Lab Experiment Sheet-1

School of Engineering and Technology

Course Code & Name: ENCS351 Operating System

Program Name: B.Tech CSE, AI ML, Data Science, Cyber, FSD, UX/UI

Name – Mandeep Singh Course – BTECH CSE DS -Sem 5

Roll No -2301420049

Summary of objectives

Task 1: Process Creation Utility

To accomplish this, I wrote a Python function called task1. I used a

for loop to call os.fork() three times, which created three distinct child processes. Inside the code block for each child (where pid == 0),

I used os.getpid() and os.getppid() to print its own Process ID and its parent's ID, along with a custom message.

In the parent's code block, I made sure the parent process wouldn't exit prematurely by calling os.waitpid() for each child, ensuring it waited for all of them to finish their execution.

Task 2: Command Execution Using exec()

For this task, I created a function task2 that forked a single child process.

In the section of code executed by the child, I used os.execvp("ls", ["ls", "-l"]).

This system call replaced the child process's own code with the ls -l command, effectively making the child execute that command in the terminal.

The parent process simply waited for the command to finish before the script continued.

Task 3: Zombie & Orphan Processes

I simulated these two special process states in separate functions.

- Zombie Process: I created a child that printed a message and exited immediately using os._exit(0). The key to creating a zombie was making the parent process skip the os.wait() call. Instead, I made the parent sleep for 10 seconds. During this time, the child was "defunct" or a zombie because it had terminated, but the parent hadn't yet acknowledged its termination to clean it up from the process table.

• Orphan Process: I did the reverse for the orphan process. I made the parent process exit immediately after forking, while the child process was programmed to sleep for 5 seconds. By the time the child woke up, its original parent was gone. I confirmed it had become an orphan by printing its new parent's PID (os.getppid()), which had changed to 1 (the system's init process).

Task 4: Inspecting Process

Info from /proc I wrote a function inspect_process that accepts a Process ID (PID) as an input. To get the required information, my script directly interacted with the /proc virtual filesystem:

• I read and printed the Name, State, and VmSize by opening and parsing lines from the /proc/[pid]/status file.

• I found the executable's full path by using os.readlink() on the /proc/[pid]/exe symbolic link.

• I listed all open file descriptors by using os.listdir() on the /proc/[pid]/fd directory.

Task 5: Process Prioritization

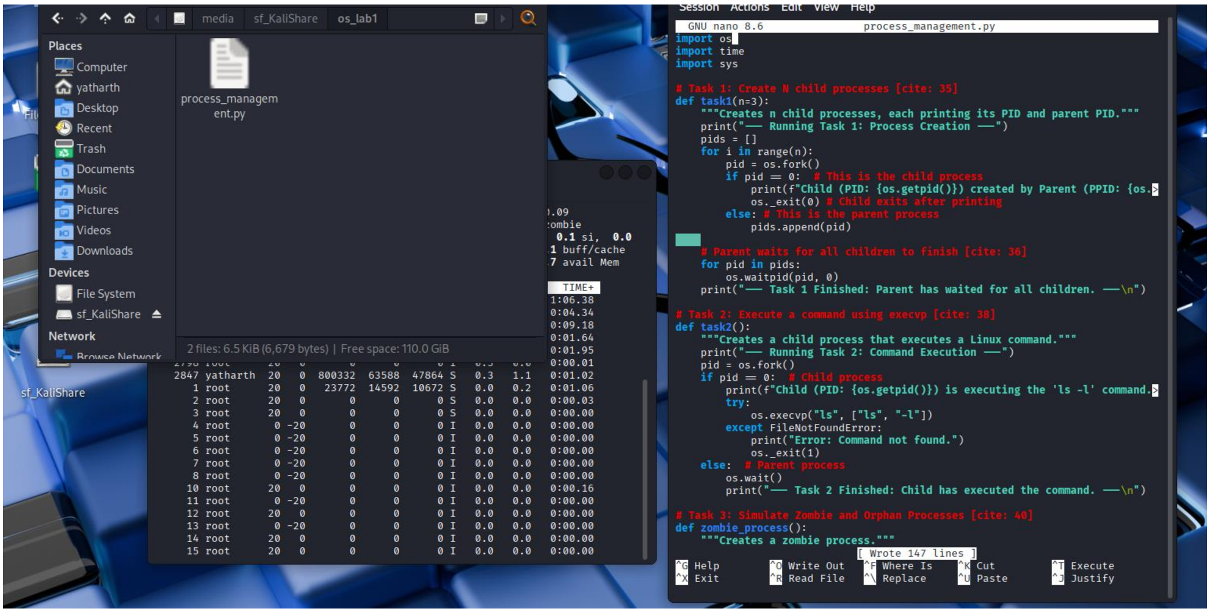
To demonstrate the effect of priority, my task5 function forked multiple child processes. Inside each child, I assigned a different priority using the os.nice() call, with values of 0, 5, and 10. A lower nice value corresponds to a higher priority.

After setting the priority, each child performed an identical, CPU-intensive calculation (a large summation loop). By observing the output, I confirmed that the child with the highest priority (the lowest nice value) consistently finished its task first, showing the scheduler was giving it more CPU time.

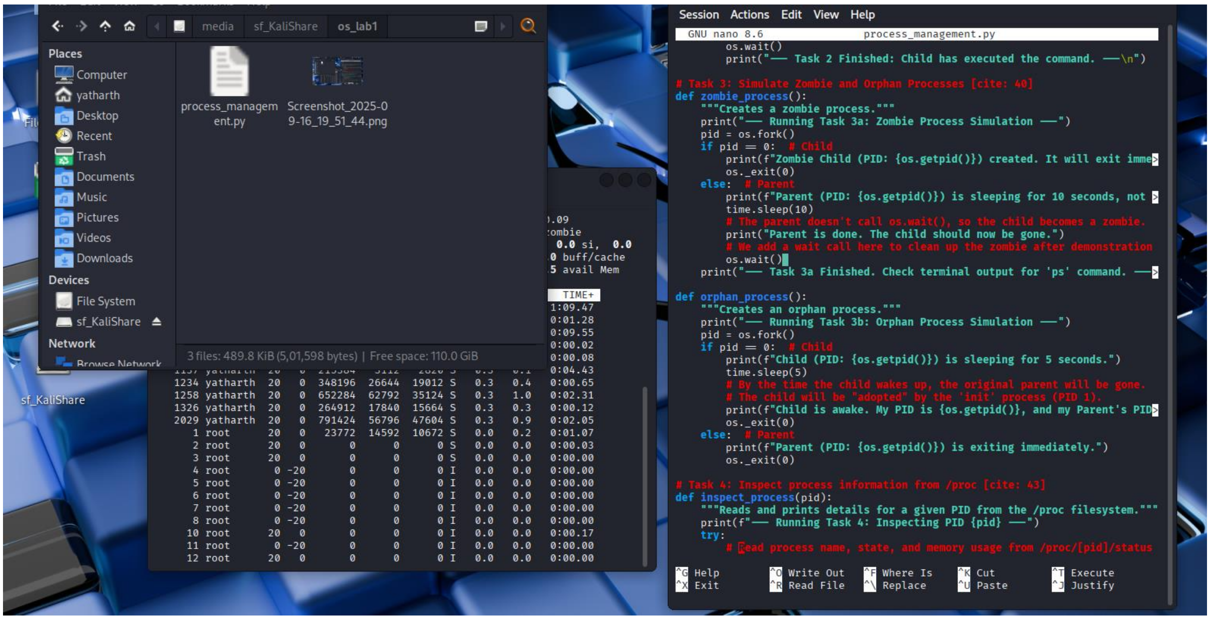
:

Code Snippets:

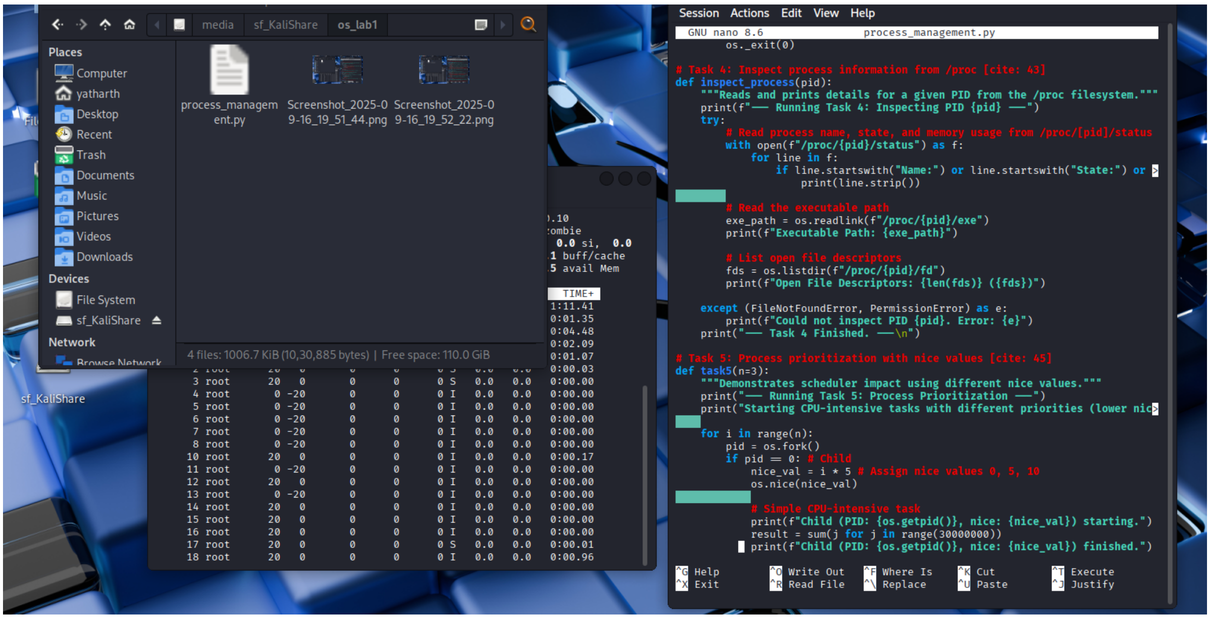
Task1 & Task2:



Task3:



Task4:



Task5: