Process Management

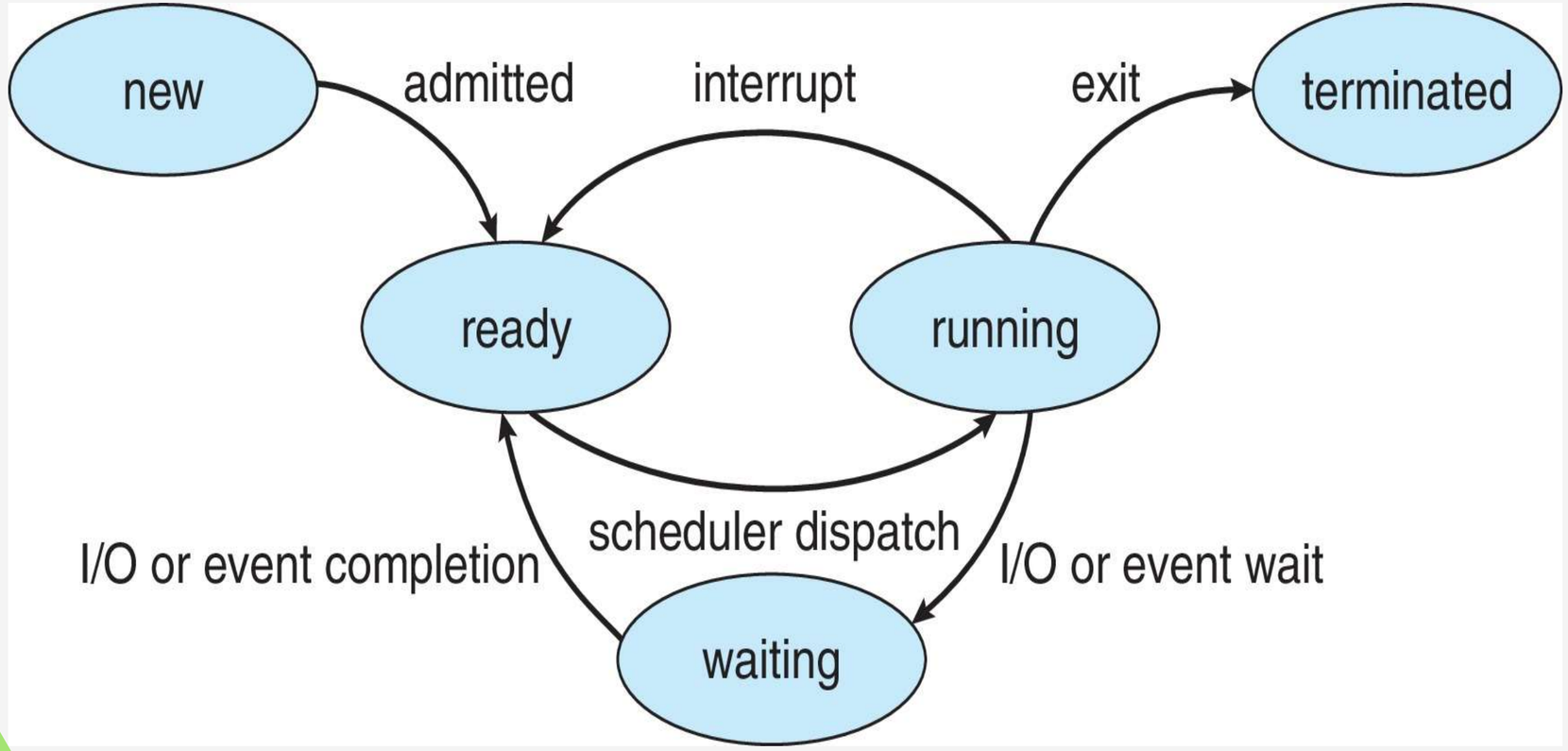
Course Topics

- ✓ Introduction
- ✓ Process State
- ✓ State Transition Diagram
- ✓ Process in Memory
- ✓ Process Control Block
- ✓ Context Switching

Process

- A program in execution.
- A process will need certain resources-such as CPU time, memory, files, and I/O devices-to accomplish its task.
- These resources are allocated to the process either when it is created or while it is executing.
- A process is the unit of work in most systems. Such a system consists of a collection of processes:

Process States



Only one process can be running on any processor at any instant, although many processes may be ready and waiting.

Process State

State of a process is defined in part by the current activity of that process. Each process may be in one of following states

New: The process is being created.

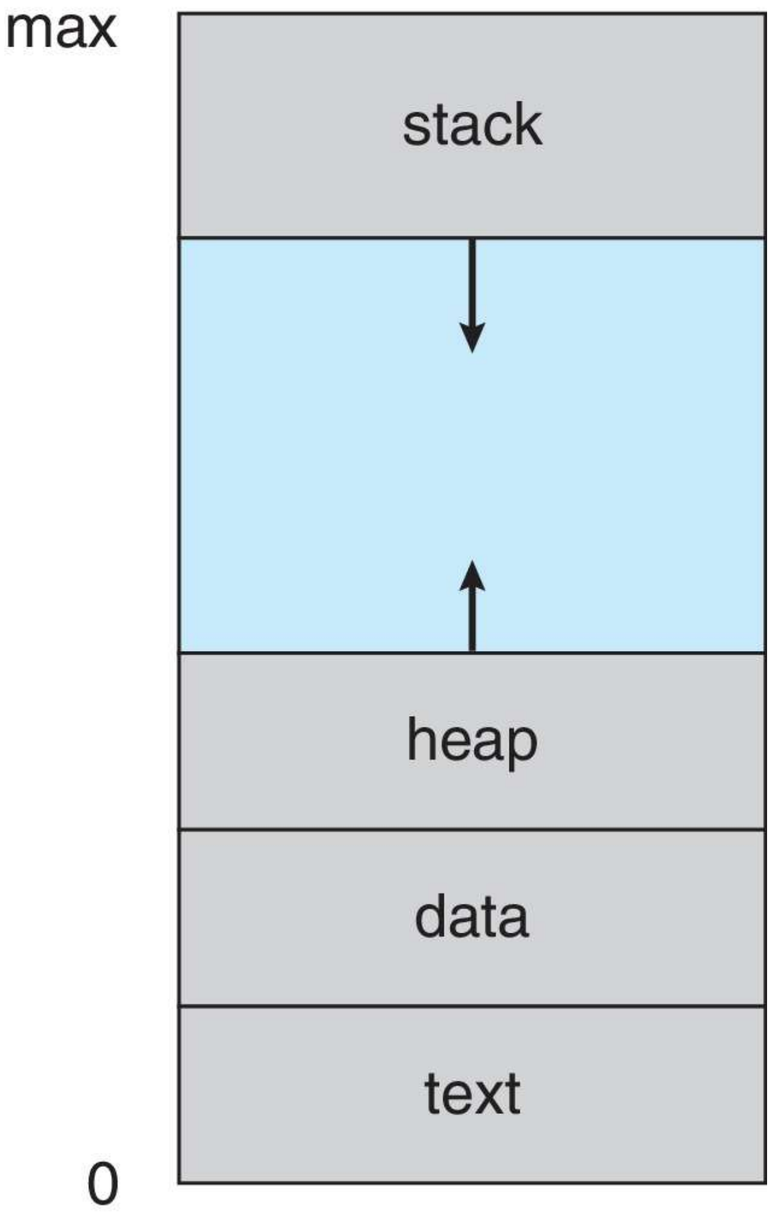
Ready: The process is waiting to be assigned to a processor.

Running: Instructions are being executed.

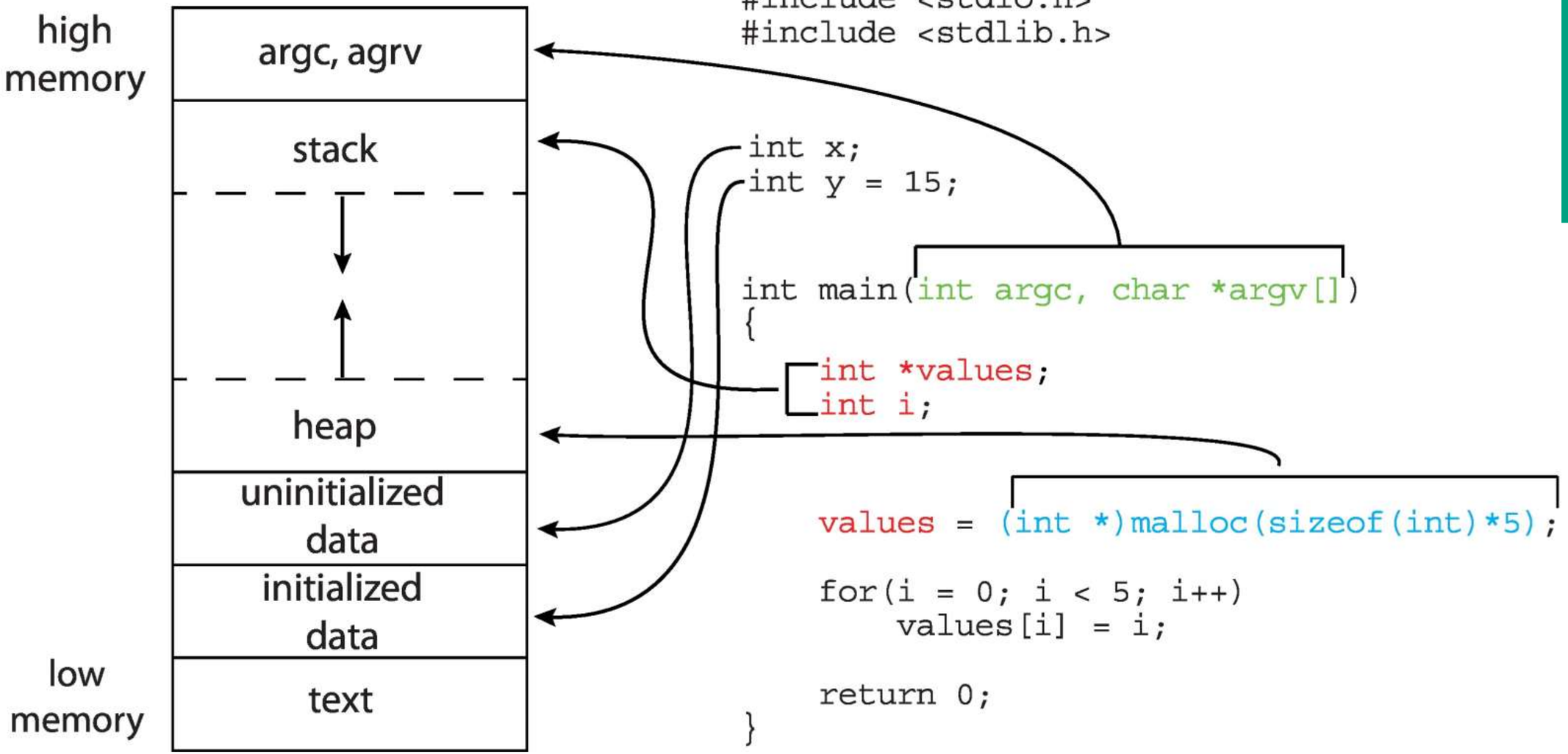
Waiting: The process is waiting for some event to occur (such as an I/O completion or reception of a signal).

Terminated: The process has finished execution.

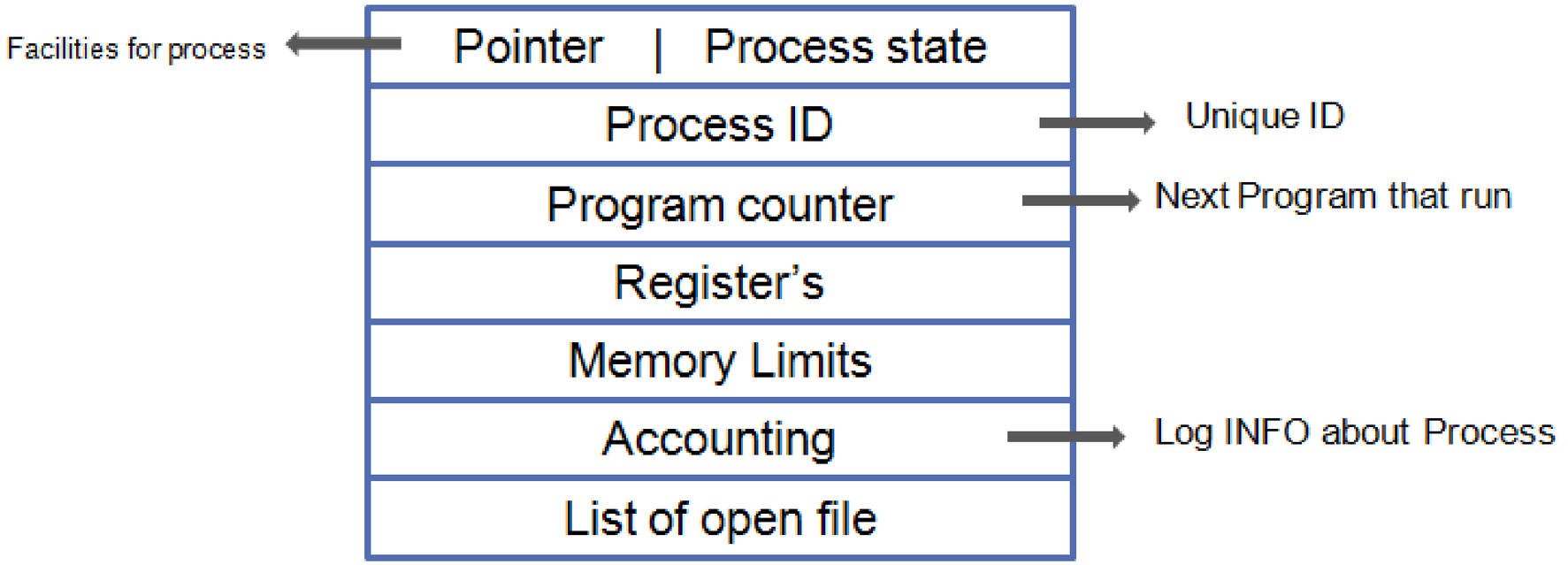
Process in Memory



Memory Layout of a C Program



Process Control Block



PCB Diagram

Process Control Block

Information associated with each process(also called task control block)

Pointer: It is a stack pointer that is required to be saved when the process is switched from one state to another to retain the current position of the process.

Process state – running, waiting, etc.

Program counter – location of instruction to next execute

CPU registers – contents of all process-centric registers

CPU scheduling information- priorities, scheduling queue pointers

Memory-management information – memory allocated to the process

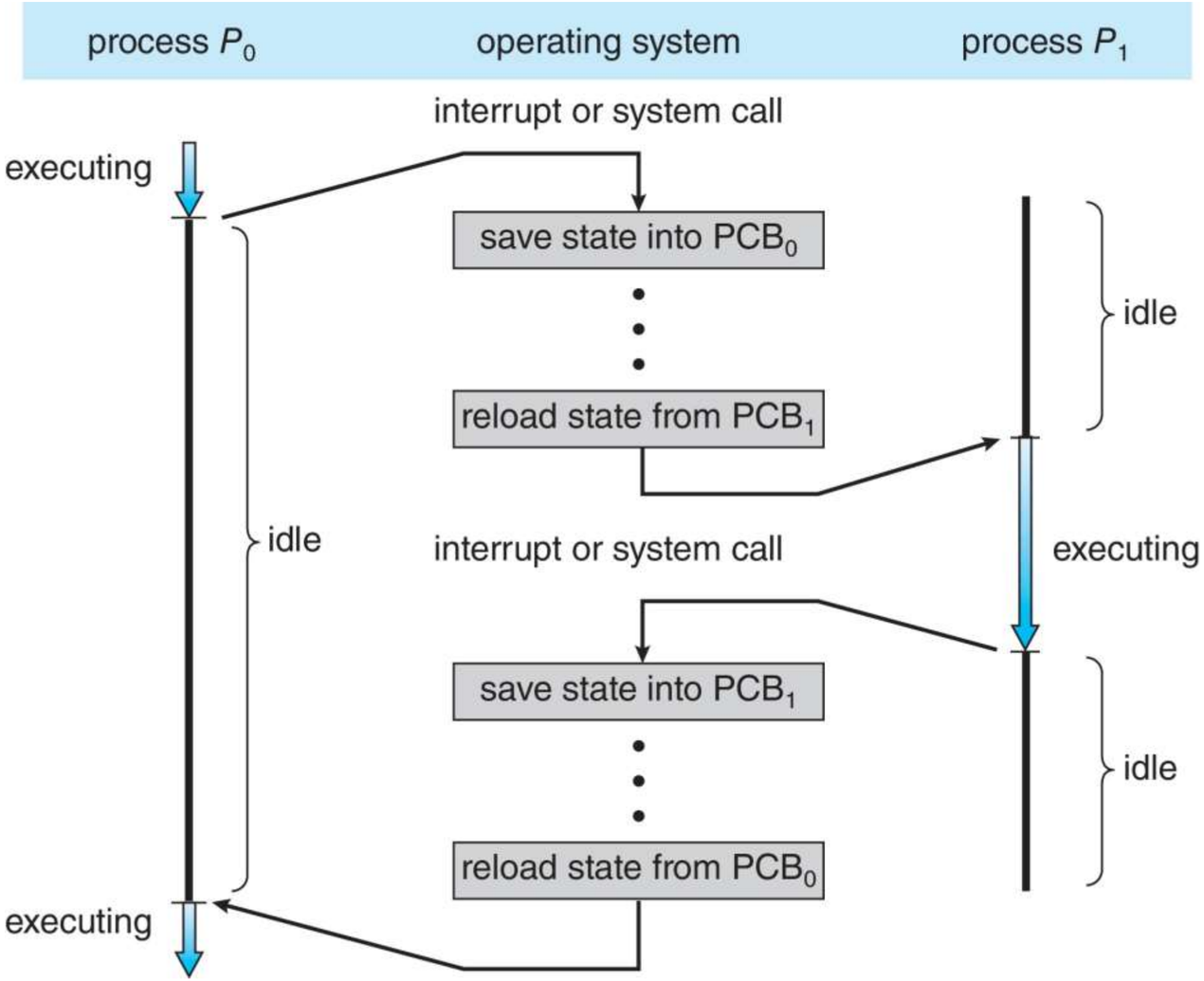
Accounting information – CPU used, clock time elapsed since start, time limits.

Context Switching

- ✓ 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 via a context switch.
- ✓ Context of a process represented in the PCB.

Context Switch

- ✓ Context-switch time is overhead; the system does no useful work while switching.



Context Switch

- ✓ Context-switch time is pure overhead; the system does no useful work while switching.
  - ✓ The more complex the OS and the PCB ➔ the longer the context switch
- ✓ Time dependent on hardware support
  - ✓ Some hardware provides multiple sets of registers per CPU ➔ multiple contexts loaded at once