Managing Volumes and Logical Groups in Linux using LVM

This guide covers how to add, delete, resize volumes, and create logical groups using LVM (Logical Volume Manager) in Linux. LVM allows for flexible disk management, making it easier to manage disk space in dynamic environments.

1. Creating a Physical Volume (PV)

First, identify the disk you want to use (e.g., /dev/sdb). Initialize the disk as a physical volume using the following command:

sudo pvcreate /dev/sdb

2. Creating a Volume Group (VG)

After creating the physical volume, create a volume group (VG). This example creates a volume group named 'vg_data' and adds the physical volume to it. If desired, multiple physical volumes can be added to a single volume group.

sudo vgcreate vg_data /dev/sdb

3. Creating a Logical Volume (LV)

Now, create a logical volume within the volume group. This example creates a 10GB volume named 'lv_data' in 'vg_data':

sudo lvcreate -L 10G -n lv_data vg_data

To verify the logical volume creation, use the command below:

sudo lvdisplay

4. Formatting and Mounting the Logical Volume

After creating the logical volume, format it with a filesystem (e.g., ext4):

sudo mkfs.ext4 /dev/vg_data/lv_data

Then, create a directory to mount the volume and mount it as shown below:

sudo mkdir /mnt/data
sudo mount /dev/vg_data/lv_data /mnt/data

5. Resizing a Logical Volume

To extend or reduce a logical volume, use the following steps:

- To extend the logical volume by an additional 5GB:

```
sudo lvextend -L +5G /dev/vg_data/lv_data
sudo resize2fs /dev/vg_data/lv_data
```

- To reduce the logical volume (proceed carefully to avoid data loss):

1. Unmount the volume:
```
sudo umount /mnt/data
```

2. Resize the filesystem:
```
sudo resize2fs /dev/vg_data/lv_data 8G
```

3. Shrink the logical volume:
```
sudo lvreduce -L 8G /dev/vg_data/lv_data
```

4. Re-mount the volume:
```
sudo mount /dev/vg_data/lv_data /mnt/data
```

6. Deleting a Logical Volume and Volume Group

To delete a logical volume, volume group, and physical volume, use the following commands:

To delete the logical volume:
```
sudo lvremove /dev/vg_data/lv_data
```

To delete the volume group:
```
sudo vgremove vg_data
```

To delete the physical volume:
```
sudo pvremove /dev/sdb
```