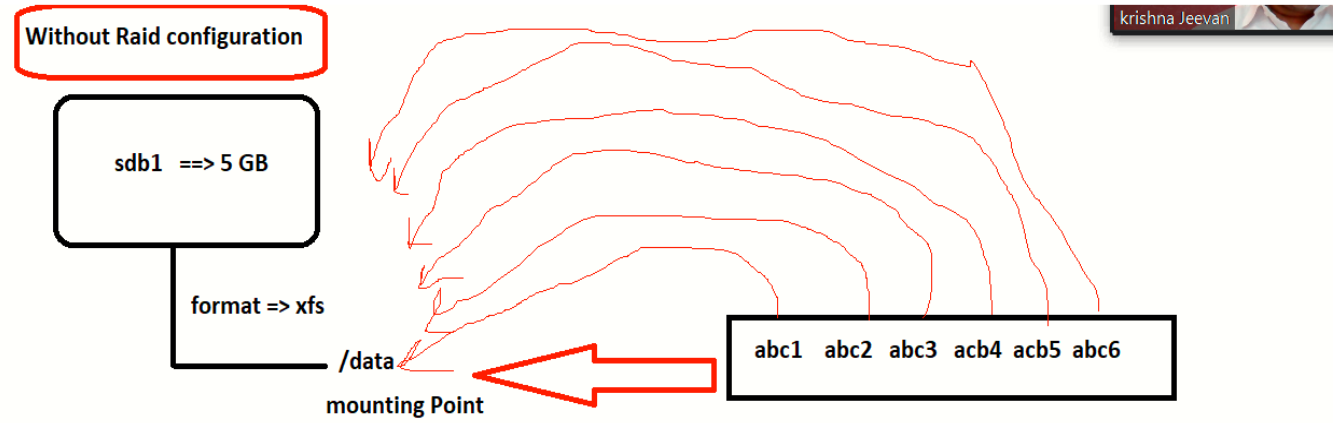
********** RAID **********

- RAID (Redundant Array of Inexpensive Disks or Drives, or Redundant Array of Independent Disks) is a data storage virtualization technology that combines multiple physical disk drive components into one or more logical units for the purposes of data redundancy, performance improvement, or both.

- RAID storage uses multiple disks in order to provide fault tolerance, to improve overall performance, and to increase storage capacity in a system.

- RAID is a technology that is used to increase the performance and/or reliability of data storage.



1- single disk == we are the data at a time in single disk (writting speed is slow)
2- Disk Failover OR Fault Tolerance ==> if any case this drive is failed due to any reason we can not have the backup

Who Should Use RAID?

System Administrators and others who manage large amounts of data would benefit from using RAID technology. Primary reasons to deploy RAID include:

- Enhances speed
- Increases storage capacity using a single virtual disk
- Minimizes disk failure

Types of RAID ?

1- Hardware Raid

Hardware RAID was the initial type of RAID available, where a specially built RAID controller handles the drives so that the processes are almost transparent to the host computer.

2- Software Raid

Software RAID is a newer type of RAID where no specialized hardware is needed, and the host computer is responsible for the drives.

Types of Raid Level ?

1- Raid- 0 (Stripping Without Parity OR Stripped Volume)
2- Raid- 1 (Mirror Volume or Mirroring concept)
3- Raid- 5 (Stripping with Parity)

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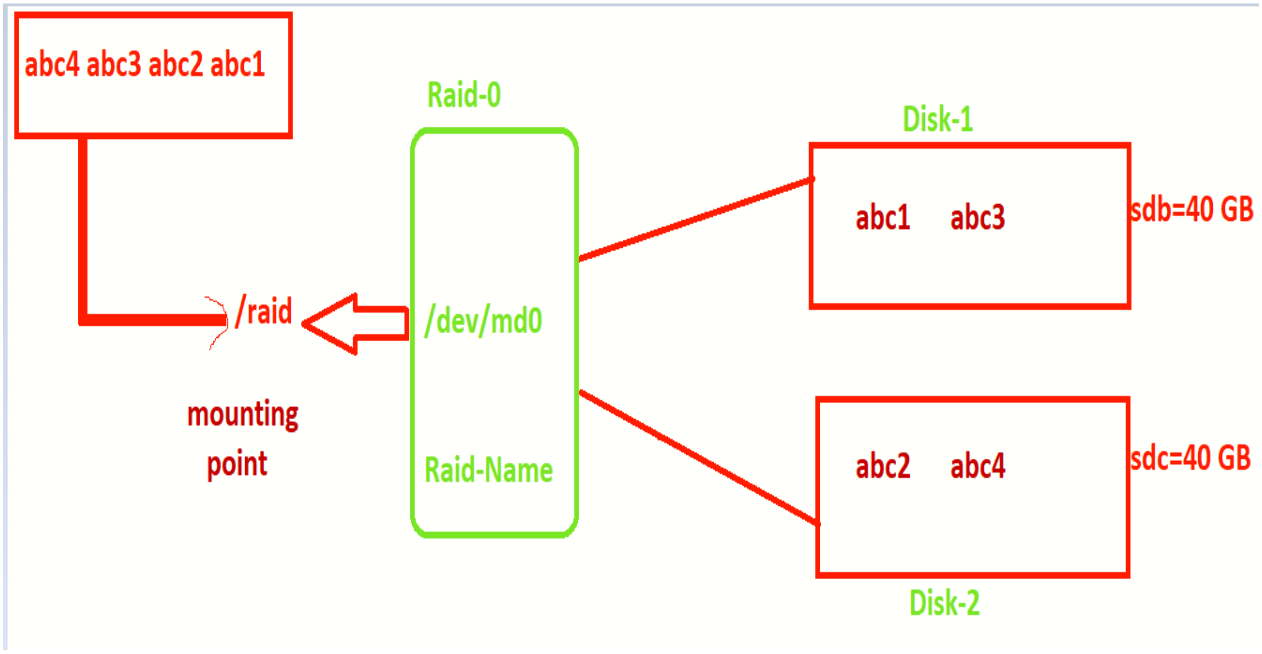
4- Raid- 6 (Stripping with dual parity)
5- Raid- 10 (Mirror Volume + stripped Volume)

Raid - 0 (Stripping Without Parity OR Stripped Volume)

Requirements:

- It works on striping concept
- Min 2 Hard disk
- Same Size
- Same configuration
- Provides high data writing speed.
- Cost will increase
- Fault Tolerance is not available.
- No redundancy available.
- Not recommended for any critical data storage backup
- We can use raid-0 only in data backup with high data writing speed only.
- Disk usage ===== 100%

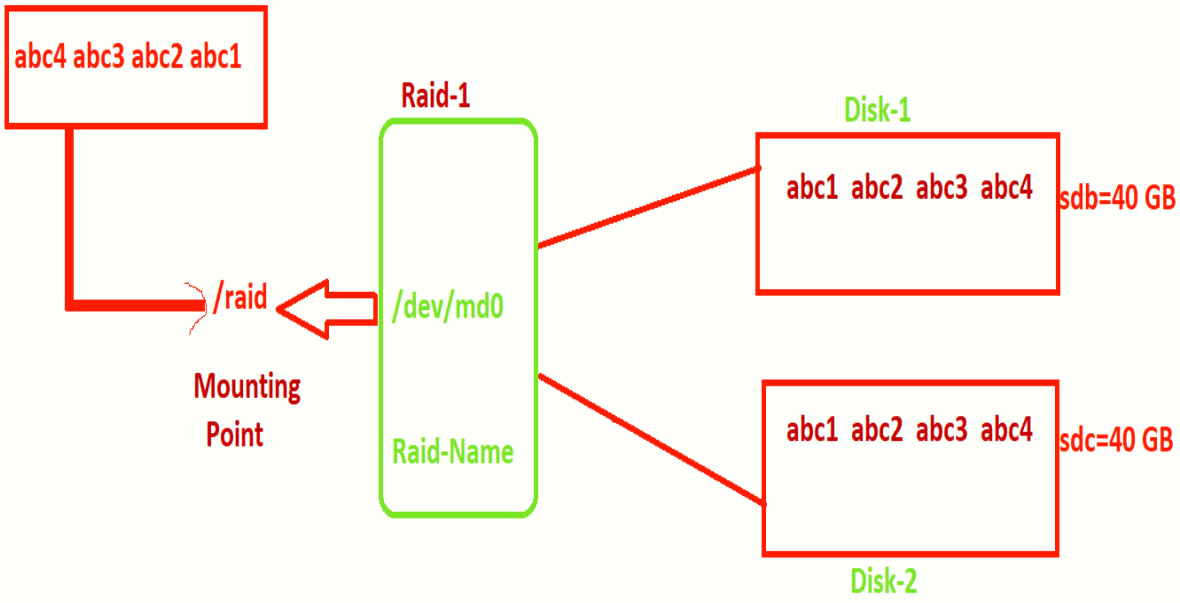


Pros	Cons
Data is stripped into multiple drives	No support for Data Redundancy
Disk space is fully utilized	No support for Fault Tolerance
Minimum 2 drives required	No error detection mechanism
High performance	Failure of either disk results in complete data loss in respective array

Raid - 1 (Mirror Volume or Mirroring concept)

Requirements:

- Mirror means same data will write in second disk.
- Raid 1 use the mirror concept.
- Min 2 Hard disk
- Same Size
- Same configuration
- Costly as compare RAID-0
- data writing speed is slow as compare to raid - 0
- because first we are writing the data in first disk then we are creating mirror in second disk
- Fault Tolerance is available.
- if one disk is failure we can recover the data from my second disk.
- recommended for any critical data storage backup
- Disk usage ===== 50 %



Pros	Cons
Performs mirroring of data i.e identical data from one drive is written to another drive for redundancy.	Expense is higher (1 extra drive required per drive for mirroring)
High read speed as either disk can be used if one disk is busy	Slow write performance as all drives has to be updated
Array will function even if any one of the drive fails	
Minimum 2 drives required	

Raid - 5 (Stripping with parity)

Requirements:

- It works on stripping with Parity concept
- Min 3 Hard disk
- Same Size
- Same configuration
- Data writing is also fast as compare to raid - 0.
- Cost will increase if we compare it with raid-0.
- Fault Tolerance is available.
- recommended for any critical data storage backup
- If we need high data writing speed with fault tolerance concept we can use raid-5.
- Raid-5 provides one disk failure concept out of three.
- Disk usage ===== total disk size – one disk size ➔ 66 %

Parity ?

A parity bit is a bit added to the end of the data string used for error checking. However, parity bits can only check for errors, not correct them.

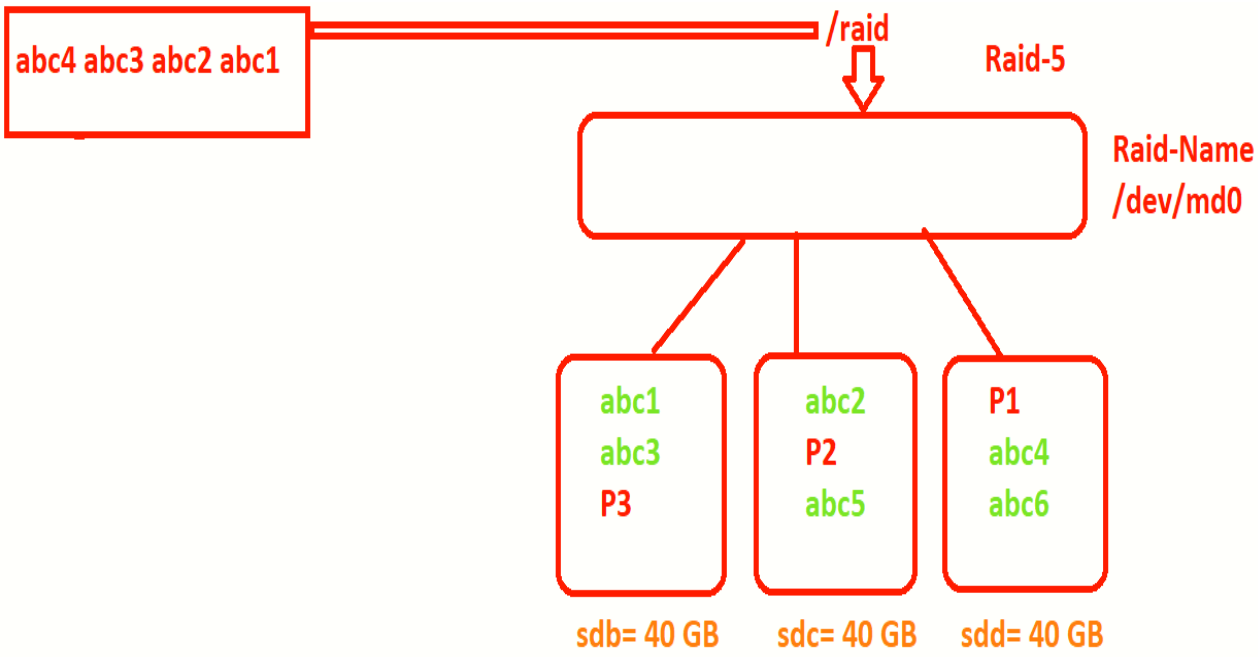
parity ==> it works on X-OR operator.

0 0 ==> 0

0 1 ==> 1

1 0 ==> 1

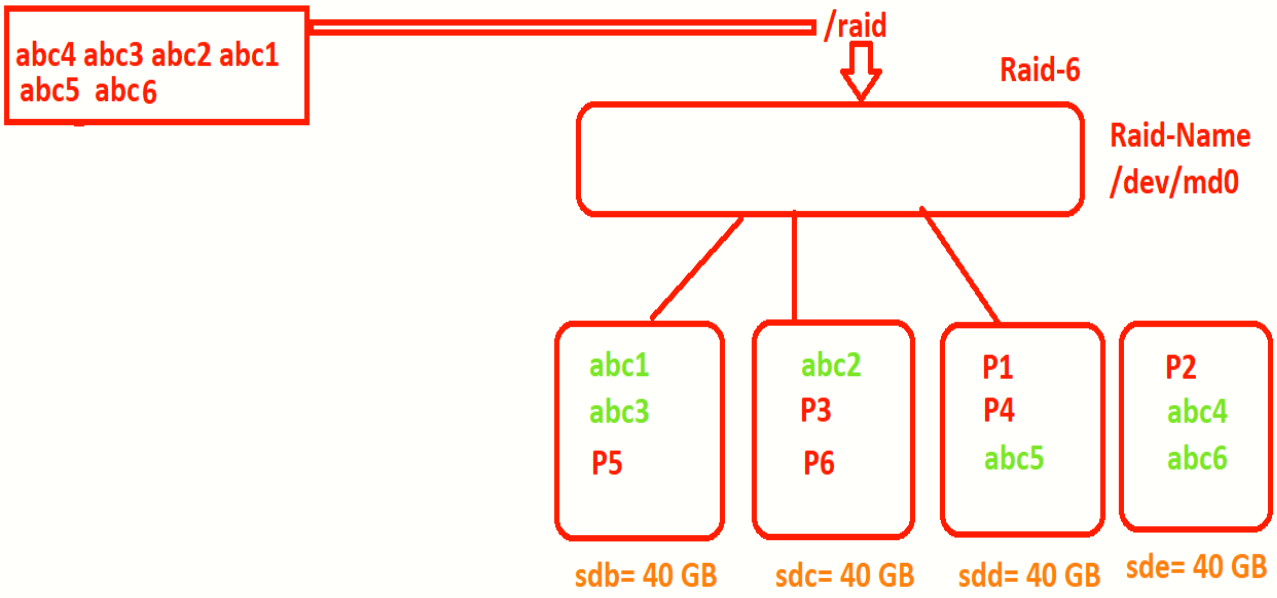
1 1 ==> 0



Pros	Cons
Block level stripping with DISTRIBUTED parity	In case of disk failure recovery may take longer time as parity has to be calculated from all available drives
Parity is distributed across the disks in an array	
High Performance	
Cost effective	
Minimum 3 drives required	

Raid - 6 (Stripping with Dual Parity)

- Raid 6 works on stripping with dual parity concept.
- Min 4 hard disk
- Same size
- Same configuration
- Dual fault tolerance available (it provide two disk failure concept)
- Or you can generate dual parity
- Much costly setup as compare to raid-5
- Data writing speed is also fast as compare to raid-5.



Pros	Cons
Block level stripping with DUAL distributed parity	Cost Expense can become a factor
2 parity blocks are created	Writing data takes longer time due to dual parity
Can survive concurrent 2 drive failures in an array	
Extra Fault Tolerance and Redundancy	
Minimum 4 drives required	

Raid – 10 (Mirror Volume + Stripped Volume)

The Advantages Of RAID 10

- Combining these two storage levels makes **RAID 10** fast and resilient at the same time. If you need hardware-level protection for your data and faster storage performance, **RAID 10** is a simple, relatively inexpensive fix.

- **RAID 10** is secure because mirroring duplicates all your data.

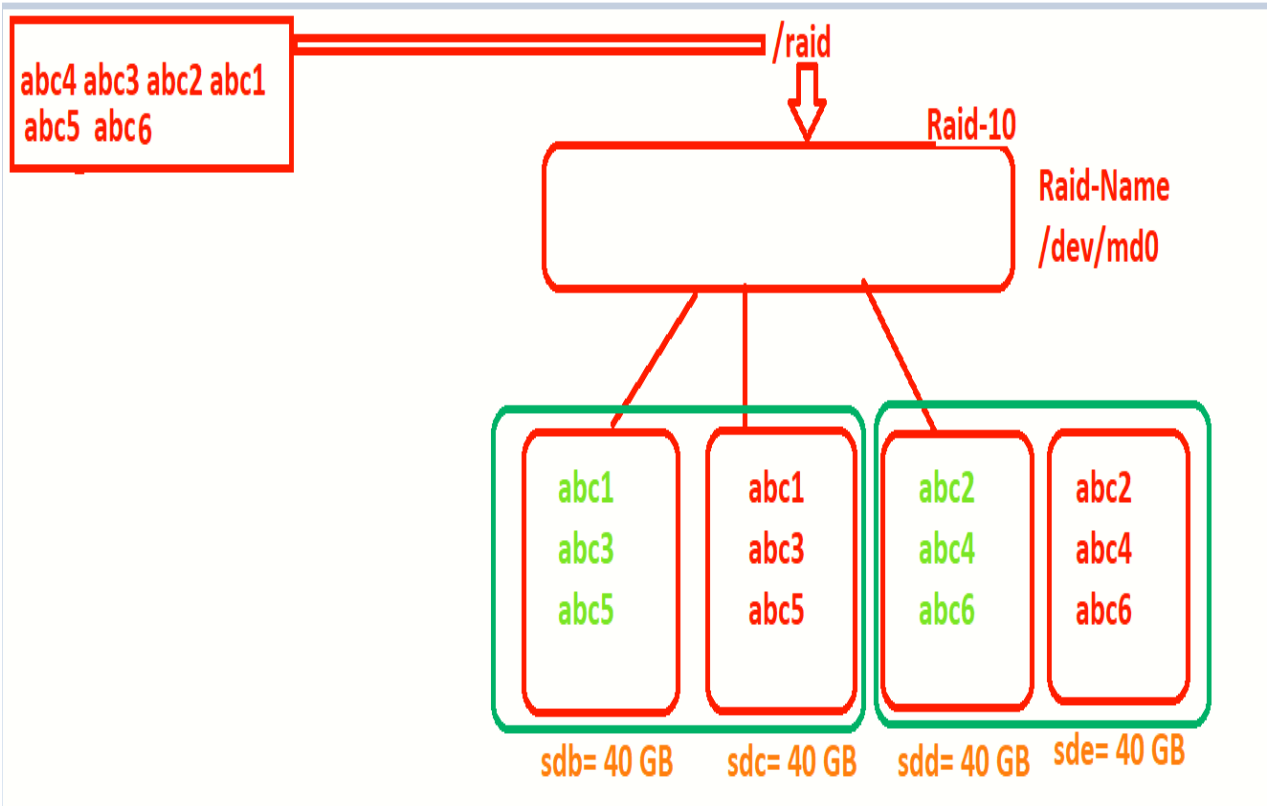
- RAID 10, also known as RAID 1+0, is a RAID configuration that combines disk mirroring and disk striping to protect data.

- It requires a minimum of four disks and stripes data across mirrored pairs.

- As long as one disk in each mirrored pair is functional, data can be retrieved.

- If two disks in the same mirrored pair fail, all data will be lost because there is no parity in the striped sets.

- RAID 10 provides data redundancy and improves performance, and is the a good option for I/O-intensive applications –
- including email, web servers, databases and operations that require high disk performance -- and organizations that require little to no downtime.


abc4 abc3 abc2 abc1
abc5 abc6
/raid
Raid-10
Raid-Name
/dev/md0
abc1
abc3
abc5
abc1
abc3
abc5
abc2
abc4
abc6
abc2
abc4
abc6
sdb= 40 GB
sdc= 40 GB
sdd= 40 GB
sde= 40 GB