Day 4-Working with Hardware in Linux

When a device is connected to a Linux system (e.g., USB, disk, network card), the **kernel** detects the change and generates an event known as a **uEvent**. This event is handled by **udev**, a device manager daemon running in **user space**. It listens for these events and dynamically creates corresponding **device nodes** in the `/dev` directory. Device nodes in `/dev` are special files that represent hardware devices. For example:

After plugging in a USB drive, a new entry like `/dev/sdb1` appears.

Useful Tools for Device and Hardware Inspection

- `dmesg`
  Displays messages from the **kernel ring buffer**, which includes boot logs and hardware-related events. For example:
  - `dmesg | tail  # View latest kernel messages`
- `udevadm`
  A command-line tool to interact with `udev` and get real-time device info.
  - `udevadm info` command queries the `udev` database for device details. For example:
    - `udevadm info --query=path --name=/dev/sda4`
- `udevadm monitor` – Listens to and displays real-time kernel uEvents. For example:
  - `udevadm monitor`

Storage and Device Utilities

- `lsblk`
  Lists information about block devices (e.g., disks and partitions). For example:
  - `lsblk`
- `lspci`
  Displays all PCI devices (network cards, graphics, etc.). For example:
  - `lspci`
- `lshw`
  Provides **detailed hardware information**, including memory, CPU, and peripherals. For example:
  - `sudo lshw -short`
- `lscpu`
  Displays CPU architecture info. For example:
  - `lscpu`
- `lsmem`
  Summarizes available memory in the system. For example:
  - `lsmem`
- `free`
  Shows memory usage (total, used, and free). For example:
  - `free -h`

Major Numbers (Device Types)

Device files in `/dev` have associated **major numbers** that identify the driver responsible for them.

	Major Number	Device Type
1	1	RAM devices

2	3	HDD/CD-ROM
3	6	Parallel printer
4	8	SCSI disk devices

- You can use Use `ls -l /dev/sda` to view major/minor numbers of a device.