

LVM

LVM ????

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Learning

????????????

- [How to Resize LVM Partition Inside an Extended Partition](#)

LVM Snapshot

- [Use LVM Snapshot To Backup Your Data In Linux - OSTechNix](#)

????

Logical Volume - LV

```
# 查看 LV 信息
```

```
lvdisplay -C
```

```
# 创建 LV
```

```
lvcreate -L 10G -n LV_name VG_name
```

```
# 删除 LV
```

```
lvremove /dev/VG_name>/LV_name
```

```
# 重命名 LV
```

```
lvrename /dev/VG-name/old-LV-name /dev/VG-name/new-LV-name
```

```
# 查看 LV 列表
```

```
lvs
```

```
lvs -a -o name,copy_percent,devices
```

```
lvs -a -o name,copy_percent,devices <vg-name>
```

```
lvs -a --segments -o +devices
```

```
# 扩展 LV 大小
```

```
lvextend -L +2G /dev/vg/lv
```

```
lvextend -l +100%FREE /dev/vg_db2v9/lv_root
```

```
ext2online /dev/vg/lv (RHEL v4)
```

```
resize2fs /dev/vg/lv (RHEL v5,6)
```

```
xfs_growfs /dev/vg/lv (RHEL v7 with XFS filesystem)
```

```
btrfs filesystem resize max <mount-point> (Fedora 40)
```

```
# 删除 LV (RHEL v4)
```

```
# 445GB -> 2GB
```

```
umount /worktmp
```

```
e2fsck -f /dev/rootVG/worktmpLV
```

```
resize2fs /dev/rootVG/worktmpLV 1843M
```

```

lvreduce -L 2GB /dev/rootVG/worktmpLV
resize2fs /dev/rootVG/worktmpLV
mount /worktmp

# 1843MB 2GB 90% GB

# Shrinking LV (RHEL 5/6)
# 100 GB -> 5GB
umount /opt/oracle/arclog
resize2fs /dev/VolGroup00/arclogLV 5G
lvreduce -L 5G /dev/VolGroup00/arclogLV
e2fsck -f /dev/VolGroup00/arclogLV
mount /opt/oracle/arclog

```

Volume Group - VG

```

# VG
vgdisplay -C

# / VG
vgchange -a y VG_name
vgchange -a n VG_name
# vgdisplay /dev/**

# VG
vgcreate VG_name /dev/pv1 /dev/pv2

# VG
vgrename vg_esxa01db01 vg_root

# VG
vgremove VG_name

# PV VG
vgextend VG_name /dev/pv3

# VG PV
# NOTE: PV (pvs -o+pv_used)
vgreduce VG_name /dev/mypv

```

Physical Volume - PV

```
# [ ] PV [ ]
pvdisplay -C

# [ ] PV [ ]
pvs -o+pv_used

# [ ] PV
pvcreate /dev/hdd1

# [ ] PV
pvremove /dev/hdd1

# [ ] disk [ ] PV[ ]
dd if=/dev/zero of=/dev/sdd bs=512 count=1

# [ ] LUN Disk [ ]
pvresize /dev/sd[X]
```

LVM ???????

“ ? RHEL 8 ???? LVM ??????????:

Do you want to remove the signature? [Y]es/[N]o:

?: ????? N????????????????

?: ??? LVM ?????????????????????? reboot ???

pvs

???????? PV disk????????????

Extend PV Disk: /dev/sda2 50GB to 100GB

```
[root@my-db2v11fp7 ~]# lsblk
NAME          MAJ:MIN RM  SIZE RO TYPE MOUNTPOINT
sda            8:0    0 100G  0 disk
```

```
└─sda1      8:1  0  1G  0 part /boot
└─sda2      8:2  0 49G  0 part
  └─rootvg-root 253:0  0 15G  0 lvm /
  └─rootvg-swap 253:1  0  4G  0 lvm [SWAP]
    └─rootvg-worktmp 253:2  0 512M  0 lvm /worktmp
sr0          11:0  1 1024M  0 rom
```

[root@my-db2v11fp7 ~]# pvs

```
PV      VG   Fmt Attr PSize  PFree
/dev/sda2 rootvg lvm2 a-- <49.00g <29.50g
```

[root@my-db2v11fp7 ~]# fdisk -ul /dev/sda

Command (m for help): p

Disk /dev/sda: 107.4 GB, 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

Disk label type: dos

Disk identifier: 0x000def6b

Device	Boot	Start	End	Blocks	Id	System
/dev/sda1	*	2048	2099199	1048576	83	Linux
/dev/sda2		2099200	104857599	51379200	8e	Linux LVM

Command (m for help): d

Partition number (1,2, default 2): 2

Partition 2 is deleted

Command (m for help): p

Disk /dev/sda: 107.4 GB, 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

Disk label type: dos

Disk identifier: 0x000def6b

Device	Boot	Start	End	Blocks	Id	System
/dev/sda1	*	2048	2099199	1048576	83	Linux

Command (m for help): n

Partition type:

- p primary (1 primary, 0 extended, 3 free)
- e extended

Select (default p): p

Partition number (2-4, default 2): 2

First sector (2099200-209715199, default 2099200):

Using default value 2099200

Last sector, +sectors or +size{K,M,G} (2099200-209715199, default 209715199):

Using default value 209715199

Partition 2 of type Linux and of size 99 GiB is set

Command (m for help): t

Partition number (1,2, default 2): 2

Hex code (type L to list all codes): 8e

Changed type of partition 'Linux' to 'Linux LVM'

Command (m for help): p

Disk /dev/sda: 107.4 GB, 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

Disk label type: dos

Disk identifier: 0x000def6b

Device	Boot	Start	End	Blocks	Id	System
/dev/sda1	*	2048	2099199	1048576	83	Linux
/dev/sda2		2099200	209715199	103808000	8e	Linux LVM

Command (m for help): w

The partition table has been altered!

Calling ioctl() to re-read partition table.

WARNING: Re-reading the partition table failed with error 16: Device or resource busy.

The kernel still uses the old table. The new table will be used at

the next reboot or after you run partprobe(8) or kpartx(8)

Syncing disks.

```
[root@my-db2v11fp7 ~]# reboot
```

```
[root@my-db2v11fp7 ~]# lsblk
```

NAME	MAJ:MIN	RM	SIZE	RO	TYPE	MOUNTPOINT
sda	8:0	0	100G	0	disk	
└─sda1	8:1	0	1G	0	part	/boot
└─sda2	8:2	0	99G	0	part	
└─rootvg-root	253:0	0	15G	0	lvm	/
└─rootvg-swap	253:1	0	4G	0	lvm	[SWAP]
└─rootvg-worktmp	253:2	0	512M	0	lvm	/worktmp
sr0	11:0	1	1024M	0	rom	

```
[root@my-db2v11fp7 ~]# pvresize /dev/sda2
```

```
Physical volume "/dev/sda2" changed
```

```
1 physical volume(s) resized or updated / 0 physical volume(s) not resized
```

```
[root@my-db2v11fp7 ~]# pvs
```

PV	VG	Fmt	Attr	PSize	PFree
/dev/sda2	rootvg	lvm2	a--	<99.00g	<79.50g

?????

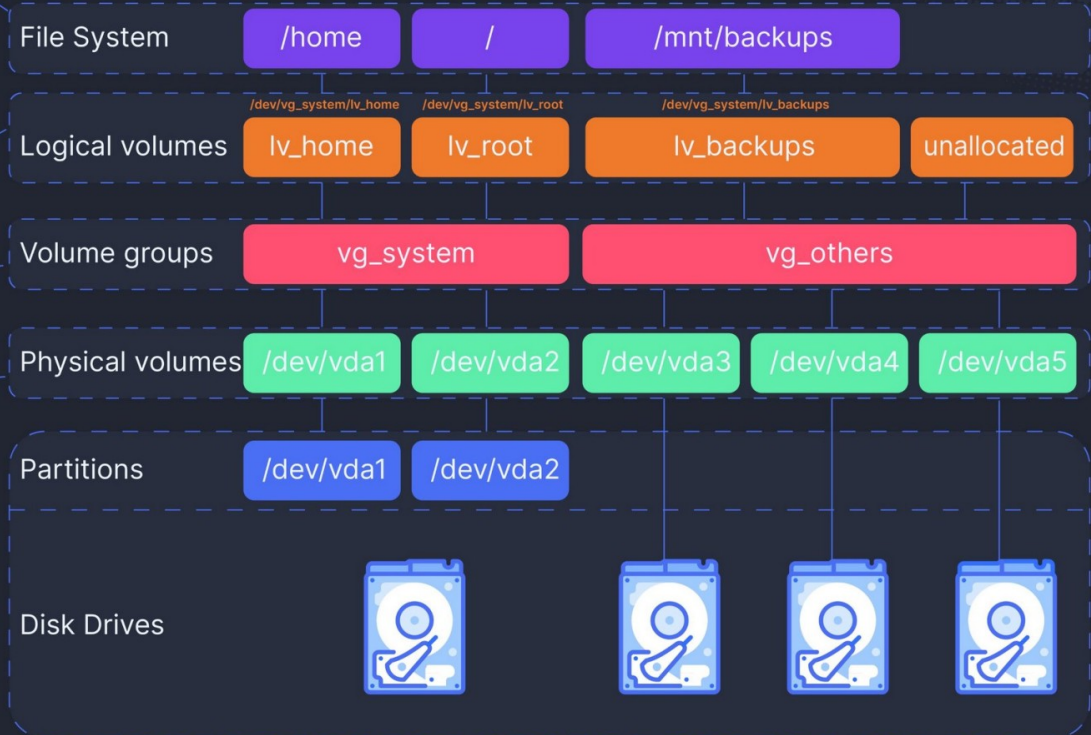
Linux Logical Volume Manager

The filesystem sits on top of the logical volume and it will be formatted to a specific fs type (vfat, xfs, ext4) and mounted anywhere on the system

A Logical Volume sits inside a Volume Group and it's what is assigned to a file system.

A Volume Group can have multiple physical Volumes

Physical volumes are directly related to hard drives or partitions



Volume Group Management Commands

Command	Description
<code>vgcreate</code>	Create a volume group
<code>vgscan</code>	Search for all volume groups
<code>vgdisplay</code> , <code>vgs</code>	Display information about vgs
<code>vgextend</code>	Add physical volumes to a vg
<code>vgremove</code>	Remove volume group(s)
<code>vgrename</code>	Rename a volume group
<code>vgchange</code>	Change volume group attributes
<code>vgck</code>	Check the consistency of vgs
<code>vgmerge</code>	Merge volume groups
<code>vgsplit</code>	Move pvs into a new or existing vg
<code>vgcfgbackup</code>	Backup vg configuration(s)
<code>vgcfgrestore</code>	Restore vg configuration
<code>vgconvert</code>	Convert vg metadata format
<code>vgexport</code>	Unregister vgs from the system
<code>vgimport</code>	Register exported vg with system
<code>vgimportclone</code>	Import a vg from cloned pvs
<code>vgmknodes</code>	Create the special files for vg devices in /dev

Physical Volume Management Commands

Command	Description
<code>pvcreate</code>	Initialize a disk or partition for use as a physical volume
<code>pvs</code>	Scan all disks for pvs
<code>pvdisplay</code> , <code>pvs</code>	Display information about pvs
<code>pvresize</code>	resize a physical volume
<code>pvmove</code>	Move extents from one physical volume to another
<code>pvck</code>	Check metadata on pvs
<code>pvremove</code>	Remove LVM label(s) from pvs
<code>pvchange</code>	Change attributes of physical volumes

Logical Volume Management Commands

Command	Description
<code>lvcreate</code>	Create a logical volume
<code>lvscan</code>	Scan (all disks) for lvs
<code>lvdisplay</code> , <code>lvs</code>	Display info about lvs
<code>lvextend</code>	Extend size of a lv
<code>lvremove</code>	Remove a logical volume
<code>lvrename</code>	Rename a logical volume
<code>lvchange</code>	Change attributes of a lv
<code>lvreduce</code> , <code>lvresize</code>	Reduce and resize the size of a logical volume
<code>lvconvert</code>	Convert a logical volume from linear to mirrored

Examples

Create Physical Volumes

```
$ sudo pvcreate /dev/vda1 /dev/vda2 /dev/vda3 /dev/vda4 /dev/vda5
```

Create Volume groups

```
$ sudo vgcreate vg_system /dev/vda1 /dev/vda2
$ sudo vgcreate vg_others /dev/vda3 /dev/vda4 /dev/vda5
```

Create Logical Volumes

```
$ sudo lvcreate -L 20GB -n lv_home vg_system
$ sudo lvcreate -L 35GB -n lv_root vg_system
$ sudo lvcreate -L 70GB -n lv_backups vg_others
```

FAQ

???? PV

“ Device /dev/sdj not found (or ignored by filtering).

Solution: ????????????

```
# fdisk -l /dev/sdj
```

WARNING: GPT (GUID Partition Table) detected on '/dev/sdj'! The util fdisk doesn't support GPT. Use GNU Parted.

Disk /dev/sdj: 3848.3 GB, 3848290697216 bytes

255 heads, 63 sectors/track, 467861 cylinders

Units = cylinders of 16065 * 512 = 8225280 bytes

Sector size (logical/physical): 512 bytes / 4096 bytes

I/O size (minimum/optimal): 4096 bytes / 4096 bytes

Disk identifier: 0x00000000

Device	Boot	Start	End	Blocks	Id	System
/dev/sdj1		1	267350	2147483647+	ee	GPT

Partition 1 does not start on physical sector boundary.

??????????????????

?????? PV

???????? PV ? VG ? LV

“ ??? PV - /dev/sdc ??????? VG ? LV ??????????

Couldn't find device with uuid APgmaN-yCZG-WfQS-L5zm-vd6g-oEJc-WjzNrT.

Can't remove locked LV isths_DMS

Couldn't find device with uuid APgmaN-yCZG-WfQS-L5zm-vd6g-oEJc-WjzNrT.

WARNING: Partial LV isths_home needs to be repaired or removed.

WARNING: Partial LV isths_DMS needs to be repaired or removed.

WARNING: Partial LV pvmove0 needs to be repaired or removed.

There are still partial LVs in VG vg_db.

To remove them unconditionally use: vgreduce --removemissing --force.

Proceeding to remove empty missing PVs.

Solution: VG Name: vg_db

```
# vgcfgbackup vg_db
```

```
Couldn't find device with uuid APgmaN-yCZG-WfQS-L5zm-vd6g-oEJc-WjzNrT.
```

```
Volume group "vg_db" successfully backed up.
```

/etc/lvm/backup/vg_db:

```
...
logical_volumes {
...
...
}
...
```

“ ??? logical_volumes ?????

?? vgcfgrestore

```
# vgcfgrestore vg_db
```

```
Restored volume group vg_db
```

???????????? LV ? VG

```
pvs
vgs
lvs
```

```
vgremove vg_db
```

USB ????? LVM ????????????

```
“ # mount -t ext3 /dev/VolGroup00/LogVol00 /mnt/lvm00
   mount: wrong fs type, bad option, bad superblock on
   /dev/mapper/VolGroup00-LogVol00,
       missing codepage or helper program, or other error
   In some cases useful info is found in syslog - try
   dmesg | tail or so
```

Solution:

```
vgchange -an VolGroup00
vgchange -ay VolGroup00
mount -t ext3 /dev/VolGroup00/LogVol00 /mnt/lvm00
```

???? LV

?????????? pvdisplay -C ????????????? LV

```
“ Couldn't find device with uuid ZrneWS-8KHd-UiXV-rQ4q-YU0o-r9Ga-
  0ZVBPW
```

Solution: ??????????? LVM ?????????????????????????????????????

```
# vgreduce -removemissing <vg-name>
```

“ TIPS?

?????????? device ??? VG?????? pvdisplay ?

?? GPT ??

With parted

```
# parted /dev/vdb
```

```
GNU Parted 3.4
```

```
Using /dev/vdb
```

```
Welcome to GNU Parted! Type 'help' to view a list of commands.
```

```
(parted) mklabel GPT
```

```
(parted) mkpart primary 2048s 100%
```

```
(parted) q
```

```
Information: You may need to update /etc/fstab.
```

????

VG Import/Export

???? VG ??????????????

“ ?????????????? VG ? Exort????? VG Import?

- [How To Move LVM Volume Group To Another Machine In Linux](#)

?? PV Disk

????? LV ?????????? PV Disk (/dev/sdb1)

“ NOTE: ?? LV ??? VG ????????????

https://access.redhat.com/site/documentation/en-US/Red_Hat_Enterprise_Linux/6/html-single/Logical_Volume_Manager_Administration/index.html#disk_remove_ex

<http://www.tecmint.com/lvm-storage-migration/>

```
# pvs -o+pv_used
PV      VG  Fmt Attr PSize PFree Used
/dev/sda1 myvg lvm2 a- 17.15G 12.15G 5.00G
/dev/sdb1 myvg lvm2 a- 17.15G 12.15G 5.00G
/dev/sdc1 myvg lvm2 a- 17.15G 12.15G 5.00G
/dev/sdd1 myvg lvm2 a- 17.15G 2.15G 15.00G
```

```
# pvremove /dev/sdb1
/dev/sdb1: Moved: 2.0%
...
/dev/sdb1: Moved: 79.2%
...
```

```
/dev/sdb1: Moved: 100.0%
```

```
# pvs -o+pv_used
PV      VG  Fmt Attr PSize PFree Used
/dev/sda1 myvg lvm2 a- 17.15G 7.15G 10.00G
/dev/sdb1 myvg lvm2 a- 17.15G 17.15G 0
/dev/sdc1 myvg lvm2 a- 17.15G 12.15G 5.00G
/dev/sdd1 myvg lvm2 a- 17.15G 2.15G 15.00G
```

```
# vgreduce myvg /dev/sdb1
Removed "/dev/sdb1" from volume group "myvg"
[root@tng3-1 ~]# pvs
PV      VG  Fmt Attr PSize PFree
/dev/sda1 myvg lvm2 a- 17.15G 7.15G
/dev/sdb1   lvm2 -- 17.15G 17.15G
/dev/sdc1 myvg lvm2 a- 17.15G 12.15G
/dev/sdd1 myvg lvm2 a- 17.15G 2.15G
```

?? PV Disk

???? PV Disk (/dev/sdb1) ???????????? PV Disk (/dev/sdd1)

?????? Mirror ?? *??*

????:

- <https://www.thegeekdiary.com/centos-rhel-7-how-to-create-and-remove-the-lvm-mirrors-using-lvconvert/>
- <https://linux.m2osw.com/creating-drive-mirror-lvm-including-exact-partition-cloning>

??:

- VG: vg_data
- LV: db_worktmp, lv_mydev, lv_worktmp
- PV: from /dev/sdb1 to /dev/sdc

1. ???????????

```
#> lvs -a -o name,copy_percent,devices,lv_size vg_data
```

```
LV      Cpy%Sync Devices      LSize
```

```
db_worktmp      /dev/sdb1(0)   20.00g
lv_mydev        /dev/sdb1(5121) 60.00g
lv_mydev        /dev/sdb1(10242) 60.00g
lv_worktmp      /dev/sdb1(20482) 500.00m
```

2. ?????????? VG ?

```
#> vgextend vg_data /dev/sdc
```

3. ????? LV ?? Mirror

```
#> lvconvert -m1 vg_data/db_worktmp
#> lvconvert -m1 vg_data/lv_mydev
#> lvconvert -m1 vg_data/lv_worktmp
```

```
[[ Mirror ]]
```

```
#> lvs -a -o name,copy_percent,devices,lv_size vg_data
```

4. ????? LV ?? Mirror?????????

```
#> lvconvert -m0 vg_data/db_worktmp /dev/sdb1
#> lvconvert -m0 vg_data/lv_mydev /dev/sdb1
#> lvconvert -m0 vg_data/lv_worktmp /dev/sdb1
```

5. ? VG ??? PV /dev/sdb1, ????? PV

```
#> vgreduce vg_data /dev/sdb1
#> pvremove /dev/sdb1
```

?????? PV ???? pvmove

NOTE: PV ????? VG ?????

```
# pvs -o+pv_used
PV      VG  Fmt Attr PSize PFree Used
/dev/sda1 myvg lvm2 a- 17.15G 7.15G 10.00G
/dev/sdb1 myvg lvm2 a- 17.15G 15.15G 2.00G
/dev/sdc1 myvg lvm2 a- 17.15G 15.15G 2.00G
```

```
# pvcreate /dev/sdd1
Physical volume "/dev/sdd1" successfully created
```



```
# vgextend myvg /dev/sdd1
Volume group "myvg" successfully extended
[root@tng3-1]# pvs -o+pv_used
PV      VG  Fmt Attr PSize PFree Used
/dev/sda1  myvg lvm2 a- 17.15G 7.15G 10.00G
/dev/sdb1  myvg lvm2 a- 17.15G 15.15G 2.00G
/dev/sdc1  myvg lvm2 a- 17.15G 15.15G 2.00G
/dev/sdd1  myvg lvm2 a- 17.15G 17.15G 0
```

```
# pvmove /dev/sdb1 /dev/sdd1
/dev/sdb1: Moved: 10.0%
...
/dev/sdb1: Moved: 79.7%
...
/dev/sdb1: Moved: 100.0%

[root@tng3-1]# pvs -o+pv_used
PV      VG  Fmt Attr PSize PFree Used
/dev/sda1  myvg lvm2 a- 17.15G 7.15G 10.00G
/dev/sdb1  myvg lvm2 a- 17.15G 17.15G 0
/dev/sdc1  myvg lvm2 a- 17.15G 15.15G 2.00G
/dev/sdd1  myvg lvm2 a- 17.15G 15.15G 2.00G
```

```
# vgreduce myvg /dev/sdb1
Removed "/dev/sdb1" from volume group "myvg"
```

Filesystems

Linux Filesystem Comparison

Linux Filesystem Comparison

Filesystem	EXT4	XFS	Btrfs	ZFS	ReiserFS
Creation Timestamp	✗	✓	✓	✓	✗
Last Read Timestamp	✓	✓	✓	✓	✓
Access Control List	✓	✓	✓	✓	✓
Metadata Checksum	✓	✓	✓	✓	✗
Extended Attributes	✓	✓	✓	✓	✓
Hard/Soft Links	✓	✓	✓	✓	✓
File Change Log	✗	✓	✗	✗	✗
Snapshot Support	✗	✗	✓	✓	✗
Encryption	✓	✗	✗	✓	✗
Deduplication	✗	✓	✓	✓	✗
Data Checksum	✗	✗	✓	✓	✗
Persistent Cache	✗	✗	✗	✓	✗
Compression	✗	✗	✓	✓	✗
Online Grow	✓	✓	✓	✓	✓
Offline Shrink	✓	✗	✓	✗	✓
Online Shrink	✗	✗	✓	✗	✗
Add/Remove Disks	✗	✗	✓	✓	✗



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