

**Hardware Networking**

**Configure local storage**

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**1. Learn About Different Filesystem Types (e.g., ext4, NTFS)**

A **filesystem** is a method of storing and organizing data on a storage device. Different operating systems use different filesystems.

**Common Filesystem Types:**

| **Filesystem** | **Description** | **Supported OS** |
| --- | --- | --- |
| **ext4** | Default Linux filesystem, supports journaling, large file sizes | Linux |
| **ext3** | Older version of ext4, slower performance | Linux |
| **ext2** | Non-journaled, used for USB drives | Linux |
| **XFS** | High-performance journaling filesystem | Linux |
| **Btrfs** | Supports snapshots, self-healing, RAID | Linux |
| **NTFS** | Windows default filesystem, supports large files | Windows, Read-only in Linux |
| **FAT32** | Used in USB drives, limited file size (4GB max) | Windows, Linux, macOS |
| **exFAT** | Improved FAT32, supports large files | Windows, Linux, macOS |
| **HFS+** | macOS filesystem (older version) | macOS |
| **APFS** | New macOS filesystem, optimized for SSDs | macOS |

To check the filesystem type of a mounted disk:

df -T

**2. Manage Disk Partitions and Filesystems Using fdisk, mkfs, and mount**

**1. List All Partitions:**

lsblk

or

fdisk -l

**2. Create a New Partition Using fdisk:**

sudo fdisk /dev/sdb

* Press n → Create a new partition
* Press p → Primary partition
* Choose partition number and size
* Press w → Save changes and exit

**3. Format the Partition with mkfs:**

sudo mkfs.ext4 /dev/sdb1

**4. Mount the Partition:**

sudo mount /dev/sdb1 /mnt

**5. Verify Mounting:**

df -h

**6. Auto-Mount on Boot (/etc/fstab):**

echo "/dev/sdb1 /mnt ext4 defaults 0 2" | sudo tee -a /etc/fstab

**3. Create a 2048MB Partition and Verify If It Has Been Created**

**Step 1: Open fdisk for Partitioning**

sudo fdisk /dev/sdb

**Step 2: Create the Partition**

1. Press n → Create a new partition
2. Press p → Primary partition
3. Choose partition number (1)
4. Set the size:
5. +2048M
6. Press w → Save and exit

**Step 3: Verify the Partition**

lsblk

or

fdisk -l /dev/sdb

**Step 4: Format the Partition**

sudo mkfs.ext4 /dev/sdb1

**Step 5: Mount and Check**

sudo mount /dev/sdb1 /mnt

df -h | grep /mnt

**4. Why LVM is Required?**

**LVM (Logical Volume Manager)** is used for **flexible disk management** in Linux. It allows dynamic resizing, snapshots, and multiple disks in a single volume.

**Why is LVM Required?**

1. **Flexible Disk Management**
   * You can resize partitions without unmounting them.
   * Easily add new disks to existing volumes.
2. **Better Storage Utilization**
   * Combine multiple physical disks into a **single logical volume**.
   * Prevent wasted space by allocating storage dynamically.
3. **Snapshots for Backup**
   * LVM allows **snapshots**, enabling backups without affecting running services.
4. **Dynamic Resizing**
   * Traditional partitions require reformatting; LVM allows resizing without data loss.
5. **RAID-Like Capabilities**
   * Combine multiple drives for redundancy and performance.

**Basic LVM Commands:**

* **Create a Physical Volume:**
* sudo pvcreate /dev/sdb
* **Create a Volume Group:**
* sudo vgcreate my\_vg /dev/sdb
* **Create a Logical Volume:**
* sudo lvcreate -L 10G -n my\_lv my\_vg
* **Format and Mount the Volume:**
* sudo mkfs.ext4 /dev/my\_vg/my\_lv
* sudo mount /dev/my\_vg/my\_lv /mnt

**5. How Can You Find Out How Much Memory Linux is Using?**

There are multiple commands to check memory usage in Linux:

**1. Using free Command**

free -h

Output Example:

total used free shared buff/cache available

Mem: 16Gi 5Gi 8Gi 512Mi 3Gi 10Gi

Swap: 4Gi 1Gi 3Gi

* total → Total RAM
* used → RAM in use
* free → Available RAM
* swap → Virtual memory usage

**2. Using top or htop Command**

* Run top to see live memory usage.
* Run htop for a better graphical representation.

**3. Using vmstat Command**

vmstat -s

Displays detailed memory usage statistics.

**4. Checking /proc/meminfo File**

cat /proc/meminfo

Shows detailed memory breakdown, including buffers and cached memory.

**6. What is a Typical Size for a Swap Partition Under a Linux System?**

The recommended **swap partition size** depends on the system's RAM and workload.

**General Recommendations:**

| **RAM Size** | **Recommended Swap (Non-Hibernation)** | **Swap for Hibernation** |
| --- | --- | --- |
| 2GB or less | 2 × RAM | 2 × RAM |
| 4GB – 8GB | Equal to RAM | 1.5 × RAM |
| 8GB – 16GB | 4GB – 8GB | Equal to RAM |
| 16GB+ | 2GB – 4GB | Equal to RAM |

**Checking Swap Size:**

swapon --show

or

free -h

**Creating a Swap File (if no swap partition exists):**

sudo fallocate -l 4G /swapfile

sudo chmod 600 /swapfile

sudo mkswap /swapfile

sudo swapon /swapfile

To make it permanent, add this to /etc/fstab:

/swapfile swap swap defaults 0 0

**7. What is the Maximum File Size on the ext4 File System?**

**The maximum file size in ext4 depends on the block size used during formatting.**

| **Block Size** | **Maximum File Size** |
| --- | --- |
| 1 KB | 16 TB |
| 2 KB | 256 TB |
| 4 KB | 4 PB (Petabytes) |

**Checking ext4 Block Size:**

sudo tune2fs -l /dev/sda1 | grep "Block size"

Example output:

Block size: 4096

**Checking Maximum File Size:**

df -T /dev/sda1

**8. What is the Maximum File Size on the XFS File System? (Detailed Answer)**

**XFS is a high-performance journaling filesystem designed for scalability.**

**Maximum File Size in XFS:**

* **64-bit XFS:** Supports a **maximum file size of 8 exabytes (EB)**.
* **Maximum Filesystem Size:** **16 exabytes (EB)**.

| **Block Size** | **Maximum File Size** |
| --- | --- |
| 512 B | 500 TB |
| 1 KB | 1 PB |
| 4 KB | 8 EB |

**Check if a Filesystem is XFS:**

df -T | grep xfs

**Advantages of XFS Over ext4:**

1. **Better for Large Files**: Suitable for servers with big data.
2. **Supports Parallel I/O**: Can handle multiple read/write operations efficiently.
3. **Online Resizing**: Can grow an XFS filesystem while mounted (but not shrink).
4. **Journaled Metadata**: Prevents data corruption.