

Работа с дисками

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Работа с дисками parted

Before allocation:

```
server:/$ df -h
Filesystem      Size  Used Avail Use% Mounted on
udev            1.5G     0  1.5G   0% /dev
tmpfs           301M   1.1M  300M   1% /run
/dev/sda2       16G    13G   2.4G  84% /
tmpfs           1.5G     0  1.5G   0% /dev/shm
tmpfs           5.0M     0  5.0M   0% /run/lock
tmpfs           1.5G     0  1.5G   0% /sys/fs/cgroup
/dev/loop0      91M    91M     0 100% /snap/core/6350
tmpfs           301M     0  301M   0% /run/user/1000
```

Now extend the partition:

```
server:/$ sudo parted
[sudo] password for username:
GNU Parted 3.2
Using /dev/sda
Welcome to GNU Parted! Type 'help' to view a list of commands.
(parted) print
Model: VMware Virtual disk (scsi)
Disk /dev/sda: 32.2GB
Sector size (logical/physical): 512B/512B
Partition Table: gpt
Disk Flags:
Number  Start   End     Size    File system  Name  Flags
  1      1049kB 2097kB  1049kB                bios_grub
  2      2097kB 17.2GB  17.2GB  ext4
(parted) resizepart 2
Warning: Partition /dev/sda2 is being used. Are you sure you want to continue?
Yes/No? Yes
End?  [17.2GB]? 32.2GB
(parted) q
Information: You may need to update /etc/fstab.
```

5. Thereafter, grow the filesystem using the *resize2fs*:

```
server:/$ sudo resize2fs /dev/sda2
resize2fs 1.44.1 (24-Mar-2018)
Filesystem at /dev/sda2 is mounted on /; on-line resizing required
old_desc_blocks = 2, new_desc_blocks = 4
The filesystem on /dev/sda2 is now 7860816 (4k) blocks long.
```

Finally, the disk capacity has increased:

```
server:/$ df -h
```

Filesystem	Size	Used	Avail	Use%	Mounted on
udev	1.5G	0	1.5G	0%	/dev
tmpfs	301M	1.1M	300M	1%	/run
/dev/sda2	30G	15G	14G	53%	/
tmpfs	1.5G	0	1.5G	0%	/dev/shm
tmpfs	5.0M	0	5.0M	0%	/run/lock
tmpfs	1.5G	0	1.5G	0%	/sys/fs/cgroup
/dev/loop0	91M	91M	0	100%	/snap/core/6350
tmpfs	301M	0	301M	0%	/run/user/1000

Работа с дисками lvm

Команды с описанием

`df -h` - отображает статус дисков в файловой системе

`fdisk -l` - показать какие есть диски

`lsblk` - показать какие есть диски

`cfdisk /dev/sdb` - редактирование раздела sdb

`/etc/fstab` - тут прописываем новые диски

`mount /media/hdd2` - присоединяет диск, прописанный в файле *fstab* с именем *hdd2*

Обновление инфы о дисках

```
echo 1 > /sys/block/sda/device/rescan
```

```
echo "- - -" | tee /sys/class/scsi_host/host*/scan
```

How to add an extra second hard drive on Linux LVM and increase the size of storage

Author: Vivek Gite Last updated: August 6, 2023 [48 comments](#)

I have 250GB disk installed on my home Linux server. I just bought a brand new 250GB SATA disk

and I want to add a new disk to my existing LVM volume to increase its size total size to 500GB. How do I add a disk to LVM and extend an LVM volume on Linux operating system?

Logical volume management (LVM) creates an easy to use layer over physical disks. You can combine multiple disks and create logical storage volumes. This provides specific benefits such as:

1. No restriction on disk size
2. Increased disk throughput
3. Mirroring volumes for business critical data
4. Volume snapshots
5. Easy backups and restores using snapshots
6. Easy data relocation
7. Resizing storage pools (add or remove disks) without reformatting disks

This tutorial **shows you how to make partitioning, formatting, and add a new disk to LVM volume on Linux**. For demo purpose, I am using Ubuntu VM, but the commands remain same for bare metal or any other virtualization technology such as KVM, Xen, VMware and so on.

Warning: Be careful with `lvm/mkfs.ext4` and other commands, and device names as wrong device name can wipe out all data. **Proceed with caution** and always keep full backups. The nixCraft or author is not responsible for data loss.

Step 1 – Find out information about existing LVM

LVM Storage Management divided into three parts:

1. **Physical Volumes (PV)** – Actual disks (e.g. `/dev/sda`, `/dev/sdb`, `/dev/vdb` and so on)
2. **Volume Groups (VG)** – Physical volumes are combined into volume groups. (e.g. `my_vg = /dev/sda + /dev/sdb`.)
3. **Logical Volumes (LV)** – A volume group is divided up into logical volumes (e.g. `my_vg` divided into `my_vg/data`, `my_vg/backups`, `my_vg/home`, `my_vg/mysql` and so on)

Type the following commands to find out information about each part.

How to display physical volumes (pv)

Type the following `pvs` command to see info about physical volumes:

```
$ sudo pvs
```

Sample outputs:

[Fig.01: How to display information about LVM physical volumes](#)

Fig.01: How to display information about LVM physical volumes

So currently my LVM include a physical volume (actual disk) called /dev/vda5. To see detailed attributes information, type:

```
$ sudo pvdisplay
```

Sample outputs:

[Fig.02: See attributes of a physical volume \(PV\)](#)

Fig.02: See attributes of a physical volume (PV)

From above output it is clear that our volume group named ubuntu-box-1-vg is made of a physical volume named /dev/vda5.

How to display information about LVM volume Groups (vg)

Type any one of the following vgs command/vgdisplay command to see information about volume groups and its attributes:

```
$ sudo vgs
```

OR

```
$ sudo vgdisplay
```

Sample outputs:

[Fig.03: How to see information about LVM volume groups \(vg\)](#)

Fig.03: How to see information about LVM volume groups (vg)

How to display information about LVM logical volume (lv)

Type any one of the following lvs command/lvdisplay command to see information about volume groups and its attributes:

```
$ sudo lvs
```

OR

```
$ sudo lvdisplay
```

Sample outputs:

[Fig.04: How to display information about logical volumes \(lv\)](#)

Fig.04: How to display information about logical volumes (lv)

My ubuntu-box-1-vg volume group divided into two logical volumes:

1. /dev/ubuntu-box-1-vg/root – Root file system
2. /dev/ubuntu-box-1-vg/swap_1 – Swap space

Based upon above commands, you can get a basic idea how LVM organizes storage device into Physical Volumes (PV), Volume Groups (VG), and Logical Volumes (LV):

[Fig.05: How LVM organizes storage device into Physical Volumes \(PV\), Volume Groups \(VG\), & Logical Volumes \(LV\)](#)

Fig.05: How LVM organizes storage device into Physical Volumes (PV), Volume Groups (VG), & Logical Volumes (LV)

Step 2 – Find out information about new disk

You need to add a new disk to your server. In this example, for demo purpose I added a new disk drive, and it has 5GiB size. To find out information about new disks run:

```
$ sudo fdisk -l
```

OR

```
$ sudo fdisk -l | grep '^Disk /dev/'
```

Sample outputs:

[Fig.06: Find out installed disk names on Linux](#)

Fig.06: Find out installed disk names on Linux

Another option is to scan for all devices visible to LVM2:

```
$ sudo lvmdiskscan
```

Sample outputs:

```
/dev/ram0          [      64.00 MiB]
/dev/ubuntu-box-1-vg/root [    37.49 GiB]
/dev/ram1          [      64.00 MiB]
/dev/ubuntu-box-1-vg/swap_1 [     2.00 GiB]
/dev/vda1          [   487.00 MiB]
/dev/ram2          [      64.00 MiB]
/dev/ram3          [      64.00 MiB]
/dev/ram4          [      64.00 MiB]
/dev/ram5          [      64.00 MiB]
/dev/vda5          [   39.52 GiB] LVM physical volume
/dev/ram6          [      64.00 MiB]
```

```
/dev/ram7          [      64.00 MiB]
/dev/ram8          [      64.00 MiB]
/dev/ram9          [      64.00 MiB]
/dev/ram10         [      64.00 MiB]
/dev/ram11         [      64.00 MiB]
/dev/ram12         [      64.00 MiB]
/dev/ram13         [      64.00 MiB]
/dev/ram14         [      64.00 MiB]
/dev/ram15         [      64.00 MiB]
/dev/vdb           [      5.00 GiB]
2 disks
18 partitions
0 LVM physical volume whole disks
1 LVM physical volume
```

Step 3 – Create physical volumes (pv) on new disk named /dev/vdb

Type the following command:

```
$ sudo pvcreate /dev/vdb
```

Sample outputs:

```
Physical volume "/dev/vdb" successfully created
```

Now run the following command to verify:

```
$ sudo lvmdiskscan -l
```

Sample outputs:

```
WARNING: only considering LVM devices
/dev/vda5          [      39.52 GiB] LVM physical volume
/dev/vdb           [      5.00 GiB] LVM physical volume
1 LVM physical volume whole disk
1 LVM physical volume
```

Step 4 – Add newly created pv named /dev/vdb to an existing lv

Type the following command to add a physical volume /dev/vdb to “ubuntu-box-1-vg” volume group:

```
$ sudo vgextend ubuntu-box-1-vg /dev/vdb
```

Sample outputs:

```
Volume group "ubuntu-box-1-vg" successfully extended
```

Finally, you need extend the /dev/ubuntu-box-1-vg/root to create total 45GB (/dev/vdb (5G)+ existing /dev/ubuntu-box-1-vg/root (40G))

```
$ sudo lvm lvextend -l +100%FREE /dev/ubuntu-box-1-vg/root
```

Sample outputs:

```
Size of logical volume ubuntu-box-1-vg/root changed from 37.49 GiB (9597 extents) to 42.52 GiB (10448 extents).
Logical volume root successfully resized.
```

However, if you run `df -h` or any other command you will still see /dev/ubuntu-box-1-vg/root as 40G. You need to run the following command to enlarge the filesystem created inside the “root” volume:

```
$ sudo resize2fs -p /dev/mapper/ubuntu--box--1--vg-root
```

Sample outputs:

```
resize2fs 1.42.13 (17-May-2015)
Filesystem at /dev/mapper/ubuntu--box--1--vg-root is mounted on /; on-line resizing required
old_desc_blocks = 3, new_desc_blocks = 3
The filesystem on /dev/mapper/ubuntu--box--1--vg-root is now 11146240 (4k) blocks long.
```

Verify it again using the [df command](#) or mount command. For example:

```
$ mount
```

```
$ mount | grep '/dev/mapper/ubuntu'
```

OR

```
$ df -H
```

Sample outputs:

Filesystem	Size	Used	Avail	Use%	Mounted on
udev	1.1G	0	1.1G	0%	/dev
tmpfs	146M	12M	135M	9%	/run
/dev/mapper/ubuntu--box--1--vg-root	45G	2.3G	41G	6%	/
tmpfs	512M	0	512M	0%	/dev/shm
tmpfs	5.3M	0	5.3M	0%	/run/lock
tmpfs	512M	0	512M	0%	/sys/fs/cgroup
/dev/vda1	495M	109M	361M	24%	/boot
tmpfs	103M	0	103M	0%	/run/user/0

Изменения размера раздела

Complete Steps and Explanation

ssh to server, sudo -i to become root

Confirm there is a limited amount of disk space. In the output below, note the / (root) volume only has 3.9 GB disk space:

```
user@server:~$ df -h
Filesystem Size Used Avail Use% Mounted on
udev      1.9G  0  1.9G   0% /dev
tmpfs     394M  1.1M  393M   1% /run
/dev/mapper/ubuntu--vg-ubuntu--lv 3.9G  3.2G  489M  87% /
tmpfs     2.0G  0  2.0G   0% /dev/shm
tmpfs     5.0M  0  5.0M   0% /run/lock
tmpfs     2.0G  0  2.0G   0% /sys/fs/cgroup
/dev/loop0 89M  89M  0 100% /snap/core/7270
/dev/sda2 976M  77M  833M   9% /boot
/dev/loop1 90M  90M  0 100% /snap/core/7713
tmpfs     394M  0  394M   0% /run/user/1000
```

Next confirm in Linux that there is actually a lot more space available. As you will see from the output below, there is **24G** on the **/dev/sda3** volume. The other 1GB is used in the boot volume and the **BIOS boot**

```
user@server:~# fdisk -l
Disk /dev/loop0: 88.5 MiB, 92778496 bytes, 181208 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/loop1: 89 MiB, 93327360 bytes, 182280 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/sda: 25 GiB, 26843545600 bytes, 52428800 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 4096 bytes
I/O size (minimum/optimal): 4096 bytes / 4096 bytes
Disklabel type: gpt
Disk identifier: ED41F7A6-5D09-457B-A55C-C7F1E30DE419
```

```
Device Start End Sectors Size Type
/dev/sda1 2048 4095 2048 1M BIOS boot
/dev/sda2 4096 2101247 2097152 1G Linux filesystem
/dev/sda3 2101248 52426751 50325504 24G Linux filesystem
```

```
Disk /dev/mapper/ubuntu--vg-ubuntu--lv: 4 GiB, 4294967296 bytes, 8388608 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 4096 bytes
I/O size (minimum/optimal): 4096 bytes / 4096 bytes
```

The one set of instructions referred to starting this process using `parted`, so parted log is below. The instructions as per Stack read something like:

“First you need to run parted and use its `resizepart` command to expand the partition to use the whole disk, then run `pvresize` to tell LVM about the new space, then run `lvresize` to grow the logical volume, and finally `resize2fs` on the logical volume to grow the filesystem to use the new space. This can be done without a reboot.”

Please note however I diverted slightly from these steps. The first command I learnt / used in parted, was just used to print the partition information:

```
user@server:~# parted
GNU Parted 3.2
Using /dev/sda
Welcome to GNU Parted! Type 'help' to view a list of commands.
(parted) print
Model: Msft Virtual Disk (scsi)
Disk /dev/sda: 26.8GB
```

```
Sector size (logical/physical): 512B/4096B
Partition Table: gpt
Disk Flags:

Number Start End Size File system Name Flags
1 1049kB 2097kB 1049kB bios_grub
2 2097kB 1076MB 1074MB ext4
3 1076MB 26.8GB 25.8GB

(parted) quit
```

This was followed by me checking and re-checking information using `fdisk` and `df -h` to make sure I was understanding the current situation.

Then I finally started the procedure:

```
user@server:~# parted
GNU Parted 3.2
Using /dev/sda
Welcome to GNU Parted! Type 'help' to view a list of commands.
(parted) resizepart
Partition number? 3
End? [26.8GB]?
(parted) quit
Information: You may need to update /etc/fstab.
```

...

```
user@server:~# pvresize /dev/sda3
Physical volume "/dev/sda3" changed
1 physical volume(s) resized / 0 physical volume(s) not resized
```

At this point I tried using `lvresize` but couldn't get it to work. It appears there is both `lvresize` and `lvextend`. As per the "microhowto.info" article:

"The difference is that `lvextend` can only increase the size of a volume, whereas `lvresize` can increase or reduce it."

The first attempt at specifying 24GB did not work. After I completed the procedure I found that you can also specify a flag 100%, but unfortunately, I didn't get that information in time and just ended up specifying 23GB. If I have the time I might try and use the 100% flag. For reference, the flag is

```
lvextend -l +100%FREE /dev/VGNAME/LVNAME
```

Below first attempt but insufficient space:

```
user@server:~# lvextend --size 24G /dev/mapper/ubuntu--vg-ubuntu--lv
Insufficient free space: 5120 extents needed, but only 5119 available
```

Second attempt reducing space to allocate:

```
user@server:~# lvextend --size 23G /dev/mapper/ubuntu--vg-ubuntu--lv
Size of logical volume ubuntu-vg/ubuntu-lv changed from 4.00 GiB (1024 extents) to 23.00 GiB (5888 extents).
Logical volume ubuntu-vg/ubuntu-lv successfully resized.
```

After `lvextend`, one has to use `resize2fs`. This was kind of scary because it appeared I was going to work on a live disk, but it went quick.

```
user@server:~# resize2fs /dev/mapper/ubuntu--vg-ubuntu--lv
resize2fs 1.44.1 (24-Mar-2018)
Filesystem at /dev/mapper/ubuntu--vg-ubuntu--lv is mounted on /; on-line resizing required
old_desc_blocks = 1, new_desc_blocks = 3
The filesystem on /dev/mapper/ubuntu--vg-ubuntu--lv is now 6029312 (4k) blocks long.
```

TADA! The disk is now 23G big as seen by `df-h` output below:

```
user@server:~# df -h
Filesystem Size Used Avail Use% Mounted on
udev      1.9G  0  1.9G   0% /dev
tmpfs     394M  1.1M  393M   1% /run
/dev/mapper/ubuntu--vg-ubuntu--lv 23G  3.2G  19G  15% /
tmpfs     2.0G  0  2.0G   0% /dev/shm
tmpfs     5.0M  0  5.0M   0% /run/lock
tmpfs     2.0G  0  2.0G   0% /sys/fs/cgroup
/dev/loop0 89M  89M  0 100% /snap/core/7270
/dev/sda2 976M  77M  833M   9% /boot
/dev/loop1 90M  90M  0 100% /snap/core/7713
tmpfs     394M  0  394M   0% /run/user/1000
user@server:~#
```

В Centos 7 файловая система по умолчанию- **xfs** .

поддержка файловой системы xfs только расширяется, а не уменьшается. Поэтому, если вы хотите изменить размер файловой системы, используйте `xfs_growfs`, а не `resize2fs`.

```
xfs_growfs /dev/root_vg/root
```

Примечание: Для использования файловой системы ext4

```
resize2fs /dev/root_vg/root
```

How to expand /dev/mapper/cl-root (/dev/mapper/centos-root)

Step-by-step instructions

When adding a Code Sample, please choose the 'Normal (DIV)' formatting, in order to avoid text glitch over the page borders

---You MUST be root to perform the below steps---

1. Check the current disk status to ensure dev/mapper/cl-root (/dev/mapper/centos-root) is exactly 50G and /dev/mapper/cl-home (/dev/mapper/centos-home) is much larger in size.

df -h

Example:

```
[root@ptaserver /]# df -h
Filesystem      Size  Used Avail Use% Mounted on
devtmpfs        7.8G   0  7.8G   0% /dev
tmpfs           7.8G   0  7.8G   0% /dev/shm
tmpfs           7.8G 802M  7.0G  11% /run
tmpfs           7.8G   0  7.8G   0% /sys/fs/cgroup
/dev/mapper/cl-root  50G  11G   40G  22% /
/dev/sda1       1014M 265M  750M  27% /boot
/dev/mapper/cl-home 441G  33M 441G   1% /home
tmpfs           1.6G   0  1.6G   0% /run/user/1001
tmpfs           1.6G   0  1.6G   0% /run/user/1007
tmpfs           1.6G   0  1.6G   0% /run/user/1003
tmpfs           1.6G   0  1.6G   0% /run/user/1005
tmpfs           1.6G   0  1.6G   0% /run/user/1006
tmpfs           1.6G   0  1.6G   0% /run/user/1008
tmpfs           1.6G   0  1.6G   0% /run/user/0
```

2. Stop PTA

service appmgr stop

3. Copy everything from the home directory out

cp -a /home /home2

4. Unmount the volume

umount /dev/mapper/cl-home (umount /dev/mapper/centos-home)

5. Delete the home logical volume

lvremove /dev/mapper/cl-home (lvremove /dev/mapper/centos-home)

Example:

```
[root@ptaserver /]# lvremove /dev/mapper/cl-home
Do you really want to remove active logical volume cl/home? [y/n]: y
Logical volume "home" successfully removed
```

6. Extend the root logical volume to take up the rest of the space

lvextend -l +100%FREE /dev/mapper/cl-root (lvextend -l +100%FREE /dev/mapper/centos-root)

Example:

```
[root@ptaserver /]# lvextend -l +100%FREE /dev/mapper/cl-root
Size of logical volume cl/root changed from 50.00 GiB (12800 extents) to 481.12 GiB (123167 ex
Logical volume cl/root successfully resized.
```

7. Extend the xfs partition

xfs_growfs /dev/mapper/cl-root (xfs_growfs /dev/mapper/centos-root)

Example:

```
[root@ptaserver /]# xfs_growfs /dev/mapper/cl-root
meta-data=/dev/mapper/cl-root    isize=512    agcount=4, agsize=3276800 blks
      =                       sectsz=512    attr=2, projid32bit=1
      =                       crc=1        finobt=0 spinodes=0
data      =                       bsize=4096   blocks=13107200, imaxpct=25
      =                       sunit=0      swidth=0 blks
naming    =version 2             bsize=4096   ascii-ci=0 ftype=1
log       =internal             bsize=4096   blocks=6400, version=2
      =                       sectsz=512   sunit=0 blks, lazy-count=1
realtime  =none                 extsz=4096   blocks=0, rtextents=0
data blocks changed from 13107200 to 128744448
```

8. Check that /dev/mapper/cl-root (/dev/mapper/centos-root) has been increased in size and that /dev/mapper/cl-home (/dev/mapper/centos-home) has been removed

df -h

Example:

```
[root@ptaserver /]# df -h
Filesystem      Size  Used Avail Use% Mounted on
devtmpfs        7.8G   0    7.8G   0% /dev
tmpfs           7.8G   0    7.8G   0% /dev/shm
tmpfs           7.8G  810M   7.0G  11% /run
tmpfs           7.8G   0    7.8G   0% /sys/fs/cgroup
/dev/mapper/cl-root 492G  11G  481G   3% /
/dev/sda1       1014M  265M   750M  27% /boot
tmpfs           1.6G   0    1.6G   0% /run/user/1001
tmpfs           1.6G   0    1.6G   0% /run/user/0
tmpfs           1.6G   0    1.6G   0% /run/user/1007
tmpfs           1.6G   0    1.6G   0% /run/user/1003
tmpfs           1.6G   0    1.6G   0% /run/user/1005
tmpfs           1.6G   0    1.6G   0% /run/user/1006
tmpfs           1.6G   0    1.6G   0% /run/user/1008
```

9. Move the home directory data back and remove the temporary home2 directory

```
mv /home2/* /home/
rmdir /home2
```

10. Remove the /dev/mapper/cl-home (lvremove /dev/mapper/centos-home) entry from /etc/fstab

```
vi /etc/fstab
```

DELETE the line:

/dev/mapper/cl-home	/home	xfs	defaults	0 0
---------------------	-------	-----	----------	-----

11. Start PTA

```
service appmgr start
```

12. Run Diagnostics to ensure PTA is functioning again:

```
RUN_DIAGNOSTICS
```