

Programming Assignment 1: Creating Processes

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Problem Statement

write a C++ program that will create exactly nine new processes (not including the initial program itself). This could be achieved with a simple loop, with the original processes creating nine children. The difficulty, however, is that you are not to allow any single process to create more than two child processes (so the children of the original process will need to create child processes of their own, while also abiding by the rule that they each cannot create more than two children).

Fork()

1. Fork is a System call that creates a child process from the parent process. It created an exact copy of the address space.
2. It returns 0 for the child process and positive integer for the parent. If fork() fails to create a process then it returns -1.
3. getpid() – It returns the process ID of the calling process
4. getppid() – It returns the process ID of the process which created it (parent process ID)

Implementation

1. For creating 9 processes, I have used fork() system call. Also, to keep track of process counts, I have used shared variable viz. "ProcessCount".
2. I have used multiple other shared variables to keep synchronization between processes.
3. I have used a "for loop" to create 2 children per process. However, as it creates 2 children each, it gives the process count in the multiple of 2 i.e., 2, 4, 6, 8, etc.
4. Thus, to create last process (9th) I have used another fork call and making only one process to call it. I have used multiple shared variables to make sure only one process it created.
5. At the end I am waiting for all processes to complete its execution.

Demo

1. Using the terminal, run the "*Assignment_1_ParentChild.cpp*" file.
 - a. `g++ Assignment_1_ParentChild.cpp`
 - b. `./a.out`
2. Output:

```
kartikidindorkar@Kartikis-MacBook-Pro Programs % g++ Assignment_1_ParentChild.cpp
kartikidindorkar@Kartikis-MacBook-Pro Programs % ./a.out
Initial Process ID 7310 from Parent 6676
[Child] pid 7311 from [Parent] pid 7310
[Child] pid 7312 from [Parent] pid 7310
[Child] pid 7313 from [Parent] pid 7311
[Child] pid 7314 from [Parent] pid 7312
[Child] pid 7315 from [Parent] pid 7311
[Child] pid 7316 from [Parent] pid 7312
[Child] pid 7317 from [Parent] pid 7313
[Child] pid 7318 from [Parent] pid 7315
[Child] pid 7319 from [Parent] pid 7317
kartikidindorkar@Kartikis-MacBook-Pro Programs % g++ Assignment_1_ParentChild.cpp
kartikidindorkar@Kartikis-MacBook-Pro Programs % ./a.out
Initial Process ID 7323 from Parent 6676
[Child] pid 7324 from [Parent] pid 7323
[Child] pid 7325 from [Parent] pid 7323
[Child] pid 7326 from [Parent] pid 7324
[Child] pid 7327 from [Parent] pid 7325
[Child] pid 7328 from [Parent] pid 7324
[Child] pid 7329 from [Parent] pid 7325
[Child] pid 7330 from [Parent] pid 7326
[Child] pid 7331 from [Parent] pid 7328
[Child] pid 7332 from [Parent] pid 7330
kartikidindorkar@Kartikis-MacBook-Pro Programs % g++ Assignment_1_ParentChild.cpp
kartikidindorkar@Kartikis-MacBook-Pro Programs % ./a.out
Initial Process ID 7613 from Parent 6676
[Child] pid 7614 from [Parent] pid 7613
[Child] pid 7615 from [Parent] pid 7613
[Child] pid 7616 from [Parent] pid 7614
[Child] pid 7617 from [Parent] pid 7615
[Child] pid 7618 from [Parent] pid 7614
[Child] pid 7619 from [Parent] pid 7615
[Child] pid 7620 from [Parent] pid 7616
[Child] pid 7621 from [Parent] pid 7618
[Child] pid 7622 from [Parent] pid 7620
kartikidindorkar@Kartikis-MacBook-Pro Programs % █
```