****RAID(Redundent Array of Independent Disk)*****

27/11/2022---

RAID 0:-

When we stored any data in Raid 0 then our data divided into two part.Then if any case Disk 1 is crash ,then we can't recover our data in RAID 0.

LAB:-

#Add two hard-disk

```
[root@localhost ~]# lsblk
NAME            MAJ:MIN RM  SIZE RO TYPE MOUNTPOINT
sda               8:0    0   50G  0 disk
├─sda1            8:1    0    1G  0 part /boot
└─sda2            8:2    0   49G  0 part
  ├─centos-root 253:0    0   47G  0 lvm  /
  └─centos-swap 253:1    0    2G  0 lvm  [SWAP]
sdb               8:16   0    9G  0 disk
sdc               8:32   0   10G  0 disk
sr0              11:0    1  4.4G  0 rom  /run/media/root/CentOS 7 x86_64
```

#for update your system

yum update

#for install mdadm

yum install mdadm -y **#mdadm - manage MD devices aka Linux Software RAID)**

lsblk **# it is used to display details about block devices and these block devices(except ram disk)**

mdadm --create --verbose /dev/md0 --level=0 --raid-devices=2 /dev/sdb /dev/sdc **#This command is used to create two hard disk as a single raid disk**

```
[root@localhost ~]# mdadm --create --verbose /dev/md0 --level=0 --raid-devices=2 /
dev/sdb /dev/sdc
mdadm: chunk size defaults to 512K
mdadm: Defaulting to version 1.2 metadata
mdadm: array /dev/md0 started.
[root@localhost ~]#
```

mkfs.ext4 /dev/md0 **#for make file system is utilized to make a file system on a formatted storage device**

```
[root@localhost ~]# mkfs.ext4 /dev/md0
mke2fs 1.42.9 (28-Dec-2013)
Filesystem label=
OS type: Linux
Block size=4096 (log=2)
Fragment size=4096 (log=2)
Stride=128 blocks, Stripe width=256 blocks
1245184 inodes, 4976128 blocks
248806 blocks (5.00%) reserved for the super user
First data block=0
Maximum filesystem blocks=2153775104
152 block groups
32768 blocks per group, 32768 fragments per group
8192 inodes per group
Superblock backups stored on blocks:
        32768, 98304, 163840, 229376, 294912, 819200, 884736, 1605632, 2654208,
        4096000

Allocating group tables: done
Writing inode tables: done
Creating journal (32768 blocks): done
Writing superblocks and filesystem accounting information: done
```

mkdir /mnt/raid0 **#for make diractory in mnt path**

mount /dev/md0 /mnt/raid0-drive **#for mount the filesystem found on a device to big tree structure(Linux filesystem) rooted at '/}**

lsblk **# for it is used to check the detail in hard disk and one raid0-drive**

```
[root@localhost ~]# lsblk
NAME            MAJ:MIN RM  SIZE RO TYPE  MOUNTPOINT
sda               8:0    0   50G  0 disk
├─sda1            8:1    0    1G  0 part  /boot
└─sda2            8:2    0   49G  0 part
  ├─centos-root 253:0    0   47G  0 lvm   /
  └─centos-swap 253:1    0    2G  0 lvm   [SWAP]
sdb               8:16   0    9G  0 disk
└─md0             9:0    0   19G  0 raid0 /mnt/raid0
sdc               8:32   0   10G  0 disk
└─md0             9:0    0   19G  0 raid0 /mnt/raid0
sr0              11:0    1  4.4G  0 rom   /run/media/root/CentOS 7 x86_64
```

df -h **#for see partition that my configuration becomes success or not**

```
[root@localhost ~]# df -h
Filesystem               Size  Used Avail Use% Mounted on
devtmpfs                 894M     0  894M   0% /dev
tmpfs                    910M     0  910M   0% /dev/shm
tmpfs                    910M   11M  900M   2% /run
tmpfs                    910M     0  910M   0% /sys/fs/cgroup
/dev/mapper/centos-root   47G  4.1G   43G   9% /
/dev/sda1               1014M  185M  830M  19% /boot
tmpfs                    182M   24K  182M   1% /run/user/0
/dev/sr0                 4.4G  4.4G     0 100% /run/media/root/CentOS 7 x86_64
/dev/md0                  19G   45M   18G   1% /mnt/raid0
[root@localhost ~]#
```

RAID 1:-

Prefer this:- https://www.linuxbabe.com/linux-server/linux-software-raid-1-setup

---

In RAID 1, the original file is stored on one disk drive, and identical copies of the file are stored on the other disk drives in the array. As a result, RAID 1 produces disk drives that are mirrored copies of each other. Unlike RAID 0, RAID 1 provides data redundancy, creating a fault-tolerant array.

own language-When we stored any data in raid 1 then they create a copy of our data and store in 2nd storage.Then if any case Disk 1 is crash ,then we can recover data by 2nd disk.

LAB:-

-Add two disk

```
[root@localhost ~]# lsblk
NAME            MAJ:MIN RM  SIZE RO TYPE MOUNTPOINT
sda               8:0    0   50G  0 disk
├─sda1            8:1    0    1G  0 part /boot
└─sda2            8:2    0   49G  0 part
  ├─centos-root 253:0    0   47G  0 lvm  /
  └─centos-swap 253:1    0    2G  0 lvm  [SWAP]
sdb               8:16   0   10G  0 disk
sdc               8:32   0    9G  0 disk
sr0              11:0    1  4.4G  0 rom  /run/media/root/CentOS 7 x86_64
```

yum install mdadm -y **#for install mdadm software**

mdadm --create --verbose /dev/md1 --level=1 --raid-devices=2 /dev/sdb/ /dev/sdc/ **#assign disk to md1**

```
[root@localhost ~]# mdadm --create --verbose /dev/md1 --level=1 --raid-devices=2 /
dev/sdb /dev/sdc
mdadm: Note: this array has metadata at the start and
    may not be suitable as a boot device.  If you plan to
    store '/boot' on this device please ensure that
    your boot-loader understands md/v1.x metadata, or use
    --metadata=0.90
mdadm: size set to 9427968K
mdadm: largest drive (/dev/sdb) exceeds size (9427968K) by more than 1%
Continue creating array? y
mdadm: Defaulting to version 1.2 metadata
mdadm: array /dev/md1 started.
```

#mkfs.ext4 /dev/md1 **#for make file system of md1**

```
[root@localhost ~]# mkfs.ext4 /dev/md1
mke2fs 1.42.9 (28-Dec-2013)
Filesystem label=
OS type: Linux
Block size=4096 (log=2)
Fragment size=4096 (log=2)
Stride=0 blocks, Stripe width=0 blocks
589824 inodes, 2356992 blocks
117849 blocks (5.00%) reserved for the super user
First data block=0
Maximum filesystem blocks=2151677952
72 block groups
32768 blocks per group, 32768 fragments per group
8192 inodes per group
Superblock backups stored on blocks:
        32768, 98304, 163840, 229376, 294912, 819200, 884736, 1605632

Allocating group tables: done
Writing inode tables: done
Creating journal (32768 blocks): done
Writing superblocks and filesystem accounting information: done
```

#mkdir /mnt/raid1 **#Create directory in mnt path**

#mount /dev/mnt1 /mnt/raid1 **#mount(add) mnt filr in raid1**

df -h /mnt/raid1 **# show mount file**

```
[root@localhost ~]# df -h /mnt/raid1
Filesystem      Size  Used Avail Use% Mounted on
/dev/md1        8.8G   37M  8.3G   1% /mnt/raid1
```

RAID1 configuration completed

#cd /mnt/raid1 **#Go to raid1 path**

#touch > test **#create and write something in test file**

write something in test file-(Ctrl+D)

```
[root@localhost ~]# mkdir /mnt/raid1
[root@localhost ~]# cd /mnt/raid1
[root@localhost raid1]# cat > file1
hi
suryadev chaudhary here.!
[root@localhost raid1]# ll
total 4
-rw-r--r--. 1 root root 30 Feb 19 05:24 file1
[root@localhost raid1]# cat file1
hi
suryadev chaudhary here.!
```

mdadm --examine /dev/sdb /dev/sdc **# show disk status (Active or not)**

```
   Device Role : Active device 0
   Array State : AA ('A' == active, '.' == missing, 'R' == replacing)
/dev/sdc:
          Magic : a92b4efc
        Version : 1.2
    Feature Map : 0x0
     Array UUID : 2aba0c95:7fdcab2a:349cd3a0:64d4f30b
           Name : localhost.localdomain:1  (local to host localhost.localdomain)
  Creation Time : Sun Feb 19 05:21:50 2023
     Raid Level : raid1
   Raid Devices : 2

 Avail Dev Size : 18855936 sectors (8.99 GiB 9.65 GB)
     Array Size : 9427968 KiB (8.99 GiB 9.65 GB)
    Data Offset : 18432 sectors
   Super Offset : 8 sectors
   Unused Space : before=18280 sectors, after=0 sectors
          State : clean
    Device UUID : 5baab0f8:d5d48102:015f36fa:08723abd

    Update Time : Sun Feb 19 06:17:35 2023
  Bad Block Log : 512 entries available at offset 136 sectors
       Checksum : a4b8456c - correct
         Events : 17


   Device Role : Active device 1
   Array State : AA ('A' == active, '.' == missing, 'R' == replacing)
```

#cat /proc/mdstat

```
[root@localhost raid1]# cat /proc/mdstat
Personalities : [raid1]
md1 : active raid1 sdc[1] sdb[0]
      9427968 blocks super 1.2 [2/2] [UU]

unused devices: <none>
```

#mdadm --detail /dev/md1 **#show detail of md1**

```
[root@localhost ~]# mdadm --detail /dev/md1
/dev/md1:
           Version : 1.2
     Creation Time : Sun Feb 19 05:21:50 2023
        Raid Level : raid1
        Array Size : 9427968 (8.99 GiB 9.65 GB)
     Used Dev Size : 9427968 (8.99 GiB 9.65 GB)
      Raid Devices : 2
     Total Devices : 2
       Persistence : Superblock is persistent

       Update Time : Sun Feb 19 05:23:05 2023
             State : clean
    Active Devices : 2
   Working Devices : 2
    Failed Devices : 0
     Spare Devices : 0

Consistency Policy : resync

              Name : localhost.localdomain:1  (local to host localhost.localdomain
)
              UUID : 2aba0c95:7fdcab2a:349cd3a0:64d4f30b
            Events : 17

    Number   Major   Minor   RaidDevice State
       0       8       16        0      active sync   /dev/sdb
       1       8       32        1      active sync   /dev/sdc
```

remove one disk from system

Again check mdadm disk detail

#mdadm --detail /dev/md1 **#show detail of md1**

```
[root@localhost ~]# mdadm --detail /dev/md1
/dev/md1:
           Version : 1.2
     Creation Time : Sun Feb 19 05:21:50 2023
        Raid Level : raid1
        Array Size : 9427968 (8.99 GiB 9.65 GB)
     Used Dev Size : 9427968 (8.99 GiB 9.65 GB)
      Raid Devices : 2
     Total Devices : 1
       Persistence : Superblock is persistent

       Update Time : Sun Feb 19 06:25:30 2023
             State : clean, degraded
    Active Devices : 1
   Working Devices : 1
    Failed Devices : 0
     Spare Devices : 0

Consistency Policy : resync

              Name : localhost.localdomain:1  (local to host localhost.localdomain)
              UUID : 2aba0c95:7fdcab2a:349cd3a0:64d4f30b
            Events : 21

    Number   Major   Minor   RaidDevice State
       0       8       16        0      active sync   /dev/sdb
       -       0        0        1      removed
```

#showing one disk removed

still my data is saved

```
[root@localhost ~]# cat /mnt/raid1/file1
hi
suryadev chaudhary here.!
[root@localhost ~]#
```

#cat /etc/fstab **#open this file and copy UID from here**

```
[root@localhost ~]# cat /etc/fstab

#
# /etc/fstab
# Created by anaconda on Sun Jan 29 10:04:30 2023
#
# Accessible filesystems, by reference, are maintained under '/dev/disk'
# See man pages fstab(5), findfs(8), mount(8) and/or blkid(8) for more info
#
/dev/mapper/centos-root /                       xfs     defaults        0 0
UUID=b7efb72f-889f-4bb8-ac15-5ce419df0441 /boot                   xfs     defaults
        0 0
/dev/mapper/centos-swap swap                    swap    defaults        0 0
```

#vi /mnt/raid1-**paste here(Ex-'UID' ext4 0 0)**

```
b7efb72f-889f-4bb8-ac15-5ce419df0441 ext4 0 0
~
```

#mount -a

#reboot **#reboot system**

#df -h **#detail of system disk**

#mdadm --detail /dev/md1 **#show detail of md1**

RAID 5:-

Prefer this site :- https://www.slashroot.in/how-configure-raid-level-5-linux

---

=>When we create RAID 5 configuration then need to required minimum 3 disk.

=>When we stored any data in raid 5 then they create a copy of our data and store in 2nd disk and create index file and stored in 3rd Disk.Then if any case Disk 1 is crash ,then we can recover data by 3rd disk.

=>It is slower than RAID 0 and RAID 1

add 3 disk

yum install mdadm -y **#install mdadm**

mdadm --create --verbose /dev/md5 --level=5 --raid-devices=3 /dev/sdb /dev/sdc /dev/sdd **#assign disk to md5**

```
[root@localhost run]# mdadm --create --verbose /dev/md5 --level=5 --raid-devices=3 /dev/sdb /dev/sdc /dev
/sdd
mdadm: layout defaults to left-symmetric
mdadm: layout defaults to left-symmetric
mdadm: chunk size defaults to 512K
mdadm: size set to 9427968K
mdadm: largest drive (/dev/sdd) exceeds size (9427968K) by more than 1%
Continue creating array?
Continue creating array? (y/n) y
mdadm: Defaulting to version 1.2 metadata
mdadm: array /dev/md5 started.
[root@localhost run]#
```

mkdir /mnt/raid5 **#Create directory in mnt path**

mount /dev/md5 /mnt/raid5 **#mount(add) mnt filr in raid5**

mdadm --detail /dev/md5 **#VIEW RAID DEVICE INFORMATION IN DETAIL**

```
[root@localhost run]# mdadm --detail /dev/md5
/dev/md5:
           Version : 1.2
     Creation Time : Sun Feb 19 06:53:13 2023
        Raid Level : raid5
        Array Size : 18855936 (17.98 GiB 19.31 GB)
     Used Dev Size : 9427968 (8.99 GiB 9.65 GB)
      Raid Devices : 3
     Total Devices : 3
       Persistence : Superblock is persistent

       Update Time : Sun Feb 19 06:54:01 2023
             State : clean
    Active Devices : 3
   Working Devices : 3
    Failed Devices : 0
     Spare Devices : 0

            Layout : left-symmetric
        Chunk Size : 512K

Consistency Policy : resync

              Name : localhost.localdomain:5  (local to host localhost.localdomain)
              UUID : 13c067b1:b5290106:5c05b1a8:afd54765
            Events : 18

    Number   Major   Minor   RaidDevice State
       0       8       16        0      active sync   /dev/sdb
       1       8       32        1      active sync   /dev/sdc
       3       8       48        2      active sync   /dev/sdd
```

mdadm /dev/md5 --fail /dev/sdd **# remove disk from system**

```
[root@localhost ~]# mdadm /dev/md5 --fail /dev/sdd
mdadm: set /dev/sdd faulty in /dev/md5
```

mdadm --detail /dev/md5 **#VIEW RAID DEVICE INFORMATION IN DETAIL**

```
[root@localhost ~]# mdadm --detail /dev/md5
/dev/md5:
           Version : 1.2
     Creation Time : Sun Feb 19 06:53:13 2023
        Raid Level : raid5
        Array Size : 18855936 (17.98 GiB 19.31 GB)
     Used Dev Size : 9427968 (8.99 GiB 9.65 GB)
      Raid Devices : 3
     Total Devices : 3
       Persistence : Superblock is persistent

       Update Time : Sun Feb 19 07:03:47 2023
             State : clean, degraded
    Active Devices : 2
   Working Devices : 2
    Failed Devices : 1
     Spare Devices : 0

            Layout : left-symmetric
        Chunk Size : 512K

Consistency Policy : resync

              Name : localhost.localdomain:5  (local to host localhost.localdomain)
              UUID : 13c067b1:b5290106:5c05b1a8:afd54765
            Events : 20

    Number   Major   Minor   RaidDevice State
       0       8       16        0      active sync   /dev/sdb
       1       8       32        1      active sync   /dev/sdc
       -       0        0        2      removed

       3       8       48        -      faulty   /dev/sdd
```

df-h **#detail of system disk**

blkid -UID copy paste =>/mnt/raid5 ext4 #copy UID and paste here default 0 0

reboot #reboot system

COMBINE RAID1 & RAID5:-

---

lsblk

mkdir /mnt/raid0

mkdir /mnt/raid1

mkdir /mnt/raid5

lsblk

mdadm --create --verbose /dev/md1 --level=1 --raid-devices=2 /dev/sdd /dev/sde

```
mdadm --create --verbose /dev/md5 --level=5 --raid-devices=3 /dev/sdf
/dev/sdg /dev/sdh
mkfs.ext4 /dev/md1
mkfs.ext4 /dev/md5
blkid
vi /etc/fstab
blkid
mkfs.xfs /dev/md5
mkfs.xfs -f /dev/md5
blkid
vi /etc/fstab
mount -a
df -h
mdadm --detail /dev/md0
mdadm --detail /dev/md1
mdadm --detail /dev/md5
halt
blkid
lsblk
mdadm --detail /dev/md5
mdadm --detail /dev/md1
mdadm --detail /dev/md0
UUID=60d13cb5-d012-468d-9e3f-cd7aad05f6cd /mnt/raid0 ext4 defaults 0 0
UUID=5abde479-7c55-498f-81c2-1705f2b47394 /mnt/raid1 ext4 defaults 0 0
UUID=b8ac3cd7-b25d-4e4f-860e-92a02980d150 /mnt/raid5 xfs defaults 0 0
```