This tutorial will help you in extending LVM partition without rebooting the server.

1- At first, I want to expand the size in the \root directory, as shown below by using "df -h" command line the \root has only 66 GB available.

```
[root@localhost ~]# df -h
Filesystem              Size  Used Avail Use% Mounted on
devtmpfs                 16G     0   16G   0% /dev
tmpfs                    16G     0   16G   0% /dev/shm
tmpfs                    16G   12M   16G   1% /run
tmpfs                    16G     0   16G   0% /sys/fs/cgroup
/dev/mapper/rhel-root    71G  5.5G   66G   8% /
/dev/sda1              1014M  192M  823M  19% /boot
/dev/mapper/rhel-home    20G   33M   20G   1% /home
tmpfs                   3.2G     0  3.2G   0% /run/user/0
```

2- By using “lsblk” it's shows that the VM has unmounted disk drive in “sdb” with a size of 1T.

```
[root@localhost ~]# 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 98.9G  0 part
  ├─rhel-root 253:0    0   71G  0 lvm  /
  ├─rhel-swap 253:1    0  7.9G  0 lvm  [SWAP]
  └─rhel-home 253:2    0   20G  0 lvm  /home
sdb             8:16   0    1T  0 disk
sr0            11:0    1 1024M  0 rom
```

3- "We need to create a new partition. Run fdisk /dev/sdb, where /dev/sdb is the label of our disk (Disk /dev/sdb):"[1]

4- Then type “n” for create a new partition

```
[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.

Device does not contain a recognized partition table
Building a new DOS disklabel with disk identifier 0x1baed589.

Command (m for help): n
```

5-“P” for primary:

```
Partition type:
   p   primary (0 primary, 0 extended, 4 free)
   e   extended
Select (default p): p
```


5- Press “ENTER button” 3 times to choose the default sitting:

```
Partition number (1-4, default 1):
First sector (2048-2147483647, default 2048):
Using default value 2048
Last sector, +sectors or +size{K,M,G} (2048-2147483647, default 2147483647):
Using default value 2147483647
Partition 1 of type Linux and of size 1024 GiB is set
```


6- Then “t” to “indicate the type of partition” [1]:

7- “L” to list all OS type therefore we will choose “8e” in our case since it’s Linux LVM.

```
Command (m for help): t
Selected partition 1
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  Venix 80286     85  Linux extended  c7  Syrinx
 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  Amoeba          e1  DOS access
 a  OS/2 Boot Manag 50  OnTrack DM      94  Amoeba 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/
10  OPUS            55  EZ-Drive        a7  NeXTSTEP        f0  Linux/PA-RISC b
11  Hidden FAT12    56  Golden Bow      a8  Darwin UFS      f1  SpeedStor
12  Compaq diagnost 5c  Priam Edisk     a9  NetBSD          f4  SpeedStor
14  Hidden FAT16 <3 61  SpeedStor       ab  Darwin boot     f2  DOS secondary
16  Hidden FAT16    63  GNU HURD or Sys af  HFS / HFS+      fb  VMware VMFS
17  Hidden HPFS/NTF 64  Novell Netware  b7  BSDI fs         fc  VMware VMKCORE
18  AST SmartSleep  65  Novell Netware  b8  BSDI swap       fd  Linux raid auto
1b  Hidden W95 FAT3 70  DiskSecure Mult bb  Boot Wizard hid fe  LANstep
1c  Hidden W95 FAT3 75  PC/IX           be  Solaris boot    ff  BBT
1e  Hidden W95 FAT1 80  Old Minix
Hex code (type L to list all codes): 8e
Changed type of partition 'Linux' to 'Linux LVM'
```

8- "w" to save changes.

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

Calling ioctl() to re-read partition table.
Syncing disks.
[root@localhost ~]#
```

9- "To use the created volume in LVM, initialize it with the "**pvcreate"** command:" [1]

```
[root@localhost ~]# pvcreate /dev/sdb1
  Physical volume "/dev/sdb1" successfully created.
```

10-"vgdisplay" to show the name of the volume group, VG "rhel".

```
[root@localhost ~]# vgdisplay
  --- Volume group ---
  VG Name               rhel
  System ID
  Format                lvm2
  Metadata Areas        1
  Metadata Sequence No  4
  VG Access             read/write
  VG Status             resizable
  MAX LV                0
  Cur LV                3
  Open LV               3
  Max PV                0
  Cur PV                1
  Act PV                1
  VG Size               <98.88 GiB
  PE Size               4.00 MiB
  Total PE              25313
  Alloc PE / Size       25312 / <98.88 GiB
  Free  PE / Size       1 / 4.00 MiB
  VG UUID               hMM5vt-0qKf-Xdmp-cDjE-Laz3-icgr-ZwTvSL
```

11-"Add our partition to below group:" [1]

```
[root@localhost ~]# vgextend rhel /dev/sdb1
  Volume group "rhel" successfully extended
```

12-“Using “**lvdisplay”**, we look at the name and path to the logical one that needs to be expanded (by default, this is root and **/dev/rhel/root**):” [1]

```
[root@localhost ~]# lvdisplay
  --- Logical volume ---
  LV Path                /dev/rhel/root
  LV Name                root
  VG Name                rhel
  LV UUID                Am[redacted]
  LV Write Access        read/write
  LV Creation host, time localhost, 2020-04-20 13:01:24 +0300
  LV Status              available
  # open                 1
  LV Size                71.00 GiB
  Current LE             18176
  Segments               1
  Allocation             inherit
  Read ahead sectors     auto
  - currently set to     8192
  Block device           253:0

  --- Logical volume ---
  LV Path                /dev/rhel/home
  LV Name                home
  VG Name                rhel
  LV UUID                HA[redacted]
  LV Write Access        read/write
  LV Creation host, time localhost, 2020-04-20 13:01:25 +0300
  LV Status              available
  # open                 1
  LV Size                20.00 GiB
  Current LE             5120
  Segments               1
  Allocation             inherit
  Read ahead sectors     auto
  - currently set to     8192
  Block device           253:2

  --- Logical volume ---
  LV Path                /dev/rhel/swap
  LV Name                swap
  VG Name                rhel
  LV UUID                EM[redacted]
  LV Write Access        read/write
  LV Creation host, time localhost, 2020-04-20 13:01:26 +0300
  LV Status              available
  # open                 2
  LV Size                <7.88 GiB
  Current LE             2016
  Segments               1
  Allocation             inherit
  Read ahead sectors     auto
  - currently set to     8192
  Block device           253:1
```

13-**“lvextend”** specify the path to the logical volume.

```
[root@localhost ~]# lvextend /dev/rhel/root /dev/sdb1
  Size of logical volume rhel/root changed from 71.00 GiB (18176 extents) to <1.07 TiB (280319 extents).
  Logical volume rhel/root successfully resized.
```

14-**“xfs_growfs”** expand the file system and execute.

```
[root@localhost ~]# lvextend /dev/rhel/root /dev/sdb1
  Size of logical volume rhel/root changed from 71.00 GiB (18176 extents) to <1.07 TiB (280319 extents).
  Logical volume rhel/root successfully resized.
[root@localhost ~]# xfs_growfs /dev/rhel/root
meta-data=/dev/mapper/rhel-root  isize=512    agcount=4, agsize=4653056 blks
         =                       sectsz=512   attr=2, projid32bit=1
         =                       crc=1        finobt=0 spinodes=0
data     =                       bsize=4096   blocks=18612224, imaxpct=25
         =                       sunit=0      swidth=0 blks
naming   =version 2              bsize=4096   ascii-ci=0 ftype=1
log      =internal               bsize=4096   blocks=9088, version=2
         =                       sectsz=512   sunit=0 blks, lazy-count=1
realtime =none                   extsz=4096   blocks=0, rtextents=0
data blocks changed from 18612224 to 287046656
```

15-“df -h” Check the result:

```
[root@localhost ~]# df -h
Filesystem              Size  Used Avail Use% Mounted on
devtmpfs                 16G     0   16G   0% /dev
tmpfs                    16G     0   16G   0% /dev/shm
tmpfs                    16G   12M   16G   1% /run
tmpfs                    16G     0   16G   0% /sys/fs/cgroup
/dev/mapper/rhel-root   1.1T  5.5G  1.1T   1% /
/dev/sda1              1014M  192M  823M  19% /boot
/dev/mapper/rhel-home    20G   33M   20G   1% /home
tmpfs                   3.2G     0  3.2G   0% /run/user/0
```

References:

1- https://pocketadmin.tech/en/centos-8-extend-lvm/