Operating Systems

CSN-232

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Wait Time

AT	PT	CT
0	3	3
1	6	9
4	4	13
6	2	15

(1) FCFS

A : (CT − AT) − PT = 3 − 3 = 0

B : 8 − 6 = 2

C : 9 − 4 = 5

D : 9 − 2 = 7

(2) SJF

CT
3
9
15
11

A = 0

B = 2

C = 7

D = 3

(3) RJF

CT
3
15
8
10

A = 0, B = 14 − 6 = 8

C = 0, D = 2

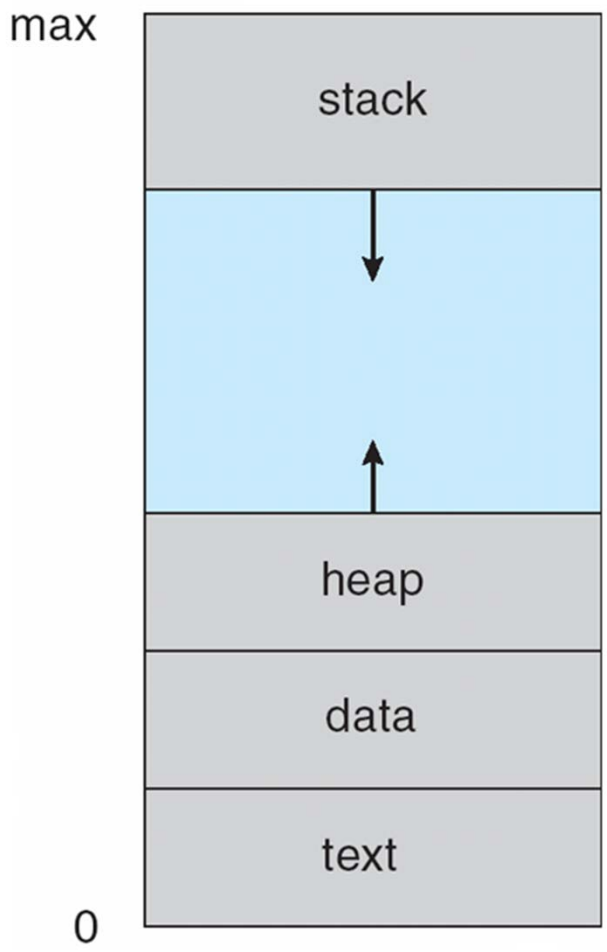
Process Concept

- 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
- Multiple parts
  - The program code, also called **text section**
  - Current activity including **program counter**, processor registers
  - **Stack** containing temporary data
    - Function parameters, return addresses, local variables
  - **Data section** containing global variables
  - **Heap** containing memory dynamically allocated during run time

Process Concept (Cont.)

- Program is ***passive*** entity stored on disk (**executable file**), process is ***active***
  - Program becomes process when executable file loaded into memory
- Execution of program started via GUI mouse clicks, command line entry of its name, etc
- One program can be several processes
  - Consider multiple users executing the same program

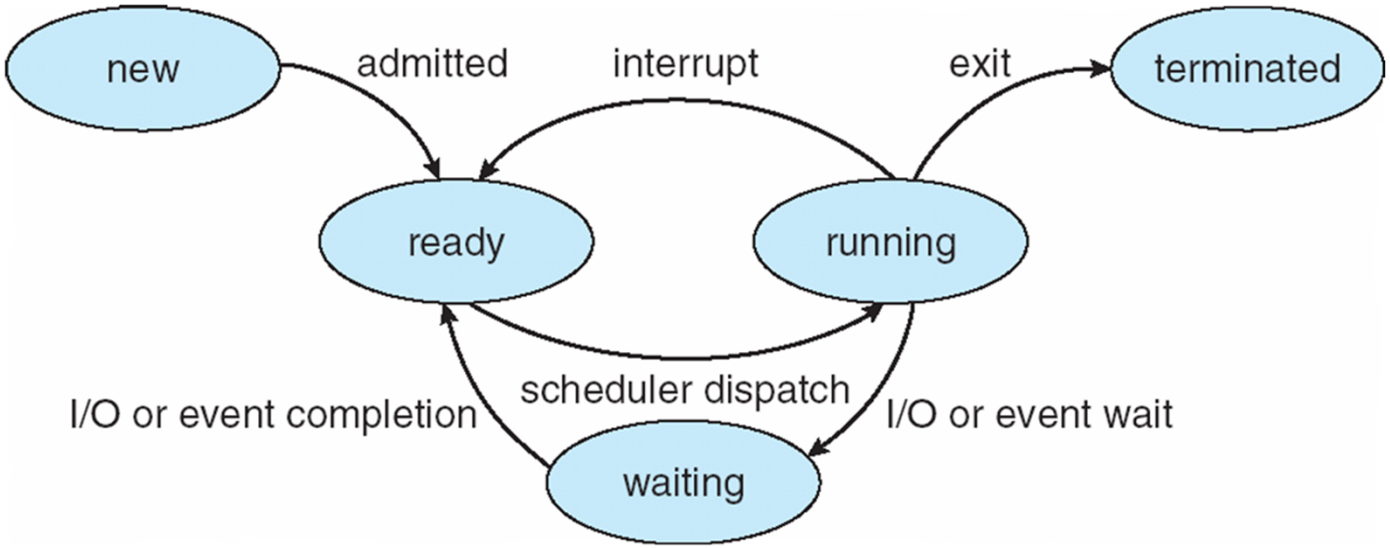
Process in Memory



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

Diagram of Process State

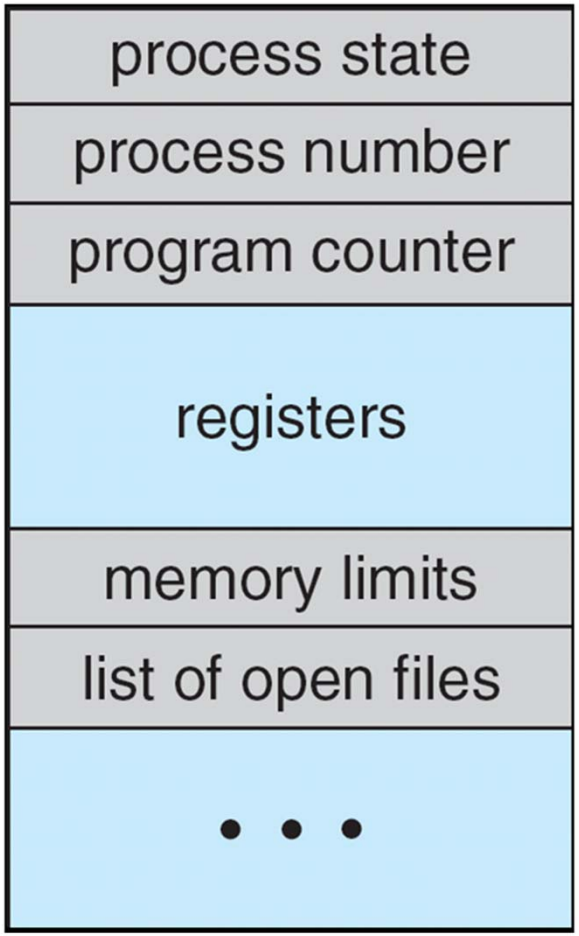


Process Control Block (PCB)

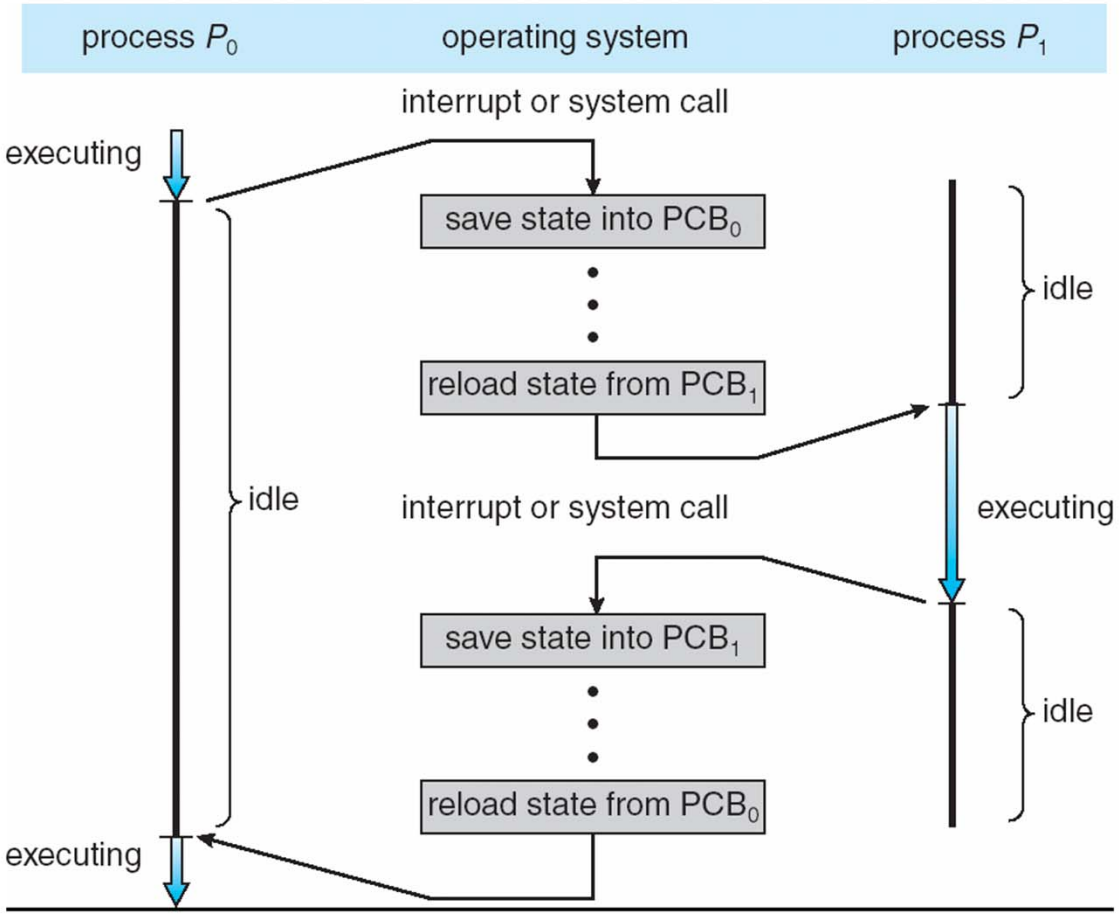
Information associated with each process

(also called **task control block**)

- 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
- I/O status information – I/O devices allocated to process, list of open files



CPU Switch From Process to Process



CPU burst

CPU burst: the amount of time the process uses the processor before it is no longer ready.

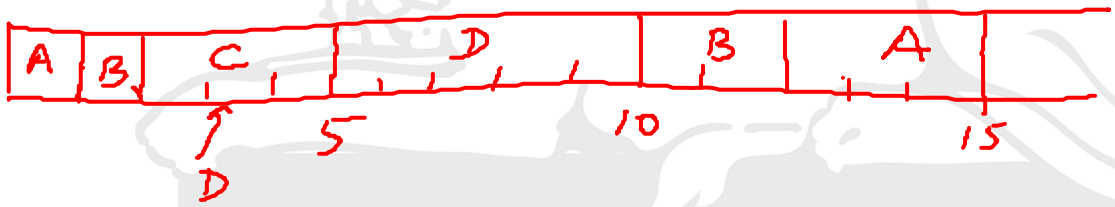
Types of CPU bursts:
long bursts -- process is CPU bound (i.e. array work)
short bursts – process is I/O bound (i.e. vi)

Burst Time and Priority

Process	Arrival time	Burst	Priority
A	0.0000	4	3
B	1.0001	3	4
C	2.0001	3	6
D	3.0001	5	5

A larger priority number has higher priority.

(a) Preemptive algo'



(b) Non-preemptive Algo'