EECE 4029: Operating Systems and Systems Programming

Spring 2022

HOMEWORK I

Given: Jan. 31, 2022

Programming problem:

An operating system's pid manager is responsible for managing process identifiers. When a process is first created, it is assigned a unique pid by the pid manager. The pid is returned to the pid manager when the process completes execution, and the manager may later reassign this pid. Process identifiers are discussed more fully in Section 3.3.1 of the textbook. What is most important here is to recognize that process identifiers must be unique; no two active processes can have the same pid.

Use the following constants to identify the range of possible pid values:

#define MIN PID 300

#define MAX PID 5000

You may use any data structure of your choice to represent the availability of process identifiers. One strategy is to adopt what Linux has done and use a bitmap in which a value of 0 at position i indicates that a process id of value i is available and a value of 1 indicates that the process id is currently in use.

Implement the following API for obtaining and releasing a pid:

• int allocate map(void)—Creates and initializes a data structure for representing pids; returns -1 if unsuccessful, 1 if successful

• int allocate pid(void)—Allocates and returns a pid; returns -1 if unable to allocate a pid (all pids are in use)

• void release pid(int pid)—Releases a pid

Please submit your source code for this question. To receive full credits for this problem, please include screen shots of your test results.