Operating Systems Project #1 - xv6 System Calls

SWE3004-42 Introduction to Operating Systems - Fall 2018

Due date: September 30 (Sun) 11:59pm

1 Goal

In this project, you will implement three system calls in xv6 - getnice, setnice, ps.

2 Synopsis

```
int getnice(int pid)
int setnice(int pid, int value)
void ps(int pid);
```

3 Description of the System Calls

- The getnice function obtains and returns the nice value of a process. It returns -1 if there is no process corresponding to the pid.

- The setnice function sets the nice value of a process. The default nice value is 20. Lower nice values cause more favorable scheduling. The range of valid nice value is [0, 40]. If the nice value is invalid, do not change the nice value of the process. On success, setnice function returns 0. If there is no process corresponding to the pid of the nice value is invalid, it returns -1.

- The ps function prints out process(s)'s information, which includes pid, nice, status, and name of each process. If the pid is 0, print out all processes' information. Otherwise, print out corresponding process's information. If there is no process corresponding to the pid, print out nothing.

You must print out a process's information with the following printf format specifiers for ease of grading.

```
printf("%d %d %s %s\n", pid, niceness, state, process_name);
```

The state of a process can be SLEEPING, RUNNABLE, RUNNING, or ZOMBIE.

4 How to Run xv6

4.1 Install QEMU

Xv6 should be installed along with QEMU virtual machine. So, please run the following commands if you like to work in your own Ubuntu machine.

```
$ sudo apt-get install build-essential
$ sudo apt-get install gcc-multilib
$ sudo apt-get install git
$ git clone https://github.com/geofft/qemu.git -b 6.828-1.7.0
$ sudo apt-get install libsdl1.2-dev
$ sudo apt-get install autoconf
$ sudo apt-get install libtool
```

```
$ cd qemu
$ git submodule update --init pixman
$ ./configure --disable-kvm --target-list="i386-softmmu x86_64-softmmu" --disable-werror
$ make
$ sudo make install
```

5 How to Start Project

Download xv6 source code by running the following git command.

```
git clone https://github.com/jinsoox/xv6-skku.git -b pa1
```

In the xv6-skku directory, you will find a bunch of source code files. Among them, the followings are the files that you need to read and modify.

- **sysproc.c**: add the implementation of your method here

- **syscall.h**: define the position of the system call vector that connects to your implementation
  define additional symbol

- **user.h**: define the function that can be called through the shell

- **syscall.c**: external definitions of the functions that connect the shell and the kernel. Use the position defined in syscall.h to add the function to the system call vector

- **usys.S**: use the macro to connect the call of user to the system call function

- **defs.h**: add a forward declaration of your new system call

- ~~**sysfunc.h**: add the new system call handler into this file too like~~ ~~`int sys_newsystemcall(void)`~~

Note that the xv6-skku repository has a slightly different codes from the original xv6 source codes.
(i) xv6-skku implemented a `halt` system call, and
(ii) added a tarball target to Makefile so that it enables "make tarball" command.
To start xv6, you must run the following command.

```
$ cd xv6-public skku
$ make qemu-nox
```

To kill xv6, you need to run `halt` command, which calls halt() system call.

6 How to Submit

To submit your project, you must run `make tarball` command in xv6-skku directory to compress your source codes into one .tar.gz file. This .tar.gz file must be submitted in swin.skku.edu using the following command.

```
$ os_submit project1 your_tar_file_name
```

Note: Please don't forget writing your ID and project number in the Makefile before creating a tarball.

For any questions, please post them in Piazza so that we can share your questions and answers with other students and TAs. Please feel free to raise any issues and post any questions. Also, if you know the answers to other students' questions, please post them. You would get some credits for participating in the Q&A discussions.