# Linux 系统下 LV 的磁盘故障与修复

## 一【实验目标】

- 学习并掌握 Linux 系统下创建 LV

## 二【实验环境】

- 实验机环境：Centos 6.6
- 目标机环境：  Centos 6.6
- 实验拓扑：如图 1 所示。

图 1 实验拓扑

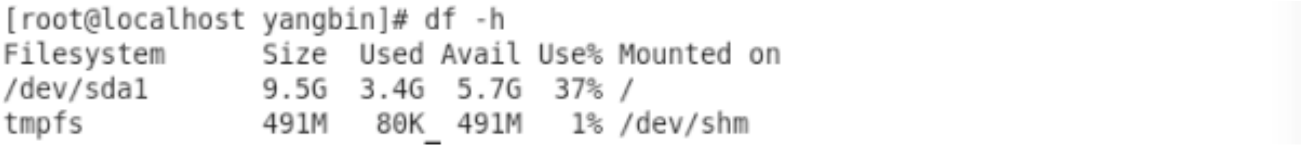
## 三【实验原理】

在 Linux 的 LAM 管理模式下，当磁盘出现故障时需要进行修复。

## 四【实验步骤】

### 1、 新加磁盘启动系统后，查看现有磁盘使用情况

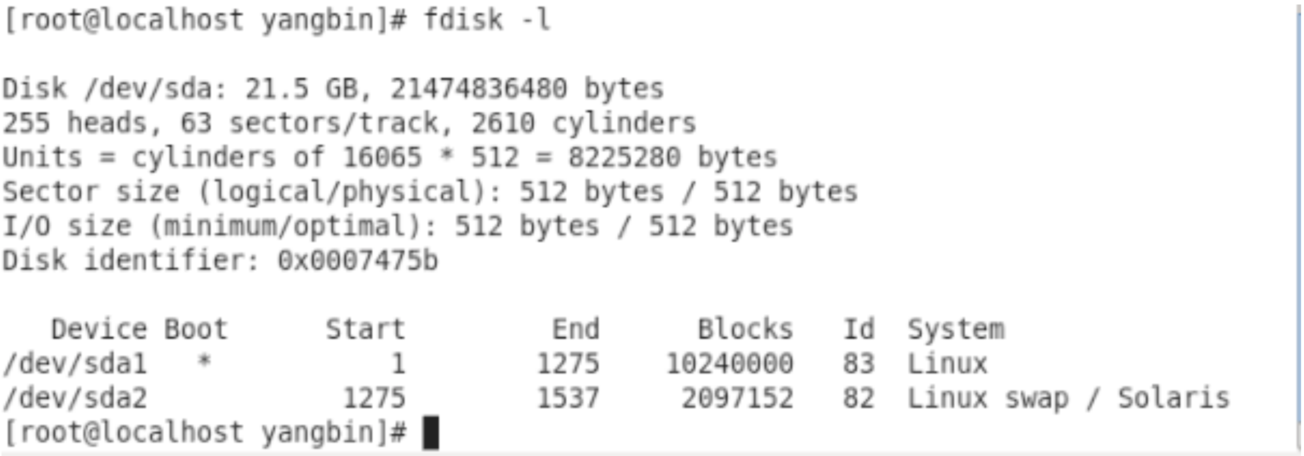
(1)命令：df –h



```
[root@localhost yangbin]# df -h
Filesystem      Size  Used Avail Use% Mounted on
/dev/sda1       9.5G  3.4G  5.7G  37% /
tmpfs           491M   80K  491M   1% /dev/shm
```

图 2

(2)命令：fdisk –l



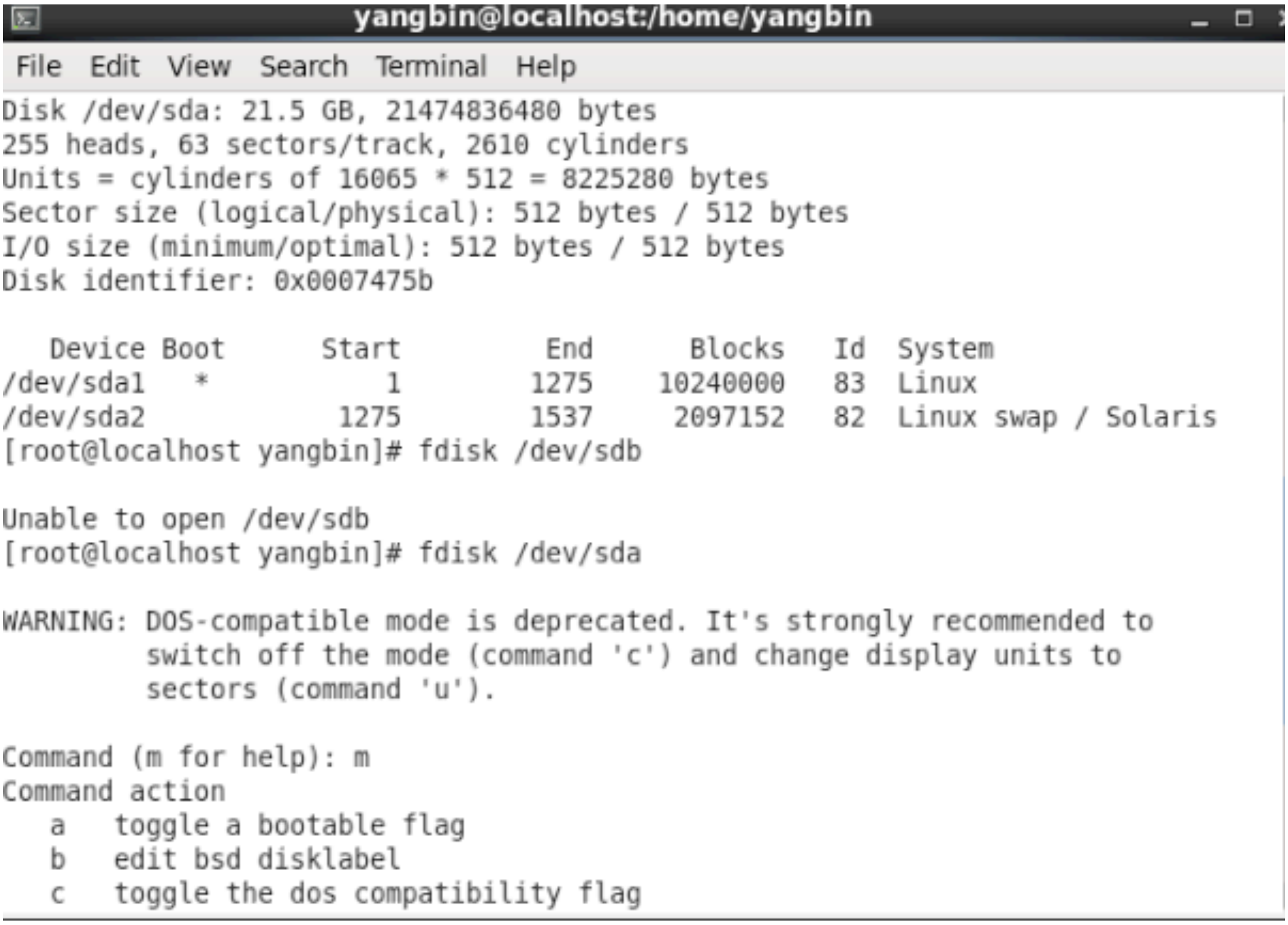
```
[root@localhost yangbin]# fdisk -l

Disk /dev/sda: 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: 0x0007475b

   Device Boot      Start         End      Blocks   Id  System
/dev/sda1   *           1        1275    10240000   83  Linux
/dev/sda2            1275        1537     2097152   82  Linux swap / Solaris
[root@localhost yangbin]# 
```

图 3

## 2、 对磁盘 sda 进行分区

如果不知道 fdisk 里面的具体操作，可输入 m 进行帮助。最常用的是 n（新建）d（删除）p（打印）q（退出）t（修改系统标识符）w（写入并退出）。

命令：fdisk /dev/sda


yangbin@localhost:/home/yangbin
File Edit View Search Terminal Help

```
Disk /dev/sda: 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: 0x0007475b

   Device Boot      Start         End      Blocks   Id  System
/dev/sda1   *           1        1275    10240000   83  Linux
/dev/sda2            1275        1537     2097152   82  Linux swap / Solaris
[root@localhost yangbin]# fdisk /dev/sdb

Unable to open /dev/sdb
[root@localhost yangbin]# fdisk /dev/sda

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
```

图 4

(1) 建立新的分区

输入 **p** 打印现有分区情况（还没有分区）

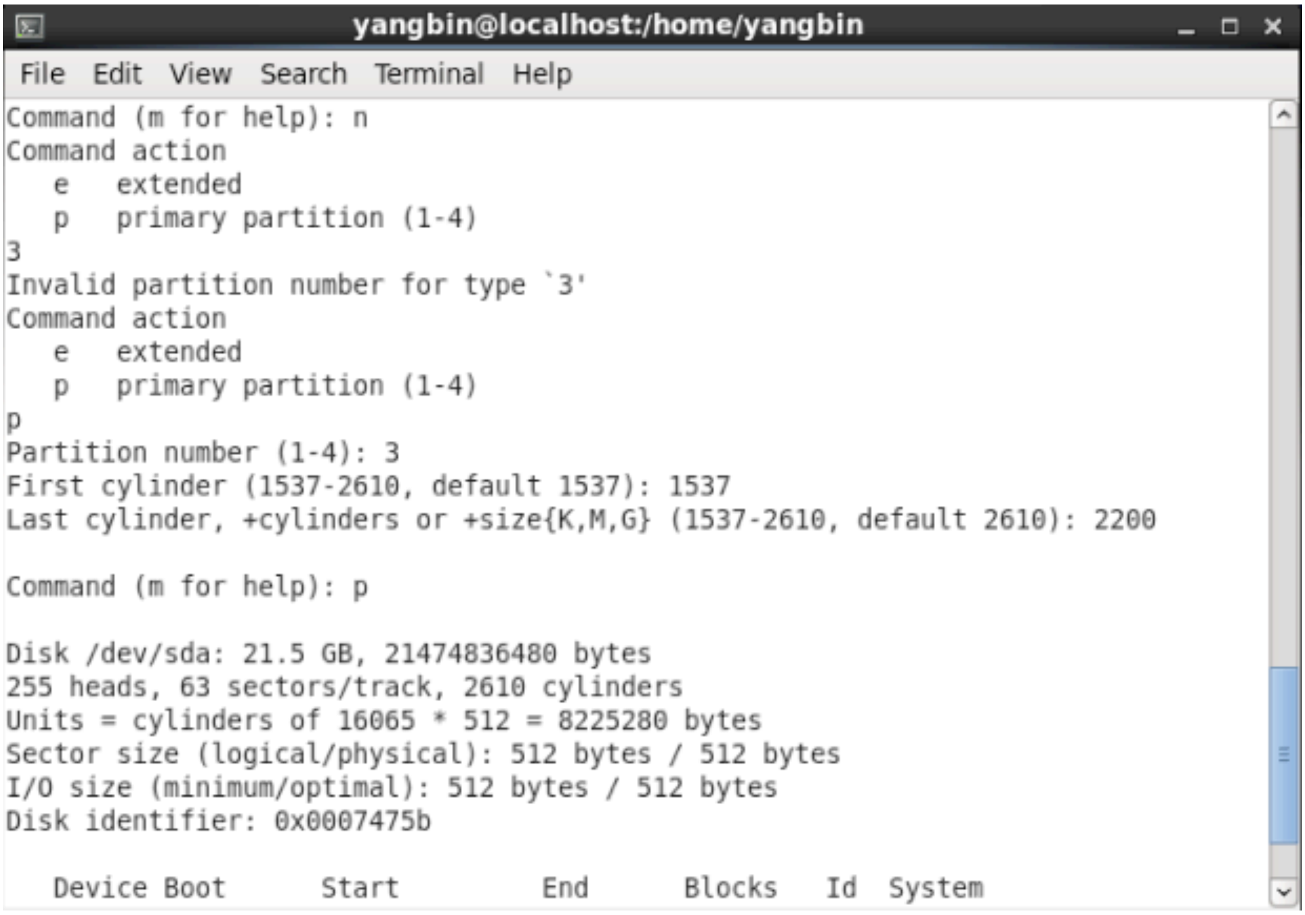
输入 **n** 新建分区

输入 **p** 为建立主分区（此时的 p 是在 n 后的，不是打印）

输入 **1** 为建立第一个主分区

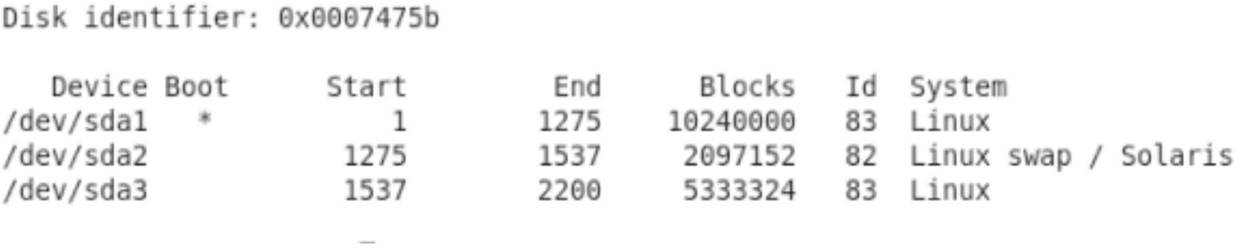
分区起始位置可以直接回车，默认是 1

输入 **p** 打印分区情况，发现已建立一个分区 **/dev/sda3，**但是 此分区为 Linux 格式


yangbin@localhost:/home/yangbin
File Edit View Search Terminal Help

```
Command (m for help): n
Command action
   e   extended
   p   primary partition (1-4)
3
Invalid partition number for type `3'
Command action
   e   extended
   p   primary partition (1-4)
p
Partition number (1-4): 3
First cylinder (1537-2610, default 1537): 1537
Last cylinder, +cylinders or +size{K,M,G} (1537-2610, default 2610): 2200

Command (m for help): p

Disk /dev/sda: 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: 0x0007475b

   Device Boot      Start         End      Blocks   Id  System
```

图 5



```
Disk identifier: 0x0007475b

   Device Boot      Start         End      Blocks   Id  System
/dev/sda1   *           1        1275    10240000   83  Linux
/dev/sda2            1275        1537     2097152   82  Linux swap / Solaris
/dev/sda3            1537        2200     5333324   83  Linux
```

图 6

(2)改变系统标识符：

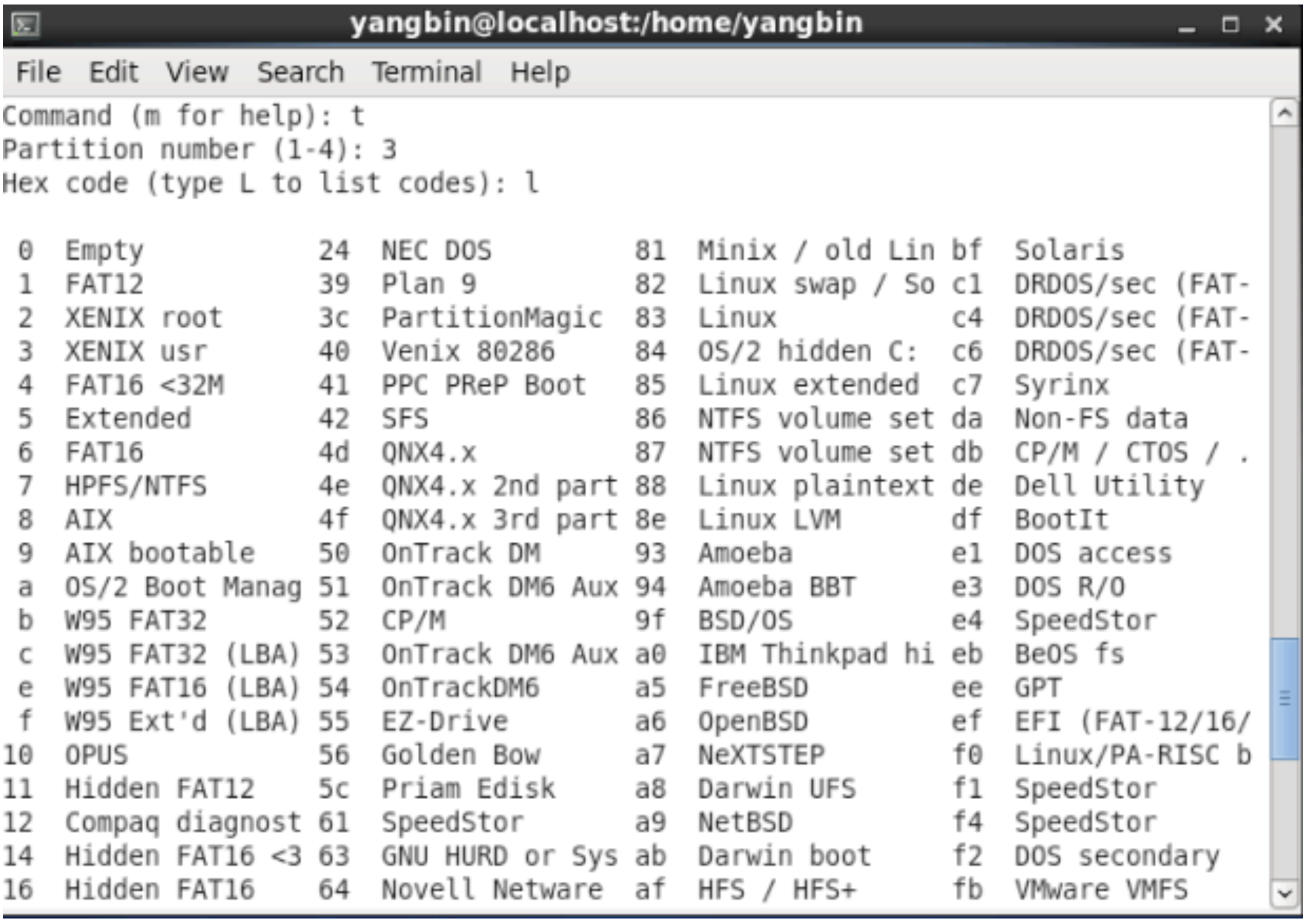
输入 t 改变分区 1 的属性

输入 L 查看有个属性对应的命令

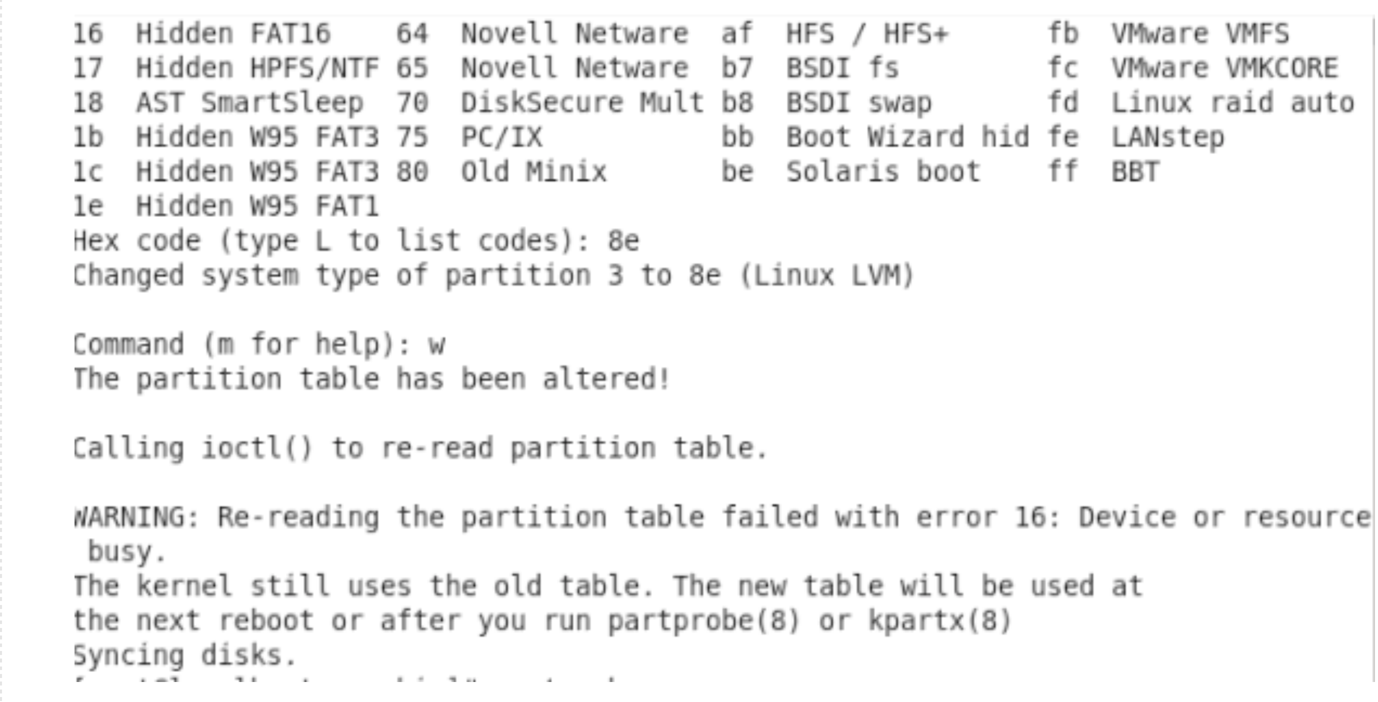
输入 8e 改变分区 1 为 Linux LVM 格式

输入 p 打印分区情况，发现建立的分区 /dev/sda3 为 Linux LVM 格式

tip:再次使用 **fdisk -l** 查看系统内磁盘情况发现 /dev/sda 上已有一个 Linux LVM 格式的 **/dev/sda3** 分区


yangbin@localhost:/home/yangbin
File Edit View Search Terminal Help

```
Command (m for help): t
Partition number (1-4): 3
Hex code (type L to list codes): l

 0  Empty           24  NEC DOS         81  Minix / old Lin bf  Solaris
 1  FAT12           39  Plan 9          82  Linux swap / So c1  DRDOS/sec (FAT-
 2  XENIX root      3c  PartitionMagic  83  Linux           c4  DRDOS/sec (FAT-
 3  XENIX usr       40  Venix 80286     84  OS/2 hidden C:  c6  DRDOS/sec (FAT-
 4  FAT16 <32M      41  PPC PReP Boot   85  Linux extended  c7  Syrinx
 5  Extended        42  SFS             86  NTFS volume set da  Non-FS data
 6  FAT16           4d  QNX4.x          87  NTFS volume set db  CP/M / CTOS / .
 7  HPFS/NTFS       4e  QNX4.x 2nd part 88  Linux plaintext de  Dell Utility
 8  AIX             4f  QNX4.x 3rd part 8e  Linux LVM       df  BootIt
 9  AIX bootable    50  OnTrack DM      93  Amoeba          e1  DOS access
 a  OS/2 Boot Manag 51  OnTrack DM6 Aux 94  Amoeba BBT      e3  DOS R/O
 b  W95 FAT32       52  CP/M            9f  BSD/OS          e4  SpeedStor
 c  W95 FAT32 (LBA) 53  OnTrack DM6 Aux a0  IBM Thinkpad hi eb  BeOS fs
 e  W95 FAT16 (LBA) 54  OnTrackDM6      a5  FreeBSD         ee  GPT
 f  W95 Ext'd (LBA) 55  EZ-Drive        a6  OpenBSD         ef  EFI (FAT-12/16/
10  OPUS            56  Golden Bow      a7  NeXTSTEP        f0  Linux/PA-RISC b
11  Hidden FAT12    5c  Priam Edisk     a8  Darwin UFS      f1  SpeedStor
12  Compaq diagnost 61  SpeedStor       a9  NetBSD          f4  SpeedStor
14  Hidden FAT16 <3 63  GNU HURD or Sys ab  Darwin boot     f2  DOS secondary
16  Hidden FAT16    64  Novell Netware  af  HFS / HFS+      fb  VMware VMFS
```



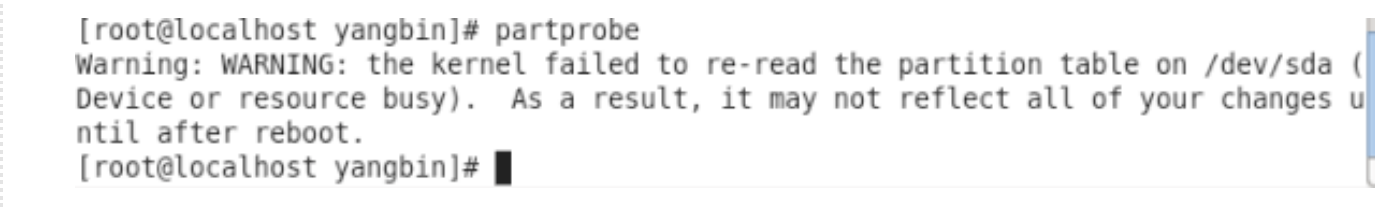
```
16  Hidden FAT16    64  Novell Netware  af  HFS / HFS+      fb  VMware VMFS
17  Hidden HPFS/NTF 65  Novell Netware  b7  BSDI fs         fc  VMware VMKCORE
18  AST SmartSleep  70  DiskSecure Mult b8  BSDI swap       fd  Linux raid auto
1b  Hidden W95 FAT3 75  PC/IX           bb  Boot Wizard hid fe  LANstep
1c  Hidden W95 FAT3 80  Old Minix       be  Solaris boot    ff  BBT
1e  Hidden W95 FAT1
Hex code (type L to list codes): 8e
Changed system type of partition 3 to 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.
```

图 7

(3)使 kernel 重新读取分区表

命令：**partprobe**

对于 /dev/sda 的警告不予理会



```
[root@localhost yangbin]# 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 u
ntil after reboot.
[root@localhost yangbin]# █
```

图 8

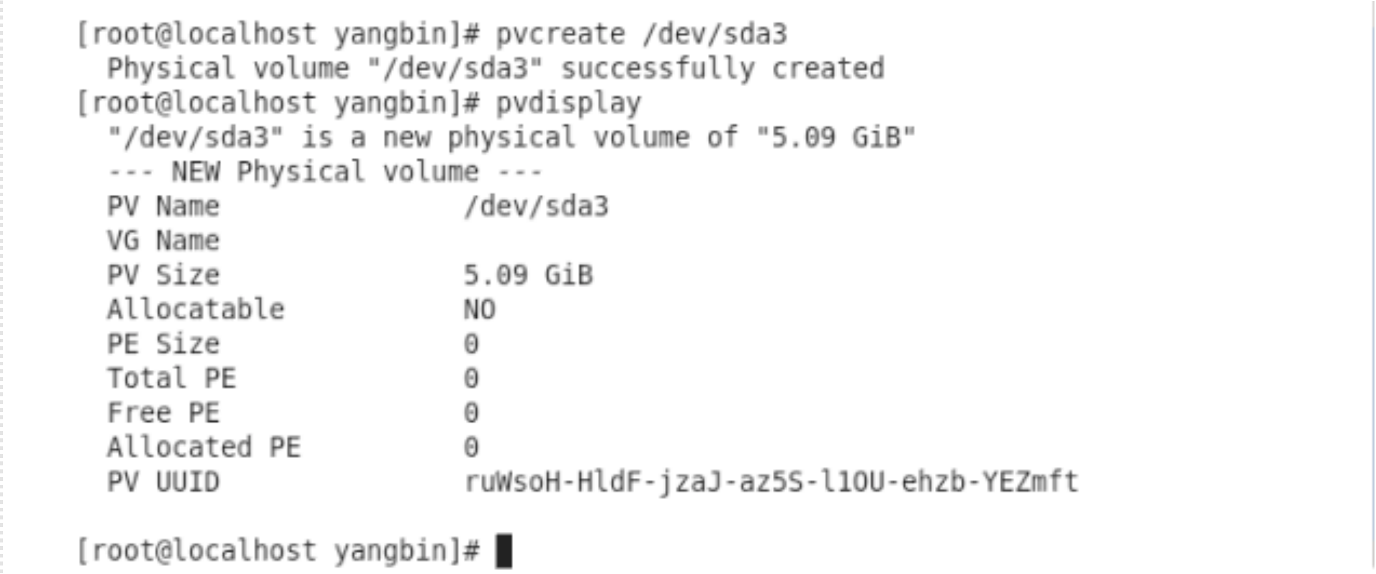
### 3、 创建 PV:

扫面系统 PV：**pvscan**

创建 PV：**pvcreate /dev/sdb1**

查看 PV：**pvdisplay**

这样我们就创建了一个 5.09G 的 PV，注意 Allocatable 为 NO



```
[root@localhost yangbin]# pvcreate /dev/sda3
  Physical volume "/dev/sda3" successfully created
[root@localhost yangbin]# pvdisplay
  "/dev/sda3" is a new physical volume of "5.09 GiB"
  --- NEW Physical volume ---
  PV Name               /dev/sda3
  VG Name
  PV Size               5.09 GiB
  Allocatable           NO
  PE Size               0
  Total PE              0
  Free PE               0
  Allocated PE          0
  PV UUID               ruWsoH-HldF-jzaJ-az5S-l1OU-ehzb-YEZmft

[root@localhost yangbin]# █
```

图 9

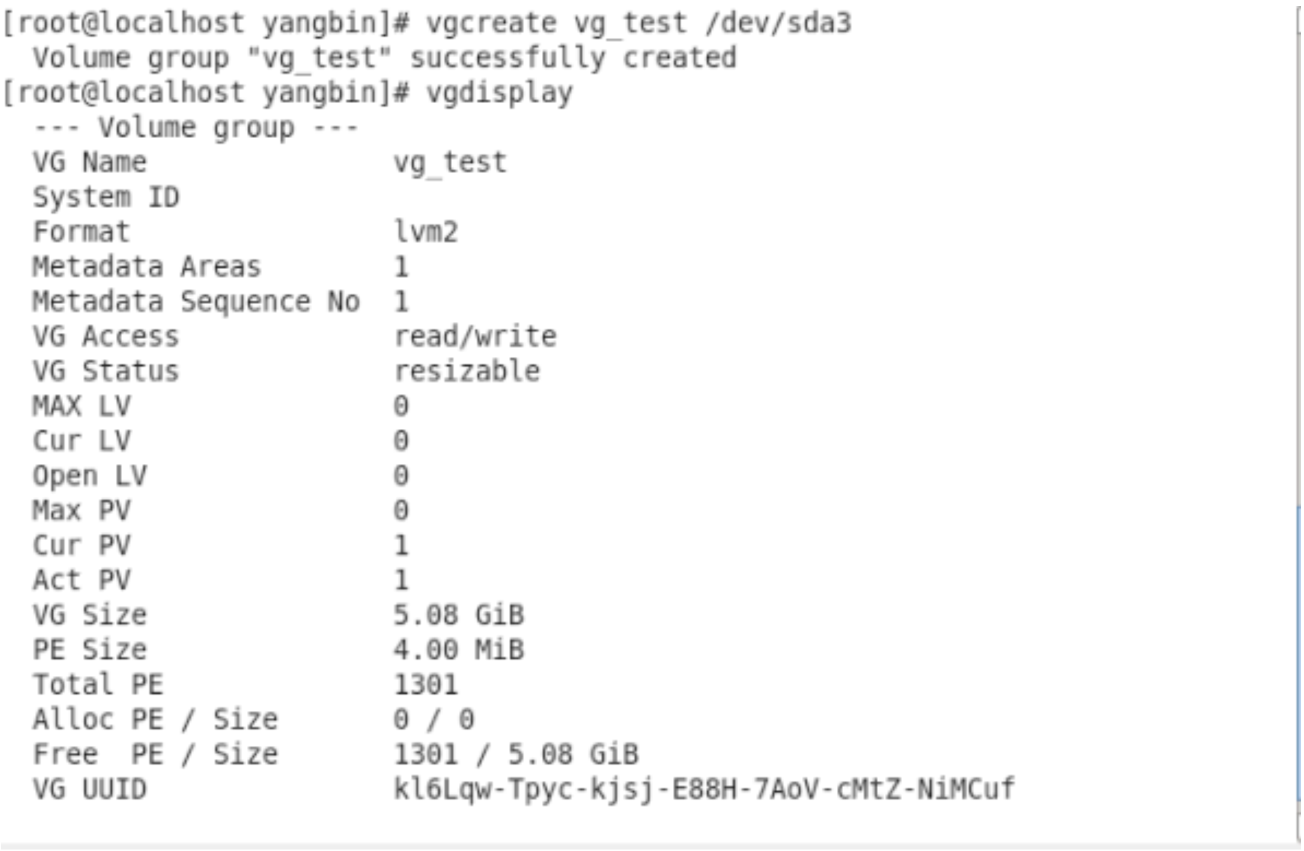
### 4、 创建 VG:

扫面系统 VG：**vgscan**

创建 VG：**vgcreate vg_test /dev/sdb1**

查看 VG：**vgdisplay**

这样我们就创建了一个 5.09G（**1301** 个 PE，要记住这个数字）的 VG（名字为 **vg_test**）



```
[root@localhost yangbin]# vgcreate vg_test /dev/sda3
  Volume group "vg_test" successfully created
[root@localhost yangbin]# vgdisplay
  --- Volume group ---
  VG Name               vg_test
  System ID
  Format                lvm2
  Metadata Areas        1
  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                1
  Act PV                1
  VG Size               5.08 GiB
  PE Size               4.00 MiB
  Total PE              1301
  Alloc PE / Size       0 / 0
  Free  PE / Size       1301 / 5.08 GiB
  VG UUID               kl6Lqw-Tpyc-kjsj-E88H-7AoV-cMtZ-NiMCuf
```

图 10

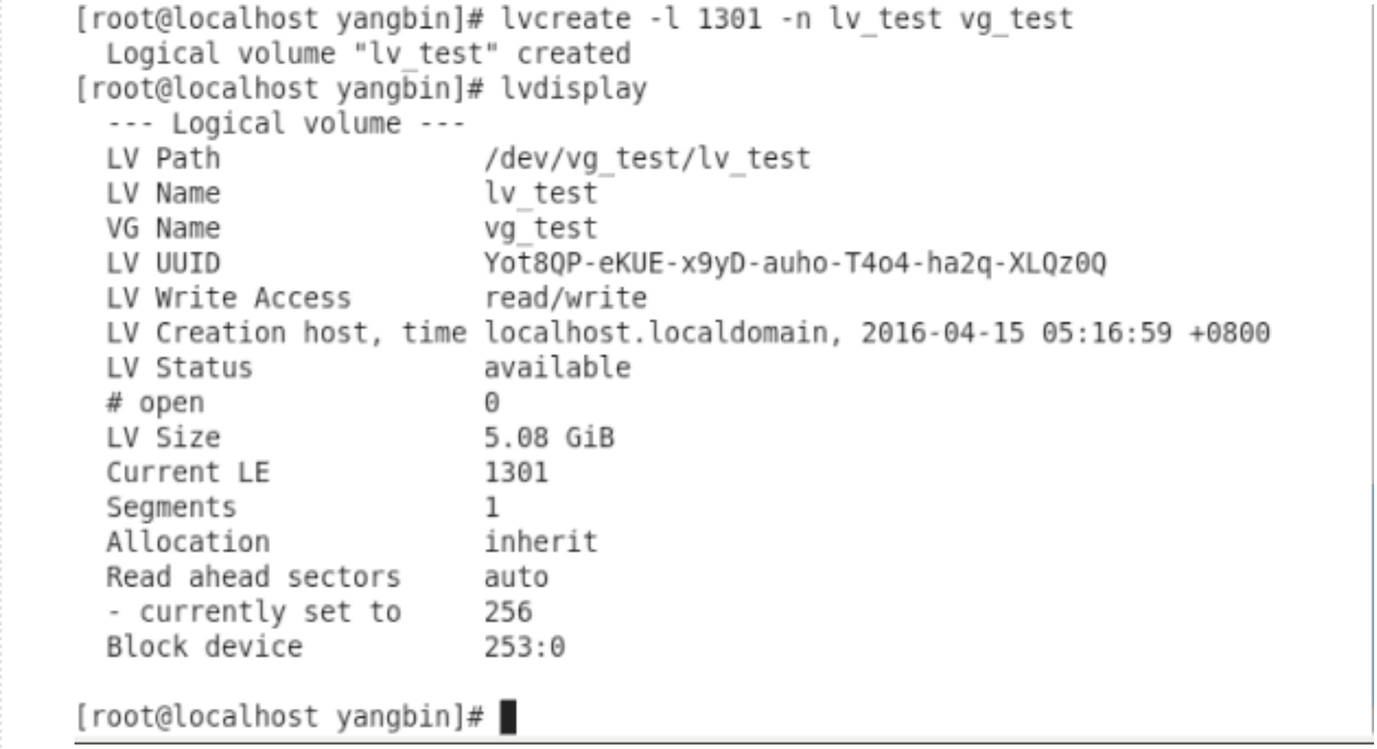
### 5、 创建 LV:

扫描系统 LV：lvscan

创建 LV：lvcreate -l 1301 -n lv_test vg_test （1301 是 VG 中 PE 的个数）

查看 LV：lvdisplay

这样我们就创建了一个名字为 lv_test 的 LV

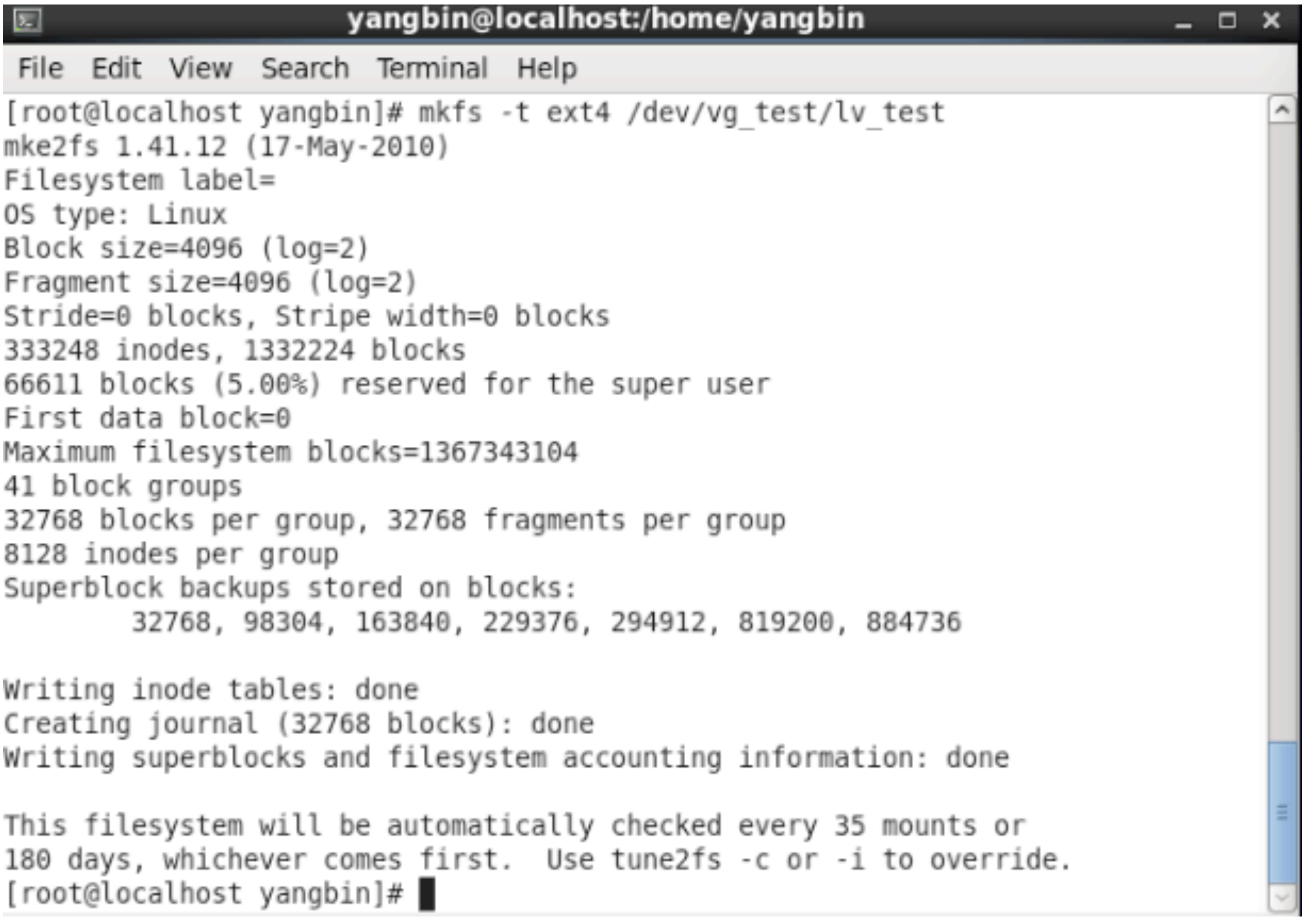


```
[root@localhost yangbin]# lvcreate -l 1301 -n lv_test vg_test
  Logical volume "lv_test" created
[root@localhost yangbin]# lvdisplay
  --- Logical volume ---
  LV Path                /dev/vg_test/lv_test
  LV Name                lv_test
  VG Name                vg_test
  LV UUID                Yot8QP-eKUE-x9yD-auho-T4o4-ha2q-XLQz0Q
  LV Write Access        read/write
  LV Creation host, time localhost.localdomain, 2016-04-15 05:16:59 +0800
  LV Status              available
  # open                 0
  LV Size                5.08 GiB
  Current LE             1301
  Segments               1
  Allocation             inherit
  Read ahead sectors     auto
  - currently set to     256
  Block device           253:0

[root@localhost yangbin]# █
```

图 12

## 6、 格式化 LV:

**命令：mkfs –t ext4 /dev/vg_test/lv_test**

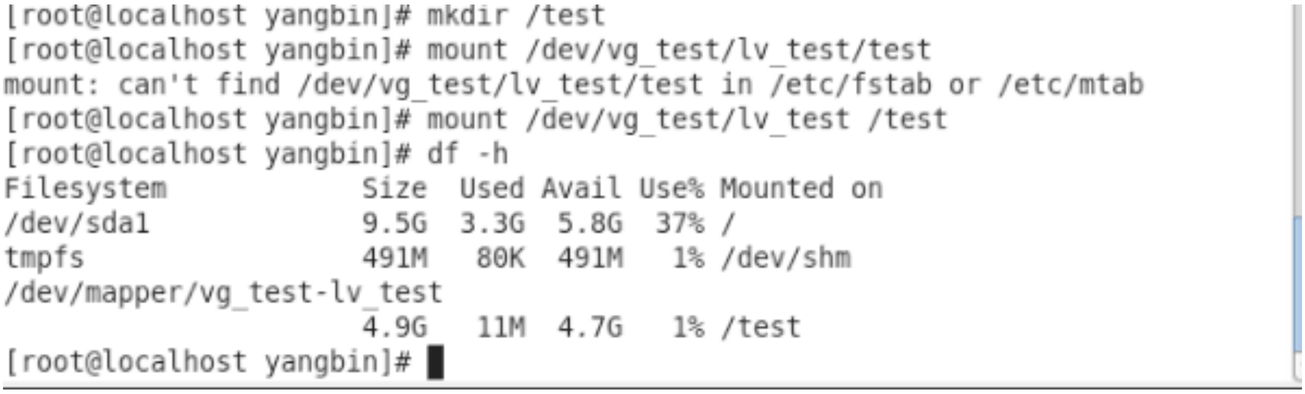

yangbin@localhost:/home/yangbin
File Edit View Search Terminal Help

```
[root@localhost yangbin]# mkfs -t ext4 /dev/vg_test/lv_test
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
333248 inodes, 1332224 blocks
66611 blocks (5.00%) reserved for the super user
First data block=0
Maximum filesystem blocks=1367343104
41 block groups
32768 blocks per group, 32768 fragments per group
8128 inodes per group
Superblock backups stored on blocks:
        32768, 98304, 163840, 229376, 294912, 819200, 884736

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

This filesystem will be automatically checked every 35 mounts or
180 days, whichever comes first.  Use tune2fs -c or -i to override.
[root@localhost yangbin]# 
```

**7 挂载目录并创建:**

**命令：mkdir /test**

**mount /dev/vg_test/lv_test /test**

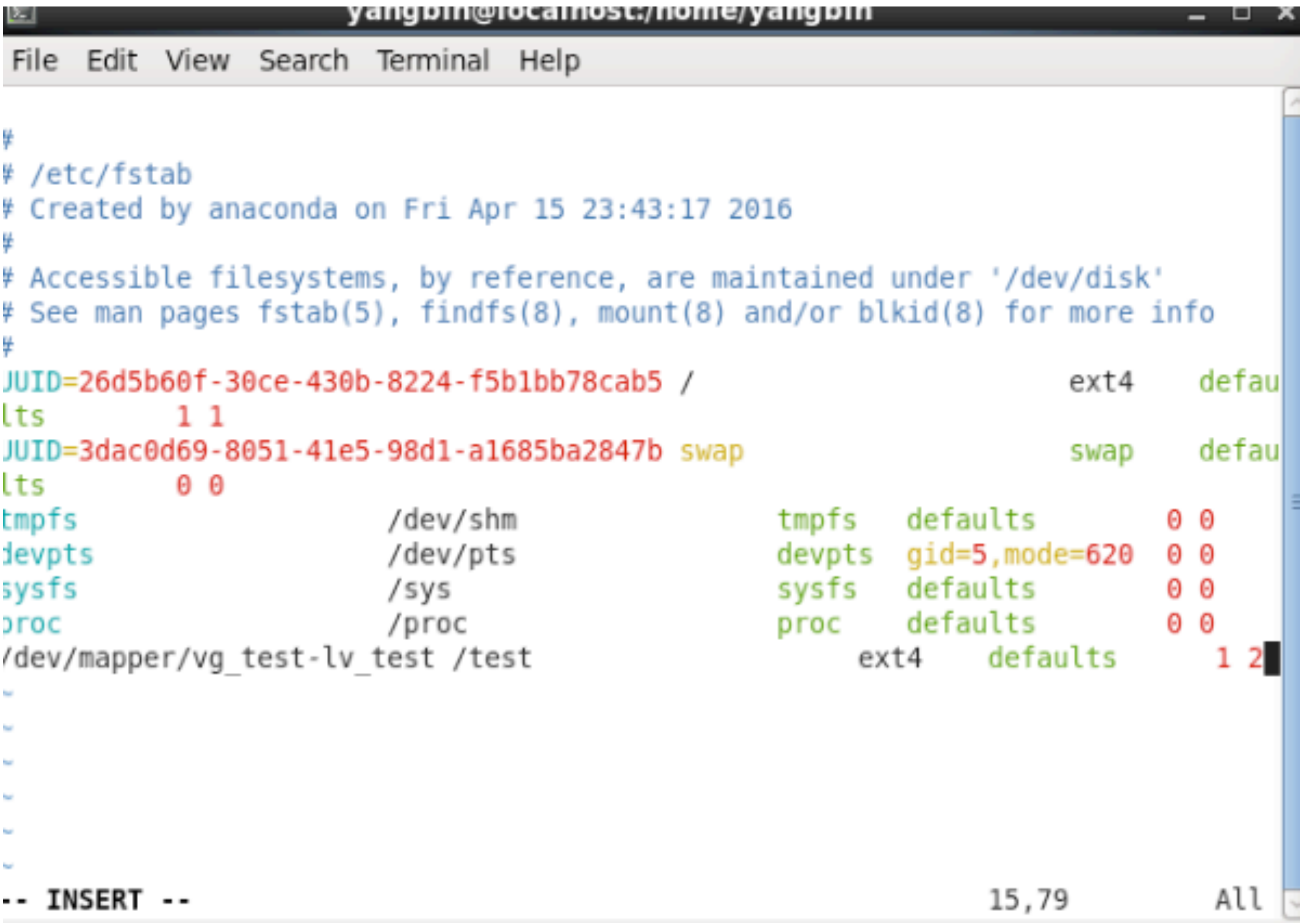


```
[root@localhost yangbin]# mkdir /test
[root@localhost yangbin]# mount /dev/vg_test/lv_test/test
mount: can't find /dev/vg_test/lv_test/test in /etc/fstab or /etc/mtab
[root@localhost yangbin]# mount /dev/vg_test/lv_test /test
[root@localhost yangbin]# df -h
Filesystem            Size  Used Avail Use% Mounted on
/dev/sda1             9.5G  3.3G  5.8G  37% /
tmpfs                 491M   80K  491M   1% /dev/shm
/dev/mapper/vg_test-lv_test
                      4.9G   11M  4.7G   1% /test
[root@localhost yangbin]# 
```

**8 设置开机挂载**

**命令：vim /etc/fstab**

加入：/dev/mapper/vg_test-lv_test /test      ext4     defaults        1 2


yangbin@localhost:/home/yangbin
File Edit View Search Terminal Help

```
#
# /etc/fstab
# Created by anaconda on Fri Apr 15 23:43:17 2016
#
# 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
#
UUID=26d5b60f-30ce-430b-8224-f5b1bb78cab5 /                       ext4    defau
lts        1 1
UUID=3dac0d69-8051-41e5-98d1-a1685ba2847b swap                    swap    defau
lts        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/mapper/vg_test-lv_test /test                    ext4    defaults        1 2
~
~
~
~
~
~
-- INSERT --                                                  15,79         All
```

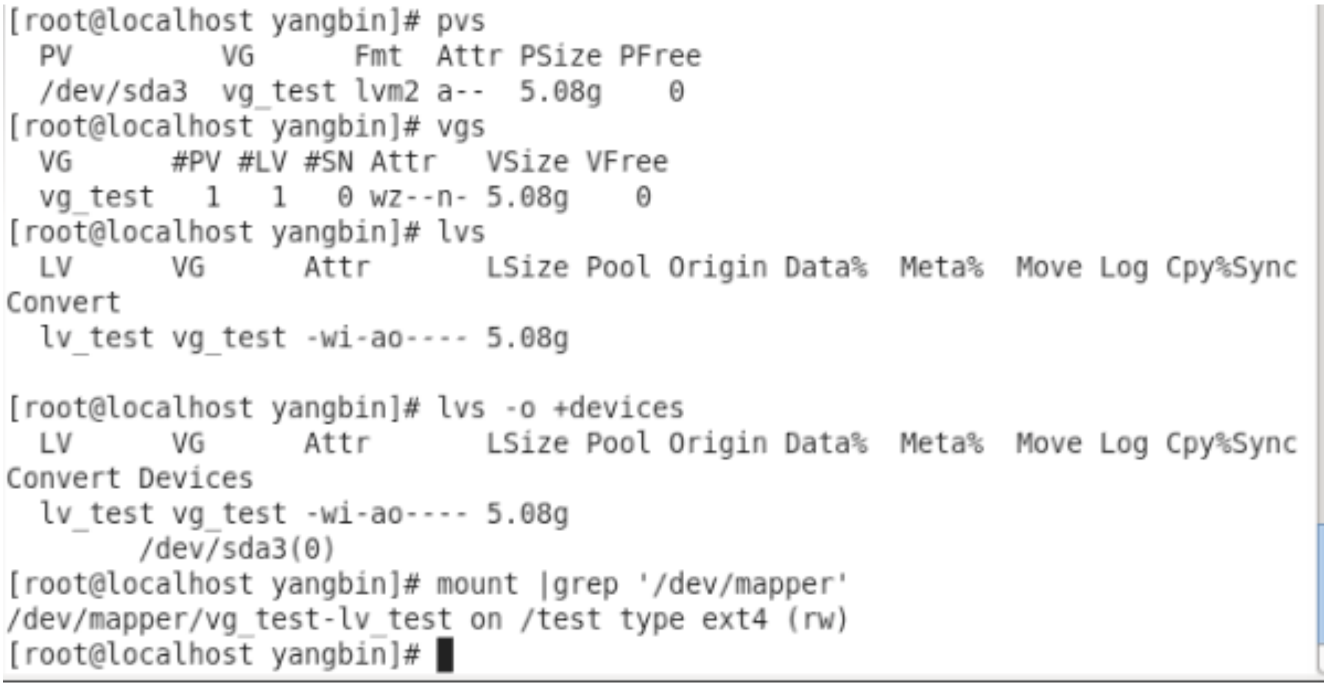
## 五【LAM 灾难修复】

1 PV 损坏与替换

模拟错误并进行恢复操作

（1） 检查磁盘及文件系统状况

命令：pvs
vgs
lvs
lvs –o +devices
mount |grep ‘/dev/mapper’



```
[root@localhost yangbin]# pvs
  PV         VG      Fmt  Attr PSize PFree
  /dev/sda3  vg_test lvm2 a--   5.08g    0
[root@localhost yangbin]# vgs
  VG      #PV #LV #SN Attr   VSize VFree
  vg_test   1   1   0 wz--n- 5.08g    0
[root@localhost yangbin]# lvs
  LV      VG      Attr       LSize Pool Origin Data%  Meta%  Move Log Cpy%Sync
Convert
  lv_test vg_test -wi-ao---- 5.08g

[root@localhost yangbin]# lvs -o +devices
  LV      VG      Attr       LSize Pool Origin Data%  Meta%  Move Log Cpy%Sync
Convert Devices
  lv_test vg_test -wi-ao---- 5.08g
        /dev/sda3(0)
[root@localhost yangbin]# mount |grep '/dev/mapper'
/dev/mapper/vg_test-lv_test on /test type ext4 (rw)
[root@localhost yangbin]# █
```

（2） 备份文件

命令：/etc/lvm/backup:# cp * /testback/

（4） 如若文件系统损坏，采用故障卷替换的方法。

命令：pvcreate --restorefile /etc/lvm/backup/test \n

（3） 同步 metadata

命令：vgchange -an test

（5） 修复文件

命令：reiserfsck /dev/test/lv0 --check
      reiserfsck /dev/test/lv0 --rebuild-sb
      reiserfsck /dev/test/lv0 --check
      reiserfsck /dev/test/lv0 --rebuild-tree
      reiserfsck /dev/test/lv0 - – check

2 通过备份修复文件

（1）提示操作错误的情况类似：

```
# vgscan
 Reading all physical volumes.  This may take a while...
 WARNING: Inconsistent metadata found for VG vg_test - updating to use version 18
 Removing PV /dev/sdc (DHmMDP-bqQy-TalG-2GLa-sh6o-fyVW-3XQ3gp) that no longer
belongs to VG vg_test
 Found volume group "vg_test" using metadata type lvm2
#pvs
 PV                VG          Fmt  Attr PSize     PFree
/dev/sdb      vg_test lvm2 a-      200.00m 100.00m
/dev/sdc                      lvm2 --      204.00m 204.00m
```

（2）通过恢复配置还原：

```
  # vgcfgrestore -f /etc/lvm/archive/vg_test_01564.vg vg_test
     Cannot restore Volume Group vg_test with 1 PVs marked as missing.
     Restore failed.
```

（3）手动修改配置

```
...
     pv1 {
          id = "DHmMDP-bqQy-TalG-2GLa-sh6o-fyVW-3XQ3gp"
          device = "unknown device"
          flags = ["MISSING"]
 ...
```

（4）再次恢复

```
  # vgcfgrestore -f vg_test_edited.vg vg_test
     Restored volume group vg_test
```

## 六【实验思考】

LAM 故障的类别有很多，解决的方式也很多但是恢复的话很多时候数据并不能完全恢复，所以做好备份以及防患于未然是非常重要的。