FATİH
SULTAN
MEHMET
VAKIF ÜNİVERSİTESİ

Name & Surname: Metin Kağıt

Student No: 1821221033

Department: BLM

Lecture: Operating Systems - Project 1

CONTENT

1- Abstract

This project involves the development of a program that executes subprocesses and facilitates communication between the main process and subprocesses through pipe channels. The program implements the fundamental operating system concept of 'Transaction Manager' using the C programming language. To achieve this, four separate forks were created from the main file 'trmn.c', and the subprocesses ('adder.c', 'multiplier.c', 'divider.c', and 'subtractor.c') were executed using the 'execve()' command. Data exchange was enabled between the child processes and the parent project. Upon program completion, the child processes created earlier were closed using the exit signal, followed by termination of the main program.

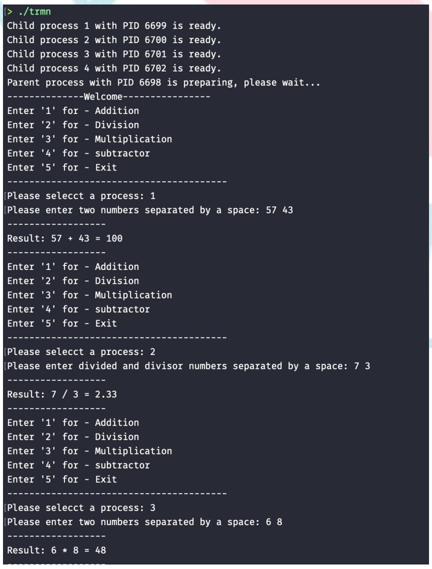
2- Project Topic

The topic of the project is implementing the fundamental operating system concept of 'Transaction Manager' using the C programming language. The program executes subprocesses and provide communication between the main process and subprocesses through pipe channels.

3- Project Outputs and Success Criteria

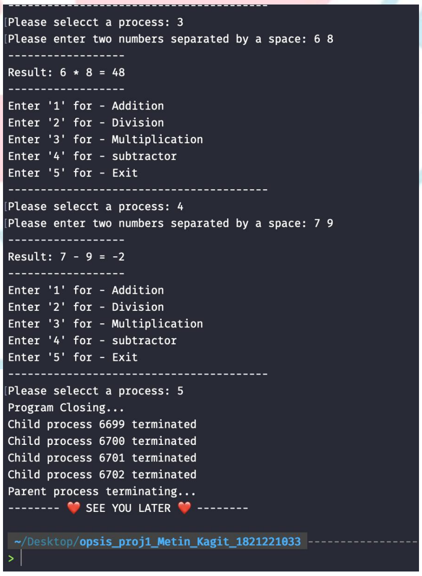
The project output involves understanding the fork structure and the working principles of 'execve()'. It also includes learning how to use pipes and signals. Throughout the project, I gained knowledge on how child and parent processes can work together and communicate with each other via pipes.

The success criteria require the completion of the tasks outlined in the document. This involves sending to the child process through a pipe, the operation is calculated, and the result is written back into the pipe. The parent process then reads the result and prints it.



```
> ./trmn
Child process 1 with PID 6699 is ready.
Child process 2 with PID 6700 is ready.
Child process 3 with PID 6701 is ready.
Child process 4 with PID 6702 is ready.
Parent process with PID 6698 is preparing, please wait...
-------------Welcome---------------
Enter '1' for - Addition
Enter '2' for - Division
Enter '3' for - Multiplication
Enter '4' for - subtractor
Enter '5' for - Exit
---------------------------------------
Please selecct a process: 1
Please enter two numbers separated by a space: 57 43
------------------
Result: 57 + 43 = 100
------------------
Enter '1' for - Addition
Enter '2' for - Division
Enter '3' for - Multiplication
Enter '4' for - subtractor
Enter '5' for - Exit
---------------------------------------
Please selecct a process: 2
Please enter divided and divisor numbers separated by a space: 7 3
------------------
Result: 7 / 3 = 2.33
------------------
Enter '1' for - Addition
Enter '2' for - Division
Enter '3' for - Multiplication
Enter '4' for - subtractor
Enter '5' for - Exit
---------------------------------------
Please selecct a process: 3
Please enter two numbers separated by a space: 6 8
------------------
Result: 6 * 8 = 48
```

Picture 1.0 (Console Output)



```
---------------------------------------
Please selecct a process: 3
Please enter two numbers separated by a space: 6 8
------------------
Result: 6 * 8 = 48
------------------
Enter '1' for - Addition
Enter '2' for - Division
Enter '3' for - Multiplication
Enter '4' for - subtractor
Enter '5' for - Exit
---------------------------------------
Please selecct a process: 4
Please enter two numbers separated by a space: 7 9
------------------
Result: 7 - 9 = -2
------------------
Enter '1' for - Addition
Enter '2' for - Division
Enter '3' for - Multiplication
Enter '4' for - subtractor
Enter '5' for - Exit
---------------------------------------
Please selecct a process: 5
Program Closing...
Child process 6699 terminated
Child process 6700 terminated
Child process 6701 terminated
Child process 6702 terminated
Parent process terminating...
-------- ❤️ SEE YOU LATER ❤️ --------

 ~/Desktop/opsis_proj1_Metin_Kagit_1821221033 -----------------
>
```

Picture 1.1 (Console Output)

4- Things Done During the Project

This project started by creating the necessary classes and importing the libraries to be used in the project. Then the necessary variables were defined in the main program and pipelines were created. After this step, a fork structure was created and 4 child processes were created and the classes for addition, subtraction, division and multiplication operations were executed in these child processes using the "execve()" command. The pipelines created in this process were sent as arguments to the child processes so that the parent and child processes could communicate with each other.

After creating the basic structure, a while loop was implemented to obtain user input. The loop prompts the user to choose a process, input two numbers based on the selected process. Then parent process assigns the entered numbers to a variable as a string array. The variable is then written to the pipe and sent to the designated child process. Upon completion of the child process, the parent process retrieves the result from the pipe and displays it on the screen. If the user selects the exit option, a shutdown command is sent to the child processes. At this stage, the parent process waits for the subprocesses to close. Once they have closed, the parent program terminates.

Files perform addition, subtraction, multiplication and division in the following way: when data is received from the main operation, it is stored in a variable. This variable is then passed to a function which converts the digits in the string into integers and performs the desired operation. Finally, the result is written back into the pipe. Finally, a makefile was written to compile and run the program.

5- Additional explanations

After accessing the main directory of the file on the console;

- To compile, enter the "make" command.
- After compiling, enter the command "./trmn" to run the program.

Note: If you would like to view a higher resolution image of the outputs, please refer to the 'screenshots' folder.

6- References

- Operating System Lecture Labrotory Examples.

- https://www.geeksforgeeks.org/c-program-demonstrate-fork-and-pipe/

- https://stackoverflow.com/

- https://jameshfisher.com/2017/02/17/how-do-i-call-a-program-in-c-with-pipes/