Disks, Partitions & Filesystems (Core)

Linux Commands Course · Section 14

IDSchool

Storage Concepts

- **Disk** → physical device (e.g., /dev/sda, /dev/nvme0n1)
- **Partition** → logical segment of a disk (e.g., /dev/sda1)
- **Filesystem** → structure that defines how data is stored (e.g., ext4, xfs, btrfs)

Linux uses a single unified directory tree — all disks and partitions get *mounted* somewhere under /.

Listing Storage Devices — lsblk

List block devices (disks, partitions, LVM volumes).

```
lsblk -f
```

Example output:

```
NAME   FSTYPE LABEL  UUID                                 MOUNTPOINT
sda
├─sda1 ext4   root   21f0-4c3f                           /
├─sda2 swap   swap   a1b2c3d4-e5f6-7890-1122-334455667788 [SWAP]
```

- NAME → device name
- FSTYPE → filesystem type
- MOUNTPOINT → where it’s mounted

Display UUIDs and Filesystem Info — blkid

Show filesystem type and unique IDs.

```
sudo blkid
```

Example:

```
/dev/sda1: UUID="21f0-4c3f" TYPE="ext4" PARTLABEL="root"
/dev/sda2: UUID="a1b2c3d4" TYPE="swap"
```

UUIDs are used in `/etc/fstab` for stable device mounting.

Check Disk Usage — df -h

View mounted filesystems and their space usage.

```
df -h
```

Example:

```
Filesystem      Size  Used Avail Use% Mounted on
/dev/sda1        50G   20G   28G  42% /
tmpfs           2.0G  2.0M  2.0G   1% /run
```

`-h` makes sizes human-readable.

Directory Usage — du

Show how much space files and directories take.

```
du -sh *
```

- `-s` → summarize totals
- `-h` → human-readable sizes

Example output:

```
4.0K  Documents
1.2G  Downloads
400M  Pictures
```

Great for finding large folders.

Mounting a Filesystem — mount

Mount a device (attach it to a directory).

```
sudo mount /dev/sdb1 /mnt
```

Verify with:

```
df -h | grep sdb1
```

Unmount when done:

```
sudo umount /mnt
```

Mount read-only:

```
sudo mount -o ro /dev/sdb1 /mnt
```

Persistent Mounts — /etc/fstab

/etc/fstab defines filesystems that auto-mount at boot.

View file:

```
cat /etc/fstab
```

Example entry:

```
UUID=21f0-4c3f  /data  ext4  defaults  0 2
```

Fields:

1. Device or UUID
2. Mount point
3. Filesystem type
4. Options (defaults, ro, noatime, etc.)
5. Dump (backup flag)
6. fsck order (1=root, 2=others)

Partitioning (Demo Only!) – fdisk and parted

Use **only with care** – modifying partitions can erase data!

List disks and partitions:

```
sudo fdisk -l
```

Interactive mode (dangerous!):

```
sudo fdisk /dev/sdb
```

For modern disks (>2TB) use parted:

```
sudo parted /dev/sdb
```

You can view, create, and delete partitions. Always unmount before modifying.

Creating a Filesystem — mkfs

Format a partition with a filesystem.

Example (ext4):

```
sudo mkfs.ext4 /dev/sdb1
```

Other examples:

```
sudo mkfs.xfs /dev/sdb1
sudo mkfs.vfat /dev/sdb1
```

Check before formatting to avoid destroying data!

Filesystem Check — fsck

Scans and repairs filesystem errors.

```
sudo fsck /dev/sdb1
```

Run only on **unmounted** filesystems.

You can auto-confirm fixes with `-y`:

```
sudo fsck -y /dev/sdb1
```

Filesystem Tuning — tune2fs

View or modify filesystem parameters (ext filesystems).

```
sudo tune2fs -l /dev/sda1
```

Example adjustments:

```
sudo tune2fs -m 1 /dev/sda1   # reserve 1% space for root
sudo tune2fs -c 0 /dev/sda1   # disable auto-check by mount count
```

Resizing Filesystems — resize2fs

Resize an **ext** filesystem after adjusting partition size.

Shrink (offline only):

```
sudo resize2fs /dev/sdb1 20G
```

Expand to fill available space:

```
sudo resize2fs /dev/sdb1
```

Run after resizing partition with fdisk or parted.

Swap Space — Virtual Memory

Linux uses **swap** as overflow for RAM.

Enable swap area:

```
sudo swapon /dev/sda2
```

Disable it:

```
sudo swapoff /dev/sda2
```

Show current swap usage:

```
swapon --show
```

Or view via `free -h`.

Creating a Swap File (Alternative)

If no swap partition exists, create one as a file.

```
sudo fallocate -l 2G /swapfile
sudo chmod 600 /swapfile
sudo mkswap /swapfile
sudo swapon /swapfile
```

Make it permanent in /etc/fstab:

```
/swapfile none swap sw 0 0
```

Recap

- Inventory: `lsblk`, `blkid`, `df -h`, `du -sh *`
- Mounting: `mount`, `umount`, `/etc/fstab`
- Partitioning (demo): `fdisk`, `parted`
- Filesystems: `mkfs`, `fsck`, `tune2fs`, `resize2fs`
- Swap: `swapon`, `swapoff`, `/swapfile`

These commands form the foundation of disk and storage management in Linux.
