Understanding Computers Today and Tomorrow

Chapter 5:

System Software: Operating Systems and Utility Programs

Overview

- This chapter covers:
  - Differences between system software and application software
  - Functions of and general differences between operating systems
  - Specific operating systems most widely used today
  - Functions of and various types of utility programs
  - A look at future of operating systems

System Software vs. Application Software

- System Software
  - The operating system and utility programs that control a computer system and allow you to use your computer
    - Enables the boot process, launches applications, transfers files, controls hardware configuration, manages files on the hard drive, and protects from unauthorized use
- Application Software
  - Programs that allow a user to perform specific tasks on a computer
    - Word processing, playing games, preparing taxes, browsing the Web, listening to music, etc.

The Operating System

- Operating System
  - A collection of programs that manage and coordinate the activities taking place within a computer system
  - Acts as an intermediary between the user and the computer and between the application programs and system hardware

The Operating System

- Functions of an Operating System
  - Interfacing with Users (typically via a GUI)
  - Booting the Computer
    - Loads essential part of operating system (kernel) into memory
    - Reads opening batch of instructions
    - Determines hardware connected to computer
  - Configuring Devices
    - Device drivers are often needed; can be reinstalled if needed
    - Plug and Play devices are recognized automatically

FIGURE 5-3
Finding new hardware. Most operating systems are designed to detect new hardware and to try to configure it automatically.

The Operating System

TASK MANAGER
These programs are running, even before any application programs are launched by the user.

NOTIFICATION AREA ICONS
These programs were launched during the boot process and will show in the notification area unless they are closed by the user (right-click an icon to see if you can close that program).

Courtesy of Microsoft

FIGURE 5-2
Running programs.
Many programs are launched by the operating system when the computer boots.

The Operating System

- Managing Network Connections
  - Manages wired connections to home or office network
  - Manages wireless connections at home, school, work, or on the go
- Managing and Monitoring Resources and Jobs
  - Makes resources available to devices
  - Monitors for problems and attempts to correct those that arise
  - Schedules jobs
    - Jobs to be printed
    - Files to be retrieved from hard drive

The Operating System

- File Management
  - Keeps track of stored files on computer so they can be retrieved when needed
    - Files usually viewed in a hierarchical format
- Security
  - Passwords
  - Biometric characteristics
  - Firewalls

The Operating System

- Processing Techniques for Increased Efficiency
  - Multitasking
    - The ability of an operating system to have more than one program (task) open at one time
      - CPU rotates between tasks
      - Switching is done quickly
      - Appears as though all programs executing at the same time

The Operating System

- Multithreading
  - The ability to rotate between multiple threads so that processing is completed faster and more efficiently
  - Thread
    - Sequence of instructions within a program that is independent of other thread
- Multiprocessing
  - Each CPU (or core) typically works on a different job
  - Used with personal computers with multi-core processors
- Parallel Processing
  - CPUs or cores typically works together to complete one job more quickly
  - Used with servers and mainframes
  - In either case, tasks are performed simultaneously

The Operating System

FIGURE 5-7
Sequential vs. simultaneous processing.

The Operating System

- Memory Management
  - Optimizing the use of main memory (RAM)
  - Virtual memory
    - Memory-management technique that uses hard drive space as additional RAM

FIGURE 5-8
How virtual memory works.

The Operating System

- Buffering and Spooling
  - Used with printers and other peripheral devices
  - 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

The Operating System

- Differences Among Operating Systems
  - Command Line Interface
    - Requires user to communicate instructions to computer via typed commands
  - Graphical User Interface
    - Graphics based interface
    - Most operating systems today use GUI

COMMAND LINE INTERFACE
Commands are entered using the keyboard.

Courtesy of Microsoft

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

FIGURE 5-10
Command line vs. graphical user interfaces.

The Operating System

- Types of Operating Systems
  - Personal (Desktop) Operating Systems
    - Designed to be installed on a single computer
  - Server (Network) Operating Systems
    - Designed to be installed on a network server
    - Client computers still use a personal operating system
    - Server operating system controls access to network resources
  - Many operating systems come in both versions
  - Mobile and embedded operating systems also exist

The Operating System

- The Types of Processors Supported
  - Desktop, mobile, server processors
  - 32-bit or 64-bit CPUs
- Support for Virtualization and Other Technologies
  - New types of buses
  - Virtualization
  - Power-consumption concerns
  - Touch and gesture input
  - Web-based software

Operating Systems for Personal Computers and Servers

Courtesy of Microsoft

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.

FIGURE 5-12
DOS. Even though DOS has become technologically obsolete, Windows users can still issue DOS commands via the Command Prompt.

Operating Systems for Personal Computers and Servers

- Windows
  - The predominant personal operating system developed by Microsoft Corporation
  - Windows 1.0 through Windows XP
    - Windows 1.0 released in 1985
      - Windows 1.0 through *Windows 3.x* were operating environments for DOS
      - Graphical shell wrapped around DOS
      - Designed to make using DOS easier

Operating Systems for Personal Computers and Servers

- Windows 95, Windows 98, and Windows ME
  - Designed for personal computers
- Windows NT (New Technology)
  - First 32-bit version of Windows designed for high-end workstations and servers
  - Replaced by Windows 2000
- Windows XP
  - Replaced Windows
  - Support for new hardware, networking and the internet, multimedia, and pen input were included
  - Microsoft will provide support until 2014

Operating Systems for Personal Computers and Servers

- Windows Vista
  - Replaced Windows 2000
  - Was current version until the release of Windows 7
  - Uses an Aero interface
    - Transparent windows
    - Dynamic elements such as *Live Thumbnails* of task bar buttons and a *Flip 3d* feature
  - Additional features
    - Sidebar, Instant Search
    - Built-in security
    - Much improved networking, collaboration, and synchronization tools

Operating Systems for Personal Computers and Servers

- Hardware requirements for Vista have increased over earlier versions of Windows

– Windows 7

- Newest version of Windows released Oct. 2009
  - 32-bit and 64-bit versions in four editions
  - Home Premium (primary version for home users)
  - Professional (primary version for businesses)
  - Starts up and responds faster than Vista

Operating Systems for Personal Computers and Servers

- Will run well on netbooks and mobile tablets
- Additional Features
  - Device Stage
  - Libraries
  - HomeGroup for improved home networking
  - Support for touch, voice, and pen output
  - Improved accessory features

– Windows 8
  - Currently under development
  - Expected to be released October 26, 2012

Operating Systems for Personal Computers and Servers

Courtesy Microsoft Corporation

FIGURE 5-15
A preview of the Windows 8 desktop.

Operating Systems for Personal Computers and Servers

- Windows Server and Windows Home Server
  - Windows Server is a server version of Windows
    - Windows Server 2008 is the most recent version
    - Includes *Internet Information Services 7.0*
      - » Powerful Web platform for Web applications and Web services
    - Other features
      - » Built-in virtualization technologies
      - » New security tools and enhancements
      - » Streamlined configuration and management tools

Operating Systems for Personal Computers and Servers

- Windows Home Server
  - Preinstalled on home server devices
  - Provides services for a home network
  - Can back up all devices in the home automatically

- Mac OS
  - Proprietary operating system for computers made by Apple Corporation
  - Based on the BSD UNIX operating system; originally set the standard for graphical user interfaces
  - Mac OS X Family
    - Mac OS X Snow Leopard

Operating Systems for Personal Computers and Servers

- Allows multithreading and multitasking
- Supports dual 64-bit processors
- Has high level of multimedia functions and connectivity
- Includes *Safari* Web browser
- MAX OS Server
  - *Max OS X Lion Server*

FIGURE 5-16
Mac OS X Lion Mission Control.

Operating Systems for Personal Computers and Servers

- UNIX
  - Operating system developed in the late 1960s for midrange servers
  - Multiuser, multitasking operating system
  - More expensive, requires a higher level of technical knowledge; tends to be harder to install, maintain, and upgrade
  - “UNIX” initially referred to the original UNIX operating system, now refers to a group of similar operating systems based on UNIX
  - Single UNIX Specification
    - A standardized UNIX environment

Operating Systems for Personal Computers and Servers

- Linux
  - Developed by Linus Torvalds in 1991—resembles UNIX but was developed independently
  - Is increasingly being used with personal computers, servers, mainframes, and supercomputers
  - Is open-source software; has been collaboratively modified by volunteer programmers all over the world
  - Originally used a command line interface, most recent versions use a GUI
  - Strong support from mainstream companies, such as Sun, IBM, HP, and Novell
  - Much less expensive than Windows or Mac OS

Operating Systems for Personal Computers and Servers

Courtesy of Novell

FIGURE 5-17

Linux. This version of Linux includes a 3D graphical interface to increase the user's workspace.

Operating Systems for Mobile Phones and Other Devices

- Mobile and Embedded Versions of Windows
  - Windows Phone 7
    - Newest version of Windows designed for mobile phones
    - Designed primarily for touch input
    - Has new tilt-based Smart screen interface
      - Tiles contain real-time information and can be customized by user
    - Contains apps such as mobile versions of Internet Explorer and Microsoft Word, Excel, and PowerPoint

Operating Systems for Mobile Phones and Other Devices

- Windows Embedded
  - Family of operating systems designed primarily for consumer and industrial devices that are not personal computers
    - Cash registers, digital photo frames, GPS devices, ATM machines, medical devices, and robots
- Android
  - Linux-based operating system created with current mobile device capabilities in mind
    - Can create applications that take full advantage of all the features a mobile device has to offer

Operating Systems for Mobile Phones and Other Devices

- Open program platform
  - Hardware manufactures must adhere to certain specifications
- Has a customizable Home screen and a standard set of apps
- Supports multitasking, NFC mobile payment transactions, Internet phone calls, and a variety of sensors
- Can select, copy, and paste text
- Also used with Google TV hardware and will be used with Sony's upcoming PlayStation *Play Phone*

Operating Systems for Mobile Phones and Other Devices

- iOS
  - Designed for Apple Mobile phones and mobile devices
    - Current version is *iOS 5*
    - Supports multitasking
    - Includes Safari Web browser and apps for email, messaging, music, search, and video calling via *FaceTime*

Operating Systems for Mobile Phones and Other Devices

- BlackBerry OS and Blackberry Tablet OS
  - Designed for BlackBerry devices
  - Supports multitasking
- HP webOS
  - Linux-based mobile operating system
  - Designed for Palm devices
  - Supports multitasking
- Symbian OS
  - Use to be the most widely used mobile operating system
  - Use is now declining and is expected to continue

Operating Systems for Mobile Phones and Other Devices

FIGURE 5-18
Examples of mobile operating systems.

Courtesy of Samsung

WINDOWS PHONE 7

Courtesy of Motorola

ANDREOID

Courtesy of Apple

APPLE IOS

Courtesy, Hewlett-Packard Company

HP WEBOS

Operating Systems for Larger Computers

- Larger computers sometimes use operating systems designed solely for that type of system
- IBM's z/OS is designed for IBM mainframes
- Windows, UNIX, and Linux are also used with servers, mainframes, and supercomputers
- Often a group of Linux computers are linked together to form a Linux supercomputing cluster
- Larger computers may also use a customized operating system based on a conventional operating system

Utility Programs

- Utility Program
  - 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 and as suites

Courtesy of Symantec

FIGURE 5-19
Utility suites. Utility suites contain a number of related utility programs.

Utility Programs

- File Management Programs
  - Enable the user to perform file management tasks, such as:
    - Looking at the contents of a storage medium
    - Copying, moving, and renaming files and folders
    - Deleting files and folders
    - File management program in Windows is Windows Explorer

Utility Programs

Use the Back button to go to the previous location.

The Address bar shows the current location.

Use the New folder button to create a new folder in the current location.

Use the Views button to specify how the items in the right pane are displayed.

Enter keywords to search for a folder or file meeting the criteria you supply.

Use the Organize button to copy files and folders.

Click to see the folders in or add folders to the current library.

Click an item in the left pane to display its contents in the right pane.

Double-click a folder to open it.

The Navigation pane contains Favorites, Libraries, drives, and network resources.

Double-click a document to open it in its associated program.

Courtesy of Microsoft

FIGURE 5-20 Using Windows Explorer to look at the files stored on a computer.

FIGURE 5-21
Using Windows Explorer to copy files.

1. Navigate to the drive and folder containing the file you want to copy or move, and then select the file.
2. Click the Organize button and select *Copy* to copy the file to the Clipboard.
3. Navigate to the drive and folder where you want the file to go.
4. Click the Organize button and select *Paste* to copy the file to the current location.
5. The file is copied.

Courtesy of Microsoft

Utility Programs

- Search Tools
  - Designed to search for documents and other files on the user's hard drive
  - Are often integrated into file management programs
  - Third-party search tools are also available
- Diagnostic and Disk Management Programs
  - 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

Utility Programs

- Uninstall and Cleanup Utilities
  - Uninstall utilities remove programs from your hard drive without leaving bits and pieces behind
  - Important to properly uninstall programs, not just delete them
  - Clean up utilities delete temporary files
    - Recycle Bin
    - Temporary Internet files
    - Temporary installation files

Utility Programs

- 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
  - Both zip and unzip files
  - WinZip (Windows users) and Stuffit (Mac users)
- Backup and Recovery Utilities
  - Make the backup and restoration process easier
  - Creating a backup means making a duplicate copy of data and/or other computer content
    - Can use a recordable or rewritable CD or DVD disc, a USB flash drive, or an external hard drive
  - Good backup procedures are critical for businesses

Utility Programs

- Individuals should back up important documents, e-mail, photos, home video, etc.
- Back up your entire computer once all programs have been installed, so your system can be restored to that configuration.
- Can do the backup manually or use backup utility programs (stand alone or those built into operating systems)

Utility Programs

FIGURE 5-24
The Windows Backup program.

Courtesy of Microsoft

Utility Programs

- Antivirus, Antispyware, Firewalls, and Other Security Programs
  - Security Concerns
    - Viruses, spyware, identity theft, phishing schemes
  - Security programs protect computers and users and it is essential that all computer users protect themselves and their computers
    - Antivirus programs
    - Antispyware programs
    - Firewalls
    - Many are included in Windows and other operating systems

The Future of Operating Systems

- Will continue to become more user-friendly
- Will eventually be driven primarily by a voice interface, touch, and/or gesture interface
- Likely to continue to become more stable and self-healing
- Will likely continue to include security and other technological improvements as they become available
- Will almost certainly include improvements in the areas of synchronizing and coordinating data and activities among a person's various computing and communicating devices
- May be used primarily to access software available through the Internet or other networks