

CS 470 Lab 2 Documentation

Project Goal: The goal of Lab 2 was to simulate process management with a parent process and 10 child processes, each performing a unique task while utilizing C system calls such as `fork()`, `execvp()`, and `wait()`. Additionally, a Makefile was created to facilitate compilation and execution.

Theoretical Knowledge: A process is an active instance of a program, and new processes are created using `fork()`. These new processes can replace their execution context using `execvp()`, allowing them to run different commands or programs. Synchronization between processes is achieved with `wait()`, ensuring that the parent process properly manages child execution. This lab provided hands-on experience in managing concurrency and handling process execution effectively.

Implementation Summary: The main function of the program initializes global variables for process IDs and status codes. A loop is used to create 10 child processes via `fork()`, with basic error handling to ensure proper process creation. Within each child process, a switch statement determines which command to execute using `execvp()`, such as `echo`, `ls`, `date`, and `pwd`. If `execvp()` fails, an error is displayed using `perror()`, and the process exits. The parent process waits for each child to complete using `wait()`, collecting their termination status.

Results and Observations:

- Each child process successfully executed its designated task.
- The parent process correctly managed process execution and termination.
- Error handling ensured that any failures in `fork()` or `execvp()` were reported.
- Process execution order was not strictly sequential due to concurrent execution.

Conclusion: This lab reinforced the importance of process management in Unix-like systems. Understanding how `fork()`, `execvp()`, and `wait()` interact provided deeper insight into process coordination and execution control. Future improvements could include additional synchronization mechanisms to better manage execution order and avoid unintended behavior due to concurrency.