A process is a set of sequential steps that are required to do a particular task.

A process is an instance of a program in execution.

For e.g.: in Windows, if we edit two text files, simultaneously, in notepad, then it means we are implementing two different instances of the same program.

For an operating system, these two instances are separate processes of the same application.

A process needs certain resources such as:
- CPU Time
- Memory Files
- I/O Devices

to accomplish its task.

These resources are allocated to the process either when it is created or while it is executing.

The various states of a process are:

- **New:** A process that has just been created.
- **Ready:** The process is ready to be executed.
- **Running:** The process whose instructions are being executed is called running process.

The process goes through a series of process states for performing its task.

As a process executes, it changes state.

Various events can cause a process to change state.
Process States

- **Waiting:**
  - The process is waiting for some event to occur such as completion of I/O operation.

- **Terminated:**
  - The process has finished its execution.

**Note:** Only one process can be running on any processor at any instant. However, there can be many processes in ready and waiting states.

Process Control Block (PCB)

- Process Control Block (PCB) is a data structure used by the operating system to store all the information about a process.
  - It is also known as Process Descriptor.
  - When a process is created, the operating system creates a corresponding PCB.

Process Control Block (PCB)

- Information in a PCB is updated during the transition of process states.
  - When a process terminates, its PCB is released.
  - Each process has a single PCB.

Process Control Block (PCB)

- The PCB of a process contains the following information:
  - Process State
  - Program Counter
  - Registers
  - Memory Limits
  - List of Open Files

Process Control Block (PCB)

- **Process Number:** Each process is allocated a unique number for the purpose of identification.
- **Process State:** It specifies the current state of a process.
- **Program Counter:** It indicates the address of next instruction to be executed.

- **Registers:** These hold the data or result of calculations. The content of these registers is saved so that a process can be resumed correctly later on.
- **Memory Limits:** It stores the amount of memory units allocated to a process.
- **List of Open Files:** It stores the list of open files and their access rights.
Process Scheduling

- In multiprogramming, several processes are kept in main memory so that when one process is busy in I/O operation, other processes are available to CPU.
- In this way, CPU is busy in executing processes at all times.
- This method of selecting a process to be allocated to CPU is called Process Scheduling.

Process Scheduling consists of the following sub-functions:
- **Scheduling**: Selecting the process to be executed next on CPU is called scheduling.
  - In this function a process is taken out from a pool of ready processes and is assigned to CPU.
  - This task is done by a component of operating system called **Scheduler**.

Process Scheduling

- Dispatching: Setting up the execution of the selected process on the CPU is called dispatching.
  - It is done by a component of operating system called **Dispatcher**.
  - Thus, a dispatcher is a program responsible for assigning the CPU to the process, that has been selected by the Scheduler.
- **Context Save**: Saving the status of a running process when its execution is to be suspended is known as context save.

Scheduling Queues

- In multiprogramming, several processes are there in ready or waiting state.
- These processes form a queue.
- The various queues maintained by operating system are:
  - **Job Queue**
  - **Ready Queue**
  - **Device Queue**

Scheduling Queues

- **Job Queue**: As the process enter the system, it is put into a job queue. This queue consists of all processes in the system.
- **Ready Queue**: It is a doubly linked list of processes that are residing in the main memory and are ready to run.
- **Device Queue**: It contains all those processes that are waiting for a particular I/O device.
  - Each device has its own device queue.
- Diagram on the next slide shows the queues.
Scheduling Queues

Context Switch
- Switching the CPU from one process to another process requires saving the state of old process and loading the saved state of new process.
- This task is known as Context Switch.
- When context switch occurs, operating system saves the context of old process in its PCB and loads the saved context of the new process.

Context Switch

Thank You
Have a Nice Day