Programming Assignment #1 – A Simple Shell

A Simple Shell

- Control flow of your simple shell:
  - Display the prompt sign “>” and take a string from user
  - Parse the string into a program name and arguments
  - Fork a child process
  - Have the child process execute the program
  - Wait until the child terminates
  - Go to the first step

Example Output

```
justin@justin-virtual-machine:~/Desktop/SimpleShell$ ls
a.out  shell.c  shell.o  simpleshell.c  simpleshell.o  trace
justin@justin-virtual-machine:~/Desktop/SimpleShell$ ./a.out
>ls
a.out  shell.c  shell.o  simpleshell.c  simpleshell.o  trace
>/bin/ls
a.out  shell.c  shell.o  simpleshell.c  simpleshell.o  trace
>which ls
/bin/ls
>rm shell.o
>ls
a.out  shell.c  simpleshell.c  simpleshell.o  trace
>
```

Important System Calls

- fork()
  - Create a child process
  - http://man7.org/linux/man-pages/man2/fork.2.html
- exec() family
  - Have the current process execute the program specified in the pathname
  - http://man7.org/linux/man-pages/man3/exec.3.html
- wait() family
  - wait() wait the termination of anyone of the child processes
  - waitpid() waits the termination of the specified child process
  - http://man7.org/linux/man-pages/man2/waitpid.2.html

Waiting on child processes

- If a command is ended with “&”, then the shell will not be blocked on a child process

- For example:
  - sleep 10s
    - The prompt re-appears after 10 seconds
  - sleep 10s &
    - The prompt re-appears immediately

- A child process becomes a zombie if it is not waited by its parent process
  - How to deal with this problem?

Test Cases

- Your shell must correctly handle test cases of the following format
  - **`<program> <arg1> <arg2> <…>`**
- Test cases are like the following, but not limited to:
  - **`clear`**
  - **`ls -l`**
  - **`cp a.txt b.txt`**
  - **`cat c.txt &`**
- Do not leave zombie processes in the system!

Bonus!

- I/O redirection (+10 pts)
  - **`ls –l > a.txt`**
- Pipe (+10 pts)
  - **`ls | more`**

Facebook Group

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