

## LVM(Logical Volume manager):-

Prefer this lecture for theory and lab also:-

<https://www.youtube.com/watch?v=FsSf3rmu2Cc>

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- =>It is a tool for logical volume manage which includes allocating disks,stripping,mirroring ans resizing logical volumes.
  - =>It works on RAID technique
  - =>We prevant our data to loss using LVM
  - =>Increase disk volume using LVM

Logical volume(LV) -----

- Linear
- Striped
- Mirrored
- Snapshot
- Virtual

DEVICE MAPPER-----

- linear
- striped
- mirror
- snapshot and snapshot-origin
- error
- zero
- multipath
- crypt

-----

lsblk  
pvdisplay  
pvs  
lvs  
vgs

-----  
LAB:-

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## **Steps for create Logical Volume**

:- ADD one new hardisk in our centos machine

### **#step1 : for check hardisk information**

lsblk

### **#step2 : for create physical volume**

`pvcreate /dev/sdd`

```
[root@localhost ~]# pvcreate /dev/sdb /dev/sdc
Physical volume "/dev/sdb" successfully created.
Physical volume "/dev/sdc" successfully created.
```

/dev/sdd – New device name

### **#step3 : for create virtual group**

`vgcreate SURYA /dev/sdd`

```
[root@localhost ~]# vgcreate SURYA /dev/sdb /dev/sdc
Volume group "SURYA_" successfully created
```

SURYA - new virtual group name

/dev/sdd – device name

### **#step4 : for create logical volume with 1GB space**

`lvcreate -n surya_lab --size 1G SURYA`

```
[root@localhost ~]# lvcreate -n surya_lab --size 1G SURYA
Logical volume "surya_lab" created.
```

-n surya\_lab – new logical volume name

-L 1G – specified volume

SURYA – volume group name

### **#step5 : create file system**

`mkfs -t ext4 /dev/mapper/ SURYA /surya_lab`

```

[root@localhost ~]# mkfs.ext4 /dev/mapper/SURYA-surysa_lab1
mke2fs 1.42.9 (28-Dec-2013)
Could not stat /dev/mapper/SURYA-surysa_lab1 --- No such file or directory

The device apparently does not exist; did you specify it correctly?
[root@localhost ~]# mkfs.ext4 /dev/mapper/SURYA-surya_lab
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
65536 inodes, 262144 blocks
13107 blocks (5.00%) reserved for the super user
First data block=0
Maximum filesystem blocks=268435456
8 block groups
32768 blocks per group, 32768 fragments per group
8192 inodes per group
Superblock backups stored on blocks:
    32768, 98304, 163840, 229376

Allocating group tables: done
Writing inode tables: done
Creating journal (8192 blocks): done
Writing superblocks and filesystem accounting information: done

```

### **#step6 : create a directory**

mkdir lab

### **#step7 : mount directory with logical partition**

mount /dev/mapper/HPCSA-hpcs\_a\_lab lab

### **# for add mount permanent**

cat /etc/fstab

#copy your partition

```

tmpfs /run/user/0 tmpfs rw,seclabel,nosuid,nodev,relatime,size=186304k,mode=700 0 0
gvfsd-fuse /run/user/0/gvfs fuse.gvfsd-fuse rw,nosuid,nodev,relatime,user_id=0,group_id=0 0 0
/dev/sr0 /run/media/root/CentOS\0407\040x86_64 iso9660 ro,nosuid,nodev,relatime,uid=0,gid=0,icharset=utf8,dmode=0500,mode=0400 0 0
/dev/mapper/SURYA-surya_lab /root/lab ext4 rw,seclabel,relatime,data=ordered 0 0

```

### **# edit in this file like below**

vim /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
/dev/mapper/SURYA-surya_lab /root/lab ext4 rw,defaults 0 0

```

**# display physical volume partition**  
pvdisplay

```

[root@localhost ~]# pvdisplay
--- Physical volume ---
PV Name               /dev/sda2
VG Name               centos
PV Size               <49.00 GiB / not usable 3.00 MiB
Allocatable           yes
PE Size               4.00 MiB
Total PE              12543
Free PE               1
Allocated PE          12542
PV UUID               6vszNK-ej7d-DYbs-0F5c-pGRa-wIX2-ar0GrG

--- Physical volume ---
PV Name               /dev/sdb
VG Name               SURYA
PV Size               10.00 GiB / not usable 4.00 MiB
Allocatable           yes
PE Size               4.00 MiB
Total PE              2559
Free PE               2303
Allocated PE          256
PV UUID               PBxUuR-VCv8-LpTz-KVFI-1hFl-0Sie-esjvuo

--- Physical volume ---
PV Name               /dev/sdc
VG Name               SURYA
PV Size               10.00 GiB / not usable 4.00 MiB
Allocatable           yes
PE Size               4.00 MiB
Total PE              2559
Free PE               2559
Allocated PE          0
PV UUID               sCzhFe-f6eQ-NUr0-MrUe-990y-2R09-YN64bX

```

**# show volume group partition**

vgdisplay

```
[root@localhost ~]# vgdisplay
```

```
--- Volume group ---
```

VG Name	centos
System ID	
Format	lvm2
Metadata Areas	1
Metadata Sequence No	3
VG Access	read/write
VG Status	resizable
MAX LV	0
Cur LV	2
Open LV	2
Max PV	0
Cur PV	1
Act PV	1
VG Size	<49.00 GiB
PE Size	4.00 MiB
Total PE	12543
Alloc PE / Size	12542 / 48.99 GiB
Free PE / Size	1 / 4.00 MiB
VG UUID	xyr5Yr-938N-62d0-TaKm-PBEV-KuVI-U2bd1E

```
--- Volume group ---
```

VG Name	SURYA
System ID	
Format	lvm2
Metadata Areas	2
Metadata Sequence No	2
VG Access	read/write
VG Status	resizable
MAX LV	0
Cur LV	1
Open LV	0
Max PV	0
Cur PV	2
Act PV	2
VG Size	19.99 GiB
PE Size	4.00 MiB
Total PE	5118
Alloc PE / Size	256 / 1.00 GiB
Free PE / Size	4862 / 18.99 GiB
VG UUID	EcLeJz-blGG-C1iZ-a3Yq-It6e-q4y4-TIqIfF

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## ## Steps for extend logical volume

# for extend logical volume

lvextend -L +2G /dev/mapper/SURYA-surya\_lab

```
[root@localhost ~]# lvextend -L +2G /dev/mapper/SURYA-surya_lab
Size of logical volume SURYA/surya_lab changed from 1.00 GiB (256 extents) to 3.00 GiB (768 extents).
Logical volume SURYA/surya_lab successfully resized.
```

---

## ## Steps for resize Logical Volume

# for resize your allocated space

resize2fs /dev/mapper/SURYA-surya\_lab

```
[root@localhost ~]# resize2fs /dev/mapper/SURYA-surya_lab
resize2fs 1.42.9 (28-Dec-2013)
Filesystem at /dev/mapper/SURYA-surya_lab is mounted on /root/lab; on-line resizing required
old_desc_blocks = 1, new_desc_blocks = 1
The filesystem on /dev/mapper/SURYA-surya_lab is now 786432 blocks long.
```

---

## ## steps for Delete logical volume

# step1 : Unmount the drive

Umount /dev/mapper/HPCSA-hpcsa\_lab lab

# Step2 : Remove/Delete the logical volume

Lvremove /dev/mapper/HPCSA-hpcsa\_lab lab

-----X-----X-----X-----X-----

# create partition

```
fdisk /dev/mapper/SURYA-surya_lab      #press n for new partition
                                         #press p for primary
                                         #press 'enter' for assign all storage
                                         # press t for convert partition linux to lvm
                                         #press 8e for lvm partition
                                         #press w for exit
```

```
[root@localhost ~]# fdisk /dev/mapper/SURYA-surya_lab
Welcome to fdisk (util-linux 2.23.2).
```

```
Changes will remain in memory only, until you decide to write them.
Be careful before using the write command.
```

```
Device does not contain a recognized partition table
Building a new DOS disklabel with disk identifier 0xf3f6269b.
```

```
Command (m for help): n
Partition type:
   p   primary (0 primary, 0 extended, 4 free)
   e   extended
Select (default p): p
Partition number (1-4, default 1):
First sector (2048-2097151, default 2048):
Using default value 2048
Last sector, +sectors or +size{K,M,G} (2048-2097151, default 2097151):
Using default value 2097151
Partition 1 of type Linux and of size 1023 MiB is set
```

```
Command (m for help): t
Selected partition 1
Hex code (type L to list all codes): 8e
Changed type of partition 'Linux' to 'Linux LVM'
```

```
Command (m for help): w
The partition table has been altered!
```

```
Calling ioctl() to re-read partition table.
```

```
WARNING: Re-reading the partition table failed with error 22: Invalid argument.
The kernel still uses the old table. The new table will be used at
the next reboot or after you run partprobe(8) or kpartx(8)
Syncing disks.
```

```
# show mounted file
mount -av
```



```
[root@localhost ~]# mount -av
/ : ignored
/boot : already mounted
swap : ignored
/root/lab : already mounted
[root@localhost ~]# █
```

## add one more disk and create their partition also convert into linux partition

```
[root@localhost ~]# fdisk /dev/sdc
Welcome to fdisk (util-linux 2.23.2).

Changes will remain in memory only, until you decide to write them.
Be careful before using the write command.

Device does not contain a recognized partition table
Building a new DOS disklabel with disk identifier 0x51d20b93.

Command (m for help): n
Partition type:
   p   primary (0 primary, 0 extended, 4 free)
   e   extended
Select (default p): p
Partition number (1-4, default 1):
First sector (2048-20971519, default 2048):
Using default value 2048
Last sector, +sectors or +size{K,M,G} (2048-20971519, default 20971519):
Using default value 20971519
Partition 1 of type Linux and of size 10 GiB is set

Command (m for help): t
Selected partition 1
Hex code (type L to list all codes): 8e
Changed type of partition 'Linux' to 'Linux LVM'

Command (m for help): p

Disk /dev/sdc: 10.7 GB, 10737418240 bytes, 20971520 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk label type: dos
Disk identifier: 0x51d20b93
```

Device	Boot	Start	End	Blocks	Id	System
/dev/sdc1		2048	20971519	10484736	8e	Linux LVM

```
Command (m for help): █
```

# extend 1gb in previous group

```
[root@localhost ~]# vgextend vgapps /dev/sdc1
Volume group "vgapps" successfully extended
[root@localhost ~]#
[root@localhost ~]#
[root@localhost ~]# lvextend -L +1000M /dev/vgapps/app2-lv
Size of logical volume vgapps/app2-lv changed from 1000.00 MiB (250 extents) to 1.95 GiB (500 extents).
Logical volume vgapps/app2-lv successfully resized.
```

# resizing the block

```
[root@localhost ~]# resize2fs /dev/vgapps/app2-lv 2000M
resize2fs 1.45.6 (20-Mar-2020)
Filesystem at /dev/vgapps/app2-lv is mounted on /app2; on-line resizing required
old_desc_blocks = 1, new_desc_blocks = 1
The filesystem on /dev/vgapps/app2-lv is now 512000 (4k) blocks long.
```

# show resizing blocks

```
[root@localhost ~]# df -h
```

Filesystem	Size	Used	Avail	Use%	Mounted on
devtmpfs	877M	0	877M	0%	/dev
tmpfs	907M	0	907M	0%	/dev/shm
tmpfs	907M	18M	890M	2%	/run
tmpfs	907M	0	907M	0%	/sys/fs/cgroup
/dev/mapper/cs-root	17G	5.5G	12G	33%	/
/dev/sda1	1014M	258M	757M	26%	/boot
tmpfs	182M	12K	182M	1%	/run/user/42
tmpfs	182M	4.0K	182M	1%	/run/user/1000
/dev/mapper/vgapps-app1--lv	966M	24K	900M	1%	/app1
/dev/mapper/vgapps-app2--lv	2.0G	24K	1.9G	1%	/app2

## Extending a Disk using LVM

For the first time we have created a VG, now we will extend it

```
# vgextend vgapps /dev/sdb2
```

Add space to LV

```
# lvextend -L+1G /dev/vgapps/app1-lv
```

Make this new space available to FileSystem

Here is the basic command for ext4:

```
# resize2fs /dev/vgapps/app1-lv 3T
```

```
# create logical volume
```

```
#lvcreate-L 1GB -s -n surya_lab_snap /dev/mapper/SURYA-surya_lab
```

```
#lvconvert --merge /dev/mapper/SURYA-surya_lab
```

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## NOTES

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### Steps of LVM for adding new space

Install a new Hard Disk drive  
Make a partition to use it  
Designate physical volume (PV)  
Manage Volume Group (VG)  
Manage Logical Volume (LV)  
Apply a filesystem  
Set a mount point

---

### Steps for LVM

1. Install a new hard disk drive
2. Designate Physical Volumes (PV) so that it will be available to LVM as storage capacity.

Command to create a PV:

```
# pvcreate /dev/sdb1  
# pvcreate /dev/sdc
```

The first command designates partition 1 on storage disk b as a PV.  
The second command sets the total capacity of storage disk c as a PV.

Display PV capacity and additional information:

```
# pvdisplay
```

### 3. Manage Volume Groups

Now we have created PV

We can create Volume Group (VGs)

A server can have multiple VG

A disk can be part of multiple VG

PV can only be member of one VG

VG must have at least one member (vg00 is our group name and others are our PVs)

```
# vgcreate vg00 /dev/sdb1 /dev/sdc
```

To display information for a VG named vg00

```
# vgdisplay vg00
```

### 4. Now it's time to manage Logical Volumes

VG can be subdivided into one or more LVs (lvcreate is the command)

```
# lvcreate -L size(1G or 1T) -n lvname vgname
```

To display information for a LV

```
# lvdisplay /dev/vg00/lvname
```

### 5. Now we have LV also, so we can now move with apply a filesystem and set a mount point.

- Run the mkfs.ex4 command on the LV.
- Create a mount point by using mkdir.
- Manually mount the volume using the mount command, or edit the /etc/fstab file to mount the volume automatically when the system boots.
- Use the df -h command to verify the storage capacity is available.