

How to create physical volume, volume group and logical volume

What is lvm (Logical volume Management), it's a set of utility provided by Linux os to manage hard disks by allocating disks, striping, mirroring and resizing etc.

with lvm tool a hard drive, or a set of hard drives is allocated to one or more physical volume. A physical volume or multiple physical volumes can be combined in to volume group and one or more logical volume can be created.

Below we can see using the fdisk command with -l (list) option.

```
[root@db12c02 yum.repos.d]# fdisk -l
```

```
Disk /dev/sda: 16.1 GB, 16106127360 bytes
255 heads, 63 sectors/track, 1958 cylinders
Units = cylinders of 16065 * 512 = 8225280 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk identifier: 0x000e63a5
```

```
Device Boot Start End Blocks Id System
/dev/sda1 * 1 64 512000 83 Linux
Partition 1 does not end on cylinder boundary.
/dev/sda2 64 1959 15215616 8e Linux LVM
```

```
Disk /dev/sdb: 32.2 GB, 32212254720 bytes
```

```
255 heads, 63 sectors/track, 3916 cylinders
Units = cylinders of 16065 * 512 = 8225280 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk identifier: 0x00006e50
```

```
Device Boot Start End Blocks Id System
```

```
Disk /dev/mapper/vg01-LogVol01: 11.3 GB, 11282677760 bytes
255 heads, 63 sectors/track, 1371 cylinders
Units = cylinders of 16065 * 512 = 8225280 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk identifier: 0x00000000
```

```
Disk /dev/mapper/vg01-LogVol00: 4294 MB, 4294967296 bytes
255 heads, 63 sectors/track, 522 cylinders
Units = cylinders of 16065 * 512 = 8225280 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk identifier: 0x00000000
```

As you can see my disk /dev/sdb is a newly added hard drive. So we will create partition using the below command

```
[root@db12c02 yum.repos.d]# fdisk /dev/sdb
```

```
WARNING: DOS-compatible mode is deprecated. It's strongly recommended to
switch off the mode (command 'c') and change display units to
sectors (command 'u').
```

```
Command (m for help): m
```

```
Command action
```

- a toggle a bootable flag
- b edit bsd disklabel
- c toggle the dos compatibility flag
- d delete a partition
- l list known partition types
- m print this menu
- n add a new partition
- o create a new empty DOS partition table
- p print the partition table
- q quit without saving changes
- s create a new empty Sun disklabel
- t change a partition's system id
- u change display/entry units
- v verify the partition table
- w write table to disk and exit
- x extra functionality (experts only)

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

```
Command action
```

- e extended
- p primary partition (1-4)

```
p
```

```
Partition number (1-4): 1
```

```
First cylinder (1-3916, default 1):
```

```
Using default value 1
```

```
Last cylinder, +cylinders or +size{K,M,G} (1-3916, default 3916):
```

```
Using default value 3916
```

```
Command (m for help): t [very important to change the system type to 8e as it refers to Linux LVM]
```

```
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.

Rescan the disk using the partprobe command

```
[root@db12c02 yum.repos.d]# partprobe
Warning: WARNING: the kernel failed to re-read the partition table on /dev/sda (Device or resource
busy). As a result, it may not reflect all of your changes until after reboot.
Warning: Unable to open /dev/sr0 read-write (Read-only file system). /dev/sr0 has been opened read-
only.
```

Check using the fdisk command if the partition is created.

```
[root@db12c02 yum.repos.d]# fdisk -l
```

```
Disk /dev/sda: 16.1 GB, 16106127360 bytes
255 heads, 63 sectors/track, 1958 cylinders
Units = cylinders of 16065 * 512 = 8225280 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk identifier: 0x000e63a5
```

Device	Boot	Start	End	Blocks	Id	System
/dev/sda1	*	1	64	512000	83	Linux

Partition 1 does not end on cylinder boundary.

/dev/sda2		64	1959	15215616	8e	Linux LVM
-----------	--	----	------	----------	----	-----------

```
Disk /dev/sdb: 32.2 GB, 32212254720 bytes
255 heads, 63 sectors/track, 3916 cylinders
Units = cylinders of 16065 * 512 = 8225280 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk identifier: 0x00006e50
```

Device	Boot	Start	End	Blocks	Id	System
/dev/sdb1		1	3916	31455238+	8e	Linux LVM

```
Disk /dev/mapper/vg01-LogVol01: 11.3 GB, 11282677760 bytes
255 heads, 63 sectors/track, 1371 cylinders
Units = cylinders of 16065 * 512 = 8225280 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk identifier: 0x00000000
```

```
Disk /dev/mapper/vg01-LogVol00: 4294 MB, 4294967296 bytes
255 heads, 63 sectors/track, 522 cylinders
Units = cylinders of 16065 * 512 = 8225280 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
```

I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk identifier: 0x00000000

Create physical volume using pvcreate command
[root@db12c02 yum.repos.d]# pvcreate /dev/sdb1
Physical volume "/dev/sdb1" successfully created

Display the information about physical volume
[root@db12c02 yum.repos.d]# pvdisplay

```
--- Physical volume ---
PV Name      /dev/sda2
VG Name      vg01
PV Size      14.51 GiB / not usable 3.00 MiB
Allocatable  yes (but full)
PE Size      4.00 MiB
Total PE     3714
Free PE      0
Allocated PE 3714
PV UUID      DkqoB6-k6Vz-Ezg1-txUX-s1JY-Wqvx-FTyIML
```

"/dev/sdb1" is a new physical volume of "30.00 GiB"

```
--- NEW Physical volume ---
PV Name      /dev/sdb1
VG Name
PV Size      30.00 GiB
Allocatable  NO
PE Size      0
Total PE     0
Free PE      0
Allocated PE 0
PV UUID      Jv9id0-Yroy-INGo-iRLN-EM34-vQNi-2Cc9b2
```

Create Volume group with one physical volume

[root@db12c02 yum.repos.d]# vgcreate vg02 /dev/sdb1
Volume group "vg02" successfully created

Create 20GB logical volume using lvcreate command as below

[root@db12c02 yum.repos.d]# lvcreate -L 20480M vg02 -n vg02-logvol00
Logical volume "vg02-logvol00" created

[root@db12c02 yum.repos.d]# lvdisplay

```
--- Logical volume ---
LV Path      /dev/vg02/vg02-logvol00
LV Name      vg02-logvol00
VG Name      vg02
LV UUID      gZixiT-5eV2-0LeW-HB64-qSvC-2oRe-5KXB12
```

LV Write Access read/write
LV Creation host, time db12c02.localdomain, 2013-08-06 18:52:56 +0300
LV Status available
open 0
LV Size 20.00 GiB
Current LE 5120
Segments 1
Allocation inherit
Read ahead sectors auto
- currently set to 256
Block device 252:2

--- Logical volume ---

LV Path /dev/vg01/LogVol01
LV Name LogVol01
VG Name vg01
LV UUID qIUePz-ZtAB-44a5-iVIE-0Ptf-dv1w-kpR1Ez
LV Write Access read/write
LV Creation host, time db12c02.localdomain, 2013-08-06 16:16:29 +0300
LV Status available
open 1
LV Size 10.51 GiB
Current LE 2690
Segments 1
Allocation inherit
Read ahead sectors auto
- currently set to 256
Block device 252:0

--- Logical volume ---

LV Path /dev/vg01/LogVol00
LV Name LogVol00
VG Name vg01
LV UUID 51erzf-Awly-zFv9-N8zv-lW9u-7cNe-vGRcLA
LV Write Access read/write
LV Creation host, time db12c02.localdomain, 2013-08-06 16:16:32 +0300
LV Status available
open 2
LV Size 4.00 GiB
Current LE 1024
Segments 1
Allocation inherit
Read ahead sectors auto
- currently set to 256
Block device 252:1

Format the newly created logical volume to ext4 filesystem
[root@db12c02 yum.repos.d]# mkfs.ext4 /dev/vg02/vg02-logvol00

```
mke2fs 1.41.12 (17-May-2010)
Filesystem label=
OS type: Linux
Block size=4096 (log=2)
Fragment size=4096 (log=2)
Stride=0 blocks, Stripe width=0 blocks
1310720 inodes, 5242880 blocks
262144 blocks (5.00%) reserved for the super user
First data block=0
Maximum filesystem blocks=4294967296
160 block groups
32768 blocks per group, 32768 fragments per group
8192 inodes per group
Superblock backups stored on blocks:
    32768, 98304, 163840, 229376, 294912, 819200, 884736, 1605632, 2654208,
    4096000
```

```
Writing inode tables: done
Creating journal (32768 blocks): done
Writing superblocks and filesystem accounting information: done
```

This filesystem will be automatically checked every 30 mounts or 180 days, whichever comes first. Use tune2fs -c or -i to override.

```
Now create directory to mount the newly created file system
[root@db12c02 yum.repos.d]# mkdir /u01
```

```
Mount the logical volume to the directory
[root@db12c02 yum.repos.d]# mount /dev/vg02/vg02-logvol00 /u01
```

Change the directory with the newly created mount poing and create some file

```
[root@db12c02 yum.repos.d]# cd /u01
[root@db12c02 u01]# touch file1 file2 file3
[root@db12c02 u01]# ls
file1 file2 file3 lost+found
[root@db12c02 u01]# ls -ltr
total 16
drwx-----. 2 root root 16384 Aug  6 18:54 lost+found
-rw-r--r--. 1 root root   0 Aug  6 18:55 file2
-rw-r--r--. 1 root root   0 Aug  6 18:55 file1
-rw-r--r--. 1 root root   0 Aug  6 18:55 file3
[root@db12c02 u01]# pvdisplay
--- Physical volume ---
PV Name      /dev/sdb1
VG Name      vg02
PV Size      30.00 GiB / not usable 2.01 MiB
Allocatable  yes
PE Size      4.00 MiB
```

Total PE 7679
Free PE 2559
Allocated PE 5120
PV UUID Jv9id0-Yroy-INGo-iRLN-EM34-vQNi-2Cc9b2

--- Physical volume ---

PV Name /dev/sda2
VG Name vg01
PV Size 14.51 GiB / not usable 3.00 MiB
Allocatable yes (but full)
PE Size 4.00 MiB
Total PE 3714
Free PE 0
Allocated PE 3714
PV UUID DkqoB6-k6Vz-Ezg1-txUX-s1JY-WqvX-FTyIML

[root@db12c02 u01]# lvs

--- Logical volume ---

LV Path /dev/vg02/vg02-logvol00
LV Name vg02-logvol00
VG Name vg02
LV UUID gZixiT-5eV2-0LeW-HB64-qSvC-2oRe-5KXBI2
LV Write Access read/write
LV Creation host, time db12c02.localdomain, 2013-08-06 18:52:56 +0300
LV Status available
open 1
LV Size 20.00 GiB
Current LE 5120
Segments 1
Allocation inherit
Read ahead sectors auto
- currently set to 256
Block device 252:2

--- Logical volume ---

LV Path /dev/vg01/LogVol01
LV Name LogVol01
VG Name vg01
LV UUID qIUEPz-ZtAB-44a5-iVIE-OPtf-dv1w-kpR1Ez
LV Write Access read/write
LV Creation host, time db12c02.localdomain, 2013-08-06 16:16:29 +0300
LV Status available
open 1
LV Size 10.51 GiB
Current LE 2690
Segments 1
Allocation inherit
Read ahead sectors auto

- currently set to 256
Block device 252:0

--- Logical volume ---

LV Path /dev/vg01/LogVol00
LV Name LogVol00
VG Name vg01
LV UUID 51erzf-Awly-zFv9-N8zv-IW9u-7cNe-vGRcLA
LV Write Access read/write
LV Creation host, time db12c02.localdomain, 2013-08-06 16:16:32 +0300
LV Status available
open 2
LV Size 4.00 GiB
Current LE 1024
Segments 1
Allocation inherit
Read ahead sectors auto
- currently set to 256
Block device 252:1

[root@db12c02 u01]# fdisk -l

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Device	Boot	Start	End	Blocks	Id	System
/dev/sdb1		1	3916	31455238+	8e	Linux LVM

Disk /dev/mapper/vg01-LogVol01: 11.3 GB, 11282677760 bytes
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Units = cylinders of 16065 * 512 = 8225280 bytes
Sector size (logical/physical): 512 bytes / 512 bytes

I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk identifier: 0x00000000

Disk /dev/mapper/vg01-LogVol00: 4294 MB, 4294967296 bytes
255 heads, 63 sectors/track, 522 cylinders
Units = cylinders of 16065 * 512 = 8225280 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk identifier: 0x00000000

Disk /dev/mapper/vg02-vg02--logvol00: 21.5 GB, 21474836480 bytes
255 heads, 63 sectors/track, 2610 cylinders
Units = cylinders of 16065 * 512 = 8225280 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk identifier: 0x00000000

Now change the fstab entry so that the newly created logical volume is mounted and available automatically on boot

```
# /etc/fstab
# Created by anaconda on Tue Aug 6 16:19:00 2013
#
# Accessible filesystems, by reference, are maintained under '/dev/disk'
# See man pages fstab(5), findfs(8), mount(8) and/or blkid(8) for more info
#
/dev/mapper/vg01-LogVol01 / ext4 defaults 1 1
UUID=85143375-4bf8-4369-b2d9-f71d2ba89a50 /boot ext4 defaults 1 2
/dev/mapper/vg01-LogVol00 swap swap defaults 0 0
tmpfs /dev/shm tmpfs defaults 0 0
devpts /dev/pts devpts gid=5,mode=620 0 0
sysfs /sys sysfs defaults 0 0
proc /proc proc defaults 0 0
/dev/vg02/vg02-logvol00 /u01 ext4 defaults 1 1 [Add this entry]
~
```