

Individual Project
Due Friday, 03/05, at 11:59pm
Points 100

I. Project Organization

This project will study **multiprogramming using fork and pipe on a Unix/Linux machine.**

- Code 60 points
- Output 20 points
- Summary 20 points

Code

The code should be nicely formatted with plenty of comments. It should be easy to read, properly indented, employ good naming standards, good structure, etc.

Output

Output will be graded by running your program. Your program will be tested on a machine (lab00.cs.ndsu.nodak.edu -- lab20.cs.ndsu.nodak.edu) in the computer science Linux lab.

Summary

The task will **be to add up the integer numbers in a file.** The file will be in ASCII text with one three digit number per line. The summary section should discuss the results of running a single process versus multiple processes on adding numbers in a file. You should complete Table 1 and discuss your result.

The **summary section should include three parts:**

1. Record the running time in Table 1
2. Discuss your result in Table 1 (1-2 pages)
3. What was learned by doing this project

Your results must be presented clearly and be reproducible, e.g.

Table 1

	Parent Reads File		
	Small	Medium	Large
1 Process			
2 Processes			
4 Processes			
	Children Read File		
	Small	Medium	Large
1 Process			
2 Processes			
4 Processes			

II. Project Description

Problem Overview

Your solution must be written in the C programming language.

You must use fork and pipe to complete this project.

Your program must compile and run on the QBB244 lab computers using the gcc compiler.

This project creates processes to add all numbers in a file. The user will enter a number (1, 2, or 4) of parallel processes to create for processing the numbers. The system will then create this many processes, evenly dividing the file contents between the processes. For example, if the file has 1000 numbers and the user wants 4 processes, then each process would process 250 numbers in the file.

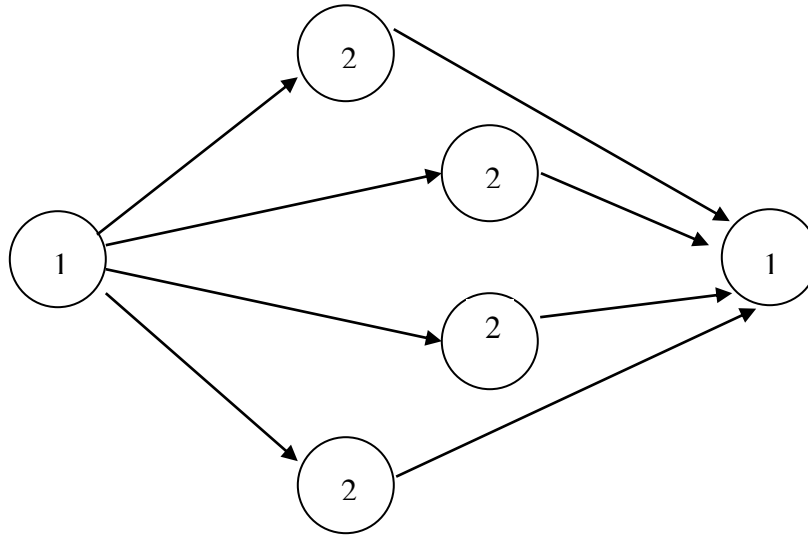
You must test two ways for getting the data to the child processes:

- Have the parent read the file and then send the appropriate numbers to the corresponding child process using a pipe.
- Have the parent determine appropriate offsets in the file, send the offsets to the corresponding child process using a pipe, and have the child process read its portion of the file.
- In either of the above cases the child process(es) should return results to the parent process using a pipe.

III. System Description

The system is illustrated in the diagram shown below. The processes are as follows:

1. **Parent process.** This process allows the user to input the number of processes to create (1, 2, or 4). It determines what portion of the file each process must work on and informs the process via a pipe. More specifically, the first child process handles the first block in the file, and the second child process handles the second one and so on. The parent then waits for each child to report its result. Once each result is received, it combines the results and prints the overall result.
2. **Child process.** Receives which part of the file to process. Process the file and send results back to the parent process.



IV. Project Guidelines

Data Files

Example input files will be available in a readable directory in the instructor's lab244 account.
These data files are:

- small.txt 1,000 numbers
- medium.txt 1,000,000 numbers
- large.txt 1,000,000,000 numbers
- After the assignment is complete remove (delete) the large.txt file from your directories.

Submitting

Submit your project on Blackboard. Include in your submission the following files:

- 1) A Word document for the written pieces of the project
 - a. This should include a copy of your output.
- 2) Your source code file(s)
 - a. Be sure your name is included in the header comments of your source code file(s).

Show all work for partial credit.

TURNING IN YOUR PROJECT:

Create a Word document that contains your answers.

- Embed all visualizations (graphs, tables, etc.) in your document.
- Use the equation editor where appropriate.
- Include a single line 3 column document header that includes:
 - o Your name (on the left)
 - o "CSCI 474 – p01" (in the center)
 - o Page number (on the right)
- Name our file proj01-LnameFM.docx
 - o Lname = your last name
 - o F = your first initial
 - o M = your middle initial

Submit your Word document on Blackboard.

This assignment is due on Friday, 03/05 @ 11:59pm.

This is an individual project. You are allowed to discuss the project with other students in the class but each student must create their own answer document. Copying all or part of a solution is not allowed.