

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) [Info](#)

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1 minute ago 

Saved filter sets

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	Name 	Volume ID	Type	Size	IOPS	Throughput
<input checked="" type="checkbox"/>		vol-0ccc2ac9272db714a	gp3	15 GiB	3000	125
<input type="checkbox"/>		vol-01d16c8221937f3ad	gp3	8 GiB	3000	125
<input checked="" type="checkbox"/>		vol-05c48e907618eabce	gp3	20 GiB	3000	125
<input type="checkbox"/>		vol-07086dfd5f4c6a712	gp3	8 GiB	3000	125
<input checked="" type="checkbox"/>		vol-0b7263dd64c2f27fd	gp3	10 GiB	3000	125

```
ubuntu@ip-172-31-33-36: ~  
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  
ubuntu@ip-172-31-33-36:~$
```

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  X + v
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: ~  X + v
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: ~  X + v
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:~# 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
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/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: ~  
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:

```
pvccreate /dev/nvme1n1 /dev/nvme2n1
```

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

- a. 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:~#
```

- b. 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:~# |
```

- c. Verify filesystem:

```
lsblk -f
```

nvme1n1	LVM2_membe	LVM2 00	c990Aj-LjrP-BY9n-S0MN-qx8v-S3Rz-K1cqqs
└─lvm_practice-8G_lv			
	ext4	1.0	41aaa302-e458-446f-ae0d-accfcf3fe589

- d. 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-h: 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: ~ X + v
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: ~  
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: ~  
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: ~  
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>`

```
root@ip-172-31-33-36: ~  
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/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  /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-DcOG-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                 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

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-TOGw-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: ~  
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:~# |
```