**Assignment No. 4**

**Logical Volume Management**

**Aim :** To Study and implement logical volumes in physical disk via LVM utility.

**Software Specifications –**

OS – Linux Ubuntu 12.04 desktop i386

LVM - 2.2.02.90

VirtualBox

**Theory :**

LVM stands for Logical Volume Management. It is a system of managing logical volumes, or filesystems, that is much more advanced and flexible than the traditional method of partitioning a disk into one or more segments and formatting that partition with a filesystem.

**Common uses**

LVM is commonly used for the following purposes:

Managing large hard disk farms by allowing disks to be added and replaced without downtime or service disruption, in combination with hot swapping.

On small systems (like a desktop at home), instead of having to estimate at installation time how big a partition might need to be in the future, LVM allows file systems to be easily resized later as needed.

Performing consistent backups by taking snapshots of the logical volumes.

Creating single logical volumes of multiple physical volumes or entire hard disks (somewhat similar to RAID 0, but more similar to JBOD), allowing for dynamic volume resizing.

LVM can be considered as a thin software layer on top of the hard disks and partitions, which creates an abstraction of continuity and ease-of-use for managing hard drive replacement, re-partitioning, and backup.

**LVM is suitable for:**

* Managing large hard disk farmes by letting you add disks, replace disks, copy and share contents from one disk to another without disrupting service (hot swapping).
* On small systems (like a desktop at home), instead of having to estimate at installation time how big a partition might need to be in the future, LVM allows you to resize your disk partitions easily as needed.
* Making backups by taking "snapshots."
* Creating single logical volumes of multiple physical volumes or entire hard disks (somewhat similar to RAID 0, but more similar to JBOD), allowing for dynamic volume resizing.

One can think of LVM as a thin software layer on top of the hard disks and partitions, which creates an illusion of continuity and ease-of-use for managing hard-drive replacement, repartitioning, and backup.

**Features of LVM:**

The LVM can:

* Resize volume groups online by absorbing new physical volumes (PV) or ejecting existing ones.
* Resize logical volumes (LV) online by concatenating extents onto them or truncating extents from them.
* Create read-only snapshots of logical volumes.
* Create read-write snapshots of logical volumes.
* Stripe whole or parts of logical volumes across multiple PVs, in a fashion similar to RAID 0.
* Mirror whole or parts of logical volumes, in a fashion similar to RAID 1.
* Move online logical volumes between PVs.
* Split or merge volume groups *in*. This can be useful when migrating whole logical volumes to or from offline storage.

The LVM will also work in a shared-storage cluster (where disks holding the PVs are shared between multiple host computers), but requires an additional daemon to propagate state changes between cluster nodes.

**LVM does not:**

* Provide parity-based redundancy across LVs, as with RAID levels 3 through 6. This functionality is instead provided by the Linux multiple disk subsystem, which can be used as LVM physical volumes.

**Limitations of LVM:**

* Both LVM disks and non-LVM disks can exist simultaneously on your system, but a given disk or partition must be managed entirely by either LVM or non-LVM methods. That is, you cannot combine these techniques for use with a single disk or partition.
* The extent size of a volume group is fixed when the volume group is created. It cannot be changed without recreating the volume group.

**To configure LVM, these are the steps involved:**

Starting with a hard disk drive, create a physical volume – PV

Create a volume group – VG. A volume group is a virtual container for one or more physical volumes (hard disks)

Add physical volume to volume group. The size of the VG equals the size of the PV, or the sum of the PVs, if more than one

Create logical volumes. A logical volume, LV, is the LVM equivalent of a partition

Assign filesystems to logical volumes

**EXPERIMENT STEPS :**

1. **Create disk partitions to work as LVM**

**root@ubuntu:~# fdisk /dev/sda**

**Command (m for help): n**

**Command action**

**e extended**

**p primary partition (1-4)**

**p**

Partition number (1-4): **2**

First cylinder (2497-2610, default 2497):

Using default value 2497

Last cylinder, +cylinders or +size{K,M,G} (2497-2610, default 2610): +2520

Value out of range.

Last cylinder, +cylinders or +size{K,M,G} (2497-2610, default 2610): 2520

Command (m for help): n

Command action

e extended

p primary partition (1-4)

**p**

Partition number (1-4): **3**

First cylinder (2521-2610, default 2521):

Using default value 2521

Last cylinder, +cylinders or +size{K,M,G} (2521-2610, default 2610): 2580

**Command (m for help): p**

Disk /dev/sda: 21.5 GB, 21474836480 bytes

255 heads, 63 sectors/track, 2610 cylinders

Units = cylinders of 16065 \* 512 = 8225280 bytes

Disk identifier: 0x000bd484

Device Boot Start End Blocks Id System

/dev/sda1 \* 1 2496 20049088+ 83 Linux

/dev/sda2 2581 2610 240975 5 Extended

/dev/sda3 2581 2610 240943+ 83 Linux

**/dev/sda4 2497 2520 192780 8e Linux LVM**

**/dev/sda5 2521 2580 481950 8e Linux LVM**

1. **Create Physical Volume and display details**

**root@ubuntu:~# pvcreate /dev/sda4**

Writing physical volume data to disk "/dev/sda4"

Physical volume "/dev/sda4" successfully created

**root@ubuntu:~# pvcreate /dev/sda5**

Writing physical volume data to disk "/dev/sda5"

Physical volume "/dev/sda5" successfully created

**root@ubuntu:~# pvdisplay**

Displays the storage configuration of disks

1. **Create Volume Group and display details**

**root@ubuntu:~# vgcreate /dev/vgnims /dev/sda{4,5}**

**root@ubuntu:~# vgdisplay**

Configuration of volume group created

1. **Create Logical Volumes**

**root@ubuntu:/home/varshapriya# lvcreate -L +50M -n nimsvl1 vgnims**

Rounding up size to full physical extent 52.00 MiB

Logical volume "nimsvl1" created

**root@ubuntu:/home/varshapriya# lvcreate -L +50M -n nimsvl2 vgnims**

Rounding up size to full physical extent 52.00 MiB

Logical volume "nimsvl2" created

**root@ubuntu:/home/varshapriya# lvcreate -L +50M -n nimsvl3 vgnims**

Rounding up size to full physical extent 52.00 MiB

Logical volume "nimsvl3" created

**root@ubuntu:/home/varshapriya# lvs**

1. **Create File System**

**root@ubuntu:/home/supriya# mkfs -t ext3 /dev/vgnims/nimsvl1**

mke2fs 1.41.9 (22-Aug-2009)

Filesystem label=

OS type: Linux

Block size=1024 (log=0)

Fragment size=1024 (log=0)

13328 inodes, 53248 blocks

2662 blocks (5.00%) reserved for the super user

First data block=1

Maximum filesystem blocks=54525952

7 block groups

8192 blocks per group, 8192 fragments per group

1904 inodes per group

Superblock backups stored on blocks:

8193, 24577, 40961

Writing inode tables: done

Creating journal (4096 blocks): done

Writing superblocks and filesystem accounting information: done

This filesystem will be automatically checked every 31 mounts or

180 days, whichever comes first. Use tune2fs -c or -i to override.

**display logical volums :**

**root@ubuntu:/home/supriya# lvdisplay**

--- Logical volume ---

LV Path **/dev/vgnims/nimsvl1**

LV Name nimsvl1

VG Name vgnims

LV UUID aa2X2F-fHLQ-3vta-SmiT-8YrK-dHdQ-4B41kO

LV Write Access read/write

LV Creation host, time ubuntu, 2012-03-14 04:38:06 -0700

LV Status NOT available

LV Size 52.00 MiB

Current LE 13

Segments 1

Allocation inherit

Read ahead sectors auto

--- Logical volume ---

LV Path **/dev/vgnims/nimsvl2**

LV Name nimsvl2

VG Name vgnims

LV UUID SUcFfh-6LAu-334Y-Qid0-MfRO-PXSf-suI4mD

LV Write Access read/write

LV Creation host, time ubuntu, 2012-04-24 21:54:34 -0700

LV Status available

# open 0

LV Size 52.00 MiB

Current LE 13

Segments 1

Allocation inherit

Read ahead sectors auto

- currently set to 256

Block device 252:0

--- Logical volume ---

LV Path **/dev/vgnims/nimsvl3**

LV Name nimsvl3

VG Name vgnims

LV UUID u63nE1-Uzu3-kN2p-PN3t-B2AL-IfWG-B5h3X2

LV Write Access read/write

LV Creation host, time ubuntu, 2012-04-24 21:54:49 -0700

LV Status available

# open 0

LV Size 52.00 MiB

Current LE 13

Segments 1

Allocation inherit

Read ahead sectors auto

- currently set to 256

Block device 252:1

1. **Extend Volume Group**

**root@ubuntu:/home/supriya# vgextend /dev/vgnims /dev/sda5**

Volume group "vgnims" successfully extended

**root@ubuntu:/home/supriya# vgdisplay vgnims**

--- Volume group ---

VG Name vgnims

System ID

Format lvm2

Metadata Areas 3

Metadata Sequence No 5

VG Access read/write

VG Status resizable

MAX LV 0

Cur LV 3

Open LV 0

Max PV 0

Cur PV 3

Act PV 3

VG Size 736.00 MiB

PE Size 4.00 MiB

Total PE 184

Alloc PE / Size 39 / 156.00 MiB

Free PE / Size 145 / 580.00 MiB

VG UUID HjNQGZ-RaIR-HN1c-MN6H-rl2a-tfZg-PdBVHi

1. **Extending logical volume : nimsvl1 by 1MB**

**root@ubuntu:/home/supriya# lvextend -v -L +1M /dev/vgnims/nimsvl1**

Finding volume group vgnims

Rounding up size to full physical extent 4.00 MiB

Archiving volume group "vgnims" metadata (seqno 5).

Extending logical volume nimsvl1 to 56.00 MiB

Found volume group "vgnims"

Found volume group "vgnims"

Found volume group "vgnims"

Creating volume group backup "/etc/lvm/backup/vgnims" (seqno 6).

Logical volume nimsvl1 successfully resized

1. **Reducingvolume group :**

**i.e. removing physical volumes from volume group**

root@ubuntu:/home/supriya# vgreduce /dev/vgnims /dev/sda3

Removed "/dev/sda3" from volume group "vgnims"

/dev/sda4

/dev/sda5

/dev/sda3

Logical volume

/vgnims/nimsvl1

Logical volume

/vgnims/nimsvl2

Logical volume

/vgnims/nimsvl3

**Volume Group - /dev/vgnims**

Volume Group Extended

andReduced

Volume Group Created

Volume Group Created with

**Conclusion:**

Thus, we have studied logical volume management in Ubantu successfully.