Lab 2: Linux Basics

Step 1: Baseline Observation

Run `uptime` and record:

```
❯ uptime
 10:14:56 up 48 min,  1 user,  load average: 0.36, 0.50, 0.66
```

- Current time: `10:14:56`
- System uptime: `48 min`
- Load averages: `0.36, 0.50, 0.66`

Run `top` and record:

- Load averages (top): `0.41, 0.49, 0.63`
- Top CPU consumer: `brave` (browser)
- Memory usage (baseline): `5561.3`

Step 2: Process Lifecycle Mechanics

Anchor your shell

Run `ps` for interactive shell:

```
❯ ps
    PID TTY          TIME CMD
   4421 pts/0    00:00:00 fish
   6930 pts/0    00:00:00 ps
```

- PID: `4421`
- TTY: `pts/0`
- Command name: `fish`

Using `/proc` for that PID:

- Complete command line (`/proc/<PID>/cmdline`):

```
❯ cat /proc/4421/cmdline
fish
```

- Executable path (`/proc/<PID>/exe`): `/proc/4421/exe`

```
❯ ls -al exe
lrwxrwxrwx 1 markus markus 0 Jan 13 12:26 exe -> /usr/bin/fish*
```

- Current working directory (`/proc/<PID>/cwd`): `/proc/4421/cwd`

```
/proc/4421🔒
❯ ls -al cwd
lrwxrwxrwx 1 markus markus 0 Jan 13 12:51 cwd -> /proc/4421/
```

Inspect open files (`/proc/4421/fd/`):

1.
   - **FD**: `0`
   - **Target**: `/dev/pts/0`
   - **Representation**: the terminal I'm using
2.
   - **FD**: `3`
   - **Target**: `/proc/4421/fd/`
   - **Representation**: a directory handle
3.
   - **FD**: `4`
   - **Target**: `/run/user/1000/fish_universal_variables.notifier|`
   - **Representation**: a data pipe to another program for notifications

Prove process termination

- New shell PID (via `pidof`): `9608`
- PID/TTY verification:

```
❯ ps
    PID TTY          TIME CMD
   9608 pts/2    00:00:00 fish
   9938 pts/2    00:00:00 ps
```

- Terminal closed? Yes
- `kill <PID> -0` fails? Yes

```
❯ kill 4421
kill: (4421): No such process
```

- `/proc/<PID>` exists? No:

```
❯ ls /proc/4421
ls: cannot access '/proc/4421': No such file or directory
```

Step 3: Observe Idle Behaviour

- Load averages (start): `load average: 0.62, 0.58, 0.62`
- Load averages (end): `load average: 0.35, 0.51, 0.59`
- Processes remain same?
  - No they've decreased a bit

Step 4: Controlled CPU Pressure

- Baseline `top` load/CPU:
  - Around `4%` with top consumer being `obsidian` (md application, I'm using linux as my regular OS)
- Workload CPU usage: `11.7%`
- Workload load averages: `load average: 1.10, 0.66, 0.61`
- Load averages after stopping: `load average: 0.49, 0.57, 0.59`

Risk Path (CPU):
Interactive user shell -> User command execution -> single process allowed to consume 100% CPU -> Keystrokes in other terminals are delayed

CIA Classification: Availability

- **Justification:** Higher CPU usage can impact other applications, causing them to slow down or possibly crash/fail.

Step 5: Controlled Disk Pressure

- Baseline load averages:

```
Total DISK READ:         0.00 B/s | Total DISK WRITE:        0.00 K/s
Current DISK READ:       0.00 B/s | Current DISK WRITE:       0.00 B/s
```

- Sustained write throughput (`iotop`):

```
❯ dd if=/dev/zero of=/tmp/lab-io-test bs=1M count=1024 status=progress
1024+0 records in
1024+0 records out
1073741824 bytes (1.1 GB, 1.0 GiB) copied, 0.346526 s, 3.1 GB/s
```

- Disk activity elevated?
  - Yes, write peaks significantly, saw around `Total DISK WRITE: 100 K/s` and `Current DISK WRITE: 500 B/s`

Risk Path (Disk):
Local file system -> User file creation (dd) -> User process allowed unrestricted disk I/O -> Other file operations hang or time out

CIA Classification: Availability

- **Justification:** Higher Disk usage can bottleneck programs causing them to slow down to crash/fail.

Step 6: Controlled Memory Pressure

- Baseline load averages: `load average: 0.57, 0.50, 0.42`

```
load average: 1.84, 0.95, 0.61

15582 markus    20   0   37.3g  24.8g   4896 D  32.5  79.8   0:19.70 perl
```

- Resident memory usage: `24.8g`
- Percent memory usage: `79.8`
- Process disappeared from `top` ?
  - No, it stayed there till my computer froze after about 2 minutes

- Memory usage dropped?
    - No, it stayed consistent

Risk Path (Memory):
System Memory -> Script execution -> Process allowed to allocate RAM exceeding physical limits -> System freezes and requires reboot

CIA Classification: Availability

- **Justification:** My computer froze after a couple minutes, requiring a reboot