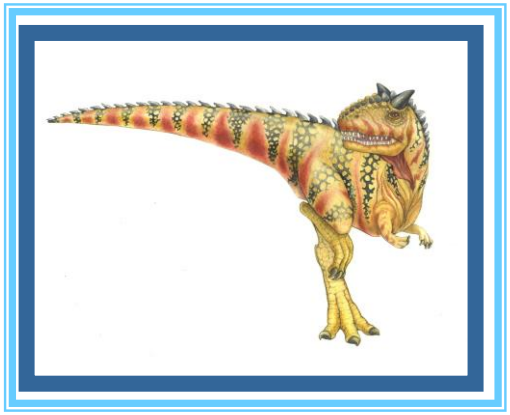
Processes
Day2: March 2022

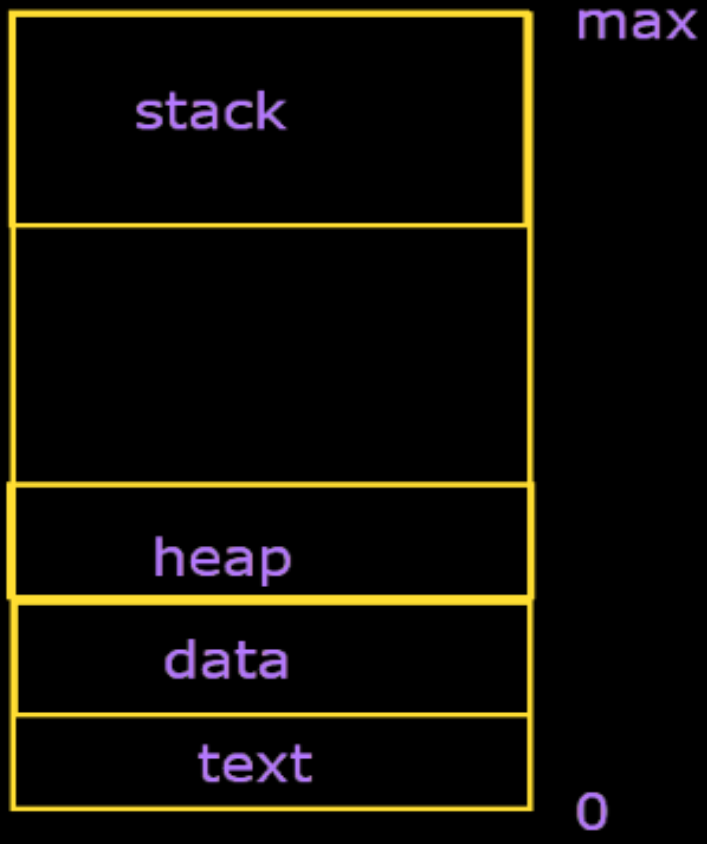
Kiran Waghmare



Process:
-instance of computer program that being executed.
-shorter lifetime.
-dynamic instance of code and data.
-RAM memory for storage
-required resources memory, cpu, Io devices,...

Process Memory

Process: a program in execution
-sequenctial fashion for execution of program
-Program include:
    -program counter
    -stack
    -data section



Process in Operating System

- A process is a **program in execution** which then forms the basis of all computation.
- The process is not as same as program code but a lot more than it.
- A process is an 'active' entity as opposed to the program which is considered to be a 'passive' entity.
- Attributes held by the process include hardware state, memory, CPU, etc.

- **Process memory** is divided into four sections for efficient working :
- The **Text section** is made up of the compiled program code, read in from non-volatile storage when the program is launched.
- The **Data section** is made up of the global and static variables, allocated and initialized prior to executing the main.
- The **Heap** is used for the dynamic memory allocation and is managed via calls to new, delete, malloc, free, etc.
- The **Stack** is used for local variables. Space on the stack is reserved for local variables when they are declared.

Process concept:

-Batch system -jobs

-Time shared systems-time slice (quantum)

-Execution:

- -program counter
- -stack
- -data section

Process state

1.New ✓

2.Running

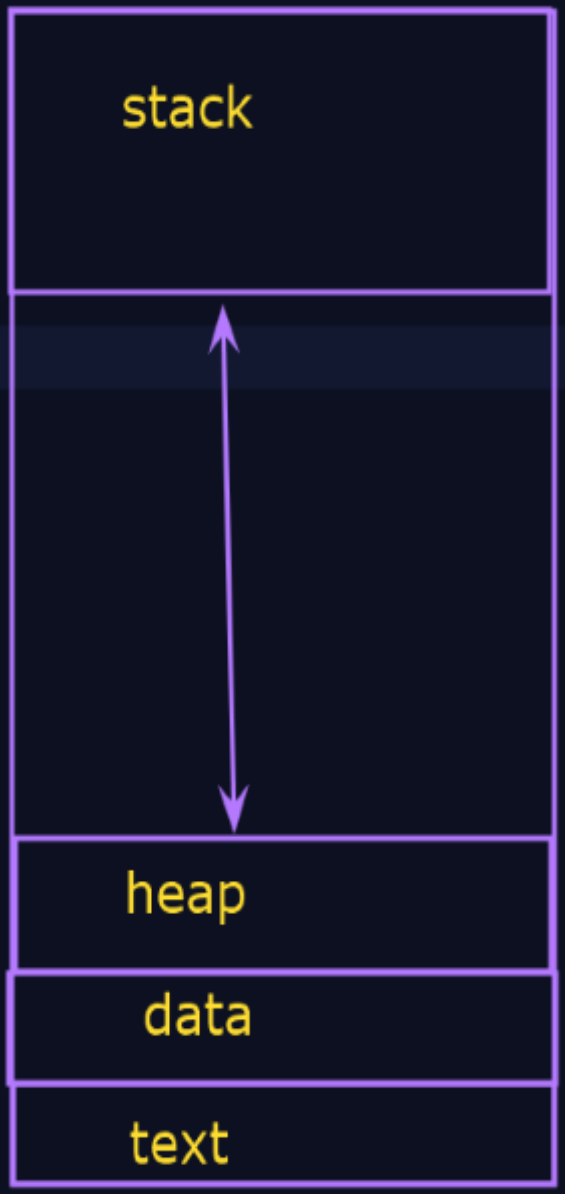
3.Waiting

4.Ready

5.Terminate

Life cycle of Process

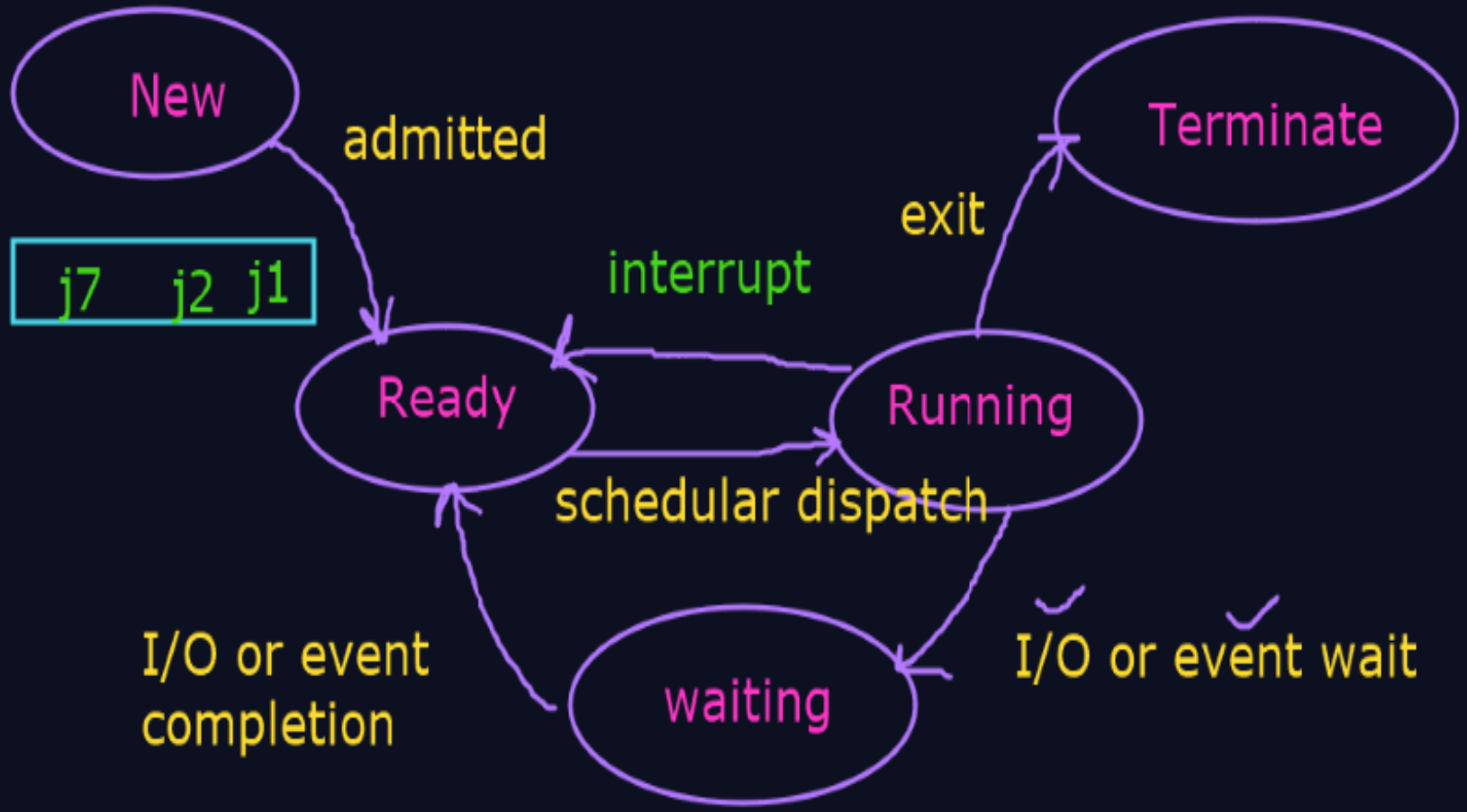
Process in memory



Process Concept

- An operating system executes a variety of programs:
  - Batch system – jobs
  - Time-shared systems – user programs or tasks
- Textbook uses the terms *job* and *process* almost interchangeably
- **Process – a program in execution; process execution must progress in sequential fashion**
- A process includes:
  - program counter
  - stack
  - data section

Process states: Life cycle of Process

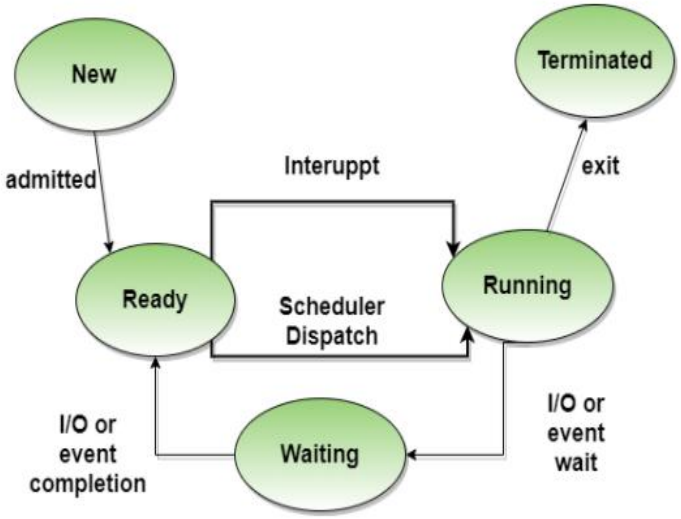


Process State

- As a process executes, it changes *state*
  - **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 processor
  - **terminated**: The process has finished execution

The different Process States

- Processes in the operating system can be in any of the following states:
- NEW- The process is being created.
- READY- The process is waiting to be assigned to a processor.
- RUNNING- Instructions are being executed.
- WAITING- The process is waiting for some event to occur(such as an I/O completion or reception of a signal).
- TERMINATED- The process has finishe

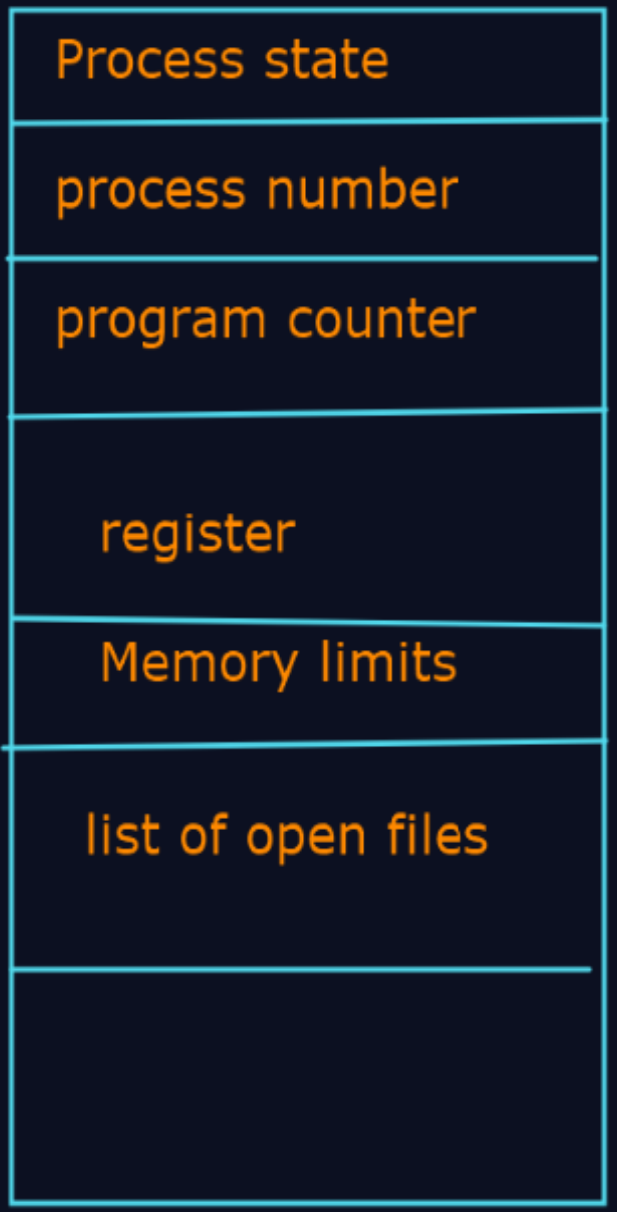


Process Control Block (PCB)

Information associated with each process

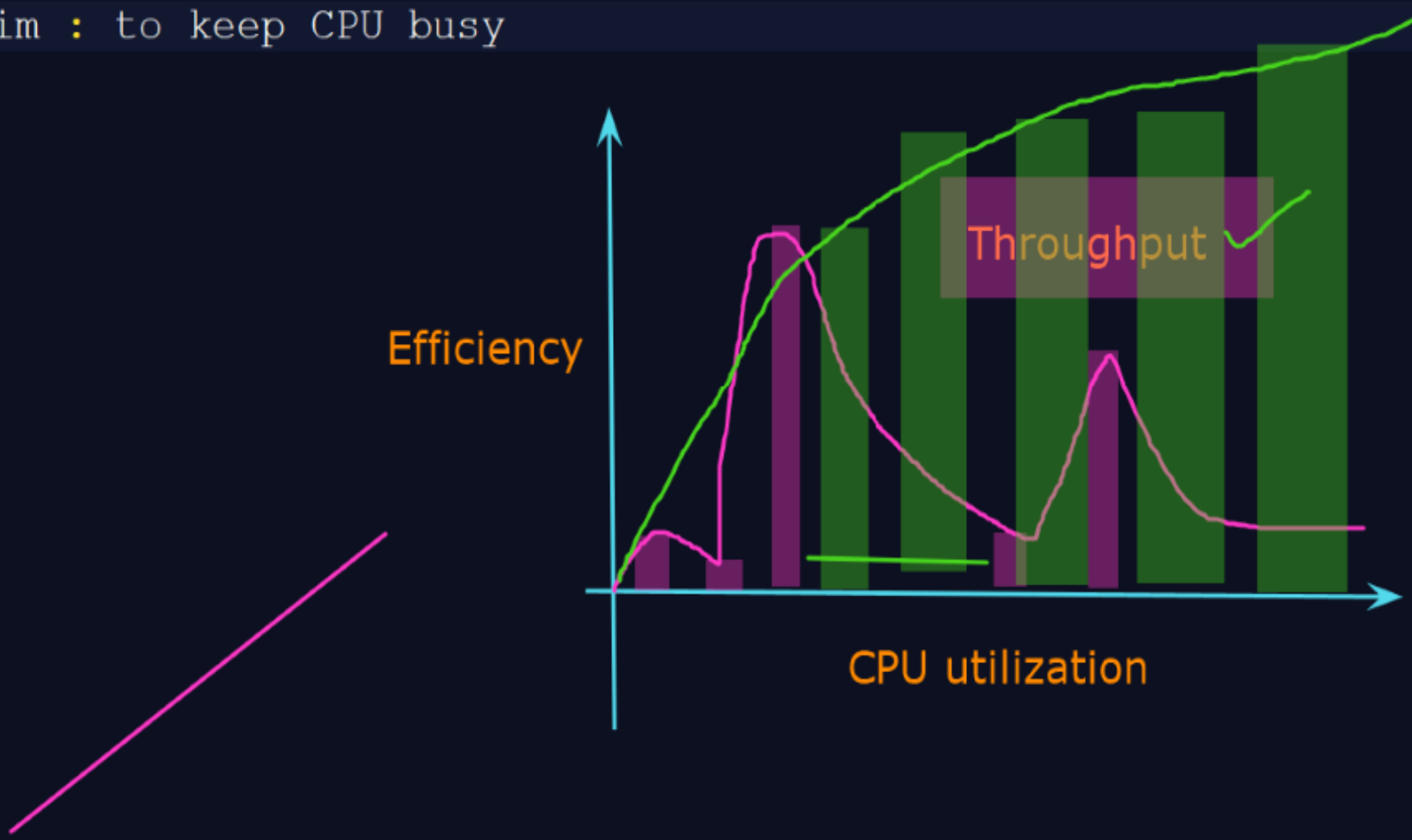
- Process state
- Program counter
- CPU registers
- CPU scheduling information
- Memory-management information
- Accounting information
- I/O status information

Process Control Block:



Process Scheduling:

- process hich is in ready state
- process will move from ready to running state(allocating CPU)
- Aim : to keep CPU busy



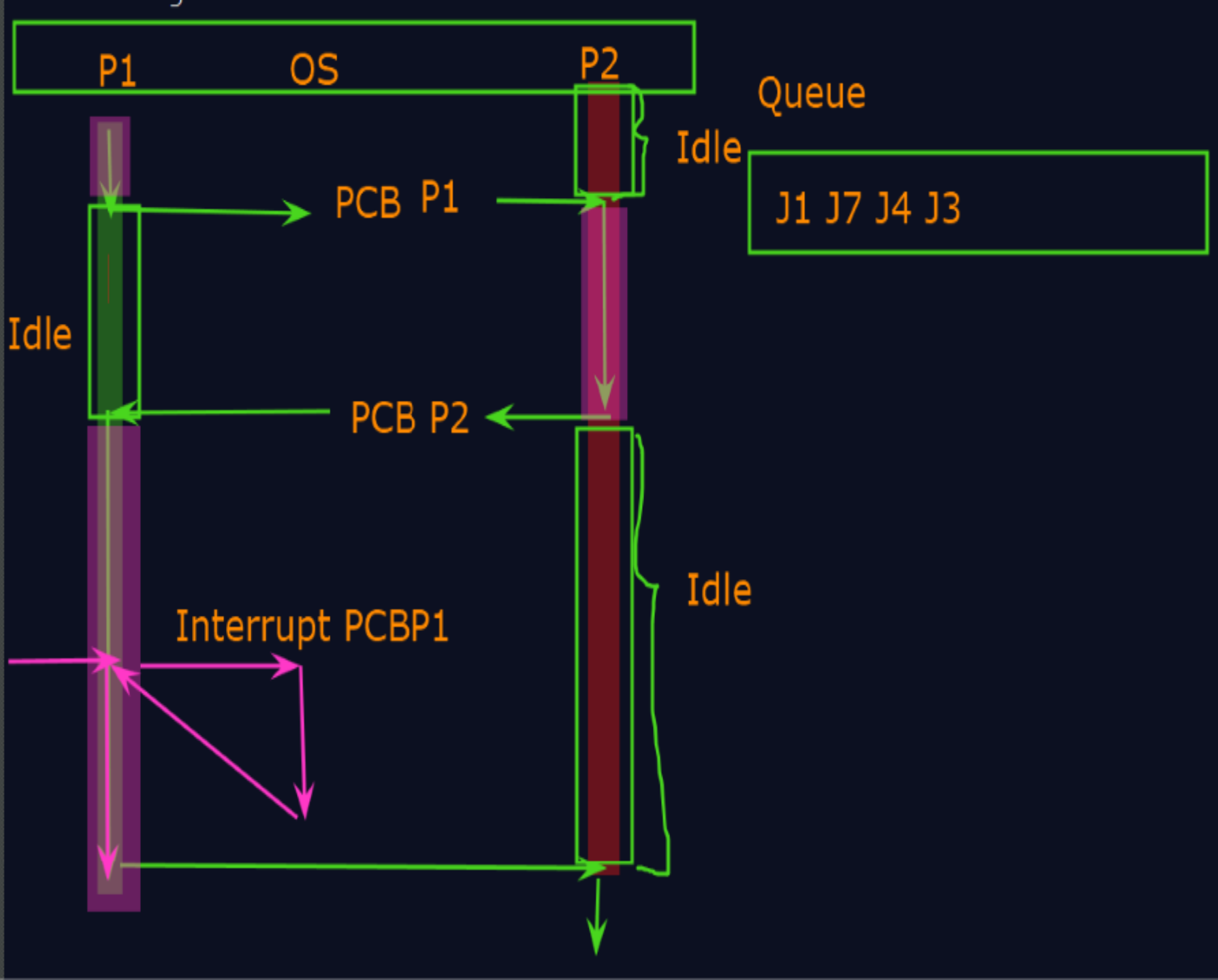
What is Process Scheduling?

- The act of determining which process is in the ready state, and should be moved to the running state is known as **Process Scheduling**.

- The prime aim of the process scheduling system is to **keep the CPU busy all the time and to deliver minimum response time for all programs**. For achieving this, the scheduler must apply appropriate rules for swapping processes IN and OUT of CPU.

Scheduling fell into one of the two general categories:

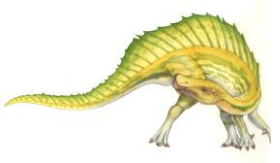
- **Non Pre-emptive Scheduling:** When the currently executing process gives up the CPU voluntarily.
- **Pre-emptive Scheduling:** When the operating system decides to favour another process, pre-empting the currently executing process.

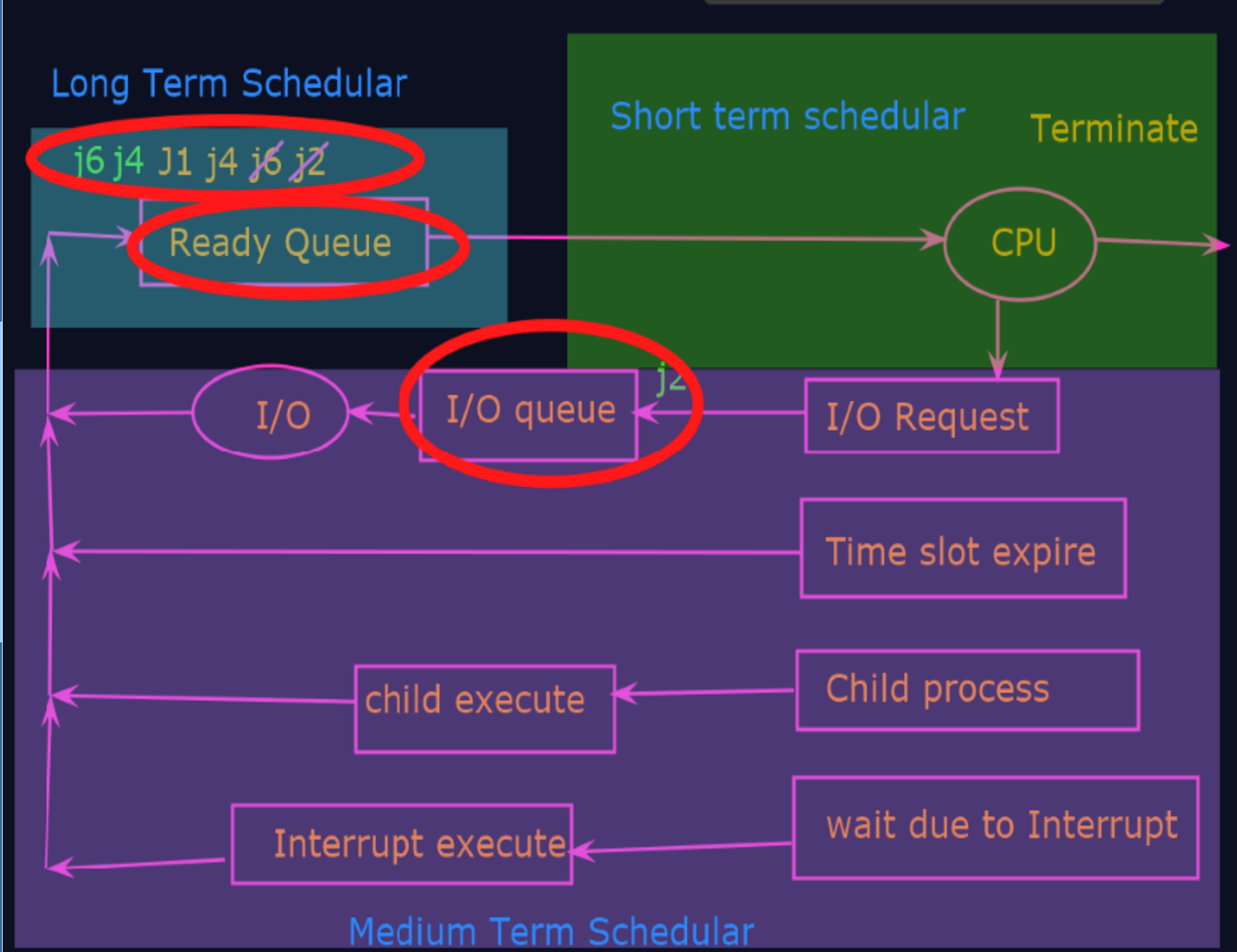

P1
OS
P2
Queue
Idle
J1 J7 J4 J3
PCB P1
Idle
PCB P2
Idle
Interrupt PCBP1

Process Scheduling

- When there are two or more runnable processes then it is decided by the Operating system which one to run first then it is referred to as Process Scheduling.
- A scheduler is used to make decisions by using some scheduling algorithm.
- Given below are the properties of a **Good Scheduling Algorithm**:

- Response time should be **minimum** for the users.
- The **number of jobs processed per hour should be maximum** i.e Good scheduling algorithm should give maximum throughput.
- The utilization of the CPU should be 100%.
- Each process should get a fair share of the CPU.




Long Term Schedular
j6 j4 J1 j4 j6 j2
Ready Queue
Short term schedular
Terminate
CPU
I/O
I/O queue
j2
I/O Request
Time slot expire
child execute
Child process
Interrupt execute
wait due to Interrupt
Medium Term Schedular

Process Scheduling Queues

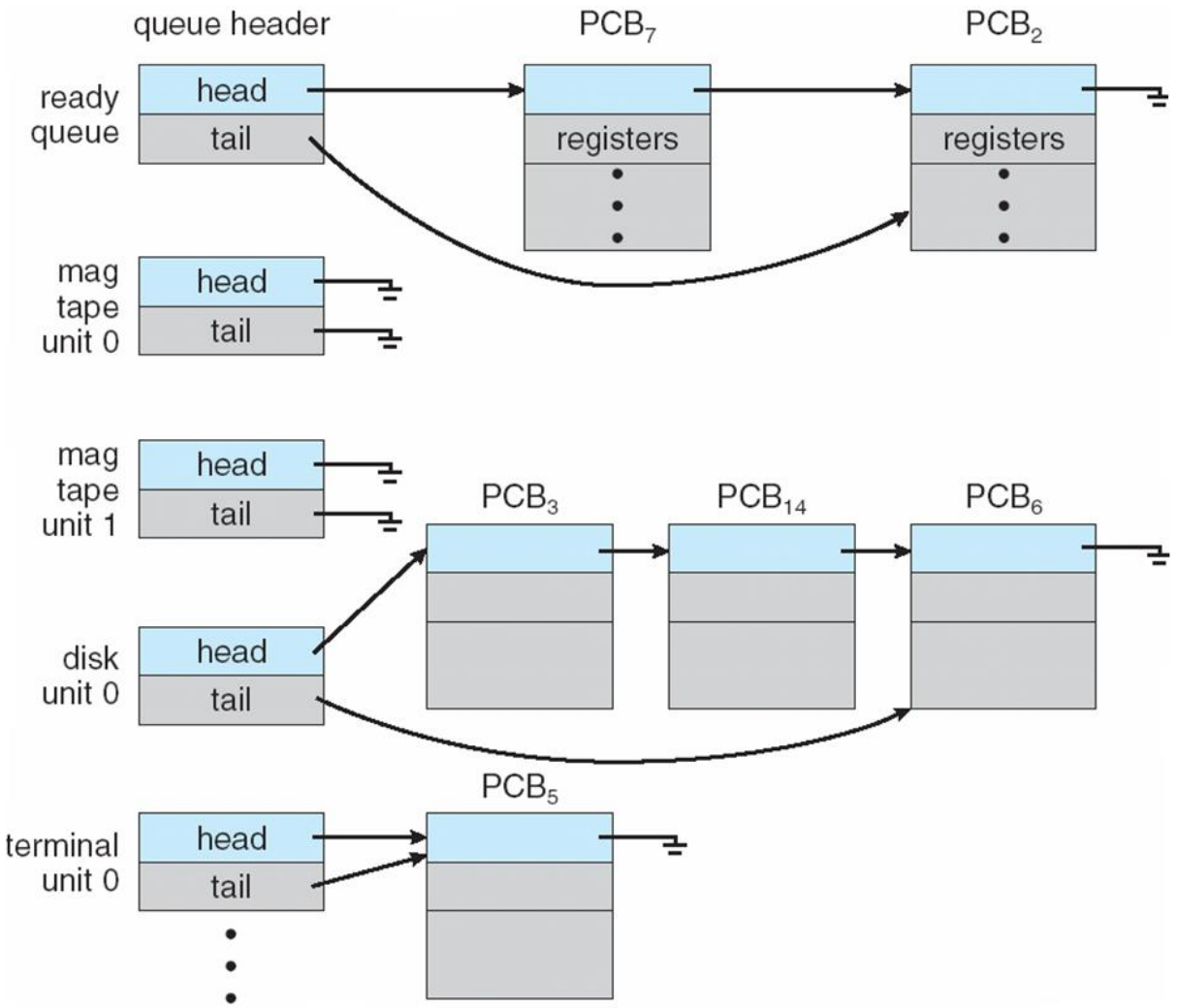
- **Job queue** – set of all processes in the system
- **Ready queue** – set of all processes residing in main memory, ready and waiting to execute
- **Device queues** – set of processes waiting for an I/O device
- Processes migrate among the various queues

What are Scheduling Queues?

- All processes, upon entering into the system, are stored in the **Job Queue**.
- Processes in the Ready state are placed in the **Ready Queue**.
- Processes waiting for a device to become available are placed in **Device Queues.** There are unique device queues available for each I/O device.
- A new process is initially put in the Ready queue. It waits in the ready queue until it is selected for execution(or dispatched). Once the process is assigned to the CPU and is executing, one of the following several events can occur:

- The process could issue an I/O request, and then be placed in the I/O queue.
- The process could create a new subprocess and wait for its termination.
- The process could be removed forcibly from the CPU, as a result of an interrupt, and be put back in the ready queue.

Ready Queue And Various I/O Device Queues



Types of Schedulers

- There are three types of schedulers available:

- Long Term Scheduler
- Short Term Scheduler
- Medium Term Scheduler