

# Day 13 – Linux Logical Volume Manager (LVM) Hands-On using AWS EC2 and EBS

## Task 01: Check Current Storage

1. lsblk: list block devices in Linux system.

```
ubuntu@ip-172-31-33-36:~$ lsblk
NAME      MAJ:MIN RM  SIZE RO TYPE MOUNTPOINTS
loop0      7:0    0 27.6M  1 loop /snap/amazon-ssm-agent/11797
loop1      7:1    0 27.8M  1 loop /snap/amazon-ssm-agent/12322
loop2      7:2    0   74M  1 loop /snap/core22/2163
loop3      7:3    0   74M  1 loop /snap/core22/2292
loop4      7:4    0 50.9M  1 loop /snap/snapd/25577
loop5      7:5    0 48.1M  1 loop /snap/snapd/25935
nvme0n1    259:0  0   8G  0 disk 
└─nvme0n1p1 259:1  0   7G  0 part /
└─nvme0n1p14 259:2  0   4M  0 part
└─nvme0n1p15 259:3  0 106M  0 part /boot/efi
└─nvme0n1p16 259:4  0 913M  0 part /boot
ubuntu@ip-172-31-33-36:~$ |
```

2. df -h : Check storage availability

```
root@ip-172-31-33-36:/# df -h
Filesystem      Size  Used Avail Use% Mounted on
/dev/root       6.8G  2.6G  4.2G  38% /
tmpfs           458M    0  458M   0% /dev/shm
tmpfs           183M  900K  182M   1% /run
tmpfs           5.0M    0  5.0M   0% /run/lock
efivarfs        128K   3.8K  120K   4% /sys/firmware/efi/efivars
/dev/nvme0n1p16 881M   89M  730M  11% /boot
/dev/nvme0n1p15 105M   6.2M  99M   6% /boot/efi
tmpfs            92M   12K   92M   1% /run/user/1000
root@ip-172-31-33-36:/#
```

Created three AWS EBS volumes (10GB, 15GB, 20GB) and attached them to my AWS EC2 instance.

⌚ Successfully created volume [vol-05c48e907618eabce](#).

Volumes (3/5) <a href="#">Info</a>							Last updated	1 minute ago
	Name <a href="#">🔗</a>	Volume ID	Type	Size	IOPS	Throughput		
<input checked="" type="checkbox"/>		<a href="#">vol-0ccc2ac9272db714a</a>	gp3	15 GiB	3000	125		
<input type="checkbox"/>		<a href="#">vol-01d16c8221937f3ad</a>	gp3	8 GiB	3000	125		
<input checked="" type="checkbox"/>		<a href="#">vol-05c48e907618eabce</a>	gp3	20 GiB	3000	125		
<input type="checkbox"/>		<a href="#">vol-07086dfd5f4c6a712</a>	gp3	8 GiB	3000	125		
<input checked="" type="checkbox"/>		<a href="#">vol-0b7263dd64c2f27fd</a>	gp3	10 GiB	3000	125		

```
ubuntu@ip-172-31-33-36: ~ $ lsblk
NAME      MAJ:MIN RM  SIZE RO TYPE MOUNTPOINTS
loop0      7:0    0 27.6M  1 loop /snap/amazon-ssm-agent/11797
loop1      7:1    0 27.8M  1 loop /snap/amazon-ssm-agent/12322
loop2      7:2    0 74M   1 loop /snap/core22/2163
loop3      7:3    0 74M   1 loop /snap/core22/2292
loop4      7:4    0 50.9M  1 loop /snap/snapd/25577
loop5      7:5    0 48.1M  1 loop /snap/snapd/25935
nvme0n1   259:0  0   8G  0 disk
└─nvme0n1p1 259:1  0   7G  0 part /
└─nvme0n1p14 259:2  0   4M  0 part
└─nvme0n1p15 259:3  0 106M  0 part /boot/efi
└─nvme0n1p16 259:4  0 913M  0 part /boot
nvme1n1   259:5  0  10G  0 disk
nvme2n1   259:6  0  15G  0 disk
nvme3n1   259:7  0  20G  0 disk
```

New Attached Volumes  
10GB,15GB,20GB

## Mount EBS Volume:

**Step1: To mount an EBS volume, create a mount point directory**

`mkdir /mnt/EBS_volume_mount`

```
root@ip-172-31-33-36:/home/ubuntu# mkdir /mnt/EBS_volume_mount
root@ip-172-31-33-36:/home/ubuntu# ls /mnt/
EBS_volume_mount
root@ip-172-31-33-36:/home/ubuntu#
```

**step2: format EBS disk with ext4 file system**

`mkfs -t ext4 /dev/nvme3n1`

```
root@ip-172-31-33-36:~# mkfs -t ext4 /dev/nvme3n1
mke2fs 1.47.0 (5-Feb-2023)
Creating filesystem with 5242880 4k blocks and 1310720 inodes
Filesystem UUID: 6869616c-dc11-4248-8f1b-b021e7210046
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

root@ip-172-31-33-36:~#
```

**step3: mount an attached EBS volume to a specific directory in the Linux file system.**

`mount /dev/nvme3n1 /mnt/EBS_volume_mount`

```
root@ip-172-31-33-36:~# df -h
Filesystem      Size  Used Avail Use% Mounted on
/dev/root       6.8G  2.6G  4.2G  38% /
tmpfs          458M    0  458M   0% /dev/shm
tmpfs          183M  932K  182M   1% /run
tmpfs          5.0M    0  5.0M   0% /run/lock
efivarsfs      128K  3.8K  120K   4% /sys/firmware/efi/efivars
/dev/nvme0n1p16 881M   89M  730M  11% /boot
/dev/nvme0n1p15 105M   6.2M  99M   6% /boot/efi
tmpfs          92M   12K   92M   1% /run/user/1000
root@ip-172-31-33-36:~# mount /dev/nvme3n1 /mnt/EBS_volume_mount
root@ip-172-31-33-36:~# df -h
Filesystem      Size  Used Avail Use% Mounted on
/dev/root       6.8G  2.6G  4.2G  38% /
tmpfs          458M    0  458M   0% /dev/shm
tmpfs          183M  932K  182M   1% /run
tmpfs          5.0M    0  5.0M   0% /run/lock
efivarsfs      128K  3.8K  120K   4% /sys/firmware/efi/efivars
/dev/nvme0n1p16 881M   89M  730M  11% /boot
/dev/nvme0n1p15 105M   6.2M  99M   6% /boot/efi
tmpfs          92M   12K   92M   1% /run/user/1000
/dev/nvme3n1     20G   24K   19G   1% /mnt/EBS_volume_mount
root@ip-172-31-33-36:~# |
```

#### Step4: Verify using lsblk command

```
root@ip-172-31-33-36:~# lsblk
NAME      MAJ:MIN RM  SIZE RO TYPE MOUNTPOINTS
loop0      7:0    0 27.6M  1 loop /snap/amazon-ssm-agent/11797
loop1      7:1    0 27.8M  1 loop /snap/amazon-ssm-agent/12322
loop2      7:2    0   74M  1 loop /snap/core22/2292
loop3      7:3    0 48.1M  1 loop /snap/snapd/25935
loop4      7:4    0   74M  1 loop /snap/core22/2163
loop5      7:5    0 50.9M  1 loop /snap/snapd/25577
nvme0n1   259:0  0   8G  0 disk
└─nvme0n1p1 259:1  0   7G  0 part /
└─nvme0n1p14 259:2  0   4M  0 part
└─nvme0n1p15 259:3  0 106M  0 part /boot/efi
└─nvme0n1p16 259:4  0 913M  0 part /boot
nvme1n1   259:5  0   10G 0 disk
nvme2n1   259:6  0   15G 0 disk
nvme3n1   259:7  0   20G 0 disk /mnt/EBS_volume_mount
root@ip-172-31-33-36:~# |
```

Its shows disk name, size, type and mounted point

# Using LVM (Logical Volume Management) Create Physical volume, Volume Group, Logical Volume

## 1. create physical volume:

```
pvcreate /dev/nvme1n1 /dev/nvme2n1
```

```
root@ip-172-31-33-36:~# pvcreate /dev/nvme1n1 /dev/nvme2n1
Physical volume "/dev/nvme1n1" successfully created.
Physical volume "/dev/nvme2n1" successfully created.
root@ip-172-31-33-36:~# pvs
PV          VG Fmt Attr PSize  PFree
/dev/nvme1n1  lvm2 --- 10.00g 10.00g
/dev/nvme2n1  lvm2 --- 15.00g 15.00g
root@ip-172-31-33-36:~# |
```

## 2. list physical volume: pvs

## 3. Create a volume group:

```
vgcreate "<vg_name>" "<pv_name>" "<pv_name>"
```

```
root@ip-172-31-33-36:~# pvs
PV          VG Fmt Attr PSize  PFree
/dev/nvme1n1  lvm2 --- 10.00g 10.00g
/dev/nvme2n1  lvm2 --- 15.00g 15.00g
root@ip-172-31-33-36:~# vgcreate "lvm_practice" /dev/nvme1n1 /dev/nvme2n1
Volume group "lvm_practice" successfully created
root@ip-172-31-33-36:~# vgs
VG          #PV #LV #SN Attr   VSize  VFree
lvm_practice  2   0   0 wz--n- 24.99g 24.99g
root@ip-172-31-33-36:~# |
```

## 4. Create a logical volume from volume group:

```
lvcreate -L <size> -n <lv_name> <vg_name>
```

### a. Create 8GB logical volume from lvm\_practice volume group

```
root@ip-172-31-33-36:~# vgs
VG          #PV #LV #SN Attr   VSize  VFree
lvm_practice  2   0   0 wz--n- 24.99g 24.99g
root@ip-172-31-33-36:~# lvcreate -L 8G -n 8G_lv lvm_practice
Logical volume "8G_lv" created.
root@ip-172-31-33-36:~# lvs
LV    VG          Attr      LSize Pool Origin Data%  Meta%  Move Log Cpy%Sync Convert
 8G_lv lvm_practice -wi-a----- 8.00g
root@ip-172-31-33-36:~# |
```

b. Create 3.5GB logical volume from lvm\_practice volume group

```
root@ip-172-31-33-36:~# lvs
  LV      VG          Attr      LSize Pool Origin Data%  Meta%  Move Log Cpy%Sync Convert
  7GB_lv  lvm_practice -wi-a---- 7.00g
  8G_lv   lvm_practice -wi-a---- 8.00g
root@ip-172-31-33-36:~# lvcreate -L 3500M -n 3.5Gb_lv lvm_practice
Logical volume "3.5Gb_lv" created.
root@ip-172-31-33-36:~# lvs
  LV      VG          Attr      LSize Pool Origin Data%  Meta%  Move Log Cpy%Sync Convert
  3.5Gb_lv lvm_practice -wi-a---- <3.42g
  7GB_lv   lvm_practice -wi-a---- 7.00g
  8G_lv    lvm_practice -wi-a---- 8.00g
root@ip-172-31-33-36:~#
```

## Mounting Logical Volumes

### 1. Mount logical volume 8G\_lv to mount point /mnt/8G\_lv\_mount

- Create directory in mnt for mounting logical volume /mnt/8G\_lv\_mount

```
mkdir /mnt/8G_lv_mount
```

```
root@ip-172-31-33-36:~# mkdir /mnt/8G_lv_mount
root@ip-172-31-33-36:~# ls /mnt/
8G_lv_mount  EBS_volume_mount
root@ip-172-31-33-36:~#
```

- Formatting logical volume to file system:

```
mkfs.ext4 /dev/<vg_name>/<lv_name>
```

```
root@ip-172-31-33-36:~# mkfs.ext4 /dev/lvm_practice/8G_lv
mke2fs 1.47.0 (5-Feb-2023)
Creating filesystem with 2097152 4k blocks and 524288 inodes
Filesystem UUID: 41aaa302-e458-446f-ae0d-accfcf3fe589
Superblock backups stored on blocks:
      32768, 98304, 163840, 229376, 294912, 819200, 884736, 1605632

Allocating group tables: done
Writing inode tables: done
Creating journal (16384 blocks): done
Writing superblocks and filesystem accounting information: done

root@ip-172-31-33-36:~# |
```

- Verify filesystem:

```
lsblk -f
```

```
nvme0n1      LVM2_member  LVM2  00          c990Aj-LjrP-BY9n-S0MN-qx8v-S3Rz-K1cqqs
└─lvm_practice-8G_lv      ext4      1.0          41aaa302-e458-446f-ae0d-accfcf3fe589
```

- Mount logical volume to mount point:

```
mount /dev/<vg_name>/<lv_name> /mnt/<directory_name>
```

```
root@ip-172-31-33-36:~# mount /dev/lvm_practice/8G_lv /mnt/8G_lv_mount
root@ip-172-31-33-36:~# df -h
df: command not found
root@ip-172-31-33-36:~# df -h
Filesystem      Size  Used Avail Use% Mounted on
/dev/root       6.8G  2.6G  4.2G  38% /
tmpfs           458M    0  458M   0% /dev/shm
tmpfs           183M  932K 182M   1% /run
tmpfs            5.0M    0  5.0M   0% /run/lock
efivarfs        128K   3.8K 120K   4% /sys/firmware/efi/efivars
/dev/nvme0n1p16  881M   89M 730M  11% /boot
/dev/nvme0n1p15  105M   6.2M  99M   6% /boot/efi
tmpfs            92M   12K  92M   1% /run/user/1000
/dev/mapper/lvm_practice-8G_lv  7.8G   24K  7.4G  1% /mnt/8G_lv_mount
```

**Extend Logical Volume:** storage becomes full, increase size without downtime

```
root@ip-172-31-33-36:~# lvs
  LV      VG      Attr      LSize  Pool Origin Data%  Meta%  Move Log Cpy%Sync Convert
  3.5Gb_lv  lvm_practice -wi-a---- <3.42g
  7GB_lv   lvm_practice -wi-a----  7.00g
  8G_lv    lvm_practice -wi-ao----  8.00g
root@ip-172-31-33-36:~# vgs
  VG      #PV #LV #SN Attr  VSize  VFree
  lvm_practice  2   3   0 wz--n- 24.99g 6.57g
root@ip-172-31-33-36:~#
```

## 1. Extend Logical volume size:

```
lvextend -L +<additional size> /dev/<vg_name>/<lv_name>
```

```
root@ip-172-31-33-36:~# lvextend -L +2G /dev/lvm_practice/8G_lv
  Size of logical volume lvm_practice/8G_lv changed from 8.00 GiB (2048 extents) to 10.00 GiB (2560 extents).
  Logical volume lvm_practice/8G_lv successfully resized.
root@ip-172-31-33-36:~# lvs
  LV      VG      Attr      LSize  Pool Origin Data%  Meta%  Move Log Cpy%Sync Convert
  3.5Gb_lv  lvm_practice -wi-a---- <3.42g
  7GB_lv   lvm_practice -wi-a----  7.00g
  8G_lv    lvm_practice -wi-ao---- 10.00g
root@ip-172-31-33-36:~# vgs
  VG      #PV #LV #SN Attr  VSize  VFree
  lvm_practice  2   3   0 wz--n- 24.99g 4.57g
root@ip-172-31-33-36:~# |
```

## 2. Resize filesystem:

```
resize2fs /dev/<vg_name>/<lv_name>
```

```
root@ip-172-31-33-36:~# df -h
Filesystem      Size  Used Avail Use% Mounted on
/dev/root       6.8G  2.6G  4.2G  38% /
tmpfs           458M   0  458M  0% /dev/shm
tmpfs           183M  932K  182M  1% /run
tmpfs           5.0M   0  5.0M  0% /run/lock
efivarfs        128K  3.8K  120K  4% /sys/firmware/efi/efivars
/dev/nvme0n1p16  881M  89M  730M 11% /boot
/dev/nvme0n1p15  105M  6.2M  99M  6% /boot/efi
tmpfs            92M  12K  92M  1% /run/user/1000
/dev/mapper/lvm_practice-8G_lv  7.8G  24K  7.4G  1% /mnt/8G_lv_mount
root@ip-172-31-33-36:~# resize2fs /dev/lvm_practice/8G_lv
resize2fs 1.47.0 (5-Feb-2023)
Filesystem at /dev/lvm_practice/8G_lv is mounted on /mnt/8G_lv_mount; on-line resizing required
old_desc_blocks = 1, new_desc_blocks = 2
The filesystem on /dev/lvm_practice/8G_lv is now 2621440 (4k) blocks long.

root@ip-172-31-33-36:~# df -h
Filesystem      Size  Used Avail Use% Mounted on
/dev/root       6.8G  2.6G  4.2G  38% /
tmpfs           458M   0  458M  0% /dev/shm
tmpfs           183M  932K  182M  1% /run
tmpfs           5.0M   0  5.0M  0% /run/lock
efivarfs        128K  3.8K  120K  4% /sys/firmware/efi/efivars
/dev/nvme0n1p16  881M  89M  730M 11% /boot
/dev/nvme0n1p15  105M  6.2M  99M  6% /boot/efi
tmpfs            92M  12K  92M  1% /run/user/1000
/dev/mapper/lvm_practice-8G_lv  9.8G  24K  9.3G  1% /mnt/8G_lv_mount
root@ip-172-31-33-36:~# |
```

Reduce size of logical volume:

**1. Unmount a volume:**

```
umount /mnt/<lv_mount_directory_name>
```

```
root@ip-172-31-33-36:~# df -h
Filesystem           Size   Used  Avail Use% Mounted on
/dev/root            6.8G  2.6G  4.2G  38% /
tmpfs                458M    0  458M  0% /dev/shm
tmpfs                183M  932K  182M  1% /run
tmpfs                5.0M    0  5.0M  0% /run/lock
efivarfs             128K   3.8K  120K  4% /sys/firmware/efi/efivars
/dev/nvme0n1p16      881M   89M  730M  11% /boot
/dev/nvme0n1p15      105M   6.2M  99M  6% /boot/efi
tmpfs                92M   12K  92M  1% /run/user/1000
/dev/mapper/lvm_practice-8G_lv  9.8G   24K  9.3G  1% /mnt/8G_lv_mount
root@ip-172-31-33-36:~# umount /mnt/8G_lv_mount/
root@ip-172-31-33-36:~# df -h
Filesystem           Size   Used  Avail Use% Mounted on
/dev/root            6.8G  2.6G  4.2G  38% /
tmpfs                458M    0  458M  0% /dev/shm
tmpfs                183M  932K  182M  1% /run
tmpfs                5.0M    0  5.0M  0% /run/lock
efivarfs             128K   3.8K  120K  4% /sys/firmware/efi/efivars
/dev/nvme0n1p16      881M   89M  730M  11% /boot
/dev/nvme0n1p15      105M   6.2M  99M  6% /boot/efi
tmpfs                92M   12K  92M  1% /run/user/1000
root@ip-172-31-33-36:~# |
```

**2. Check filesystem:**

```
e2fsck -f /dev/lvm_practice/8G_lv
```

```
root@ip-172-31-33-36:~# e2fsck -f /dev/lvm_practice/8G_lv
e2fsck 1.47.0 (5-Feb-2023)
Pass 1: Checking inodes, blocks, and sizes
Pass 2: Checking directory structure
Pass 3: Checking directory connectivity
Pass 4: Checking reference counts
Pass 5: Checking group summary information
/dev/lvm_practice/8G_lv: 11/655360 files (0.0% non-contiguous), 66735/2621440 blocks
root@ip-172-31-33-36:~# |
```

**3. Resize file system:**

```
resize2fs /dev/lvm_practice/8G_lv 6G
```

```
root@ip-172-31-33-36:~# resize2fs /dev/lvm_practice/8G_lv 6G
resize2fs 1.47.0 (5-Feb-2023)
Resizing the filesystem on /dev/lvm_practice/8G_lv to 1572864 (4k) blocks.
The filesystem on /dev/lvm_practice/8G_lv is now 1572864 (4k) blocks long.
```

```
root@ip-172-31-33-36:~# |
```

#### 4. Reduce Logical Volume size:

```
lvreduce -L 6G /dev/lvm_practice/8G_lv
```

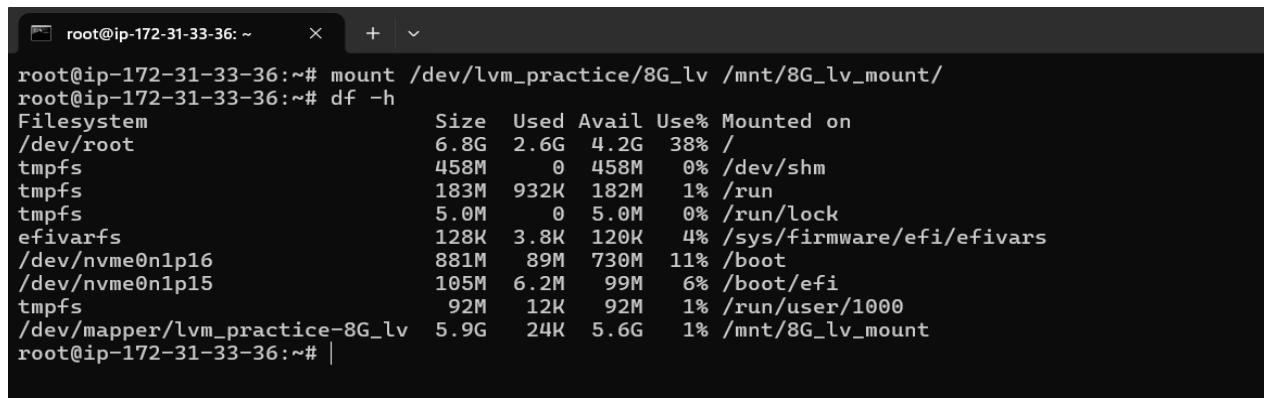
```
root@ip-172-31-33-36:~# lsblk
NAME      MAJ:MIN RM  SIZE RO TYPE MOUNTPOINTS
loop0      7:0    0 27.6M  1 loop /snap/amazon-ssm-agent/11797
loop1      7:1    0 27.8M  1 loop /snap/amazon-ssm-agent/12322
loop2      7:2    0   74M  1 loop /snap/core22/2163
loop3      7:3    0 50.9M  1 loop /snap/snapd/25577
loop4      7:4    0   74M  1 loop /snap/core22/2292
loop5      7:5    0 48.1M  1 loop /snap/snapd/25935
nvme0n1    259:0  0   8G  0 disk
└─nvme0n1p1 259:1  0   7G  0 part /
  └─nvme0n1p14 259:2  0   4M  0 part
  └─nvme0n1p15 259:3  0 106M  0 part /boot/efi
  └─nvme0n1p16 259:4  0 913M  0 part /boot
nvme1n1    259:5  0   10G 0 disk
└─lvm_practice-8G_lv 252:0  0   10G 0 lvm
nvme2n1    259:6  0   15G 0 disk
└─lvm_practice-8G_lv 252:0  0   10G 0 lvm
└─lvm_practice-7GB_lv 252:1  0   7G  0 lvm
└─lvm_practice-3.5Gb_lv 252:2  0   3.4G 0 lvm
root@ip-172-31-33-36:~#
```

```
root@ip-172-31-33-36:~# lvreduce -L 6G /dev/lvm_practice/8G_lv
WARNING: Reducing active logical volume to 6.00 GiB.
THIS MAY DESTROY YOUR DATA (filesystem etc.)
Do you really want to reduce lvm_practice/8G_lv? [y/n]: y
Size of logical volume lvm_practice/8G_lv changed from 10.00 GiB (2560 extents) to 6.00 GiB (1536 extents).
Logical volume lvm_practice/8G_lv successfully resized.
root@ip-172-31-33-36:~#
```

```
root@ip-172-31-33-36:~# lsblk
NAME      MAJ:MIN RM  SIZE RO TYPE MOUNTPOINTS
loop0      7:0    0 27.6M  1 loop /snap/amazon-ssm-agent/11797
loop1      7:1    0 27.8M  1 loop /snap/amazon-ssm-agent/12322
loop2      7:2    0   74M  1 loop /snap/core22/2163
loop3      7:3    0 50.9M  1 loop /snap/snapd/25577
loop4      7:4    0   74M  1 loop /snap/core22/2292
loop5      7:5    0 48.1M  1 loop /snap/snapd/25935
nvme0n1    259:0  0   8G  0 disk
└─nvme0n1p1 259:1  0   7G  0 part /
  └─nvme0n1p14 259:2  0   4M  0 part
  └─nvme0n1p15 259:3  0 106M  0 part /boot/efi
  └─nvme0n1p16 259:4  0 913M  0 part /boot
nvme1n1    259:5  0   10G 0 disk
└─lvm_practice-8G_lv 252:0  0   6G  0 lvm
nvme2n1    259:6  0   15G 0 disk
└─lvm_practice-7GB_lv 252:1  0   7G  0 lvm
└─lvm_practice-3.5Gb_lv 252:2  0   3.4G 0 lvm
root@ip-172-31-33-36:~# |
```

## 5. Mount again:

```
mount /dev/<vg_name>/<lv_name> /mnt/<directory_name>
```



A terminal window titled "root@ip-172-31-33-36: ~" showing the output of LVM commands and the file system status.

```
root@ip-172-31-33-36:~# mount /dev/lvm_practice/8G_lv /mnt/8G_lv_mount/
root@ip-172-31-33-36:~# df -h
Filesystem      Size   Used  Avail Use% Mounted on
/dev/root       6.8G  2.6G  4.2G  38% /
tmpfs          458M    0  458M   0% /dev/shm
tmpfs          183M  932K  182M   1% /run
tmpfs          5.0M    0  5.0M   0% /run/lock
efivarfs        128K  3.8K  120K   4% /sys/firmware/efi/efivars
/dev/nvme0n1p16 881M   89M  730M  11% /boot
/dev/nvme0n1p15 105M   6.2M  99M   6% /boot/efi
tmpfs           92M   12K  92M   1% /run/user/1000
/dev/mapper/lvm_practice-8G_lv  5.9G  24K  5.6G   1% /mnt/8G_lv_mount
root@ip-172-31-33-36:~# |
```

## Add New Disk to Volume Group

### 1. Attach new EBS volume to ec2 instance:

created 13 GB volume and attach to ec2 instance.

```
root@ip-172-31-33-36:~# lsblk
NAME      MAJ:MIN RM  SIZE RO TYPE MOUNTPOINTS
loop0      7:0    0 27.6M  1 loop /snap/amazon-ssm-agent/11797
loop1      7:1    0 27.8M  1 loop /snap/amazon-ssm-agent/12322
loop2      7:2    0   74M  1 loop /snap/core22/2163
loop3      7:3    0 50.9M  1 loop /snap/snaps/25577
loop4      7:4    0   74M  1 loop /snap/core22/2292
loop5      7:5    0 48.1M  1 loop /snap/snaps/25935
nvme0n1    259:0  0   8G  0 disk
└─nvme0n1p1 259:1  0   7G  0 part /
  └─nvme0n1p14 259:2  0   4M  0 part
  └─nvme0n1p15 259:3  0 106M  0 part /boot/efi
  └─nvme0n1p16 259:4  0 913M  0 part /boot
nvme1n1    259:5  0   10G 0 disk
└─lvm_practice-8G_lv 252:0  0   6G 0 lvm  /mnt/8G_lv_mount
nvme2n1    259:6  0   15G 0 disk
└─lvm_practice-7GB_lv 252:1  0   7G 0 lvm
└─lvm_practice-3.5Gb_lv 252:2  0  3.4G 0 lvm
nvme3n1    259:7  0   13G 0 disk
root@ip-172-31-33-36:~#
```

### 2. Create physical volume:

```
pvccreate /dev/nvme3n1
```

```
root@ip-172-31-33-36:~# pvccreate /dev/nvme3n1
Physical volume "/dev/nvme3n1" successfully created.
root@ip-172-31-33-36:~# pvs
PV          VG          Fmt Attr PSize  PFree
/dev/nvme1n1 lvm_practice lvm2 a-- <10.00g <4.00g
/dev/nvme2n1 lvm_practice lvm2 a-- <15.00g <4.58g
/dev/nvme3n1           lvm2 ---  13.00g 13.00g
root@ip-172-31-33-36:~# |
```

### 3. Add new physical volume in volume group:

```
vgextend <vg_name> </dev/nvme3n1>
```

```
root@ip-172-31-33-36:~# vgs
  VG          #PV #LV #SN Attr  VSize  VFree
  lvm_practice  2   3   0 wz--n- 24.99g 8.57g
root@ip-172-31-33-36:~# vgextend lvm_practice /dev/nvme3n1
  Volume group "lvm_practice" successfully extended
root@ip-172-31-33-36:~# vgs
  VG          #PV #LV #SN Attr  VSize  VFree
  lvm_practice  3   3   0 wz--n- <37.99g 21.57g
root@ip-172-31-33-36:~# |
```

#### 4. Verify volume group:

`vgdisplay`

```
root@ip-172-31-33-36:~# vgdisplay
--- Volume group ---
VG Name          lvm_practice
System ID
Format          lvm2
Metadata Areas   3
Metadata Sequence No 7
VG Access        read/write
VG Status        resizable
MAX LV           0
Cur LV           3
Open LV          1
Max PV           0
Cur PV           3
Act PV           3
VG Size          <37.99 GiB
PE Size          4.00 MiB
Total PE         9725
Alloc PE / Size  4203 / <16.42 GiB
Free  PE / Size  5522 / 21.57 GiB
VG UUID          EZL8GI-bm58-oASv-8RFn-veKo-I3cZ-vHt6Cu
```

Display detail information about physical volume, volume group, logical volume

1. Display physical volume information:

`pvdisplay`

```
root@ip-172-31-33-36:~# pvdisplay
--- Physical volume ---
PV Name              /dev/nvme1n1
VG Name              lvm_practice
PV Size              10.00 GiB / not usable 4.00 MiB
Allocatable          yes
PE Size              4.00 MiB
Total PE             2559
Free PE              1023
Allocated PE         1536
PV UUID              c990Aj-LjrP-BY9n-S0MN-qx8v-S3Rz-K1cqqs

--- Physical volume ---
PV Name              /dev/nvme2n1
VG Name              lvm_practice
PV Size              15.00 GiB / not usable 4.00 MiB
Allocatable          yes
PE Size              4.00 MiB
Total PE             3839
Free PE              1172
Allocated PE         2667
PV UUID              5huCK5-CR1M-8901-Dc0G-oEyc-Vhjj-Z7qk21

--- Physical volume ---
PV Name              /dev/nvme3n1
VG Name              lvm_practice
PV Size              13.00 GiB / not usable 4.00 MiB
Allocatable          yes
PE Size              4.00 MiB
Total PE             3327
Free PE              3327
Allocated PE         0
PV UUID              cdmTPI-Puwc-Z3VL-YpC2-k0U1-rBco-EZNJ3A

root@ip-172-31-33-36:~# |
```

2. Display information about volume group:

`vgdisplay`

```
root@ip-172-31-33-36:~# vgdisplay
--- Volume group ---
VG Name          lvm_practice
System ID
Format           lvm2
Metadata Areas   3
Metadata Sequence No 7
VG Access        read/write
VG Status        resizable
MAX LV
Cur LV
Open LV
Max PV
Cur PV
Act PV
VG Size         <37.99 GiB
PE Size          4.00 MiB
Total PE         9725
Alloc PE / Size 4203 / <16.42 GiB
Free  PE / Size 5522 / 21.57 GiB
VG UUID          EZL8GI-bm58-oASv-8RFn-veKo-I3cZ-vHt6Cu

root@ip-172-31-33-36:~#
```

### 3. Display information about logical volumes:

`lvdisplay`

```
root@ip-172-31-33-36:~# lvdisplay
--- Logical volume ---
LV Path          /dev/lvm_practice/8G_lv
LV Name          8G_lv
VG Name          lvm_practice
LV UUID          QMwCLT-TQGw-pyyk-CJSN-JD9t-s7t2-1o38du
LV Write Access  read/write
LV Creation host, time ip-172-31-33-36, 2026-02-18 10:32:06 +0000
LV Status        available
# open           1
LV Size          6.00 GiB
Current LE       1536
Segments         1
Allocation       inherit
Read ahead sectors auto
- currently set to 256
Block device    252:0

--- Logical volume ---
LV Path          /dev/lvm_practice/7GB_lv
LV Name          7GB_lv
VG Name          lvm_practice
LV UUID          hzVXwf-Vutt-UZxB-peGN-zbsk-Yreo-4RBEM1
LV Write Access  read/write
LV Creation host, time ip-172-31-33-36, 2026-02-18 10:37:00 +0000
LV Status        available
# open           0
LV Size          7.00 GiB
Current LE       1792
Segments         1
Allocation       inherit
Read ahead sectors auto
- currently set to 256
Block device    252:1

--- Logical volume ---
LV Path          /dev/lvm_practice/3.5Gb_lv
LV Name          3.5Gb_lv
VG Name          lvm_practice
LV UUID          Vkd9h6-x9Gf-RyeT-HSIh-4zhm-56H0-QgE8ma
LV Write Access  read/write
LV Creation host, time ip-172-31-33-36, 2026-02-18 11:00:18 +0000
LV Status        available
# open           0
LV Size          <3.42 GiB
Current LE       875
Segments         1
Allocation       inherit
Read ahead sectors auto
- currently set to 256
Block device    252:2

root@ip-172-31-33-36:~# |
```

**Rename logical volume:** change logical volume name.

*lvrename <vg\_name> <lv\_name> <new\_name>*

```
root@ip-172-31-33-36:~# lvs
  LV      VG          Attr      LSize  Pool Origin Data%  Meta%  Move Log Cpy%Sync Convert
  3.5Gb_lv  lvm_practice -wi-a---- <3.42g
  7GB_lv    lvm_practice -wi-a----  7.00g
  8G_lv     lvm_practice -wi-ao----  6.00g
root@ip-172-31-33-36:~# lvrename lvm_practice 7GB_lv new_7gb
Renamed "7GB_lv" to "new_7gb" in volume group "lvm_practice"
root@ip-172-31-33-36:~# lvs
  LV      VG          Attr      LSize  Pool Origin Data%  Meta%  Move Log Cpy%Sync Convert
  3.5Gb_lv  lvm_practice -wi-a---- <3.42g
  8G_lv     lvm_practice -wi-ao----  6.00g
  new_7gb   lvm_practice -wi-a----  7.00g
root@ip-172-31-33-36:~# |
```

**Remove logical volume:** Delete logical volume permanently.

### 1. Step 1: Unmount logical volume.

```
root@ip-172-31-33-36:~# df -h
Filesystem           Size  Used Avail Use% Mounted on
/dev/root            6.8G  2.6G  4.2G  38% /
tmpfs                458M    0  458M   0% /dev/shm
tmpfs                183M  944K 182M   1% /run
tmpfs                5.0M    0  5.0M   0% /run/lock
efivarfs             128K  3.8K 120K   4% /sys/firmware/efi/efivars
/dev/nvme0n1p16      881M  89M  730M  11% /boot
/dev/nvme0n1p15      105M  6.2M  99M   6% /boot/efi
/dev/mapper/lvm_practice-8G_lv  5.9G  24K  5.6G  1% /mnt/8G_lv_mount
tmpfs                92M   12K  92M   1% /run/user/1000
root@ip-172-31-33-36:~# umount /mnt/8G_lv_mount/
```

```
root@ip-172-31-33-36:~# df -h
Filesystem           Size  Used Avail Use% Mounted on
/dev/root            6.8G  2.6G  4.2G  38% /
tmpfs                458M    0  458M   0% /dev/shm
tmpfs                183M  944K 182M   1% /run
tmpfs                5.0M    0  5.0M   0% /run/lock
efivarfs             128K  3.8K 120K   4% /sys/firmware/efi/efivars
/dev/nvme0n1p16      881M  89M  730M  11% /boot
/dev/nvme0n1p15      105M  6.2M  99M   6% /boot/efi
tmpfs                92M   12K  92M   1% /run/user/1000
root@ip-172-31-33-36:~# |
```

### 2. Step 2 : Remove logical volume

```
lvremove /dev/<vg_name>/<lv_name>
```

```
root@ip-172-31-33-36:~# lvs
  LV      VG     Attr       LSize  Pool Origin Data%  Meta%  Move Log Cpy%Sync Convert
  3.5Gb_lv  lvm_practice -wi-a---- <3.42g
  8G_lv    lvm_practice -wi-a----  6.00g
  new_7gb   lvm_practice -wi-a----  7.00g
root@ip-172-31-33-36:~# lvremove /dev/lvm_practice/8G_lv
Do you really want to remove and DISCARD active logical volume lvm_practice/8G_lv? [y/n]: y
  Logical volume "8G_lv" successfully removed.
root@ip-172-31-33-36:~# lvs
  LV      VG     Attr       LSize  Pool Origin Data%  Meta%  Move Log Cpy%Sync Convert
  3.5Gb_lv  lvm_practice -wi-a---- <3.42g
  new_7gb   lvm_practice -wi-a----  7.00g
root@ip-172-31-33-36:~# |
```