DIPLOMA WALLAH

(Your One Stop Hub For Diploma Resources)

OPERATING SYSTEM AND ADMINISTRATION

Complete Notes Based on Full Syllabus

- Diploma Engineering

4th Semester

www.diplomawallah.in

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Diploma Wallah

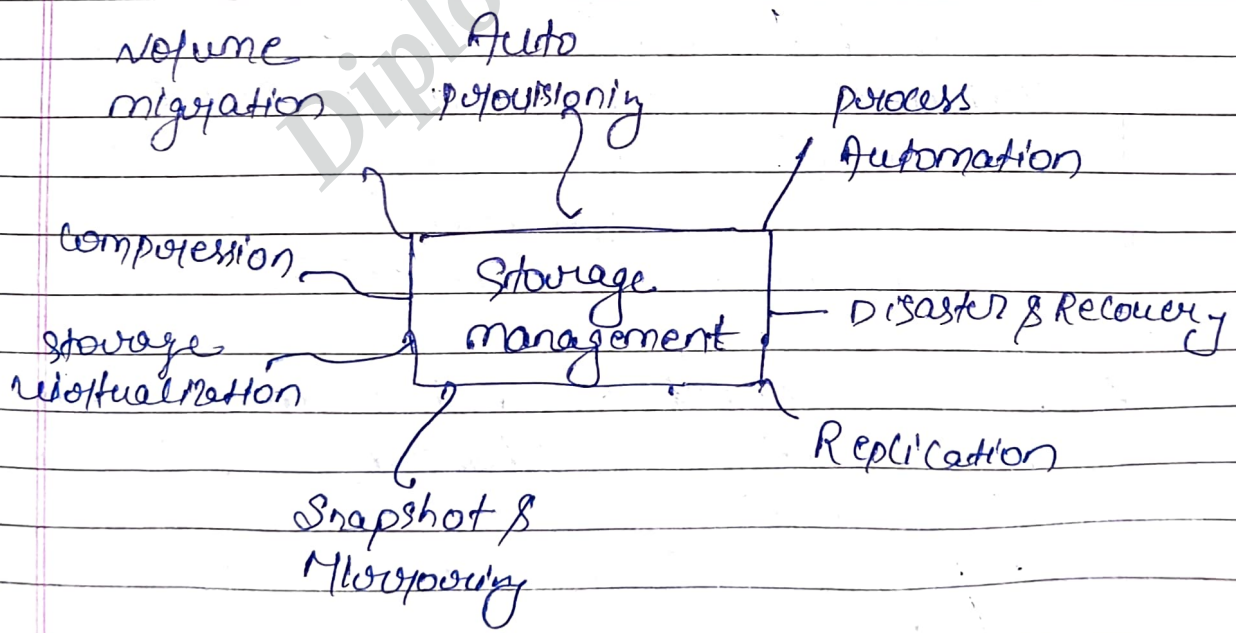
Ch-13

Storage management

- Storage management is a process that is used to optimize the use of storage devices.
- It is used to improve the performance of their data storage resources.

Storage management has some key attributes which is generally used to manage the storage capacity of the system.

1. performance
2. Reliability
3. Recoverability
4. Capacity.



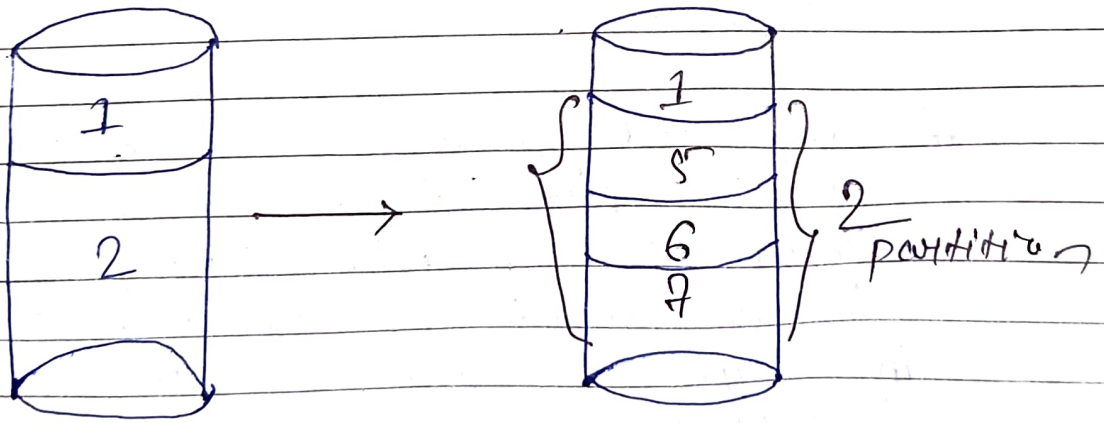
* Volume migration
→ Data ko ek Storage se dusre storage me shift karna bina downtime ke.
* process Automation
→ Storage ke repetitive tasks ko automatic banana.
(Ex. Harvest ko baje backup lena, 80% ho jaye to alert bhejna).
* Disaster and Recovery
→ Agar system wash ho jaye, flood ; fire ya hardware fail ho jaye toh bhi data recover karna.
* Replication
→ Ek data ka real-time copy banake dusri jagah store karna.
* Auto-provisioning
→ Jab bhi storage ki zarrot ho, system automatically space allocate kar de.
- Ek company ke 100 employee hai or sabko 50GB Storage auto assign hota hai., koi naye employee aaya toh system automatically usko storage de dega.
* ~~Auto~~ Snapshot and mirroring
→ Ek instant photo (backup) lena data ka. (snapshot)
→ Mirroring :- Ek hi data ko disk par copy karna.
Ex - Jaise hum whatsapp chat ka screenshot liye wo snapshot, aur ek hi Photo hamare do phones me auto-sync hojaye (mirroring)

* Disk partition, formatting, ~~operating~~ mounting.

* Disk partioning is the process of dividing a disk into one or more logical areas, often known as partitions, on which the user can work separately.
* If a partition is created, the disk will store the information about the location and size of partition in the partition table.

- With the partition table, each partition can appear to the OS as a logical disk, and user can read and write data on those disk.

We need disk partition because:-
- To upgrade harddisk.
- dual booting
- Efficient disk management
- Ensure backup & security.
- work with different file system using the same system.



Disk formatting

Disk formatting is the process of preparing a blank slate to a storage device, preparing it to store new data by erasing any existing information, and creating a structure for organising files.

It involve:- * erasing any existing data
* setup the new file system.
* creat the directory structure so that device can recognise and used by OS.

Type:
- low level formatting
- high " "

* Low level formatting is a process initializing a disk at physical level, which include the creation of tracks, sectors and other physical parameters that define how data is stored in disk.

* High level formatting is the process of creating a file system and directory structure on a disk, allowing it to be recognised and used by an OS.
This type of formatting is usually performed by user when they first acquire a new disk.

High level formatting
↓
Clear data on harddisc
↓
Generate boot information
↓
Initialize FAT (file allocation table)
↓
Label logical bad sectors.

* Mounting
Mounting is a basic component in OS. which involve to making files, and directory from one file system available to use within another file system.

* mounting means making a storage device ready to use by attaching it to the OS file system.

* without mounting OS cannot access the data.

- A mount point is the place (folder/drive/letter) where the device is attached.
- unmounting means safely removing the device from the system.

Windows Ex- when we insert a USB or harddisc, it automatically gets a drive letter like E:, F:, G:,

- That drive letter is mount point.

Mounting = Connecting a storage device to OS.
mountpoint = The location (folder/dir/drive letter) where device is attached.

In Linux/unix
- No drive letters, only directories.
- We have to manually mount a device to a folder.

Ex
```
mkdir /mnt/usb
mount /dev/sdb1 /mnt/usb
```
now the usb content available inside the mnt/usb.

It is Important :-
→ To access external storage device (USB, HDD)
→ To connect different file system (NTFS, FAT32, EXT4).
- For using network storage (NFS, SMB).

LVM (Logical volume management)

- It is a way to manage storage (disks) on linux/unix system more flexibility than normal partitions.
- Instead of dividing a disk into fixed partition, LVM lets we create logical volume that can be resized, moved or combine easily.

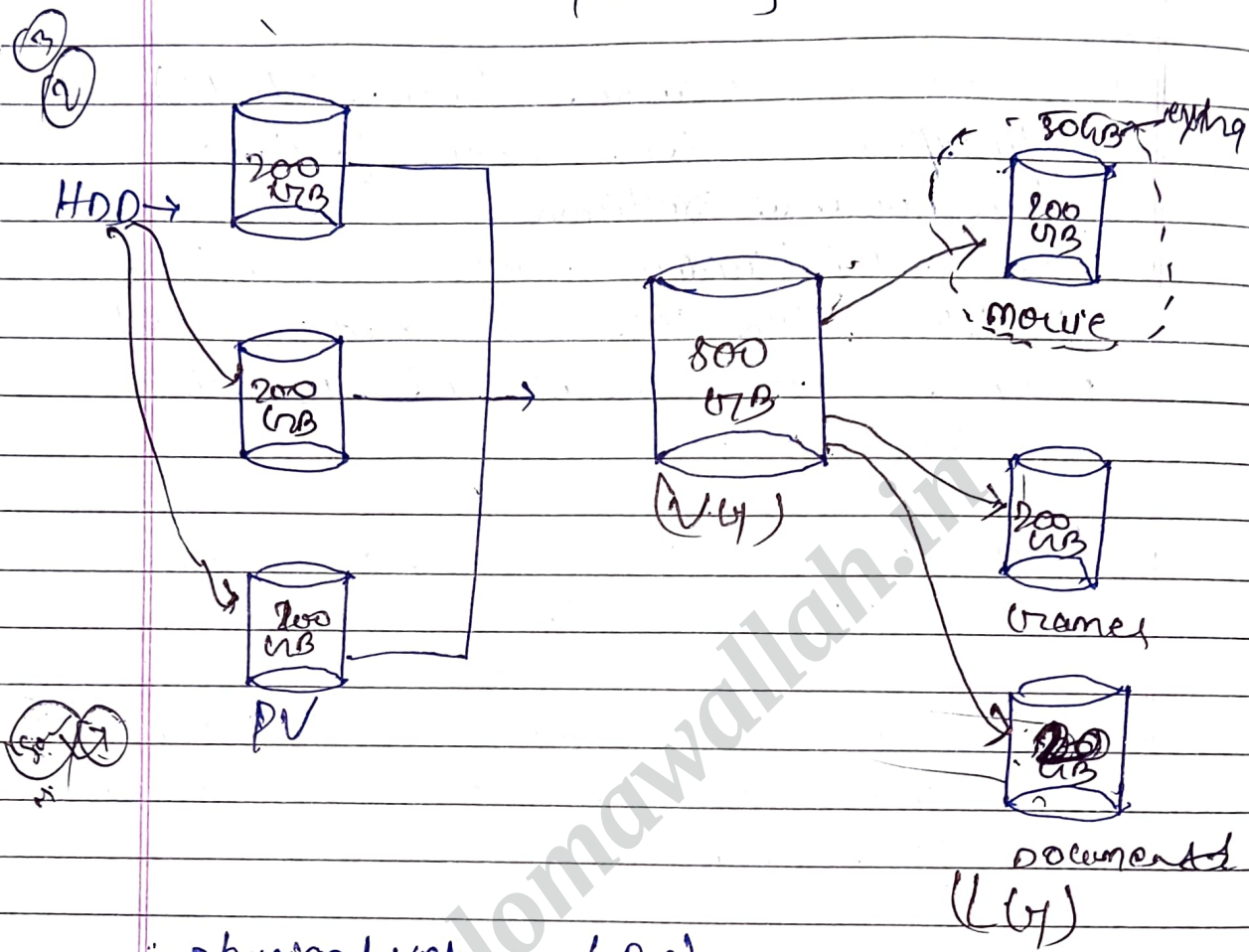
(It is like a virtual storage on top of physical disks).

Ex- we have a hard drive of 500GB.
we want to store movies, games and documents.

without LVM:-
- we have to make fixed partition of 200GB for movies, 200GB games, 100GB documents.
- If movie exceed 200GB, we can't easily use space from documents.

With LVM:-
- we combine the whole 500GB into a volume group (VG).
- Then we create logical volume (LV) for movies, games, documents.
- Later we can increase movies LV to 300GB using free space from VG without reformatting.

LVM working

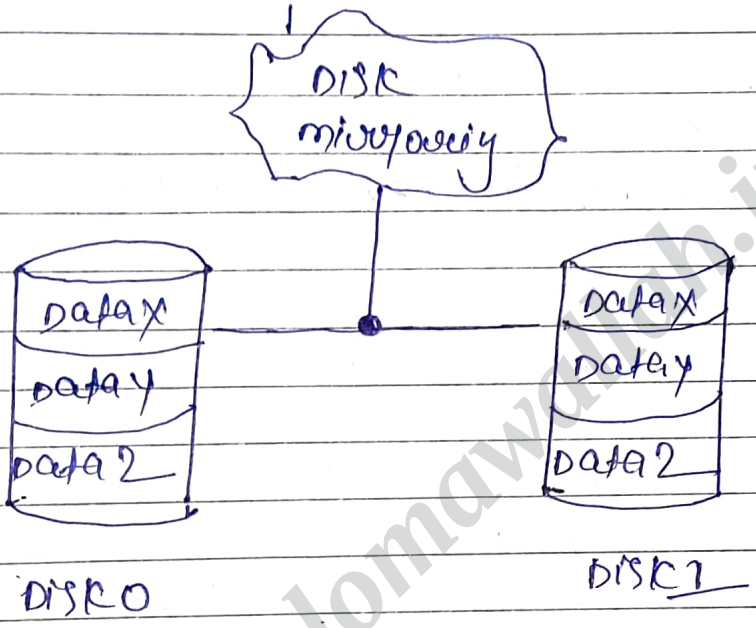


- physical volume (PV)
- VG (volume group)
- LV (logical group)

* DISK mirroring
- DISK mirroring is the process to store same data on two disks at the same time.
- It is used to keep data safe, if one fails one will be kept.
- Every file written on DISK A is also copied to DISK B.

Advantage
- Data Saftey
- System keeps working even if one disk crashes.

disadvantage.
→ need double storage
- Expensive (extra disk required)
- If data is deleted or corrupted - copy also get deleted.



Extended disk using LVM

→ If we have a 500 GB.
- we created a volume group of 500 GB.
- we have to create a logical volume 200 GB → and we need 300 GB.

Case 1 : 0 VG
maan lo VG me 100 GB khali pada hai
1. check free space in VG
sudo vgdisplay vg_data

2. Extend the LV to 300GB.
Sudo lvextend -L 300G /dev/vg_data/lv_movies
3. Resize the filesystem.
Sudo resize2fs /dev/vg_data/lv_movies.

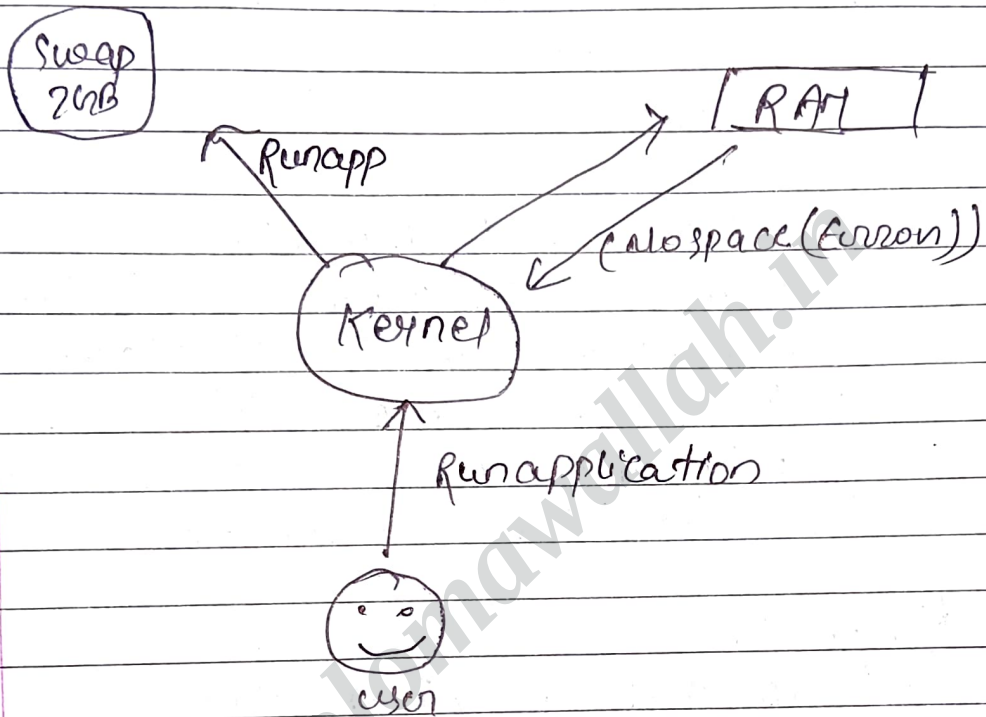
Ab mera movies LV = 300GB ho gaya.

Case 2: VG me free space Nahi hai
If 500GB is already filled.
then we have to set new 500GB storage

1. Add
Sudo pvcreate /dev/sde
2. Extend
Sudo vgextend vg_data /dev/sde.
3. Now extend the LV (add 100GB more)
Sudo lvextend -L +100G /dev/vg_data/lv_movies.
4. Resize the filesystem
Sudo resize2fs /dev/vg_data/lv_movies
• Ab tumhara LV movies = 200GB + 100GB = 300GB.

* VG free space ho to naya disk add karne ki zaroorat to nahi.
* VG full ho to naya disk add karke extend karna padta hai.
* Always resize filesystem after extending LV.

Swap partition:- virtual memory.
It working like a RAM.
used when RAM is full or busy.



If we want ~~to create~~ more swap then
Create more swap.
In one ~~extend~~ we make 60 partition.

Swap is a space on a disk that is used when the amount of physical RAM memory is full. When a Linux system runs out of RAM, inactive pages are moved from the RAM to the swap space.

ways to add swap space :-

Swap partition - A dedicated partition marked as swap.

- Swap file - A normal file configured as swap.

Eg - Swap in Linux.

```
sudo fallocate -l 1G /swapfile      #Create 1GB swap
sudo chmod 600 /swapfile            # set correct permission
sudo mkswap /swapfile               #make it swap
sudo swapon /swapfile               # Enable it
echo '/swapfile none swap sw 0 0' | sudo tee -a /etc/fstab  #permanent.
```

Key points:

- Swap acts as extended RAM.
- Slower than RAM but prevent from crashing.
- Size usually depends on system RAM (1-2x RAM recommended.)

RAID

Redundant Array of Independent Disks.

* RAID combines multiple disks into one logical unit to improve:
  - performance
  - Reliability

Raid level	purpose	Notes
RAID 0	speed	data split across disks (no backup)
RAID 1	Backup	Exact copy (mirroring) on two disks.
RAID 5	Speed + safety	striping with parity needs 3+ disks.
RAID 10	Speed + Backup	Combination of RAID 1 + RAID 0.

Hardware RAID vs Soft

Hardware RAID is managed by a dedicated RAID controller card in the system.

Features:

High performance.

Reliability, cost expensive.

Setup using configured boot or via RAID card BIOS.

Ex. RAID 1 mirroring on 2 disk managed by a RAID controller → fast, safe, and transparent to OS.

Software RAID

Software RAID is managed by the OS
eg. Linux (mdadm tool).

Feature

- performance
- Reliability
- cost cheap or free.
- Setup using OS tools and commands.

Ex. Linux mdadm RAID5 setup → Combine 3 disk for speed + safety without RAID card.

- Hardware RAID = fast & reliable but costly.
- Software RAID = free & flexible but uses CPU.

Last unit of OS.