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/sdal)
- 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 $\emph{mounted}$ 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 *
```

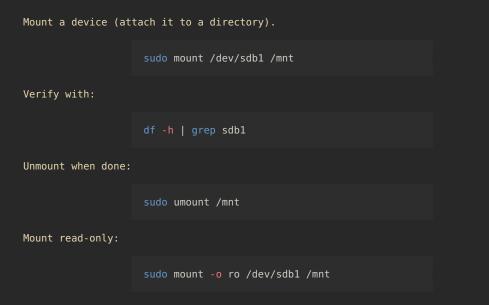
- <u>-s → summarize</u> totals
- -h → human-readable sizes

Example output:

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

Great for finding large folders.

Mounting a Filesystem — mount



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:		
	swaponshow	
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, resize2fsSwap: swapon, swapoff, /swapfile

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