

CS 3305A: Operating Systems
Department of Computer Science
Western University
Assignment 2
Fall 2021
Due Date: October 8, 2021

Purpose

The goals of this assignment are the following:

- Get experience with the *fork()*, *wait()* and *pipe()* system functions.
- Learn how to use pipe for bi-directional communication between parent and child process.
- Gain more experience with the C programming language from an OS perspective.

Inter-Processes Communications (100 points)

Write a C program that will accept three strings from the user as **command-line arguments** (for example, X, Y, and Z). Your *parent* process will create a child process. The parent process will read the first command-line argument into variable X while the child process will read second and third command-line argument into variable Y and Z, respectively. The parent process will write X to the pipe and wait for the child process to finish. The child process will read X from the pipe written by the parent process. After that, the child process concatenates Y and Z to generate Y' and then concatenates X and Y' to generate Z'. The child process will write Z' into the pipe (i.e., shared memory). The parent process will read Z' from the pipe and output the resulting string. The expected output from your program should look like the following for the arguments "CS", "3305", and "is fun!":

1. parent (PID 2209) created a child (PID 2213)
2. parent (PID 2209) receives X = "CS" from the user
3. parent (PID 2209) writes X = "CS" to the pipe
4. child (PID 2213) receives Y = "3305" and Z = "is fun!" from the user
5. child (PID 2213) concatenates Y and Z to generate Y' = " 3305 is fun!"
6. child (PID 2213) reads X from pipe = "CS"
7. child (PID 2213) concatenates X and Y' to generate Z' = "CS 3305 is fun!"
8. child (PID 2213) writes Z' into the pipe
9. parent (PID 2209) reads concatenated result from the pipe (Z' = "CS 3305 is fun!")

Hints: fork(), wait(), pipe(), write(), read()

Mark Distribution

This section describes a tentative allocation of marks assigned for the desired features.

- **Inter-Processes Communications (100 points)**
 - a) Parent reads *X* from user: 10 points
 - b) Child reads *Y* & *Z* from user: 12 points
 - c) A pipe is created for communication between *parent* and *child*: 20 points
 - d) Parent writes *X* into the pipe: 12 points
 - e) Child reads *X* from the pipe: 12 points
 - f) Child writes *Z'* into the pipe: 12 points
 - g) Parent reads *Z'* from the pipe: 12 points
 - h) Output the correct string: 10 point

Computing Platform for Assignments

You are responsible for ensuring that your program compiles and runs without error on the computing platform mentioned below. **Marks will be deducted** if your program fails to compile, or your program runs into errors on the specified computing platform (see below).

- Students have virtual access to the MC 244 lab, which contains 30 Fedora 28 systems. Linux machines available to you are: **linux01.gaul.csd.uwo.ca** through **linux30.gaul.csd.uwo.ca**.
- It is your responsibility to ensure that your code compiles and runs on the above systems. You can SSH into MC 244 machines (please see the Assignment 1 file transfer tutorial).
- If you are off campus, you have to SSH to **compute.gaul.csd.uwo.ca** first (this server is also known as **sylvia.gaul.csd.uwo.ca**, in honour of Dr. Sylvia Osborn), and then to one of the MC 244 systems (**linux01.gaul.csd.uwo.ca** through **linux30.gaul.csd.uwo.ca**) (please see the Assignment 1 file transfer tutorial).
- <https://wiki.sci.uwo.ca/sts/computer-science/gaul>

Assignment Submission

You need to submit only one C file. The name of your submitted C file must be “assignment2.c”. Marks will be deducted if your submitted C file name is different. You must submit your assignment through OWL. Be sure to test your code on one of MC 244 systems (see “Computing Platform for Assignments” section above). **Marks will be deducted** if your program fails to compile or your program runs into errors on the computing platform mentioned above.

Assignment 2 FAQ will be made available on OWL, as needed. Also, consult TAs, and the Instructor for any questions you may have regarding this assignment.