Process Concepts

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1. Process:

A process is an instance of a program in execution. A program by itself is not a process; a program is a ***passive entity***, such as a file containing a list of instructions stored on disks, whereas a process is an active entity, with a program counter specifying the next instruction to execute and a set of associated resources. A program becomes a process when an executable file is loaded into memory. A process is an executing program which has three sections;

i. **Text Section:** It include current activity represented by value of program counter, content of CPU register, local variables and temporary data such as function parameter.
ii. **Data Section:** It includes global variable or global data.
iii. **Heap:** It store the address of memory allocated to process.

2. Process States and Transition:

As a process executes, it changes *state* accordingly. The state of process is defined by the current activity of that process. It is as shown in the figure given below;

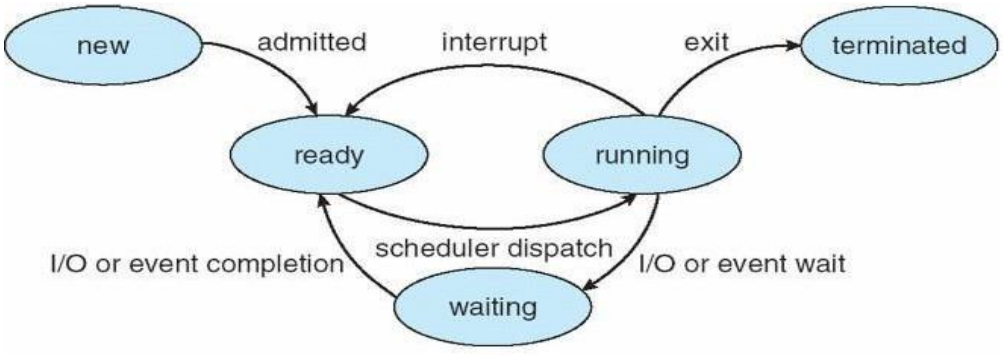

Fig: Process state Transition diagram

Each process may be in one of the following states at a time;

i. **New**: The process is being created
ii. **Ready**: The process is waiting to be assigned to a processor
iii. **Running**: Instructions are being executed

iv. **Waiting**: The process is waiting for some event to occur
v. **Terminated**: The process has finished execution

3. PCB (Process Control Block)

In operating system each process is represented by a process control block (PCB) or a task control block. It is a data structure that physically represents a process in the memory of a computer system. It contains many pieces of information associated with a specific process that includes the following;

- **Identifier (Process number or process name)**: A unique identifier associated with this process, to distinguish it from all other processes.
- **State**: Each process may be in any one of these stages; new, ready, running, waiting, and terminate. It is useful to indicate the current state of the process.
- **Priority**: It contains priority of the process set by the user or operating system.
- **Program counter**: It indicates the address of the next instruction in the program to be executed.
- **Registers:** They vary in number and type depending on the computer architecture. Register includes accumulator, general purpose register, specific purpose register, etc. When CPU switch from one process to another due to an interrupt, the current state of process is saved that allow the process to be continued correctly later.
- **Memory limits**: It contains information about memory management such as base address, limit of memory, segment number, etc.
- **Status of open file:** It contains information about the list of open files such as the number of open files, operation perform on file, etc.

4. Concurrent Process, parallel processing:

The simultaneous execution of several interrelated computer programs is known as concurrent processing. In simple terms, concurrent means something that happens at the same time as something else. It is a computing model in which multiple processors execute instructions simultaneously for better performance.

Parallel processing is a mode of operation in which a process is split into parts, which are executed simultaneously on different processors attached to the same computer. Parallel processing makes the program run faster because there are more CPUs running in it.