows 7.
Stand-Alone Operating Systems

• **UNIX**
  - Features preemptive multitasking
  - Has many versions that are not compatible
  - Hard to use—defaults to a command-line user interface
  - Mac OS X is based on UNIX
Stand-Alone Operating Systems

• **Linux**
  - Developed by Linus Torvalds in 1991
  - **Open source software**—source code is available to users
  - Powerful, free
  - Features such as
    - Multitasking
    - Virtual memory
    - Internet support
    - GUI
  - Gaining acceptance for Web servers
  - Disadvantages
    - Lack of technical support prevents adoption in corporate environments
    - Difficult to run Microsoft Office applications
Stand-Alone Operating Systems

• **PC Versus Mac Versus Linux**
  o **Platform**—determined by combination of microprocessor chip & OS
  o PCs
    • Dominate marketplace
    • Windows OS
    • Intel or AMD chip
    • More software available
  o Macs
    • Mac OS
    • Motorola or IBM chip
    • Most current OS can run Windows software
    • Creative fields are almost exclusive to Mac
  o Linux
    • Can be installed on PC or Mac
    • More secure—fewer viruses
Stand-Alone Operating Systems

Operating System Usage

- Windows: 92%
- Mac: 5%
- Linux: 1%
- Other: 2%
Stand-Alone Operating Systems

- **Server operating systems**
  - **Microsoft Windows Server 2008**
    - Used in corporate environments to support client/server systems
    - Benefits include:
      - Security
      - Web server
      - Administration
      - Virtualization
  - **Other server operating systems**
    - Unix
    - Linux
    - Netware by Novell
    - Solaris
    - Mac OS X Server
Stand-Alone Operating Systems

- **Embedded operating systems**
  - Designed for specific applications
  - Compact and efficient
  - Eliminate many unneeded features of OSs
  - Used in PDAs, cell phones, kitchen appliances, point-of-sale devices, industrial robots, etc.
Stand-Alone Operating Systems

• **Microsoft Windows Mobile**
  - Designed for smartphones and PDAs
  - Includes simplified versions of Windows programs
  - Supports handwriting recognition and voice recording
  - Supports synchronizing with corresponding programs on desktop computers
Stand-Alone Operating Systems

• More embedded operating systems
  o Window CE
    • Used in devices such as hand-held PCs, video game players, digital cameras, and industrial products such as barcode readers
  o Palm OS
    • Developed for PDAs—currently used in smartphones such as Palm Pixi
  o Symbian OS
    • Open industry standard operating system for data-enabled mobile phones with many add-on devices
Stand-Alone Operating Systems
Stand-Alone Operating Systems

- More embedded operating systems
  - **Android**
    - Supports CDMA (Code Division Multiple Access) and more screen resolutions
  - **iPhone OS**
    - Features
      - Genius Mixes
      - Genius Recommendations
      - Saving video from mail and MMS into Camera Roll
      - Save a New Clip option