Linux 系统下镜像 LV 容错性验证

一【实验目标】

- 学习创建镜像 LV，并且理解容错性的概念，并验证镜像 LV 的容错性

二【实验环境】

- 实验机环境：Centos 6.6
- 目标机环境：Centos 6.6

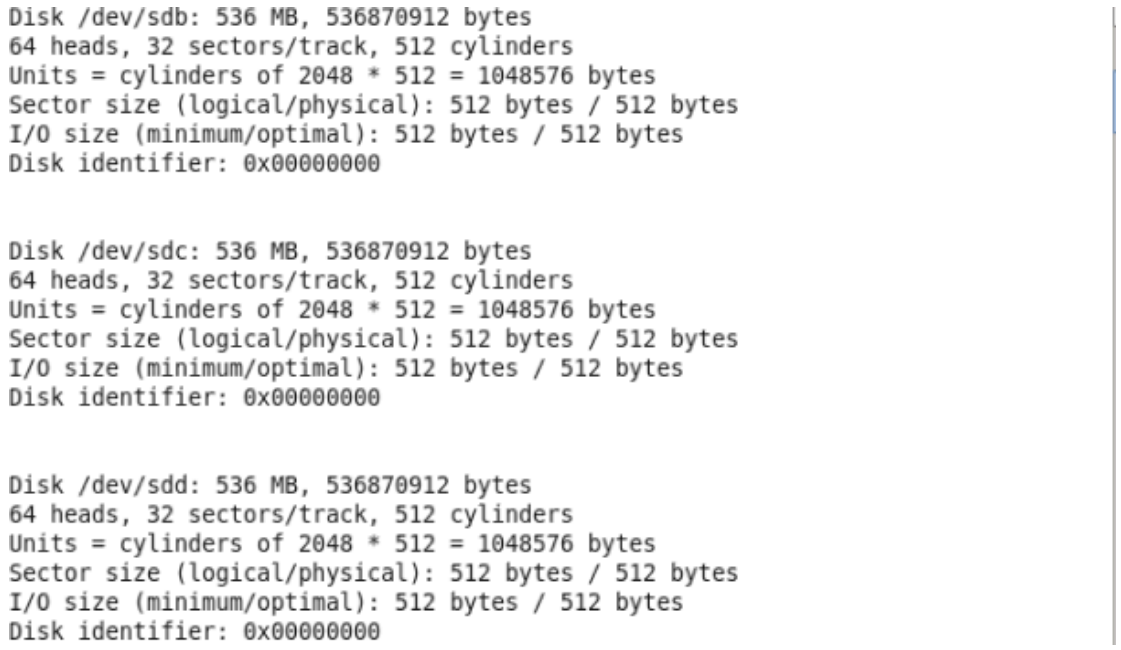
三【实验原理】

容错性：计算机系统的容错性是指软件检测应用程序所运行的软件或者硬件中发生的错误并从错误中恢复的能力。

镜像指的是一个磁盘上的数据另外一个磁盘上存在一个完全相同的副本。

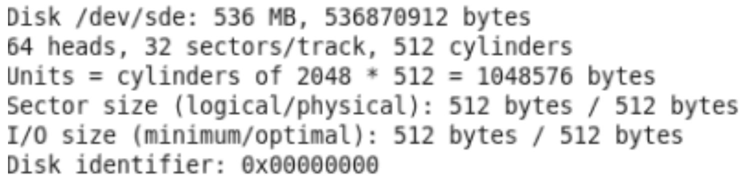
四【实验步骤】

1 添加 4 块物理硬盘，每块 0.5G



```
Disk /dev/sdb: 536 MB, 536870912 bytes
64 heads, 32 sectors/track, 512 cylinders
Units = cylinders of 2048 * 512 = 1048576 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk identifier: 0x00000000


Disk /dev/sdc: 536 MB, 536870912 bytes
64 heads, 32 sectors/track, 512 cylinders
Units = cylinders of 2048 * 512 = 1048576 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk identifier: 0x00000000


Disk /dev/sdd: 536 MB, 536870912 bytes
64 heads, 32 sectors/track, 512 cylinders
Units = cylinders of 2048 * 512 = 1048576 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk identifier: 0x00000000
```

图 1



```
Disk /dev/sde: 536 MB, 536870912 bytes
64 heads, 32 sectors/track, 512 cylinders
Units = cylinders of 2048 * 512 = 1048576 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk identifier: 0x00000000
```

图 2

2 将 sdb sdc sdd sde 创建物理卷，并将 sdb sdc sdd 添加到卷组 vmTest

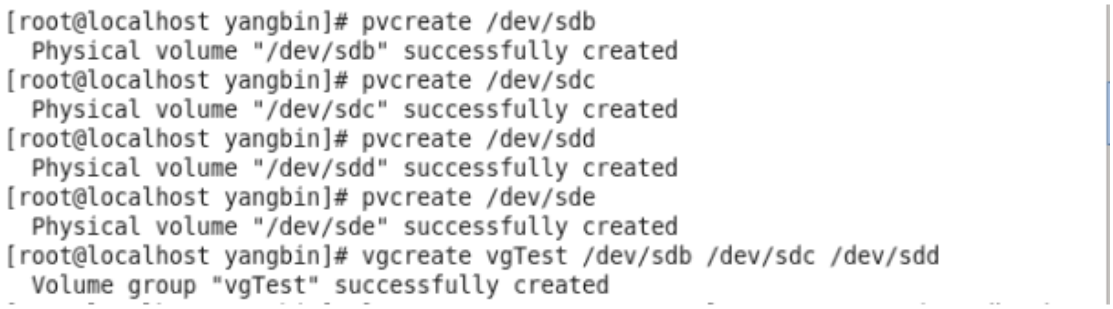
命令：pvcreate /dev/sdb

pvcreate /dev/sdc

pvcreate /dev/sdd

pvcreate /dev/sde

vgcreate vgTest /dev/sdb /dev/sdc /dev/sdd



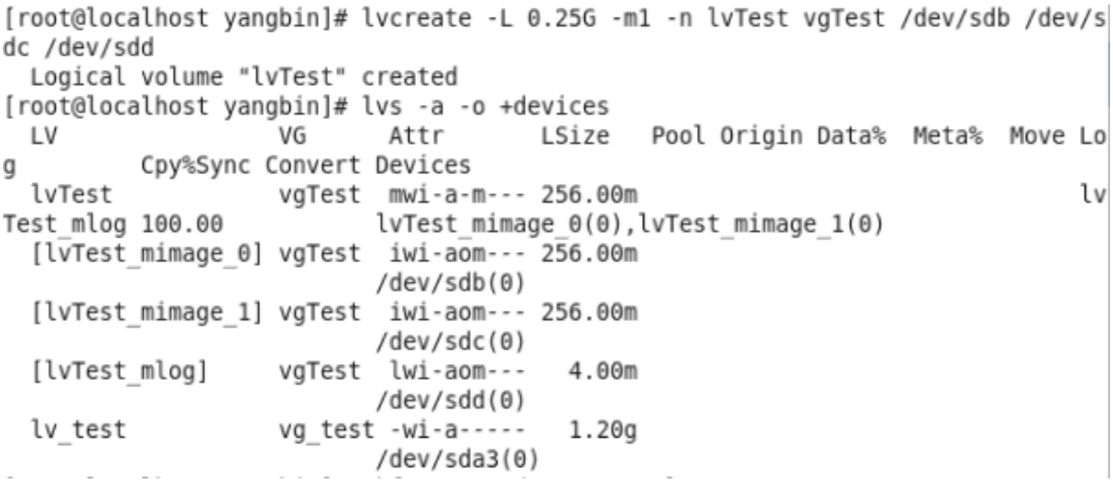
```
[root@localhost yangbin]# pvcreate /dev/sdb
  Physical volume "/dev/sdb" successfully created
[root@localhost yangbin]# pvcreate /dev/sdc
  Physical volume "/dev/sdc" successfully created
[root@localhost yangbin]# pvcreate /dev/sdd
  Physical volume "/dev/sdd" successfully created
[root@localhost yangbin]# pvcreate /dev/sde
  Physical volume "/dev/sde" successfully created
[root@localhost yangbin]# vgcreate vgTest /dev/sdb /dev/sdc /dev/sdd
  Volume group "vgTest" successfully created
```

图 3

3 创建逻辑卷 lv

命令：lvcreate –L 0.25G –m1 –n lvTest vgTest /dev/sdb /dev/sdc /dev/sdd

查看 lv 信息：lvs –a –o +devices



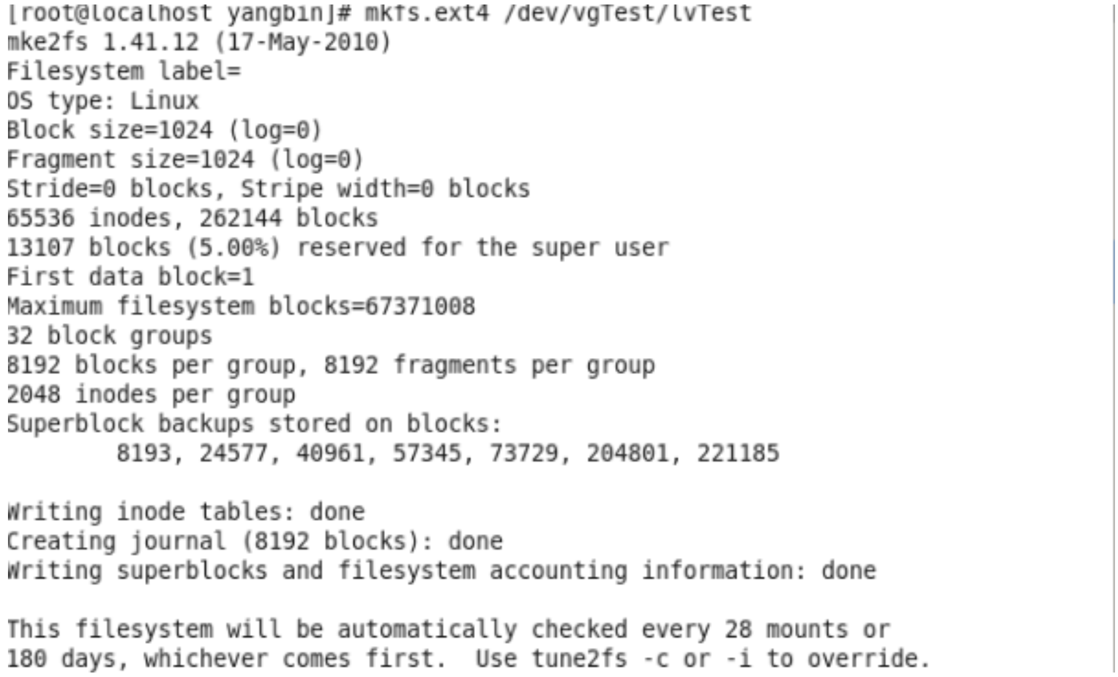
```
[root@localhost yangbin]# lvcreate -L 0.25G -m1 -n lvTest vgTest /dev/sdb /dev/s
dc /dev/sdd
  Logical volume "lvTest" created
[root@localhost yangbin]# lvs -a -o +devices
  LV                VG      Attr       LSize   Pool Origin Data%  Meta%  Move Lo
g         Cpy%Sync Convert Devices
  lvTest            vgTest  mwi-a-m--- 256.00m                                  lv
Test_mlog 100.00           lvTest_mimage_0(0),lvTest_mimage_1(0)
  [lvTest_mimage_0] vgTest  iwi-aom--- 256.00m
                           /dev/sdb(0)
  [lvTest_mimage_1] vgTest  iwi-aom--- 256.00m
                           /dev/sdc(0)
  [lvTest_mlog]     vgTest  lwi-aom---   4.00m
                           /dev/sdd(0)
  lv_test           vg_test -wi-a-----   1.20g
                           /dev/sda3(0)
```

图 4

lvm 需要用到参数-m1 由图可知 /dev/sdb 和/dev/sdc 互为镜像,/dev/sdd 作为日志存储使用

4 将分区格式化，在逻辑卷上创建一个文件，并对/dev/sdc 进行破坏

（1）命令：格式化分区:mkfs.ext4 /dev/vgTest/lvTest



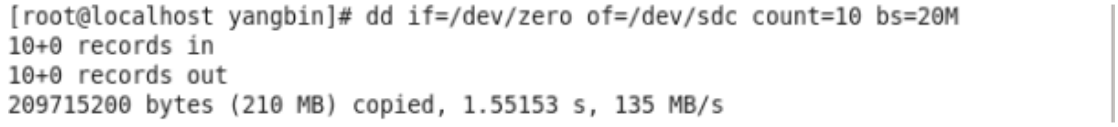
```
[root@localhost yangbin]# mkfs.ext4 /dev/vgTest/lvTest
mke2fs 1.41.12 (17-May-2010)
Filesystem label=
OS type: Linux
Block size=1024 (log=0)
Fragment size=1024 (log=0)
Stride=0 blocks, Stripe width=0 blocks
65536 inodes, 262144 blocks
13107 blocks (5.00%) reserved for the super user
First data block=1
Maximum filesystem blocks=67371008
32 block groups
8192 blocks per group, 8192 fragments per group
2048 inodes per group
Superblock backups stored on blocks:
        8193, 24577, 40961, 57345, 73729, 204801, 221185

Writing inode tables: done
Creating journal (8192 blocks): done
Writing superblocks and filesystem accounting information: done

This filesystem will be automatically checked every 28 mounts or
180 days, whichever comes first.  Use tune2fs -c or -i to override.
```

图 5

（2）命令：dd if=/dev/zero of=/dev/sdc count=10 bs=20M

将输入设备/dev/zero 中大小为 20M 的块复制到/dev/sdc 中，复制

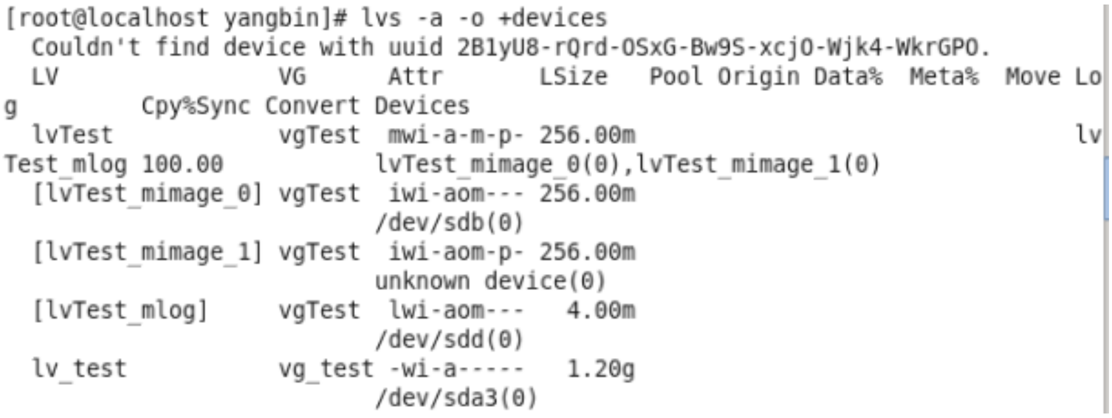
10 块，即填充 0 到/dev/sdc 的前 200M。（这里有个问题，为什么显示的是 210M 啊）



```
[root@localhost yangbin]# dd if=/dev/zero of=/dev/sdc count=10 bs=20M
10+0 records in
10+0 records out
209715200 bytes (210 MB) copied, 1.55153 s, 135 MB/s
```

图 6

（3）命令：查看 lv：lvs –a –o +devices



```
[root@localhost yangbin]# lvs -a -o +devices
  Couldn't find device with uuid 2B1yU8-rQrd-OSxG-Bw9S-xcjO-Wjk4-WkrGPO.
  LV                VG      Attr       LSize   Pool Origin Data%  Meta%  Move Lo
g         Cpy%Sync Convert Devices
  lvTest            vgTest  mwi-a-m-p- 256.00m                                  lv
Test_mlog 100.00           lvTest_mimage_0(0),lvTest_mimage_1(0)
  [lvTest_mimage_0] vgTest  iwi-aom--- 256.00m
                           /dev/sdb(0)
  [lvTest_mimage_1] vgTest  iwi-aom-p- 256.00m
                           unknown device(0)
  [lvTest_mlog]     vgTest  lwi-aom---   4.00m
                           /dev/sdd(0)
  lv_test           vg_test -wi-a-----   1.20g
                           /dev/sda3(0)
```

图 7

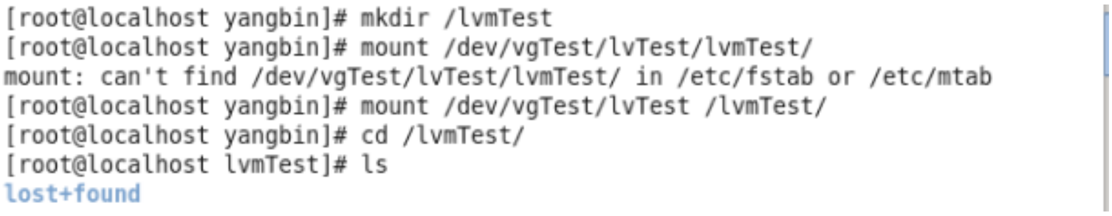
可以看到 /dev/sdc 已经被破坏了

（4）重新挂载逻辑卷

命令：mkdir /lvmTest

mount /dev/vgTest/lvTest　/lvmTest/

cd /lvmTest



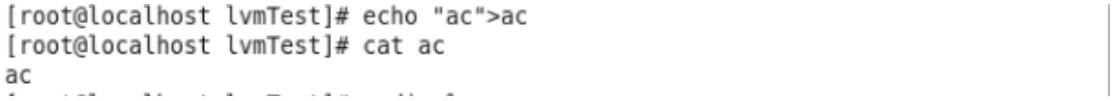
```
[root@localhost yangbin]# mkdir /lvmTest
[root@localhost yangbin]# mount /dev/vgTest/lvTest/lvmTest/
mount: can't find /dev/vgTest/lvTest/lvmTest/ in /etc/fstab or /etc/mtab
[root@localhost yangbin]# mount /dev/vgTest/lvTest /lvmTest/
[root@localhost yangbin]# cd /lvmTest/
[root@localhost lvmTest]# ls
lost+found
```

图 8

（5）向 lvmTest 中写入文件 ac

命令：echo “ac”>ac

cat ac

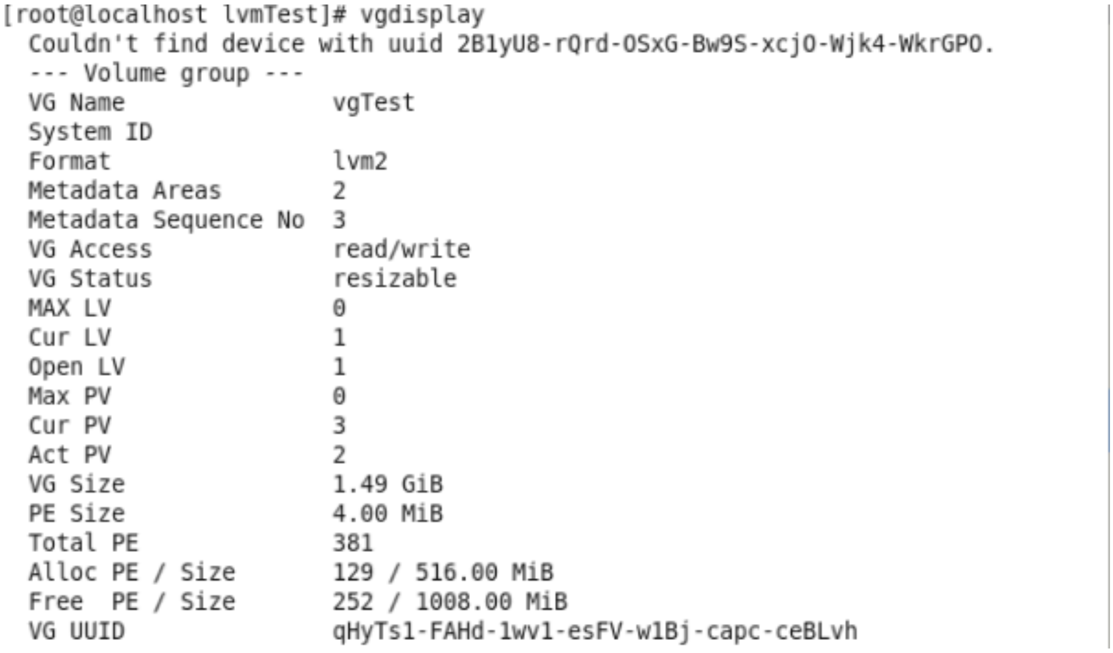


```
[root@localhost lvmTest]# echo "ac">ac
[root@localhost lvmTest]# cat ac
ac
```

图 9

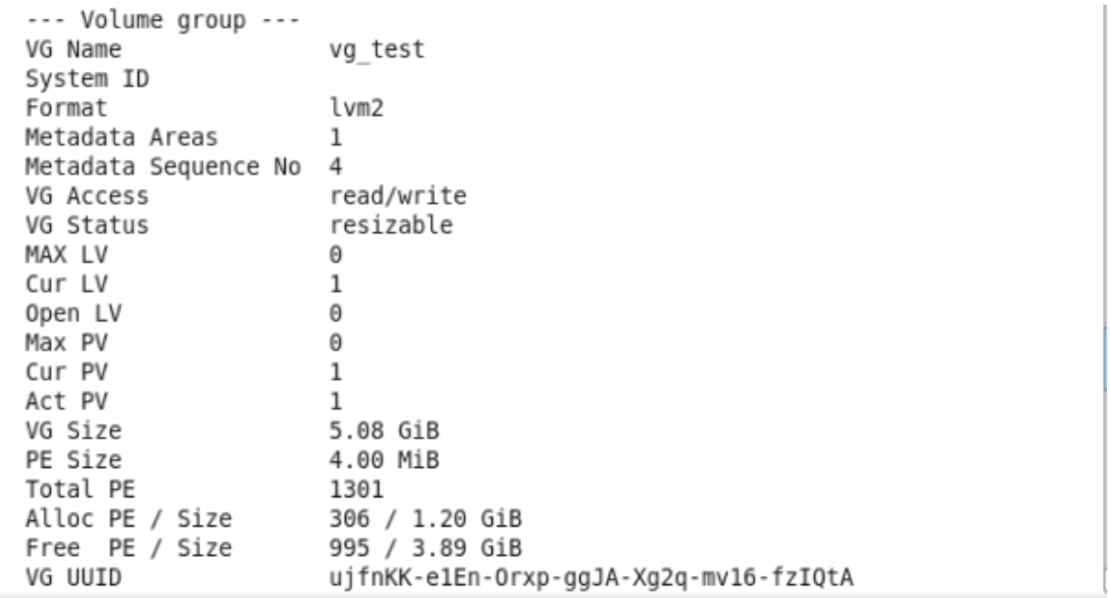
（6）将坏掉的物理卷/dev/sdc 移除

命令：vgdisplay



```
[root@localhost lvmTest]# vgdisplay
  Couldn't find device with uuid 2B1yU8-rQrd-OSxG-Bw9S-xcjO-Wjk4-WkrGPO.
  --- Volume group ---
  VG Name               vgTest
  System ID
  Format                lvm2
  Metadata Areas        2
  Metadata Sequence No  3
  VG Access             read/write
  VG Status             resizable
  MAX LV                0
  Cur LV                1
  Open LV               1
  Max PV                0
  Cur PV                3
  Act PV                2
  VG Size               1.49 GiB
  PE Size               4.00 MiB
  Total PE              381
  Alloc PE / Size       129 / 516.00 MiB
  Free  PE / Size       252 / 1008.00 MiB
  VG UUID               qHyTs1-FAHd-1wv1-esFV-w1Bj-capc-ceBLvh
```

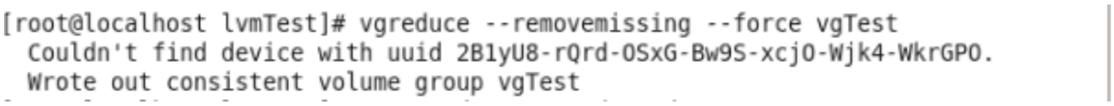
图 10



```
  --- Volume group ---
  VG Name               vg_test
  System ID
  Format                lvm2
  Metadata Areas        1
  Metadata Sequence No  4
  VG Access             read/write
  VG Status             resizable
  MAX LV                0
  Cur LV                1
  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       306 / 1.20 GiB
  Free  PE / Size       995 / 3.89 GiB
  VG UUID               ujfnKK-e1En-Orxp-ggJA-Xg2q-mv16-fzIQtA
```

图 11

命令：vgcreate –removemissing –force vgTest

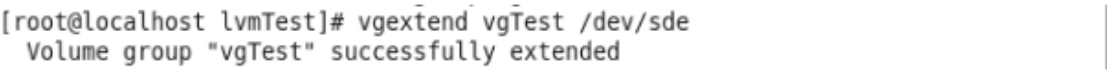


```
[root@localhost lvmTest]# vgreduce --removemissing --force vgTest
  Couldn't find device with uuid 2B1yU8-rQrd-OSxG-Bw9S-xcjO-Wjk4-WkrGPO.
  Wrote out consistent volume group vgTest
```

图 12

5 向卷组中加入新的物理卷/dev/sde

命令：vgextend vgTest /dev/sde

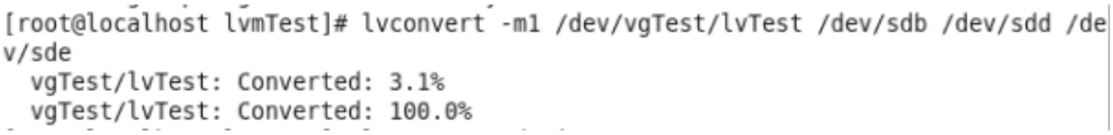


```
[root@localhost lvmTest]# vgextend vgTest /dev/sde
  Volume group "vgTest" successfully extended
```

图 13

6 数据恢复

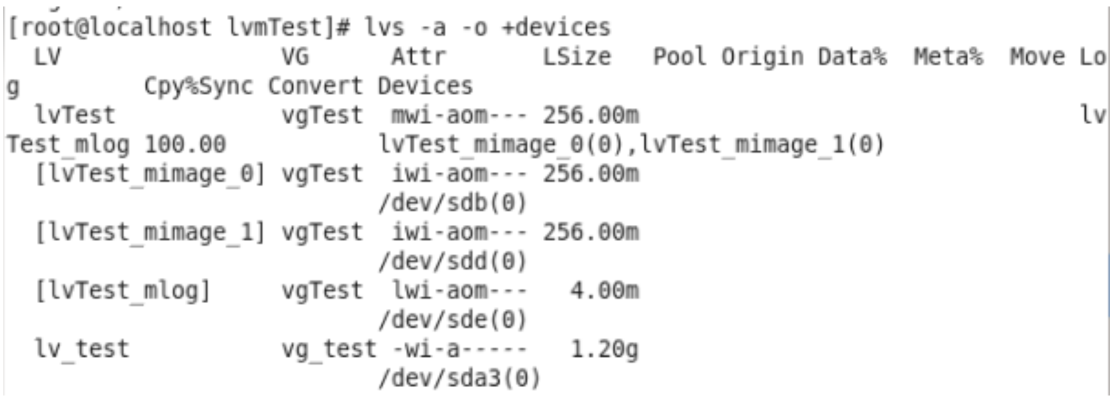
命令：lvconvert –m1 /dev/vgTest/lvTest /dev/sdb /dev/sdd /dev/sde



```
[root@localhost lvmTest]# lvconvert -m1 /dev/vgTest/lvTest /dev/sdb /dev/sdd /de
v/sde
  vgTest/lvTest: Converted: 3.1%
  vgTest/lvTest: Converted: 100.0%
```

图 14

命令：查看 lvs –a –o +decives



```
[root@localhost lvmTest]# lvs -a -o +devices
  LV                VG      Attr       LSize   Pool Origin Data%  Meta%  Move Lo
g         Cpy%Sync Convert Devices
  lvTest            vgTest  mwi-aom--- 256.00m                                 lv
Test_mlog 100.00           lvTest_mimage_0(0),lvTest_mimage_1(0)
  [lvTest_mimage_0] vgTest  iwi-aom--- 256.00m
                           /dev/sdb(0)
  [lvTest_mimage_1] vgTest  iwi-aom--- 256.00m
                           /dev/sdd(0)
  [lvTest_mlog]     vgTest  lwi-aom---   4.00m
                           /dev/sde(0)
  lv_test           vg_test -wi-a-----   1.20g
                           /dev/sda3(0)
```

图 15

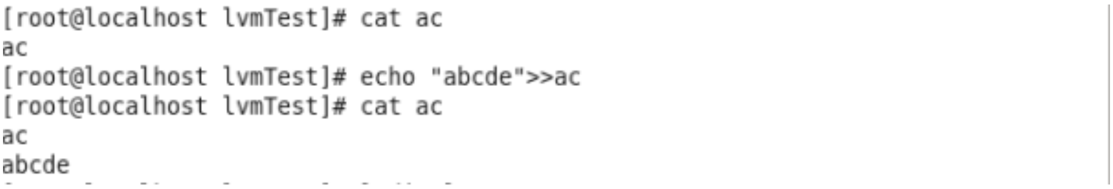
sde 已被加入

7 核实数据

命令：cat “ac”

echo “abcde”>>ac

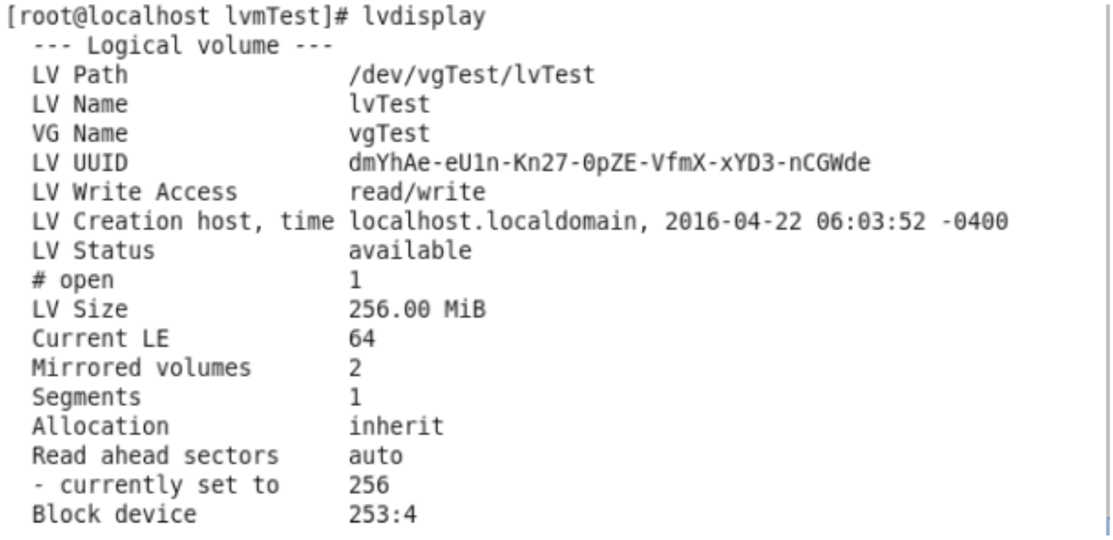
cat ac



```
[root@localhost lvmTest]# cat ac
ac
[root@localhost lvmTest]# echo "abcde">>ac
[root@localhost lvmTest]# cat ac
ac
abcde
```

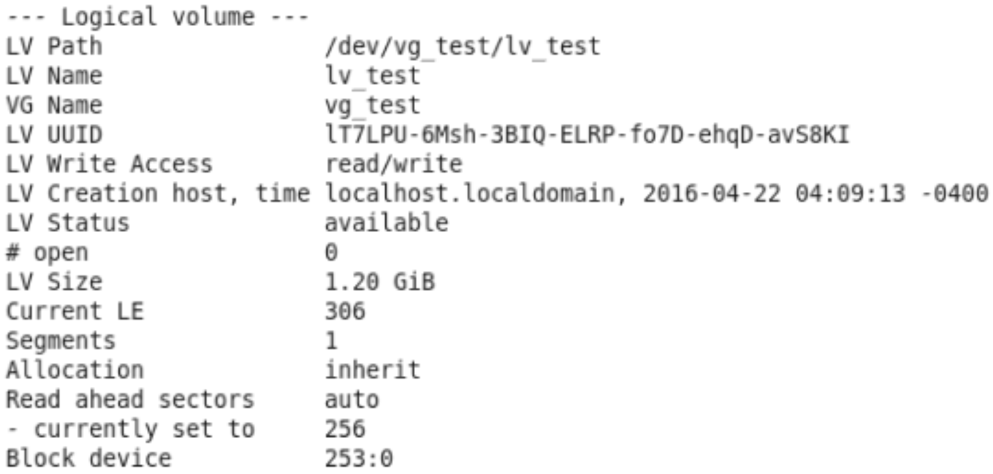
图 16

命令：查看 lv：lvdisplay



```
[root@localhost lvmTest]# lvdisplay
  --- Logical volume ---
  LV Path                /dev/vgTest/lvTest
  LV Name                lvTest
  VG Name                vgTest
  LV UUID                dmYhAe-eU1n-Kn27-0pZE-VfmX-xYD3-nCGWde
  LV Write Access        read/write
  LV Creation host, time localhost.localdomain, 2016-04-22 06:03:52 -0400
  LV Status              available
  # open                 1
  LV Size                256.00 MiB
  Current LE             64
  Mirrored volumes       2
  Segments               1
  Allocation             inherit
  Read ahead sectors     auto
  - currently set to     256
  Block device           253:4
```

图 17



```
--- Logical volume ---
LV Path                /dev/vg_test/lv_test
LV Name                lv_test
VG Name                vg_test
LV UUID                lT7LPU-6Msh-3BIQ-ELRP-fo7D-ehqD-avS8KI
LV Write Access        read/write
LV Creation host, time localhost.localdomain, 2016-04-22 04:09:13 -0400
LV Status              available
# open                 0
LV Size                1.20 GiB
Current LE             306
Segments               1
Allocation             inherit
Read ahead sectors     auto
- currently set to     256
Block device           253:0
```

图 18

五【实验结论】

从试验中可以看出，在 lv 镜像被破坏后，lvm 任然可以正常工作，见能从镜像中准确恢复出数据。容错性得到验证。