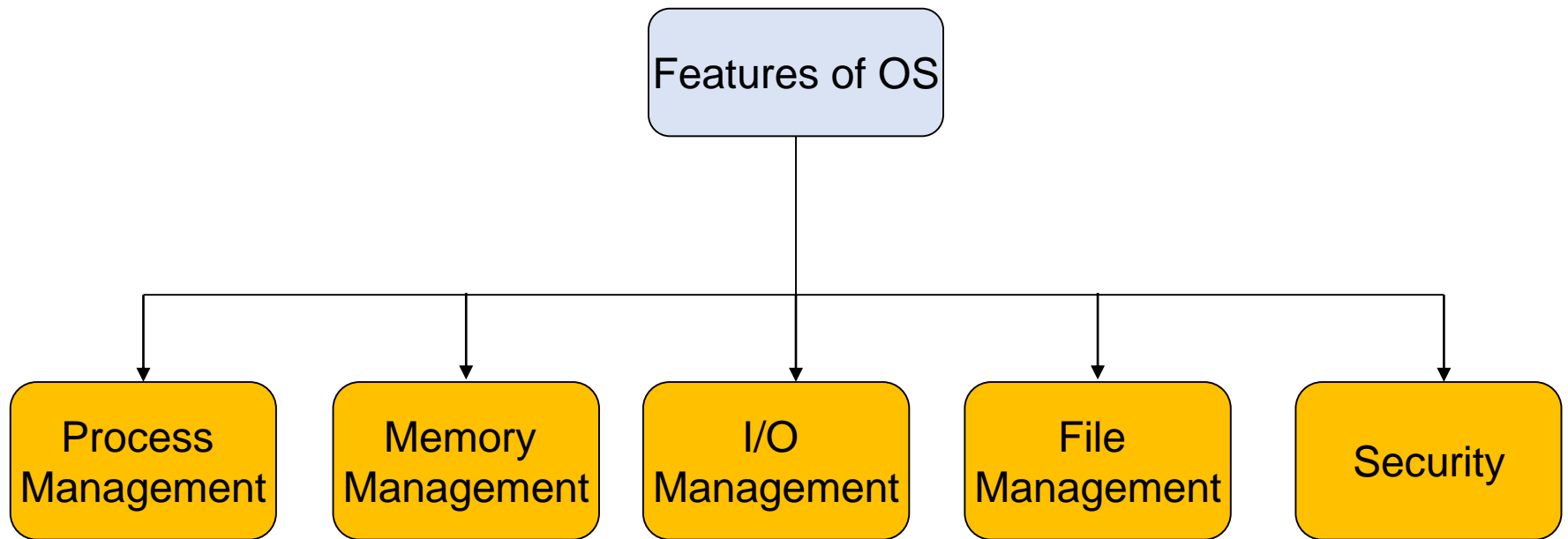
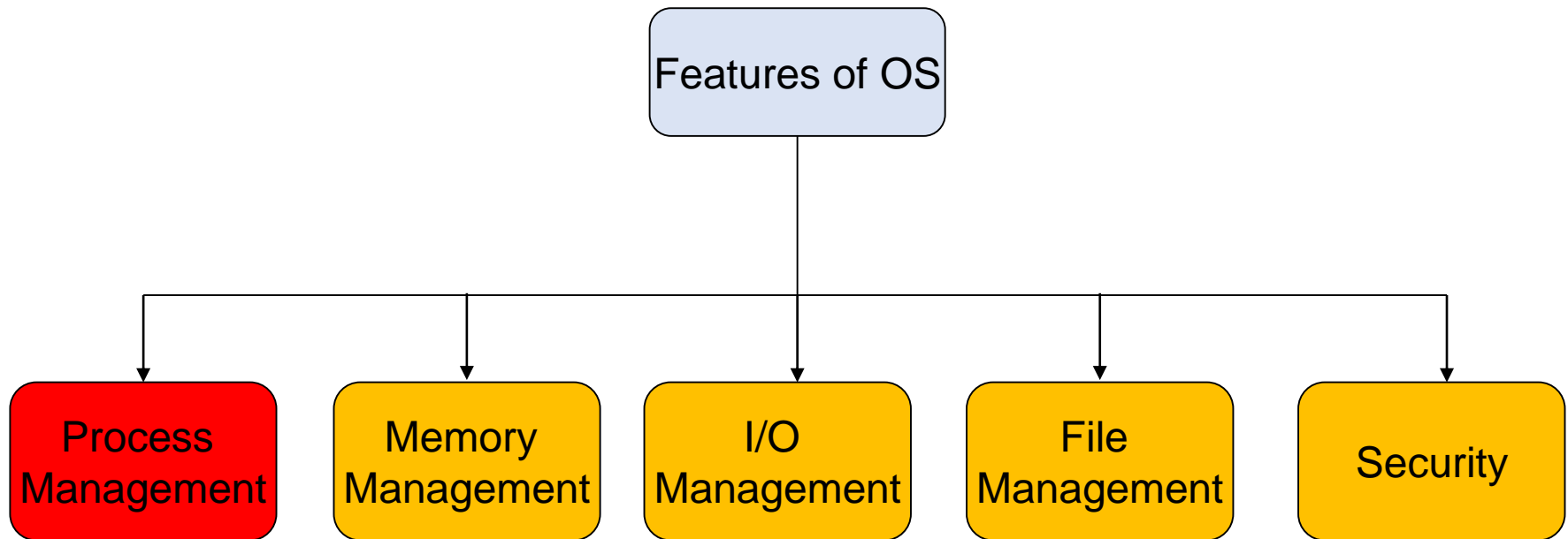


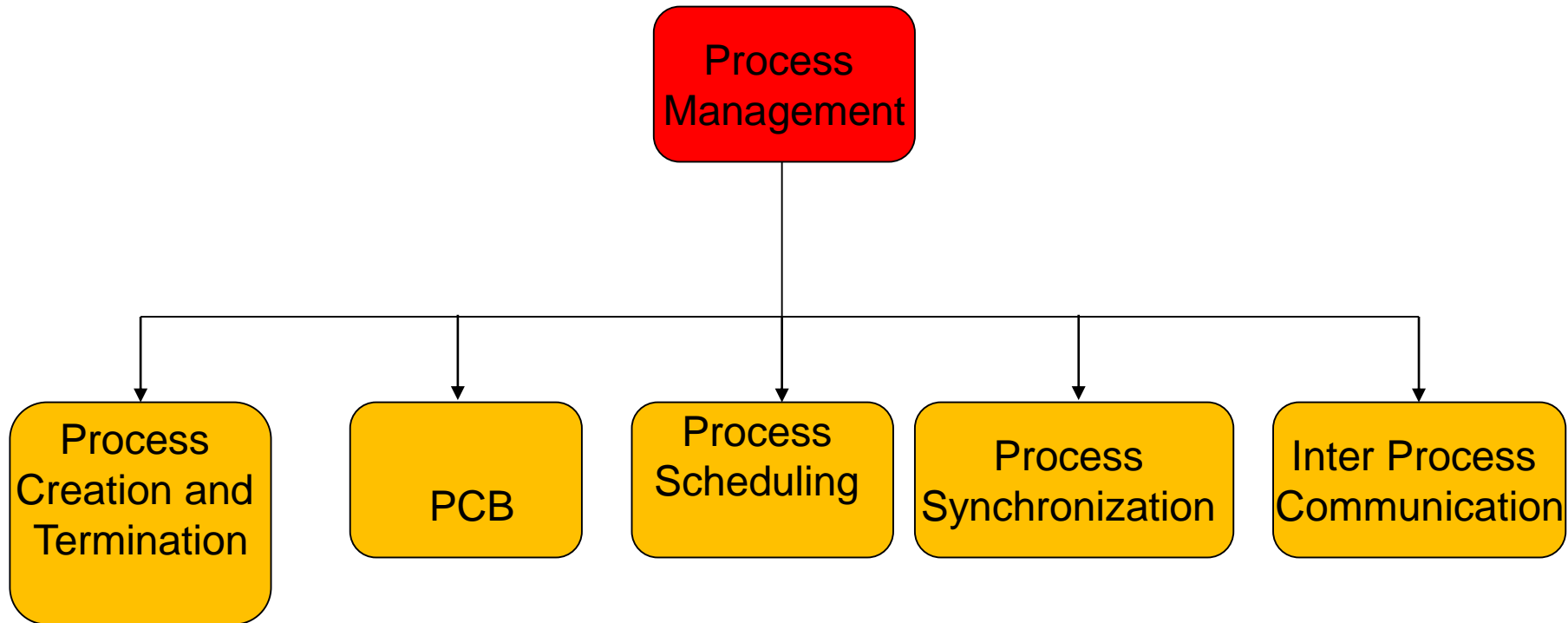
# Features of OS



# Features of OS



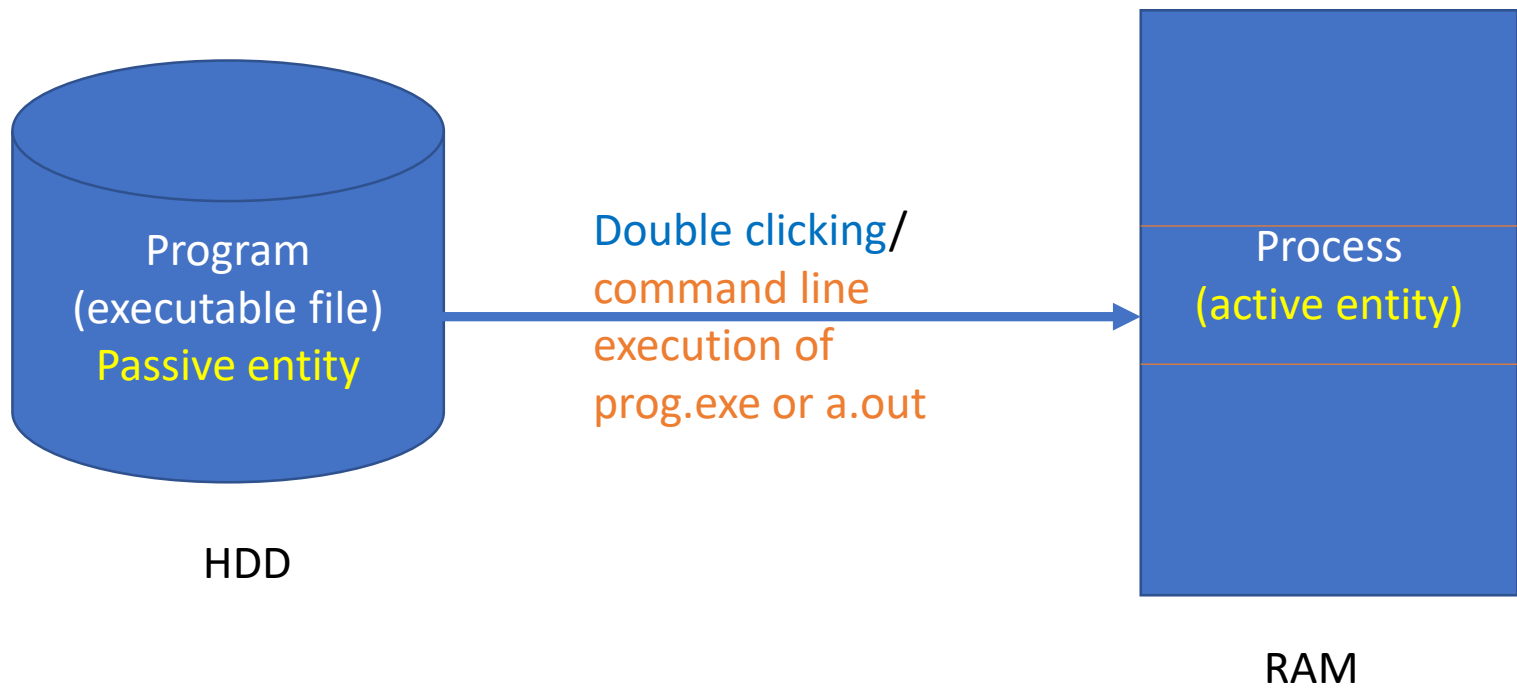
# Jobs of OS in Process Management



# Process Concept

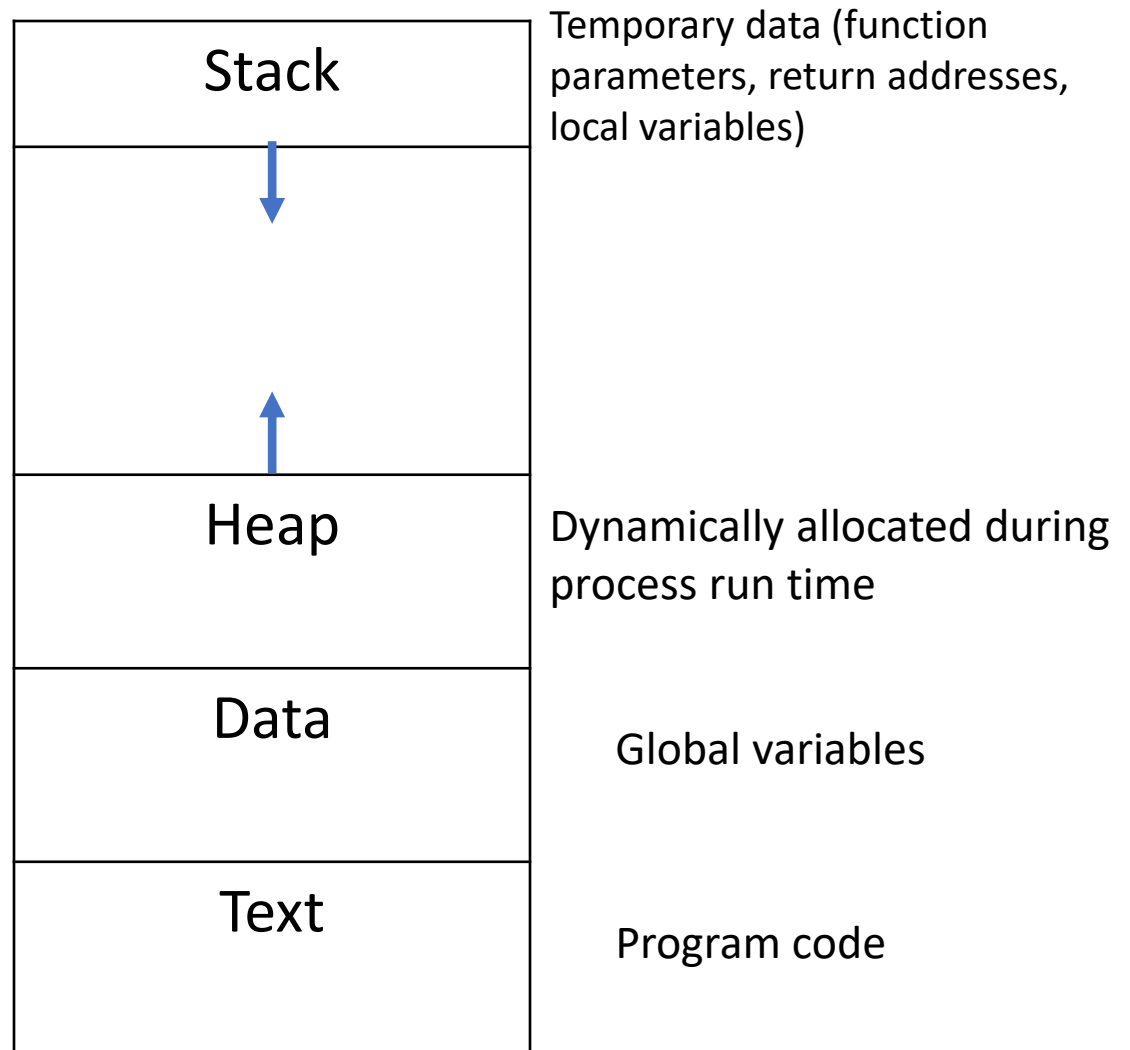
# Process Concept

- 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;



A process includes:

- program counter
- stack
- data section
- text section



*Process in memory*

# 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



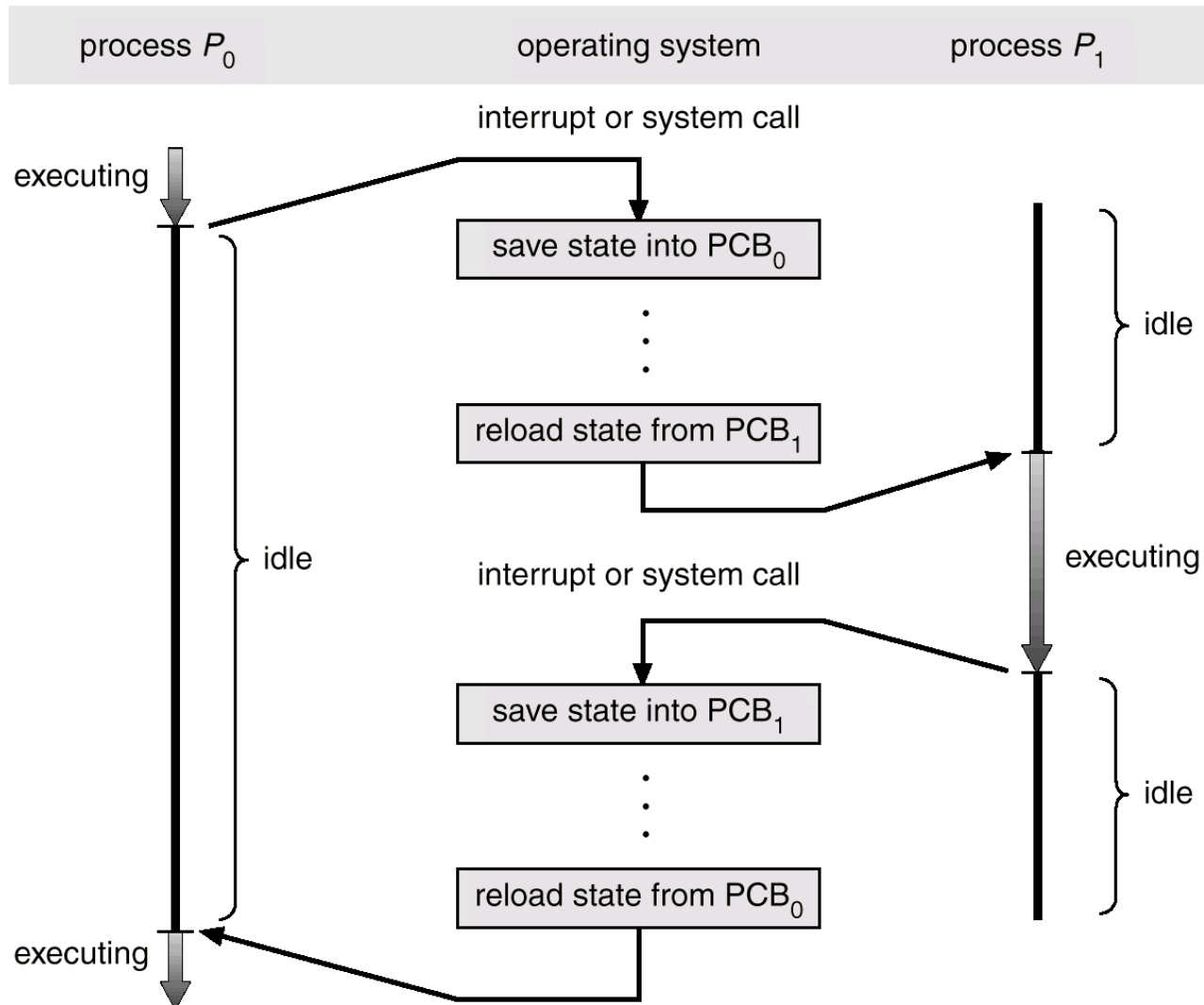
# Process Control Block (PCB)

Stack **pointer**: required to be saved when the process is switched from one state to another to retain the current position of the process.

Accumulator, base, **registers** and general purpose **registers**.

pointer	process state
process number	
program counter	
registers	
memory limits	
list of open files	
• • •	

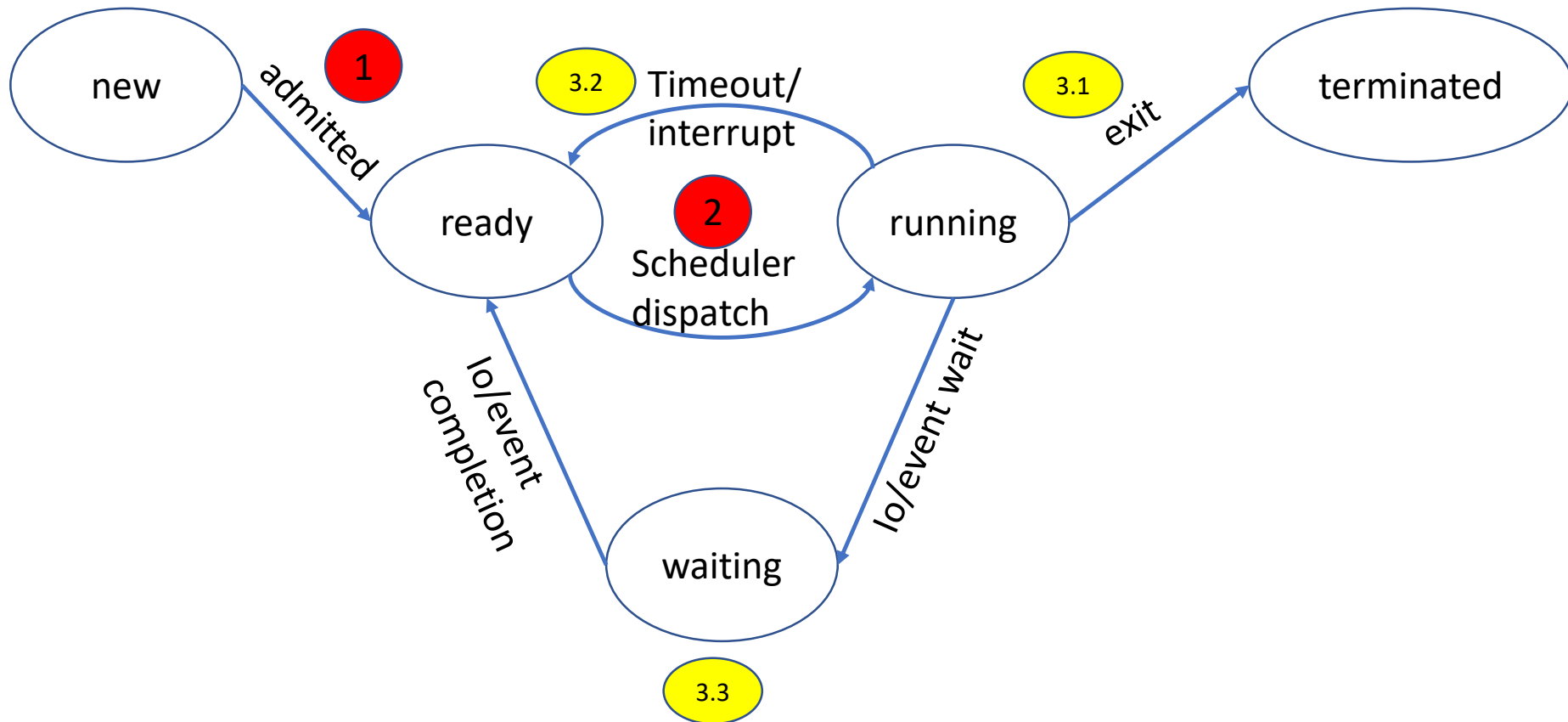
# CPU Switch From Process to Process



# Process State

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

# Diagram of Process State



# Process scheduling queues

(1)

JOB QUEUE

As processes enter the system, they are put into a **job queue**, which consists of all processes in the system.

(2)

READY QUEUE

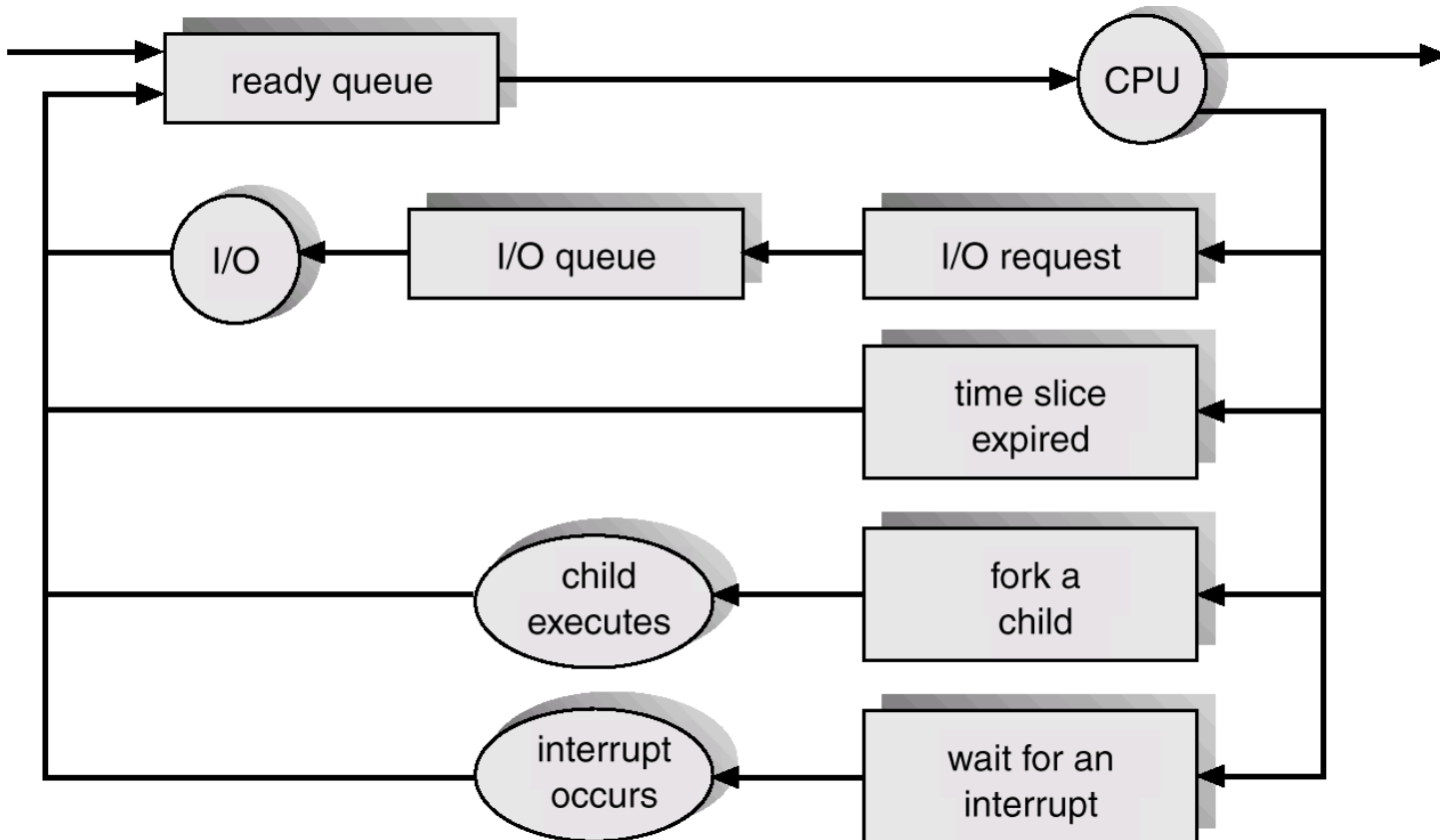
The processes that are residing in main memory and are ready and waiting to execute are kept on a list called the **ready queue**.



(3) Device queues – set of processes waiting for an I/O device.

Process migrates between the various queues.

# Representation of Process Scheduling



# Schedulers

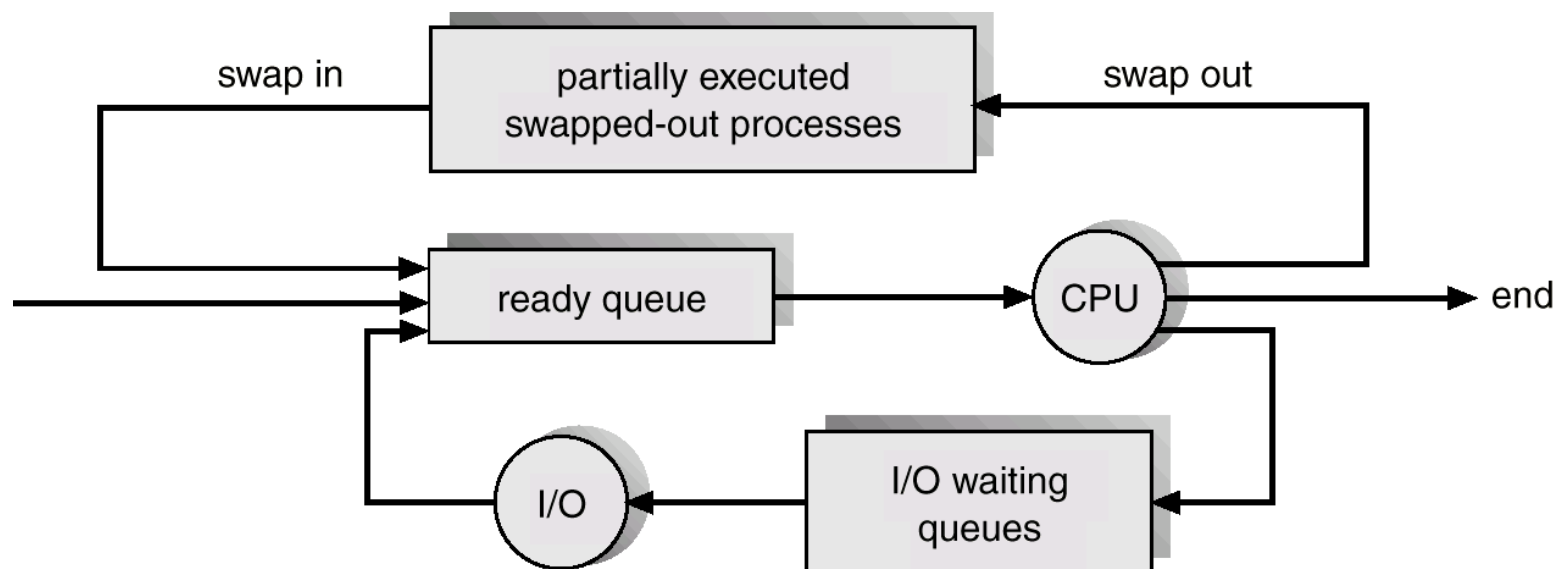
- Long-term scheduler (or job scheduler) – selects which processes should be brought into the ready queue.



- Short-term scheduler (or CPU scheduler) – selects which process should be executed next and allocates CPU.



# Addition of Medium Term Scheduling



Running  Ready



# Schedulers (Cont.)

- Short-term scheduler is invoked very frequently (milliseconds)  
⇒ (must be fast).
- Long-term scheduler is invoked very infrequently (seconds, minutes)  
⇒ (may be slow).
- The long-term scheduler controls the *degree of multiprogramming*.
- Processes can be described as either:
  - I/O-bound process – spends more time doing I/O than computations.
  - CPU-bound process – spends more time doing computations.

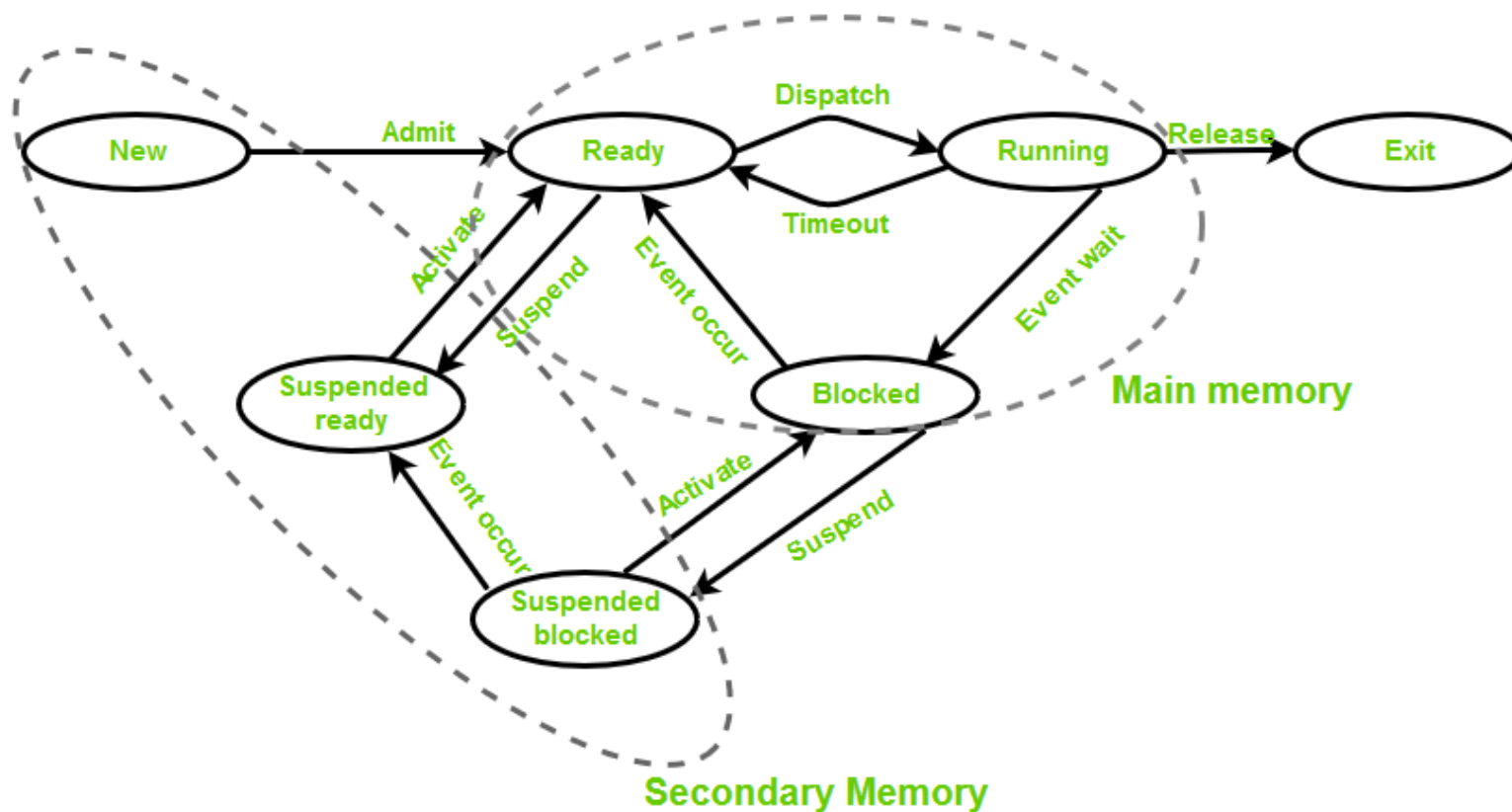
# Dispatcher:

- It is the module that gives control of the CPU to the process selected by the short-time scheduler.
- A dispatcher switches execution from one process to another process called **context switching**. It also setup user registers, memory mapping, etc.
- **Dispatch latency**: amount of time taken by the system to stop one process and give permission to another process to being execution.

# context switch

- When CPU switches to another process, the system must save the state of the old process and load the saved state for the new process.
- Context-switch time is overhead; the system does no useful work while switching.
- Time dependent on hardware support.

# Six and Seven state process model:



END