

Operating System

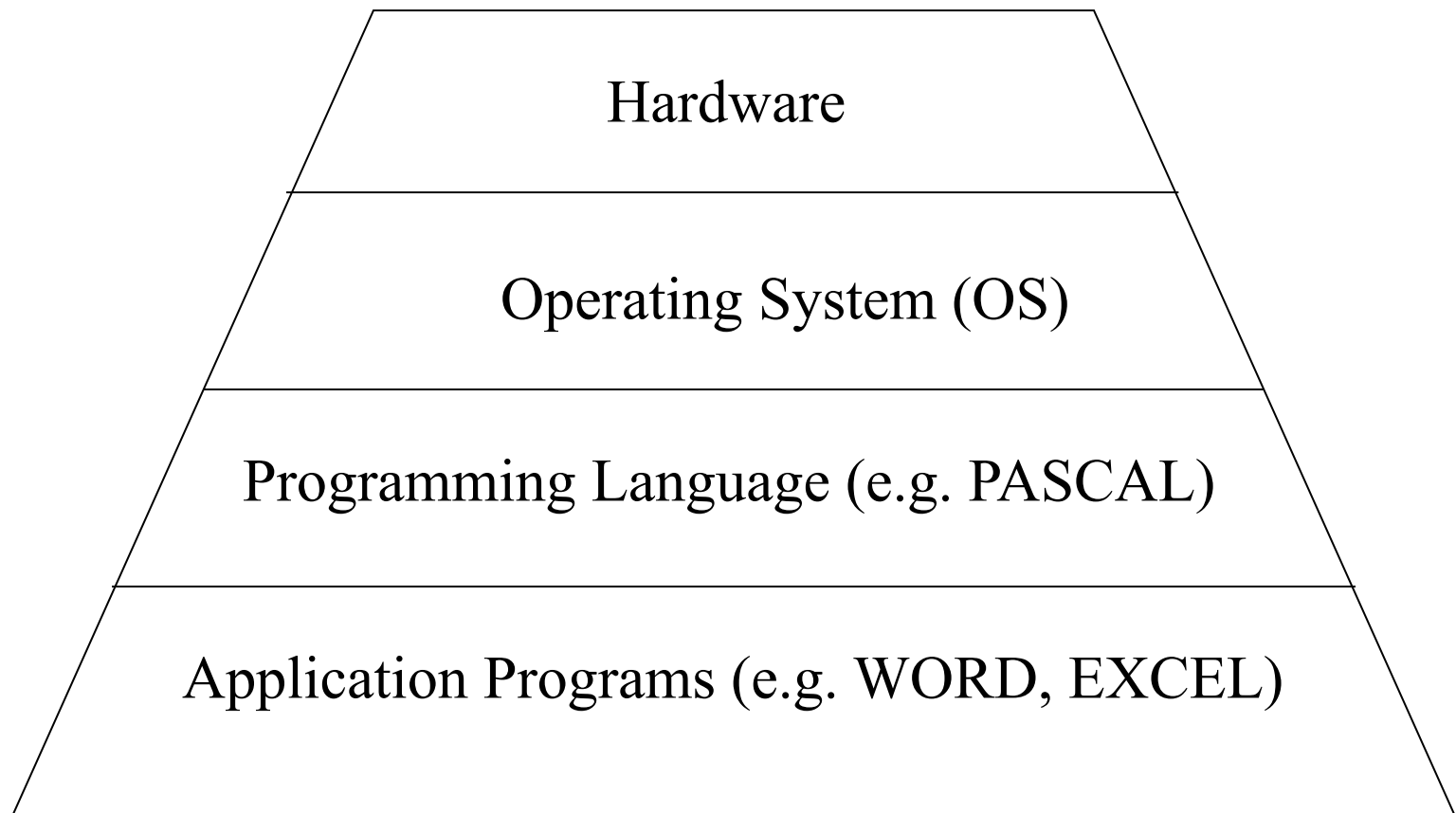
Lecture Schedule

- **Week 1:**
 - Introduction to Operating Systems, Computer System Structures, Operating System Structures
- **Week 2 : Process Management**
 - Processes and Threads, CPU Scheduling
- **Week 3: Process Management**
 - CPU Scheduling, Process Synchronization
- **Week 4: Process Management**
 - Process Synchronization
- **Week 5: Process Management**
 - Deadlocks

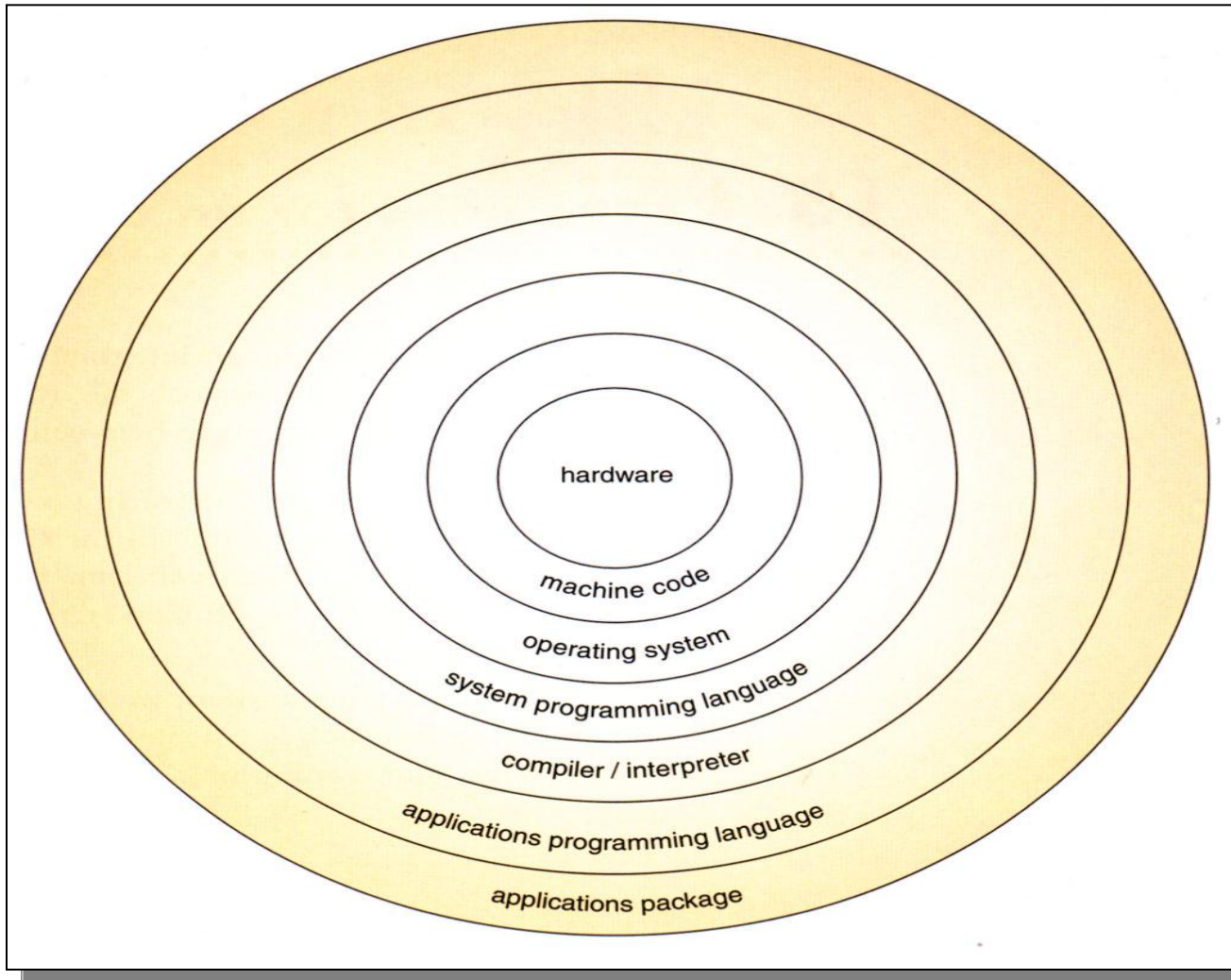
Course Schedule

- **Week 6 - Storage Management**
 - Midterm exam, Memory Management
- **Week 7 - Storage Management**
 - Memory Mangement, Virtual Memory
- **Week 8 - I/O Systems**
 - Virtual Memory, Filesystem Interface,
- **Week 9 - Other topics**
 - FileSystems Implementation, I/O subsystems
- **Week 10 - Other topics**
 - Case study – UNIX, WindowsNT, course revision and summary.

Architecture of Computer System



Detail Layered View of Computer



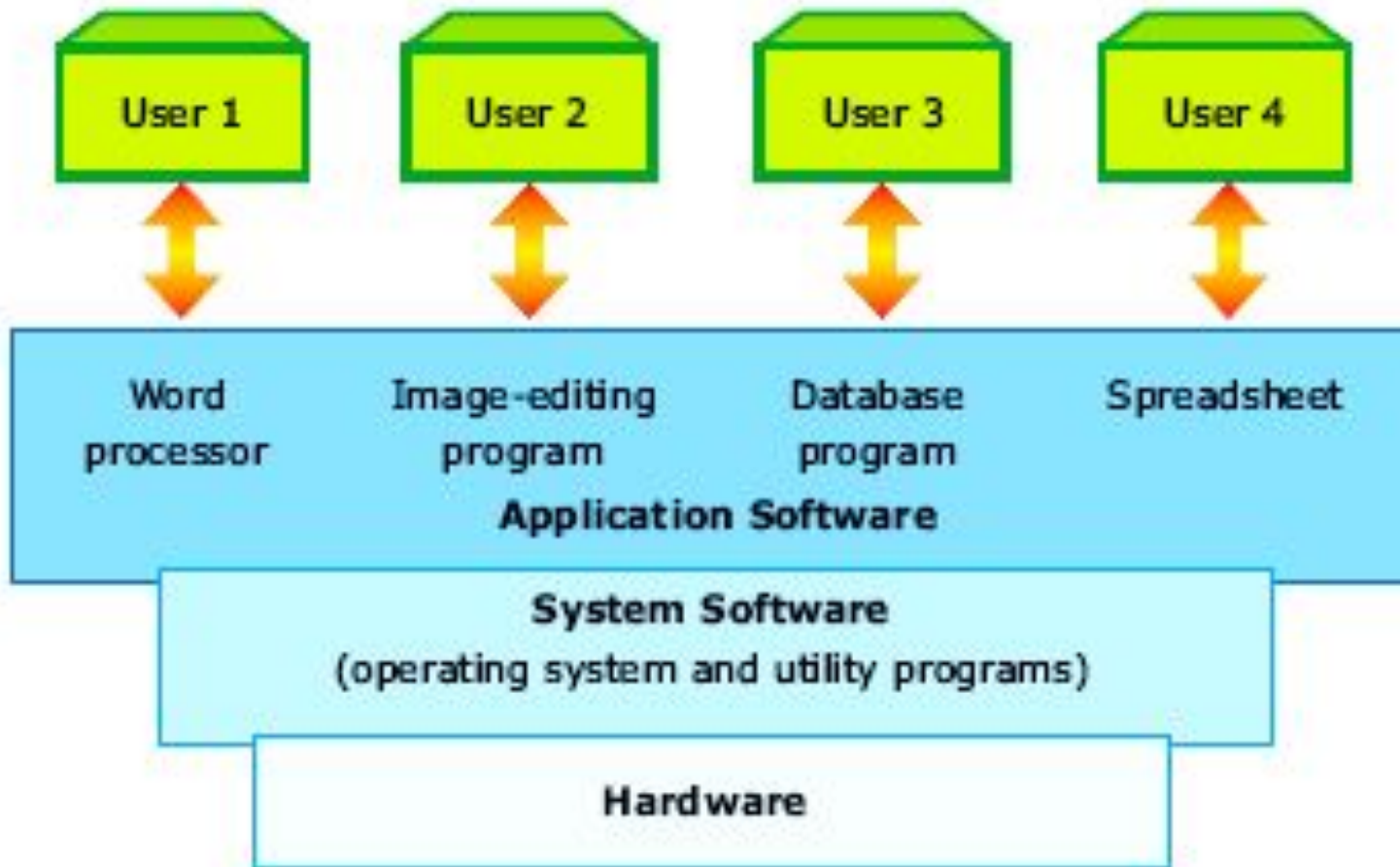
System Software, Application Software and Driver Programs

- System Software- Performs essential operation tasks
 - Operating system
 - Utility programs
- Application Software - Performs specific tasks for users
 - Business application
 - Communications application
 - Multimedia application
 - Entertainment and educational software
- Driver Programs (Device Driver)
 - small program that allows a specific input or output device to communicate with the rest of the computer system

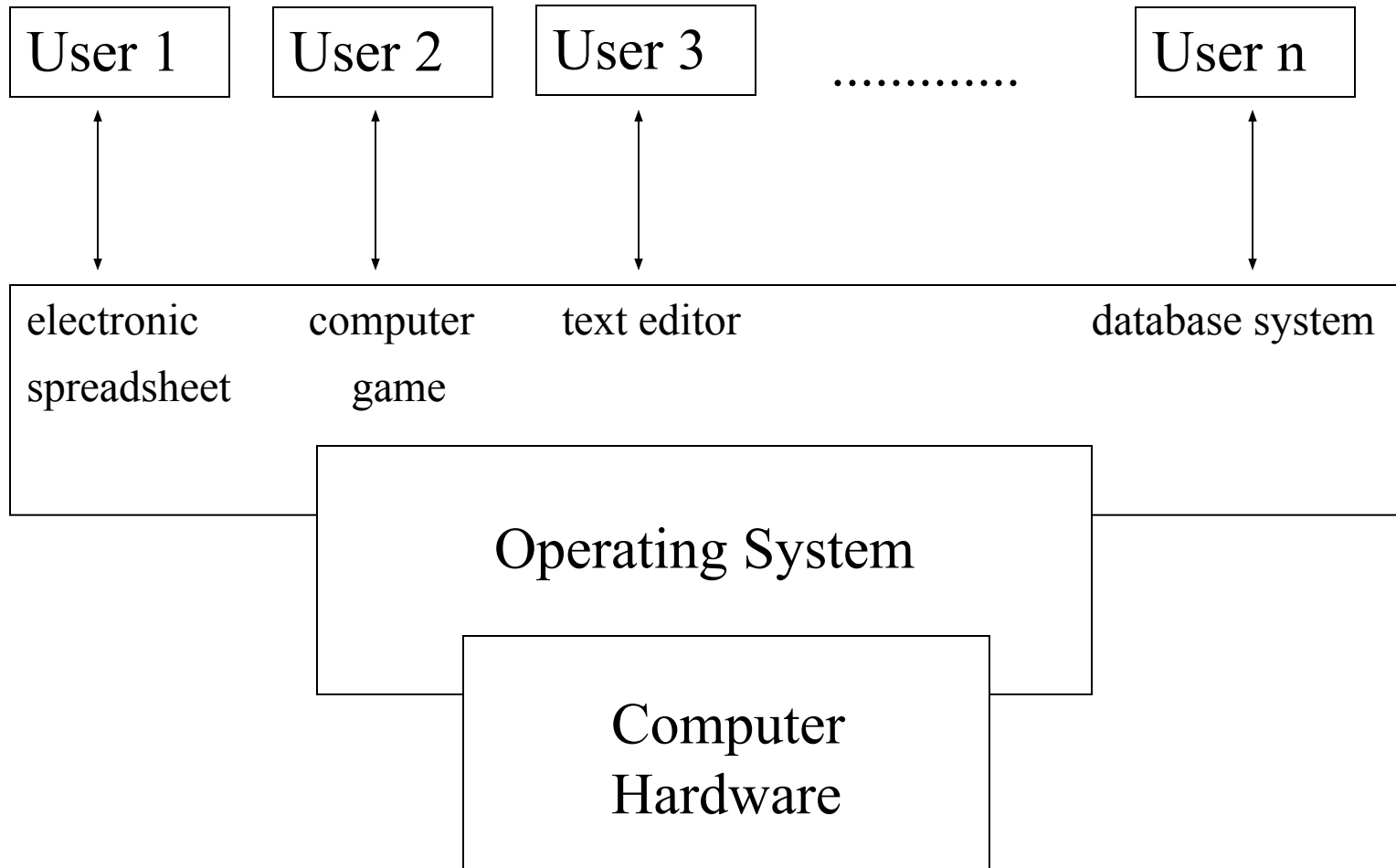
3 type of programs

- user / application programs
 - programs used by the users to perform a task
- system programs
 - an interface between user and computer
- driver programs
 - communicate I/O devices with computer

Hierarchy of computer software



Program Hierarchy



Operating System

- a collection of programs which control the resources of a computer system
- written in low-level languages (i.e. machine-dependent)
- an interface between the users and the hardware
- when the computer is on, OS will first load into the main memory

Basic functions of the operating system



Device configuration

Controls peripheral devices connected to the computer

File management

Transfers files between main memory and secondary storage, manages file folders, allocates the secondary storage space, and provides file protection and recovery

Memory management

Allocates the use of random access memory (RAM) to requesting processes

Interface platform

Allows the computer to run other applications

Other function of Operating System

- best use of the computer resources
- provide a background for user's programs to execute
- display and deal with errors when it happens
- control the selection and operation of the peripherals
- act as a communication link between users
- system protection

Common Operating Systems and Their Differences

- Network Operating System
 - UNIX / Linux / MS Windows2000 Server
- Desktop Operating System
 - MS Windows 9X/Me / Mac OS / DOS
- Mobile Operating System
 - Palm OS and Pocket PC

Examples

- Common operating systems
 - WINDOW
 - used in IBM compatible microcomputers
 - UNIX
 - multi-user, multi-tasking OS used in minicomputers and microcomputers
 - VAX/VMS
 - used in DEC's VAX series of minicomputers

DOS interface

```
C:\>dir

Volume in drive C has no label
Volume Serial Number is 0F10-129C
Directory of C:\

DIRBLOG.BAT      BOOTLOG.TXT      FRMLOG.TXT      (SOURCE)      DETLOG.TXT
DIRMANG.COM     ID_513          HD005_513      DIRSQL         DETMFLG.TXT
[KBINDOS]       NETLOG.TXT       COMPIL_513     ROOTLOG.PW    [PROGA-1]
SYSTEM.BST      AUTOEXEC.NAL    [UNZIPED]      [TBP]         [INETPB]
FRONTPG.LOG     SCANDISK.LOG    [PP]           [DYNADOC]     [PHOOO-1]
PACADRM_513     OS078047.BIN    OS28775L.BIN  [PRDR]        OS004485.BIN
[JSDMG-1_0]     [DMMSE-1]       [PP]           WEB1.DOC      [DESRM-1]
[GLOSSARY]      [XX]
                20 files(s)      8,548,884 bytes
                17 dir(s)    272,877,920 bytes free

C:\>
```



Different Types of Operating System

| UNIX | DOS | Mac OS | MS Windows | Linux | Palm OS/Pocket PC |
|---|---|-----------------------------|--|-----------------------------------|---|
| Multi-user, multi-tasking | Single-user, single-tasking | Single-user, multi-tasking | Single-user, multi-tasking | Multi-user, multi-tasking | Single-user, multi-tasking |
| Command-line user interface | Command-line user interface | GUI | GUI | Command-line user interface, GUI | GUI |
| UNIX has several versions but they lack interoperability. | DOS has been replaced by MS Windows OS. | Mac OS has easy-to-use GUI. | The first true MS Windows OS is MS Windows 95. | Linux is an open-source software. | They are specifically designed for PDA. |
| Network OS | Desktop OS | Desktop OS | Desktop OS | Network OS | Mobile OS |

Disk Operating System (DOS)

- a part of operating system to control disk operation
- 2 parts
 - small system data
 - keep track of key information of the disk
 - data area
 - where data file is stored

SMALL SYSTEM AREA in DOS

- 3 parts
 - boot/boot record
 - i.e. a short program for loading DOS into computer's memory
 - file allocation table (FAT)
 - i.e. record the status of each part of the disk and keep track of all data
 - root directory
 - i.e. record the filename, size of the file , date and time

Good Operating System

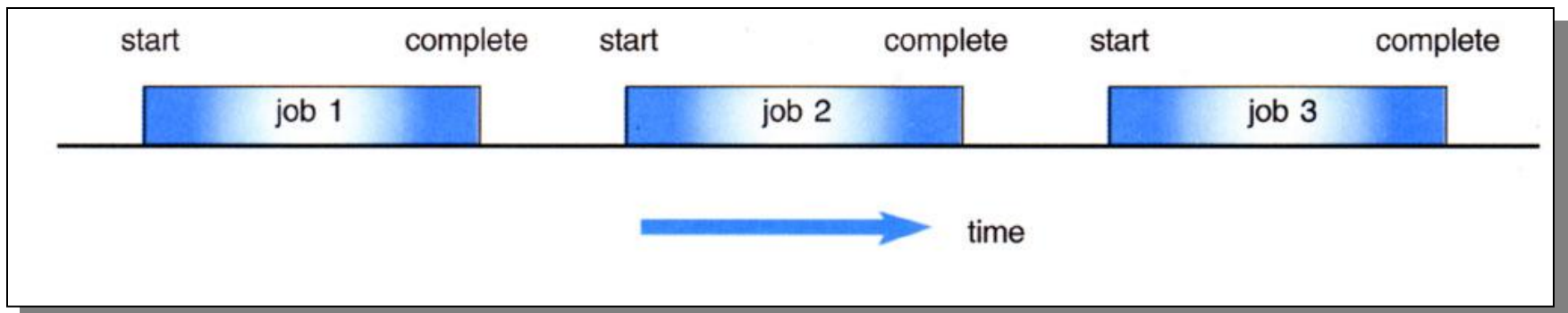
- efficient
 - time spent to execute its programs should be short
- small in size
 - memory occupied should be as small as possible
- reliable

Type of Operating System

- Batch processing
- Real time processing
- Time sharing processing

Batch processing

- Jobs, together with input data, are fed into the system in a batch.
- The jobs are then run one after another.
- No job can be started until previous job is completed

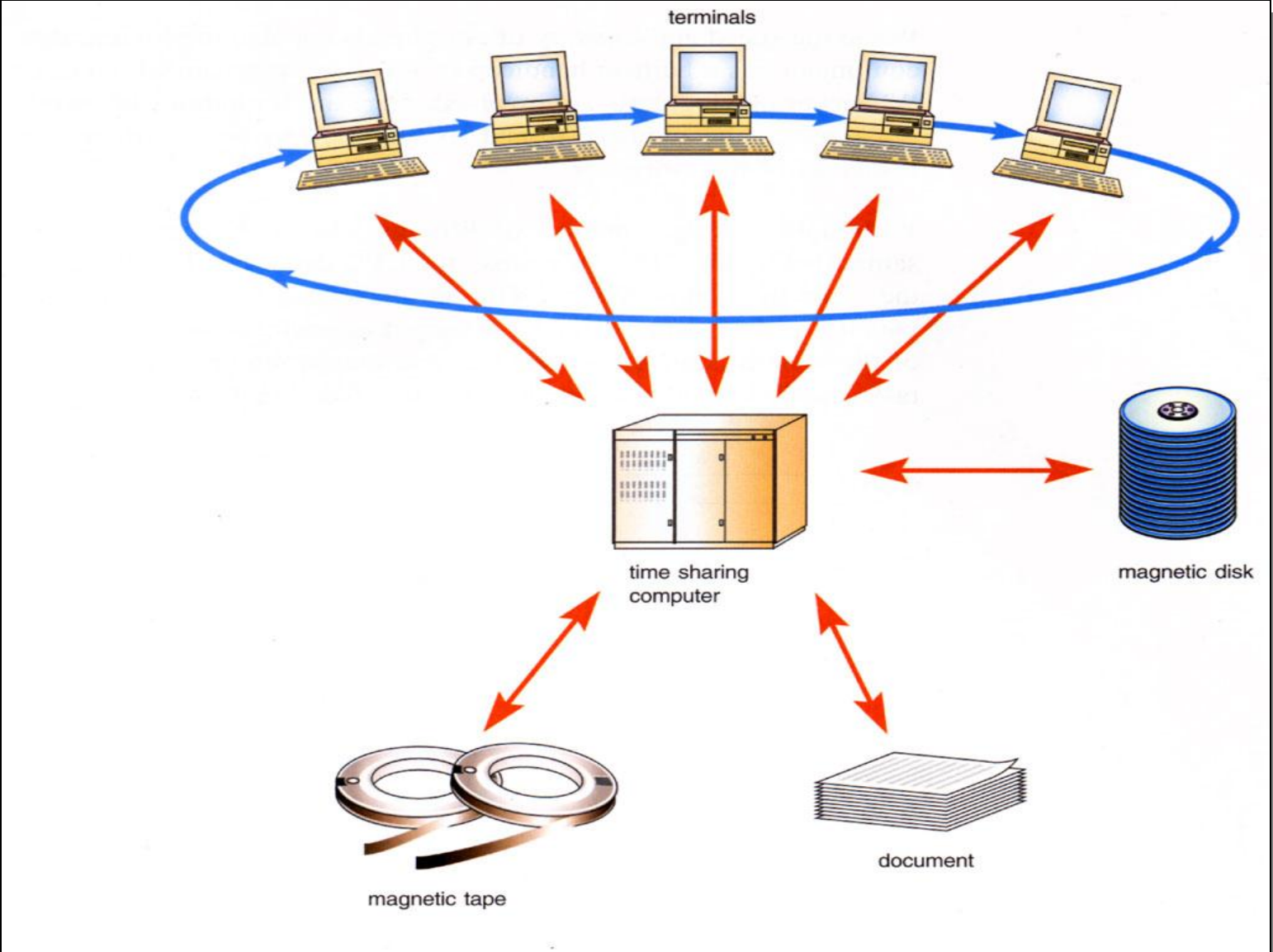


Real time processing

- immediate response is needed.
- For example
 - anti-missile defense system
 - airplane landing control system
 - interrupt error in computer system

Time sharing processing

- Each user is given a time slice to interact with the CPU.
- The size of the time slice will depend on the system.
- Each user is served in sequence.

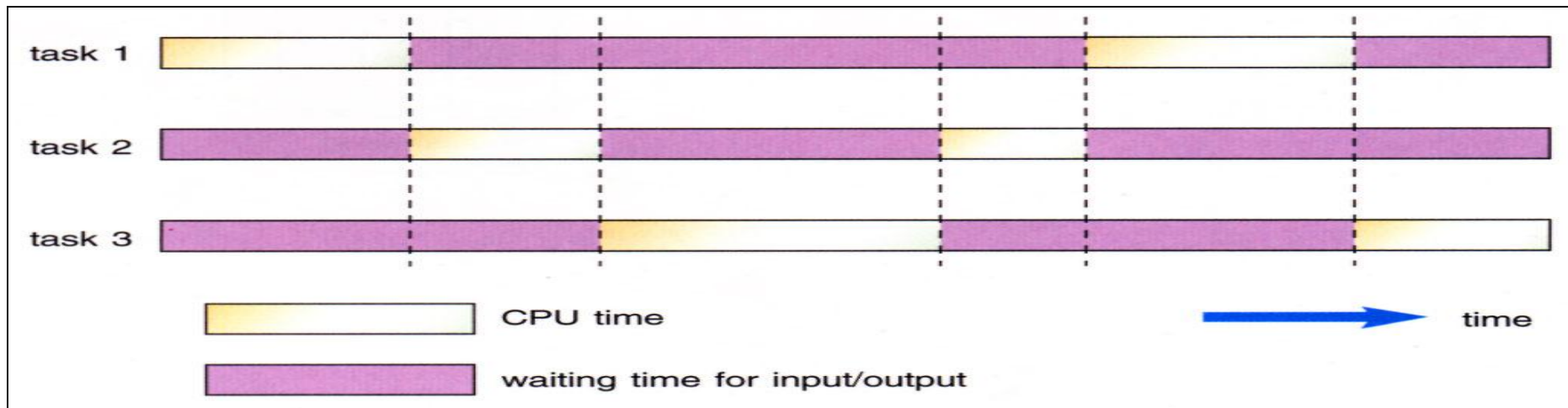


Special Features of OS

- multi-tasking
- multi-programming
- parallel processing
- buffering
- spooling

Multi-tasking

- to handle 2 or more programs at the same time from a single user 's perception
 - CPU can only perform one task at a time, however, it runs so fast that 2 or more jobs seem to execute at the same time

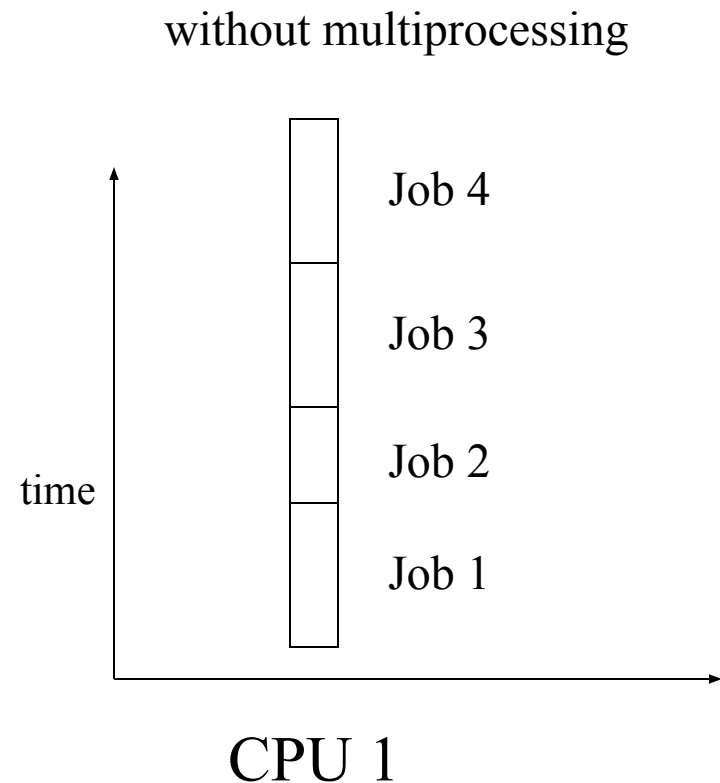
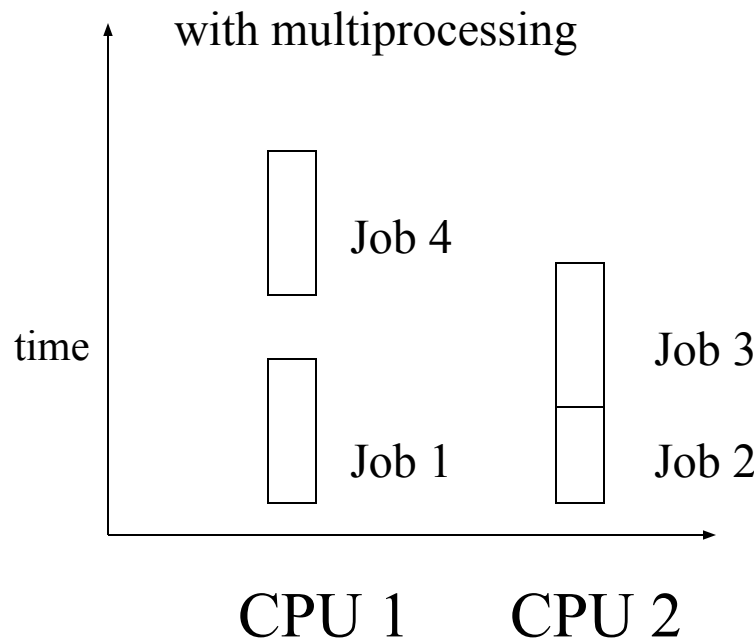


Multi-programming

- 2 or more programs store in the main memory at the same time
- when one job needs to wait (e.g. I/O operation), CPU switch to another job to execute
- when the first job finishes waiting, CPU will get back the first job to execute

Parallel Processing

- use 2 or more CPUs to handle jobs
- computer networking

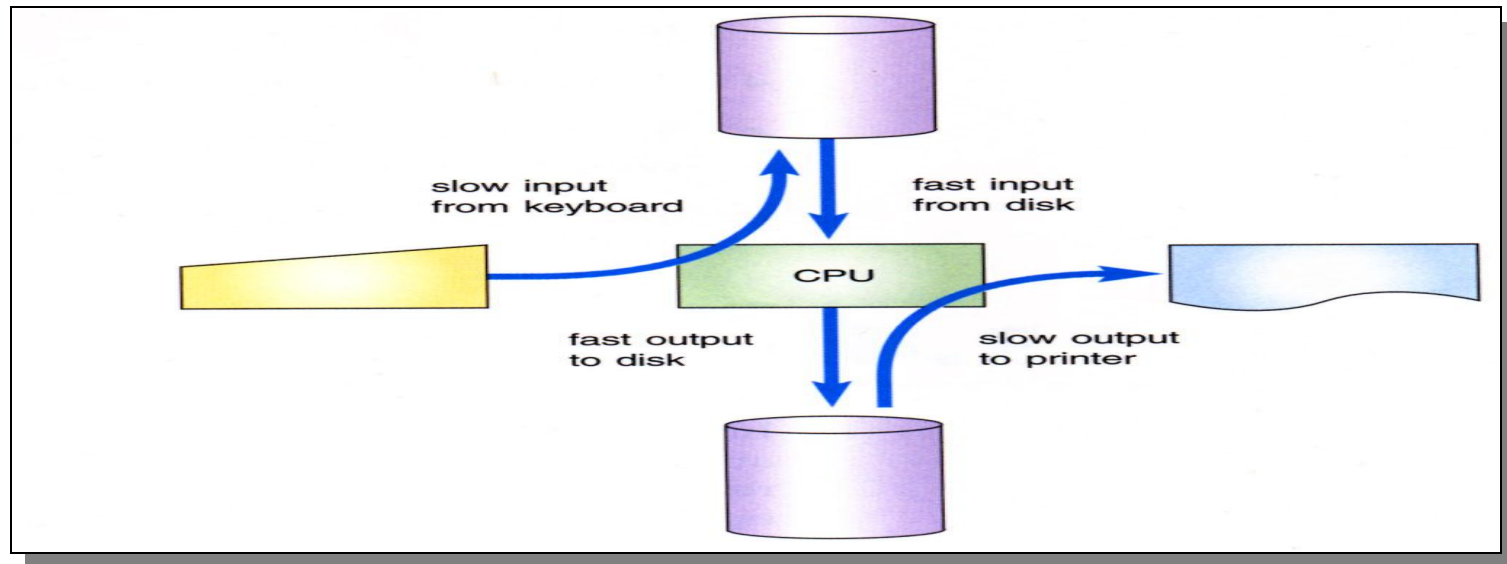


Buffering

- a temporary storage area (buffers) to read data from input device or send data to the output device
- keep CPU busy
 - because I/O operation is slow

Spooling

- a larger buffer from hard disk
- buffer store the data through I/O operation
 - because I/O operation is slow and CPU operation is fast



Thanks