Processes ch3

In the following lectures we will consider the concepts of process.

Process Concepts

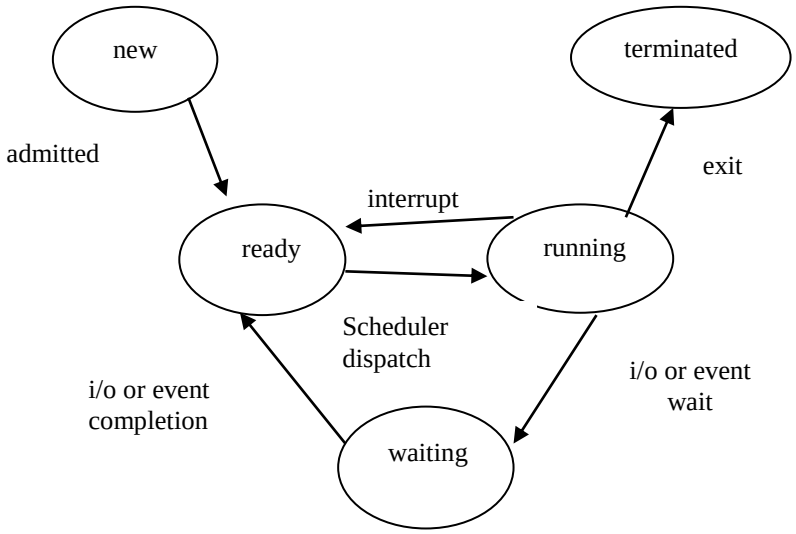
A process is a program in execution. A process is more than the program code, which is sometimes known as the text section. It also includes the current activity, as represented by the value of the program counter and the contents of the processor's registers.

Process state

The state of a process is defined in part by the current activity of the process. Each process may be in one of the following states:

- New
- Running
- Waiting
- Ready
- Terminated

This diagram is shown in fig 1 where we notice the followings:



1. At any instant of time, there is only one process running i.e allocated CPU time.

2. Exit from Running state may occur as a result of any of following events:
· Completion of process.
· Request of I/O service by a process.
· Time slice determined by interval timer has expired and hence an interrupt is
activated which forces CPU to run OS instructions.
3. The transfer from Ready to Running state (dispatch) is carried out by OS according to certain criteria as will be shown later when studying " Processor Scheduling".
4. The term " Execution " means generally, " Ready", "
Running", or " waiting".

Process Control Block (PCB)

Each process is represented by a process control block (PCB). A PCB contains many pieces of information associated with a specific process, such as:

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

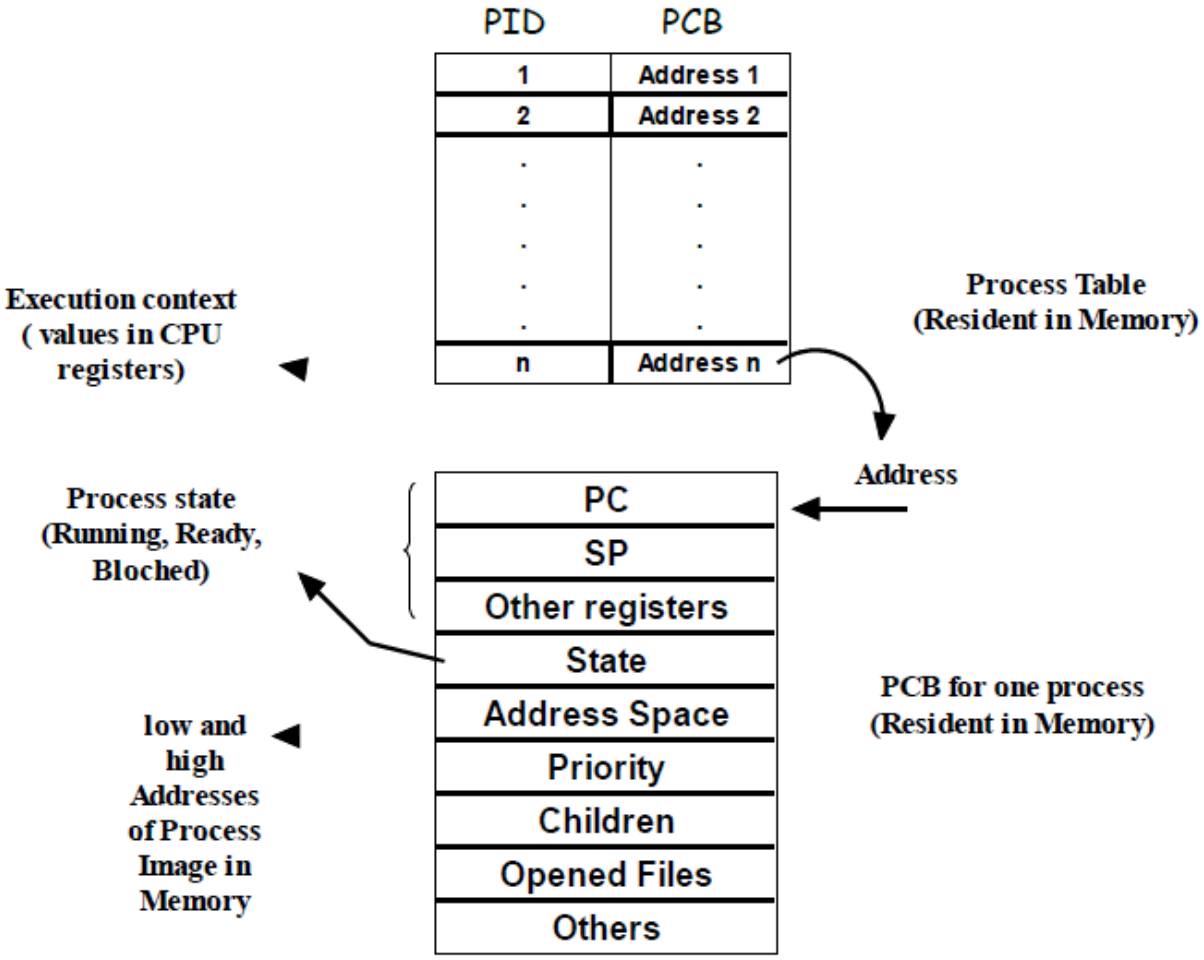


Fig 3.5 Process Table and PCB

Now, it is very useful to show the different components resident in memory in a from called " Memory Map" as shown in fig 3.6.

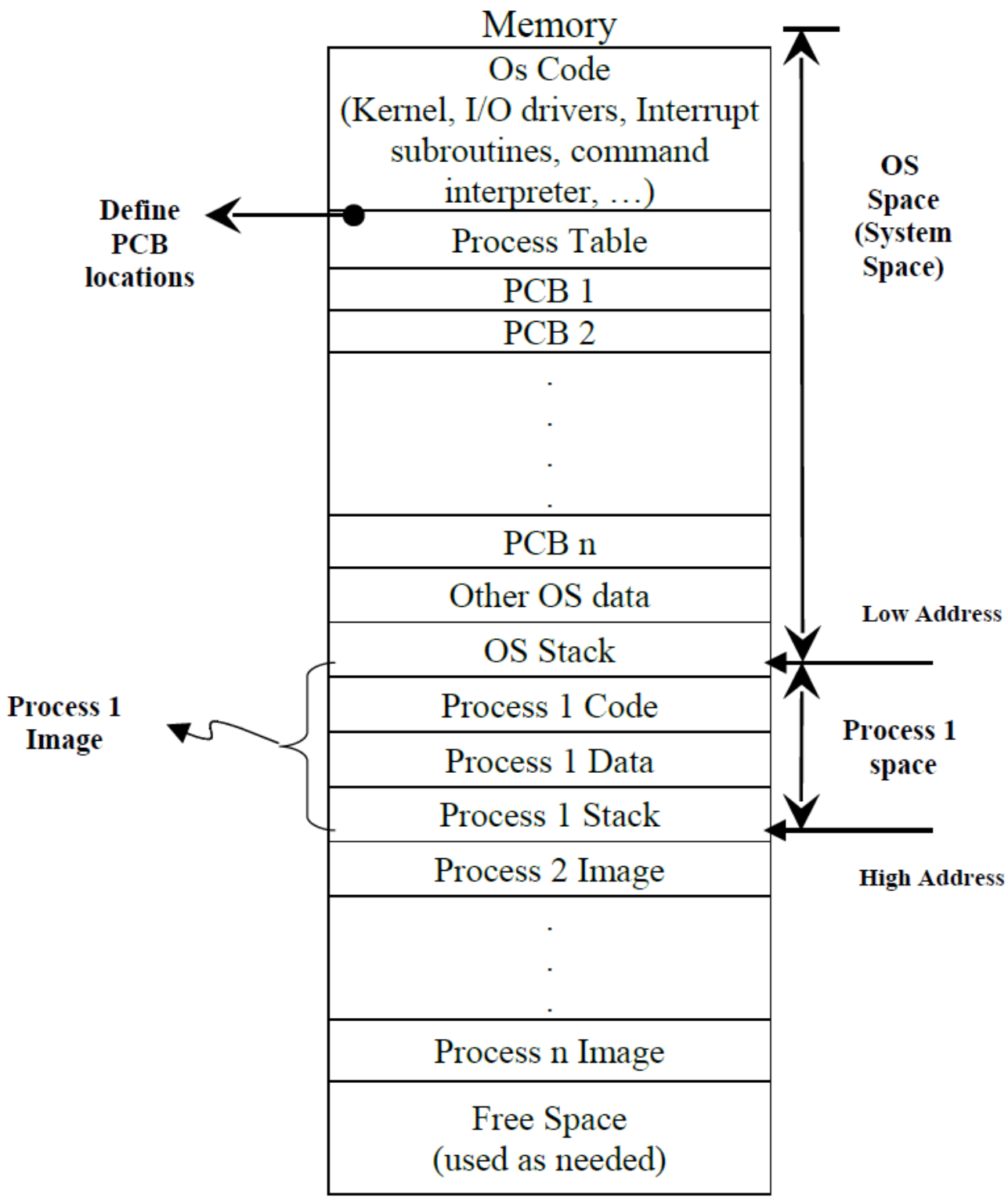


Fig 3.6 Memory Map.

Process Scheduling

A uniprocessor system can have only one running process. If more processes exist, as in multiprogramming system, there will be only one process running and the rest must wait until the CPU is free and can be rescheduled.

- **Scheduling Queues**

A new process as enter the system is put in a queue called ready queue. It waits in the ready queue until it is selected for execution. Once the process is assigned to the CPU and it is executing, one of the several event could occur:
The process could issue an I/O request, and then be placed in an I/O queue.
The process could create a new subprocess and wait for the termination.
The process could be removed forcibly from the CPU, as a result of an interrupt and be put back in the ready queue.

- **Scheduler**

A process migrates between the various scheduling queues throughout its lifetime. The operating system must select processes from these queues in some fashion. The selection process is carried out by the appropriate scheduler. There are two types of scheduling algorithms categorized according to the frequency of their execution.
• Long term scheduler (job scheduler) which selects a process from the job pool and load them into the MM.
• Short term scheduler (CPU scheduler) which select a process from the ready queue and allocate it to the CPU.

- **Context Switch**

Switching the CPU to another process requires saving the state of the old process and loading the saved state for the process. This task is known as a context switch.