CS6460: Operating System

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Q2.13: Describe at least two general methods for passing parameters to the operating system.
Answer:
1. The simplest approach is to pass the parameters in registers.
2. The parameters can be stored in a block, or table, in memory, and the address of the block is passed as parameter in register.
3. Parameters also can be placed, or pushed, onto the stack by the program and popped off the stack by the Operating System.

Q2.14: Describe how you could obtain a statistical profile of the amount of time spent by a program executing different sections of its code. Discuss the importance of obtaining such a profile.
Answer: Operating systems provide a time profile of a program to indicate the amount of time that the program executes at a particular location or set of locations. A time profile requires either a tracing facility or regular interrupts. At every occurrence of the timer interrupt, the value of the program counter is recorded. With sufficiently frequent timer interrupts, a statistical picture of the time spent on various parts of the program can be obtained.

Such statistical profiling can be useful in optimizing portions of the code which unnecessarily take more time in the CPU.

Q3.9: Describe the actions taken by a kernel to context-switch between processes.
Answer: Switching the CPU to another process requires performing a state save of the current process and a state restore of different process. this task is known as context switch. When a context switch occurs, the kernel saves the context of the old process in its PCB and loads the saved context of the new process scheduled to run.

Q3.9: Including the initial parent process, how many processes are created by the program.
Answer: The first fork() creates a child process which executes the second fork() call too. So the second fork() is called both by the parent and newly created child process. So two more new child processes are created. Hence the third fork is now called four times. So there are now seven new processes and the initial parent process. Hence there are total of 8 processes.

Q3.17: Using the program given, explain what the output will be at lines X and Y.
Answer:

Output at Line X:
CHILD: 0 CHILD: -1 CHILD: -4 CHILD: -9 CHILD: -16

Output at Line Y:
PARENT: 0 PARENT: 1 PARENT: 2 PARENT: 3 PARENT: 4