KARACHI INSTITUTE OF ECONOMICS & TECHNOLOGY

Assignment 2 (102539)

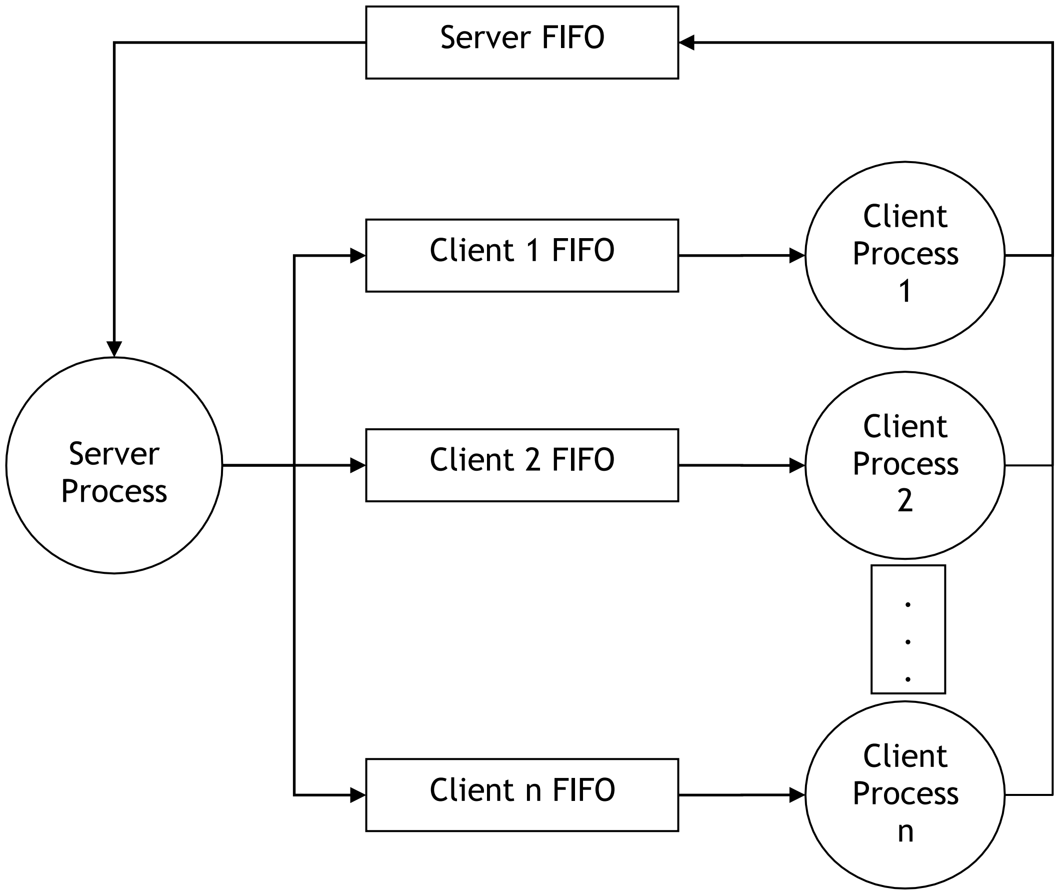
Type: Group Assignment (3 or 4 members per team)

Course: Operating Systems

Instructor: Dr. Ayaz ul Hassan Khan

Task 1: (40 marks: FIFOs creation = 10 marks, Online Clients Maintains = 10 marks, Messaging/Execution = 10 marks, Report = 10 marks)
In this task, you have to write two programs (a client and a server) which will do chatting with each other using FIFOs (to pass message from one process to another). The server process creates a SERVER_FIFO to receive client connections only. The server maintains the list of online clients. Each client creates its own CLIENT_FIFO to receive commands from server to be executed at client using system() system call. You can use getpid() system call to retrieve client's process id to be concatenated in the CLIENT_FIFO name.

The model that you are going to implement will look like as follows:



Task 2: (60 marks, Processes Creation = 10 marks, I/O Redirection = 20 marks, Redirection and Compare = 30 marks)
Write a program to redirect input/output of one arbitrary program to another arbitrary program in a direction specified by the user as it is done by the bash command interpreter when two programs A and B are joined as

- **$ A | B**

Here, both programs A and B are started back to back without any delay and the bash process is the parent of both the programs A and B.

For example, in bash command interpreter, you can join ls with less as

$ ls | less

to make the directory listing page-wise. Here the directory output of ***ls*** is re-directed to the ***less*** process, and the ***less*** process outputs it page-wise. Here both ***ls*** and ***less*** are executing simultaneously, and both are child processes of the bash process.
Your task is to write a program that takes three command line arguments as

$ assignment_prog2 programA operator programB

Here assignment_prog2 = name of your executable assignment program
programA = any arbitrary program that do I/O from standard I/O
operator = any one of the symbol from the set {p, c}
programB = any arbitrary program that do I/O from standard I/O
Here in the symbol set, ***'p'*** denotes '|' symbol as used by bash for I/O redirection and ***'c'*** denotes redirection and compare operation, in this case you should also compare the output of both programs and return TRUE or FALSE accordingly.

Now you have to create child process for ***programA*** and for ***programB***, and re-direct their standard I/O as specified by the symbol in the command-line argument.
For example, in the case of

$ assignment_prog2 programA p programB

The ***assignment_prog2*** must first spawns ***programA***, but before that, create a ***FIFO*** channel ***e.g. pipe***, and connects the input of the pipe to the standard output of ***programA***. Simultaneously, ***assignment_prog2*** starts ***programB***, but before that connects the output of the pipe to the standard input of ***programB***. Thus when ***programA*** runs, it will dump all its output to the pipe's input, and when ***programB*** is run, it will receive this ***programA's*** output from pipe's output that is connected to the ***programB's*** standard input.

Most of the Linux commands like *ls, cat, less, more, ps, etc* uses standard I/O for their input output purposes. For instance *ls, cat, ps* commands output their data to the standard output, while *less, more* commands take data from their standard input. You can make your own test program that takes any string input from standard input and output it after some transformation to the standard output.

Use any function that is required in the assignment. The system calls that are required are fork, wait, execv/execlp/execl, pipe, dup/dup2, and close.

<u>Brief introduction to dup2</u>
It is a system call that duplicates a caller specified file descriptor to another file descriptor number specified by the caller. For more information, see manual page of

dup2 and/or section “Pipes Used as Standard Input and Output” in chapter 13 of the book “Beginning Linux Programming by Wrox Press”.
Submission:

Deadline: November 07, 2019 till midnight.

Required Deliverables:

1. Task 1: two source code files, a report with code explanations and screenshots of sample executions
2. Task 2: three source code files, a report with code explanations and screenshots of sample executions

Note: You should provide proper comments in source code to get full marks.
Submission should be done on GitHub Assignment 2 through the following link:

Contribution of each member should be highlighted properly on github.