
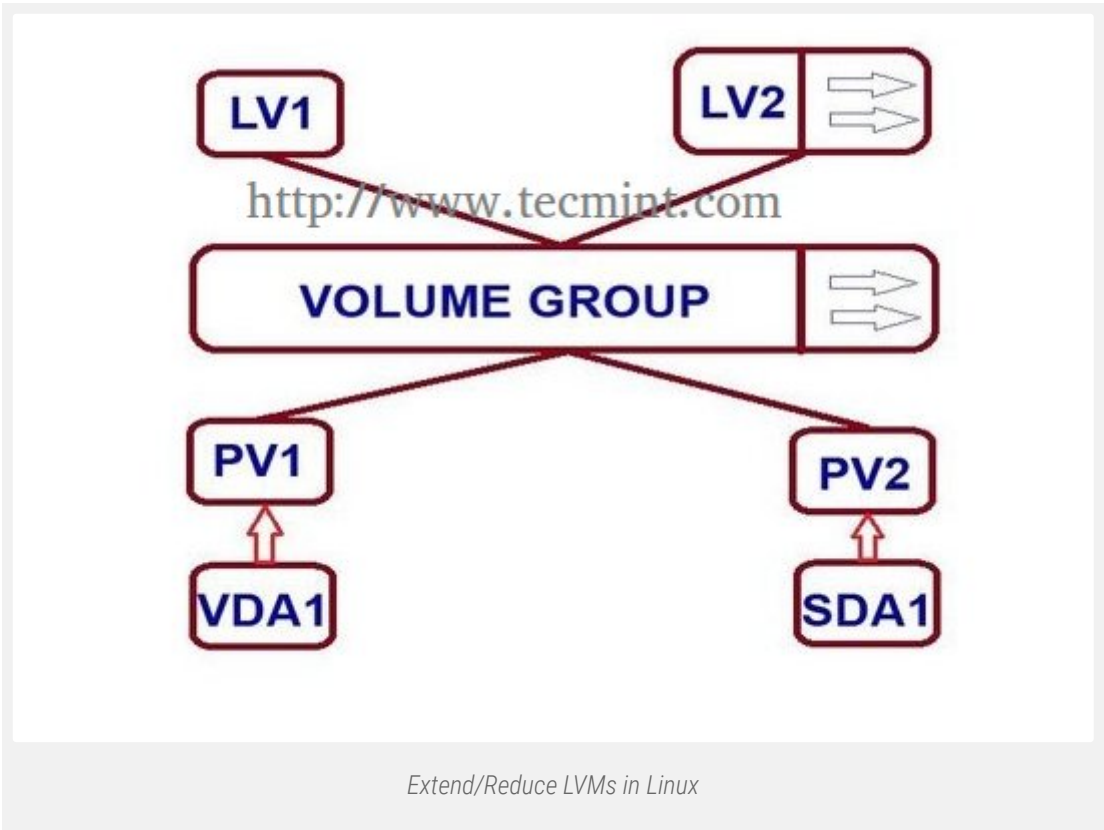


How to Extend/Reduce LVM's (Logical Volume Management) in Linux – Part II

by Babin Lonston | Published: August 8, 2014 | Last Updated: June 27, 2017

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Previously we have seen how to create a flexible disk storage using LVM. Here, we are going to see how to extend volume group, extend and reduce a logical volume. Here we can reduce or extend the partitions in Logical volume management (LVM) also called as flexible volume file-system.



Requirements

- [Create Flexible Disk Storage with LVM – Part I](#)

When do we need to reduce volume?

May be we need to create a separate partition for any other use or we need to expand the size of any low space partition, if so we can reduce the large size partition and we can expand the low space partition very easily by the following simple easy steps.

My Server Setup – Requirements

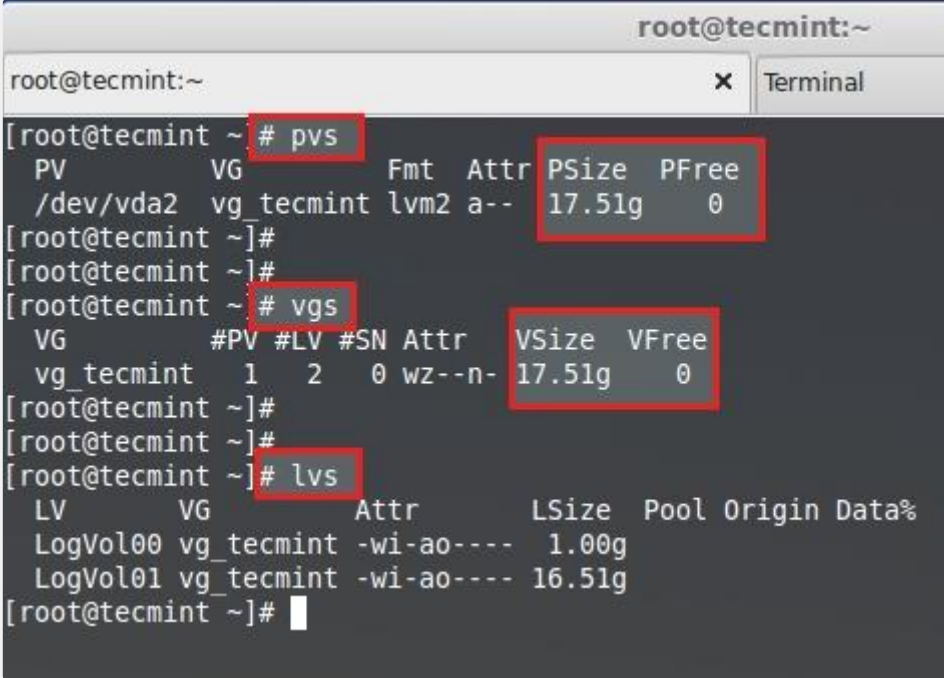
- Operating System – CentOS 6.5 with LVM Installation
- Server IP – 192.168.0.200

How to Extend Volume Group and Reduce Logical Volume

Logical Volume Extending

Currently, we have One PV, VG and 2 LV. Let's list them one by one using following commands.

```
# pvs
# vgs
# lvs
```



```

root@tecmin:~
[root@tecmin ~]# pvs
PV          VG      Fmt  Attr  PSize  PFree
/dev/vda2   vg_tecmint lvm2  a--   17.51g    0
[root@tecmin ~]#
[root@tecmin ~]#
[root@tecmin ~]# vgs
VG          #PV #LV #SN Attr   VSize  VFree
vg_tecmint    1  2   0 wz--n- 17.51g    0
[root@tecmin ~]#
[root@tecmin ~]#
[root@tecmin ~]# lvs
LV          VG      Attr      LSize   Pool Origin Data%
LogVol00    vg_tecmint -wi-ao---- 1.00g
LogVol01    vg_tecmint -wi-ao---- 16.51g
[root@tecmin ~]#

```

Logical Volume Extending

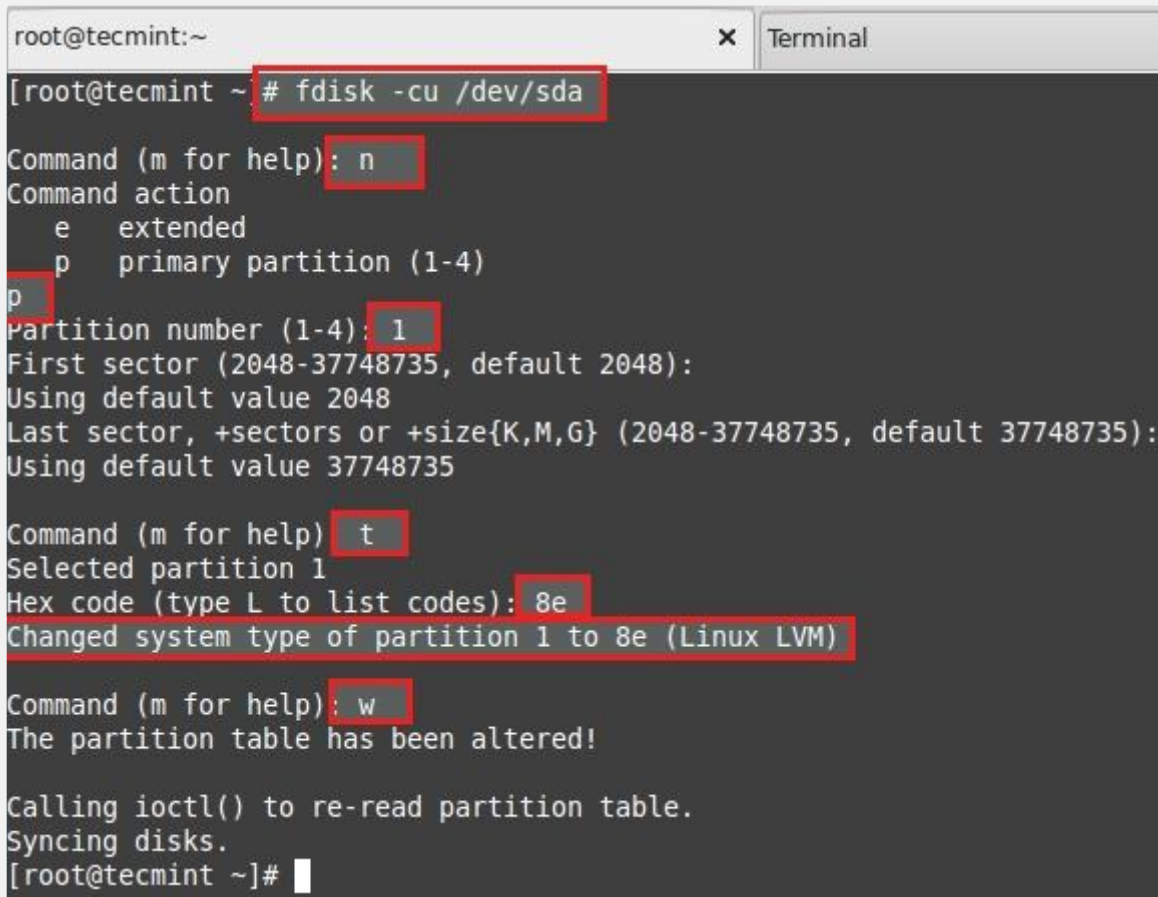
There are no free space available in Physical Volume and Volume group. So, now we can't extend the lvm size, for extending we need to add one physical volume (PV), and then we have to extend the volume group by extending the vg. We will get enough space to extend the Logical volume size. So first we are going to add one physical volume.

For adding a new PV we have to use fdisk to create the LVM partition.

```
# fdisk -cu /dev/sda
```

- To Create new partition Press **n**.
- Choose primary partition use **p**.
- Choose which number of partition to be selected to create the primary partition.
- Press **1** if any other disk available.
- Change the type using **t**.
- Type **8e** to change the partition type to Linux LVM.
- Use **p** to print the create partition (here we have not used the option).
- Press **w** to write the changes.

Restart the system once completed.



```

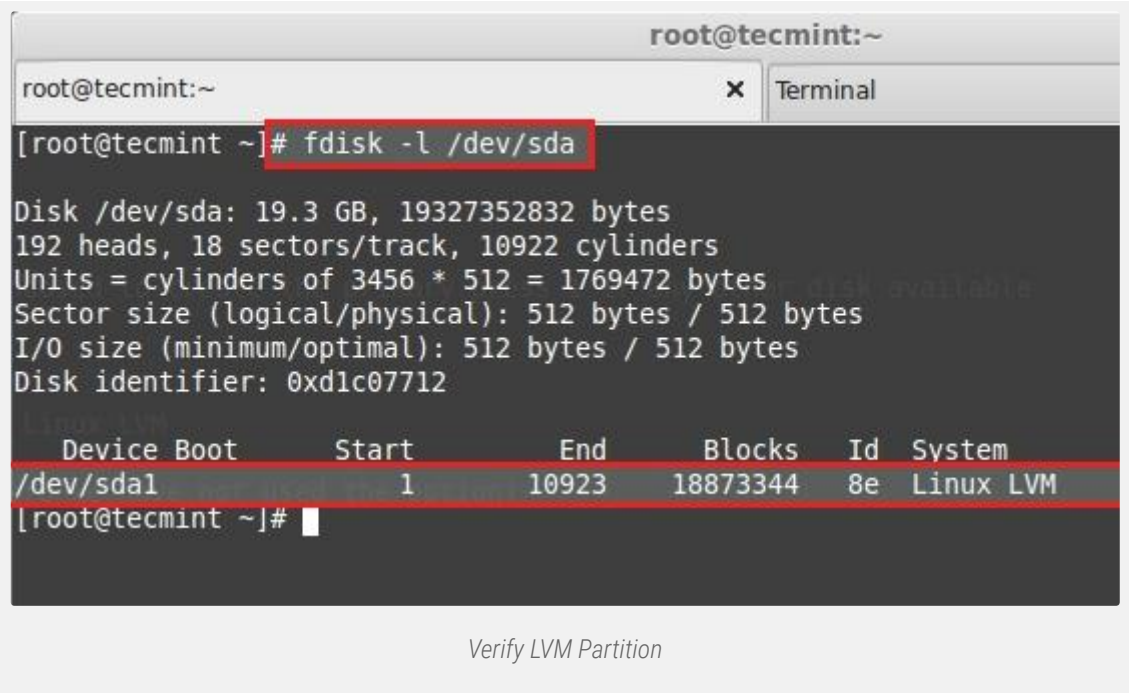
root@tecmin:~
[root@tecmin ~]# fdisk -cu /dev/sda
Command (m for help): n
Command action
  e   extended
  p   primary partition (1-4)
p
Partition number (1-4): 1
First sector (2048-37748735, default 2048):
Using default value 2048
Last sector, +sectors or +size{K,M,G} (2048-37748735, default 37748735):
Using default value 37748735
Command (m for help): t
Selected partition 1
Hex code (type L to list codes): 8e
Changed system type of partition 1 to 8e (Linux LVM)
Command (m for help): w
The partition table has been altered!
Calling ioctl() to re-read partition table.
Syncing disks.
[root@tecmin ~]#

```

Create LVM Partition

List and check the partition we have created using fdisk.

```
# fdisk -l /dev/sda
```

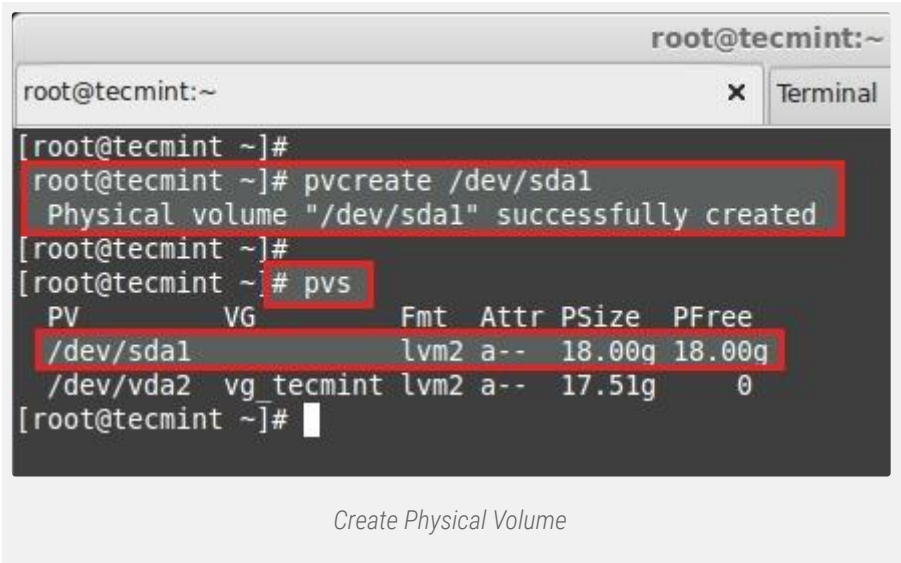


Next, create new **PV** (Physical Volume) using following command.

```
# pvcreate /dev/sda1
```

Verify the pv using below command.

```
# pvs
```



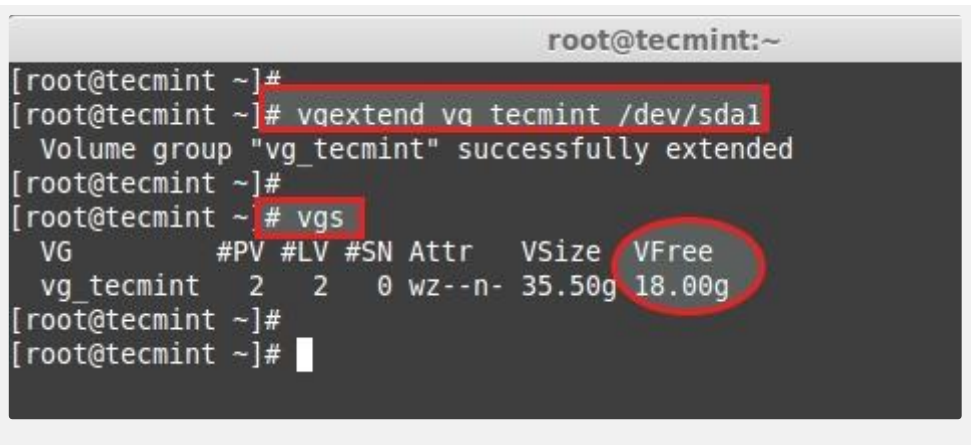
Extending Volume Group

Add this pv to **vg_tecmint** vg to extend the size of a volume group to get more space for expanding lv.

```
# vgextend vg_tecmint /dev/sda1
```

Let us check the size of a Volume Group now using.

```
# vgs
```



We can even see which **PV** are used to create particular Volume group using.

```
# pvscan
```

```
root@tecmin:~  
[root@tecmin ~]#  
[root@tecmin ~]#  
[root@tecmin ~]# pvscan  
PV /dev/vda2   VG vg_tecmint   lvm2 [17.51 GiB / 0    free]  
PV /dev/sda1   VG vg_tecmint   lvm2 [18.00 GiB / 18.00 GiB free]  
Total: 2 [35.50 GiB] / in use: 2 [35.50 GiB] / in no VG: 0 [0  ]  
[root@tecmin ~]#
```

Check Volume Group

Here, we can see which Volume groups are under Which Physical Volumes. We have just added one pv and its totally free. Let us see the size of each logical volume we have currently before expanding it.

```
root@tecmin:~  
[root@tecmin ~]#  
[root@tecmin ~]# lvdisplay  
--- Logical volume ---  
LV Path                /dev/vg_tecmint/LogVol00  
LV Name                 LogVol00  
VG Name                 vg_tecmint  
LV UUID                 ju8jzB-7GWT-PVwm-JIQ5-w1J1-zuc8-NoDfdl  
LV Write Access         read/write  
LV Creation host, time  tecmint.com, 2014-07-19 10:00:25 +0530  
LV Status                available  
# open                  1  
LV Size                 1.00 GiB  
Current LE              256  
Segments                1  
Allocation              inherit  
Read ahead sectors      auto  
- currently set to      256  
Block device            253:0  
  
--- Logical volume ---  
LV Path                /dev/vg_tecmint/LogVol01  
LV Name                 LogVol01  
VG Name                 vg_tecmint  
LV UUID                 hY57Rg-BeMQ-dEOi-fclC-m0Ea-9Jb8-753YAC  
LV Write Access         read/write  
LV Creation host, time  tecmint.com, 2014-07-19 10:00:26 +0530  
LV Status                available  
# open                  1  
LV Size                 16.51 GiB  
Current LE              4226  
Segments                1  
Allocation              inherit  
Read ahead sectors      auto  
- currently set to      256  
Block device            253:1  
[root@tecmin ~]#
```

Check All Logical Volume

- LogVol00 defined for Swap.
- LogVol01 defined for /.
- Now we have 16.50 GB size for / (root).
- Currently there are 4226 Physical Extend (PE) available.

Now we are going to expand the / partition **LogVol01**. After expanding we can list out the size as above for confirmation. We can extend using GB or PE as I have explained it in LVM PART-I, here I'm using PE to extend.

For getting the available Physical Extend size run.

```
# vgdisplay
```



```
root@tecmint:~  
[root@tecmint ~]#  
[root@tecmint ~]# vgdisplay  
--- Volume group ---  
VG Name                vg_tecmint  
System ID  
Format                 lvm2  
Metadata Areas         2  
Metadata Sequence No   4  
VG Access              read/write  
VG Status              resizable  
MAX LV                 0  
Cur LV                2  
Open LV                2  
Max PV                 0  
Cur PV                2  
Act PV                2  
VG Size                35.50 GiB  
PE Size                4.00 MiB  
Total PE               9089  
Alloc PE / Size        4482 / 17.51 GiB  
Free PE / Size         4607 / 18.00 GiB  
VG UUID                JZXiJe-uViS-DyDY-6qaX-zjF4-GkSU-hTZglt  
[root@tecmint ~]#
```

Check Available Physical Size

There are **4607** free PE available = **18GB** Free space available. So we can expand our logical volume up-to **18GB** more. Let us use the PE size to extend.

```
# lvextend -l +4607 /dev/vg_tecmint/LogVol01
```

Use **+** to add the more space. After Extending, we need to re-size the file-system using.

```
# resize2fs /dev/vg_tecmint/LogVol01
```

```
root@tecmint:~  
[root@tecmint ~]#  
[root@tecmint ~]# lvextend -l +4607 /dev/vg_tecmint/LogVol01 → 1  
Extending logical volume LogVol01 to 34.50 GiB  
Logical volume LogVol01 successfully resized → 2  
[root@tecmint ~]#  
[root@tecmint ~]# resize2fs /dev/vg_tecmint/LogVol01 → 3  
resize2fs 1.41.12 (17-May-2010)  
Filesystem at /dev/vg_tecmint/LogVol01 is mounted on /; on-line resizing required → 4  
old desc_blocks = 2, new_desc_blocks = 3  
Performing an on-line resize of /dev/vg_tecmint/LogVol01 to 9044992 (4k) blocks.  
The filesystem on /dev/vg_tecmint/LogVol01 is now 9044992 blocks long.  
[root@tecmint ~]#
```

Expand Logical Volume

- Command used to extend the logical volume using Physical extends.
- Here we can see it is extended to 34GB from 16.51GB.
- Re-size the file system, If the file-system is mounted and currently under use.
- For extending Logical volumes we don't need to unmount the file-system.

Now let's see the size of re-sized logical volume using.

```
# lvdisplay
```

root@tecmin:~

```
[root@tecmin ~]#
[root@tecmin ~]# lvs
--- Logical volume ---
LV Path                /dev/vg_tecmin/LogVol00
LV Name                 LogVol00
VG Name                 vg_tecmin
LV UUID                 ju8jzB-7GWT-PVwm-JI05-w1J1-zuc8-NoDfdl
LV Write Access         read/write
LV Creation host, time  tecmin.com, 2014-07-19 10:00:25 +0530
LV Status                available
# open                  1
LV Size                 1.00 GiB
Current LE              256
Segments                1
Allocation               inherit
Read ahead sectors      auto
- currently set to     256
Block device            253:0

--- Logical volume ---
LV Path                /dev/vg_tecmin/LogVol01
LV Name                 LogVol01
VG Name                 vg_tecmin
LV UUID                 hYS7Rg-BeMQ-dEOi-fc1c-m0Ea-9Jb8-753YAC
LV Write Access         read/write
LV Creation host, time  tecmin.com, 2014-07-19 10:00:26 +0530
LV Status                available
# open                  1
LV Size                 34.50 GiB
Current LE              8833
Segments                2
Allocation               inherit
Read ahead sectors      auto
- currently set to     256
Block device            253:1
```

Resize Logical Volume

- LogVol01 defined for / extended volume.
- After extending there is 34.50GB from 16.50GB.
- Current extends, Before extending there was 4226, we have added 4607 extends to expand so totally there are 8833.

Now if we check the vg available Free PE it will be 0.

```
# vgdisplay
```

See the result of extending.

```
# pvs
# vgs
# lvs
```

root@tecmin:~

```
[root@tecmin ~]#
[root@tecmin ~]# pvs
PV          VG      Fmt  Attr PSize  PFree
/dev/sda1   vg_tecmin  lvm2 a--  18.00g  0
/dev/vda2   vg_tecmin  lvm2 a--  17.51g  0
[root@tecmin ~]#
[root@tecmin ~]# vgs
VG          #PV #LV #SN Attr   VSize  VFree
vg_tecmin   2   2   0 wz--n- 35.50g  0
[root@tecmin ~]#
[root@tecmin ~]#
[root@tecmin ~]# lvs
LV          VG      Attr      LSize  Pool Origin Data%  Move Log C
LogVol00    vg_tecmin -wi-ao---- 1.00g
LogVol01    vg_tecmin -wi-ao---- 34.50g
[root@tecmin ~]#
[root@tecmin ~]#
```

Verify Resize Partition

- New Physical Volume added.
- Volume group vg_tecmin extended from 17.51GB to 35.50GB.
- Logical volume LogVol01 extended from 16.51GB to 34.50GB.

Here we have completed the process of extending volume group and logical volumes. Let us move towards some interesting part in Logical volume management.

Reducing Logical Volume (LVM)

Here we are going to see how to reduce the Logical Volumes. Everyone say its critical and may end up with disaster while we reduce the lvm. Reducing lvm is really interesting than any other part in Logical volume management.

- Before starting, it is always good to backup the data, so that it will not be a headache if something goes wrong.
- To Reduce a logical volume there are 5 steps needed to be done very carefully.
- While extending a volume we can extend it while the volume under mount status (online), but for reduce we must need to unmount the file system before reducing.

Let's see what are the 5 steps below.

- unmount the file system for reducing.
- Check the file system after unmount.
- Reduce the file system.
- Reduce the Logical Volume size than Current size.
- Recheck the file system for error.
- Remount the file-system back to stage.

For demonstration, I have created separate volume group and logical volume. Here, I'm going to reduce the logical volume **tecmint_reduce_test**. Now its 18GB in size. We need to reduce it to **10GB** without data-loss. That means we need to reduce **8GB** out of **18GB**. Already there is **4GB** data in the volume.

```
18GB ---> 10GB
```

While reducing size, we need to reduce only 8GB so it will roundup to 10GB after the reduce.

```
# lvs
```

root@tecmint:~

```
[root@tecmint ~]#  
[root@tecmint ~]# lvs  
  LV          VG          Attr      LSize  Pool Origin Data%  
LogVol00      vg_tecmint    -wi-ao--- 1.00g  
LogVol01      vg_tecmint    -wi-ao--- 34.50g  
tecmint_reduce_test vg_tecmint_extra -wi-a----- 18.00g  
[root@tecmint ~]#
```

Reduce Logical Volume

Here we can see the file-system information.

```
# df -h
```

root@tecmint:~

```
[root@tecmint ~]#  
[root@tecmint ~]# df -h  
Filesystem                                Size  Used Avail Use% Mounted on  
/dev/mapper/vg_tecmint-LogVol01            34G   2.2G   31G   7% /  
tmpfs                                       939M    0   939M   0% /dev/shm  
/dev/vda1                                  485M   39M   421M   9% /boot  
/dev/mapper/vg_tecmint_extra-tecmint_reduce_test 18G   3.9G   13G  24% /mnt/tecmint_reduce_test  
[root@tecmint ~]#
```

Check File System Size

- The size of the Volume is 18GB.
- Already it used upto 3.9GB.
- Available Space is 13GB.

First unmount the mount point.


```
# umount -v /mnt/tecmin_t_reduce_test/
```

```
root@tecmin:~  
[root@tecmin ~]#  
[root@tecmin ~]# umount -v /mnt/tecmin reduce test/  
/dev/mapper/vg_tecmin_extra-tecmin_reduce_test umounted  
[root@tecmin ~]#  
[root@tecmin ~]#
```

Unmount Partition

Then check for the file-system error using following command.

```
# e2fsck -ff /dev/vg_tecmin_extra/tecmin_reduce_test
```

```
root@tecmin:~  
[root@tecmin ~]#  
[root@tecmin ~]# e2fsck -ff /dev/vg_tecmin_extra/tecmin_reduce_test  
e2fsck 1.41.12 (17-May-2010)  
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/vg_tecmin_extra/tecmin_reduce_test: 1032/1179648 files (0.6% non-contiguous)  
locks  
[root@tecmin ~]#  
[root@tecmin ~]#
```

Scan Partition for Errors

Note: Must pass in every 5 steps of file-system check if not there might be some issue with your file-system.

Next, reduce the file-system.

```
# resize2fs /dev/vg_tecmin_extra/tecmin_reduce_test 10GB
```

```
root@tecmin:~  
[root@tecmin ~]# resize2fs /dev/vg tecmin extra/tecmin reduce test 10G  
resize2fs 1.41.12 (17-May-2010)  
Resizing the filesystem on /dev/vg tecmin_extra/tecmin_reduce test to 2621440 (4k) blocks.  
The filesystem on /dev/vg_tecmin_extra/tecmin_reduce_test is now 2621440 blocks long.
```

Reduce File System

Reduce the Logical volume using GB size.

```
# lvreduce -L -8G /dev/vg_tecmin_extra/tecmin_reduce_test
```

```
root@tecmin:~  
[root@tecmin ~]#  
[root@tecmin ~]# lvreduce -L -8G /dev/vg tecmin extra/tecmin_reduce_test  
WARNING: Reducing active logical volume to 10.00 GiB  
THIS MAY DESTROY YOUR DATA (filesystem etc.)  
Do you really want to reduce tecmin_reduce_test? [y/n]: y  
Reducing logical volume tecmin_reduce_test to 10.00 GiB  
Logical volume tecmin_reduce_test successfully resized  
[root@tecmin ~]#
```

Reduce Logical Partition

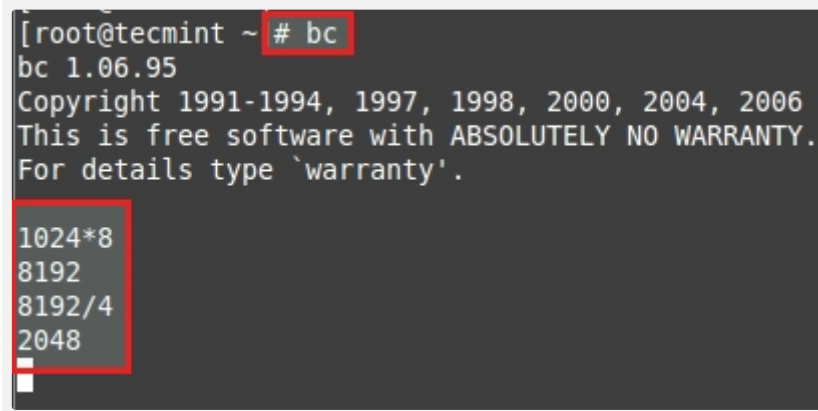
To Reduce Logical volume using PE Size we need to Know the size of default PE size and total PE size of a Volume Group to put a small calculation for accurate Reduce size.

```
# lvdisplay vg_tecmin_extra
```


Here we need to do a little calculation to get the PE size of 10GB using bc command.

```
1024MB x 10GB = 10240MB or 10GB
10240MB / 4PE = 2048PE
```

Press **CRTL+D** to exit from BC.



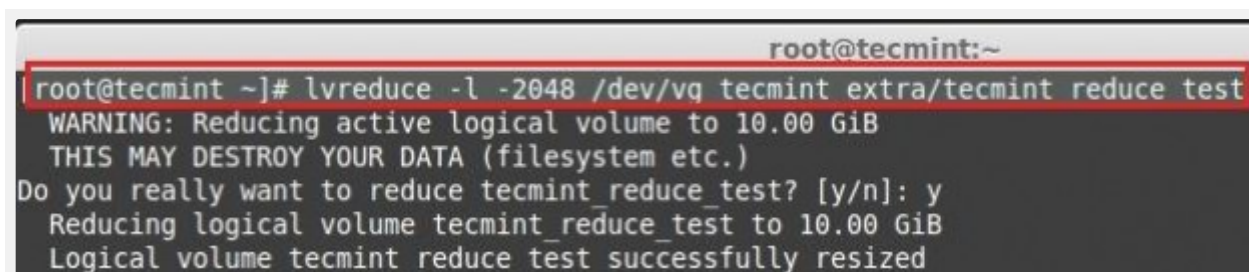
```
[root@tecmin ~]# bc
bc 1.06.95
Copyright 1991-1994, 1997, 1998, 2000, 2004, 2006
This is free software with ABSOLUTELY NO WARRANTY.
For details type `warranty'.

1024*8
8192
8192/4
2048
^D
^C
```

Calculate PE Size

Reduce the size using PE.

```
# lvreduce -l -2048 /dev/vg_tecmint_extra/tecmint_reduce_test
```

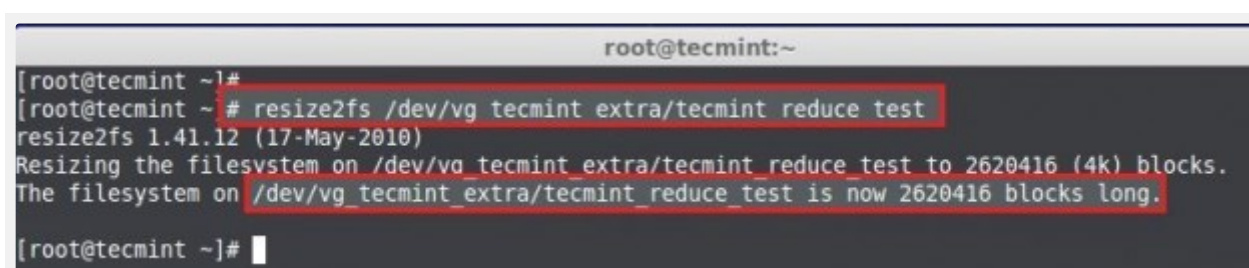


```
root@tecmin:~
root@tecmin ~]# lvreduce -l -2048 /dev/vg tecmint extra/tecmint reduce test
WARNING: Reducing active logical volume to 10.00 GiB
THIS MAY DESTROY YOUR DATA (filesystem etc.)
Do you really want to reduce tecmint_reduce_test? [y/n]: y
Reducing logical volume tecmint_reduce_test to 10.00 GiB
Logical volume tecmint_reduce_test successfully resized
```

Reduce Size Using PE

Re-size the file-system back, In this step if there is any error that means we have messed-up our file-system.

```
# resize2fs /dev/vg_tecmint_extra/tecmint_reduce_test
```



```
root@tecmin:~
[root@tecmin ~]#
[root@tecmin ~]# resize2fs /dev/vg tecmint extra/tecmint reduce test
resize2fs 1.41.12 (17-May-2010)
Resizing the filesystem on /dev/vg tecmint_extra/tecmint_reduce test to 2620416 (4k) blocks.
The filesystem on /dev/vg tecmint_extra/tecmint_reduce test is now 2620416 blocks long.
[root@tecmin ~]#
```

Resize File System

Mount the file-system back to same point.

```
# mount /dev/vg_tecmint_extra/tecmint_reduce_test /mnt/tecmint_reduce_test/
```

root@tecmin:~

```
[root@tecmin ~]#
[root@tecmin ~]# mount /dev/vg_tecmint_extra/tecmint_reduce_test /mnt/tecmint_reduce_test/
[root@tecmin ~]#
[root@tecmin ~]# df -h
Filesystem                                Size  Used Avail Use% Mounted on
/dev/mapper/vg_tecmint-LogVol01           34G   2.2G   31G   7% /
tmpfs                                     939M     0 939M   0% /dev/shm
/dev/vda1                                 485M   39M  421M   9% /boot
/dev/mapper/vg_tecmint_extra-tecmint_reduce_test 9.9G   3.9G   5.5G  42% /mnt/tecmint_reduce_test
[root@tecmin ~]#
[root@tecmin ~]#
[root@tecmin ~]# ls -l /mnt/tecmint_reduce_test/
total 14372
-rw-r--r--. 1 root root 4190876 Aug  3 17:51 03.Ingi Iduppalzhaka-N.Remix.mp3
-rw-r--r--. 1 root root 10485760 Aug  3 17:51 08. .... .mp3
drwx-r--r-- 27 root root  4096 Aug  3 17:57 2000-2002
drwx-r--r-- 22 root root  4096 Aug  3 17:51 2003-2004
drwx-r--r-- 20 root root  4096 Aug  3 17:51 2005
drwx-r--r-- 78 root root  4096 Aug  3 17:52 2006-2007
drwx-r--r--  4 root root  4096 Aug  3 17:52 2006-2007-2008-2009
drwx-r--r--  2 root root 16384 Aug  3 17:49 lost+found
[root@tecmin ~]#
```

Mount File System

Check the size of partition and files.

```
# lvdisplay vg_tecmint_extra
```

Here we can see the final result as the logical volume was reduced to 10GB size.

root@tecmin:~

```
[root@tecmin ~]#
[root@tecmin ~]# lvdisplay vg_tecmint_extra
--- Logical volume ---
LV Path                /dev/vg_tecmint_extra/tecmint_reduce_test
LV Name                 tecmint_reduce_test
VG Name                 vg_tecmint_extra
LV UUID                 inGw2j-eGwv-lqNr-xYpy-QTs3-Yihl-9e6DY8
LV Write Access         read/write
LV Creation host, time  tecmint.com, 2014-08-04 15:53:16 +0530
LV Status                available
# open                  0
LV Size                 10.00 GiB
Current LE              2559
Segments                1
Allocation               inherit
Read ahead sectors      auto
 - currently set to     256
Block device            253:2

[root@tecmin ~]#
```

Verify Logical Volume Size

In this article, we have seen how to extend the volume group, logical volume and reduce the logical volume. In the next part (Part III), we will see how to take a Snapshot of logical volume and restore it to earlier stage.