Gebze Technical University

Department Of Computer Engineering

CSE 312 /CSE 504 Spring 2023

Operating Systems

# Homework #01
# Makeup and Bonus

Due Date: 30.04.2023

1. **Your task for the homework**

   What we expect from your new OS is

   - Investigate the codes that we have shared with you.
   - Use the given any of iso files.
   - In the first Hw, we used only the timer interrupts. Instead, in this homework, we include keyboard and mouse click interrupts.
   - Handle all those interrupts, which will help us to context switching for our tasks.
   - **You have to create all of your processes by using fork syscall.**
   - By using implemented system calls such as fork, waitpid, execve, any other POSIX call that you need, you will give chance to the user to the process context switching.
   - To this end, instead of context switching for every timer interrupt, you will ignore at least 10 timer interrupts. Instead, processes may be switching by keyboard and mouse click interrupts.
   - Loading multiple programs into memory: Kernel will be able to load multiple programs into memory.
   - Handling multi-programming: you need to develop a Process Table that will hold the necessary information about the processes in the memory. You should study what Process Tables holds. You can read carefully throughout the chapter 2 of the course book or any other online resource).
   - Handling Interrupts: Our given source code can handle interrupts, and your kernel will handle and respond between multiple processes.

Perform Round Robin scheduling: Every time a timer interrupt occurs, there is a chance to make a process switch. Whenever a context scheduling occurs, you will print all the information about the processes in process table including but not limited to the entries in the list below. You can modify anything that you want if you comment on the report.

**Lifecycle**

You will implement 3 different flavors of MicroKernel. Don't worry 90 percent of the code is same between the Micro Kernels. We further explain the details below. When your kernel is loaded your OS will start a process named init with process id 0. In different Micro Kernels Init process will load programs into memory differently.

**In the first strategy** init process will initialize Process Table, load 3 different programs (listed below) to the memory start them and will enter an infinite loop until all the processes terminate.

**Second strategy** is randomly choosing one of the programs and loads it into memory 10 times (Same II program 10 different processes), start them and will enter an infinite loop until all the processes terminate.

**Final Strategy** is choosing 2 out 3 programs randomly and loading each program 3 times start them and will enter an infinite loop until all the processes terminate.

For every timer interrupt, OS should handle the interrupts and perform round robin scheduling. **Programs that you will test are here. You will pass arguments to the functions by using keyboard.**

- BinarySearch
  - Ex; Input : {10, 20, 80, 30, 60, 50, 110, 100, 130, 170} x = 110; Output : 6
- LinearSearch
  - Input : {10, 20, 80, 30, 60, 50, 110, 100, 130, 170} x = 175; Output : -1
- Collatz
  - You are going to find collatz sequence for each number less than 25. You can find information about (Collatz conjecture on internet). For each number you will show the number being interested in, and its collatz sequence and go to next number
  - Ex Output;7: 22 11 34 17 52 26 13 40 20 10 5 16 8 4 21

2. **General rules for homework**
    a. It is not a group project. Do not share your answers to anyone in any circumstance. Any cheating means at least –100 for both sides.
    b. **Your homework report is very important**, it should include your design decisions, your structures, your comments, and codes with screen shots.
    c. Write comments on the lines of your code where any critical actions happen.
    d. All the things that you have developed should be reported by using screen shots and comment on them!
        a. After the deadline, you are responsible for explaining your project to the course assistant in a demonstration.
        b. Each demo will be done in 10 minutes.
        c. Many appointments will be opened so you can select the most available time slot for yourself.
        d. In order to answer all possible questions, you need to commandyour code. The solution is to write and to do everything on yourown. Your homework grade will be evaluated by your answers