

Manual addition of RAID1 partition

1st Step

Check first the status of RAID devices by using `cat /proc/mdstat`

```
[root@localhost ~]# cat /proc/mdstat
Personalities : [raid1]
md126 : active raid1 sda1[1] sdb1[0]
      525248 blocks super 1.0 [2/2] [UU]
      bitmap: 0/1 pages [0KB], 65536KB chunk

md127 : active raid1 sdb2[1] sda2[0]
      12414976 blocks super 1.2 [2/2] [UU]
      bitmap: 0/1 pages [0KB], 65536KB chunk

unused devices: <none>
[root@localhost ~]#
```

2nd Step

Use command `fdisk` for creating disk partitions including the available disk partition. To check the disk partitions, use the command `df`.

```
[root@localhost ~]# fdisk /dev/sda

The device presents a logical sector size that is smaller than
the physical sector size. Aligning to a physical sector (or optimal
I/O) size boundary is recommended, or performance may be impacted.
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.

Command (m for help): _
```


3rd Step

Fdisk has its own few commands that I used in creating partitions. To see all the *fdisk* commands type *m*.

Creating a new partition, I used the command *n*. The partition type to use is extended for me to be able to create 2 more partitions unlike the primary partitions which is only limited to 4. To automatically use the default sector I just leave out the first sector and use up all the remaining free space in disk partition `/dev/sda` by leaving out the last sector too.

```
Command (m for help): n
Partition type:
   p   primary (2 primary, 0 extended, 2 free)
   e   extended
Select (default p): e
Partition number (3,4, default 3):
First sector (25653248-976773167, default 25653248):
Using default value 25653248
Last sector, +sectors or +size{K,M,G} (25653248-976773167, default 976773167):
Using default value 976773167
Partition 3 of type Extended and of size 453.5 GiB is set
Command (m for help): _
```

4th Step

Create 2 logical partitions, `sda5` and `sda6`.

```
Command (m for help): n
Partition type:
   p   primary (2 primary, 1 extended, 1 free)
   l   logical (numbered from 5)
Select (default p): l
Adding logical partition 5
First sector (25901056-976773167, default 25901056):
Using default value 25901056
Last sector, +sectors or +size{K,M,G} (25901056-976773167, default 976773167): +525312K
Partition 5 of type Linux and of size 513 MiB is set

Command (m for help): n
Partition type:
   p   primary (2 primary, 1 extended, 1 free)
   l   logical (numbered from 5)
Select (default p): l
Adding logical partition 6
First sector (26953728-976773167, default 26953728):
Using default value 26953728
Last sector, +sectors or +size{K,M,G} (26953728-976773167, default 976773167): +12423168K
Partition 6 of type Linux and of size 11.9 GiB is set
```


For me to check the partitions I just created I used the command `p` to print the partition table.

```
Command (m for help): p

Disk /dev/sda: 500.1 GB, 500107862016 bytes, 976773168 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
Disk label type: dos
Disk identifier: 0x0006b7a4

   Device Boot      Start         End      Blocks   Id  System
/dev/sda1 *         2048        1052671    525312   fd  Linux raid autodetect
/dev/sda2           1052672    25899007   12423168  fd  Linux raid autodetect
/dev/sda3           25899008    976773167  475437080    5  Extended
/dev/sda5           25901056    26951679    525312   83  Linux
/dev/sda6           26953728    51800063   12423168   83  Linux

Command (m for help): _
```

5th Step

For me to be able to add the partition `sda5` and `sda6` to the RAID devices their partition type should be Linux raid autodetect. I used the `t` command then choose the partition number which is 5 & 6 then type `fd` in the hex code. Type `L` to see the hex codes for certain partition types. Then check again the partition table using `p`.

```
Command (m for help): t
Partition number (1-3,5,6, default 6): 5
Hex code (type L to list all codes): fd
Changed type of partition 'Linux' to 'Linux raid autodetect'

Command (m for help): t
Partition number (1-3,5,6, default 6): 6
Hex code (type L to list all codes): fd
Changed type of partition 'Linux' to 'Linux raid autodetect'

Command (m for help): p

Disk /dev/sda: 500.1 GB, 500107862016 bytes, 976773168 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
Disk label type: dos
Disk identifier: 0x0006b7a4

   Device Boot      Start         End      Blocks   Id  System
/dev/sda1 *         2048        1052671    525312   fd  Linux raid autodetect
/dev/sda2           1052672    25899007   12423168  fd  Linux raid autodetect
/dev/sda3           25899008    976773167  475437080    5  Extended
/dev/sda5           25901056    26951679    525312   fd  Linux raid autodetect
/dev/sda6           26953728    51800063   12423168  fd  Linux raid autodetect

Command (m for help): _
```

I used `w` to write table to the disk and exit. Instead of restarting the computer to see the results I use the command `partprobe` instead.

```
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@localhost ~]# partprobe
```

I used `cat /proc/partitions` to see the list of partitions available.

```
[root@localhost ~]# cat /proc/partitions
major minor  #blocks  name

   8         16  156290904 sdb
   8         17    525312 sdb1
   8         18  12423168 sdb2
   8          0 488386584 sda
   8          1    525312 sda1
   8          2  12423168 sda2
   8          3          1 sda3
   8          5    525312 sda5
   8          6  12423168 sda6
   9        127  12414976 md127
   9        126    525248 md126
 253          0   8192000 dm-0
 253          1   4096000 dm-1
[root@localhost ~]#
```


6th Step

Looking at the output from `cat /proc/partitions`, I can now add my logical partitions to my existing RAID partitions using `mdadm --add`. Then check the status of the raid device by using `mdadm --detail`.

```
[root@localhost ~]# mdadm /dev/md126 --add /dev/sda5
mdadm: added /dev/sda5
[root@localhost ~]# mdadm --detail /dev/md126
/dev/md126:
    Version : 1.0
  Creation Time : Wed Mar 22 04:53:17 2017
    Raid Level : raid1
    Array Size : 525248 (513.02 MiB 537.85 MB)
  Used Dev Size : 525248 (513.02 MiB 537.85 MB)
    Raid Devices : 2
  Total Devices : 3
 Persistence : Superblock is persistent

  Intent Bitmap : Internal

Update Time : Wed Mar 22 07:47:35 2017
  State : clean
Active Devices : 2
Working Devices : 3
Failed Devices : 0
Spare Devices : 1

Name : localhost:boot
UUID : d028df90:6e6403ee:19e7b989:6e850827
Events : 26

   Number   Major   Minor   RaidDevice State   /dev/sdb1
     0         8       17         0   active sync
     1         8         1         1   active sync
     2         8         5          -   spare   /dev/sda5
[root@localhost ~]# _
```


7th Step

After checking the status of the raid device. I have to use `mdadm --grow --raid-device=3 /dev/md126` to update the number of raid devices of the md126 from 2 to 3 for the sda5 to finally be added to the raid array.

```
[root@localhost ~]# mdadm --grow --raid-device=3 /dev/md126
raid_disks for /dev/md126 set to 3
unfreeze
[root@localhost ~]# mdadm --detail /dev/md126
/dev/md126:
    Version : 1.0
  Creation Time : Wed Mar 22 04:53:17 2017
    Raid Level : raid1
    Array Size : 525248 (513.02 MiB 537.85 MB)
  Used Dev Size : 525248 (513.02 MiB 537.85 MB)
    Raid Devices : 3
    Total Devices : 3
 Persistence : Superblock is persistent
```

```
Intent Bitmap : Internal

  Update Time : Wed Mar 22 07:48:25 2017
    State : clean
Active Devices : 3
Working Devices : 3
Failed Devices : 0
Spare Devices : 0

    Name : localhost:boot
    UUID : d028df90:6e6403ee:19e7b989:6e850827
    Events : 48
```

| Number | Major | Minor | RaidDevice | State | |
|--------|-------|-------|------------|-------------|-----------|
| 0 | 8 | 17 | 0 | active sync | /dev/sdb1 |
| 1 | 8 | 1 | 1 | active sync | /dev/sda1 |
| 2 | 8 | 5 | 2 | active sync | /dev/sda5 |

```
[root@localhost ~]# _
```


8th Step

Checking the status of the raid devices again using `cat /proc/mdstat`. Sda5 is now included in the raid array md126.

```
[root@localhost ~]# cat /proc/mdstat
Personalities : [raid1]
md126 : active raid1 sda5[2] sda1[1] sdb1[0]
      525248 blocks super 1.0 [3/3] [UUU]
      bitmap: 0/1 pages [0KB], 65536KB chunk

md127 : active raid1 sdb2[1] sda2[0]
      12414976 blocks super 1.2 [2/2] [UU]
      bitmap: 1/1 pages [4KB], 65536KB chunk

unused devices: <none>
```

Adding logical partition sda6 to raid array md127 by repeating the same procedure and commands in adding the sda5 to raid array md126.

```
[root@localhost ~]# mdadm /dev/md127 --add /dev/sda6
mdadm: added /dev/sda6
[root@localhost ~]# mdadm --detail /dev/md127
/dev/md127:
  Version : 1.2
  Creation Time : Wed Mar 22 04:53:20 2017
  Raid Level : raid1
  Array Size : 12414976 (11.84 GiB 12.71 GB)
  Used Dev Size : 12414976 (11.84 GiB 12.71 GB)
  Raid Devices : 2
  Total Devices : 3
  Persistence : Superblock is persistent

  Intent Bitmap : Internal

  Update Time : Wed Mar 22 07:49:36 2017
    State : clean
  Active Devices : 2
  Working Devices : 3
  Failed Devices : 0
  Spare Devices : 1
```



```

Spare Devices : 1

Name : localhost:pv00
UUID : 8ee30ead:2dd8c15b:11c204d1:5cfb23fa
Events : 54

Number   Major   Minor   RaidDevice State
  0         8       2         0   active sync  /dev/sda2
  1         8      18         1   active sync  /dev/sdb2
  2         8       6         -   spare        /dev/sda6
[root@localhost ~]# _

```

Checking again the status of raid devices by using `cat /proc/mdstat`. Entering the same command will output the status of the newly added raid array. If I use the command `watch` I will be able to monitor the status of the raid array that is being process.

```

[root@localhost ~]# mdadm --grow --raid-device=3 /dev/md127
raid_disks for /dev/md127 set to 3
unfreeze
[root@localhost ~]# cat /proc/mdstat
Personalities : [raid1]
md126 : active raid1 sda5[2] sda1[1] sdb1[0]
      525248 blocks super 1.0 [3/3] [UUU]
      bitmap: 0/1 pages [0KB], 65536KB chunk

md127 : active raid1 sda6[2] sdb2[1] sda2[0]
      12414976 blocks super 1.2 [3/2] [UU_]
      [>.....] recovery = 1.9% (239744/12414976) finish=4.2min speed=47948K/sec
      bitmap: 1/1 pages [4KB], 65536KB chunk

unused devices: <none>

```

I have successfully added a new raid array to my raid devices.

```

[root@localhost ~]# cat /proc/mdstat
Personalities : [raid1]
md126 : active raid1 sda5[2] sda1[1] sdb1[0]
      525248 blocks super 1.0 [3/3] [UUU]
      bitmap: 0/1 pages [0KB], 65536KB chunk

md127 : active raid1 sda6[2] sdb2[1] sda2[0]
      12414976 blocks super 1.2 [3/3] [UUU]
      bitmap: 1/1 pages [4KB], 65536KB chunk

unused devices: <none>
[root@localhost ~]#

```


Manually expand the root directory from 8GB to 16GB using LVM

1st Step

Enter the command `lvm` then check if there are existing logical volume by using the command `lvscan`.

```
lvs - Report information about Logical Volumes.  
[root@localhost ~]# lvm  
[lvm> lvscan  
ACTIVE          '/dev/rhel/root' [7.81 GiB] inherit  
ACTIVE          '/dev/rhel/swap' [3.91 GiB] inherit  
[lvm>
```

Check the physical volume by using `pvdisk`.

```
[lvm> pvdisk  
--- Physical volume ---  
PV Name           /dev/md127  
VG Name           rhel  
PV Size           11.76 GiB / not usable 4.00 MiB  
Allocatable       yes  
PE Size           4.00 MiB  
Total PE          3009  
Free PE           20  
Allocated PE      2989  
PV UUID           g03X3c-aDzE-gell-Z5IS-7ntU-rFw0-3WzvuhX  
[lvm> _
```


Check the volume group by using the command *vgdisplay*.

Physical Extent number and size is 20 / 80.00 MiB here.

```
lvm> vgdisplay
--- Volume group ---
UG Name                rhel
System ID
Format                 lvm2
Metadata Areas         1
Metadata Sequence No   3
UG Access              read/write
UG Status              resizable
MAX LV                 0
Cur LV                2
Open LV                2
Max PU                 0
Cur PU                1
Act PU                 1
UG Size                11.75 GiB
PE Size                4.00 MiB
Total PE               3009
Alloc PE / Size        2989 / 11.68 GiB
Free PE / Size         20 / 80.00 MiB
UG UUID                CeyiL1-Ma62-Bf01-wJht-5sAc-iFN1-k5aZp3

lvm> _
```

Check the logical volume by using the *lvdisplay*.

```
lvm> lvdisplay
--- Logical volume ---
LV Path                /dev/rhel/root
LV Name                root
UG Name                rhel
LV UUID                LDMUfU-8FiU-5AR0-9EHt-fFWE-QJ8h-gG8opw
LV Write Access        read/write
LV Creation host, time localhost, 2017-03-22 22:48:00 +0000
LV Status              available
# open                 1
LV Size                7.77 GiB
Current LE             1989
Segments               1
Allocation             inherit
Read ahead sectors     auto
- currently set to    8192
Block device           253:0

--- Logical volume ---
LV Path                /dev/rhel/swap
LV Name                swap
UG Name                rhel
LV UUID                U9Mntc-bA4f-WBmM-7m36-jvcy-D4C6-q0CM3D
LV Write Access        read/write
LV Creation host, time localhost, 2017-03-22 22:48:02 +0000
LV Status              available
# open                 2
LV Size                3.91 GiB
Current LE             1000
Segments               1
Allocation             inherit
Read ahead sectors     auto
- currently set to    8192
```


2nd Step

I use *fdisk* using a disk partition where there is still a free primary partition which is *sdb*.

```
[root@localhost ~]# fdisk /dev/sdb
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.

Command (m for help): p

Disk /dev/sdb: 160.0 GB, 160041885696 bytes, 312581808 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: 0x00050205
```

| | Device | Boot | Start | End | Blocks | Id | System |
|---|-----------|------|---------|----------|----------|----|-----------------------|
| 1 | /dev/sdb1 | * | 2048 | 1052671 | 525312 | fd | Linux raid autodetect |
| 2 | /dev/sdb2 | | 1052672 | 25726975 | 12337152 | fd | Linux raid autodetect |

```
Command (m for help):
```

3rd Step

I created a new primary partition for me to be able to create a physical volume.

```
Command (m for help): n
Partition type:
   p   primary (2 primary, 0 extended, 2 free)
   e   extended
Select (default p): p
Partition number (3,4, default 3): 3
First sector (25726976-312581807, default 25726976):
Using default value 25726976
Last sector, +sectors or +size{K,M,G} (25726976-312581807, default 312581807): +8G
Partition 3 of type Linux and of size 8 GiB is set

Command (m for help): p

Disk /dev/sdb: 160.0 GB, 160041885696 bytes, 312581808 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: 0x00050205
```

| | Device | Boot | Start | End | Blocks | Id | System |
|---|-----------|------|----------|----------|----------|----|-----------------------|
| 1 | /dev/sdb1 | * | 2048 | 1052671 | 525312 | fd | Linux raid autodetect |
| 2 | /dev/sdb2 | | 1052672 | 25726975 | 12337152 | fd | Linux raid autodetect |
| 3 | /dev/sdb3 | | 25726976 | 42504191 | 8388608 | 83 | Linux |

```
Command (m for help):
```


4th Step

Change the partition type of the newly created primary partition to Linux LVM using the *fdisk* command *t*. Enter *L* command to list the partition types and their hex codes.

```

Command (m for help): t
Partition number (1-3, default 3): 3
Hex code (type L to list all codes): L

0 Empty                24 NEC DOS             81 Minix / old Lin bf Solaris
1 FAT12                27 Hidden NTFS Win 82 Linux swap / So c1 DRDOS/sec (FAT-
2 XENIX root           39 Plan 9              83 Linux           c4 DRDOS/sec (FAT-
3 XENIX usr            3c PartitionMagic     84 OS/2 hidden C: c6 DRDOS/sec (FAT-
4 FAT16 <32M          40 Uenix 80286         85 Linux extended c7 Syrix
5 Extended             41 PPC PReP Boot      86 NTFS volume set da Non-FS data
6 FAT16               42 SFS                87 NTFS volume set db CP/M / CTOS / .
7 HPFS/NTFS/exFAT 4d QNX4.x              88 Linux plaintext de Dell Utility
8 AIX                 4e QNX4.x 2nd part 8e Linux LVM      df BootIt
9 AIX bootable        4f QNX4.x 3rd part 93 Amoebe        e1 DOS access
a OS/2 Boot Manag 50 OnTrack DM         94 Amoebe BBT    e3 DOS R/O
b W95 FAT32           51 OnTrack DM6 Aux 9f BSD/OS       e4 SpeedStor
c W95 FAT32 (LBA) 52 CP/M              a0 IBM Thinkpad hi eb BeOS fs
e W95 FAT16 (LBA) 53 OnTrack DM6 Aux a5 FreeBSD      ee GPT
f W95 Ext'd (LBA) 54 OnTrackDM6       a6 OpenBSD      ef EFI (FAT-12/16/
t10 OPUS             55 EZ-Drive        a7 NeXTSTEP     f0 Linux/PA-RISC b
t11 Hidden FAT12     56 Golden Bow     a8 Darwin UFS   f1 SpeedStor
t12 Compaq diagnost 5c Priam Edisk    a9 NetBSD       f4 SpeedStor
t14 Hidden FAT16 <3 61 SpeedStor      ab Darwin boot  f2 DOS secondary
t16 Hidden FAT16     63 GNU HURD or Sys af HFS / HFS+   fb VMware VMFS
t17 Hidden HPFS/NTF 64 Novell Netware b7 BSDI fs      fc VMware VMKORE
t18 AST SmartSleep 65 Novell Netware b8 BSDI swap    fd Linux raid auto
t1b Hidden W95 FAT3 70 DiskSecure Mult bb Boot Wizard hid fe LANstep
t1c Hidden W95 FAT3 75 PC/IX         be Solaris boot ff BBT
t1e Hidden W95 FAT1 80 Old Minix

Hex code (type L to list all codes): 8e
Changed type of partition 'Linux' to 'Linux LVM'

Command (m for help):

```


5th Step

I used the *fdisk* command *w* to write to the disk and quit. Then entered command *partprobe* so that I won't reboot the computer to see the changes I made. To check the partition type again of the newly created partition I used the *fdisk* and *p* command.

```
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@localhost ~]# partprobe
[root@localhost ~]# fdisk /dev/sdb
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.

Command (m for help): p

Disk /dev/sdb: 160.0 GB, 160041885696 bytes, 312581888 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: 0x00050205

   Device Boot      Start         End      Blocks   Id  System
/dev/sdb1   *        2048       1052671       525312   fd  Linux raid autodetect
/dev/sdb2          1052672      25726975      12337152   fd  Linux raid autodetect
/dev/sdb3          25726976      42504191       8386080   8e  Linux LVM

Command (m for help): _
```

7th Step

I created a physical volume using the primary partition I just created. The command is *pvcreeate*, then I used the *pvs* command to check the physical volumes.

```

[root@localhost ~]# pvcreeate /dev/sdb3
Physical volume "/dev/sdb3" successfully created
[root@localhost ~]# pvs
  PV          VG     Fmt  Attr  PSize  PFree
  /dev/md127  rhel  lvm2 a--   11.75g  80.00m
  /dev/sdb3   lvm2 ---    8.00g   8.00g
[root@localhost ~]#
```


8th Step

I used the command `vgextend` to allocate size of the physical volume that I created which I will be using to expand the size of my logical volume root.

```
root@localhost ~]# vgextend rhel /dev/sdb3
Volume group "rhel" successfully extended
root@localhost ~]# vgs
  UG   #PV #LV #SN Attr   USize  VFree
  rhel   2   2   0 wz--n- 19.75g 8.07g
root@localhost ~]# _
```

I used the command `vgdisplay` to check the number and size of the physical extents.

```
[root@localhost ~]# vgdisplay
--- Volume group ---
UG Name                rhel
System ID
Format                 lvm2
Metadata Areas         2
Metadata Sequence No   4
UG Access               read/write
UG Status               resizable
MAX LV                 0
Cur LV                 2
Open LV                 2
Max PV                  0
Cur PV                 2
Act PV                  2
UG Size                 19.75 GiB
PE Size                 4.00 MiB
Total PE                5056
Alloc PE / Size         2989 / 11.68 GiB
Free PE / Size           2067 / 8.07 GiB
UG UUID                 CeyiL1-Ma62-Bf01-wJht-5sAc-iFN1-k5aZp3
[root@localhost ~]#
```


9th Step

Now for me to extend the size of my logical volume root I had to use the command `lvextend -l`. The `-l` option is for using the PE or physical extent number of the free PE in the volume group.

```
[root@localhost ~]# lvextend -l +2067 /dev/rhel/root
Size of logical volume rhel/root changed from 7.77 GiB (1989 extents) to 15.84 GiB (4056 extents).
Logical volume root successfully resized
[root@localhost ~]# _
```

10th Step

The `resize2fs` program will resize ext2, ext3, or ext4 file systems. It can be used to enlarge or shrink an unmounted file system located on device. If the filesystem is mounted, it can be used to expand the size of the mounted filesystem, assuming the kernel supports on-line resizing.

```
[root@localhost ~]# resize2fs /dev/rhel/root
resize2fs 1.42.9 (28-Dec-2013)
Filesystem at /dev/rhel/root is mounted on /; on-line resizing required
old_desc_blocks = 1, new_desc_blocks = 2
The filesystem on /dev/rhel/root is now 4153344 blocks long.

[root@localhost ~]#
```

To check the logical volume root I used the command `lvdisplay`.

```
[root@localhost ~]# lvdisplay
--- Logical volume ---
LV Path                /dev/rhel/root
LV Name                 root
VG Name                 rhel
LV UUID                 LDMUFU-8FiV-5AR0-9EHt-ffWE-QJBh-gG8opw
LV Write Access         read/write
LV Creation host, time localhost, 2017-03-22 22:48:00 +0800
LV Status                available
# open                  1
LV Size                 15.84 GiB
Current LE              4056
Segments                3
Allocation               inherit
Read ahead sectors      auto
- currently set to      8192
Block device            253:0
```


Checking the volume group, physical volume and logical volume using *pvs*, *vgs* and *lvs*.

```
root@localhost ~]# vgs
UG   #PU #LU #SN Attr   USize UFree
rhel  2   2   0 wz--n- 19.75g  0
root@localhost ~]# pvs
PU           UG   Fmt Attr PSize PFree
/dev/md127  rhel lvm2 a--  11.75g  0
/dev/sdb3   rhel lvm2 a--   8.00g  0
root@localhost ~]# pvs
PU           UG   Fmt Attr PSize PFree
/dev/md127  rhel lvm2 a--  11.75g  0
/dev/sdb3   rhel lvm2 a--   8.00g  0
root@localhost ~]# vgs
UG   #PU #LU #SN Attr   USize UFree
rhel  2   2   0 wz--n- 19.75g  0
root@localhost ~]# lvs
LU   UG   Attr      LSize Pool Origin Data%  Meta%  Move Log Cpy/Sync Convert
root rhel -wi-ao---- 15.84g
swap rhel -wi-ao----  3.91g
root@localhost ~]# _
```