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CO21BTECH11002

Theory Assignment

1. a)
   Another mechanism for memory protection can be protection keys. A memory protection key mechanism divides physical memory into blocks of a particular size, each of which has an associated numerical value called a protection key. Each process also has a protection key value associated with it. On a memory access the hardware checks that the current process's protection key matches the value associated with the memory block being accessed; if not, an exception occurs.

   Source:
   https://en.wikipedia.org/wiki/Memory_protection

   b)
   Two examples where programs need to share memory between them can be:
   (i) Video Player: When playing a video, the memory needs to be shared between the programs responsible for display and sound play.
   (ii) Client-server: Memory stored in server needs to be shared with client if they want to read or write the memory.

2. The following are the fields of PCB:
   (1) Process-id: Whenever a new process is created by the user, the operating system allots a number to that process called as the Process-id. This number becomes the unique identification

of that process and it also helps in distinguishing that process from all other processes existing in the system.
(2) Process State: A process may be in different states throughout its lifetime like waiting state, running state, ready state, blocked state, halted state, and so on. This field holds the current state of the respective process. For example, if the process is currently executing, the process state will hold the running state for that process.
(3) Process Priority: The priority of the process is a numeric value, lesser the value, greater is the priority of that process. The priority of the process can be assigned externally by the user or by the operating system itself. The process is assigned the priority at the time of its creation. The priority of the process may get changed over its lifetime depending on the various parameters. The parameters for changing the priority of the process can be the age of that process, the resources it consumed and so on.
(4) Process Accounting Information: This field of PCB gives the account/description of the resources used by that process. Like, the amount of CPU time, real-time used, connect time.
(5) Program Counter: This is the pointer to an instruction in the program or code that is to be executed next. This field contains the address of the instruction that will be executed next in the process.
(6) List of Open Files: It contains the information of all the files that is required by the program during its execution. This information is also useful for the operating system because it helps the operating system to close the all opened files explicitly at the termination of the program.
(7) Process I/O status Information: This field of PCB contains the list of all the I/O devices allocated to the process during its execution.

(8) CPU Registers: CPU registers are used to hold those temporary values or information. Whenever an interrupt occurs and there is a context switch between the processes, the temporary information is stored in the registers. This helps the process to resume the execution from where it left.
(9) PCB Pointer: In this field, the pointer has an address of the next PCB, whose process state is ready. In this way, the operating system maintains the hierarchy of all the processes so that a parent process could locate all the child processes it creates easily.
(10) Event Information: This field contains the information of the event for which the certain process is in block state. Whenever that event occurs, the operating system identifies the process waiting for this event using this field. If the event occurred matches with this field, then the process changes its state from blocked to ready.

Source:
https://binaryterms.com/process−control−block− pcb.html