

CSE 344 System Programming

Homework #2

Due April 13

In this homework, you are expected to develop a terminal emulator capable of handling up to 20 shell commands in a single line, without using the `"system()"` function from the standard C library. Instead, you should utilize the `"fork()"`, `"execl()"`, `"wait()"`, and `"exit()"` functions.

Your terminal emulator should include the following features:

- Each shell command should be executed via a newly created child process, meaning that multiple commands will result in multiple child processes.
- Proper handling of pipes ("|") and redirections("<", ">") by redirecting the appropriate file descriptors.
- Usage information should be printed if the program is not called properly.
- Error messages and signals that occur during execution should be printed, and the program should return to the prompt to receive new commands.
- Aside from a SIGKILL (which also should be handled properly) the program must wait for `“:q”` to finalize its execution.
- Upon completion, all pids of child processes with their corresponding commands should be logged in a separate file. Each execution should create a new log file with a name corresponding to the current timestamp.

Make sure to test your program with multiple shell commands in `/bin/sh` to ensure its functionality.

Grading:

- 1) Compilation errors: -100 points.
- 2) Improper use of `fork()`, `execl()`, `wait()`, and `exit()` will result in a deduction of 100
- 3) Make sure to include a makefile with the "make clean" command. Failure to do so will result in a deduction of 30 points.
- 4) Your report is essential, as it will serve as the primary basis for evaluation. Failure to submit your PDF report will result in a deduction of 100 points.
- 5) Late submissions will not be accepted.
- 6) Failure to clean up after child processes or leaving zombies will result in a deduction of 30 points.
- 7) The presence of memory leaks (which will be verified with `valgrind`) will result in a deduction of 30 points.

Submission rules:

- 1) Your source files, your makefile and a report; place them all in a directory named "lastname_firstname_studentnumber", and zip the directory.
- 2) Your makefile should only compile the program, not run it!
- 3) Your report must be in PDF format and should include a detailed explanation of how you solved the problem, which requirements you met, and which commands you tested
- 4) You should do your homework on your own. Your homework will be compared against online sources as well as each other's homework. Proven cases of plagiarism will result in -100 grade.