



BCA

SEMESTER – 3

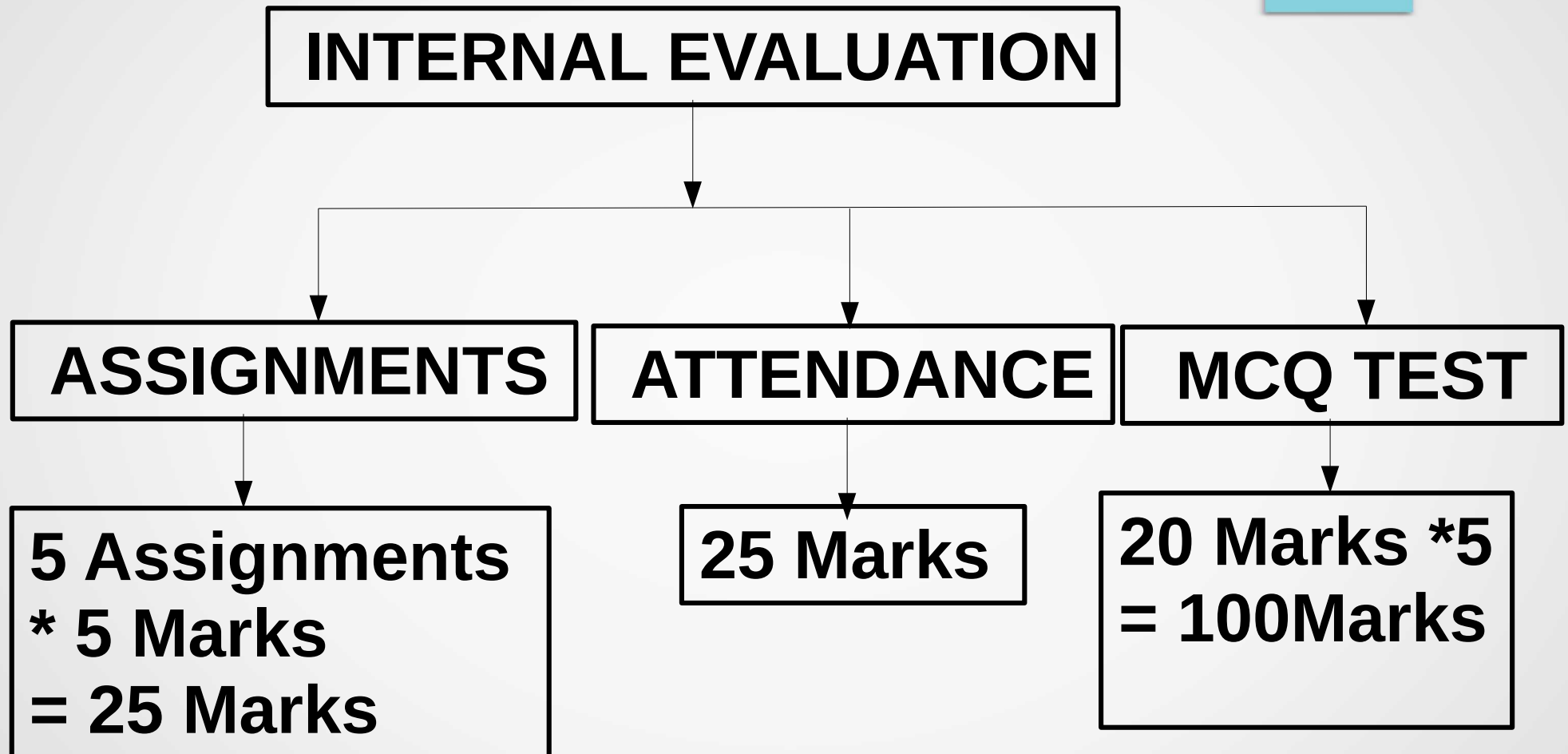
0301304

FUNDAMENTAL OF OPERATIONG SYSTEM

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UNIT	MODULES	WEIGHTAGE
1	INTRODUCTION TO OPERATING SYSTEM	20 %
2	PROCESS MANAGEMENT	20 %
3	PROCESS COMMUNICATION AND SYNCHRONIZATION	20 %
4	MEMORY MANAGEMENT	20 %
5	FILE MANAGEMENT , DISK MANAGEMENT , SECURITY AND PROTECTION	20 %

INTERNAL EVALUATION



TEXT BOOK

- Principles of Operating systems
 - Publisher : - Oxford
 - Author : - Naresh Chauhan

UNIT -1 INTRODUCTION TO OS

- Defination of Operating System
- Need for Operating System
- Types of Operating System
- Functions of Operating System

UNIT -1 Introduction

- The **power of computing** has changed the lives of common people in the last two decades.
- Every one need the computer to fulfill their requirement.
- Now a day Mobile have also double up as **mini computer called “*Smart Phone*”**.
- Do you think that the **hardware performs all these** functionalities for you?

No

- In the History of computer system every work was done manually.
- Manually work was **not efficiency** .

UNIT -1 Introduction

- So software was designed which worked on the hardware.
- This software did all the **functionalities that need to be performed on the hardware on behalf of the user.**
- **This software that operates the computer system is known as “*Operating System*” (Os).**
- It **acts as a layer** between the user and the hardware and provide friendly environment for the user.

UNIT -1 Defination of OS

- *“The low-level software that supports a computer's basic functions, such as scheduling tasks and controlling peripherals”.*
- OS work in the back ground without letting us know who is doing the job like Managing Devices, Cotrolling tasks, Communication with different devices and computers, storing data etc.
- OS has also been changed from time to time in the past due to advance in technolgoies and computer architecture.

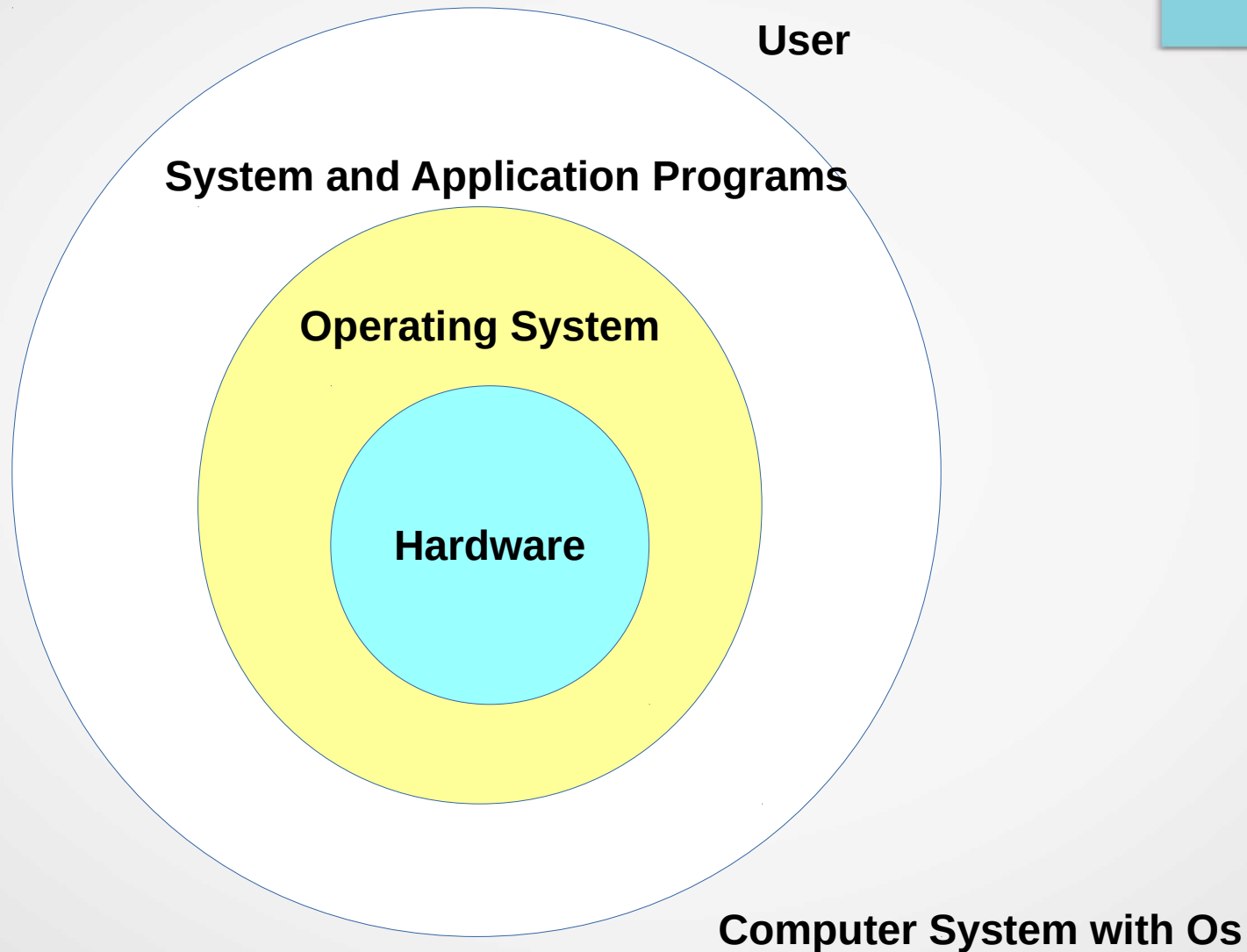
UNIT -1 Need for Os

- While saving and running a program in file, **which part of the computer system that allocates memory to the file?**
- How are the files as a logical concept **mapped to the physical disk?**
- We can **open many windows at a time**, Who manage it?
- Who ensure that the **CPU is not sitting idle?**
- Who detects **error like “out of run memory”?**

UNIT -1 Need for Os

- Who **Schedules tasks** for the CPU to execution?
- Who **manage printing on LAN Printer**?
- Who **protect the user's area** from unauthorized access.

UNIT -1 Need for Os



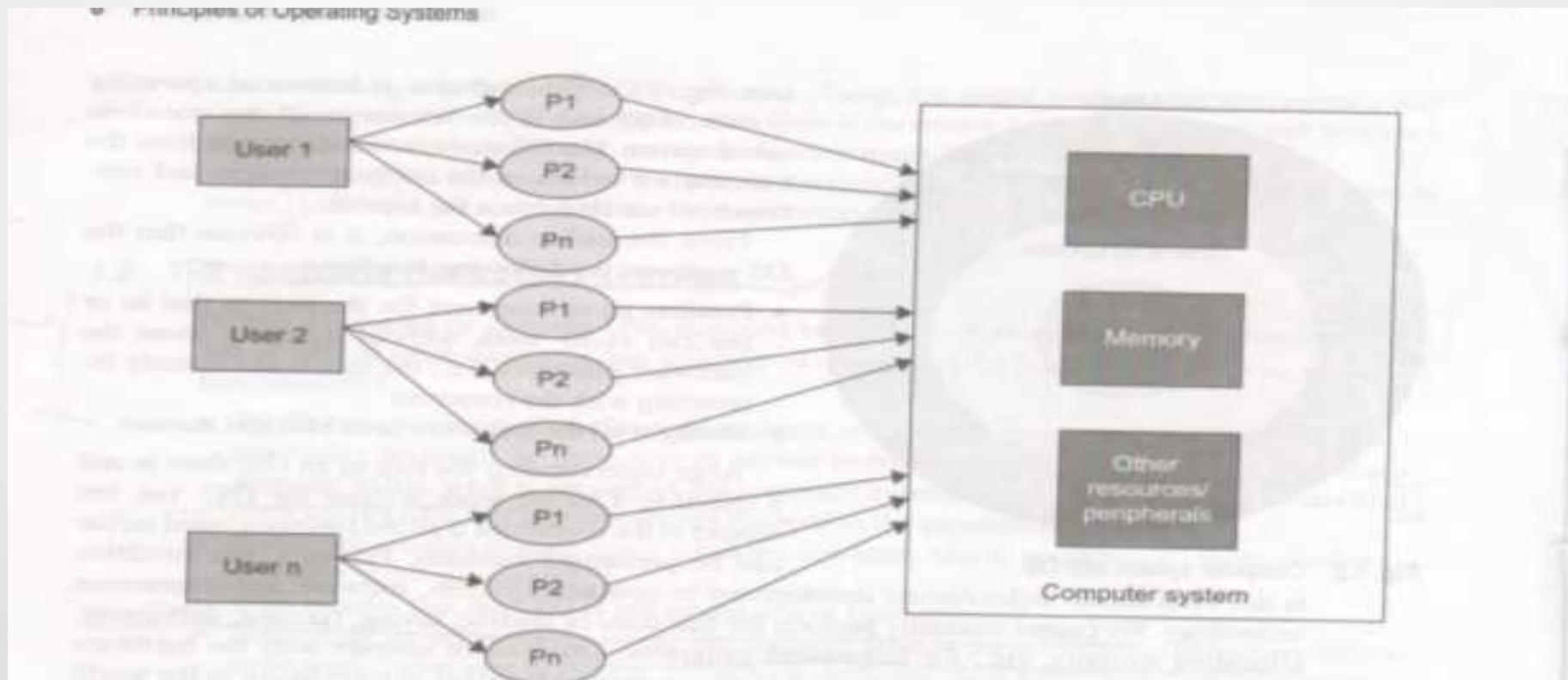
UNIT -1 OS Performs the following Functions

OS Performs the following Functions

- Present **user friendly environment** for the Users.
- **Manages all the resources** in an efficient manner.

UNIT -1 Need for Os

- The Present scenario on computer system is of **multiple users with multiple processes** to be executed on limited resources.



UNIT -1 OS Defination

- *“A software that acts as an interface between the users and hardwar of the computer system.”*
- *“A software that provides a working environment for the users's applications.”*
- *“A resource manager that manages the resources needed for all the applications in the background.”*
- *“A software in which all common fuctions required to work on the computer system have been put together.”*

Evolution of different OS

Generation	Period	Computer Architecture
First	1940s - 1950s	Vacuum Tubes based Technology (No Os), Punch Card
Second	1950s – 1960s	Transistors based technology (Delay Problem), Line Printer, COBO, FORTRAN
Third	1960s – 1980s	IC -based technology, Mini Computer (UNIX) Hard Disk, Multi Programming
Fourth	1980s - Present	LSI and VLSI based technology (DOS. WINDOW)

UNIT -1 Types of Operating Systems

- Types of Operating Systems
 - Batch Processing Systems
 - Multi – Programming Systems
 - Multi - User Time – sharing Systems
 - Multi – Tasking Systems
 - Network Operating Systems
 - Multi – Processor Operating Systems
 - Distributed Operating Systems
 - Real – Time Operating Systems
 - Embedded Operating Systems

UNIT -1 Batch Processing Systems

- The batch processing system was developed as a **result of more set-up time for execution of different types of user programs.**
- **Jobs can be combined in a batch and sent for execution** without the intervention of the user.
- Batch processing system **take a sequence of jobs in a batch and executes them one by one** without any intervention of the user.
- The main advantage of batch processing OS is it **increase the CPU utilization.**
- **Repeated jobs are done fast in batch systems** without user interaction.

Unit-1 Batch OS

- Disadvantage of Batch OS-
 - Computer operators must be **trained** for using batch systems.
 - Batch systems are **hard to debug**.
 - The other jobs will have to **wait for an unknown time** if any job fails.

UNIT -1 Multi – Programming Systems

- When a program is being performed, it is known as a **"Task", "Process", and "Job"**.
- Multi Programming **means placing several programs or jobs** in the main memory at a time.
- It means that **now several jobs are ready to be executed**,
- But **CPU can execute only one job at time**.
- How Multiple job can execute ?
 - It can be achieved with **idea of switching** between the jobs.

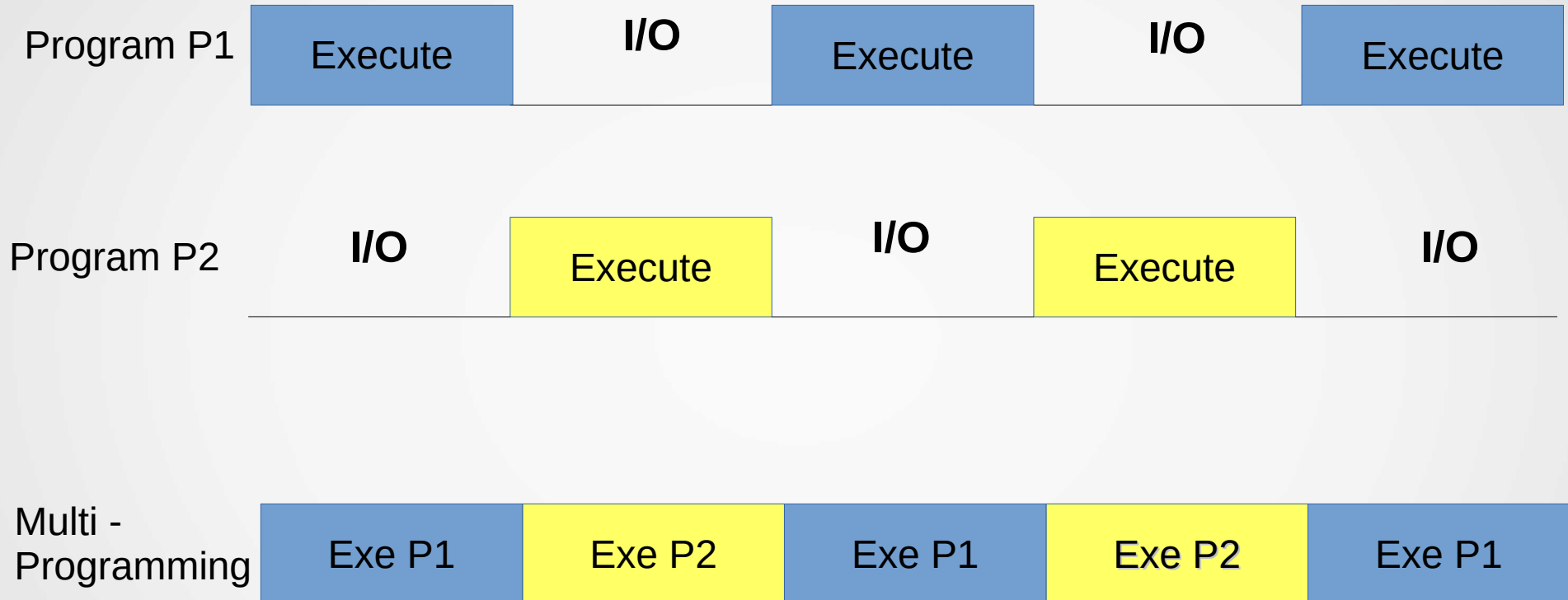
UNIT -1 Multi – Programming Systems

- There can be two type of Instruction in a programm
 - **CPU bound**
 - **I/O boud**
- CPU bound instruction means when **CPU has an instruction for processing** or computation.
- I/o bound instruction means there is a **request to an input or output device to read or write.**

UNIT -1 Multi – Programming Systems

- At the time of I/O instruction, CPU remain Idle.
- Since due to multi-programming concept **there are many jobs ready in the main memory, the CPU can switch to second job** while the first is waiting for an I/O.
- If the second job also reaches an I/O bound instruction, then CPU switches to another job and so on.

UNIT -1 Multi – Programming Systems



UNIT -1 Multi – Programming Systems

- The **major benefits of** multi programming system are
 - Less execution time
 - Increased utilization of memory
 - Increased throughput

(Throughput = number of jobs completed per unit time)
- Throughput is increased if **degree of multi programming is increase.**

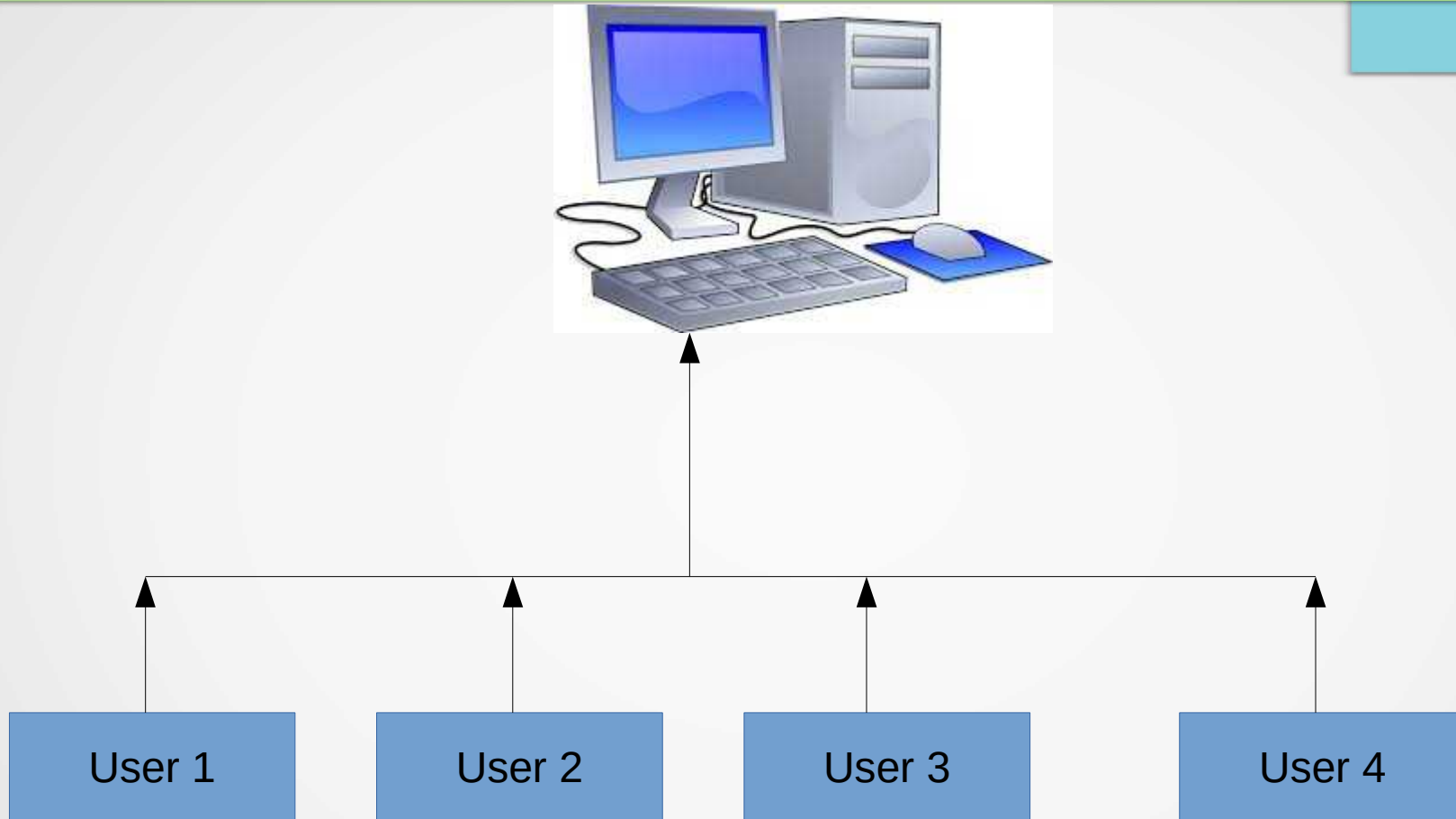
UNIT -1 Multi – User Time – Sharing Systems

- Batch and Multi-programmed systems **do not provide immediate response** to the user.
- In Multi-user time sharing system desing, where in **multiple users with their terminals (having no processors) were connected to a computer system (with processor) to perform their jobs.**
- In this arrangement, the **jobs of multiple interactive users were placed in the main memory.**
- This system was called *multiuser*.

UNIT -1 Multi – User Time – Sharing Systems

- It was also known as *time sharing* as **CPU time of main computer system was shared among multiple users** to execute their jobs.
- Multiuser time sharing system are the systems where **multiple interactive users connected through their dumb terminals access the main computer system to perform their jobs.**

UNIT -1 Multi – User Time – Sharing Systems



UNIT -1 Multi – User Time – Sharing Systems

- The **CPU switches from one job to another job on regular intervals** to have a fair distribution of its time for the users.
- The user jobs are scheduled in such a manner that **each job gets equal chance for computation.**

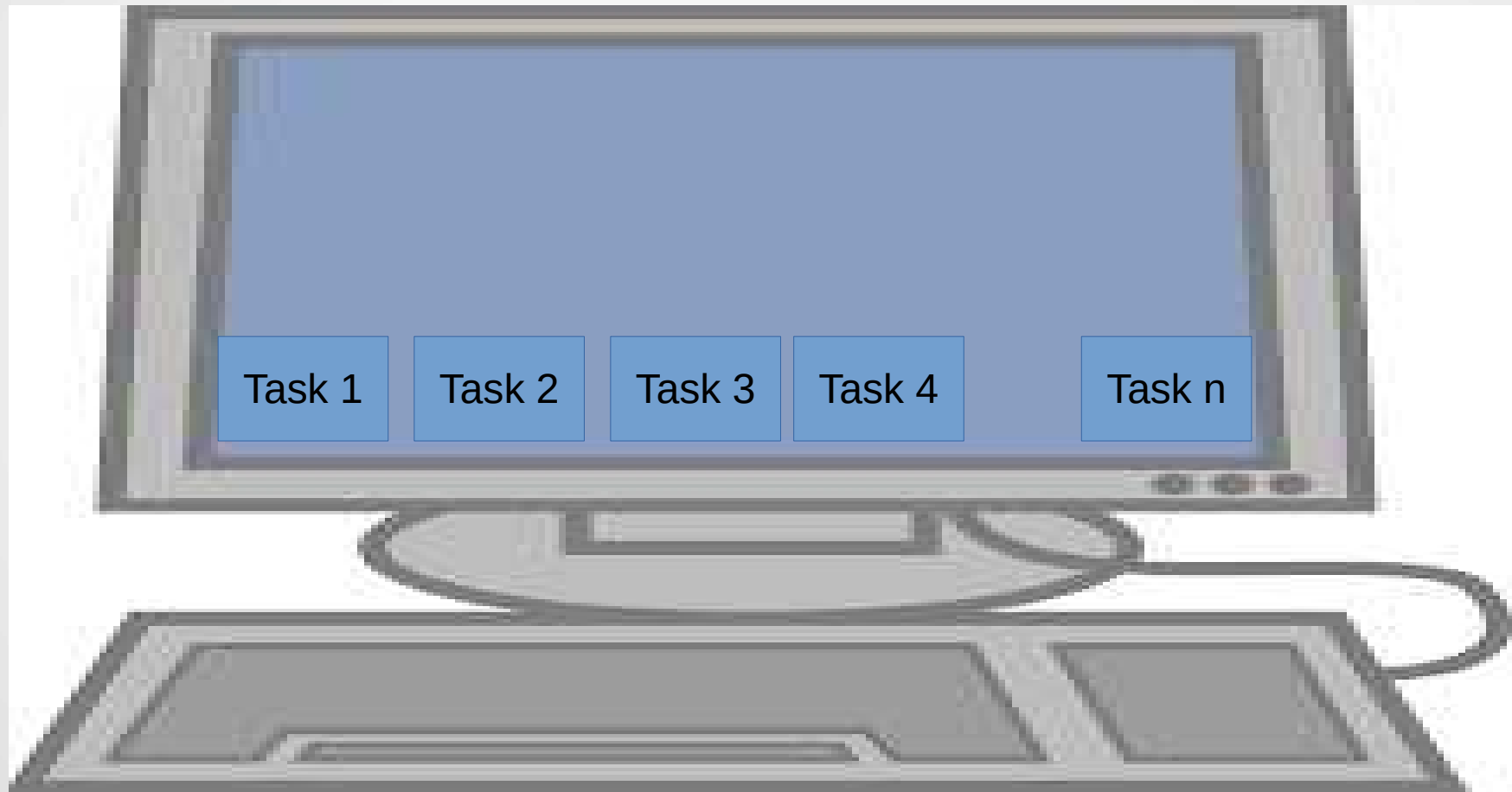
UNIT -1 Multi – User Time – Sharing Systems

- The Major benefits of multiuser time sharing systems are:
 - Multiuser facility
 - Improved Response time
 - Improved Debugging and Productivity

UNIT -1 Multi Tasking Systems

- Window was developed for personal computers such that a **single users working on a PC can open multiple windows.**
- In this way **user is able to open many windows or tasks** and work on them. This is known as multi – tasking.
- With the availability of high speed of processor, the user has **the illusion of working in parallel on multiple tasks.**
- But **it is the time – sharing scheduling technique** which has made it possible.

UNIT -1 Multi Tasking Systems



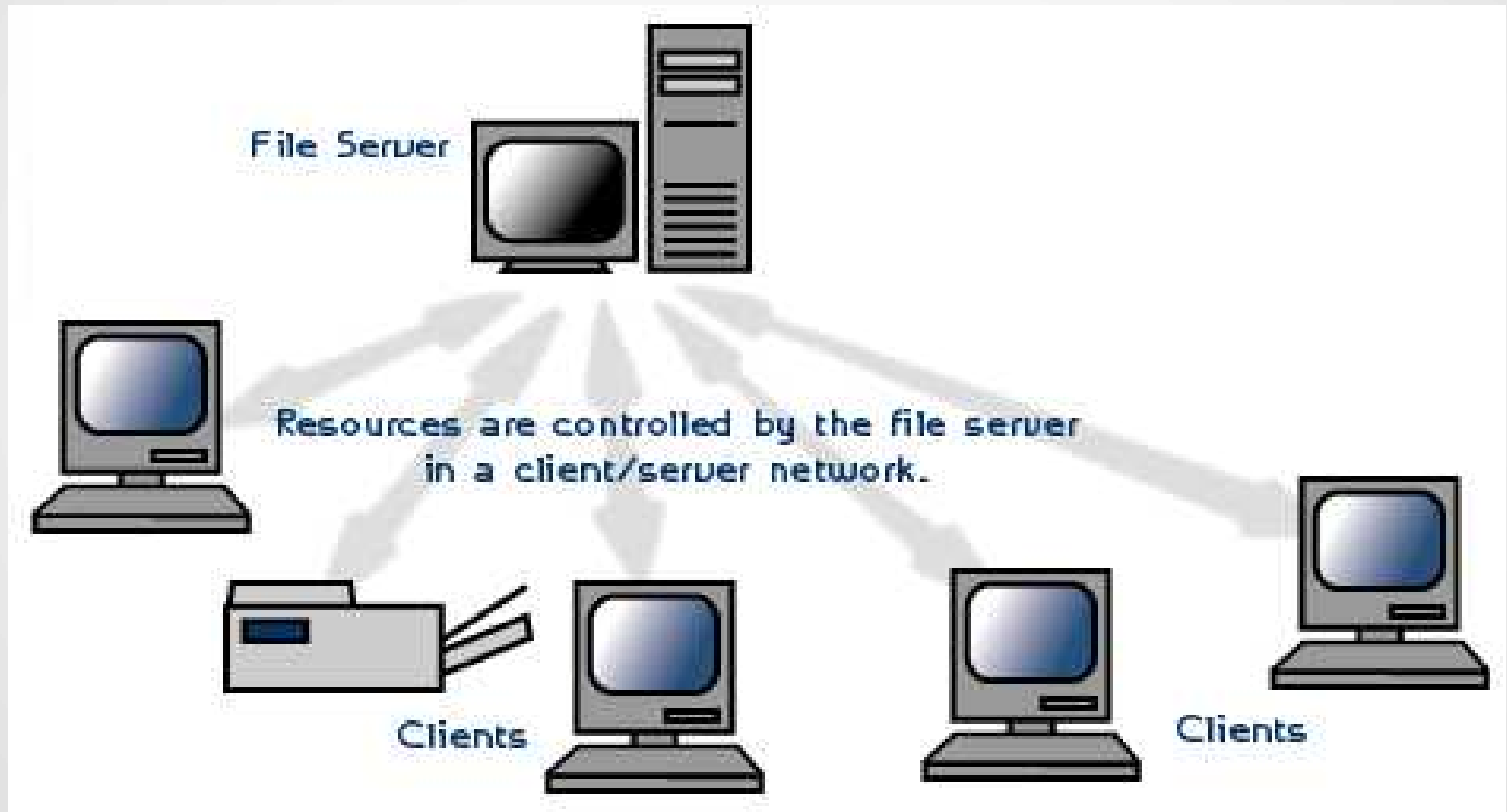
UNIT -1 Network Operating System

- Network operating system is the earliest form of operating system **that coordinates the activities on a network system.**
- In a network each node has its own local operating sytem.
- A user sitting on a node may want to work as on the local machine through its local Os or on the network system, he may do some control operations on remote node.
- Here the role of network operating system starts.

UNIT -1 Network Operating System

- The network operating system **may be considered as another layer of software on the operating system** on a local machine.
- The processes of user first contact the network operating sytem. If the operation to be performed is local on the node, the network Os passes the request to the local Os on the node.
- A **network OS also targets the resource sharing across multiple nodes of the network** where each node has its own local OS and a layer of network OS.

UNIT -1 Network Operating System



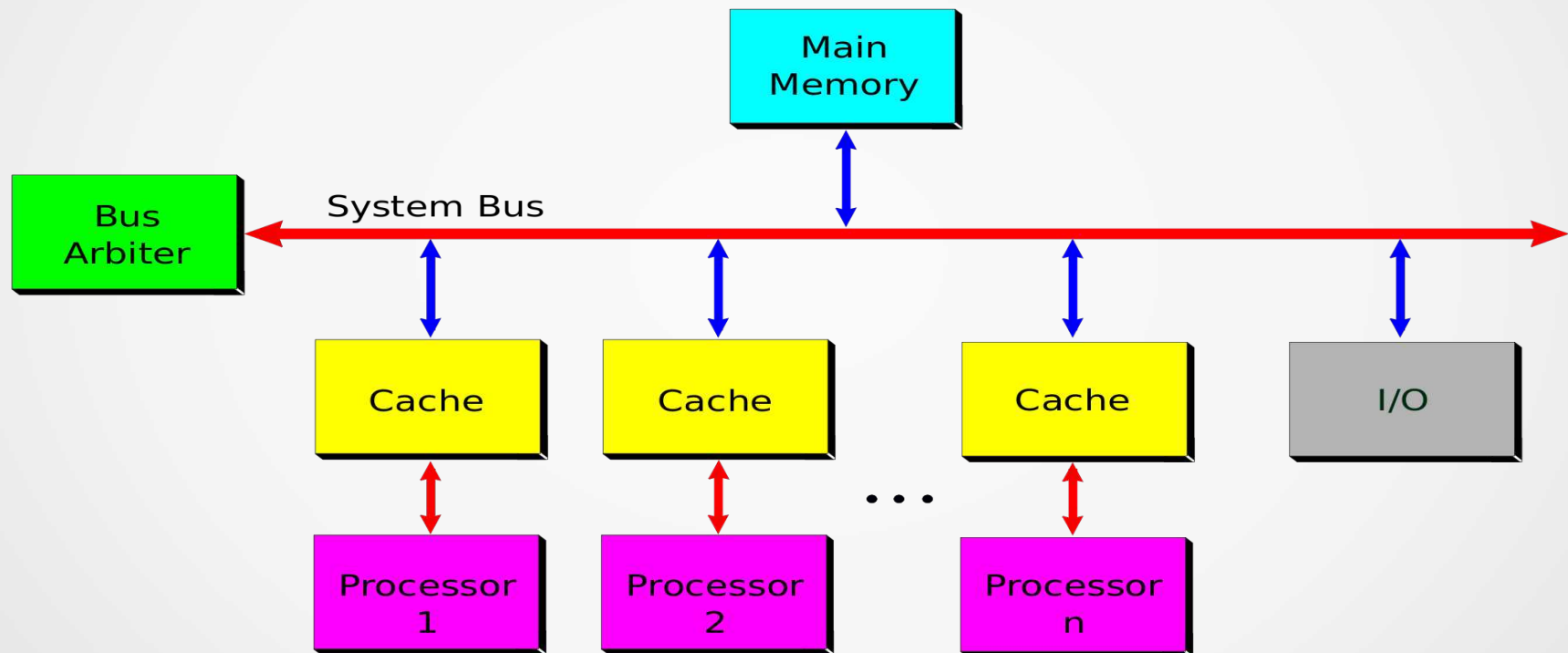
UNIT -1 Multi - Processor Systems

- With the advance in the technology, there was a desire for parallel processing with the help of **more than one processor instead of only one.**
- Multi processing systems **contain more than one processor** and share other resources.
- These types of system is **very useful for engineering and scientific application.**
- Other category of in multiprocessing environment is **mission – critical and real – time system.**

UNIT -1 Multi - Processor Systems

- In Multi Processor system environment there are multiple processors, all of them should be busy.
- **The processes should be distributed on various processors for parallel computation.**
- **The process scheduling is another challenge** as it is needed to schedule multiple processes on multiple processors.
- **The coordination of various processes should also be taken care of different inter-process communication and synchronization techniques are required.**

UNIT -1 Multi - Processor Systems



UNIT -1

- *Multi – Programming*
 - It place **more than one job/** program/ task in main memory.
- *Multiprogrammed batch systems*
 - It place more than one job in the main memory of a batch prepared for **same type of job.**
- *Multiuser system*
 - It place more than one job in the main memory **of the main computer system.** Here **jobs comes from the differen users who are connected through terminals** to the main computer

UNIT -1 Multi Tasking Systems

- *Multi - Tasking systems*
 - It place more than one job in the main memory of the system. Here **jobs are of a single user working on the system.**

UNIT -1 Distributed Operating Systems

- Distributed system are also multi – processor systems but with the following difference:
 - Distributed system works in Wide Area Network (WAN)
 - Each node in a distributed system is a complete computer having full set of peripherals including OS.
 - The users of a distributed system have an impression that they are working on a single machine.
- Resource sharing is the main motive behind distributed systems.
- This OS providing distributed computing facility employ almost same communication method and protocols as in network OS.

UNIT -1 Distributed Operating Systems

The following are **some important tasks to be met by Distributed OS.**

- Since distributed system need to access **any resource or transfer any task on any node.** There are three types of migration provided by the OS.
 - Data Migration
 - Computation Migration
 - Process migration

UNIT -1 Distributed Operating Systems

- Distributed OS must provide the **means for inter-process communication**

- **Remote Procedure Call**

A process on one node may invoke a function or procedure in a process executing on another node.

- **Remote Method Invocation**

Allow a Java process to invoke a method of an object on a remote machine.

UNIT -1 Distributed Operating Systems

- **CORBA (Common Object Request Broker Architecture)**

It is a standardized language that supports different programming languages and different Os for distributed communication.

- **DCOM (Distributed Component Object Model)**

Another standard developed by Microsoft included in Window operating system.

UNIT -1 Distributed Operating Systems

- Due to multiprocesses, **synchronization methods should** be supported by the operating system.
- **Deadlock should be handled by Os.**

UNIT -1 Real Time Operating System (RTOS)

- A **RTOS response to a user request has to be immediate or within a fixed time frame** otherwise the application will fail. This is known as real-time OS.
- This type of processing is largely **useful in defence application which are mission specific.**
- It there is no timely response, there might be loss of equipment and even life.
- Many defence applicaions like guded missile system, air traffic control sytems etc.

UNIT -1 Real Time Operating System (RTOS)

- Real time systems are two types:
 - **Hard Real-Time**
 - **Soft Real – Time**
- The system that **have hard deadlines** and must be met are called Hard Real-Time system.
 - All Defence applications are of the this type.
- There is another type known as soft real-time system **where missing of some deadline is acceptable.**
 - In a video conferenceing system

UNIT -1 Real Time Operating System (RTOS)

- Characteristic of RTOS
 - The RTOS **schedules all tasks** according to the deadline information and ensure that all deadline are met.
 - It must **have Fault tolerance**. In case of failure of any software/hardware system should need to work continue.

UNIT -1 Embedded Operating System

- Embedded system are specialized systems that tend to have very specific tasks.
- Embedded system also have operating systems but they are not generalized ones.
- The user uses the devices without any awareness of Operating system.
- Embedded operating systems are there to perform all the basic functionalities in these systems like initialization, task management, memory management etc. With little or no user interface.
- Washing Machines, Televisions and cars are other examples where these systems are being used.

UNIT -1 Embedded Operating System

- It is an operating system but not in the same structure as found in general purpose computer systems.
- Washing Machines, Televisions and cars are other examples where these systems are being used.
- Palm OS is a well known OS for Embedded system.
- Other example of Operating systems are : Symbian, iPhone, BlackBerry, Window Phone, Linux, android etc..

UNIT -1 Embedded Operating System

- Challenges for the designers of the OS for Mobile Devices are -
 - All the mobile devices have a **very small memory**. So the memory must be managed efficiently.
 - All the devices **have a slow power CPU as faster CPU** will require more power and there by a larger battery.
 - Devices like mobile phones and smartphones have a **small screen area**. So the contents should be mapped to the available size of the display screen.

Types of Operating System

Types of Operating System	Features	Example
Batch Systems	More than one job can be stored in main memory	FORTTRAN
Multiuser Systems	Jobs of different users who are connected to a main computer are executed through the multi programming	IBM, MULTICS, UNIX
Multi – Tasking Systems	Multiple tasks of a single user can be opened on the system through multi programming	Window

Types of Operating System

Types of Operating System	Features	Example
Network Systems	The user is able to connect to another machine and perform many operations	Novell Netware, Window NT, Window XP
Distributed Systems	When multiple nodes of a wide network realized as a powerful machine sharing the resources on the network.	Amoeba, V system, Chorus
Real – Time Systems	Used to handle time bound responses to the application	PSOS, VxWorks, RTLinux
Embedded Systems	Specialized systems with size, memory and power restrictions	Oalam Pilot, Android

UNIT -1 Functions of Operating System

- Various functions being performed by an operating system.
- The functions can be categorized as per two viewpoints:
 - **User view**
 - **System view**
- The **user view is a top-down** view of functions performed by an operating system.
- The **System view is bottom – up** view of functions performed by an operating sytem.

UNIT -1 Functions of Operating System

- User view
 - User interface
 - Program development & Execution
 - Accessing I/O operations
 - Accessing File System
 - Error Detection

UNIT -1 Functions of Operating System

- System View
 - Resource Manager
 - Control Program
 - Virtual Machine Manager

UNIT -1 Functions of Operating System – User View

- The user view is to **execute the user's task** on the computer system.
- But a user does not want to be over whelemed with the complex hardware details of the system. **He simply wants an interface between his application and the hardware.**
- He is **not concerned how the application will get resources** from the system and get executed.
- All these jobs will be done by the Operating System.
- In other words, **operating system acts as a mediator between the application and the computer system** that makes easy use of hardware and other resources without even knowing.

UNIT -1 Functions of Operating System – User View

From the user's point of view, the following are some functions performed by an operating system.

- ***User Interface***

- The operating system provides the interface to use the computer system. There are two types of interface:
 - Command – driven Interface
 - Graphical user Interface

UNIT -1 Functions of Operating System – User View

From the user's point of view, the following are some functions performed by an operating system.

- ***Program Development and Execution***
 - For executing a program, there are certain tasks like loading the program in main memory, initializing and accessing I/O devices and files, scheduling various resources etc.
 - All these program executions are performed by the operating system without the knowledge of the user.

UNIT -1 Functions of Operating System – User View

From the user's point of view, the following are some functions performed by an operating system.

- ***Accessing I/O Operations***
 - If you have **written some programs in high level language**, then you write some standard input output instructions according to the language being used.
 - You **donot care for the type of input/output devices and use only standard instructions for any type of devices**. The operating system relieves the user from details of input/output devices and accesses them on behalf of the user.

UNIT -1 Functions of Operating System – User View

From the user's point of view, the following are some functions performed by an operating system.

- ***Accessing File Systems***
 - A file is a logical concept to store the user's data or program. A User creates the file using some editor and saves and retrieves the files conveniently through the Os interface.

UNIT -1 Functions of Operating System – User View

From the user's point of view, the following are some functions performed by an operating system.

- ***Error Detection***

- While working on a computer system, one may encounter different types of errors. Either it is a hardware error or error in some user program.
- All these errors must be identified by the operating system and an appropriate action must be taken and the user should be notified through a message on the screen.

UNIT -1 Functions of Operating System – System View

- Beyond the user's convenience, most of the functionalities are performed in background by the operating system.
- These activities are to manages or utilize the hardware and other resources of the computer system.
- **Resource Manager**
 - The operating system is a program that controls the allocations of all the resources in the system.
 - Operating System schedules and manages the allocation of all resources in the computer system.
 - It is best called as a resource allocator and resource manager

UNIT -1 Functions of Operating System – System View

- **Control Program**

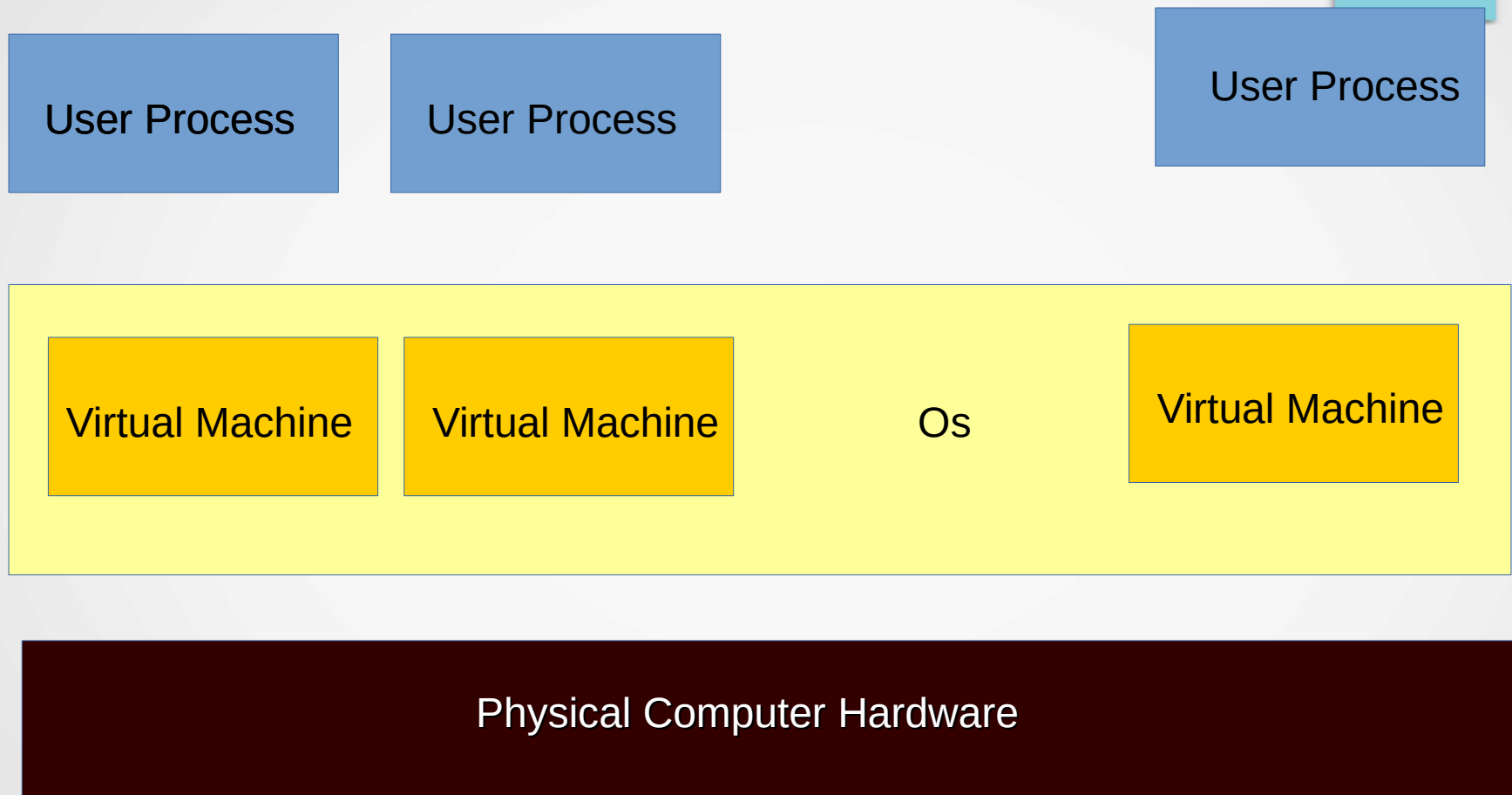
- The OS acts as a control program in the sense that it protects one user's program from another.
- It is necessary in multi-programming because a user may try to enter other user's memory and even in operating system's region.
- It does not allow the users to access any I/O devices directly as the user may misuse them.

UNIT -1 Functions of Operating System – System View

- **Virtual Machine Manage**

- A very different view to see the operating system is as a virtual machine manager.
- Operating system provides a layer on the actual hardware on which it performs the tasks of the user.
- It seem that all the work done is by the hardware.
- In other word, there is an illusion created by the operating system that there is a virtual machine that is performing all the work.

UNIT -1 Functions of Operating System – System View



Operating system as a Virtual Machine Manager



UNIT 1 COMPLETED