



# Computer Fundamentals

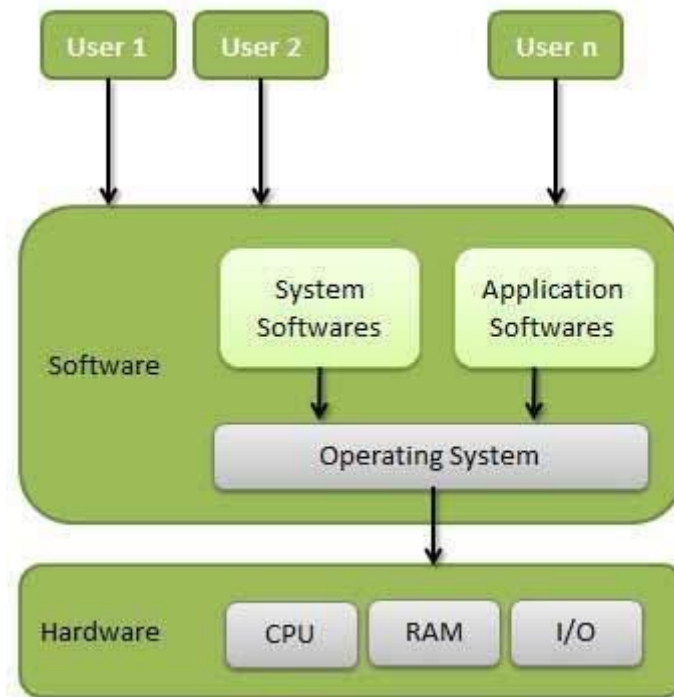
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Lecture 16



# 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





# Functions of Operating Systems

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



# 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



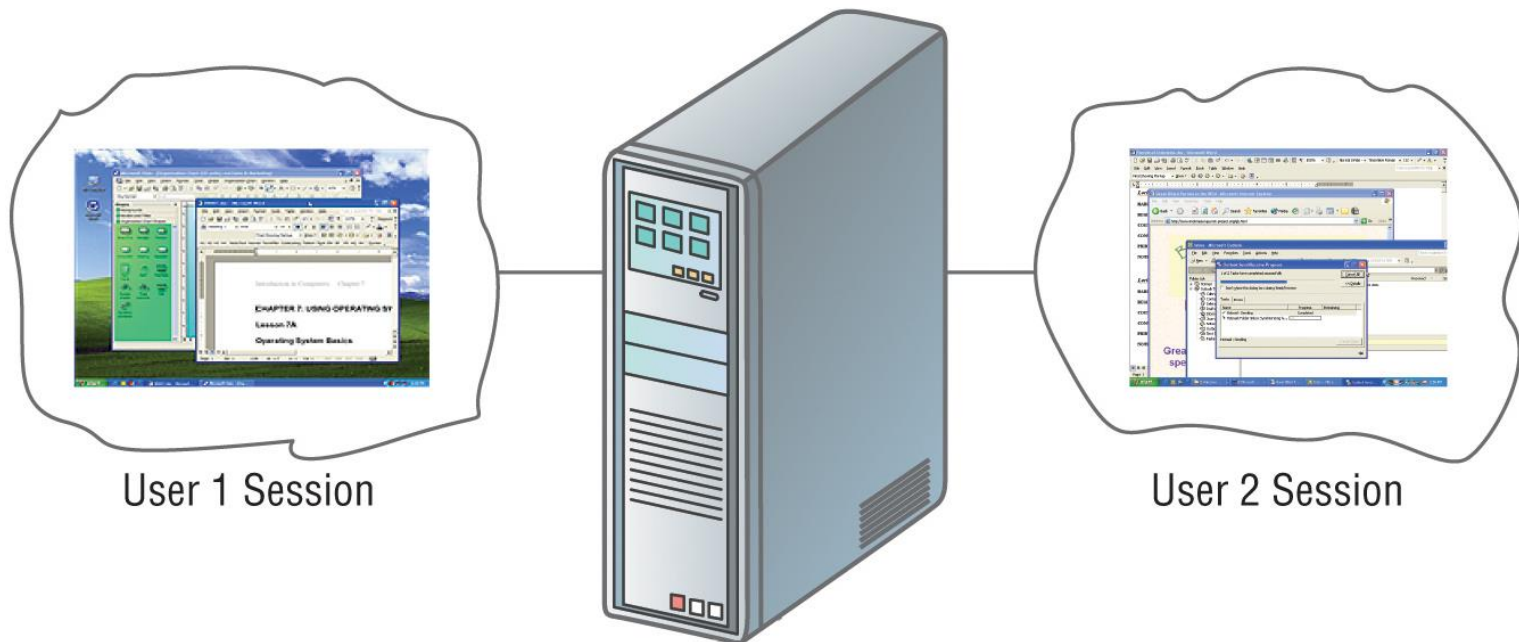
# Types of Operating Systems (cont.)

- 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





# Providing a User Interface

- User interface
  - ❑ How a user interacts with a computer
  - ❑ Require different skill sets
  
  - ❑ Graphical User Interface
  - ❑ Command Line Interface



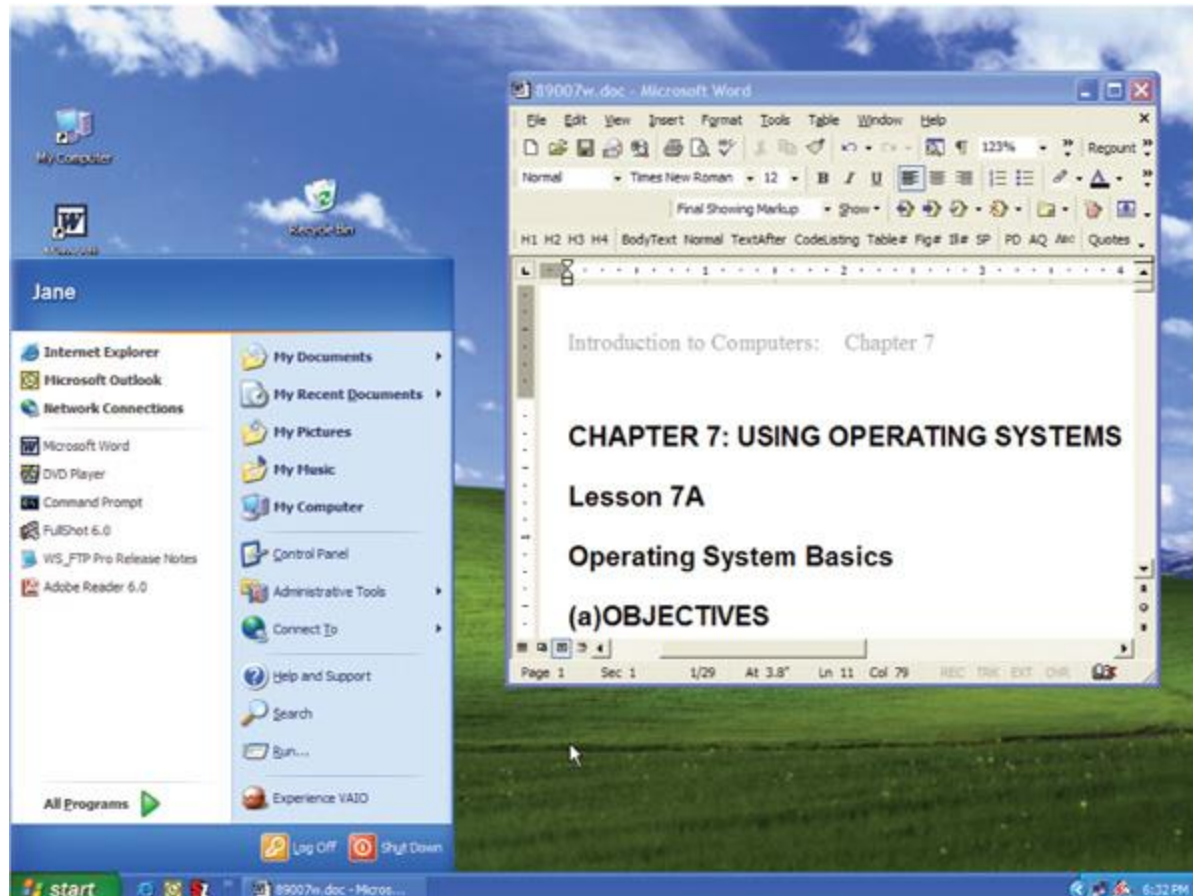
# Providing a User Interface (cont.)

- 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





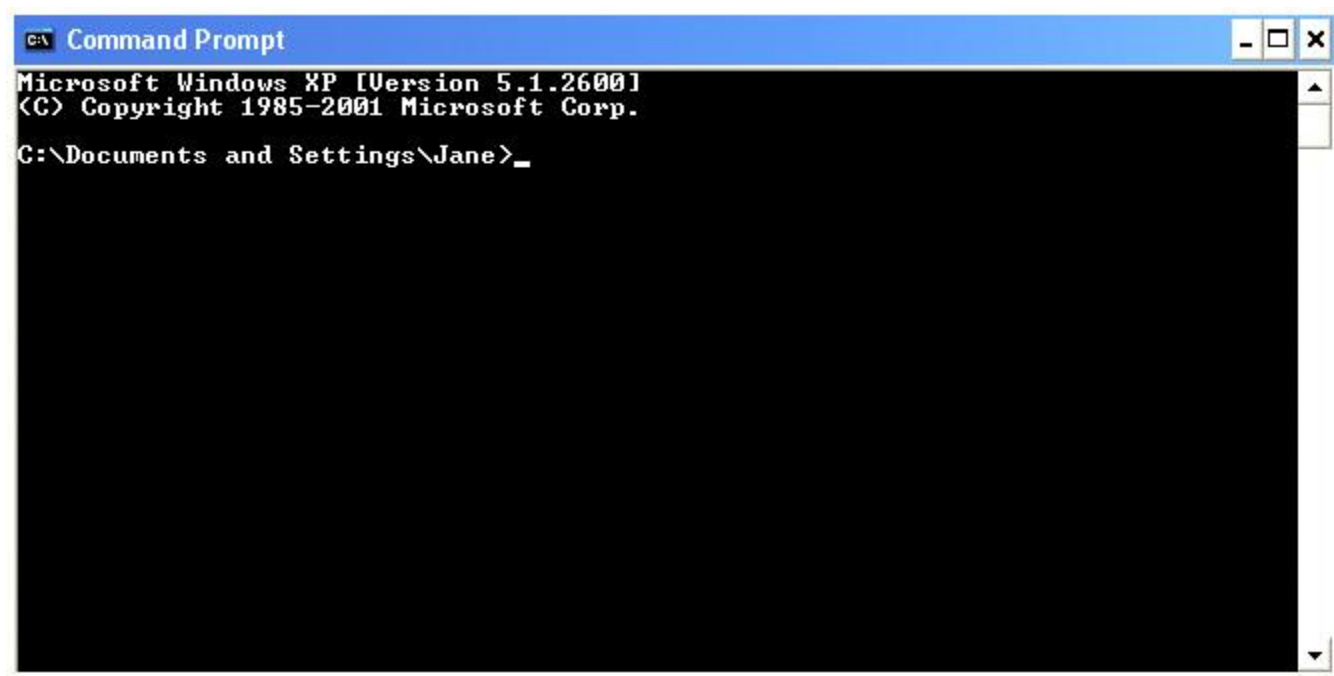
# Providing a User Interface (cont.)





# 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





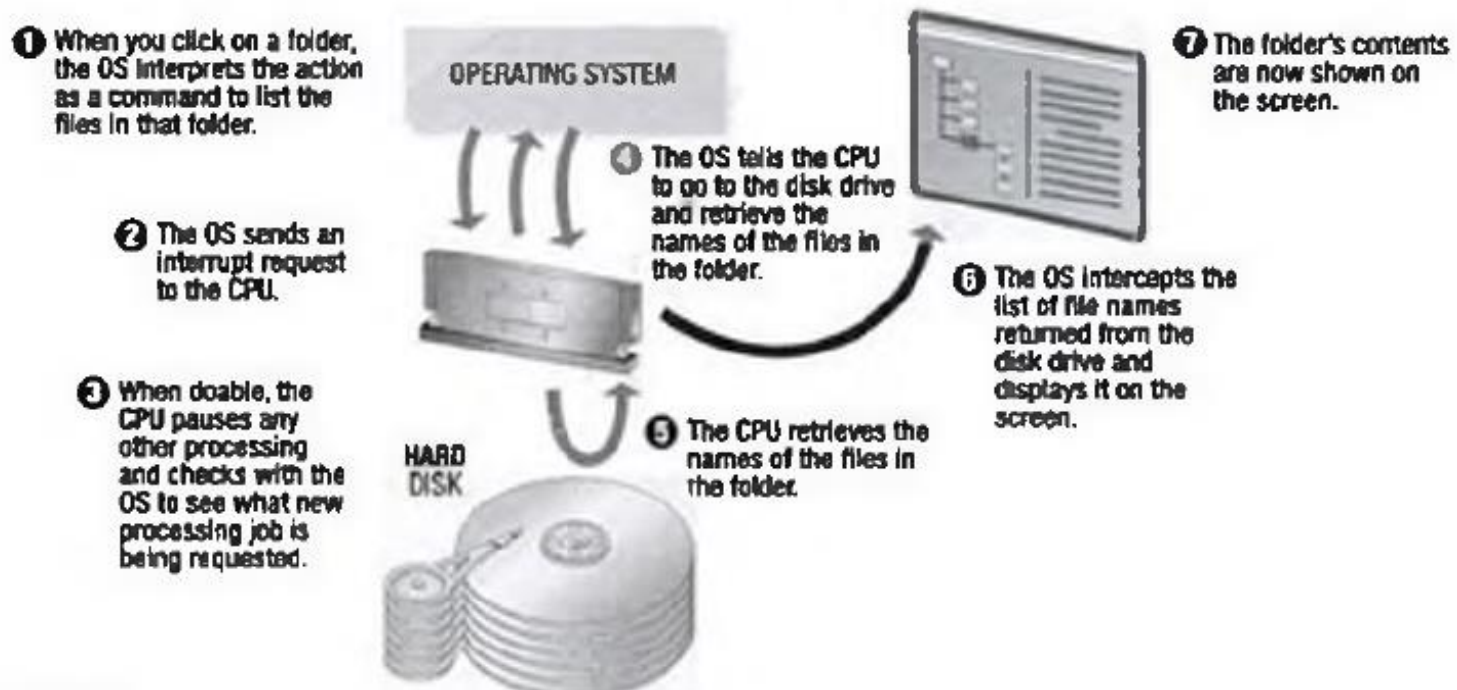
# Running Programs

- 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



# 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

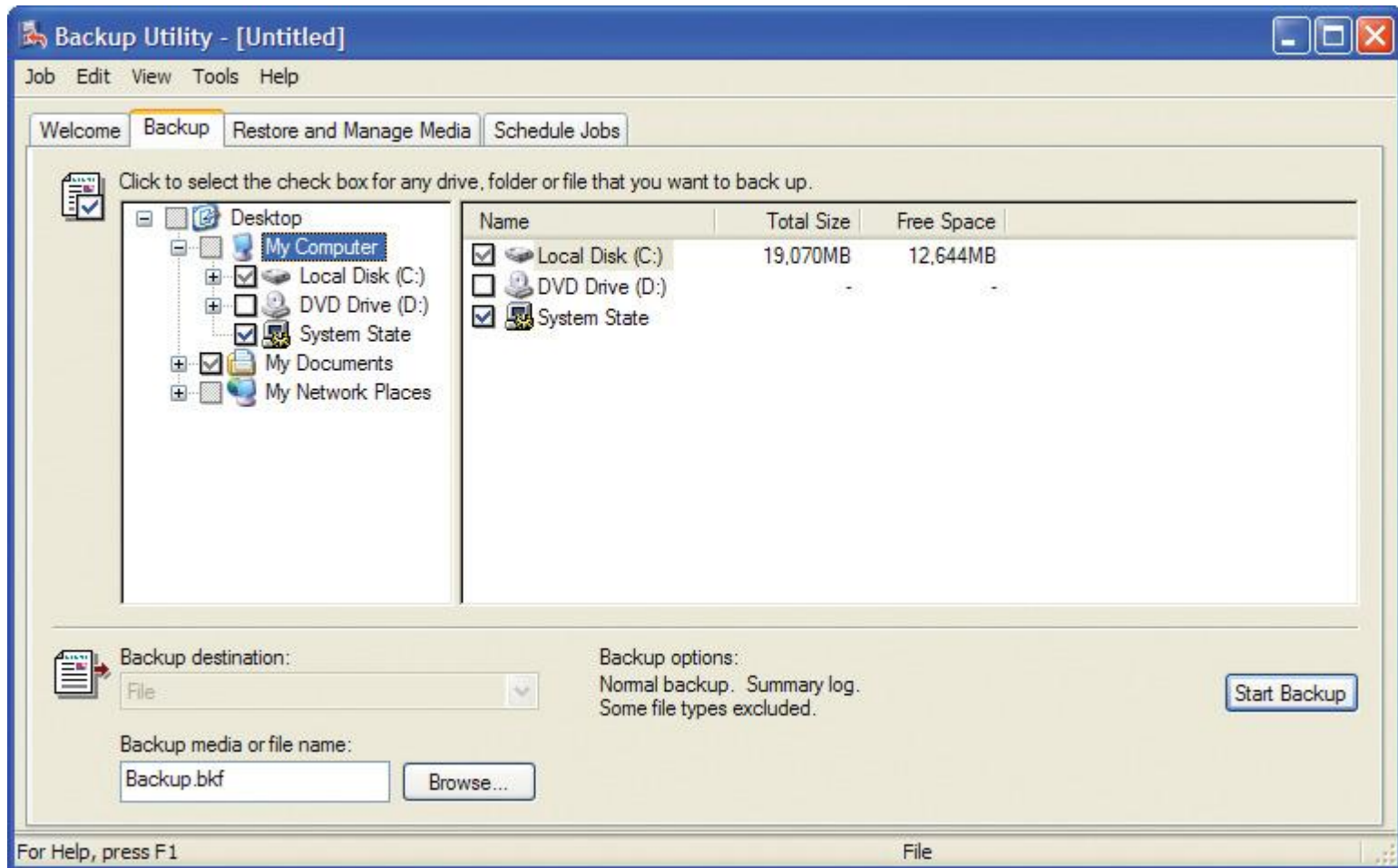
- ☐ Provide services not included with OS
- ☐ Goes beyond the four functions
- ☐ Firewall, anti-virus and compression
- ☐ Prices vary

## ➤ 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

