mysh-1: Almost complete shell!

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Contents

Introduction

- Implements almost complete shell in this assignment!
- You are going to implement these features in shell
  - Program execution by accessing absolute path
  - Background processing
  - Pipe between two processes
  - Signal handling
- Each features are designed you can get system programming experience about process and thread in Chapter 3 and 4.

Process Creation

- In your new shell, you should launch new process by entering its full path like below snippet.

```
$ /bin/ls /
bin boot dev docker etc home lib lib64 ...
$ /bin/cat /etc/hosts
127.0.0.1       localhost
127.0.1.1       aeis

# The following lines are desirable for IPv6 capable host
::1     localhost ip6-localhost ip6-loopback
ff02::1 ip6-allnodes
ff02::2 ip6-allrouters
$ /usr/bin/vim # vim launched
```

Process Creation

- In this assignment you implement this execution function by using `fork()` and `execv()` functions.
- NOTE: DO NOT USE **`execvp()`** FUNCTION!! IF DO THAT YOUR CODE WILL BE NOT GRADED!

(*Optional*) Path Reoslution

- If you implement path resolution, you get extra points. Example of path resolution is below.

```
$ ls /
bin boot dev docker etc home lib lib64 ...
$ cat /etc/hosts
127.0.0.1       localhost
127.0.1.1       aeis
# The following lines are desirable for IPv6 capable host
::1     localhost ip6-localhost ip6-loopback
ff02::1 ip6-allnodes
ff02::2 ip6-allrouters
```

(*Optional*) Path Reoslution

- If you implement path resolution, you get extra points. Example of path resolution is below.

```
$ vim # vim launched
$ cd ~
$ pwd
/home/jafffy
```

- We assume the PATH variable is defined as

```
export PATH=/usr/local/bin:/usr/bin:/bin:/usr/sbin:/sbin
```

- NOTE: DO NOT USE `execvp()`.

Background Processing

- The background processing is one of program execution method.
    - https://bash.cyberciti.biz/guide/Putting_jobs_in_background

```
$ /somepath/download-some-file &
2558 # Process ID
$ Do something
# If background process is done.
2558 done /somepath/download-some-file
```

Background Processing

- If you enter `fg` command, background process should come to foreground.

```
$ /somepath/download-some-file &
2558 # Process ID
$ Do something
$ fg
2558 running    /somepath/download-some-file
```

- In this assignment, only one background process can exist. You don't need to support multiple background process case.

Inter-Process Communication and Threading

- You should implement pipe functionality. In this assignment pipe doesn't mean IPC pipe, it is shell functionality is shown on this snippet:

```
$ /bin/cat /etc/hosts | /bin/grep localhost
127.0.0.1       localhost
::1     localhost ip6-localhost ip6-loopback

$ pwd | /bin/grep home
/home/jafffy
```

- If we type `a | b`, you should connect `a`'s `stdout` to `b`'s `stdin`.
- Checkout description about pipe in this link
  - https://en.wikipedia.org/wiki/Pipeline_(Unix)

IPC and Threading: Implementation Details

- This pipe MUST be implemented by "domain socket".
  - Tutorial: https://www.ibm.com/support/knowledgecenter/en/SSB23S_1.1.0.14/gtpc1/unixsock.html
- Issues
  - How to redirect `stdout` and `stdin`?
    - Try `dup(2)` and `dup2(2)`.
  - In server side, `listen()` will be blocked, it means your shell will be blocked also. How can you resolve this?
    - Use multithreading on pthread.
    - https://computing.llnl.gov/tutorials/pthreads/

Signal handling

- Implements signal(https://en.wikipedia.org/wiki/Signal_(IPC)) functionality in mysh.
- You should handle two signals in this scenarios:

```
# Scenario I
$ # Your input Ctrl+C
$ # Shell doesn't close.

# Scenario II
$ # Your input Ctrl+Z, but it doesn't move.
```

Grading

- Functional testing (90%)
  - Process Creation (40%)
  - IPC and Threading (40%)
  - Background processing (10%)
  - Signal handling (10%)
- Report (10%)
  - Same rule as previous assignment.

Significant Notes

- From this assignment, ask your question by mail into this mailing list.
  - Mail to: ajou-2017-fall-operating-systems-qna+noreply@googlegroups.com
  - Join us! https://groups.google.com/forum/#!forum/ajou-2017-fall-operating-systems-qna
    - Check to receive email!
  - If you answer other student's question, we give extrapoint to you and thanks for contribution! (Max 3 times)
- Get started with this link:
  - https://github.com/AEIS-Lab/mysh-1