Process
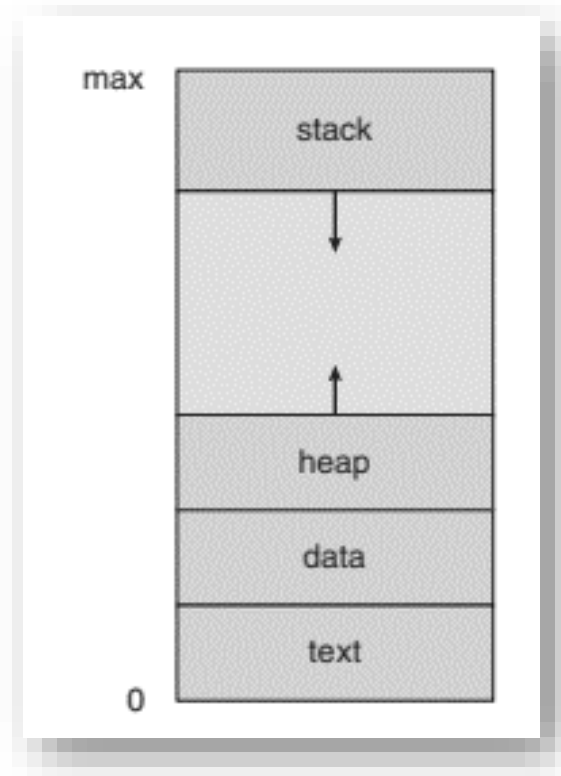
CS3600
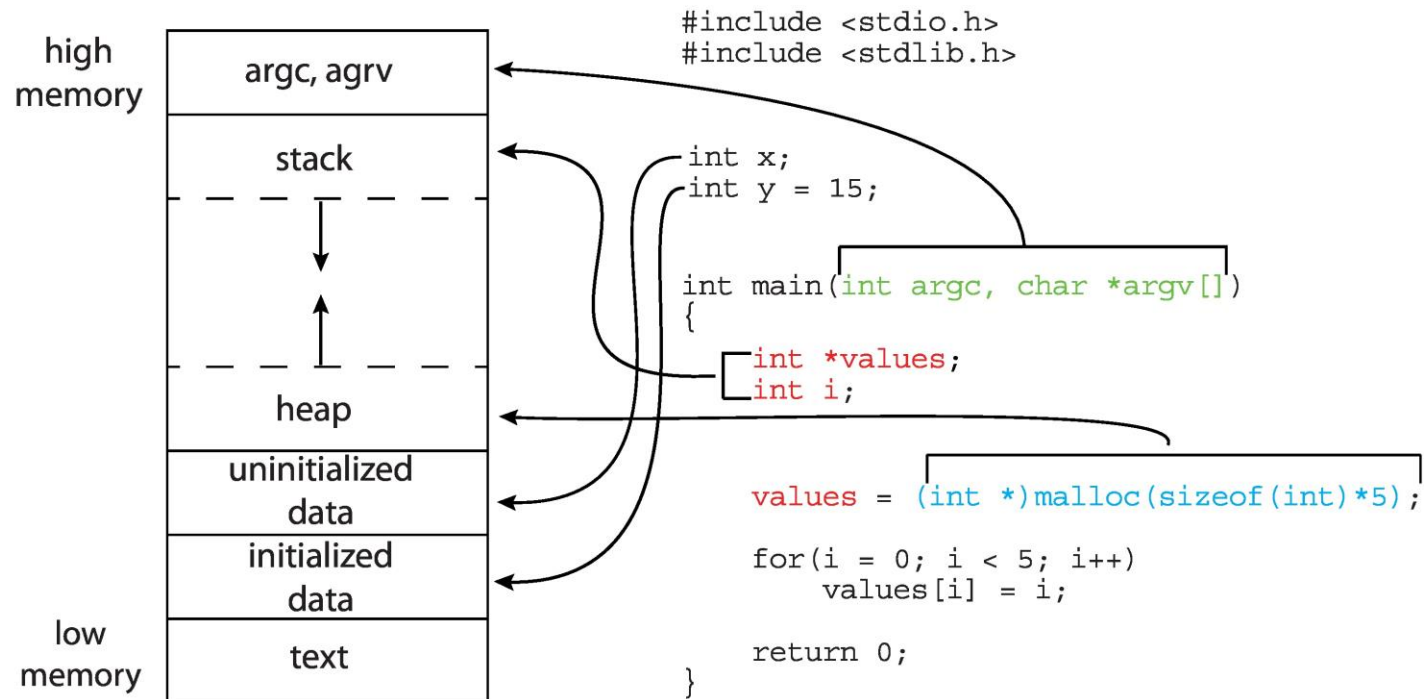
Process

- Process – instance of a program in execution.
  - The status of the current activity of a process is represented by the value of the program counter and the contents of the processor's registers.
  - Memory layout of the processor
    - Text Section
    - Data Section
    - Heap section
   - Stack Section

Memory layout of C Program


```c
#include <stdio.h>
#include <stdlib.h>

int x;
int y = 15;

int main(int argc, char *argv[])
{
    int *values;
    int i;

    values = (int *)malloc(sizeof(int)*5);

    for(i = 0; i < 5; i++)
        values[i] = i;

    return 0;
}
```
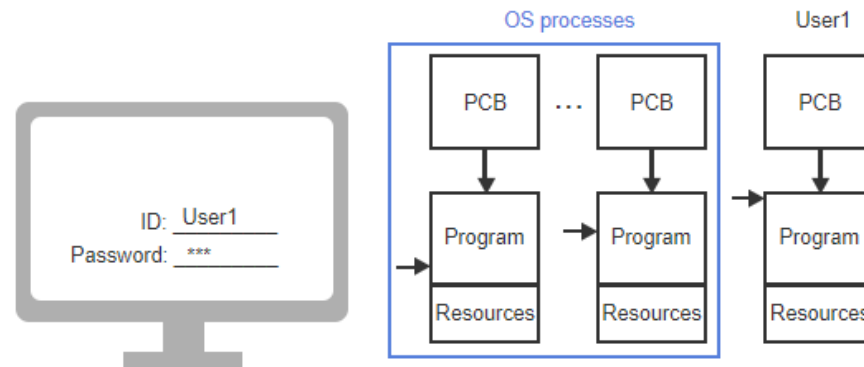
Process State

- As a process executes, it will be in different states

  - **New**: The process is being created

  - Ready state: The process is waiting to be assigned to a processor

  - Running state: Instructions are being executed

  - Blocked (waiting) state: The process is waiting for some event to occur

  - Suspended : The OS may stop a process to allow debugging/regulate performance

  - **Terminated**: The process has finished execution
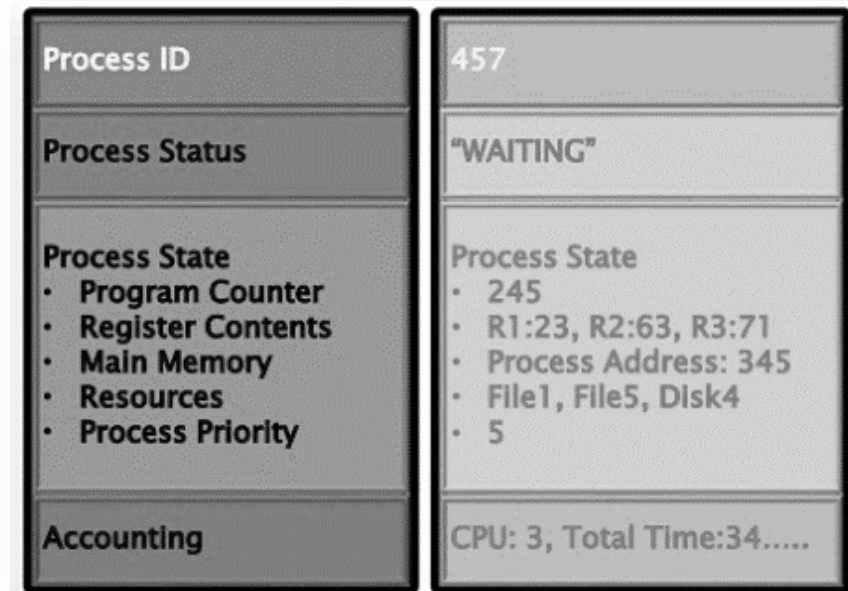
Process State transitions
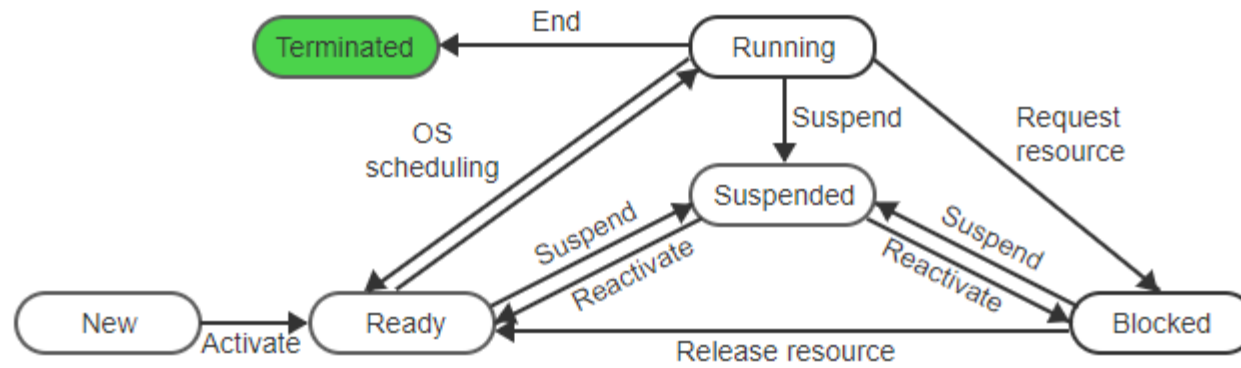
Process Control Block (PCB)

- PCB : A data structure that holds information for a process, including the current instruction address, the execution stack, the set of resources used by the process, and the program being executed.

- OS creates a new PCB (Process Control Block) for every new process. PCB is also known as task control block.

Process Control Block (PCB) Cont.

Information associated with each process

- Process state

- Program counter

- CPU registers

- CPU scheduling information
  - priorities, scheduling queue pointers

- Memory-management information
  - Page tables, segment tables

- 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

| Process ID	457
Process Status	"WAITING"
Process State • Program Counter • Register Contents • Main Memory • Resources • Process Priority	Process State • 245 • R1:23, R2:63, R3:71 • Process Address: 345 • File1, File5, Disk4 • 5
Accounting	CPU: 3, Total Time:34.....

Process Scheduling

- **Process scheduler** selects among available processes for next execution on CPU core

- Maintains **scheduling queues** of processes
  - **Ready queue** – set of all processes residing in main memory, ready and waiting to execute
  - **Wait queues** – set of processes waiting for an event (i.e., I/O)
  - Processes migrate among the various queues
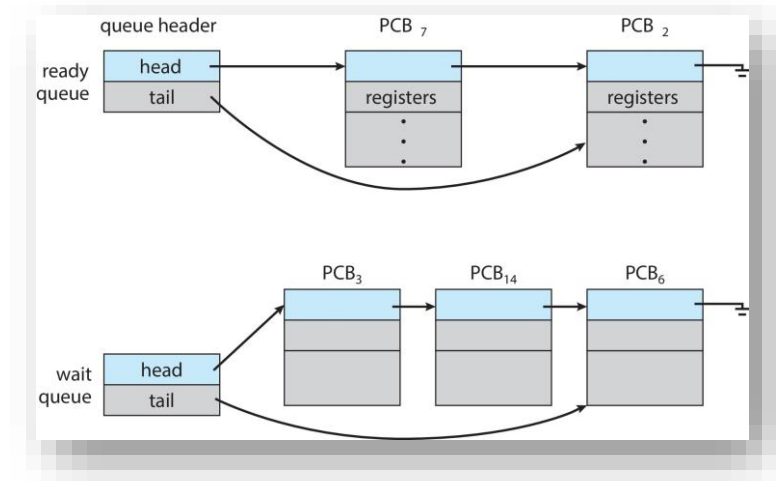
Context Switch
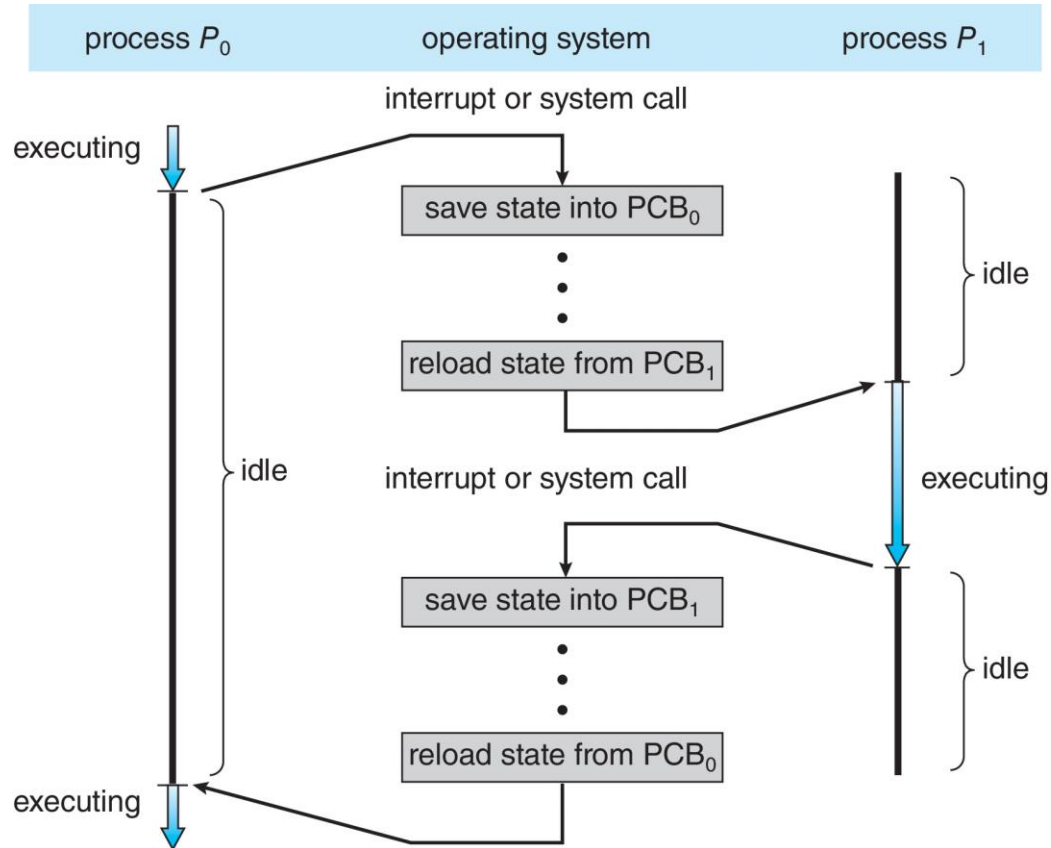
Do we need Hardware support for Context Switching?

- Lab 1

Announcements as on (02/01/21)

- Read Module 2.1 ,2.2

- Lab 1