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Department of Information Technology

Operating Systems

Process concept – Process scheduling

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Process

- Process – a program in execution

- Multiple parts

1. Stack

The process stack contains the temporary data such as method/function parameters, return address and local variables.

2. Heap

This is dynamically allocated memory to a process during its run time.

3. Text

This includes the current activity represented by the value of Program Counter and the contents of the processor's registers.

4. Data

This section contains the global and static variables.

Process State

Processes can be any of the following states:

- **New**
  - The process is in the stage of being created.

- **Ready**
  - The process has all the resources available that it needs to run, but the CPU is not currently working on this process's instructions.

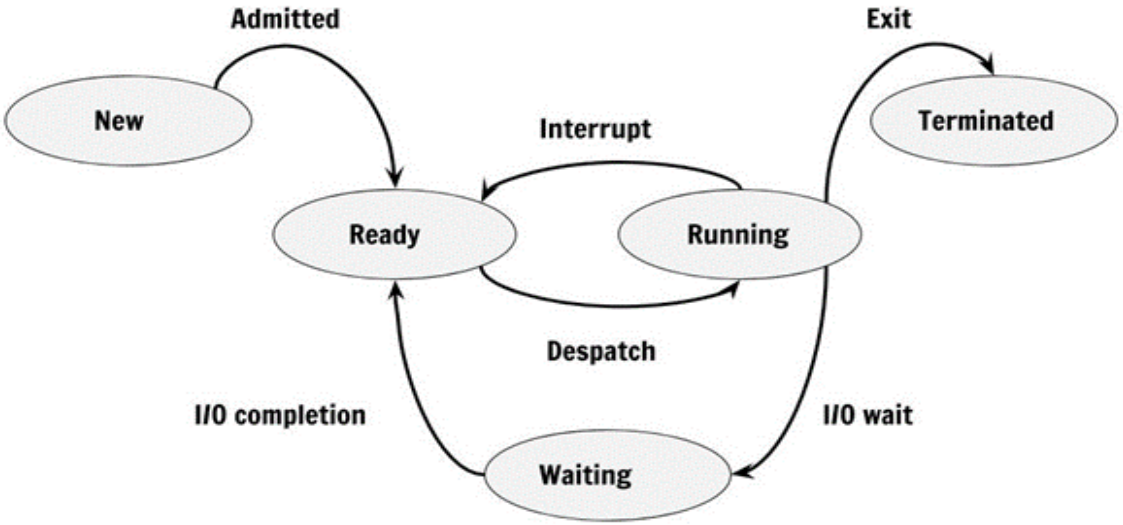
- **Running**
  - The CPU is working on this process's instructions.

• **Waiting**

- The process cannot run at the moment, because it is waiting for some resource to become available or for some event to occur.

• **Terminated**

- The process has completed.



Process Control Block

There is a Process Control Block for each process, enclosing all the information about the process. PCB is a data structure, which contains the following:

- **Process State** - It can be running, waiting etc.

- Process ID and parent process ID.

- **CPU registers and Program Counter** - Program Counter holds the address of the next instruction to be executed for that process.

- **CPU Scheduling information** -Such as priority information and pointers to scheduling queues.

- Memory Management information-Example: page tables or segment tables.

- Accounting information - User and kernel CPU time consumed, account numbers, limits, etc.

- I/O Status information-Devices allocated, open file tables, etc.

The PCB is maintained for a process throughout its lifetime, and is deleted once the process terminates.

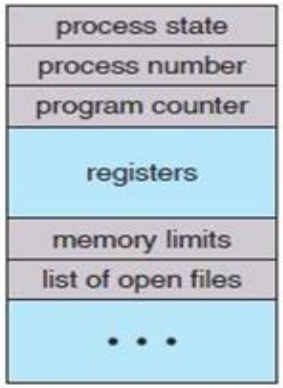


Figure 3.3 Process control block (PCB).

Process Scheduling

Definition

- The process scheduling is the activity of the process manager that handles the removal of the running process from the CPU and the selection of another process on the basis of a particular strategy.

Scheduling Queues

Scheduling queues refer to queues of process or devices.

When the process enters the system, then this process is put into a job queue. This queue consists of all processes in the system.

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

- This queue is generally stored as a linked list.
- The operating system also maintains other queues such as device queue.
- Device queue is a queue for which multiple processes are waiting for a particular I/O device.
- A newly arrived process is put in the ready queue. Processes wait in a ready queue for allocating the CPU.
- Once the CPU is assigned to a process, then that process will execute. While executing the process, any one of the following events can occur.

- The process could issue an I/O request and then it would be placed in an IO queue.

- The process could create new sub process and will wait for its termination.

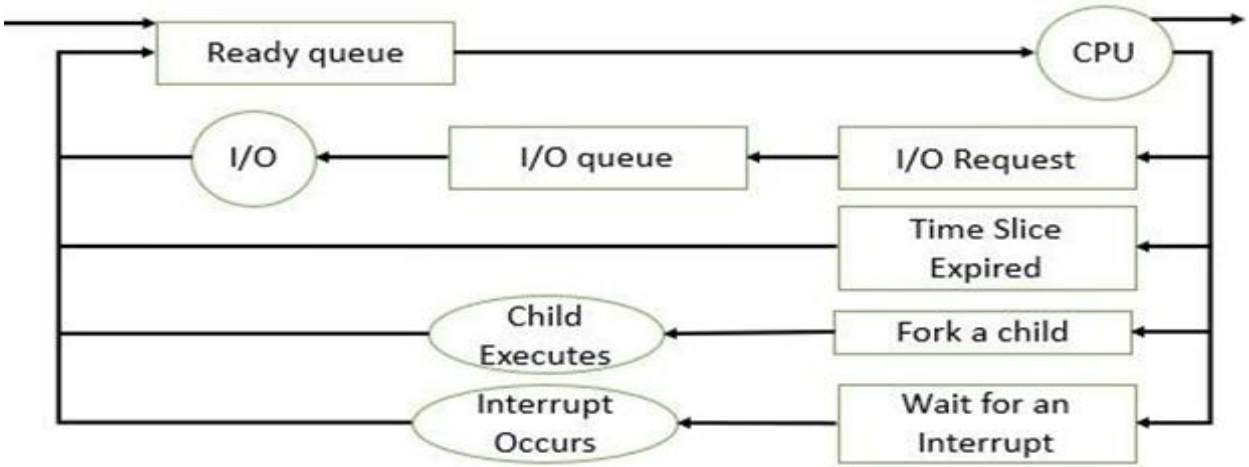


Figure 1. Queuing Diagram of Process Scheduling