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Project on File System And Disk Management

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1. Introduction

This project focuses on the management and organization of Linux file systems and disk management.
The goal is to understand how Linux handles file storage, disk partitioning, and system-level organization.
By using Linux commands, this project demonstrates how to create, mount, format, and verify file systems.

2. Overview of Linux File System

A Linux file system manages how data is stored and retrieved. It provides a hierarchical structure starting
from the root directory (/). Each file system controls permissions, file metadata, and organization.

3. Disk Structure and File System Organization

Disk storage is divided into partitions, each having its own file system. The Linux kernel interacts
with devices through /dev/ files like /dev/sda, /dev/sdb, etc. Each partition can be mounted to a directory.

4. File System Types in Linux

Common file system types in Linux include:
- ext2: Traditional Linux file system without journaling.
- ext3: ext2 with journaling support.
- ext4: Default modern Linux file system.
- XFS: High-performance journaling file system.

- Btrfs: Supports snapshots and advanced storage features.

5. Commands Used in Disk and File System Management

- fdisk – Manage disk partitions.
- mkfs – Format a partition.
- mount – Mount a file system.
- umount – Unmount a file system.
- lsblk – List all block devices.
- df – Display disk usage.
- du – Show directory sizes.
- fsck – Check and repair file system errors.

6. Implementation and Code Examples

Below are examples of Linux commands used during implementation:
1. View all disks: lsblk
2. Create a new partition: sudo fdisk /dev/sdb
3. Format the partition: sudo mkfs.ext4 /dev/sdb1
4. Mount the partition: sudo mkdir /mnt/data && sudo mount /dev/sdb1 /mnt/data
5. Verify mount: df -h
6. Unmount: sudo umount /mnt/data

7. Mounting and Unmounting Examples

Example:
A 5GB partition (/dev/sdb1) was mounted to /mnt/data using the mount command.

After work completion, it was safely unmounted using umount to prevent data loss.

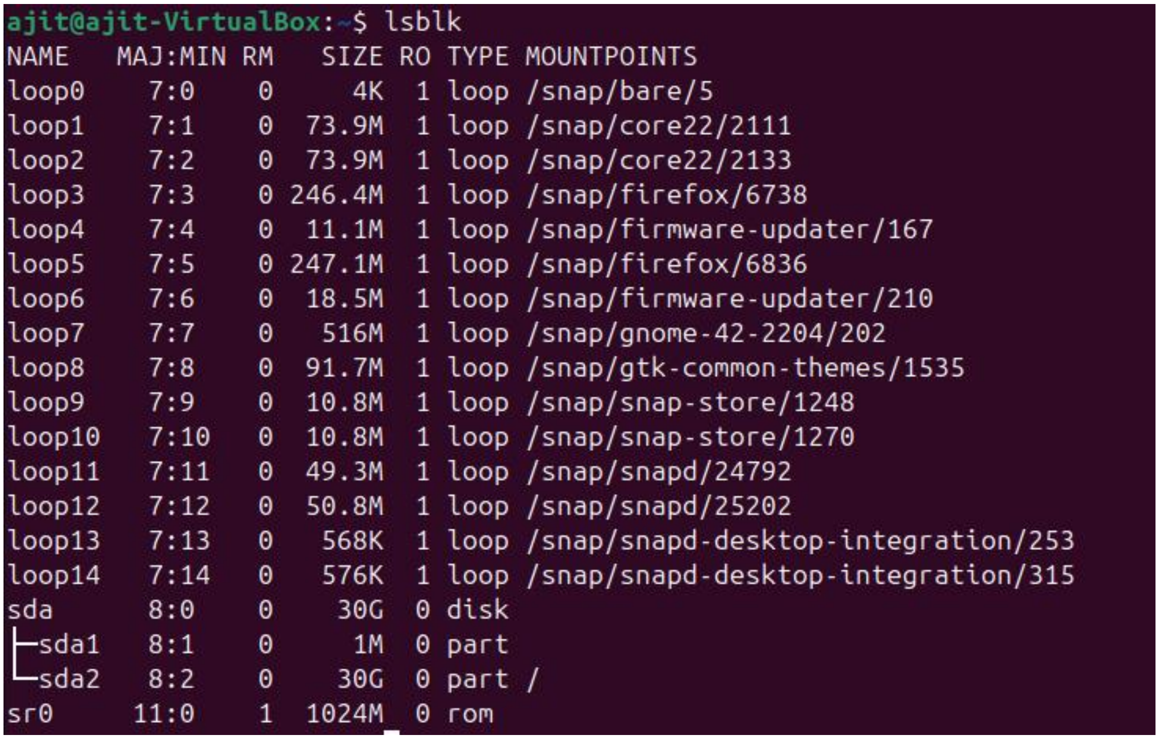
8. File System Verification and Maintenance

The fsck (File System Check) command verifies file integrity and repairs errors.
Example: sudo fsck /dev/sdb1

9. Security Measures and Best Practices

- Always unmount drives before removal.
- Set proper permissions using chmod and chown.
- Regularly check disk health and backup data.
- Use encryption for sensitive information.

10. Screenshots of Implementation



```
ajit@ajit-VirtualBox:~$ lsblk
NAME    MAJ:MIN RM   SIZE RO TYPE MOUNTPOINTS
loop0     7:0    0     4K  1 loop /snap/bare/5
loop1     7:1    0  73.9M  1 loop /snap/core22/2111
loop2     7:2    0  73.9M  1 loop /snap/core22/2133
loop3     7:3    0 246.4M  1 loop /snap/firefox/6738
loop4     7:4    0  11.1M  1 loop /snap/firmware-updater/167
loop5     7:5    0 247.1M  1 loop /snap/firefox/6836
loop6     7:6    0  18.5M  1 loop /snap/firmware-updater/210
loop7     7:7    0   516M  1 loop /snap/gnome-42-2204/202
loop8     7:8    0  91.7M  1 loop /snap/gtk-common-themes/1535
loop9     7:9    0  10.8M  1 loop /snap/snap-store/1248
loop10    7:10   0  10.8M  1 loop /snap/snap-store/1270
loop11    7:11   0  49.3M  1 loop /snap/snapd/24792
loop12    7:12   0  50.8M  1 loop /snap/snapd/25202
loop13    7:13   0   568K  1 loop /snap/snapd-desktop-integration/253
loop14    7:14   0   576K  1 loop /snap/snapd-desktop-integration/315
sda       8:0    0    30G  0 disk
├─sda1    8:1    0     1M  0 part
└─sda2    8:2    0    30G  0 part /
sr0      11:0    1  1024M  0 rom
```

11. Future Enhancements

- Add GUI-based disk management tools.
- Automate disk health monitoring.
- Integrate file system backup and restore tools.

12. Conclusion

This project demonstrates essential Linux file system and disk management practices.
Through partitioning, formatting, and mounting, users gain control over storage management.

These operations are fundamental for any Linux administrator.