PROCESS CONTROL BLOCK

- The process control stores many data items that are needed for efficient process management. They are:

- **Process State**-This specifies the process state i.e., new, ready, running, waiting or terminated.

- **Process Number**-This shows the number of the particular process.

- **Program Counter**-This contains the address of the next instruction that needs to be executed in the process.

- **Registers**-This specifies the registers that are used by the process. They may include accumulators, index registers, stack pointers, general purpose registers etc.

- **Memory Limits**- Includes values of base & limit registers, page tables etc. which are used by OS.

- **List of Open Files**-These are the different files that are associated with the process

Process Control Block (PCB)

2 Structure of Process

The structure of a process can be broken down into four parts. Given below are the major elements of a process.

2.1. Concurrent Execution and Resource Utilization:

A process enables the simultaneous execution of multiple tasks or programs within a single computer system. This concurrent execution is critical for optimizing the utilization of the central processing unit (CPU) and other system resources. By allowing various processes to run concurrently, the operating system can efficiently allocate CPU time to different tasks, thereby achieving better overall system performance.

2.2. Sharing of CPU:

The concurrent execution of processes is accomplished by sharing the CPU among them. Rather than waiting for one process to finish before starting the next, the operating system employs scheduling algorithms to allocate slices of CPU time to different processes in a time-sharing manner. This results in the appearance of parallelism, even though the CPU is rapidly switching between processes to execute them in quick succession.

2.3. Process Properties Mimicking a Processor:

A process, in its internal structure, mirrors some of the properties of a processor itself. This is where the concept of a "process control block" (PCB) comes into play. The PCB contains crucial information about a process, including its status, register values, and pointers to various components needed for execution.

2.4. Components of a Process:

- Working Registers: Like how a CPU has registers to store temporary data and control information, a process has its set of registers. These registers store data that is actively being manipulated by the process.

- Status Registers: The process status indicates whether the process is ready for execution, currently running, blocked due to some I/O operation, or terminated. This information guides the operating system's decisions about process scheduling.
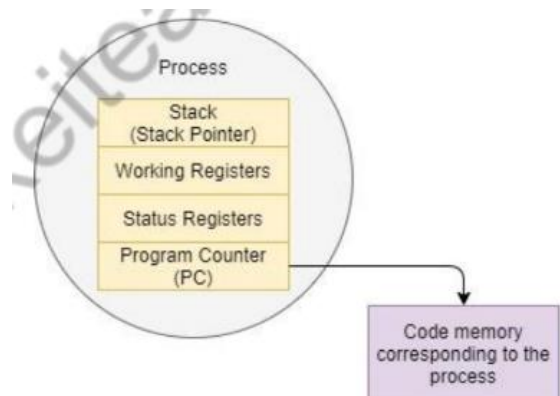

Figure 1 - Components of a Process Block Diagram

- Program Counter (PC): Just as a CPU has a program counter that keeps track of the next instruction to be executed, a process has its own program counter. The PC points to the memory address of the next instruction within the process's code that needs to be executed.

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