Operating Systems Lab Assignment - 2 Report

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Experiment: System Startup, Process Creation, and Termination Simulation in Python

Objective:

To simulate core Operating System concepts such as system booting, process creation, execution management, and graceful shutdown using Python. The goal is to understand how an OS spawns multiple concurrent processes and logs their lifecycle using multiprocessing and logging modules.

Tools Used:

Python 3.x

Linux Environment (Ubuntu/WSL via Terminal)

multiprocessing module

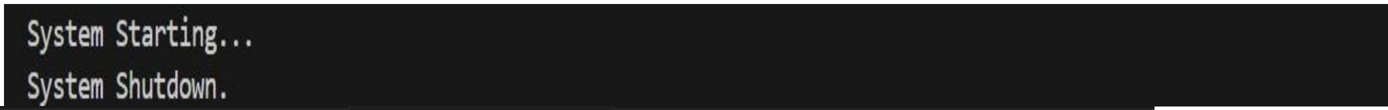
logging module

time module

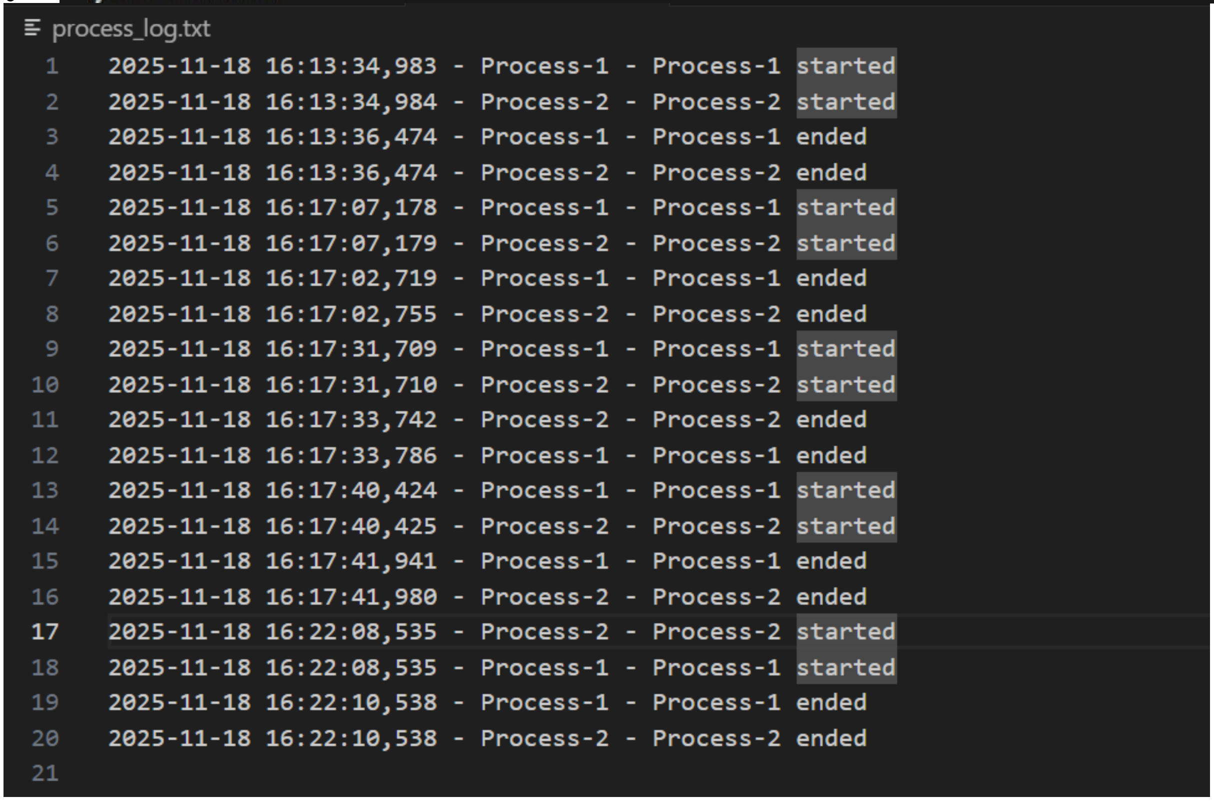
Tasks Performed:

- Task 1(Logging Setup): Initialized the logging configuration to capture timestamped messages and process names into a file named process_log.txt.
- Task 2 (Task Definition): Defined a function system_process() that mimics a system task by logging its start time, sleeping for a specific duration, and logging its end time.
- Task 3 (Process Creation): Created multiple child processes (e.g., Boot-

Loader, Network-Service) using multiprocessing.Process and started them concurrently to simulate parallel system initialization.

- Task 4 (Synchronization & Shutdown): Implemented proper termination using the join() method to ensure the main system waits for all child processes to complete before printing "System Shutdown".
- **Outputs:**
- Successfully simulated a system startup sequence.
- Generated a persistent log file (process_log.txt) that verified concurrent execution.
- Verified that the main process waits for child processes to finish before exiting.
- 

```
System Starting...
System Shutdown.
```



```
2025-11-18 16:13:34,983 - Process-1 - Process-1 started
2025-11-18 16:13:34,984 - Process-2 - Process-2 started
2025-11-18 16:13:36,474 - Process-1 - Process-1 ended
2025-11-18 16:13:36,474 - Process-2 - Process-2 ended
2025-11-18 16:17:07,178 - Process-1 - Process-1 started
2025-11-18 16:17:07,179 - Process-2 - Process-2 started
2025-11-18 16:17:02,719 - Process-1 - Process-1 ended
2025-11-18 16:17:02,755 - Process-2 - Process-2 ended
2025-11-18 16:17:31,709 - Process-1 - Process-1 started
2025-11-18 16:17:31,710 - Process-2 - Process-2 started
2025-11-18 16:17:33,742 - Process-2 - Process-2 ended
2025-11-18 16:17:33,786 - Process-1 - Process-1 ended
2025-11-18 16:17:40,424 - Process-1 - Process-1 started
2025-11-18 16:17:40,425 - Process-2 - Process-2 started
2025-11-18 16:17:41,941 - Process-1 - Process-1 ended
2025-11-18 16:17:41,980 - Process-2 - Process-2 ended
2025-11-18 16:22:08,535 - Process-2 - Process-2 started
2025-11-18 16:22:08,535 - Process-1 - Process-1 started
2025-11-18 16:22:10,538 - Process-1 - Process-1 ended
2025-11-18 16:22:10,538 - Process-2 - Process-2 ended
```

Learning Outcomes:

- Concurrency: Understood how multiprocessing allows multiple tasks to run simultaneously, simulating real OS background services.
- Synchronization: Learned the importance of join() to prevent the main system from shutting down while critical processes are still running.
- System Logging: Gained experience in implementing system logs to track the state and lifecycle of processes for debugging and auditing.
- Process Lifecycle: Visualized the start, execution, and termination phases of system processes.