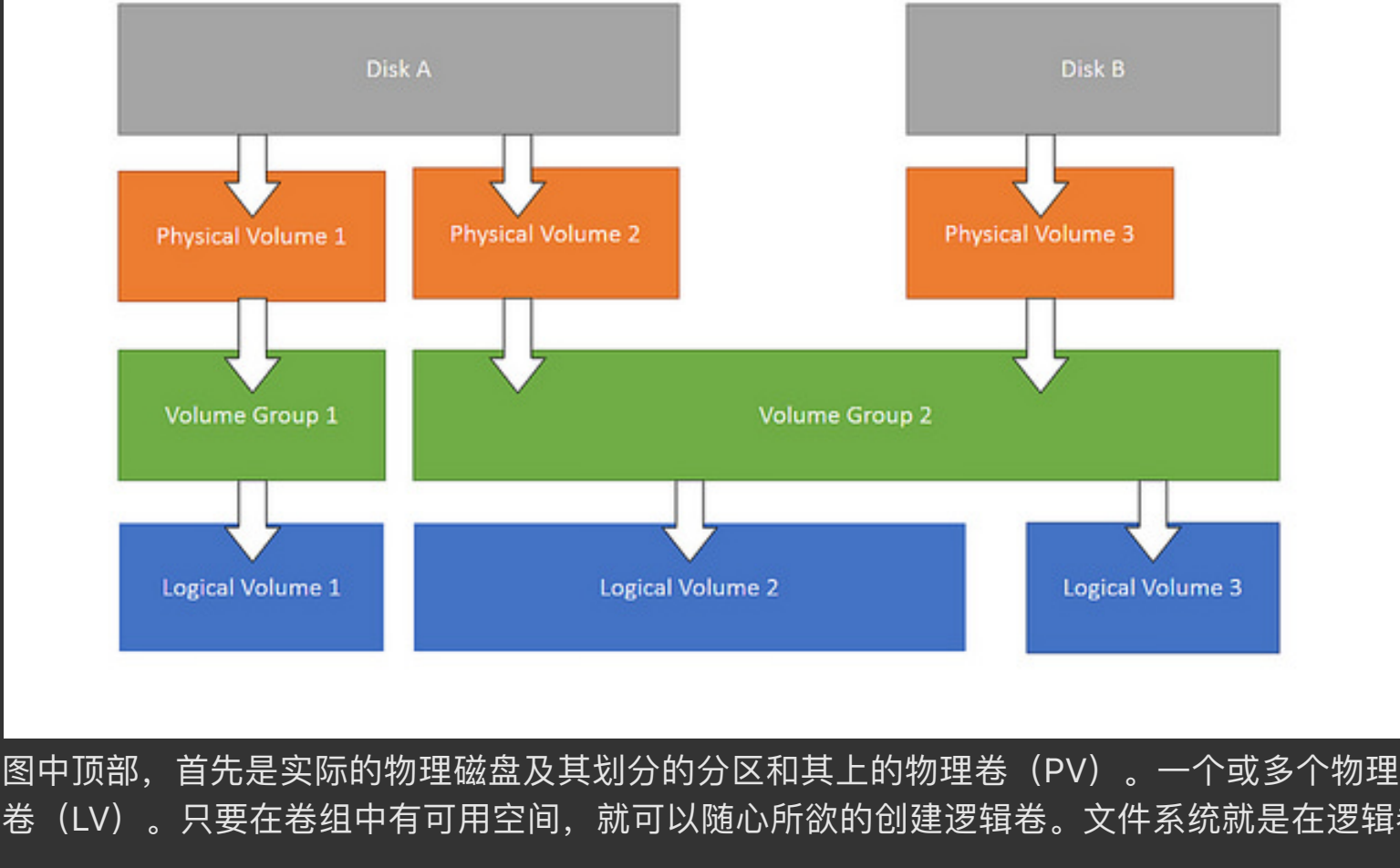


LVM由PV VG LV组成  
PV:物理卷，lvm中的低层存储单元，可以是磁盘的一个分区或者是整个磁盘，磁盘或分区只有被初始化为PV才可以被LVM使用  
VG:卷组，用将一个或多个物理卷组合在一起，创建存储池  
LV:逻辑卷，在VG中创建的一个或多个供系统挂载使用的存储空间  
linux系统将存储组织在/dev目录下

逻辑卷管理LVM是一个多才多艺的硬盘系统工具。无论在Linux或者其他类似的系统，都是非常的好用。传统分区使用固定大小分区，重新调整大小十分麻烦。但是，LVM可以创建和管理“逻辑”卷，而不是直接使用物理硬盘。可以让管理员弹性的管理逻辑卷的扩大缩小、操作简单，而不损坏已存储的数据。可以随意将新的硬盘添加到LVM，以直接扩展已经存在的逻辑卷。LVM并不需要重启就可以让内核知道分区的存在。

LVM使用分层结构，如下图所示。



图中顶部，首先是实际的物理磁盘及其划分的分区和其上的物理卷（PV）。一个或多个物理卷可以用来创建卷组（VG）。然后基于卷组可以创建逻辑卷（LV）。只要在卷组中有可用空间，就可以随心所欲的创建逻辑卷。文件系统就是在逻辑卷上创建的，然后可以在操作系统挂载和访问。

```
-----
新增两块硬盘(sdb,10g) (sdc,20g)

[root@local Desktop]# fdisk -l
Disk /dev/sdc: 21.5 GB, 21474836480 bytes, 41943040 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/sdb: 10.7 GB, 10737418240 bytes, 20971520 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

[root@local Desktop]# ll /dev|grep sd
brw-rw---- 1 root disk 8, 16 Mar 24 21:06 sdb
brw-rw---- 1 root disk 8, 32 Mar 24 21:06 sdc
```

```
创建磁盘分区

[root@local Desktop]# fdisk /dev/sdc
Welcome to fdisk (util-linux 2.23.2).

Changes will remain in memory only, until you decide to write them.
Be careful before using the write command.

Device does not contain a recognized partition table
Building a new DOS disklabel with disk identifier 0xf9271bc7.

Command (m for help): n
Partition type:
   p   primary (0 primary, 0 extended, 4 free)
   e   extended
Select (default p): p
Partition number (1-4, default 1): 1
First sector (2048-41943039, default 2048): 2048
Last sector, +sectors or +size{K,M,G} (2048-41943039, default 41943039): +10G
Partition 1 of type Linux and of size 10 GiB is set

Command (m for help): p
#查看

Disk /dev/sdc: 21.5 GB, 21474836480 bytes, 41943040 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: 0xf9271bc7

   Device Boot      Start         End      Blocks   Id  System
/dev/sdc1             2048        20973567       10485760    83   Linux

Command (m for help): w
The partition table has been altered!

Calling ioctl() to re-read partition table.
Syncing disks.

[root@local Desktop]# ll /dev |grep sd
brw-rw---- 1 root disk 8, 16 Mar 24 21:06 sdb
brw-rw---- 1 root disk 8, 32 Mar 24 21:14 sdc
brw-rw---- 1 root disk 8, 33 Mar 24 21:14 sdc1
```

```
创建PV

[root@local Desktop]# pvcreate /dev/sdb /dev/sdc1
Physical volume "/dev/sdb" successfully created
Physical volume "/dev/sdc1" successfully created

[root@local Desktop]# pvdisplay
"/dev/sdb" is a new physical volume of "10.00 GiB"
--- NEW Physical volume ---
PV Name                /dev/sdb
VG Name
PV Size                 10.00 GiB
Allocatable             NO
PE Size                 0
Total PE                0
Free PE                 0
Allocated PE            0
PV UUID                 U3fK4V-zcDi-Afdi-0DBW-Gyqd-r3E1-LWQIT9

"/dev/sdc1" is a new physical volume of "10.00 GiB"
--- NEW Physical volume ---
PV Name                /dev/sdc1
VG Name
PV Size                 10.00 GiB
Allocatable             NO
PE Size                 0
Total PE                0
Free PE                 0
Allocated PE            0
PV UUID                 P6kmMb-1Kpm-ns4i-FvUV-IFln-CU8J-eVp5zP
```

```
创建VG

[root@local Desktop]# vgcreate my_vg /dev/sdb /dev/sdc1
Volume group "my_vg" successfully created
[root@local Desktop]# vgdisplay
--- Volume group ---
VG Name                my_vg
System ID
Format                 lvm2
Metadata Areas         2
Metadata Sequence No   1
VG Access               read/write
VG Status               resizable
MAX LV                 0
Cur LV                 0
Open LV                 0
Max PV                  0
Cur PV                 2
Act PV                  2
VG Size                 19.99 GiB
PE Size                 4.00 MiB
Total PE                5118
Alloc PE / Size         0 / 0
Free PE / Size          5118 / 19.99 GiB
VG UUID                 2haU1n-NwqI-gzYU-feQ8-JBfT-czx3-TrMQyX
```

```
创建LV（还剩10g）

[root@local Desktop]# lvcreate -n my_lv -L 10G my_vg
Logical volume "my_lv" created.
[root@local Desktop]# lvdisplay
--- Logical volume ---
LV Path                /dev/my_vg/my_lv
LV Name                my_lv
VG Name                my_vg
LV UUID                61z5tW-PDVe-AirT-DU50-UNpf-CAJf-iJBDz8
LV Write Access         read/write
LV Creation host, time local, 2016-03-24 21:27:08 +0800
LV Status                available
# open                  0
LV Size                 10.00 GiB
Current LE              2560
Segments                2
Allocation               inherit
Read ahead sectors      auto
- currently set to      8192
Block device            253:4
```

```
格式化文件系统

[root@local Desktop]# mkfs.ext4 /dev/mapper/my_vg-my_lv
mke2fs 1.42.9 (28-Dec-2013)
Filesystem label=
OS type: Linux
Block size=4096 (log=2)
Fragment size=4096 (log=2)
Stride=0 blocks, Stripe width=0 blocks
655360 inodes, 2621440 blocks
131072 blocks (5.00%) reserved for the super user
First data block=0
Maximum filesystem blocks=2151677952
80 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

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

[root@local Desktop]# mkdir /test
[root@local Desktop]# ll -d /test
drwxr-xr-x 2 root root 6 Mar 24 21:32 /test

[root@local Desktop]# df -h
Filesystem      Size  Used Avail Use% Mounted on
/dev/mapper/centos-root 500G  7.1G  493G   2% /
/dev/mapper/centos-var  150G   3.8G  147G   3% /var
/dev/mapper/centos-home 300G   38M   300G   1% /home

[root@local Desktop]# mount /dev/mapper/my_vg-my_lv /test
[root@local Desktop]# df -h
Filesystem      Size  Used Avail Use% Mounted on
/dev/mapper/centos-root 500G  7.1G  493G   2% /
/dev/mapper/centos-var  150G   3.8G  147G   3% /var
/dev/mapper/centos-home 300G   38M   300G   1% /home
/dev/mapper/my_vg-my_lv 9.8G   37M   9.2G   1% /test

[root@local Desktop]# rm -rf /test/ #被挂载的目录无法rm, mv, 等操作
rm: cannot remove '/test/': Device or resource busy
```

```
扩容

[root@local Desktop]# lvresize -L +1G /dev/mapper/my_vg-my_lv
Size of logical volume my_vg/my_lv changed from 10.00 GiB (3840 extents) to 11.00 GiB (4096 extents).
Logical volume my_lv successfully resized.
[root@local Desktop]# resize2fs /dev/mapper/my_vg-my_lv #扩容后得更新文件系统
resize2fs 1.42.9 (28-Dec-2013)
Filesystem at /dev/mapper/my_vg-my_lv is mounted on /test; on-line resizing required
old_desc_blocks = 2, new_desc_blocks = 2
The filesystem on /dev/mapper/my_vg-my_lv is now 4194304 blocks long.
```

```
减小容量操作

[root@local Desktop]# umount /test/
[root@local Desktop]# e2fsck -f /dev/mapper/my_vg-my_lv #检测磁盘错误
e2fsck 1.42.9 (28-Dec-2013)
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/mapper/my_vg-my_lv: 164/720896 files (0.6% non-contiguous), 96104/2883584 blocks
[root@local Desktop]# resize2fs /dev/mapper/my_vg-my_lv 5G
resize2fs 1.42.9 (28-Dec-2013)
Resizing the filesystem on /dev/mapper/my_vg-my_lv to 1310720 (4k) blocks.
The filesystem on /dev/mapper/my_vg-my_lv is now 1310720 blocks long.
[root@local Desktop]# lvresize -L 5G /dev/mapper/my_vg-my_lv
WARNING: Reducing active and open logical volume to 5.00 GiB
THIS MAY DESTROY YOUR DATA (filesystem etc.)
Do you really want to reduce my_lv? [y/n]: y
Size of logical volume my_vg/my_lv changed from 11.00 GiB (2816 extents) to 5.00 GiB (1280 extents).
Logical volume my_lv successfully resized.
```

MANUAL PARTITIONING

Done

CENTOS 7 INSTALLATION

us

Help! (F1)

New CentOS 7 Installation

DATA

/home

centos-home

300 GiB

SYSTEM

/

centos-root

500 GiB

/var

centos-var

150 GiB

swap

centos-swap

50 GiB

+

-

↺

centos-root

Mount Point:

/

Device(s):

ATA VBOX HARDDISK (sda)

Desired Capacity:

500 GiB

Device Type:

LVM

☐ Encrypt

File System:

xfs

☒ Reformat

Label:

Volume Group

centos

(0 B free)

Name:

root

Update Settings

Note: The settings you make on this screen will not be applied until you click on the main menu's 'Begin Installation' button.

```
[root@local Desktop]# df -h
Filesystem      Size  Used Avail Use% Mounted on
/dev/mapper/centos-root 500G  3.4G  497G   1% /
devtmpfs        1.4G   0    1.4G   0% /dev
tmpfs           1.4G  144K   1.4G   1% /dev/shm
tmpfs           1.4G  8.7M   1.4G   1% /run
tmpfs           1.4G   0    1.4G   0% /sys/fs/cgroup
/dev/mapper/centos-var 150G  122M  150G   1% /var
/dev/mapper/centos-home 300G   36K   300G   1% /home
tmpfs           285M   12M   285M   1% /run/user/0

[root@local ~]# ln anaconda-ks.cfg /var/aaa
ln: failed to create hard link '/var/aaa' => 'anaconda-ks.cfg': Invalid cross-device link
[root@local ~]# ln anaconda-ks.cfg /usr/aaa
[root@local ~]# ln anaconda-ks.cfg /root/aaa
注意：说明硬链接不能跨文件系统
```