CSC 3320: System-Level Programming

Week of 04/21/2025

Lab 14

© Instructor: Dr. Md. Mahfuzur Rahman

Lab Quiz: 30 Points, Problem Solving: 70 Points

Objectives:

Today we will be covering the following topics:

1. Practice `Process Management` in a C program.
2. Practice `fork()` system call in a C program.
3. Practice write usage of process ID (PID) to create processes and assigning different tasks.

Instructions:

- Attendance is mandatory.
- Labs must be completed individually.
- If you have any questions, please do not hesitate to ask TA.
- Follow submission instructions in the deliverable section.
- There will be a lab quiz of 30 points arranged by Lab TA.
- Visit the broader grading criteria after the deliverable section. (last page)
- Lab assignments are due by 5:00 PM the next day after your lab session.

1. Write a program to create three children of the same parent process (original main process). The first child will calculate the sum of even numbers between 1 and 1000. The second child will find the sum of odd numbers between 1 and 1000. The third child will find the prime numbers between 1 and 1000 and display them. Note that a prime number is a positive integer greater than 1, which has only two proper divisors, 1 and the number itself. For example, 2, 3, 5, 7, 11, 13 are first few prime numbers. All the processes including the original parent process must report when they terminate by printing a termination message and their own PID and their parent's PID. For example, each process will print the following message before they terminate:

   `DONE. MY PID IS .... MY PARENT'S PID IS ...`

   Use the `vi` editor to create your program and save it as `lab14.c`.

2. Now, make sure you completed the following tasks:
   (a) (30 points) Make sure you created three child processes of the same parent. Do not create child of a child.
   (b) (15 points) Make sure the first child calculates the sum of even numbers. The second child calculates the sum of odd numbers. The third child finds the prime numbers.
   (c) (05 points) Make sure all processes (4 processes including the original parent process) print the termination message correctly.
   (d) (05 points) Make sure you explained your code to the TA or give enough documentation in your submission.
   (e) (03 points) Start recording your session using the `script` utility.
   (f) (03 points) Show the contents of lab14.c using the `cat` command.
   (g) (03 points) Compile lab14.c with required flags for the object file name `[use -o]` and C version `[-std=c99]`.
   (h) (03 points) Run your program using appropriate command.
   (i) (03 points) Finish your recording (use the `exit` command).

Deliverables
For today's lab, clean the text file (.txt) you recorded during your terminal session, if there are unwanted control characters. In other words, make it as you observed during your terminal session. Please name your text file as **lastname_firstname_lab14.txt**. You will need to submit the text file (terminal session record) and your C file (lab14.c) to the **Lab 14** dropbox in iCollege.

Broader Grading Criteria

- If no C (`.c`) file is submitted (regardless if `.txt` file submitted or not), a student will receive only 40% for attendance. Submission will not be graded.
- If C file is given but no `.txt` file (terminal session) is given, a submission will receive maximum 70% (will vary between 40% to 70% based on the correctness of the C program).
- If a `.txt` file is given along with the `.c` file, but the `.txt` file is not clean and not comprehensible to the TA, a submission will receive maximum 80% (will vary between 40% to 80% based on the correctness of the C program).
- If both clean `.txt` file and the `.c` file are given, your submission will be normally evaluated based on the tasks and the corresponding point distributions.
- Screenshots will not satisfy the requirements for code and/or the .txt files submission.
- There should be compatibility between lab quiz performance and problem-solving (programming) performance. Otherwise, you may be called for an interview with Lab TA.