

# ***Homeschool Enrichment***

**System Software:  
Operating Systems &  
Utility Programs**

# Overview

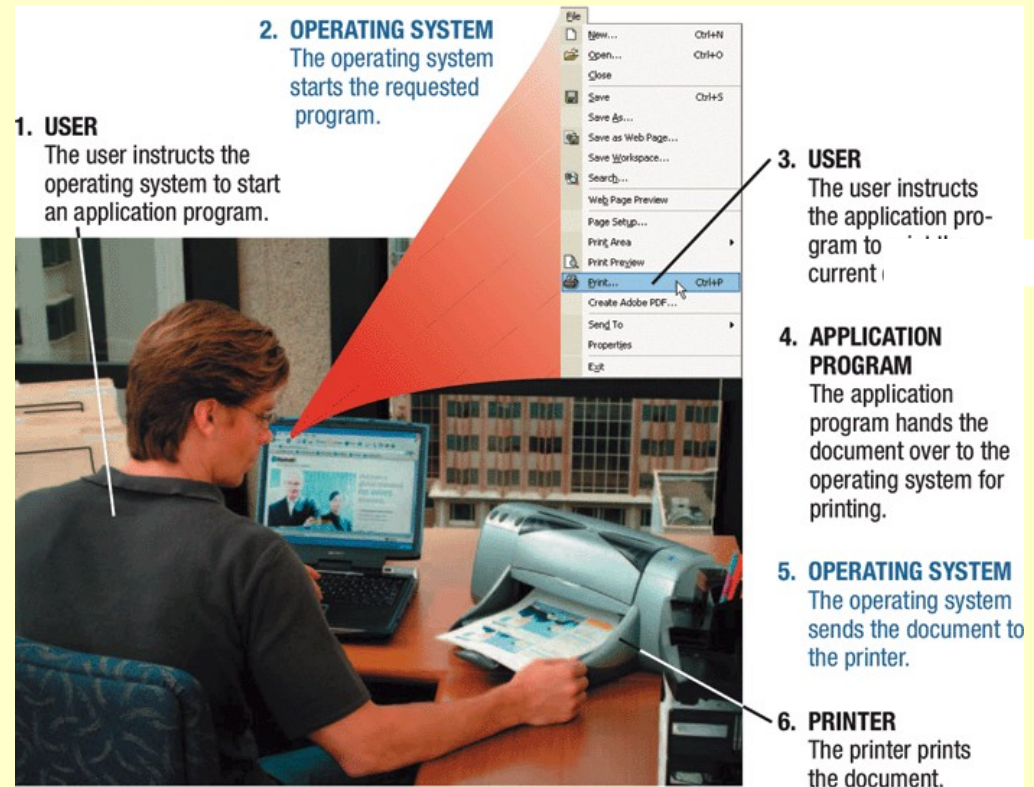
- This chapter covers:
  - Differences between system software and application software
  - Functions of and differences among operating systems
  - Various types of operating systems
  - Functions of and various types of utility programs
  - A look at the possible future of operating systems

# System Software vs. Application Software

- **System software:** acts as a mediator between application programs and the computer system's hardware, as well as between the PC and the user
- **Application software:** programs that allow a user to perform specific tasks on a computer, such as word processing, playing a game, preparing taxes, browsing the Web, and so forth

# The Operating System

- **Operating system:** a collection of programs that manage and coordinate the activities taking place within a computer system



# Functions of an Operating System

- Interfacing with users (typically via a *GUI*)
- Booting the computer
- Configuring devices
  - **Device drivers** are often needed
  - *Plug and Play* devices are recognized automatically
- Managing and monitoring resources and jobs
- File management
  - Filename rules vary with each operating system
  - File extensions are often added automatically
- Security
  - Protect access to resources via *passwords* or other security procedures
  - Many operating systems include a *firewall*
  - Security capabilities are often upgraded via *security patches*

# Processing Techniques for Increased Efficiency

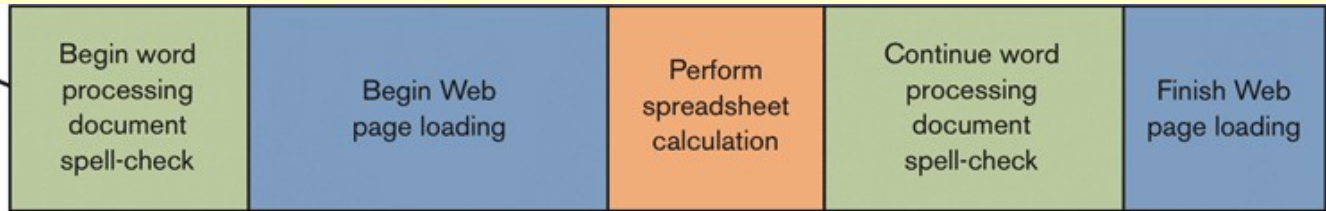
- Sequential Processing Techniques
  - *Multitasking*: the ability of an operating system to work with more than one program (*task*) at one time
    - CPU rotates between tasks (concurrent processing)
  - *Multithreading*: the ability to run multiple *threads* for a program at one time so that processing is completed faster and more efficiently
    - *Thread*: sequence of instructions within a program that is independent of other threads
    - Concurrent processing

# Processing Techniques for Increased Efficiency, *Cont'd*

- Simultaneous Processing techniques:
  - *Multiprocessing*: multiple processors are used in a single computer, usually to process multiple jobs at one time faster than with a single processor
    - Used with servers and mainframes; used with desktop PCs now (dual-core processors)
  - *Parallel processing*: multiple processors are used in a single computer, usually to process a single job faster (simultaneous processing)
  - *Coprocessing*: utilizing special processors for specialized chores (e.g. *math* or *graphics coprocessor*)

### CONCURRENT PROCESSING

Tasks are performed one right after the other.  
(multitasking and multithreading)

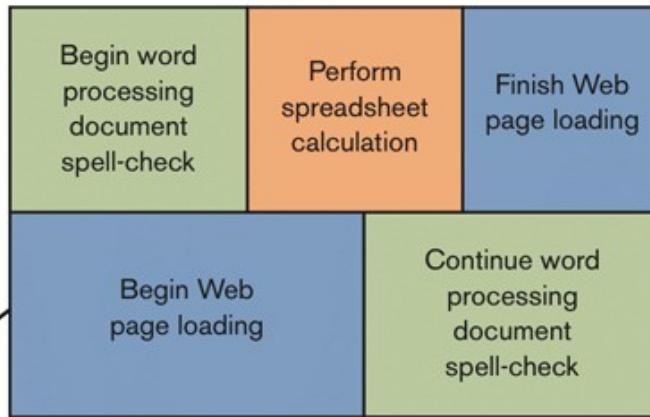


**SINGLE CPU**

(multiprocessing)

### SIMULTANEOUS PROCESSING

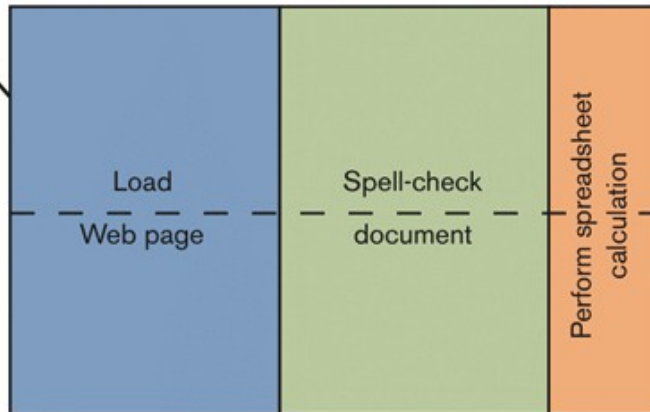
Multiple tasks are performed at the exact same time.



**CPU 1**

**CPU 2**

(parallel processing)



**CPU 1**

**CPU 2**

### CONCURRENT VS. SIMULTANEOUS PROCESSING

With concurrent processing, tasks are performed one right after another; with simultaneous processing, multiple tasks are performed at exactly the same time. The tasks shown here are more typical of a desktop PC; typical tasks for multiprocessing and parallel processing computers would be more complex.



**FIGURE 5-7**  
Concurrent vs. simultaneous processing.



# Processing Techniques for Increased Efficiency, *Cont'd*

- *Memory management*: optimizing the use of main memory (RAM)
  - **Virtual memory**: memory-management technique that uses hard drive space as additional RAM
  - **Buffer**: area in RAM or on the hard drive designated to hold input and output on their way in or out of the system
  - **Spooling**: placing items in a buffer so they can be retrieved by the appropriate device when needed

# Differences Among Operating Systems

- **Command line vs. graphical user interface (GUI)**
  - Most operating systems use GUI today

```
Microsoft Windows [Version 6.0.6002]
Copyright (c) 2006 Microsoft Corporation. All rights reserved.

C:\Users\Debbie>DIR
Volume in drive C is HP
Volume Serial Number is 0000-CCGD

Directory of C:\Users\Debbie

09/14/2010 06:42 AM <DIR> .
09/14/2010 06:42 AM <DIR> ..
09/23/2010 05:18 PM <DIR> Contacts
09/12/2010 10:24 AM <DIR> Desktop
09/17/2010 05:10 PM <DIR> Documents
09/15/2010 06:00 PM <DIR> Downloads
09/14/2010 07:27 AM <DIR> Favorites
09/06/2010 10:04 AM <DIR> Links
09/17/2010 09:11 PM <DIR> Music
09/17/2010 05:22 PM <DIR> Pictures
08/23/2010 02:10 PM <DIR> Sound Games
08/23/2010 02:10 PM <DIR> Searches
08/23/2010 03:10 PM <DIR> Videos
   File(s)                0 bytes
   Dir(s)                  243,183,996,448 bytes free

C:\Users\Debbie>CD PICTURES
C:\Users\Debbie\Pictures>COPY F:\CHRISIMB.JPG C:
1 File(s) copied.
C:\Users\Debbie\Pictures>
```

**COMMAND LINE INTERFACE**  
Commands are entered using the keyboard.



**GRAPHICAL USER INTERFACE**  
Icons, buttons, menus, and other objects are selected with the mouse to issue commands to the computer.

# Differences Among Operating Systems, *Cont'd*

- Personal vs. server operating system
  - *Personal operating system*: designed to be installed on a single PC
  - *Server operating system*: designed to be installed on a network server
    - Client PCs still use a personal operating system
    - Server operating system controls access to network resources
  - Many operating systems come in both versions

# Differences Among Operating Systems, *Cont'd*

- There are also *mobile* and *embedded operating systems*
- Most operating systems are designed for a specific type of processors (desktop CPUs or server CPUs, for instance)
- Also usually designed for either 32-bit or 64-bit PCs

# DOS

- The operating system designed for and widely used on early IBM and IBM-compatible PCs
- There were two primary forms of DOS:
  - *PC-DOS*: created originally for IBM microcomputers
  - *MS-DOS*: used with IBM-compatible PCs
- DOS traditionally used a command-line interface
- Not widely used today

```
Administrator: Command Prompt
C:\Users\Debbie>CD PICTURES
C:\Users\Debbie\Pictures>F:
F:\>COPY CHRISTMAS.JPG C:
F:\>C:
C:\Users\Debbie\Pictures>DIR
Volume in drive C is HP
Volume Serial Number is 000A-6C6D

Directory of C:\Users\Debbie\Pictures

04/21/2009  07:50 AM  <DIR>      .
04/21/2009  07:50 AM  <DIR>      ..
04/19/2009  08:29 AM  <DIR>      Christmas
10/24/2009  07:27 AM  <DIR>      Yosemite
12/06/2010  06:24 AM      1,093,158 Christmas.JPG
```

**CHANGE DIRECTORY (CD) COMMAND**  
Changes to a new location on the current drive.

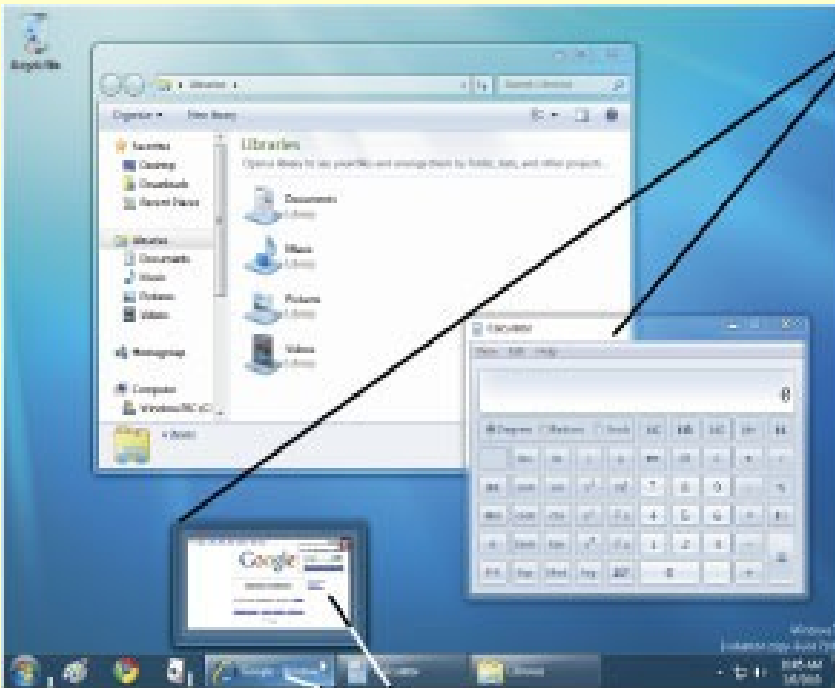
**DRIVE COMMAND**  
Changes to a new drive.

**COPY COMMAND**  
Copies files from one location to another.

**DIRECTORY (DIR) COMMAND**  
Displays the files and folders in the current location.

# Windows

- **Windows:** the primary PC operating system developed by Microsoft Corporation
  - Windows 1.0 through Windows 3.x
  - Windows 95 and Windows 98
  - Windows NT (New Technology)
  - Windows 2000
  - Windows XP
  - Windows Vista
  - Windows 7



**AERO INTERFACE**

Windows are still transparent and 3D options (such as Live Thumbnails) are active.

**PROGRAM ICONS**

Can be pinned to the taskbar.

**TASKBAR BUTTONS**

Can be rearranged by the user; pointing to a button displays a Live Thumbnail.

**DESKTOP GADGETS**

Gadgets are now located on the desktop.



**JUMP LISTS**

Right-click an icon to display the most recent documents for that program.

**SHOW DESKTOP**

Point to the Show Desktop button to make all windows temporarily transparent.

# Mac OS

- **Mac OS:** proprietary operating system for computers made by Apple Corporation
  - Based on the *UNIX* operating system; originally set the standard for graphical user interfaces
  - **Mac OS X:** most recent version of the operating system used on Apple computers;
    - Versions:
      - 10.0: "Cheetah"; 10.1: "Puma"; 10.2: "Jaguar"
      - 10.3: "Panther"; 10.4: "Tiger"; 10.5: "Leopard"
      - 10.6: "Snow Leopard"; 10.7: "Lion"; 10.8: "Mountain Lion"
    - Version 10.9: "Mavericks"



## QUICK LOOK

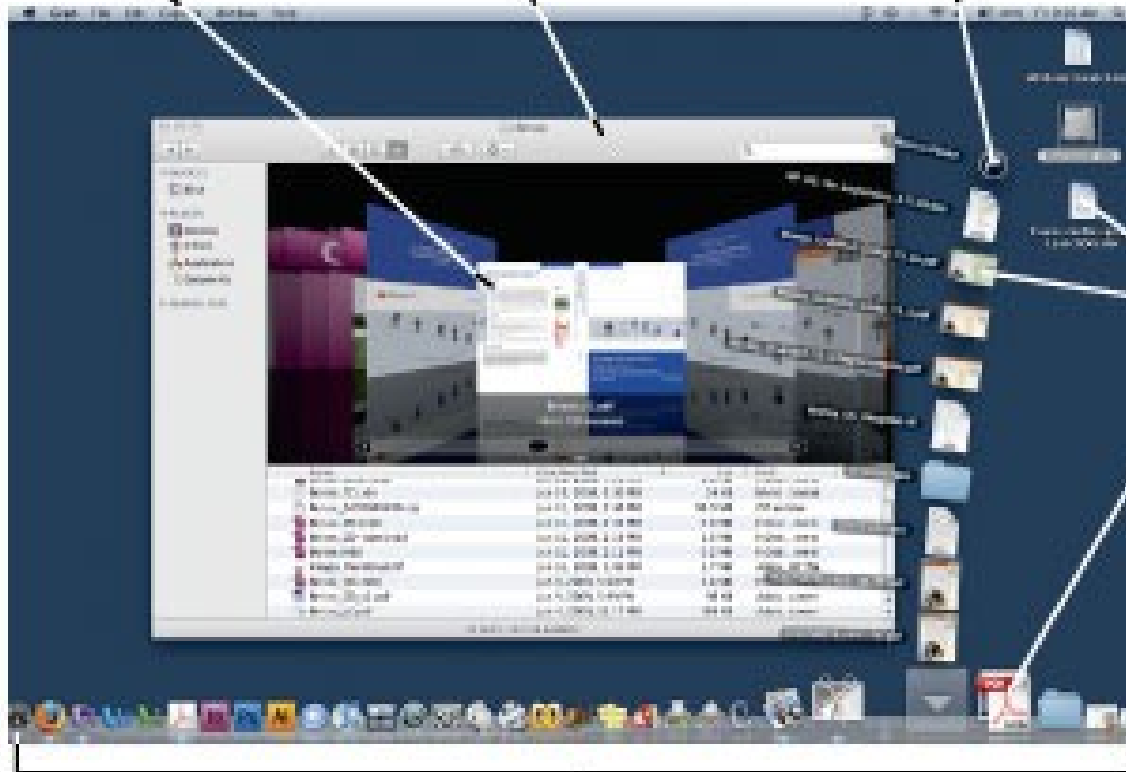
Shows previews of files without opening them.

## WINDOWS

Contain programs, icons, documents, and so forth.

## STACK

Contains a collection of documents stored on the dock by the user.



## ICONS

Represent programs, folders, documents, or other items that can be opened with the mouse.

## DOCK

Contains the user's Stacks and commonly used icons.

# Linux

- **Linux:** version (flavor) of UNIX available without charge over the Internet
  - Increasingly being used with PCs, servers, mainframes, and supercomputers
  - Is *open-source software*: has been collaboratively modified by volunteer programmers all over the world
  - Strong support from mainstream companies, such as Sun, IBM, HP, and Novell
  - Used on PCs, mainframes, and consumer appliances
  - Ubuntu: 10.04 (Lucid Lynx)



# Operating Systems for Mobile Phones & Other Devices

- **Windows:**
  - *Windows Embedded:* based on Windows; designed for non-personal computer devices, such as cash registers, GPS's and consumer electronic devices
  - *Windows Mobile:* based on Windows, multitasking, closed platform; designed for hand-held PCs, smart phones, etc.
- **Android:** Linux-based, multitasking; new, ground-up designed; open platform; application-rich
- **iPhone OS:** Mac OS X-based, multitasking, closed platform; application-rich



**WINDOWS MOBILE**



**ANDROID**



**IPHONE OS**



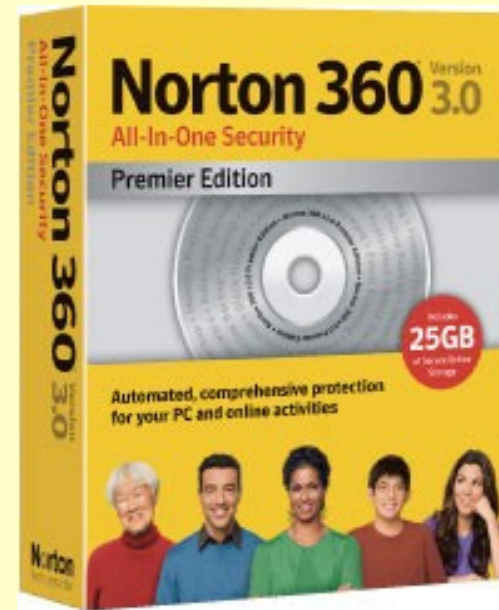
**BLACKBERRY OS**

# Operating Systems for Larger Computers

- Larger computers sometimes use operating systems designed solely for that type of system
- IBM's *i5/OS* and *z/OS* are designed for IBM mainframes
- Windows, UNIX, and Linux, are also used with both mainframes and supercomputers
- Often a group of Linux computers are linked together to form what is referred to as a *Linux supercluster* supercomputer

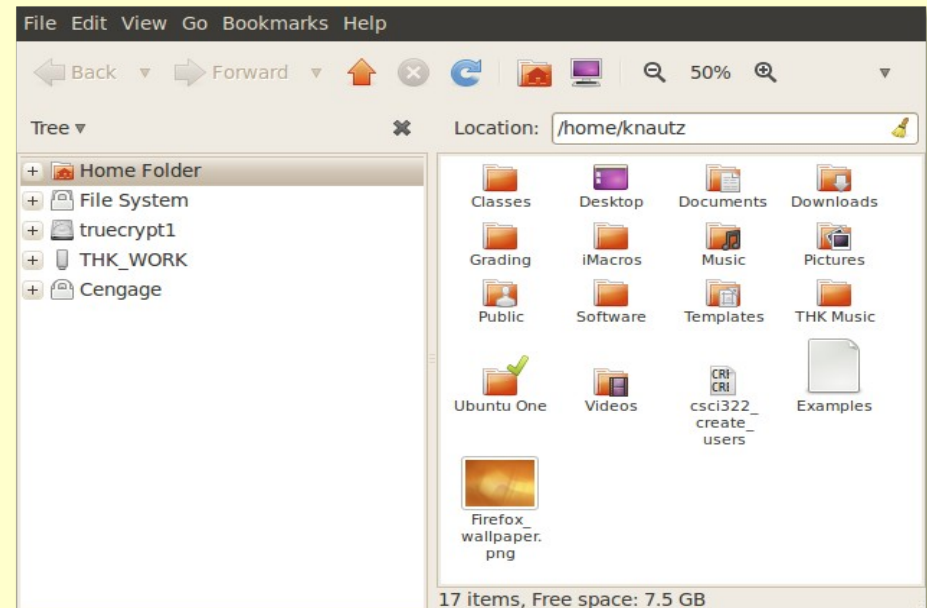
# Utility Programs

- **Utility program:** a type of software that performs a specific task, usually related to managing or maintaining the computer system
  - Many utilities are built into operating systems (for finding files, viewing images, backing up files, etc.)
  - Utilities are also available as stand-alone products



# File Management Programs

- **File management programs:** utility programs that enable the user to perform file management tasks, such as:
  - Looking at the contents of a PC or storage medium
  - Creating folders
  - Copying, moving, and renaming files and folders
  - Deleting files and folders



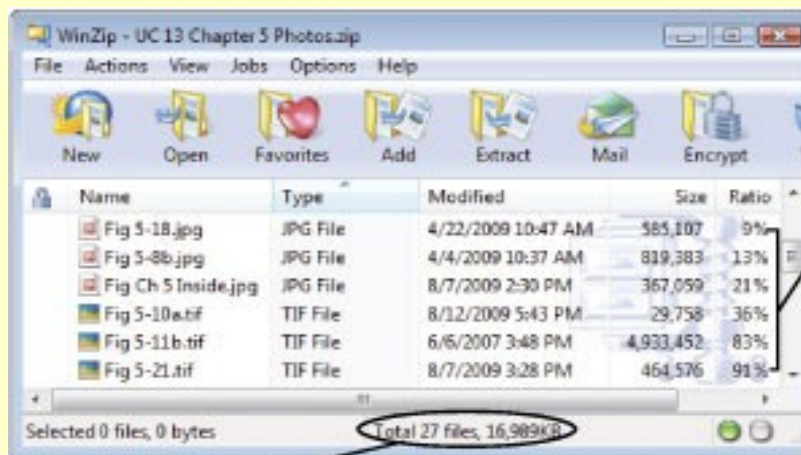


# Utility Programs, *Cont'd*

- *Search tools:* utility programs designed to search for files on the user's hard drive; included in many OS's
- *Diagnostic programs:* evaluate your system and make recommendations for fixing any errors found
- *Disk management programs:* diagnose and repair problems related to your hard drive
- *Uninstall / Cleanup programs:* removes temporary data; improves performance

# Utility Programs, *Cont'd*

- *File compression programs:* reduce the size of files so they take up less storage space on a storage medium or can be transmitted faster over the Internet
  - Required to both compress (*zip*) and decompress (*unzip*) files
  - Common programs are *WinZip* (Windows users) and *Stuffit* (Mac users)

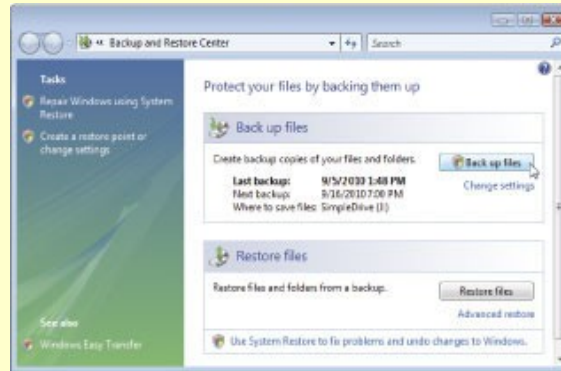


**COMPRESSION RATIOS**  
Certain image file formats (such as .tif) compress more than others (such as .jpg, which is already in a compressed format). Documents containing text fall somewhere in between.

**FILE SIZE**  
The 27 files, totalling nearly 17 MB, are zipped into a single 5 MB .zip file.

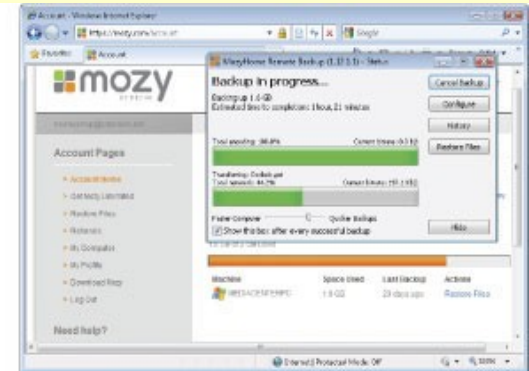
# Utility Programs, *Cont'd*

- Backup and recovery utilities: programs to make the backup and restoration process easier
  - *Backup*: a duplicate copy of data or other computer content
  - Backup data can be stored on a CD or DVD, second hard drive, flash memory drive, or uploaded to the Internet



**WINDOWS BACKUP PROGRAM**

Allows you to back up files to the desired backup medium manually or on a regular basis automatically.



**WEB-BASED BACKUP SERVICE**

Allows you to back up files to a secure Web site.

# Utility Programs, *Cont'd*

- Security programs
  - *Antivirus* programs can protect against getting a virus in the first place, as well as detect and remove viruses
  - *Antispyware programs* can detect and remove spyware programs installed on your PC
  - *Firewalls* can protect against someone accessing your PC via the Internet

# The Future of Operating Systems

- Will continue to become more user-friendly
- Will eventually, be driven primarily by a voice interface
- Likely to continue to become more stable and self-healing
- Will likely continue to include improved security features and to support multiple processors and other technological improvements
- May be used primarily to access software available through the Internet or other networks

# Summary

- System Software vs. Application Software
- The Operating System
- Operating Systems for Desktop PCs and Servers
- Operating Systems for Handheld PCs and Mobile Devices
- Operating Systems for Larger Computers
- Utility Programs
- The Future of Operating Systems