Computer Fundamentals

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Lecture 16

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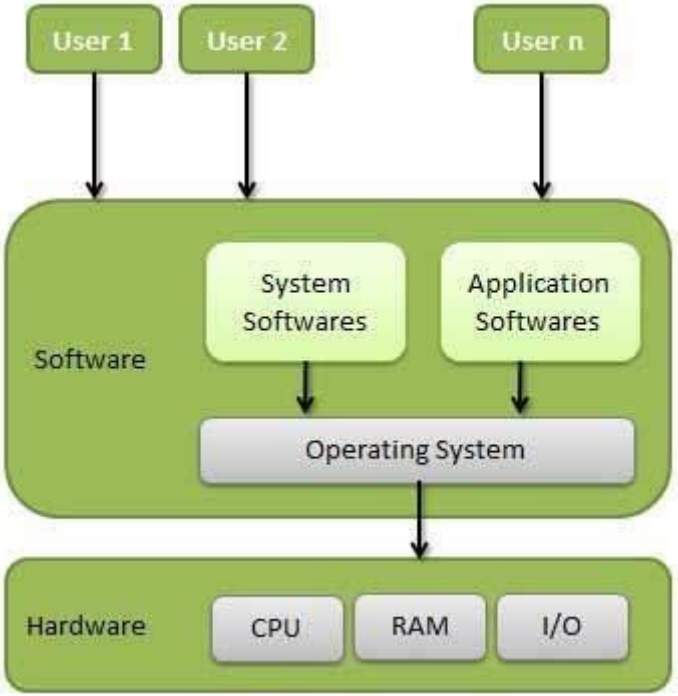
Operating Systems

- Program that acts as interface
  - Between user and computer hardware
- Controls execution of all kind of programs



Important Uses of OS

- Memory management
- Processor management
- Device management
- File management
- Security
- Control over system performance
- Error detecting aids
- Coordination between other software and users

Memory Management

- Keeps tracks of primary memory
  - What part of it are in use by whom, what part are not in use
- OS decides which process gets memory when and how much
- Allocates memory when process requests
- De-allocates memory when process no longer needs it or has been terminated

Processor Management

- Keeps tracks of processor and status of process
  - Program responsible for this task is traffic controller
- Allocates processor to process
- De-allocates processor when no longer required

Device Management

- Keeps tracks of all devices
  - Program responsible for this task is I/O controller
- Decides which process gets device when and for how much time
- Allocates device in efficient way
- De-allocates devices

File Management

- Keeps track of information, location, uses, status etc.
- Decides who gets resources
  - Allocates resources
  - De-allocates resources

Other Uses

- Security
  - By means of password and similar other techniques
  - Preventing unauthorized access to programs and data
- Control over system performance
  - Recording delays between request for service and response from system
- Error detection
  - Production of dumps, traces, error messages and debugging
- Coordination between software and users
  - Coordination and assignment of other software to users of computer

Types of Operating Systems

- Real-time operating system
- Single user/Single tasking OS
- Single user/Multitasking OS
- Multi user/Multitasking OS

Types of Operating Systems (cont.)

- Real-time operating system
  - Fast but relatively small
  - Usually embedded onto a system
    - Not loaded from disk drive
  - Designed for real time applications
    - Must respond quickly (in fraction of second)
  - Used in various fields
    - Medical diagnostics
    - Industrial systems
    - Aircrafts
    - Robotics
    - …

Types of Operating Systems (cont.)

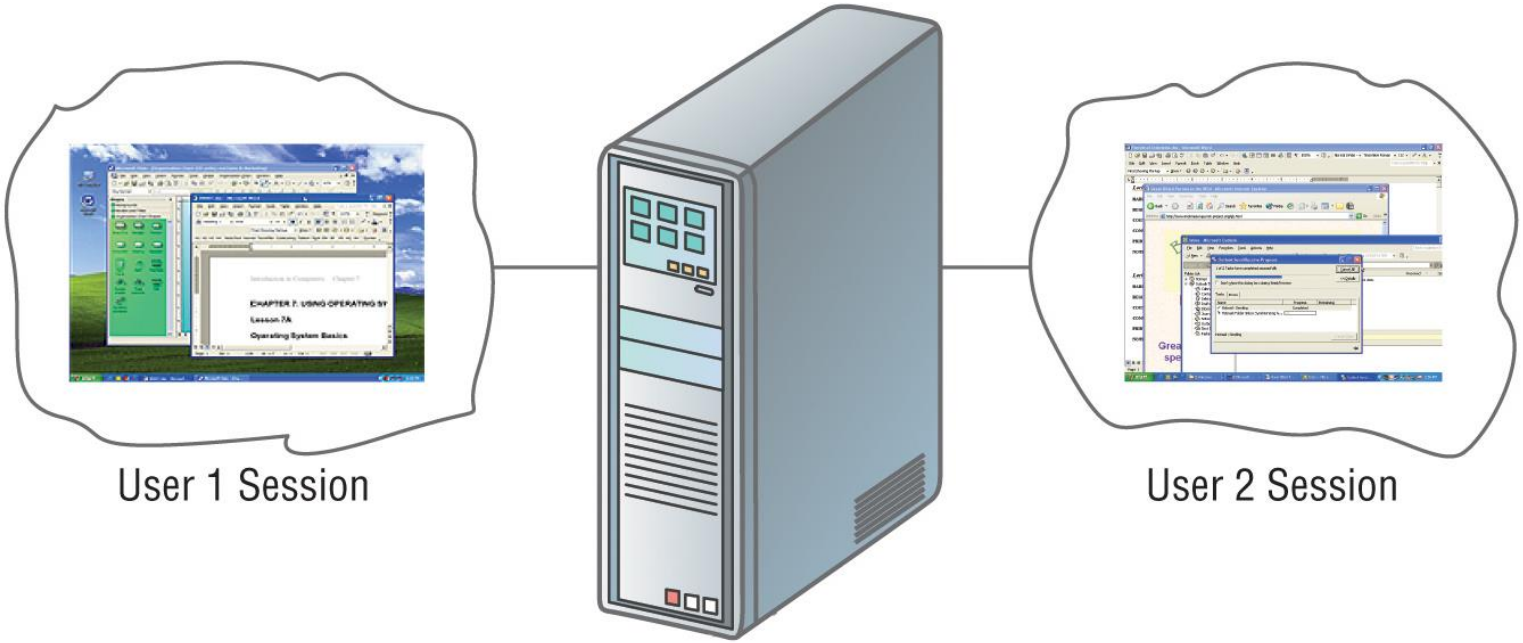
- Single user/Single tasking OS
  - One user works on the system
  - Performs one task at a time
  - MS-DOS and Palm OS
  - Take up little space on disk
  - Runs on inexpensive computers

Types of Operating Systems (cont.)

- Single user/Multitasking OS
  - User performs many tasks at once
  - Most common form of OS
  - E.g. Windows, MAC OS
  - Require expensive computers
  - Tend to be complex
    - Support for multitasking
    - Instant switch between programs

Types of Operating Systems (cont.)

- Multi user/Multitasking OS
  - Many users connect to one computer
  - Each user has a unique session
  - UNIX, Linux, and VMS
  - Maintenance can be easy
  - Requires a powerful computer



Functions of Operating Systems

- Provide a user interface
- Load/Run programs
- Manage hardware devices
- Organized file storage

Providing a User Interface

- User interface
  - How a user interacts with a computer
  - Require different skill sets

  - Graphical User Interface
  - Command Line Interface

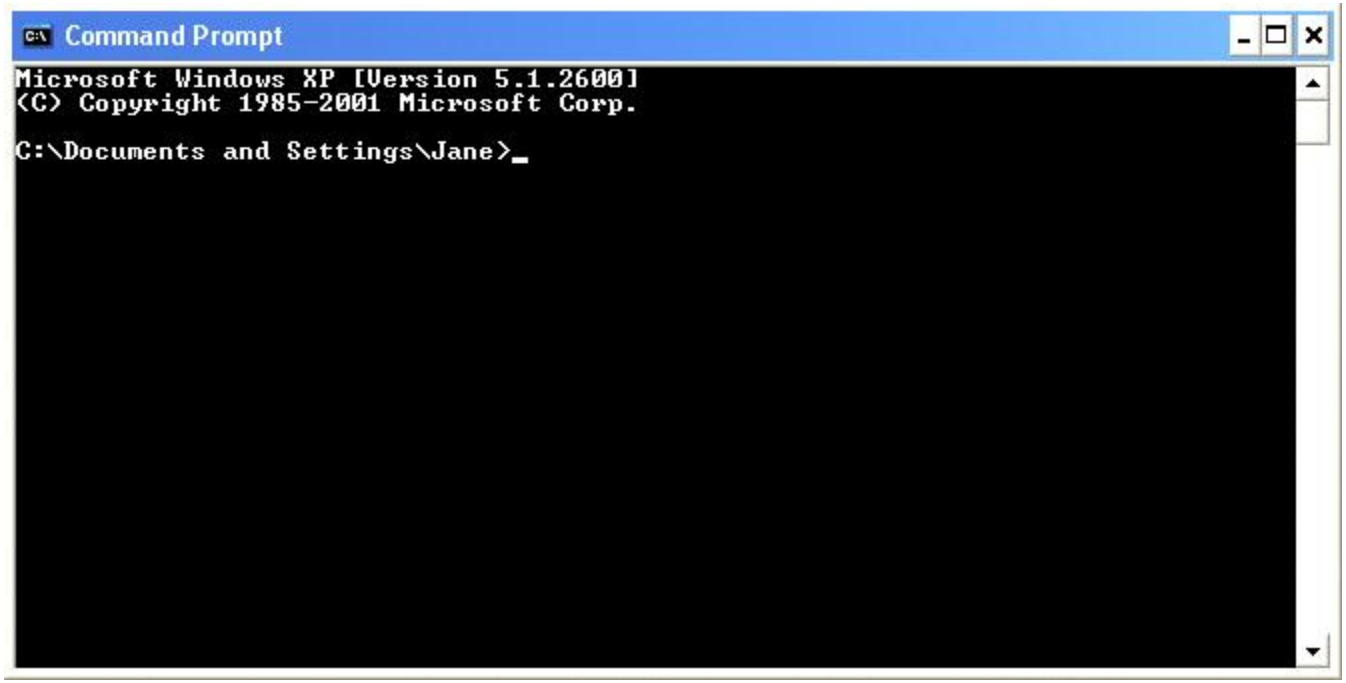
Providing a User Interface (cont.)

- Graphical user interface (GUI)
  - Most common interface
    - Windows, OS X, Gnome, KDE
  - Uses a mouse to control objects
  - Uses a desktop metaphor (symbolic representation)
    - Shortcuts open programs or documents
  - Open documents have additional objects
  - Task switching
  - Dialog boxes allow choosing possible choice of action
    - Given by OS or application

Providing a User Interface (cont.)

Providing a User Interface (cont.)

- Command line interfaces
  - Older interface
    - DOS, Linux, UNIX
  - User types commands at a prompt
  - User must remember all commands
  - Included in all GUIs

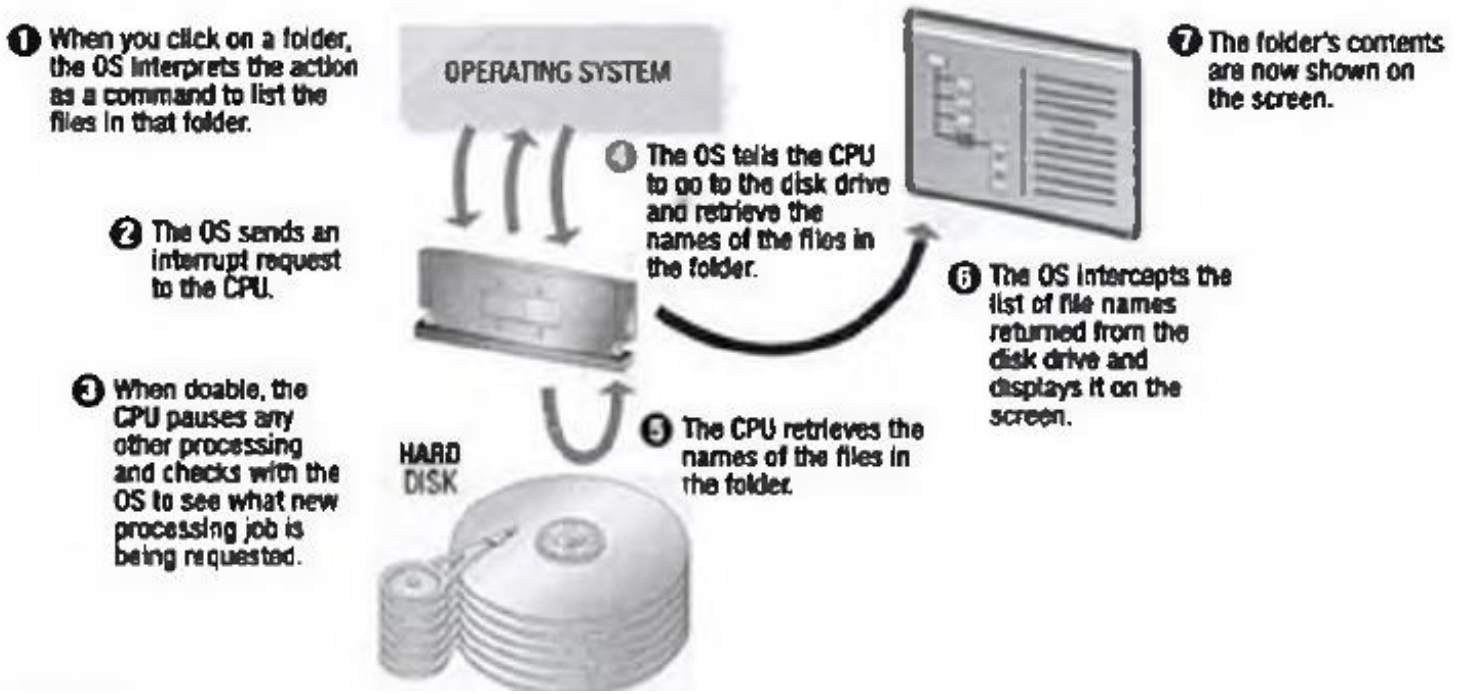


Running Programs

- Many different applications supported
- System call
  - Provides consistent access to OS features
    - E.g. clicking *Open* in MS Word gives list of files in a specified folder
  - Result of system call sent back to application rather than desktop
- Share information between programs
  - Copy and paste
  - Object Linking and Embedding (OLE)

Managing Hardware

- Programs need to access hardware
- Interrupts
  - CPU is stopped
  - Hardware device is accessed
- Device drivers control the hardware



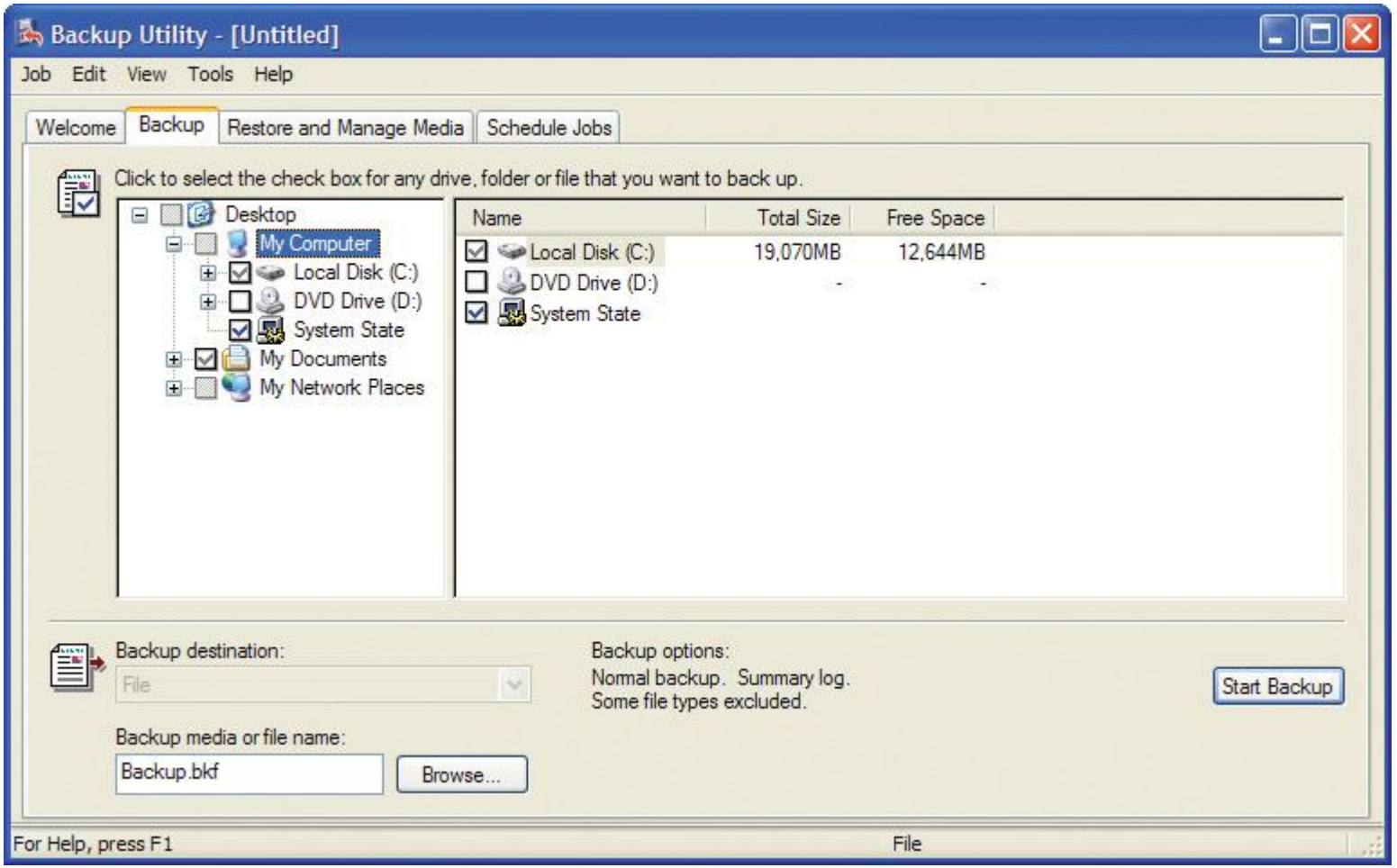
Organizing Files and Folders

- Organized storage
  - Folders can be created and nested
- Ensure that all storage devices working properly

Enhancing an OS

- Utilities
  - Provide services not included with OS
  - Goes beyond the four functions
  - Firewall, anti-virus and compression
  - Prices vary
- Backup software
  - Archives files onto removable media
  - Ensures data integrity
  - Most OS include a backup package
  - Many third party packages exist

Enhancing an OS (cont.)



Enhancing an OS (cont.)

- Anti-virus software
  - Crucial utility
  - Finds, blocks and removes viruses
  - Must be updated regularly
  - McAfee and Norton Anti-Virus
- Firewall
  - Crucial utility
  - Protects your computer from intruders
  - Makes computer invisible to hackers
  - Zone Labs, home firewall example
  - Cisco sells hardware firewalls
- Intrusion detection
  - Often part of a firewall package
  - Announces attempts to breach security
  - Snort is a Linux based package

Enhancing an OS (cont.)

- Screen savers
  - Crucial utility for command line systems
    - Prevents burn in
  - Merely fun for GUI systems
  - Screen saver decorates idle screens