ASSIGNMENT 4

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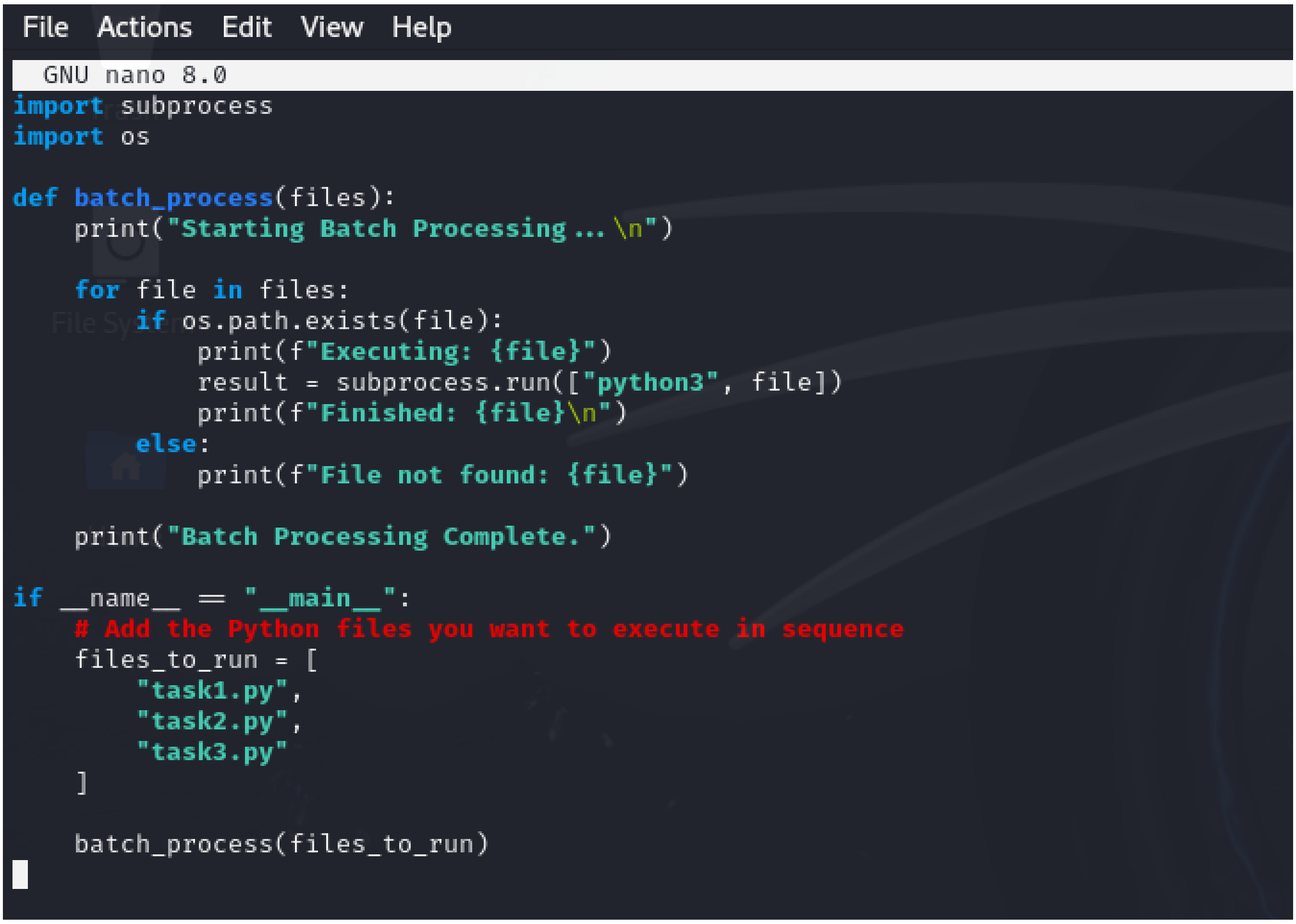
Course: BTech CSE
(Cyber Security)

Task 1: Batch Processing Simulation (Python)

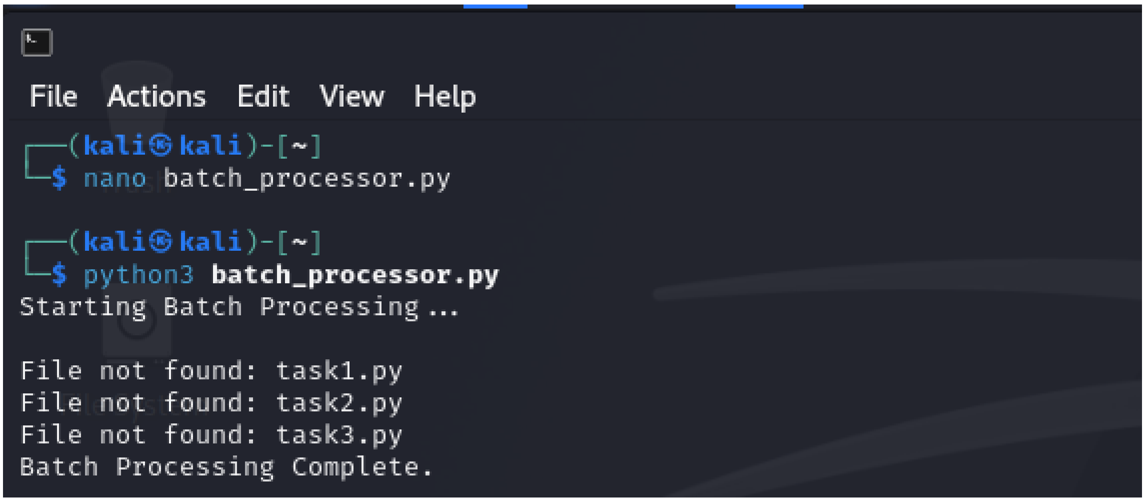
Write a Python script to execute multiple .py files sequentially, mimicking batch processing.

CODE



```python
import subprocess
import os

def batch_process(files):
    print("Starting Batch Processing...\n")

    for file in files:
        if os.path.exists(file):
            print(f"Executing: {file}")
            result = subprocess.run(["python3", file])
            print(f"Finished: {file}\n")
        else:
            print(f"File not found: {file}")

    print("Batch Processing Complete.")

if __name__ == "__main__":
    # Add the Python files you want to execute in sequence
    files_to_run = [
        "task1.py",
        "task2.py",
        "task3.py"
    ]

    batch_process(files_to_run)
```

OUTPUT

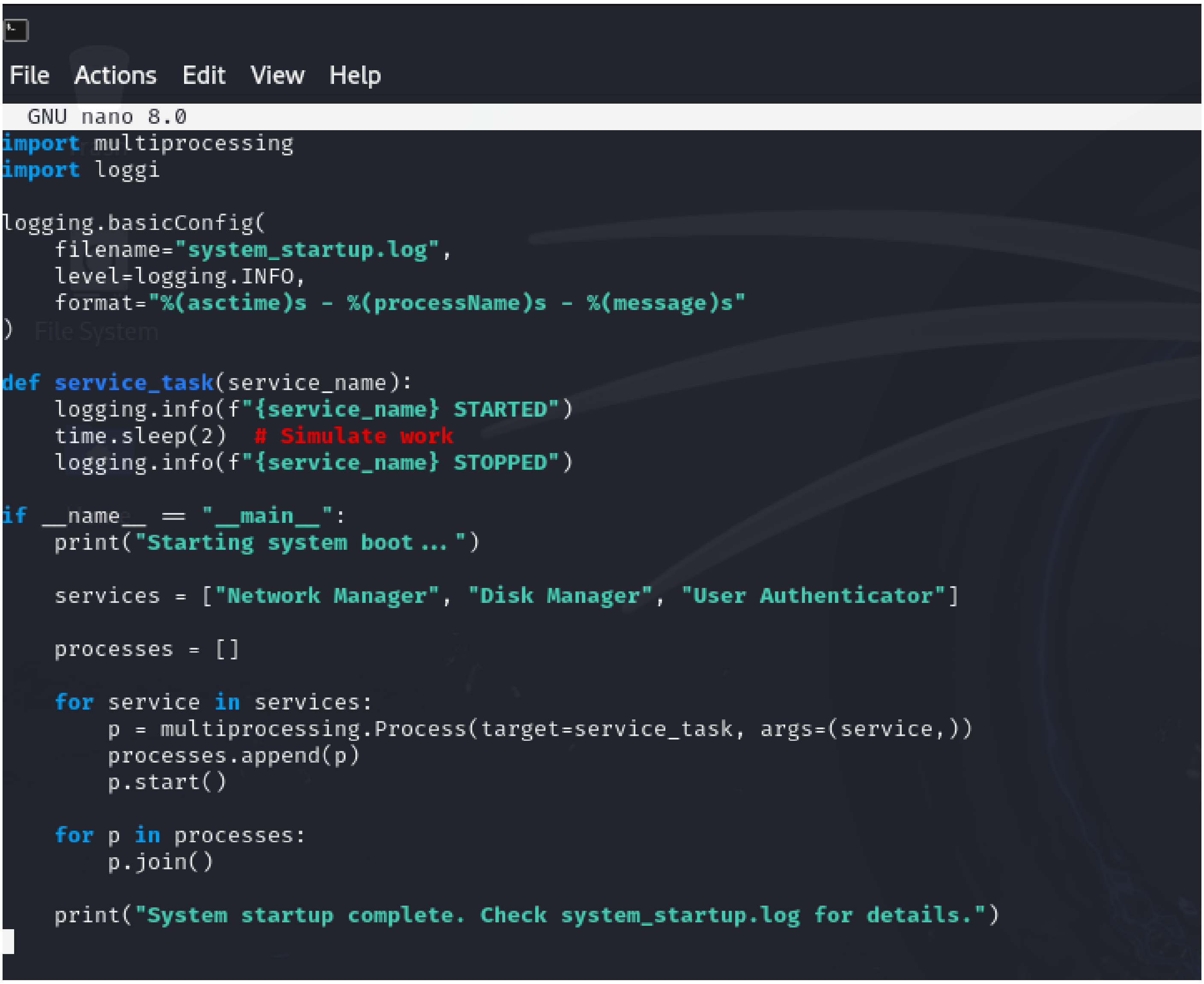


```
┌──(kali㉿kali)-[~]
└─$ nano batch_processor.py

┌──(kali㉿kali)-[~]
└─$ python3 batch_processor.py
Starting Batch Processing...

File not found: task1.py
File not found: task2.py
File not found: task3.py
Batch Processing Complete.
```

Task 2: System Startup and Logging

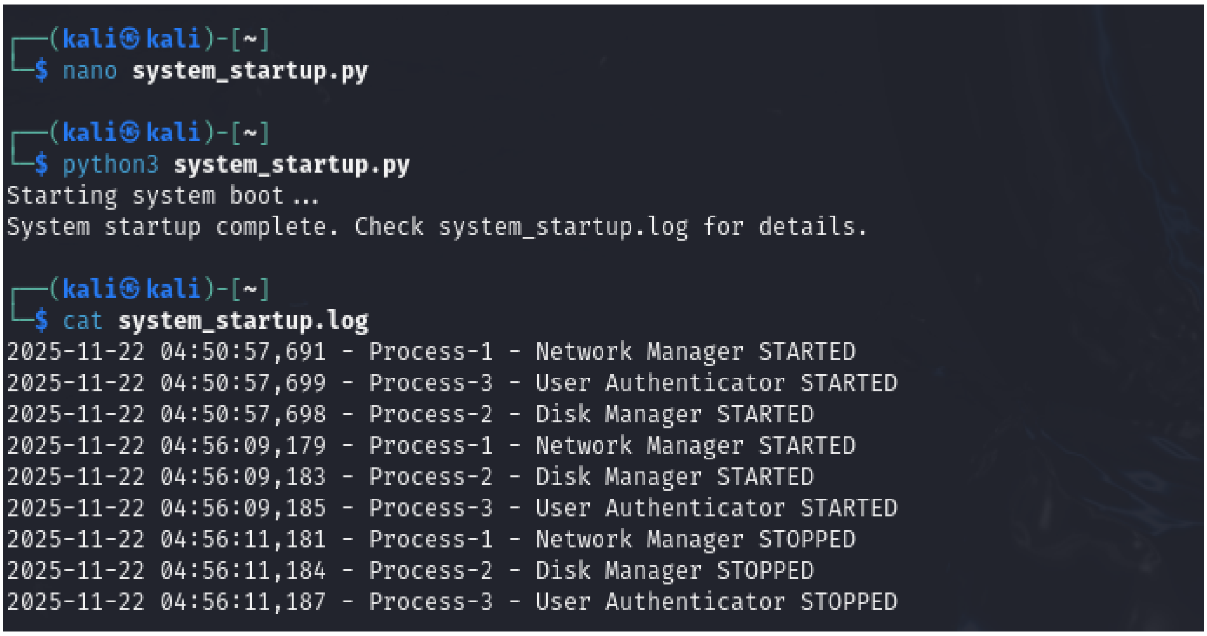
Simulate system startup using Python by creating multiple processes and logging their start and end into a log file.

CODE



```
  GNU nano 8.0
import multiprocessing
import loggi

logging.basicConfig(
    filename="system_startup.log",
    level=logging.INFO,
    format="%(asctime)s - %(processName)s - %(message)s"
)

def service_task(service_name):
    logging.info(f"{service_name} STARTED")
    time.sleep(2)  # Simulate work
    logging.info(f"{service_name} STOPPED")

if __name__ == "__main__":
    print("Starting system boot...")

    services = ["Network Manager", "Disk Manager", "User Authenticator"]

    processes = []

    for service in services:
        p = multiprocessing.Process(target=service_task, args=(service,))
        processes.append(p)
        p.start()

    for p in processes:
        p.join()

    print("System startup complete. Check system_startup.log for details.")
```

OUTPUT



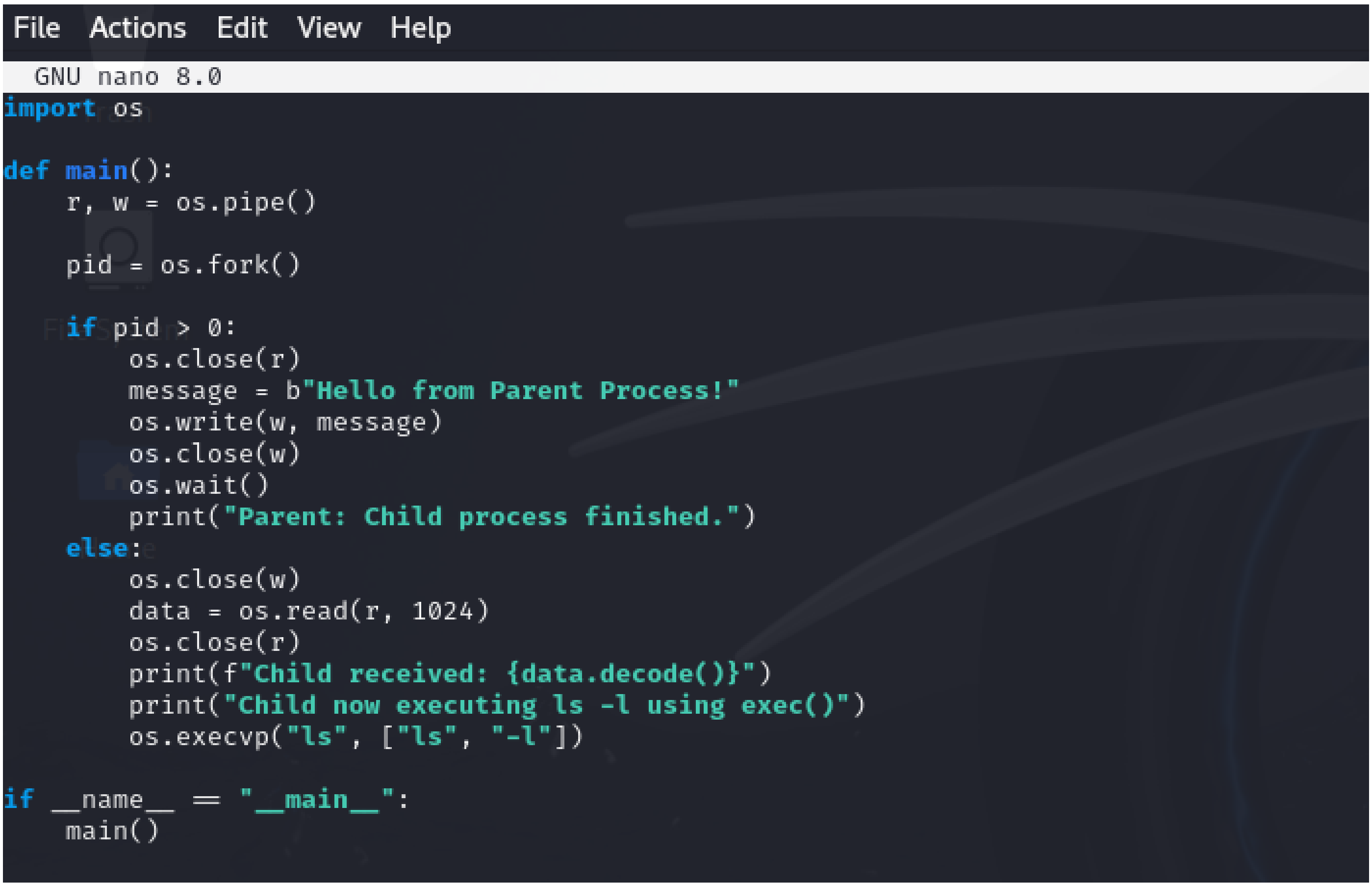
```
┌──(kali㉿kali)-[~]
└─$ nano system_startup.py

┌──(kali㉿kali)-[~]
└─$ python3 system_startup.py
Starting system boot...
System startup complete. Check system_startup.log for details.

┌──(kali㉿kali)-[~]
└─$ cat system_startup.log
2025-11-22 04:50:57,691 - Process-1 - Network Manager STARTED
2025-11-22 04:50:57,699 - Process-3 - User Authenticator STARTED
2025-11-22 04:50:57,698 - Process-2 - Disk Manager STARTED
2025-11-22 04:56:09,179 - Process-1 - Network Manager STARTED
2025-11-22 04:56:09,183 - Process-2 - Disk Manager STARTED
2025-11-22 04:56:09,185 - Process-3 - User Authenticator STARTED
2025-11-22 04:56:11,181 - Process-1 - Network Manager STOPPED
2025-11-22 04:56:11,184 - Process-2 - Disk Manager STOPPED
2025-11-22 04:56:11,187 - Process-3 - User Authenticator STOPPED
```

Task 3: System Calls and IPC (Python - fork, exec, pipe)

Use system calls (fork(), exec(), wait()) and implement basic Inter-Process Communication using pipes in C or Python.

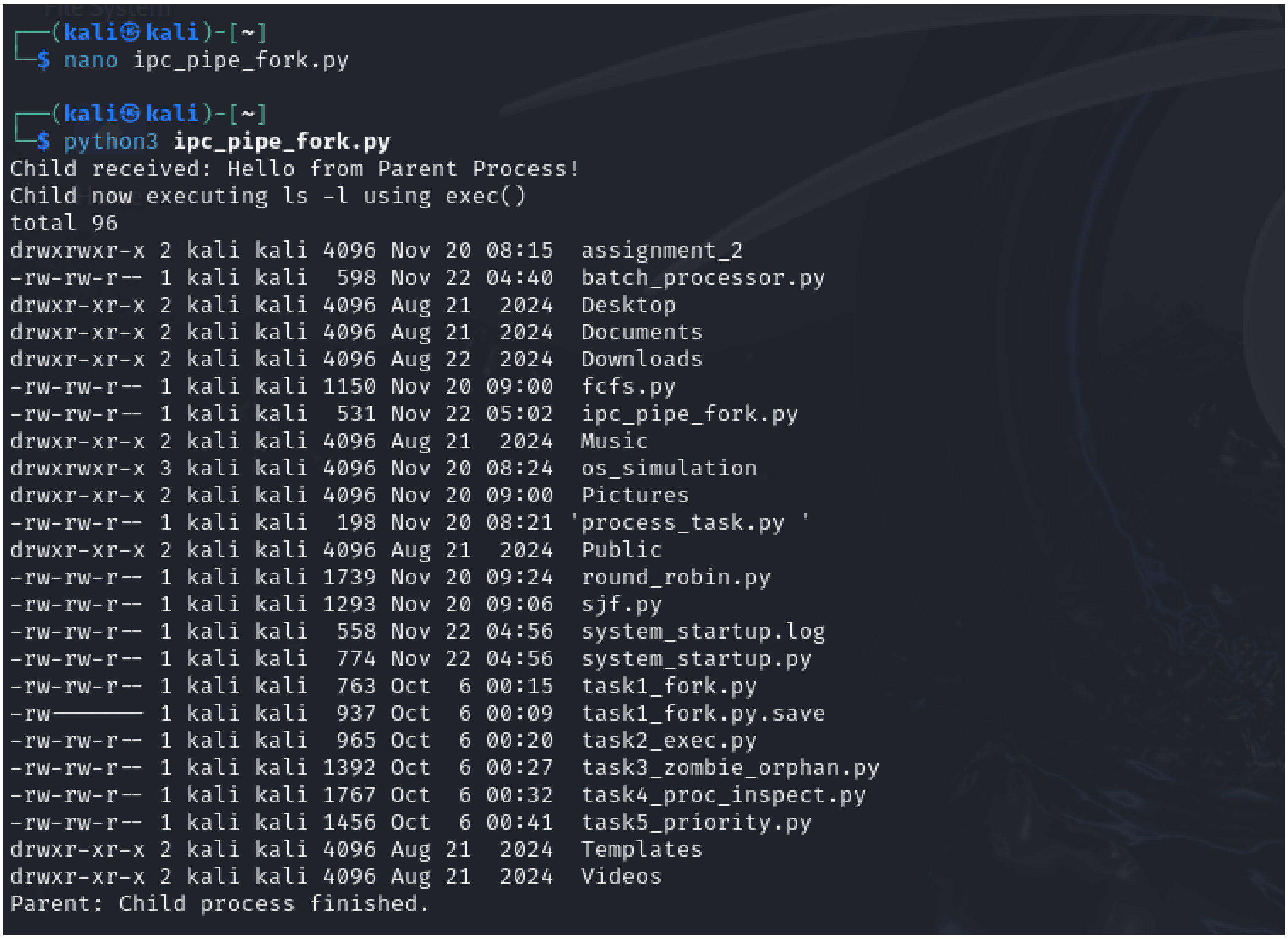
- **ipc_pipe_fork.py :** parent and child communicate via an anonymous pipe (os.pipe + os.fork).

CODE



```
import os

def main():
    r, w = os.pipe()

    pid = os.fork()

    if pid > 0:
        os.close(r)
        message = b"Hello from Parent Process!"
        os.write(w, message)
        os.close(w)
        os.wait()
        print("Parent: Child process finished.")
    else:
        os.close(w)
        data = os.read(r, 1024)
        os.close(r)
        print(f"Child received: {data.decode()}")
        print("Child now executing ls -l using exec()")
        os.execvp("ls", ["ls", "-l"])

if __name__ == "__main__":
    main()
```

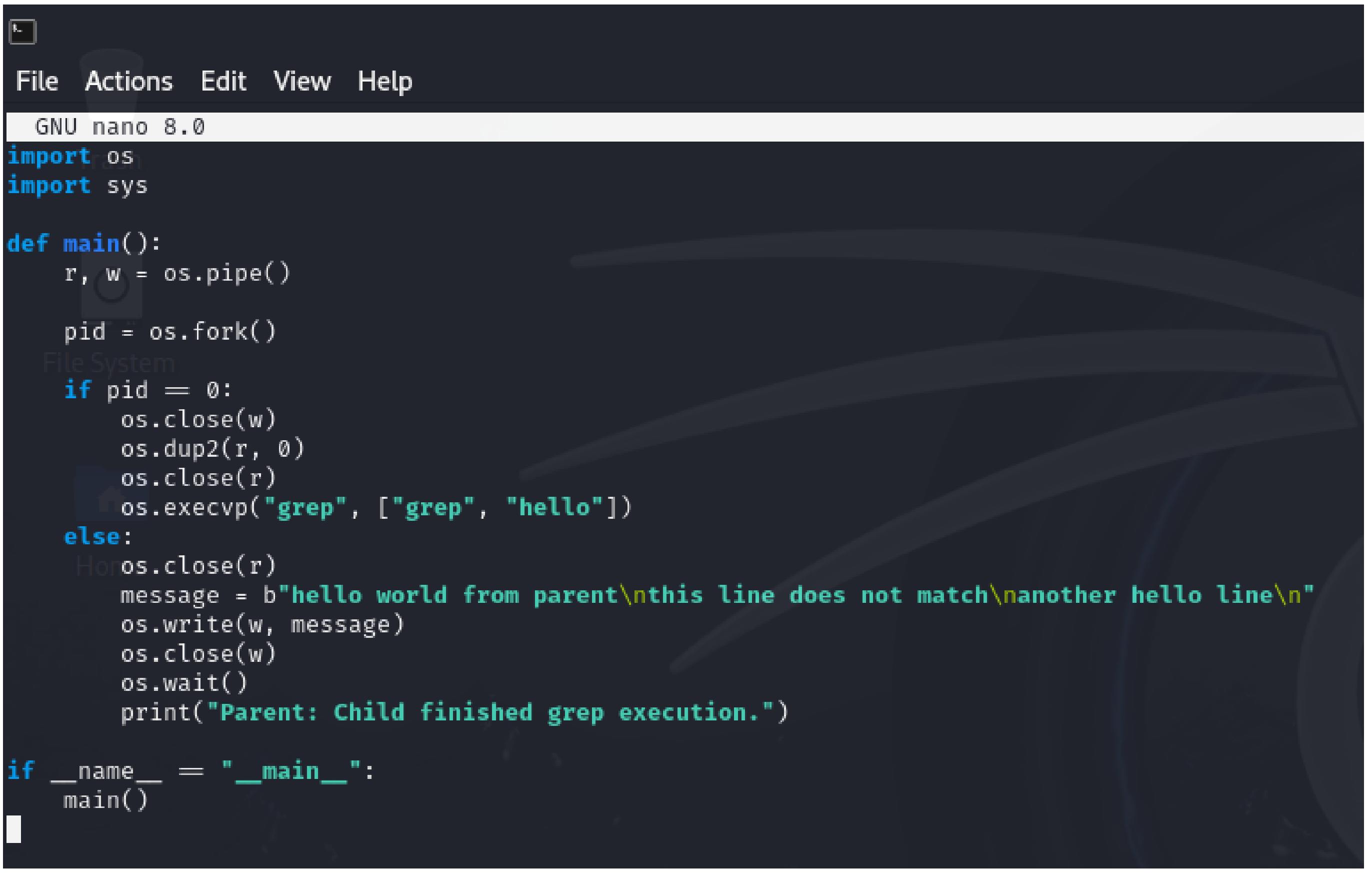
OUTPUT



```
┌──(kali㉿kali)-[~]
└─$ nano ipc_pipe_fork.py

┌──(kali㉿kali)-[~]
└─$ python3 ipc_pipe_fork.py
Child received: Hello from Parent Process!
Child now executing ls -l using exec()
total 96
drwxrwxr-x 2 kali kali 4096 Nov 20 08:15  assignment_2
-rw-rw-r-- 1 kali kali  598 Nov 22 04:40  batch_processor.py
drwxr-xr-x 2 kali kali 4096 Aug 21  2024  Desktop
drwxr-xr-x 2 kali kali 4096 Aug 21  2024  Documents
drwxr-xr-x 2 kali kali 4096 Aug 22  2024  Downloads
-rw-rw-r-- 1 kali kali 1150 Nov 20 09:00  fcfs.py
-rw-rw-r-- 1 kali kali  531 Nov 22 05:02  ipc_pipe_fork.py
drwxr-xr-x 2 kali kali 4096 Aug 21  2024  Music
drwxrwxr-x 3 kali kali 4096 Nov 20 08:24  os_simulation
drwxr-xr-x 2 kali kali 4096 Nov 20 09:00  Pictures
-rw-rw-r-- 1 kali kali  198 Nov 20 08:21 'process_task.py '
drwxr-xr-x 2 kali kali 4096 Aug 21  2024  Public
-rw-rw-r-- 1 kali kali 1739 Nov 20 09:24  round_robin.py
-rw-rw-r-- 1 kali kali 1293 Nov 20 09:06  sjf.py
-rw-rw-r-- 1 kali kali  558 Nov 22 04:56  system_startup.log
-rw-rw-r-- 1 kali kali  774 Nov 22 04:56  system_startup.py
-rw-rw-r-- 1 kali kali  763 Oct  6 00:15  task1_fork.py
-rw------- 1 kali kali  937 Oct  6 00:09  task1_fork.py.save
-rw-rw-r-- 1 kali kali  965 Oct  6 00:20  task2_exec.py
-rw-rw-r-- 1 kali kali 1392 Oct  6 00:27  task3_zombie_orphan.py
-rw-rw-r-- 1 kali kali 1767 Oct  6 00:32  task4_proc_inspect.py
-rw-rw-r-- 1 kali kali 1456 Oct  6 00:41  task5_priority.py
drwxr-xr-x 2 kali kali 4096 Aug 21  2024  Templates
drwxr-xr-x 2 kali kali 4096 Aug 21  2024  Videos
Parent: Child process finished.
```

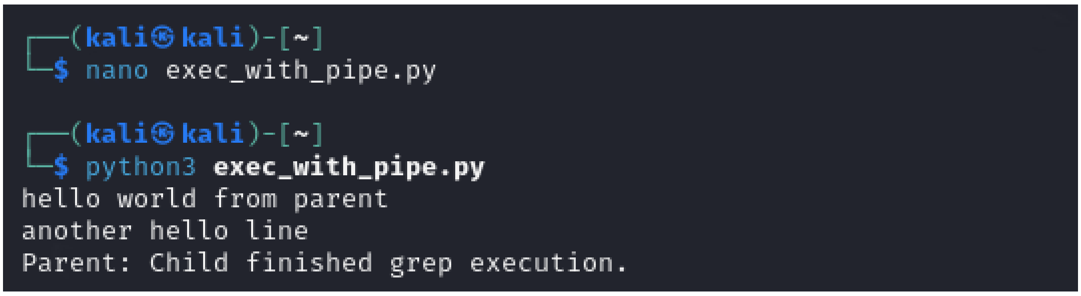
- **exec_with_pipe.py:** parent creates pipe, forks, child os.execvp() to run grep (or cat) and parent writes into pipe.

CODE



```python
import os
import sys

def main():
    r, w = os.pipe()

    pid = os.fork()

    if pid == 0:
        os.close(w)
        os.dup2(r, 0)
        os.close(r)
        os.execvp("grep", ["grep", "hello"])
    else:
        os.close(r)
        message = b"hello world from parent\nthis line does not match\nanother hello line\n"
        os.write(w, message)
        os.close(w)
        os.wait()
        print("Parent: Child finished grep execution.")

if __name__ == "__main__":
    main()
```

OUTPUT



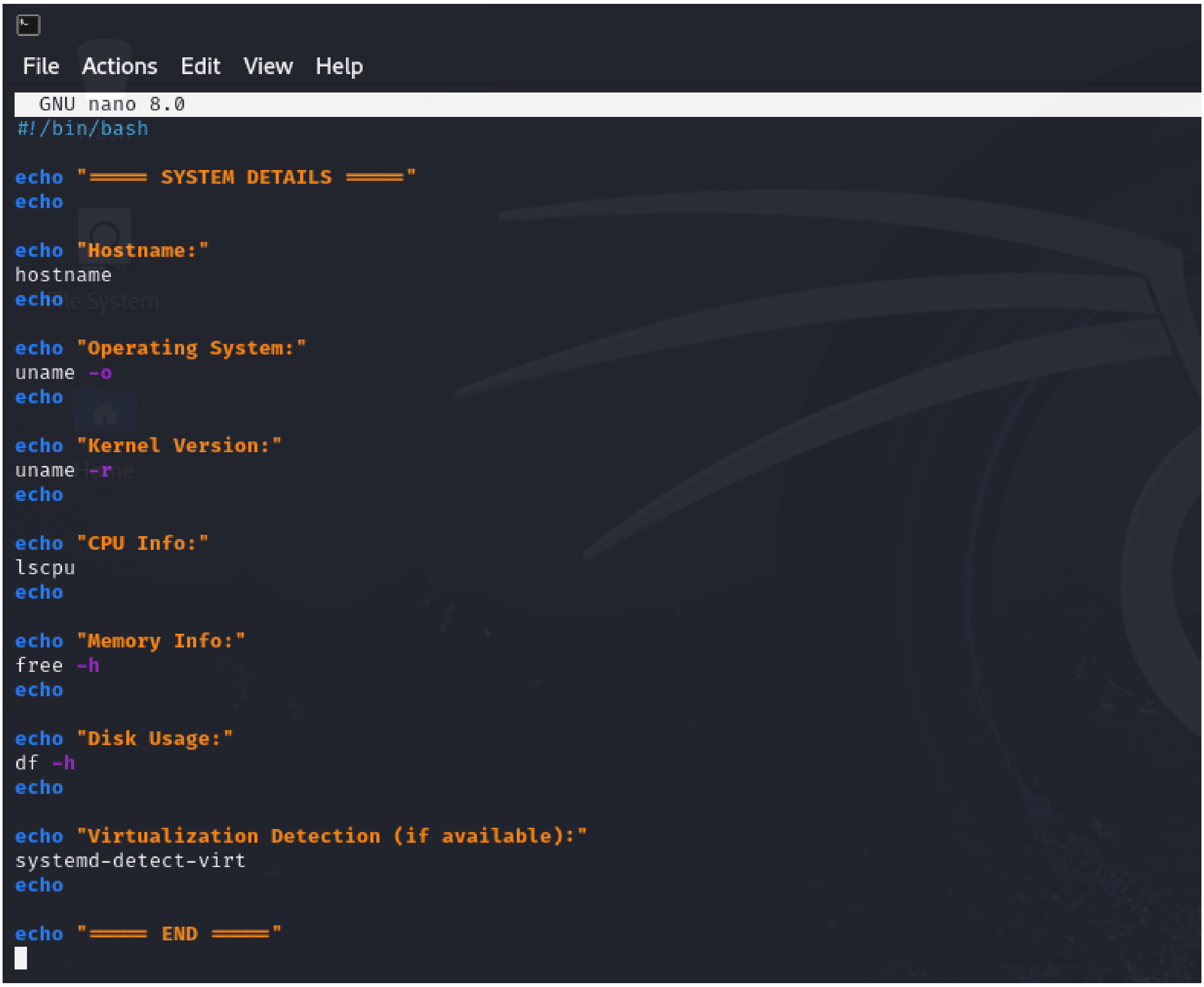
```
┌──(kali㉿kali)-[~]
└─$ nano exec_with_pipe.py

┌──(kali㉿kali)-[~]
└─$ python3 exec_with_pipe.py
hello world from parent
another hello line
Parent: Child finished grep execution.
```

Task 4: VM Detection and Shell Interaction

Create a shell script to print system details and a Python script to detect if the system is running inside a virtual machine.

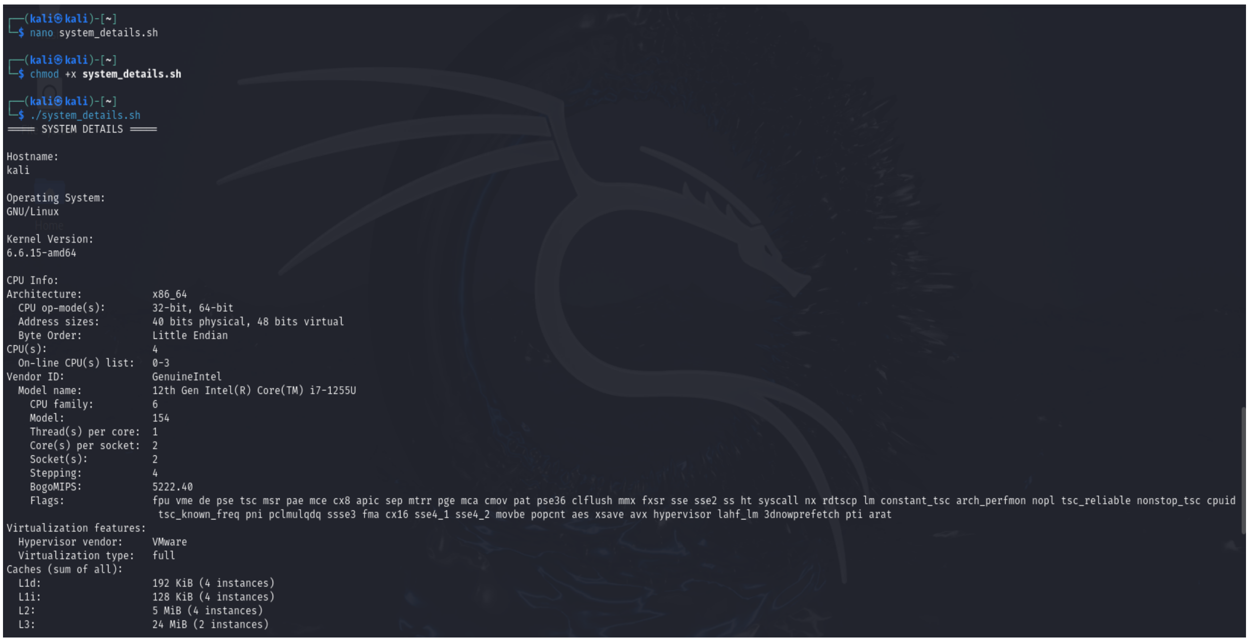
- Shell script to print system details

CODE

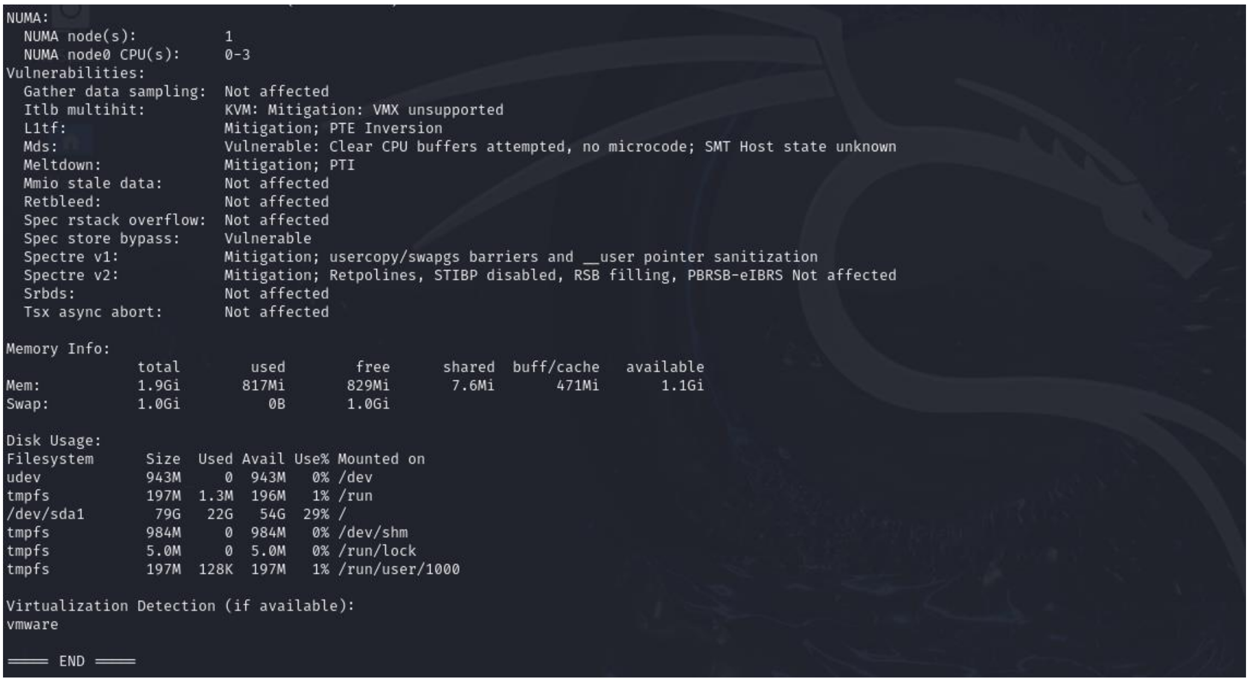


```
#!/bin/bash

echo "===== SYSTEM DETAILS ====="
echo

echo "Hostname:"
hostname
echo

echo "Operating System:"
uname -o
echo

echo "Kernel Version:"
uname -r
echo

echo "CPU Info:"
lscpu
echo

echo "Memory Info:"
free -h
echo

echo "Disk Usage:"
df -h
echo

echo "Virtualization Detection (if available):"
systemd-detect-virt
echo

echo "===== END ====="
```

OUTPUT



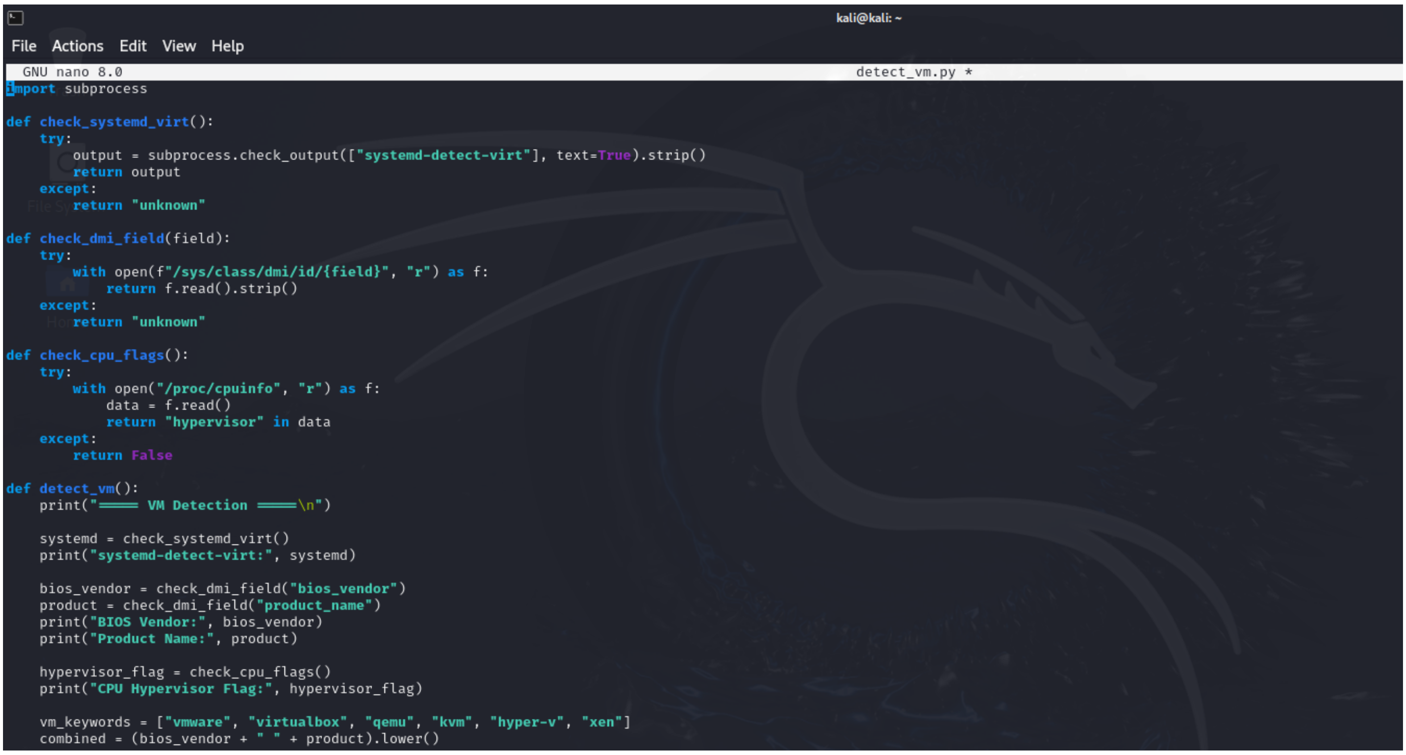
```
┌──(kali㉿kali)-[~]
└─$ nano system_details.sh

┌──(kali㉿kali)-[~]
└─$ chmod +x system_details.sh

┌──(kali㉿kali)-[~]
└─$ ./system_details.sh
═══ SYSTEM DETAILS ═══

Hostname:
kali

Operating System:
GNU/Linux

Kernel Version:
6.6.15-amd64

CPU Info:
Architecture:            x86_64
  CPU op-mode(s):        32-bit, 64-bit
  Address sizes:         40 bits physical, 48 bits virtual
  Byte Order:            Little Endian
CPU(s):                  4
  On-line CPU(s) list:   0-3
Vendor ID:               GenuineIntel
  Model name:            12th Gen Intel(R) Core(TM) i7-1255U
    CPU family:          6
    Model:               154
    Thread(s) per core:  1
    Core(s) per socket:  2
    Socket(s):           2
    Stepping:            4
    BogoMIPS:            5222.40
    Flags:               fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov pat pse36 clflush mmx fxsr sse sse2 ss ht syscall nx rdtscp lm constant_tsc arch_perfmon nopl tsc_reliable nonstop_tsc cpuid
                          tsc_known_freq pni pclmulqdq ssse3 fma cx16 sse4_1 sse4_2 movbe popcnt aes xsave avx hypervisor lahf_lm 3dnowprefetch pti arat
Virtualization features:
  Hypervisor vendor:     VMware
  Virtualization type:   full
Caches (sum of all):
  L1d:                   192 KiB (4 instances)
  L1i:                   128 KiB (4 instances)
  L2:                    5 MiB (4 instances)
  L3:                    24 MiB (2 instances)
```



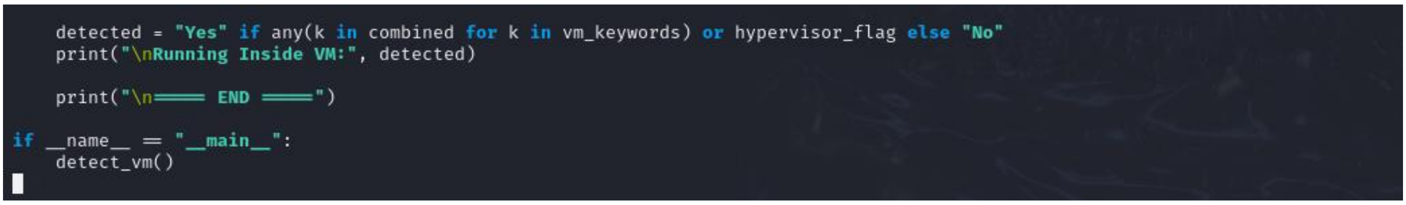
```
NUMA:
  NUMA node(s):          1
  NUMA node0 CPU(s):     0-3
Vulnerabilities:
  Gather data sampling:  Not affected
  Itlb multihit:         KVM: Mitigation: VMX unsupported
  L1tf:                  Mitigation; PTE Inversion
  Mds:                   Vulnerable: Clear CPU buffers attempted, no microcode; SMT Host state unknown
  Meltdown:              Mitigation; PTI
  Mmio stale data:       Not affected
  Retbleed:              Not affected
  Spec rstack overflow:  Not affected
  Spec store bypass:     Vulnerable
  Spectre v1:            Mitigation; usercopy/swapgs barriers and __user pointer sanitization
  Spectre v2:            Mitigation; Retpolines, STIBP disabled, RSB filling, PBRSB-eIBRS Not affected
  Srbds:                 Not affected
  Tsx async abort:       Not affected

Memory Info:
               total        used        free      shared  buff/cache   available
Mem:           1.9Gi       817Mi       829Mi       7.6Mi       471Mi       1.1Gi
Swap:          1.0Gi          0B       1.0Gi

Disk Usage:
Filesystem      Size  Used Avail Use% Mounted on
udev            943M     0  943M   0% /dev
tmpfs           197M  1.3M  196M   1% /run
/dev/sda1        79G   22G   54G  29% /
tmpfs           984M     0  984M   0% /dev/shm
tmpfs           5.0M     0  5.0M   0% /run/lock
tmpfs           197M  128K  197M   1% /run/user/1000

Virtualization Detection (if available):
vmware

═══ END ═══
```

- Python script to detect VM: detect_vm.py

CODE

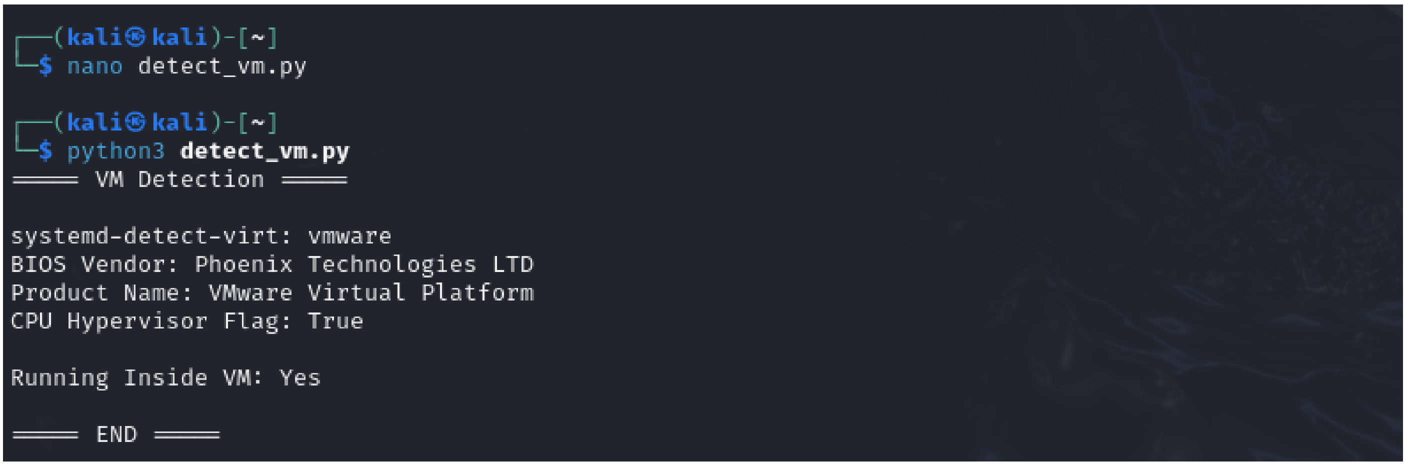


```
import subprocess

def check_systemd_virt():
    try:
        output = subprocess.check_output(["systemd-detect-virt"], text=True).strip()
        return output
    except:
        return "unknown"

def check_dmi_field(field):
    try:
        with open(f"/sys/class/dmi/id/{field}", "r") as f:
            return f.read().strip()
    except:
        return "unknown"

def check_cpu_flags():
    try:
        with open("/proc/cpuinfo", "r") as f:
            data = f.read()
            return "hypervisor" in data
    except:
        return False

def detect_vm():
    print("===== VM Detection =====\n")

    systemd = check_systemd_virt()
    print("systemd-detect-virt:", systemd)

    bios_vendor = check_dmi_field("bios_vendor")
    product = check_dmi_field("product_name")
    print("BIOS Vendor:", bios_vendor)
    print("Product Name:", product)

    hypervisor_flag = check_cpu_flags()
    print("CPU Hypervisor Flag:", hypervisor_flag)

    vm_keywords = ["vmware", "virtualbox", "qemu", "kvm", "hyper-v", "xen"]
    combined = (bios_vendor + " " + product).lower()
```



```
    detected = "Yes" if any(k in combined for k in vm_keywords) or hypervisor_flag else "No"
    print("\nRunning Inside VM:", detected)

    print("\n===== END =====")

if __name__ == "__main__":
    detect_vm()
```

OUTPUT



```
┌──(kali㉿kali)-[~]
└─$ nano detect_vm.py

┌──(kali㉿kali)-[~]
└─$ python3 detect_vm.py
===== VM Detection =====

systemd-detect-virt: vmware
BIOS Vendor: Phoenix Technologies LTD
Product Name: VMware Virtual Platform
CPU Hypervisor Flag: True

Running Inside VM: Yes

===== END =====
```