

Operating Systems(CS)

Sunday, 12th Mar, 2023

Assignment# 01

- Zero marks in all the assignments will be awarded to the students involved in plagiarism, cheating or any kind of dishonesty.
 - Deadline will not be extended in any case.
 - Late submission will result in zero marks in the assignment. Try to submit the assignment at least one day before the deadline so avoid any issues at the last moment.
 - All the submissions will be done on Google classroom.
 - You have to submit .cpp/.sh files in Zip Folder named after your roll no (20I-XXXX.zip).
 - Naming convention must be followed strictly. Each file should be named in the format ROLLNUMBER_QUESTION#.EXT e.g. 21I2023_Q1.cpp
 - Be prepared for viva or anything else after the submission of assignment.
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Problem 1 – Write a program that would first of all create “n” number of processes. To create “n” number of processes, you need to follow these steps:

- Generate any random number between 10 - 99
- Multiply the generated number by last digit of your roll number.
- Now divide your roll number with the generated number.
- Once division is done, Take the mod of respective number with 25. If your number is less than 10, add 15 to it.
- You will receive a number less than 25, now create (n x n) matrix and populate the matrix randomly.

Once the matrix has been populated successfully and you have “n” number of processes created, you have to save the whole matrix in a text file. Now you have to perform matrix multiplication. Each process will perform matrix multiplication for one row and store it in the respective text file along with its id.

$$\begin{array}{l}
 \text{P1} \\
 \text{Matrix 1} \left\{ \begin{array}{ccc} 1 & 1 & 1 \\ 2 & 2 & 2 \\ 3 & 3 & 3 \end{array} \right\} \quad \text{Matrix 2} \left\{ \begin{array}{ccc} 1 & 1 & 1 \\ 2 & 2 & 2 \\ 3 & 3 & 3 \end{array} \right\} \\
 \\
 \text{Matrix 1} \times \text{Matrix 2} \left\{ \begin{array}{ccc} 1*1+1*2+1*3 & 1*1+1*2+1*3 & 1*1+1*2+1*3 \\ 2*1+2*2+2*3 & 2*1+2*2+2*3 & 2*1+2*2+2*3 \\ 3*1+3*2+3*3 & 3*1+3*2+3*3 & 3*1+3*2+3*3 \end{array} \right\} \\
 \\
 \text{Matrix 1} \times \text{Matrix 2} \left\{ \begin{array}{ccc} 6 & 6 & 6 \\ 12 & 12 & 12 \\ 18 & 18 & 18 \end{array} \right\}
 \end{array}$$

Once all the processes perform their tasks, the main process will read all the text files of the processes and display the resultant matrix.

Problem# 02:

Develop a chat program that uses shared memory, fork(), and exec() for inter-process communication between clients. The messages between the chat clients will be stored in shared memory. Discuss the synchronization issues that can arise due to multiple processes accessing shared memory concurrently.

Your program should include the following features:

- The chat program should allow multiple clients to connect and communicate with each other.
- The messages exchanged between the clients should be stored in shared memory.
- The clients should use fork() and exec() to create child processes for communication.
- The program should discuss the synchronization issues that can arise due to multiple processes accessing shared memory concurrently. Add the description of problem in the code within a single block comment. e.g. /* problem */
- You are not required to solve the synchronization issues in your program, but you should discuss the potential problems and how they could be resolved.
- You are not allowed to use pipes for communication.

Problem# 03

Implement the following using bash scripting:

1. Create a new user (user name is OS_Assignment_1 and password is 12345) in Ubuntu
2. and assign administrator privileges to it. Switch used for this task is -uc.
3. List down all of the installed application into Ubuntu. Switch used for this task is
4. -ld.
5. Install application program like Dropbox. Switch used for this task is -ins
6. Now, set the IP address, mask, gateway, and DNS of that machine
 - a. IP Address: 10.0.0.1
 - b. Mask: 255.255.255.0
 - c. Gateway: 10.0.0.254
 - d. DNS: 8.8.8.8
7. Switch used for this task is -ipcon
8. Help of all these task will also display using -help switch.
9. Whenever your shell script is run your name and roll number with this format "21 — XXXX-NAME" will display first then perform further tasks.
10. All of your tasks will performed using functions
11. Verify your system after applying above configuration/installations to test whether shell script is working properly.

Example:

```
$ ./OS_Assignment_1.sh -uc
```

```
$ Enter user: OS_Assignment_1
```

```
$ Enter password: 12345
```

```
$ User OS_Assignment_1 is created and administrator privileges are assigned
```

Good Luck 😊