

## Lecture 1-2

## Operating Systems:-

A program that acts as an intermediary between a user of a computer and the computer hardware.

## Two Main Goals of Operating System:

- Primary Goal
- Secondary Goal

### Primary Goals:-

- Execute user programs and make solving user problems easier.
- Make the computer system convenient to use.

### Secondary Goals:-

- Use the computer hardware in an efficient manner.
- Throughput.

## Main Function of Operating Systems

- Resource Allocator
- Control program
- Kernel
- Ability to evolve.

Booting Process { Hard booting / ~~Reset~~ Cold booting } Bootstrap  
Soft booting / Warm booting }

# Features of Operating Systems-

- Efficiency : Minimum input give Maximum output
- Accuracy
- Effectiveness
- Reliability
- Maintainability
- Security
- Size (in term of the amount of memory).

## Open Source Operating System

- No need of licence
- Less secured
- Not friendly
- Flexibility depends on user community

## Closed Source Operating System

- Need to pay some cost
- More secured
- User friendly
- Flexibility depends on company permission

## Role of Operating Systems-

- Government
- Resource Allocator
- Control Programs



## Three types of Operating System:

- Multiusers
- Multitasking
- Multithreading

Multiusers

Two or more  
users work with  
the computer  
at the same  
time

Multitasking

Two or more  
processes running  
at the  
same time.

Multithreading

Two or more  
parts of the  
same process  
running at the  
same time

## Interrupts:-

- The execution of a process can be interrupted by an interrupt.
- An interrupt is a notification to the operating system that an event has occurred, which results in changes in the sequence of instructions that are executed by the CPU.

## Two types of Interrupts:-

- Hardware Interrupts
- Software Interrupts.

### Hardware Interrupts

- Also called external/asynchronous interrupts.
- Hardware are one in which the notification originates from a hardware device such as keyboard, mouse etc.

### Software Interrupts.

- Include exceptions and traps.
- Exceptions are triggered by an action of the process without its knowledge.



## Threads:-

A thread is the entity within a process that can be scheduled for execution. All threads of a process share its virtual address space and system resources.

Multithreading	Single Threading
OS supports multiple threads of execution within a single process.	OS does not recognize the separate concept of thread.

## Thread States:-

- Born State
- Ready State
- Running State
- Dead State
- Blocked State
- Waiting State
- Sleeping State.

Kernal Threads	User Threads.
→ Responsible for executing a specific function.	→ All thread management is done by the application
→ In-expensive	→ Scheduling is application specific
→ Independently scheduled	→ Kernal is not aware of the existence of threads

## Five States of Process:-

Process States  
→ Running  
→ Blocked  
→ Ready to run

→ New:

The process is being created.

→ Running:

Instructions are being executed.

→ Waiting:

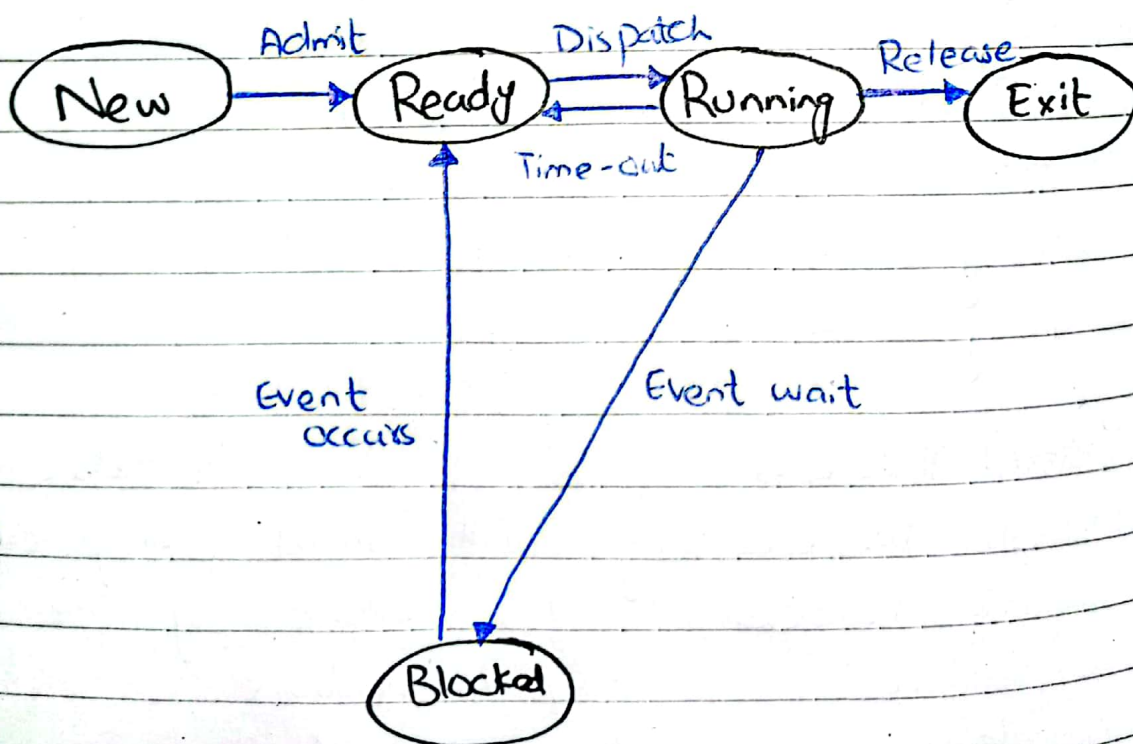
The process is waiting for some event to occur.

→ Ready:

The process is waiting to be assigned to a process.

→ Terminated:

The process has finished execution.





# Process Scheduling Queues:-

→ Job queue:

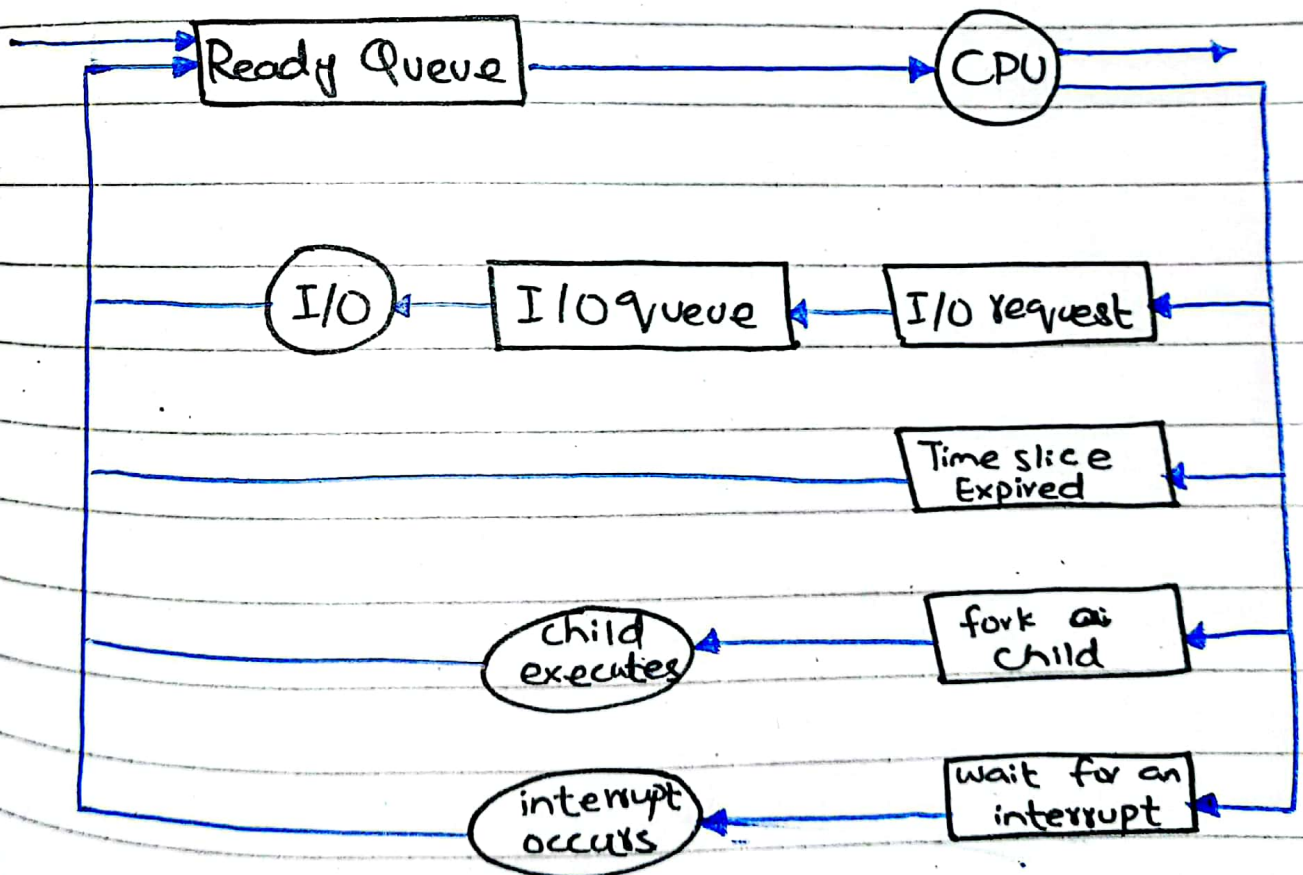
Set of all processes in the system

→ Ready queues

Set of all processes residing in main memory, ready, waiting to execute

→ Device queue:

Set of processes waiting for an I/O device



## Schedulers:-

- A process is placed in different scheduling queues throughout its life time.
- OS must select these processes from these queues in some way for scheduling process.
- The part of the OS related to this decision is called scheduler.

## Two types of Schedulers-

- Long-term scheduler (Job Scheduler)
- Short-term scheduler (CPU Scheduler).

Long-Term Scheduler	Short-Term Scheduler.
Selects which processes should be brought into the ready queue.	Selects which processes should be executed next and allocates CPU.



# CPU Schedules:

- CPU scheduling refers to the switching between processes that are being executed.
- It forms the basis of multiprogrammed systems.
- This switching ensures that CPU utilisation is maximized so that the computer is more productive.

## Two types of CPU Scheduling:

- Preemptive
- Non-preemptive

### Preemptive Scheduling

- When a process transitions from a running state to a ready state or from a waiting state to a ready state.

### Non-Preemptive Scheduling

- When a process terminates or transitions from running to waiting state.

# Dispatcher:

- The dispatcher is the module that gives a process control over the CPU after it has been selected by the short-term scheduler.

## Function of Dispatcher:

- Switching context
- Switching to user mode