



BCS6B13: Fundamentals of Operating Systems

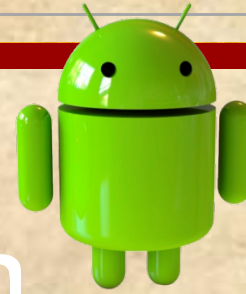
Module 1

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Computer.....

- **Hardware** (can touch and feel)
- **Software**
 - **System Software** (Operating System, compilers.....)
 - **Application Software** (spread sheet, word processors.....)

Operating System



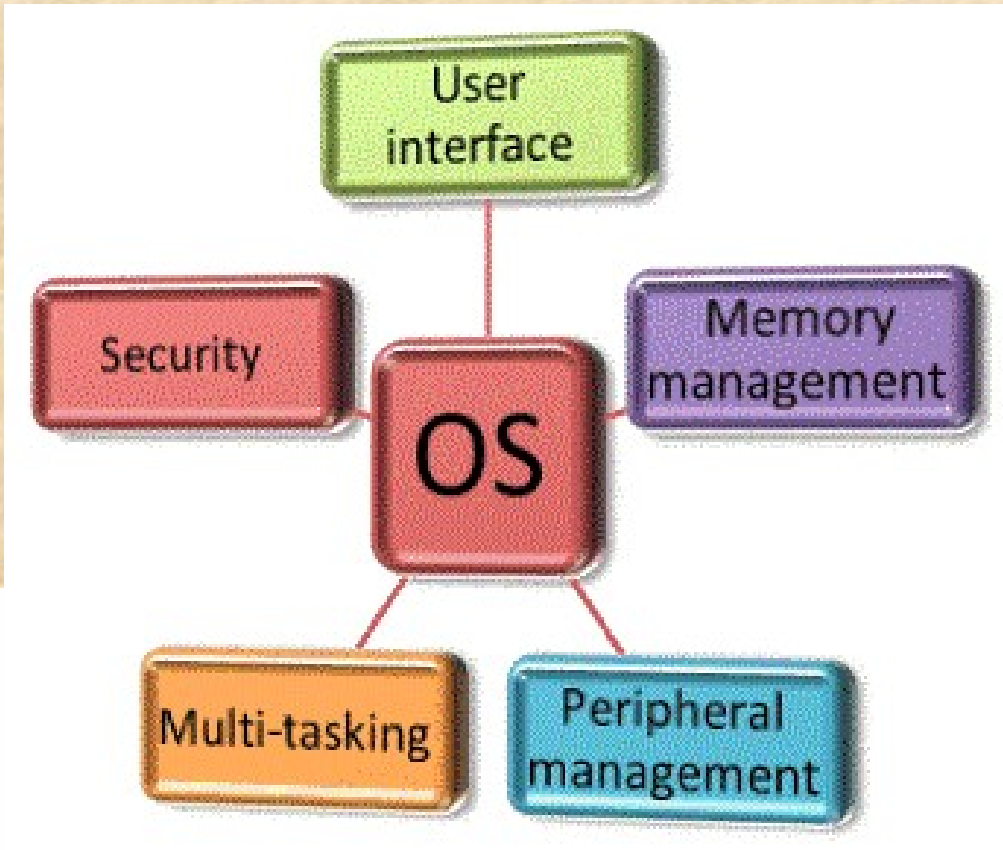
Students

Teachers

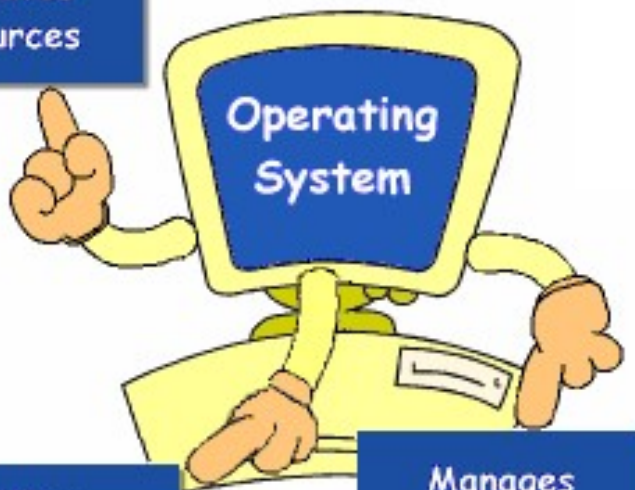


Parents

Non Teaching Staff



Allocates Resources



Monitors Activities

Manages Disks & Files

-
- Closed source ?
 - Open source ?
 - Free software ?

Android – Mobile OS



Alpha

A



Beta

B



Cupcake

C



Donut

D



Eclair

E



Froyo

F



Gingerbread

G



Honeycomb

H



Ice Cream Sandwich

I



Jelly Bean

J



KitKat

K



Lollipop

L



Marshmallow

M



Nougat

N

Operating System

- A program that controls the execution of application programs
- Program that is running all times on the computer
- An interface between applications and hardware
- It manages computer hardware and controls and coordinates the use of hardware among various application programs.

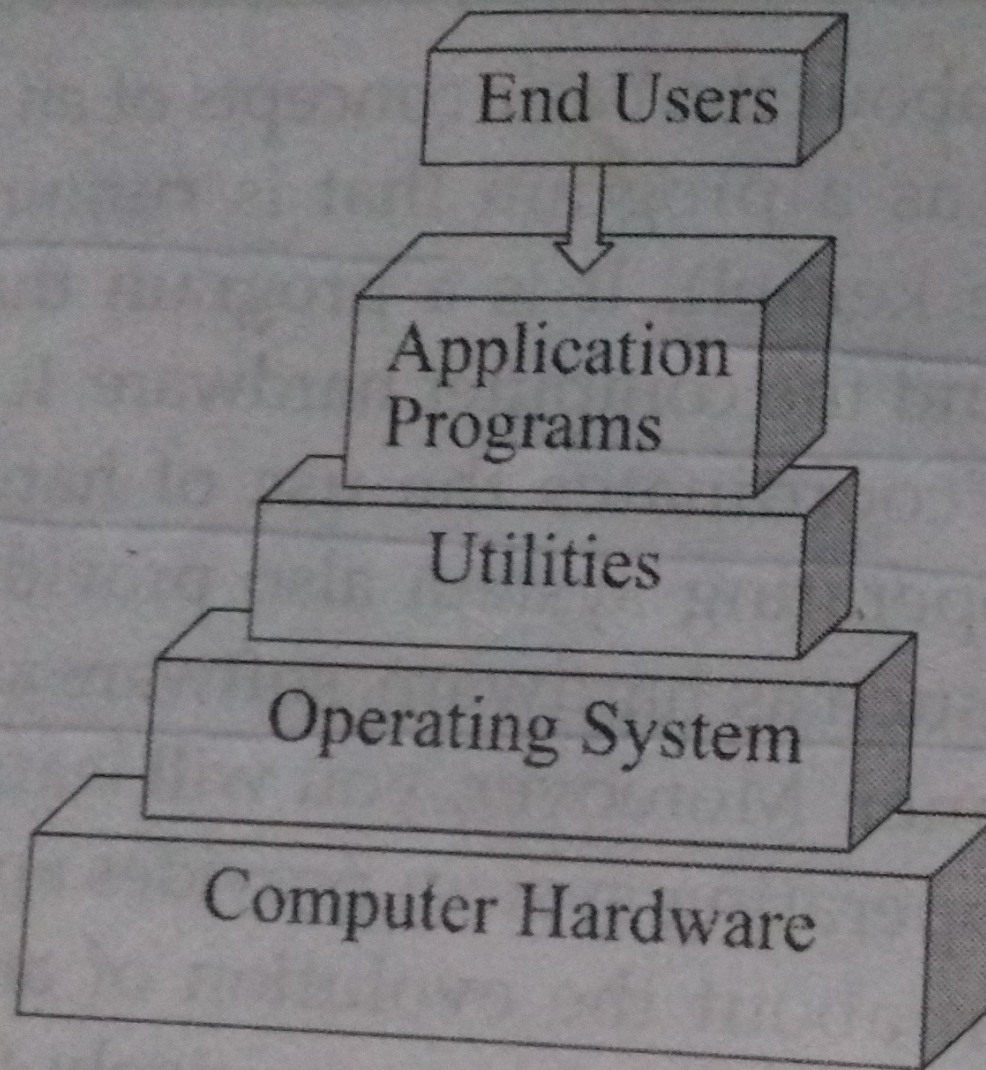


Fig. 1.1 Components of a Computer System

View Points

■ **USERS VIEW**

- OS designed for Ease of use.
- OS designed for System performance.
- Network environment: Resource Utilisation
- Hand held System : Individual usability.
- Embedded system: OS for run without user intervention.

View Points

■ **SYSTEM VIEW**

- OS as Resource Allocator
- OS as Control Program

Operating System: Objectives

- The ultimate goal of an easy to use and human friendly operating system is to transform the computer into a useful, user friendly, acceptable and affordable machine to all users. This is achieved through the following objectives:

Main objectives of an OS:

- Convenience
- Efficiency
- Ability to evolve

Convenience or ease of use

- Hide the peculiarity of the hardware through Abstraction
 - Role of Device drivers.
- Built in functionalities of an OS
 - Interrupt, System Call, Library function

Efficient Allocation and Utilization of Resources

- Resource manager
- Improve system through put
 - Number of Job executed per unit time

Ability to Evolve

- New and improved services.
- Must include provisions for easy introduction of new services and removing, improving and replacing existing services.
- Must provide interfacing facilities to connect , communicate with new types of hardware devices and upgrade versions of the existing hardware devices.

Functions of an OS

- Processor Management(scheduling algo)
- RAM management (virtual memory)
- Input / Output Management(through drivers)
- Managing the implementation of Applications.
- Authorizations Management.
- File Management.
- Information Management

Evolution of Operating Systems

TYPES OF OPERATING SYSTEMS

- Early system/ serial Processing
- Batch Processing system
- Multiprogramming system
- Time shared system
- Single user system
- Multitasking system
- Parallel system
- Distributed system
- Real time system

Early systems / serial Processing

- Mid 1940 / machines with toggle keys
- No OS/ No Programming Language/only machine coding
- Only programmers use the system.
- 1950 – Punch cards
- Magnetic tape memory - High level language
- Have to manually reserve the system\
- Costly and time consuming

Batch Processing System

- Mid 1950
- Executing programs of different users without user intervention.
- The system was called first rudimentary OS/resident monitor
- Job control Language(JCL)
- Privileged/non privileged mode
- CPU utilization less
- Swapping to improve response time.
- SPOOLing – Simultaneous Peripheral Operation Online
 - High speed disk is placed between a running program and a low speed device

Multiprogramming system

- Jobs – alternate cycles of I/O bound and CPU bound
- Separate processors – I/O Processor and main Processor.
- Takes one process – if I/O bound the main processor takes other processes and vice versa
- Main CPU waits for completion of I/O only when no other jobs to be executed in the system
- Loading of more than one program in memory.

Time shared system

- Interactive time shared multiprogramming technique.
- Separate terminal keyboard and monitor.
- For many users time is shared.
- Resource utilization is high
- Overheads – unproductive computations due to job switching

Single user system

- Computer where only one user can work at a time
- Eg: Intel processor based windows OS personal computer.
- Single keyboard, mouse and monitor.
- A user can concurrently execute many task.
- Major design issue is response time.
- Windows 95, NT,2000 vista are single user OS

Multitasking system

- Multitasking is concerned with a single user executing more than one program simultaneously.
- The OS executes each task for a small time slice in a round robin fashion so that user cannot distinguish the switching of CPU among different applications.

Multitasking system

The advantages of this system are as follows:

- (i) The ability of multitasking system that permits the user to run more than one task simultaneously, leads to increased productivity.
- (ii) Improves the system resource utilization, throughput and overall efficiency of the system.

The disadvantages are as follows:

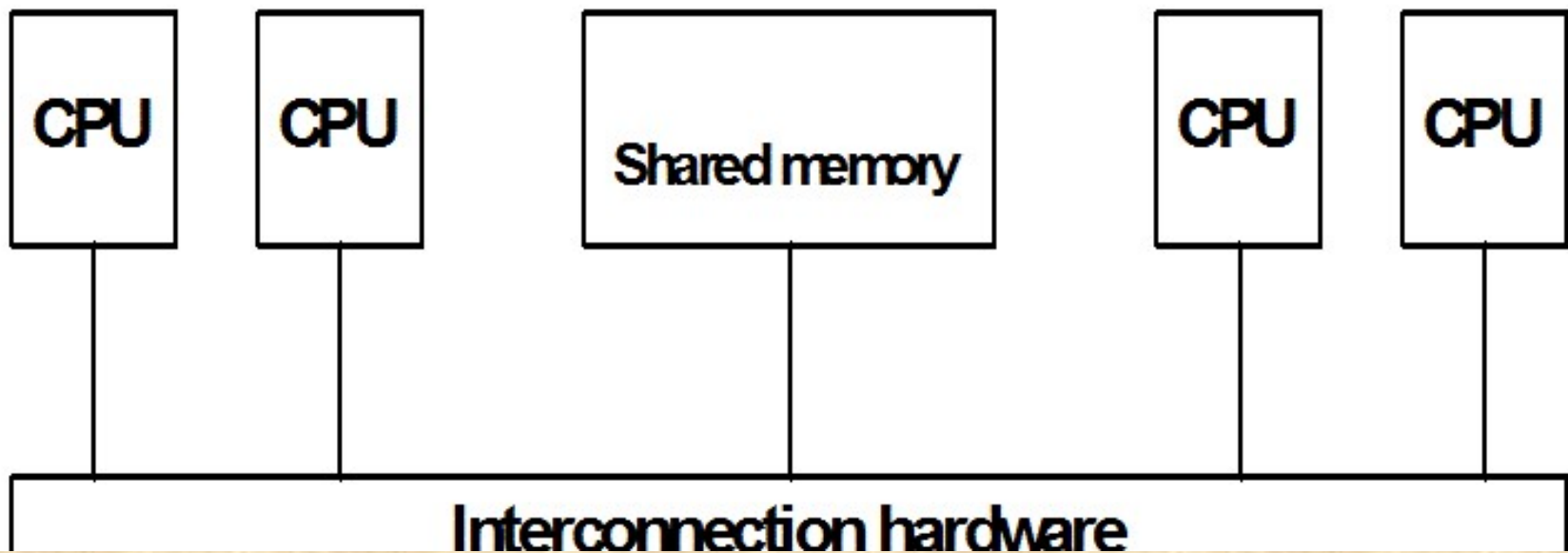
- (i) Increased overhead processing time.
- (ii) Needs more resources like memory, CPU time and I/O devices for achieving user satisfaction.

Parallel System

- Increase in clock speed increases the throughput of a system.
- We have reached the upper limits of the clock speed.
- For further increase in processing speed parallel systems with multiple CPUs are developed.
- There are **two classes of Parallel Processing System**.
 - **Tightly coupled** bus based shared memory multiprocessor system
 - **Loosely coupled** distributed memory multiprocessor system

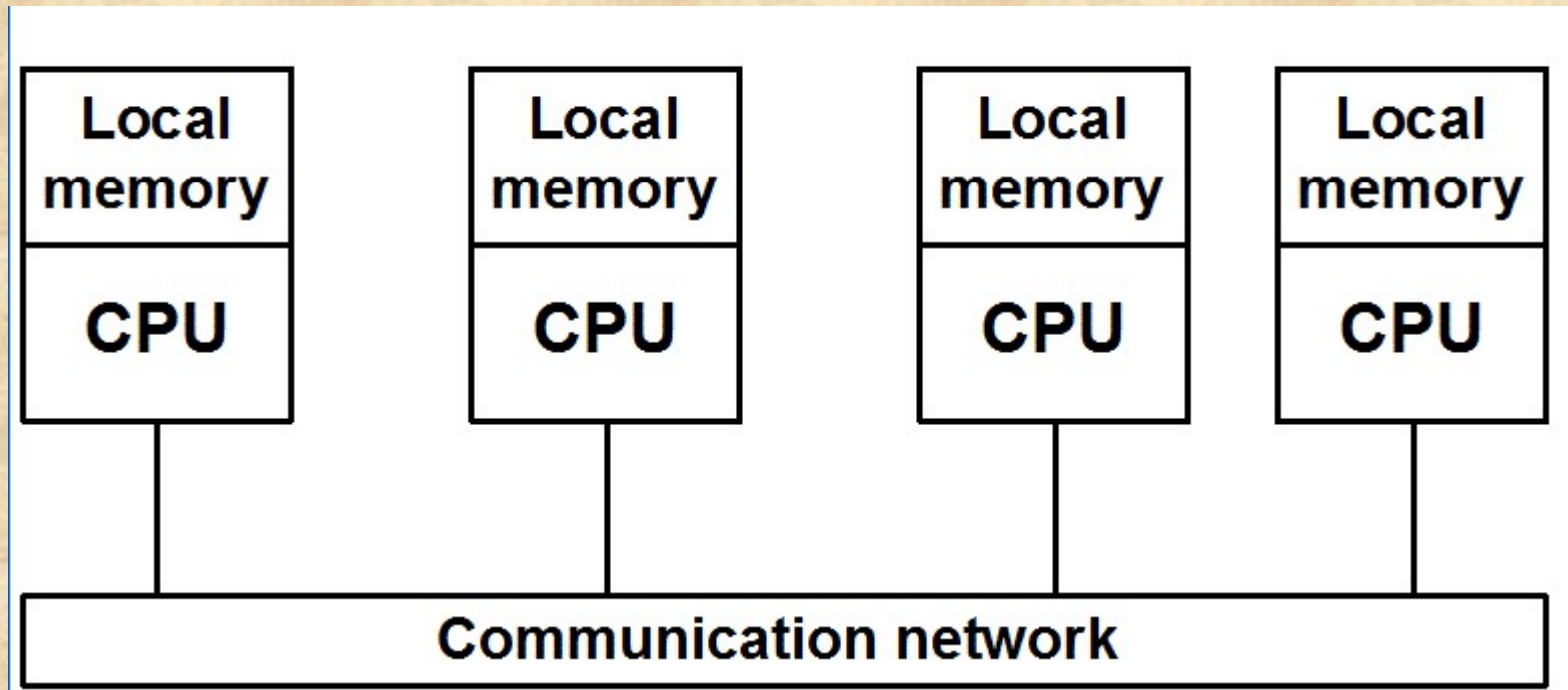
Parallel System

Tightly coupled- Shared Memory Multiprocessor System



Parallel System

Loosely coupled- Distributed memory multiprocessor system



Distributed System

- Large number of Computers connected by high speed network.
- Computers are independent , but appears to be a single unit.
- Users can work from any independent computer.
- The application can run on any of the member computers in the system depending on the availability and workload.
- Load balancing....single file system, Eg: ATM
- Advantages: data sharing, device sharing, communication, even workload distribution.
- Disadvantages: delayed communication and security

Real Time system

- It is the one which responds to real time events or inputs within a specified time limit.
- Eg: satellite control system, robots, air traffic etc....
- A real time system must work with a guaranteed response time depending on the task, otherwise the application must fail.
- Two types
 - Hard real time: must meet deadline to avoid damage
 - Soft real time: have deadline but failures don't make great loss

Real Time systems

- **Hard real time systems**
 - Aircraft
 - Airport landing services
 - Nuclear Power Stations
 - Chemical Plants
 - Life support systems
- **Soft real time systems**
 - Multimedia
 - Interactive video games