

Computers Are Your Future



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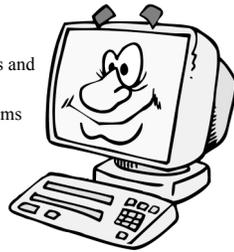
4 Software Basics

The Ghost in the Machine

A Fast, Stupid Machine

Computers:

- Have limited capabilities
- Can only do basic mathematics and logical comparisons
- Must be instructed with programs what to do



Processing with Programs

Software programs are:

- stored in memory
- a set of instructions that tell a computer what to do
- designed to solve problems

The Language of Computers

- ✓ Programmers begin with an algorithm, which is:
 - A set of step-by-step instructions (written in a natural language, e.g., English)
 - Algorithms are translated into the vocabulary of a programming language

Programming Languages

Bridge the gap

Human language

Numeric code

COBOL, BASIC, Visual BASIC, C++, Java are a few of hundreds of programming languages

Algorithms: Example

```
FOR Counter = 1 to 10
```

```
  Print Counter
```

```
NEXT counter
```

```
10001101 10101101 10111101 10001011 11001101
```

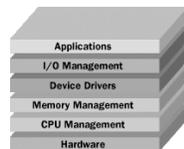
```
10001110 11101101 10101101 10100101 10101101
```

- ✓ A **compiler** is software that translates the high level language to the machine language

Two Types of Software

- ✓ **APPLICATIONS SOFTWARE**
 - programs employed by end-users to perform specific tasks
 - e.g., word processors, spreadsheets, etc.
- ✓ **SYSTEMS SOFTWARE**
 - programs and utilities that help manage the operation of the computer system
 - e.g., operating system

System Software



- ✓ **System software** includes all of the programs needed to keep a computer and its peripheral devices running smoothly
- ✓ Two major categories of system software are:
 - Operating systems (OS)
 - System utilities

The Operating System (OS): The Computer's Traffic Cop

- ✓ The **operating system** is a set of programs that perform certain basic functions with a specific type of hardware
- ✓ The functions of the operating system are:
 - Starting the computer
 - Managing programs
 - Managing memory
 - Handling messages from input and output devices
 - Enabling user interaction with the computer



Starting the Computer



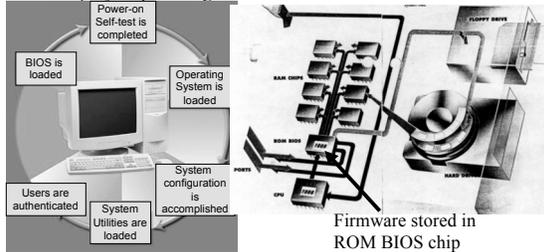
- ✓ **Booting** – The process of loading or reloading the operating system into the computer's memory
- ✓ The booting processes are:
 - **Cold boot** – Loads the OS when the power is turned on
 - **Warm boot** – Reloads the OS when the computer is already on

Starting the Computer

- ✓ The computer copies the **kernel** from the hard drive into the computer's memory
 - The kernel:
 - Is the central part of the operating system
 - Starts all applications
 - Manages devices and memory
 - Resides in memory at all times
 - Performs other essential functions

Starting the Computer

The step-by-step booting



Step 1: The BIOS and Setup Program

- ✓ **ROM** (read only memory) – Permanent and unchanging memory
- ✓ **BIOS** (basic input/output system) – The part of the system software that includes the instructions that the computer uses to accept input and output
- ✓ **Load** – To transfer from a storage device to memory
- ✓ ROM loads BIOS into the computer's memory
- ✓ **Setup program** – A special program containing settings that control the computer's hardware
 - The program can be accessed while the BIOS information is visible

Step 2: The Power-On-Self-Test (POST)

- ✓ **POST** (power-on-self-test) – A series of tests conducted on the computer's main memory (random access memory or **RAM**), input/output devices, disk drives, and the hard disk
 - BIOS conducts a Power-On-Self-Test (POST) to check the input/output system for operability
- ✓ The computer will produce a beeping sound and an error message will appear on the monitor if any problems are encountered

Step 3: The Operating System (OS) Loads

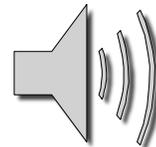
- ✓ BIOS searches for the OS
- ✓ Settings in the **CMOS**—complementary metal-oxide semiconductor—determine where to look for the OS
- ✓ The operating system's kernel is loaded into the computer's memory
- ✓ The OS takes control of the computer and begins loading system configuration information

Step 4: System Configuration

- ✓ **Registry** – A database that stores information about peripherals and software
- ✓ **Peripheral** – Device connected to a computer
- ✓ **Driver** – A utility program that makes peripheral devices function properly
- ✓ The system is configured from the operating system's registry
- ✓ Drivers are loaded into memory

Step 5: System Utilities Loads

- ✓ System utilities are loaded into memory
 - Volume control
 - Antivirus software
 - PC card unplugging utility



Step 6: Users Authentication

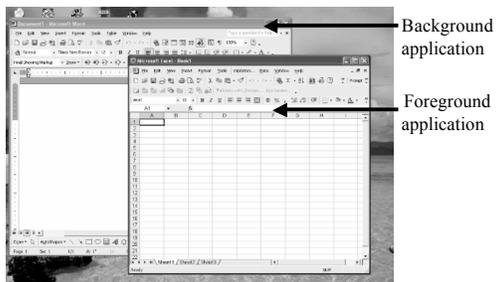
- ✓ Authentication or user login occurs
 - User name
 - Password
- ✓ The user interface starts, enabling user interaction with computer programs



Managing Applications

- ✓ **Single-tasking** operating systems run one application program at a time
- ✓ **Multitasking** operating systems have the ability to run more than one application program at a time
- ✓ Multitasking is accomplished by:
 - **A foreground application** – The active program or program in use
 - **One or more background applications** – Inactive program(s) or program(s) not in use

Example of Multitasking

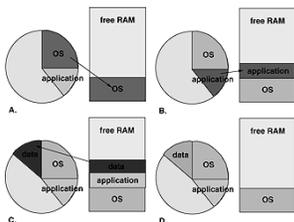


Managing Memory

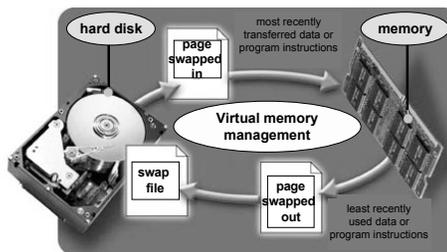
- ✓ Computers use **memory** to make processing more fluid
- ✓ The operating system allocates memory areas for each running program; it keeps programs from interfering with each other
- ✓ The operating system uses **virtual memory** as an extension of random access memory (RAM)

Parts of an Operating System

- ✓ **MEMORY MANAGER**–
- ✓ allocates memory segments for system and user processes
- ✓ **Virtual Memory**



Managing Virtual Memory



Handling Input and Output

- ✓ Input and output devices generate **interrupts**, or signals, that tell the operating system that something has happened
- ✓ The OS provides **interrupt handlers** or mini-programs that begin when an interrupt occurs
- ✓ **Interrupt request (IRQ)** lines handle the communications between input/output devices and the CPU
- ✓ An **IRQ conflict** causes system instability when two devices try to use the same IRQ line



Providing the User Interface

- ✓ The **user interface** is that part of the operating system with which the user interacts with a computer
- ✓ User interface functions:
 - Start application programs
 - Manage disks and files
 - Shut down the computer safely



The User Interface

Text-based Command Line Interpreters (CLIs)

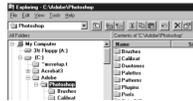
- terse, powerful, steeper learning curves, unforgiving

```
copy a:\mywork\excel\loan.xls c:\current
```

```
cd public_html\csci107
```

Graphical User Interfaces (GUIs)

- » intuitive, user-friendly
- » slower, less efficient
- » WIMP
 - windows, icons,
 - menus, pointing devices



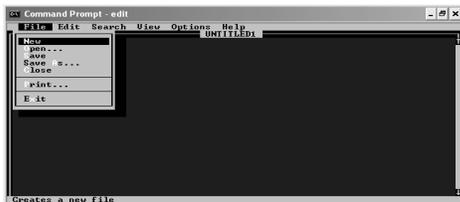
Graphical User Interface (GUI)

- ✓ Graphical user interface (GUI):
 - Uses graphics to create a desktop environment
 - Icons (small pictures) represent computer resources
 - Programs run within on-screen windows



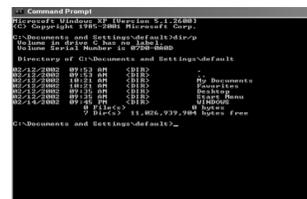
Menu-driven User Interface

- ✓ Menu-driven:
 - Text-based menus are used to show all of the options available to the user



Command-Line Interface

- ✓ Command-line:
 - The user is required to type keywords or commands in order to enter data or give instructions



MS-DOS

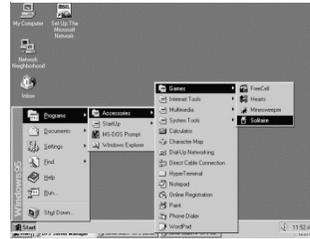
- ✓ Developed for IBM PCs in 1981
- ✓ Uses command-line interface
- ✓ Use is diminishing



Microsoft Windows

Click to view each Windows version (1985-2001)

Windows 98 (1998)



Windows XP

- ✓ Released in 2001 by Microsoft
- ✓ XP is short for “experience”
- ✓ Uses the same underlying code for all versions
- ✓ Replaces all previous versions of Windows
- ✓ Three versions:
 - Windows XP Home Edition
 - Windows XP Professional
 - Windows XP Server



Windows NT

- ✓ Released in 1993 by Microsoft
- ✓ Designed for client/server systems
- ✓ Two components:
 - Windows NT Workstation
 - Windows NT Server
- ✓ Oriented to business needs
- ✓ Offers security, remote administration, directory services, and a Web server



Windows CE

- ✓ Released in 1996 by Microsoft
- ✓ System used in PDAs or palmtops
- ✓ Runs simplified versions of Windows programs
- ✓ Data can be transferred to PCs
- ✓ Includes handwriting and voice recognition



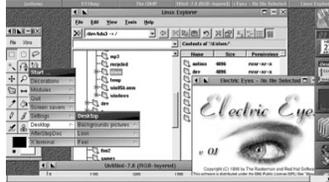
MAC OS

- ✓ Created in 1984
- ✓ First OS to use graphical user interface
- ✓ Easiest operating system for beginners
- ✓ A new version, Mac OS X, was released in 2000



Linux

- ✓ Developed in 1991 by UNIX
- ✓ **Open-source code**
–Available for all to see and use
- ✓ Competes with Windows and MAC-OS
- ✓ Powerful and free
- ✓ Growing acceptance



UNIX

- ✓ Developed by AT&T in 1970s
- ✓ Included first preemptive multitasking system
- ✓ Developed concepts of file management and path names
- ✓ Facilitates client/server networking
- ✓ Widely used by corporations



System Utilities: Tools for Housekeeping

- ✓ System utilities are programs that help the operating system manage the computer system's resources
- ✓ Types of utilities:
 - Backup software
 - Antivirus software
 - Disk scanning
 - Disk defragmentation
 - File management
 - File-searching software
 - File compression

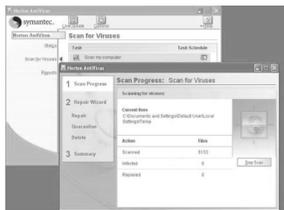


Backup Software



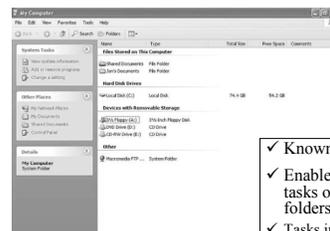
- ✓ **Backup software** includes programs that enable the user to copy data from the hard disk to another storage medium
- ✓ Types of backups:
 - **Full backup**
 - **Incremental backup**

Antivirus Software



- ✓ **Antivirus software** protects the computer from computer viruses

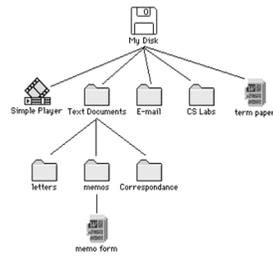
File Management Utilities



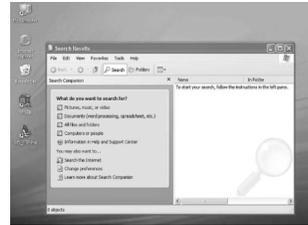
- ✓ Known as a **file manager**
- ✓ Enables the user to perform various tasks on storage devices using files, folders, and directories
- ✓ Tasks include:
 - Creating folders
 - Saving, deleting, copying, and moving files and folders
 - Examining the contents of files
 - Launching application programs

Parts of an Operating System

- ✓ **FILE MANAGER**—creates and manages the file system for storing user's data
 - logical files vs. disks and data blocks
 - hierarchical file system



Search



- ✓ **Search programs** enable users to find files on storage devices

File Compression Utility



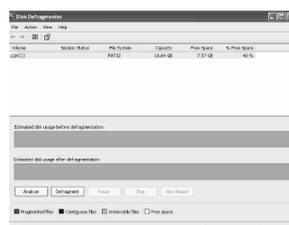
- ✓ A **file compression utility** reduces the size of a file

Disk Scanning Programs



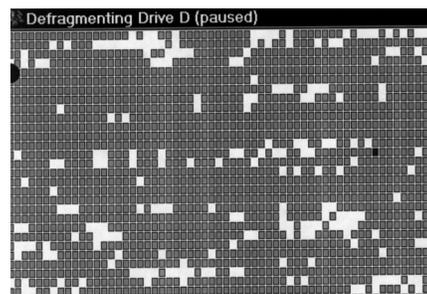
- ✓ **Disk-scanning utilities** are programs that detect and fix physical and logical problems on storage devices
- ✓ **Disk cleanup utilities** are programs that remove files that are no longer needed

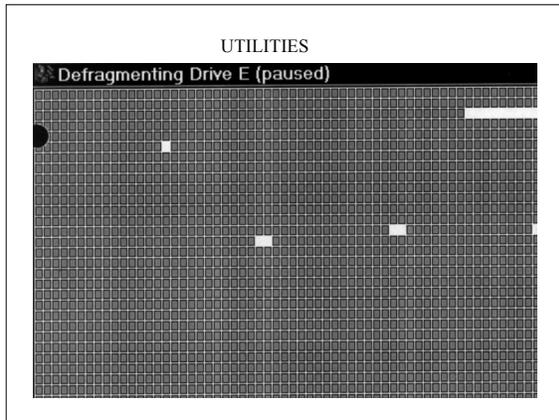
Disk Defragmentation Programs



- ✓ A **disk defragmentation program** moves data on a storage device to improve performance

Utility Example: Defragmentation





System Update

- ✓ Windows Update keeps the operating system up to date
 - windowsupdate.microsoft.com

Troubleshooting

- ✓ Computer startup failure:
 - Use a boot disk (emergency disk) in the floppy drive
- ✓ Configuration problems after adding new peripherals:
 - Start the computer in Windows' safe mode
 - Access safe mode by pressing the F8 key during the startup process

Troubleshooting

- ✓ System slowdown:
 - Scan for viruses/Spyware
 - Check the CPU fan
 - Check BIOS options
 - Defragment the hard disk

Shutting Down Your System

- ✓ Click Start, then Turn Off Computer
 - Standby - low power state
 - Shut Down – turns computer off
 - Restart – reboots computer

Chapter 4 Summary

- Two of the system software components are the operating system and system utilities
- The operating system coordinates the functions of a computer's hardware and provides support for application programs
- An operating system manages programs, memory, and input/output devices, and it also provides a means of communicating with the user
- The six steps to start a computer are loading the BIOS, power-on self-test, load operating system, configure system, load utilities, authenticate users

Chapter 4 Summary (continued)

- Two major operating systems for the personal computer are Microsoft Windows and the Mac OS X
- The basic types of user interface are command-line, menu-driven, and graphical
- System utilities keep the computer running efficiently
- Backup procedures keep data safe
- Troubleshooting is helpful for discovering errors