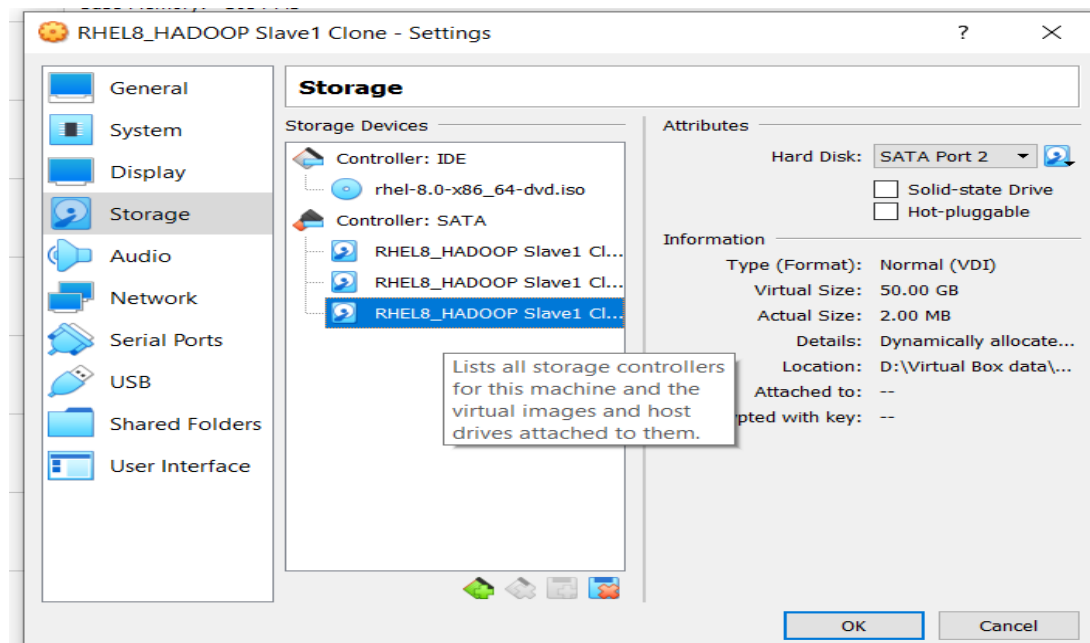
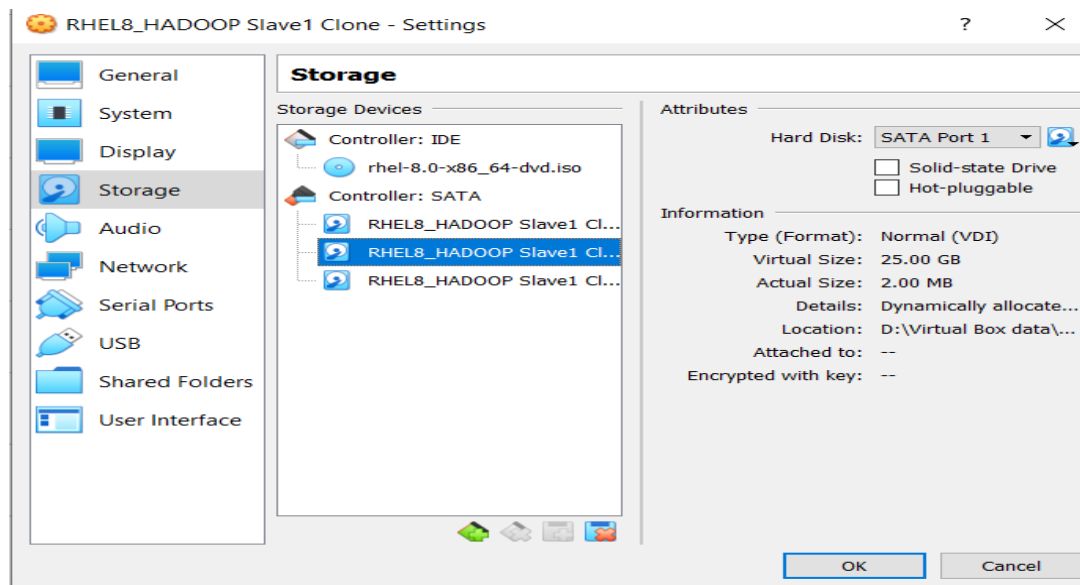


7.1: Elasticity Task

- ⚙️ Integrating LVM with Hadoop and providing Elasticity to DataNode Storage
- ⚙️ Increase or Decrease the Size of Static Partition in Linux.
- ⚙️ Automating LVM Partition using Python-Script.

Solution:

I have created 2 hard disks. Of 25Gib and 50Gib



Check the hard disks using

`fdisk -l`

```
root@localhost:~  
File Edit View Search Terminal Help  
[root@localhost ~]# fdisk -l  
Disk /dev/sda: 100 GiB, 107374182400 bytes, 209715200 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  
Disklabel type: dos  
Disk identifier: 0x3ead4acd  
  
Device      Boot    Start        End    Sectors  Size Id Type  
/dev/sda1   *        2048      2099199    2097152   1G 83 Linux  
/dev/sda2                2099200  209715199  207616000  99G 8e Linux LVM  
  
Disk /dev/sdb: 25 GiB, 26843545600 bytes, 52428800 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 /dev/sdc: 50 GiB, 53687091200 bytes, 104857600 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  
  
Enterprise Linux
```

Step 2: Create the Physical Volume for both the hard disks using

```
pvcreeate /dev/sdc
```

```
pvcreeate /dev/sdb
```

To check the physical volume is created or not using

```
pvdissplay /dev/sdb
```

```
pvdissplay /dev/sdc
```

```
File Edit View Search Terminal Help  
[root@localhost ~]# pvcreeate /dev/sdc  
Physical volume "/dev/sdc" successfully created.  
[root@localhost ~]# pvdissplay /dev/sdc  
"/dev/sdc" is a new physical volume of "50.00 GiB"  
--- NEW Physical volume ---  
PV Name          /dev/sdc  
VG Name  
PV Size          50.00 GiB  
Allocatable      NO  
PE Size          0  
Total PE         0  
Free PE          0  
Allocated PE     0  
PV UUID          1T97Zc-mkwF-qZp3-CHiB-xWS1-C0ia-0kccpJ
```

```
Activation of network connection failed

File Edit View Search Terminal Help
[root@localhost ~]# pvcreate /dev/sdb
Physical volume "/dev/sdb" successfully created.
[root@localhost ~]# pvdisplay /dev/sdb
"/dev/sdb" is a new physical volume of "25.00 GiB"
--- NEW Physical volume ---
PV Name                /dev/sdb
VG Name
PV Size                25.00 GiB
Allocatable            NO
PE Size                0
Total PE               0
Free PE                0
Allocated PE           0
PV UUID                x0GIHn-R1oq-3suu-hc3p-geqH-uVZi-AQbR20
```

Step3: Create the volume group (vg) using

`vgcreate <vg_name> <HD1_name> <HD2_name>`

`vgcreate lvmhadoop /dev/sdb /dev/sdc`

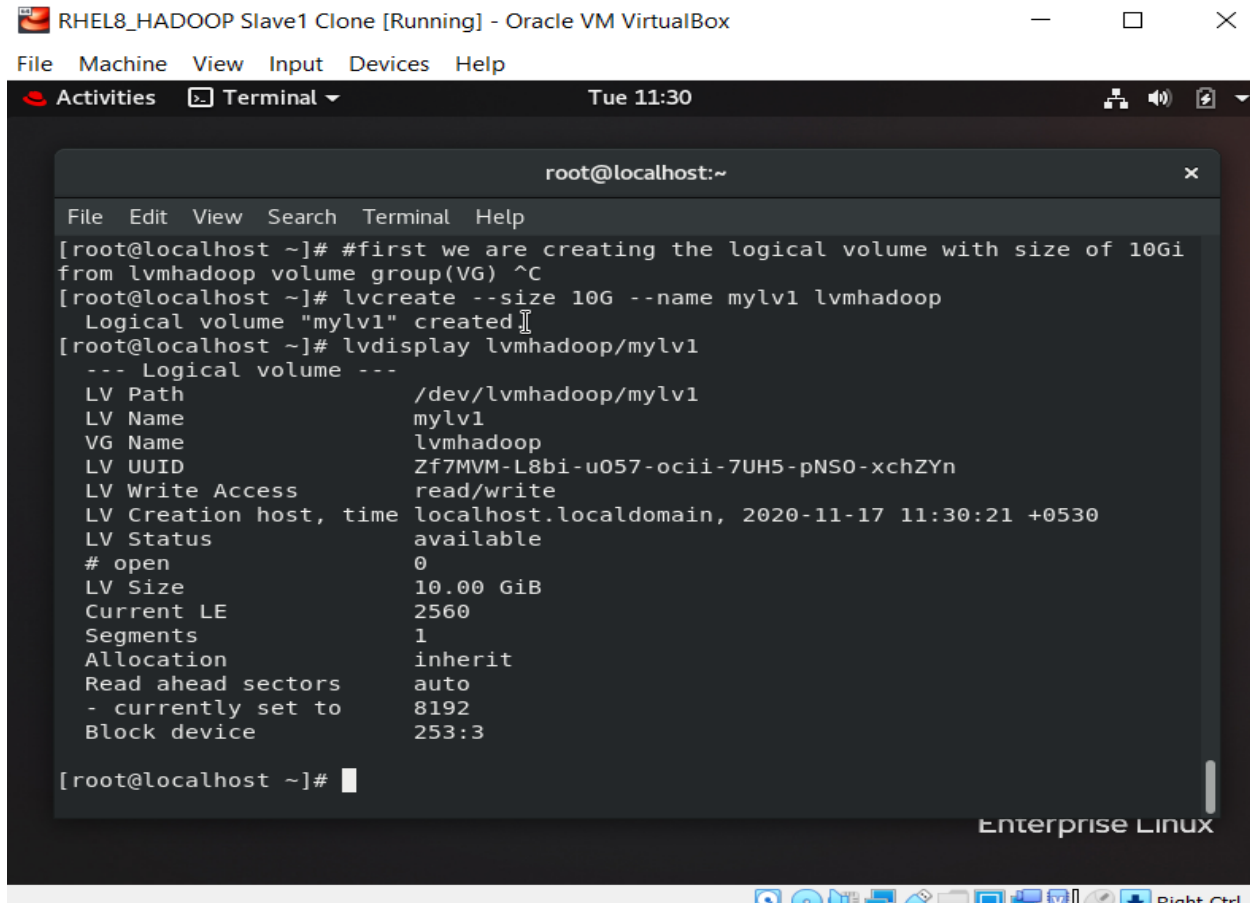
```
[root@localhost ~]# vgdisplay lvmhadoop
Volume group "lvmhadoop" not found
Cannot process volume group lvmhadoop
[root@localhost ~]# vgcreate lvmhadoop /dev/sdb /dev/sdc
Volume group "lvmhadoop" successfully created
```

```
File Edit View Search Terminal Help
[root@localhost ~]# vgdisplay lvmhadoop
--- Volume group ---
VG Name                lvmhadoop
System ID
Format                 lvm2
Metadata Areas         2
Metadata Sequence No   1
VG Access               read/write
VG Status               resizable
MAX LV                 0
Cur LV                 0
Open LV                 0
Max PV                 0
Cur PV                 2
Act PV                 2
VG Size                 74.99 GiB
PE Size                 4.00 MiB
Total PE                19198
Alloc PE / Size         0 / 0
Free PE / Size          19198 / 74.99 GiB
VG UUID                CUMMa5-W5gI-JP2I-oTeV-ezmf-l3Wf-QpF6Qw
```

Step4: Create the logical volume with size of 10Gi from lvmhadoop volume group(vg) using

```
lvcreate --size 10G --name <LV_name> <VG_name>
```

```
lvcreate --size 10G --name mylv1 lvmhadoop
```



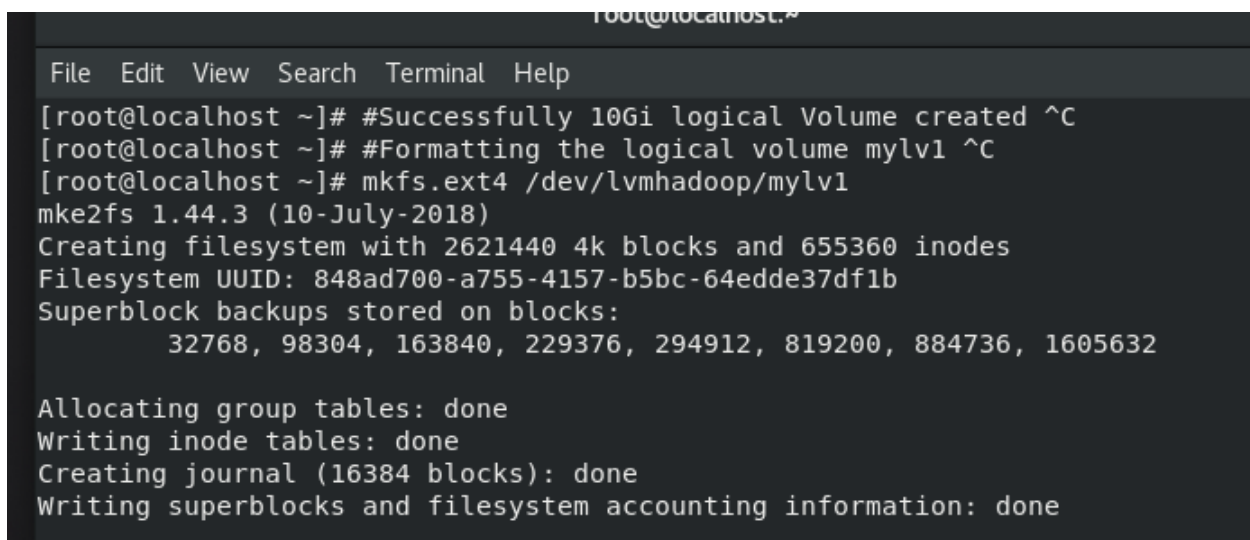
The screenshot shows a terminal window titled "root@localhost:~" with a menu bar (File, Edit, View, Search, Terminal, Help). The terminal output shows the following commands and results:

```
[root@localhost ~]# #first we are creating the logical volume with size of 10Gi
from lvmhadoop volume group(VG) ^C
[root@localhost ~]# lvcreate --size 10G --name mylv1 lvmhadoop
Logical volume "mylv1" created
[root@localhost ~]# lvdisplay lvmhadoop/mylv1
--- Logical volume ---
LV Path                /dev/lvmhadoop/mylv1
LV Name                 mylv1
VG Name                 lvmhadoop
LV UUID                 Zf7MVM-L8bi-u057-ocii-7UH5-pNS0-xchZYn
LV Write Access         read/write
LV Creation host, time  localhost.localdomain, 2020-11-17 11:30:21 +0530
LV Status                available
# open                  0
LV Size                 10.00 GiB
Current LE               2560
Segments                1
Allocation              inherit
Read ahead sectors      auto
- currently set to      8192
Block device            253:3

[root@localhost ~]#
```

The terminal window is part of an Oracle VM VirtualBox interface, with a title bar "RHEL8_HADOOP Slave1 Clone [Running] - Oracle VM VirtualBox" and standard window controls. The bottom of the window shows a taskbar with various application icons and the text "Enterprise Linux".

➔ Format the logical volume using `mkfs.ext4 /dev/lvmhadoop/mylv1`



The screenshot shows a terminal window titled "root@localhost:~" with a menu bar (File, Edit, View, Search, Terminal, Help). The terminal output shows the following commands and results:

```
[root@localhost ~]# #Successfully 10Gi logical Volume created ^C
[root@localhost ~]# #Formatting the logical volume mylv1 ^C
[root@localhost ~]# mkfs.ext4 /dev/lvmhadoop/mylv1
mke2fs 1.44.3 (10-July-2018)
Creating filesystem with 2621440 4k blocks and 655360 inodes
Filesystem UUID: 848ad700-a755-4157-b5bc-64edde37df1b
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
```

The terminal window is part of an Oracle VM VirtualBox interface, with a title bar "root@localhost:~" and standard window controls. The bottom of the window shows a taskbar with various application icons and the text "Enterprise Linux".

➔ Make the new directory and mount the logical volume to that directory

```
[root@localhost ~]# mkdir /lvmDN1
[root@localhost ~]# mount /dev/lvmhadoop/mylv1 /lvmDN1
[root@localhost ~]# df -h
```

Filesystem	Size	Used	Avail	Use%	Mounted on
devtmpfs	706M	0	706M	0%	/dev
tmpfs	721M	0	721M	0%	/dev/shm
tmpfs	721M	9.6M	712M	2%	/run
tmpfs	721M	0	721M	0%	/sys/fs/cgroup
/dev/mapper/rhel-root	50G	6.4G	44G	13%	/
/dev/mapper/rhel-home	47G	380M	47G	1%	/home
/dev/sda1	1014M	170M	845M	17%	/boot
tmpfs	145M	40K	145M	1%	/run/user/42
tmpfs	145M	5.7M	139M	4%	/run/user/0
/dev/sr0	6.7G	6.7G	0	100%	/run/media/root/RHEL-8-0-0-Ba
se0S-x86_64					
/dev/mapper/lvmhadoop-mylv1	9.8G	37M	9.3G	1%	/lvmDN1

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

```
File Edit View Search Terminal Help
[root@localhost ~]# cd /lvmDN1
[root@localhost lvmDN1]# ls
lost+found
[root@localhost lvmDN1]#
```

Step5: Start the services of Hadoop namenode

```
[root@localhost ~]# jps
2780 Jps
[root@localhost ~]# hadoop-daemon.sh start namenode
starting namenode, logging to /var/log/hadoop/root/hadoop-root-namenode-localhos
t.localdomain.out
[root@localhost ~]# jps
2839 NameNode
2890 Jps
[root@localhost ~]#
```

```
[root@localhost hadoop]# cat hdfs-site.xml
<?xml version="1.0"?>
<?xml-stylesheet type="text/xsl" href="configuration.xsl"?>

<!-- Put site-specific property overrides in this file. -->

<configuration>

<property>
<name>dfs.data.dir</name>
<value>/lvmDN1</value>
</property>

</configuration>
[root@localhost hadoop]#
```

```
[root@localhost hadoop]# cat core-site.xml
<?xml version="1.0"?>
<?xml-stylesheet type="text/xsl" href="configuration.xsl"?>

<!-- Put site-specific property overrides in this file. -->

<configuration>

<property>
<name>fs.default.name</name>
<value>hdfs://192.168.99.124:9001</value>
</property>

</configuration>
[root@localhost hadoop]#
```

Step6: Start the services of Hadoop NameNode

```
[root@localhost hadoop]# jps
4422 Jps
[root@localhost hadoop]# hadoop-daemon.sh start datanode
starting datanode, logging to /var/log/hadoop/root/hadoop-root-datanode-localhos
t.localdomain.out
[root@localhost hadoop]# jps
4531 Jps
4473 DataNode
[root@localhost hadoop]#
```

root@localhost:/etc/hadoop

```
File Edit View Search Terminal Help
4473 DataNode
[root@localhost hadoop]# hadoop dfsadmin -report
Safe mode is ON
Configured Capacity: 10501771264 (9.78 GB)
Present Capacity: 9910370304 (9.23 GB)
DFS Remaining: 9910325248 (9.23 GB)
DFS Used: 45056 (44 KB)
DFS Used%: 0%
Under replicated blocks: 0
Blocks with corrupt replicas: 0
Missing blocks: 0

-----
Datanodes available: 1 (1 total, 0 dead)

Name: 192.168.99.127:50010
Decommission Status : Normal
Configured Capacity: 10501771264 (9.78 GB)
DFS Used: 45056 (44 KB)
Non DFS Used: 591400960 (564 MB)
DFS Remaining: 9910325248(9.23 GB)
DFS Used%: 0%
DFS Remaining%: 94.37%
Last contact: Tue Nov 17 11:43:09 IST 2020
```

Step7: Now I want to increase the lv from 10Gi to 30Gi

```
[root@localhost ~]# #Now i want to increase the lv to 30Gi ^C
[root@localhost ~]# lvextend --size +20G /dev/lvmhadoop/mylv1
  Size of logical volume lvmhadoop/mylv1 changed from 10.00 GiB (2560 extents) to
  30.00 GiB (7680 extents).
  Logical volume lvmhadoop/mylv1 successfully resized.
[root@localhost ~]# lvdisplay /dev/lvmhadoop/mylv1
  --- Logical volume ---
  LV Path                /dev/lvmhadoop/mylv1
  LV Name                 mylv1
  VG Name                 lvmhadoop
  LV UUID                 Zf7MVM-L8bi-u057-ocii-7UH5-pNS0-xchZYn
  LV Write Access         read/write
  LV Creation host, time localhost.localdomain, 2020-11-17 11:30:21 +0530
  LV Status               available
  # open                  1
  LV Size                 30.00 GiB
  Current LE              7680
  Segments                2
  Allocation              inherit
  Read ahead sectors      auto
    - currently set to    8192
  Block device            253:3

[root@localhost ~]#
```

Enterprise Linux

```
[root@localhost ~]# hadoop dfsadmin -report
Safe mode is ON
Configured Capacity: 10501771264 (9.78 GB)
Present Capacity: 9910370304 (9.23 GB)
DFS Remaining: 9910325248 (9.23 GB)
DFS Used: 45056 (44 KB)
DFS Used%: 0%
Under replicated blocks: 0
Blocks with corrupt replicas: 0
Missing blocks: 0
```

```
-----
Datanodes available: 1 (1 total, 0 dead)
```

```
Name: 192.168.99.127:50010
Decommission Status : Normal
Configured Capacity: 10501771264 (9.78 GB)
DFS Used: 45056 (44 KB)
Non DFS Used: 591400960 (564 MB)
DFS Remaining: 9910325248 (9.23 GB)
DFS Used%: 0%
DFS Remaining%: 94.37%
Last contact: Tue Nov 17 11:47:15 IST 2020
```

Enterprise Linux


```
root@localhost:~  
File Edit View Search Terminal Help  
[root@localhost ~]# df -h  
Filesystem                Size      Used Avail Use% Mounted on  
devtmpfs                   706M         0  706M   0% /dev  
tmpfs                      721M         0  721M   0% /dev/shm  
tmpfs                      721M    9.6M  712M   2% /run  
tmpfs                      721M         0  721M   0% /sys/fs/cgroup  
/dev/mapper/rhel-root      50G    6.4G   44G  13% /  
/dev/mapper/rhel-home      47G    380M   47G   1% /home  
/dev/sda1                 1014M    170M   845M  17% /boot  
tmpfs                     145M     36K  145M   1% /run/user/42  
tmpfs                     145M    5.7M  139M   4% /run/user/0  
/dev/sr0                   6.7G    6.7G     0 100% /run/media/root/RHEL-8-0-0-Ba  
se0S-x86_64  
/dev/mapper/lvmhadoop-mylv1 9.8G     37M   9.3G   1% /lvmDN1  
[root@localhost ~]#
```

➔ After extending the lv to 30Gi, we must format it too. In this case, if we use mkfs.ext4, the data will be lost. So, we must use resize2fs.

```
[root@localhost ~]# #Here we have extended to 30Gi, but we have to format it too  
, if we format with mkfs.ext4 the data which is present will be lost. So, we hav  
e to use resize2fs ^C  
[root@localhost ~]# resize2fs /dev/lvmhadoop/mylv1  
resize2fs 1.44.3 (10-July-2018)  
Filesystem at /dev/lvmhadoop/mylv1 is mounted on /lvmDN1; on-line resizing requi  
red  
old_desc_blocks = 2, new_desc_blocks = 4  
The filesystem on /dev/lvmhadoop/mylv1 is now 7864320 (4k) blocks long.  
  
[root@localhost ~]# df -h  
Filesystem                Size      Used Avail Use% Mounted on  
devtmpfs                   706M         0  706M   0% /dev  
tmpfs                      721M         0  721M   0% /dev/shm  
tmpfs                      721M    9.6M  712M   2% /run  
tmpfs                      721M         0  721M   0% /sys/fs/cgroup  
/dev/mapper/rhel-root      50G    6.4G   44G  13% /  
/dev/mapper/rhel-home      47G    380M   47G   1% /home  
/dev/sda1                 1014M    170M   845M  17% /boot  
tmpfs                     145M     40K  145M   1% /run/user/42  
tmpfs                     145M    5.7M  139M   4% /run/user/0  
/dev/sr0                   6.7G    6.7G     0 100% /run/media/root/RHEL-8-0-0-Ba  
se0S-x86_64  
/dev/mapper/lvmhadoop-mylv1 30G     44M   29G   1% /lvmDN1  
[root@localhost ~]#
```



```
[root@localhost ~]# hadoop dfsadmin -report
Safe mode is ON
Configured Capacity: 31639638016 (29.47 GB)
Present Capacity: 30159491072 (28.09 GB)
DFS Remaining: 30159446016 (28.09 GB)
DFS Used: 45056 (44 KB)
DFS Used%: 0%
Under replicated blocks: 0
Blocks with corrupt replicas: 0
Missing blocks: 0
```

```
-----
Datanodes available: 1 (1 total, 0 dead)
```

```
Name: 192.168.99.127:50010
Decommission Status : Normal
Configured Capacity: 31639638016 (29.47 GB)
DFS Used: 45056 (44 KB)
Non DFS Used: 1480146944 (1.38 GB)
DFS Remaining: 30159446016(28.09 GB)
DFS Used%: 0%
DFS Remaining%: 95.32%
Last contact: Tue Nov 17 11:51:12 IST 2020
```

Step8: To reduce the lv, we must follow this 5steps

- a) make the partition offline. i.e unmount the drive
- b) clean/scan the drive using e2fsck
- c) format the drive using resize2fs
- d) reduce the logical volume
- e) make the partition online i.e mount the drive

```
[root@localhost ~]# #Toreduce the mylv1 from 30Gi to 15Gi
[root@localhost ~]# umount /dev/lvmhadoop/mylv1 /lvmDN1
umount: /lvmDN1: not mounted.
[root@localhost ~]# e2fsck -f /dev/mapper/lvmhadoop-mylv1
e2fsck 1.44.3 (10-July-2018)
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/mapper/lvmhadoop-mylv1: 11/1966080 files (0.0% non-contiguous), 167453/7864
320 blocks
[root@localhost ~]# resize2fs /dev/mapper/lvmhadoop-mylv1 15G
resize2fs 1.44.3 (10-July-2018)
Resizing the filesystem on /dev/mapper/lvmhadoop-mylv1 to 3932160 (4k) blocks.
The filesystem on /dev/mapper/lvmhadoop-mylv1 is now 3932160 (4k) blocks long.

[root@localhost ~]#
```

```
[root@localhost ~]# lvdisplay /dev/mapper/lvmhadoop-mylv1
--- Logical volume ---
LV Path                /dev/lvmhadoop/mylv1
LV Name                 mylv1
VG Name                 lvmhadoop
LV UUID                 eojfNh-0DVg-gYIk-cGeV-FtUR-epQH-00eTSI
LV Write Access         read/write
LV Creation host, time  localhost.localdomain, 2020-11-17 13:05:01 +0530
LV Status                available
# open                  0
LV Size                  30.00 GiB
Current LE               7680
Segments                1
Allocation               inherit
Read ahead sectors      auto
- currently set to      8192
Block device             253:3
```

```
root@localhost:~ x root@localhost:~ x
[root@localhost ~]# lvreduce --size -15G /dev/mapper/lvmhadoop-mylv1
WARNING: Reducing active logical volume to 15.00 GiB.
THIS MAY DESTROY YOUR DATA (filesystem etc.)
Do you really want to reduce lvmhadoop/mylv1? [y/n]: y
Size of logical volume lvmhadoop/mylv1 changed from 30.00 GiB (7680 extents) to 15.00 GiB (3840 extents).
Logical volume lvmhadoop/mylv1 successfully resized.
[root@localhost ~]#
```

Note: During reducing, the data present in the reducing part will be lost

```
[root@localhost ~]# lvdisplay lvmhadoop/mylv1
--- Logical volume ---
LV Path                /dev/lvmhadoop/mylv1
LV Name                 mylv1
VG Name                 lvmhadoop
LV UUID                 eojfNh-0DVg-gYIk-cGeV-FtUR-epQH-00eTSI
LV Write Access         read/write
LV Creation host, time  localhost.localdomain, 2020-11-17 13:05:01 +0530
LV Status                available
# open                  0
LV Size                  15.00 GiB
Current LE               3840
Segments                1
Allocation               inherit
Read ahead sectors      auto
- currently set to      8192
Block device             253:3
```

```
[root@localhost ~]# mount /dev/lvmhadoop/mylv1 /lvmDN1
[root@localhost ~]# df -h
Filesystem              Size  Used Avail Use% Mounted on
devtmpfs                 706M   0   706M   0% /dev
tmpfs                    721M   0   721M   0% /dev/shm
tmpfs                    721M  9.6M   712M   2% /run
tmpfs                    721M   0   721M   0% /sys/fs/cgroup
/dev/mapper/rhel-root    50G   6.4G   44G  13% /
/dev/mapper/rhel-home    47G  380M   47G   1% /home
/dev/sda1                1014M  170M   845M  17% /boot
tmpfs                    145M  40K   145M   1% /run/user/42
/dev/sr0                  6.7G  6.7G    0 100% /run/media/anup/RHEL-8-0-0-Ba
se0S-x86_64
tmpfs                    145M  5.7M   139M   4% /run/user/0
/dev/mapper/lvmhadoop-mylv1 15G   41M   14G   1% /lvmDN1
[root@localhost ~]#
```

```
[root@localhost ~]# hadoop dfsadmin -report
Safe mode is ON
Configured Capacity: 15719145472 (14.64 GB)
Present Capacity: 14855114752 (13.83 GB)
DFS Remaining: 14855069696 (13.83 GB)
DFS Used: 45056 (44 KB)
DFS Used%: 0%
Under replicated blocks: 0
Blocks with corrupt replicas: 0
Missing blocks: 0

-----
Datanodes available: 1 (1 total, 0 dead)

Name: 192.168.99.127:50010
Decommission Status : Normal
Configured Capacity: 15719145472 (14.64 GB)
DFS Used: 45056 (44 KB)
Non DFS Used: 864030720 (824 MB)
DFS Remaining: 14855069696(13.83 GB)
DFS Used%: 0%
DFS Remaining%: 94.5%
Last contact: Tue Nov 17 13:19:12 IST 2020
```

Lets Start with integration with python.

https://drive.google.com/file/d/18VyArgbSvmuO1dcY7K1FJILmL_rkqDz9/view?usp=sharing

GitHub: <https://github.com/Anuddeeph/Task7.1-Automation-of-Hadoop-Datanode-Using-LVM-.git>