

# Increasing the size of a Linux LVM by adding a new disk

This document describes how to increase the disk space for a VMware virtual machine running Linux that is using logical volume manager (LVM).

**Note:** These steps only apply to EXT4 file systems. See the following link for EXT3 file systems.  
[http://kb.vmware.com/selfservice/microsites/search.do?language=en\\_US&cmd=displayKC&externalId=1006371](http://kb.vmware.com/selfservice/microsites/search.do?language=en_US&cmd=displayKC&externalId=1006371)

The example below is for a VMware virtual machine running CentOS-7. It was initially set up with a 140gb disk, and was increased by 40gb for a total final size of 180gb. More specifically, it increased the /home partition by 40gb.

```
[root@testvm ~]# df -h
Filesystem                                Size  Used Avail Use% Mounted on
/dev/mapper/centos_osprey--redirect--c7-root 29G  3.9G  24G  14% /
devtmpfs                                  31G   0    31G   0% /dev
tmpfs                                      31G   0    31G   0% /dev/shm
tmpfs                                      31G  8.7M  31G   1% /run
tmpfs                                      31G   0    31G   0% /sys/fs/cgroup
/dev/mapper/centos_osprey--redirect--c7-home 99G  60M  94G   1% /home
/dev/sda1                                  497M  126M  372M  26% /boot
[root@testvm ~]#
```

## Identify the partition type

First confirm that the partition type is actually Linux LVM by running the below command.

```
[root@testvm ~]# fdisk -l

Disk /dev/sda: 150.3 GB, 150323855360 bytes, 293601280 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: 0x0009d162

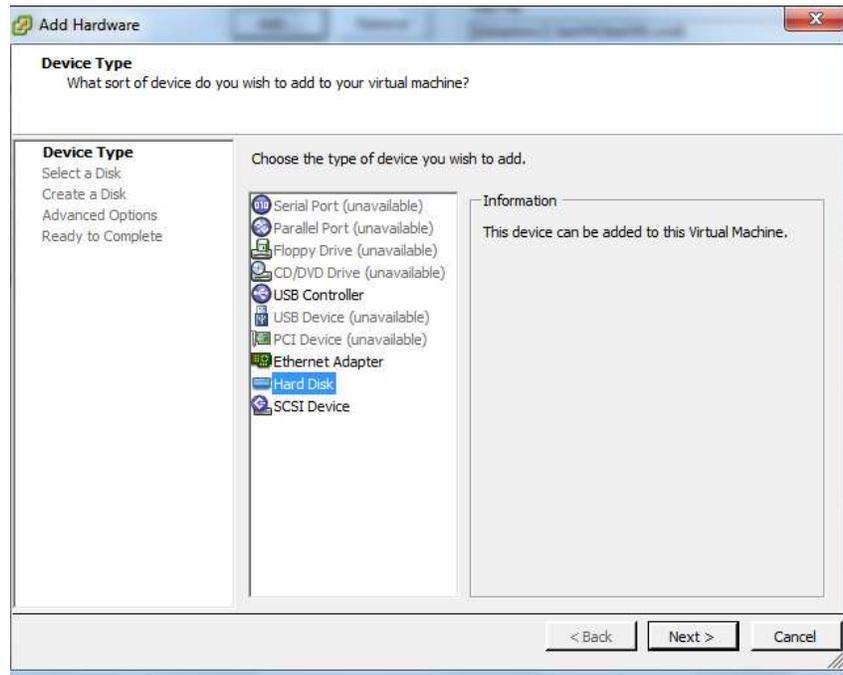
   Device Boot      Start         End      Blocks    Id System
/dev/sda1  *           2048     1026047     512000    83  Linux
/dev/sda2             1026048    209592319    104283136    8e  Linux LVM
/dev/sda3             209592320    293601279     42004480    8e  Linux LVM
```

As you can see in the above display, /dev/sda2 is listed as "Linux LVM" and it has the ID of 8e. The 8e hex code shows that it is a Linux LVM, while 83 shows a Linux native partition. You may continue after you have confirmed that you are actually working with an LVM.

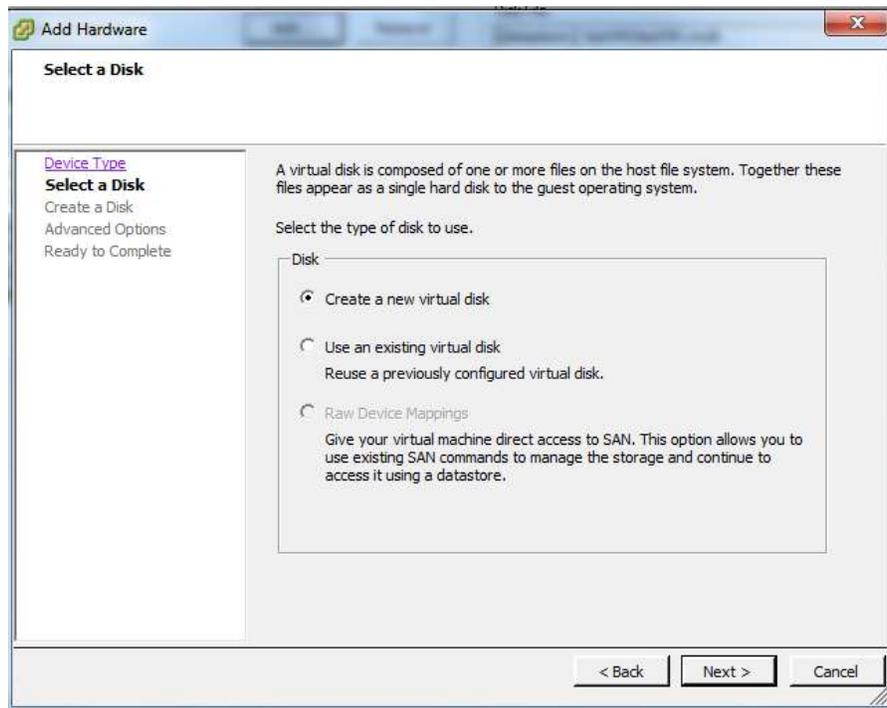
## Add a new virtual hard disk

First off we add a new disk to the virtual machine. This is done by right clicking the virtual machine in vSphere, selecting edit settings and then clicking the “Add...” button which is used to add hardware to the virtual machine.

Select hard disk and click next.



Select create a new virtual disk and click next.



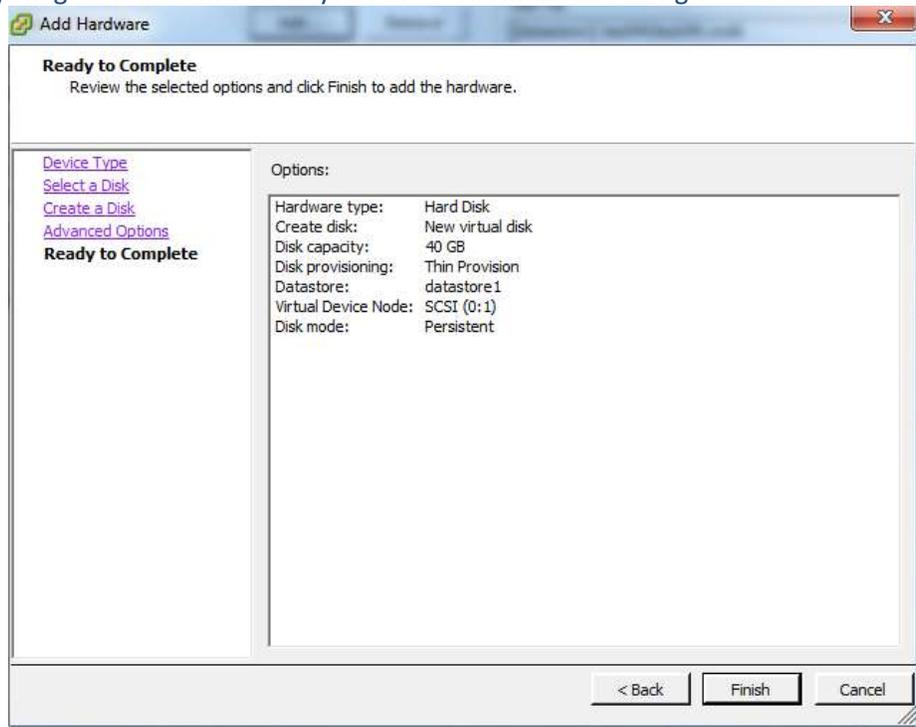
Select the disk size you want to add.

The screenshot shows the 'Add Hardware' wizard window with the 'Create a Disk' step selected. The window title is 'Add Hardware'. The main heading is 'Create a Disk' with the subtitle 'Specify the virtual disk size and provisioning policy'. On the left sidebar, there are links for 'Device Type', 'Select a Disk', 'Create a Disk', 'Advanced Options', and 'Ready to Complete'. The main content area is divided into three sections: 'Capacity' with a 'Disk Size' field set to '40' and a unit dropdown set to 'GB'; 'Disk Provisioning' with three radio button options: 'Thick Provision Lazy Zeroed', 'Thick Provision Eager Zeroed', and 'Thin Provision' (which is selected); and 'Location' with two radio button options: 'Store with the virtual machine' (selected) and 'Specify a datastore or datastore cluster:' with an empty text field and a 'Browse...' button. At the bottom right, there are three buttons: '< Back', 'Next >', and 'Cancel'.

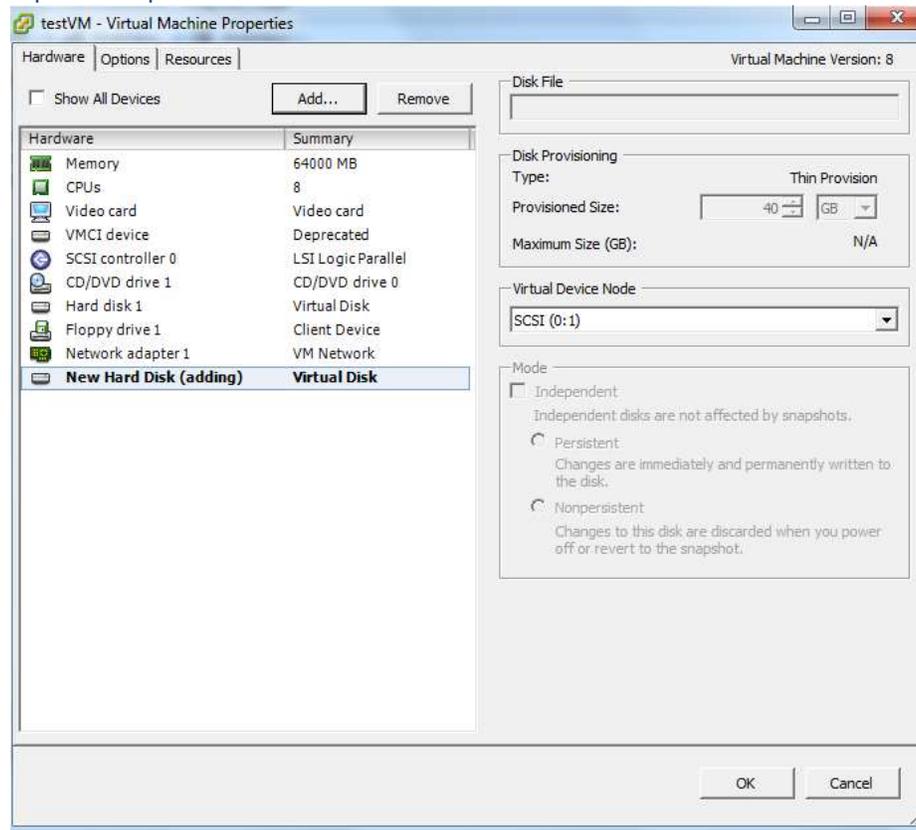
Select next on the advanced options page.

The screenshot shows the 'Add Hardware' wizard window with the 'Advanced Options' step selected. The window title is 'Add Hardware'. The main heading is 'Advanced Options' with the subtitle 'These advanced options do not usually need to be changed.'. On the left sidebar, there are links for 'Device Type', 'Select a Disk', 'Create a Disk', 'Advanced Options', and 'Ready to Complete'. The main content area is divided into two sections: 'Virtual Device Node' with a dropdown menu showing 'SCSI (0:1)'; and 'Mode' with three radio button options: 'Independent' (unchecked) with the description 'Independent disks are not affected by snapshots.', 'Persistent' (unchecked) with the description 'Changes are immediately and permanently written to the disk.', and 'Nonpersistent' (unchecked) with the description 'Changes to this disk are discarded when you power off or revert to the snapshot.'. At the bottom right, there are three buttons: '< Back', 'Next >', and 'Cancel'.

Review everything and click finish once you have confirmed the settings.



Click OK to complete the process.



## Detect the new disk space

After adding the additional disk in through VMware it did not display through “fdisk -l” for me right away. After a reboot I was able to see the second disk labeled /dev/sdb.

```
[root@testvm ~]# fdisk -l
```

```
Disk /dev/sdb: 42.9 GB, 42949672960 bytes, 83886080 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/sda: 150.3 GB, 150323855360 bytes, 293601280 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: 0x0009d162
```

## Partition the new disk space

Partition the new /dev/sdb disk with the fdisk command.

```
[root@testvm ~]# 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 0xe2f3e3af.

*(‘n’ was selected for adding a new partition)*

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

*(‘p’ is then selected as we are making a primary partition)*

```
Partition type:
```

```
  p  primary (0 primary, 0 extended, 4 free)
  e  extended
```

```
Select (default p): p
```

*As this is a new disk, we do not yet have any partitions on it so we will use partition 1 here.*

```
Partition number (1-4, default 1): 1
```

*Press enter twice above as by default the first and last cylinders of the unallocated space should be correct.*

```
First sector (2048-83886079, default 2048): <enter>
```

```
Using default value 2048
```

```
Last sector, +sectors or +size{K,M,G} (2048-83886079, default 83886079): <enter>
```

```
Using default value 83886079
```

```
Partition 1 of type Linux and of size 40 GiB is set
```

*(‘t’ is selected to change to a partition’s system ID, in this case we change to ‘1’ automatically)*

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

```
Selected partition 1
```

The hex code '8e' was entered as this is the code for a Linux LVM which is what we want this partition to be, as we will be joining it with the original Linux LVM which is currently using /dev/sda5.

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

'w' is used to write the table to disk and exit, basically all the changes that have been done will be saved and then you will be exited from fdisk.

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

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

By using "fdisk -l" now you will be able to see that /dev/sdb1 is listed, which is the new partition created on the newly added /dev/sdb disk and it is currently using all 40gb of space.

```
[root@testvm ~]# fdisk -l
```

```
Disk /dev/sdb: 42.9 GB, 42949672960 bytes, 83886080 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: 0xe2fbe3af
```

| Device    | Boot | Start | End      | Blocks   | Id | System    |
|-----------|------|-------|----------|----------|----|-----------|
| /dev/sdb1 |      | 2048  | 83886079 | 41942016 | 8e | Linux LVM |

## Increase the logical volume

The pvcreate command creates a physical volume for later use by the logical volume manager (LVM). In this case the physical volume will be the new /dev/sdb1 partition.

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

Next confirm the name of the current volume group using the vgdisplay command. The name will vary depending on your setup.

```
[root@testvm ~]# vgdisplay
--- Volume group ---
VG Name                centos_osprey-redirect-c7
System ID
Format                  lvm2
Metadata Areas          2
Metadata Sequence No   6
VG Access                read/write
VG Status                resizable
MAX LV                  0
Cur LV                  3
Open LV                  3
Max PV                  0
Cur PV                  2
Act PV                  2
VG Size                 139.50 GiB
PE Size                 4.00 MiB
```

```
Total PE          35713
Alloc PE / Size   35713 / 139.50 GiB
Free PE / Size    0 / 0
VG UUID           0QPmBX-ns5g-zzL9-WksU-Nktb-4o6z-AeXh75
```

Now extend the 'centos\_osprey-redirect-c7' volume group by adding in the physical volume of /dev/sdb1 which was created using the pvcreate command earlier.

```
[root@testvm ~]# vgextend centos_osprey-redirect-c7 /dev/sdb1
Volume group "centos_osprey-redirect-c7" successfully extended
```

Use the pvscan command to scan all disks for physical volumes. This should confirm the original /dev/sda partitions and the newly created physical volume /dev/sdb1.

```
[root@testvm ~]# pvscan
PV /dev/sda2   VG centos_osprey-redirect-c7   lvm2 [99.45 GiB / 0   free]
PV /dev/sda3   VG centos_osprey-redirect-c7   lvm2 [40.05 GiB / 0   free]
PV /dev/sdb1   VG centos_osprey-redirect-c7   lvm2 [40.00 GiB / 40.00 GiB free]
Total: 3 [179.50 GiB] / in use: 3 [179.50 GiB] / in no VG: 0 [0   ]
```

Next increase the logical volume with the lvextend command (rather than the physical volume which has already been done). This means that you will be taking the original logical volume and extending it over the new disk/partition/physical volume of /dev/sdb1.

You need to first confirm the name of the logical volume using lvdisplay. This name will vary depending on your setup.

```
[root@testvm ~]# lvdisplay
--- Logical volume ---
LV Path                /dev/centos_osprey-redirect-c7/root
LV Name                 root
VG Name                 centos_osprey-redirect-c7
LV UUID                 JrrRNs-4vEM-vCx5-e8yM-peUy-Dn3w-Jeh2dD
LV Write Access         read/write
LV Creation host, time localhost, 2016-01-22 14:57:55 -0500
LV Status                available
# open                  1
LV Size                 29.45 GiB
Current LE              7539
Segments                1
Allocation              inherit
Read ahead sectors     auto
- currently set to     8192
Block device            253:1

--- Logical volume ---
LV Path                /dev/centos_osprey-redirect-c7/home
LV Name                 home
VG Name                 centos_osprey-redirect-c7
LV UUID                 t50ZXI-FwyV-oVrM-zICT-dBvf-UB1w-o1RLtd
LV Write Access         read/write
LV Creation host, time localhost, 2016-01-22 14:57:56 -0500
LV Status                available
# open                  1
LV Size                 100.05 GiB
Current LE              25614
Segments                2
```

```

Allocation                inherit
Read ahead sectors       auto
- currently set to      8192
Block device              253:2

--- Logical volume ---
LV Path                   /dev/centos_osprey-redirect-c7/swap
LV Name                   swap
VG Name                   centos_osprey-redirect-c7
LV UUID                   iLW1b0-3g2h-BADd-1m7v-7CTQ-vSaA-21BBVL
LV Write Access           read/write
LV Creation host, time    localhost, 2016-01-22 14:57:56 -0500
LV Status                 available
# open                    2
LV Size                   10.00 GiB
Current LE                2560
Segments                  1
Allocation                inherit
Read ahead sectors       auto
- currently set to      8192
Block device              253:0

```

The logical volume is then extended using the `lvextend` command.

```

[root@testvm ~]# lvextend /dev/centos_osprey-redirect-c7/home /dev/sdb1
Size of logical volume centos_osprey-redirect-c7/home changed from 100.05 GiB (25614
extents) to 140.05 GiB (35853 extents).
Logical volume home successfully resized

```

Run `vgdisplay` and `lvdisplay` again to confirm the size of the volume group and logical volume respectively, I have done this and I now have the following.

```

VG Size          179.50 GiB
LV Size          140.05 GiB

```

If you run a “`df`” command to see available disk space it will not have changed yet as there is one final step, which is to resize the file system using the `resize2fs` command in order to make use of the new space.

*Alternatively if you're running the XFS file system (default as of RedHat/CentOS 7) you can grow the file system with “`xfs_growfs /dev/centos_osprey-redirect-c7/home`”.*

```

[root@testvm ~]# resize2fs /dev/centos_osprey-redirect-c7/home
resize2fs 1.42.9 (28-Dec-2013)
Filesystem at /dev/centos_osprey-redirect-c7/home is mounted on /home; on-line resizing
required
old_desc_blocks = 13, new_desc_blocks = 18
The filesystem on /dev/centos_osprey-redirect-c7/home is now 36713472 blocks long.

```

```

[root@testvm ~]# df -h
Filesystem                                Size  Used Avail Use% Mounted on
/dev/mapper/centos_osprey--redirect--c7-root 29G   3.9G   24G  14% /
devtmpfs                                  31G    0    31G   0% /dev
tmpfs                                      31G    0    31G   0% /dev/shm
tmpfs                                      31G   8.7M   31G   1% /run
tmpfs                                      31G    0    31G   0% /sys/fs/cgroup
/dev/sda1                                  497M  126M   372M  26% /boot
/dev/mapper/centos_osprey--redirect--c7-home 138G   60M   132G   1% /home

```