# Assignment 3

Please complete a report.

The files to be submitted for this assignment are:

1. report.pdf

## 1. CPU Scheduling [50pts]

Consider the following single-threaded processes, and their arrival times, estimated CPU costs and their priorities (a process with a higher priority number has priority over a process with lower priority number):

| Process | Estimated CPU Cost | Arrives | Priority |
|---|---|---|---|
| A | 6 | 1 | 1 |
| B | 1 | 2 | 2 |
| C | 3 | 5 | 3 |
| D | 2 | 4 | 4 |

Please note:

- Ignore context switching overhead.
- If a process arrives at time x, they are ready to run at the beginning of time x.
- Highest response ratio next (HRRN) is a non-preemptive scheduling algorithm. In HRRN, the next job is not that with the shorted estimated run time, but that with the highest response ratio defined as: 1 + waiting time / estimated CPU time.
- Newly arrived processes are scheduled last for RR. When the RR quanta expires, the currently running thread is added at the end of to the ready list before any newly arriving threads.
- The quanta for RR is 1 unit of time.
- Average turn-around time is the average time a process takes to complete after it arrives.
- SJF is non_preemptive.
- Priority scheduler is preemptive.

Given the above information please fill in the following table.

| Time | HRRN | FIFO/FCFS | RR | SJF | Priority |
|---|---|---|---|---|---|
| 1 | | | | | |
| 2 | | | | | |
| 3 | | | | | |
| 4 | | | | | |
| 5 | | | | | |
| 6 | | | | | |
| 7 | | | | | |
| 8 | | | | | |
| 9 | | | | | |
| 10 | | | | | |
| 11 | | | | | |
| 12 | | | | | |
| Avg. Turn-around Time | | | | | |

## 2. Process scheduling [50pts]

In this problem, we will implement process scheduling.

Download assignment code by:

```
#change work directory to the repository of assignment1

git remote add upstream ssh://git@mirrors.sustech.edu.cn:13389/operating-
systems/project/kernel_legacy.git

git fetch upstream

git checkout scheduling
```

**Please unable the clock interrupt first.**

In PCB, we add another integer name `labschedule_good` and the initial number is 6. **You need to implement a syscall to let user process set `labschedule_good`.**

When the child process runs for a while, it may call the syscall to modify `labschedule_good`.

In this scheduling algorithm, we need to choose the process with the largest good value to run when scheduling.

That is to say, when a process call syscall to set its `labschedule_good` smaller, it will be preempted by a runnable process with a larger `labschedule_good`.

If processes have same `labschedule_good`, they are scheduled by fifo.

You need to realize this scheduling algorithm by modify `default_sche.c`.

To test your code, you need to run user program `ex3`. Please release annotations in the main function in `ex3.c`. Other contents are prohibited to modify in `ex3.c`. And you should let user_main to run `ex3` instead of `rr`.

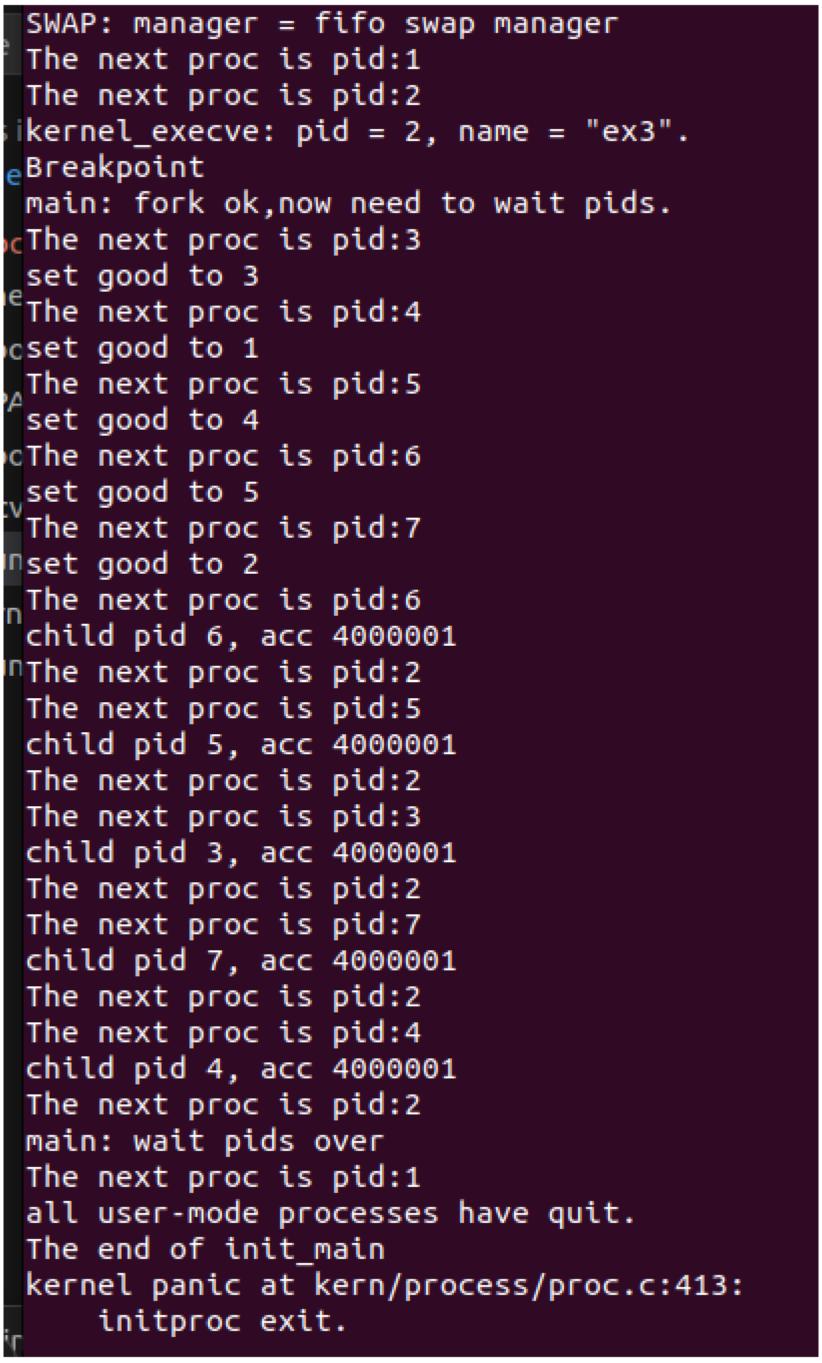
Please submit your code to GitLab

You only need to submit the files that have been modified by you from the following list:

- kern/schedule/default_sched.c
- kern/schedule/default_sched.h
- kern/syscall/syscall.c
- **kern/syscall/syscall.h**
- user/libs/ulib.c
- **user/libs/ulib.h**
- user/libs/syscall.c
- user/libs/syscall.h

**note: If you modify `kern/syscall.h` or `ulib.h`, the online test will fail. You can contact Shen Yun for manual test instead.**

Sample:



```
SWAP: manager = fifo swap manager
The next proc is pid:1
The next proc is pid:2
kernel_execve: pid = 2, name = "ex3".
Breakpoint
main: fork ok,now need to wait pids.
The next proc is pid:3
set good to 3
The next proc is pid:4
set good to 1
The next proc is pid:5
set good to 4
The next proc is pid:6
set good to 5
The next proc is pid:7
set good to 2
The next proc is pid:6
child pid 6, acc 4000001
The next proc is pid:2
The next proc is pid:5
child pid 5, acc 4000001
The next proc is pid:2
The next proc is pid:3
child pid 3, acc 4000001
The next proc is pid:2
The next proc is pid:7
child pid 7, acc 4000001
The next proc is pid:2
The next proc is pid:4
child pid 4, acc 4000001
The next proc is pid:2
main: wait pids over
The next proc is pid:1
all user-mode processes have quit.
The end of init_main
kernel panic at kern/process/proc.c:413:
    initproc exit.
```