

# Disks, Partitions & Filesystems (Core)

Linux Commands Course · Section 14

# 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 `/`.

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# **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		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.

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# 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
```

# 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`.

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# 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.

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