

# Homework 2

[Submit Assignment](#)

---

<b>Due</b>	Friday by 11:59pm	<b>Points</b>	5	<b>Submitting</b>	a file upload	<b>File Types</b>	pdf
------------	-------------------	---------------	---	-------------------	---------------	-------------------	-----

---

Solve these exercises from the OSC book (with some minor modifications).

6.13. Chapter 5 of OSC discusses possible race conditions on various kernel data structures. Most scheduling algorithms maintain a run queue, which lists processes eligible to run on a processor. On multicore systems, there are two general options: (1) each processing core has its own run queue, or (2) a single run queue is shared by all processing cores. Briefly give at least one advantage and one disadvantage of each of these approaches.

5.20. Consider the following code example for allocating and releasing processes:

```
#define MAX_PROCESSES 255
int number_of_processes = 0;

/* the implementation of fork() calls this function */
int allocate_process() {
    int new_pid;
    if (number_of_processes == MAX_PROCESSES) {
        return -1;
    } else {
        /* allocate necessary process resources */
        ++number_of_processes;
        return new_pid;
    }
}

/* the implementation of exit() call this function */
void release_process() {
    /* release process resources */
    --number_of_processes;
}
```

a. Identify the race condition(s).

b. Assume you have a mutex lock named *mutex* with the operations *acquire()* and *release()*. Indicate where the locking needs to be placed to prevent the race condition(s).

c. Could we replace the integer variable "int number\_of\_processes = 0" with the atomic integer "atomic\_t number\_of\_processes = 0" to prevent the race condition(s)? (Assume here this atomic\_t has safe, lock-free, atomic loads and stores and an atomic fetch\_and\_add/fetch\_and\_subtract like operation.)

10.10 Briefly explain why the OS often uses an FCFS disk-scheduling algorithm when the underlying device is an SSD.

10.14 Describe one advantage and two disadvantages of using SSDs as a caching tier compared with using only magnetic disks.

12.16 Consider a file system that uses inodes to represent files. Disk blocks are 8 KB in size, and a pointer to a disk block requires 4 bytes. This filesystem has 12 direct disk blocks, as well as one single, one double, and one triple indirect disk blocks entry in its inode. What is the maximum size of a file that can be stored in this file system?

Hand in your solutions as a PDF here in Canvas.