

EXPAND THE DIRECTOR STORAGE

As you use Mandiant Security Validation (MSV), you may come to a point where the default storage space for the Director is not enough and you need to expand it. The overall process is similar for all versions of the Director but is impacted by the form factor and where the Director is installed. There are differences between the underlying operating systems (CentOS 7 or Rocky Linux 8) for a virtual appliance, as well.

4.14.0.0 and later (Rocky Linux 8)

Default Director requirements

The following requirements must be met for the Security Validation Director to function properly. These requirements are the same for virtual appliance and installable software Directors:

4.14.0.0 and later

Specification	Director Minimum Requirement
Processor	64-bit x86 CPU with at least 4 cores
Memory	16 GB
Disk Storage	Virtual Appliance: 500 GB of free disk space for Director files and database storage Installer: 160 GB of free disk space for Director files and database storage
Network Interfaces	A static, routable IP address



Symlinking the Install Directory is not supported, so it is important that you dedicate enough memory to the Validation Platform.

These requirements are form-factor specific and are only required when there are separate partitions:

Specification	Form Factor	Director Minimum Requirement
<code>/opt</code>	Installable software	a minimum of 80 GB
<code>/var/lib/pgsql</code>	Installable software	a minimum of 80 GB

Change the Director's storage - local

For most Directors, you can use the same procedure, whether the Director was installed from an appliance or from the installable software.

The process involves three steps:

1. Expand the disk on the virtual infrastructure.
2. Create a new partition.
3. Increase logical volume.



- This process is completed from the command line using an account that has root access.
- This process is only possible if you are on a virtual infrastructure that allows for expansion of the disk and use a Logical Volume Manager (LVM) storage setup.

Expand the disk on the virtual infrastructure

This step varies based on where you installed your Director (VMware ESXi, Oracle VirtualBox, HyperV, Azure, AWS). For instructions, see the product's documentation. For example, if you used our AMI Director, you would follow these steps:

Change the Director's Storage - AMI .

Create a new partition

1. Connect to the Director through SSH.
2. Run the following command to start the partition creation process:

```
fdisk /dev/vda
```

Example output:

```
[root@director ~]# fdisk /dev/vda

Welcome to fdisk (util-linux 2.32.1).
Changes will remain in memory only, until you decide to write them.
Be careful before using the write command.
```

3. Use the following options (in the given order) to configure the partition:

step	Key you press	Explanation
1.	n	New partition
2.	p	New primary
3.	3	Third primary partition
4.	Enter	Default value for first sector
5.	Enter	Default value for last sector
6.	t	Set type
7.	3	Select partition 3
8.	8e	Select partition type of Linux LVM
9.	w	Write the partition table

Example output:

```
Command (m for help): n
Partition type
  p primary (2 primary, 0 extended, 2 free)
  e extended (container for logical partitions)
Select (default p): p
Partition number (3,4, default 3): 3
First sector (737280000-946995199, default 737280000):
Last sector, +sectors or +size{K,M,G,T,P} (737280000-946995199, default 946995199):
```

Created a new partition 3 of type 'Linux' and of size 100 GiB.

```
Command (m for help): t
Partition number (1-3, default 3): 3
Hex code (type L to list all codes): 8e
```

Changed type of partition 'Linux' to 'Linux LVM'.

```
Command (m for help): w
The partition table has been altered.
Syncing disks.
```

4. Verify the partition was created:

```
fdisk -l
```

Example output:

```
[root@director ~]# fdisk -l
Disk /dev/vda: 451.6 GiB, 484861542400 bytes, 946995200 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
Disklabel type: dos
Disk identifier: 0xd6c5f823

Device Boot Start End Sectors Size Id Type
/dev/vda1 * 2048 2099199 2097152 1G 83 Linux
/dev/vda2 2099200 737279999 735180800 350.6G 8e Linux LVM
/dev/vda3 737280000 946995199 209715200 100G 8e Linux LVM

Disk /dev/mapper/VolGroup0-root: 10 GiB, 10737418240 bytes, 20971520 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/mapper/VolGroup0-swap: 8 GiB, 8589934592 bytes, 16777216 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/mapper/VolGroup0-opt: 182.6 GiB, 196020797440 bytes, 382853120 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/mapper/VolGroup0-home: 5 GiB, 5368709120 bytes, 10485760 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/mapper/VolGroup0-vartmp: 1 GiB, 1073741824 bytes, 2097152 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/mapper/VolGroup0-var: 80 GiB, 85899345920 bytes, 167772160 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/mapper/VolGroup0-tmp: 50 GiB, 53687091200 bytes, 104857600 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/mapper/VolGroup0-audit: 10 GiB, 10737418240 bytes, 20971520 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/mapper/VolGroup0-varlog: 4 GiB, 4294967296 bytes, 8388608 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
```

5. Rescan the volume:

```
partprobe -s
```

Example output:

```
[root@director ~]# partprobe -s
/dev/vda: msdos partitions 1 2 3
```

Increase the logical volume

1. Create the physical volume

```
pvcreate /dev/vda3
```

Example output:

```
[root@director ~]# pvcreate /dev/vda3
Physical volume "/dev/vda3" successfully created.
```

2. Get the name of the volume group you are expanding:

```
vgdisplay
```

When working with a virtual appliance Director on Rocky Linux 8, this value is `VolGroup0` .

```
[root@director ~]# vgdisplay
--- Volume group ---
VG Name          VolGroup0
System ID
Format           lvm2
Metadata Areas   1
Metadata Sequence No 10
VG Access        read/write
VG Status        resizable
MAX LV           0
Cur LV          9
Open LV          9
Max PV           0
Cur PV          1
Act PV           1
VG Size          < 350.56 GiB
PE Size          4.00 MiB
Total PE         89743
Alloc PE / Size  89743 / < 350.56 GiB
Free PE / Size   0 / 0
VG UUID          rOqPYv-jjDW-IKwI-OoEf-k3lg-VTGT-49cpxA
```

3. Extend the physical volume group:

```
vgextend VolGroup0 /dev/vda3
```

Example output:

```
[root@director ~]# vgextend VolGroup0 /dev/vda3
Volume group "VolGroup0" successfully extended
```

4. Scan the new disk:

```
pvscan
```


Example output:

```
PV /dev/vda2 VG VolGroup0 lvm2 [< 350.56 GiB / 0 free]
PV /dev/vda3 VG VolGroup0 lvm2 [< 100.00 GiB / < 100.00 GiB free]
Total: 2 [450.55 GiB] / in use: 2 [450.55 GiB] / in no VG: 0 [0 ]
```

5. Get the path of the logical volume:

```
lvdisplay
```

For a virtual appliance Director on Rocky Linux 8, this value is `/dev/VolGroup0/root` .

 If expanding `/var` or `/opt` depending on needs, replace references to `root` with `var` or `opt` in the remaining commands, such as `/dev/VolGroup0/var` .

Example output:

```
[root@director ~]# lvdisplay
.....SEVERAL LOGICAL VOLUMES THAT CAN BE IGNORED.....

--- Logical volume ---
LV Path          /dev/VolGroup0/root
LV Name          root
VG Name          VolGroup0
LV UUID          8mEqh1-clJl-URC7-ZyU8-ZQhz-358N-xtuNoz
LV Write Access  read/write
LV Creation host, time localhost.localdomain, 2024-05-15 14:18:10 +0000
LV Status        available
# open           1
LV Size          10.00 GiB
Current LE       2560
Segments         1
Allocation       inherit
Read ahead sectors auto
 - currently set to 256
Block device     253:0
```

6. Extend the logical volume:

```
lvextend /dev/VolGroup0/root /dev/vda3
```

Example output:

```
[root@director ~]# lvextend /dev/VolGroup0/root /dev/vda3
Size of logical volume VolGroup0/root changed from 10.00 GiB (2560 extents) to < 110.00 GiB (28159 extents)
.
Logical volume VolGroup0/root successfully resized.
```

7. Expand the disk size:

```
xfs_growfs /dev/VolGroup0/root
```

Example output:

```
[root@director ~]# xfs_growfs /dev/VolGroup0/root
meta-data=/dev/mapper/VolGroup0-root isize=512  agcount=4, agsize=655360 blks
 =          sectsz=512  attr=2, projid32bit=1
 =          crc=1      finobt=1, sparse=1, rmapbt=0
 =          reflink=1  bigtime=0 inobtcount=0
data      =          bsize=4096  blocks=2621440, imaxpct=25
 =          sunit=0    swidth=0 blks
naming    =version 2      bsize=4096  ascii-ci=0, ftype=1
log       =internal log  bsize=4096  blocks=2560, version=2
 =          sectsz=512  sunit=0 blks, lazy-count=1
realtime  =none          extsz=4096  blocks=0, rtextents=0
data blocks changed from 2621440 to 28834816
```

8. Verify the disk is expanded:

```
df -h
```

Before expansion:

```
[root@director nodeone]# df -h
Filesystem      Size  Used Avail Use% Mounted on
devtmpfs        3.8G  0  3.8G  0% /dev
tmpfs           3.8G  296K  3.8G  1% /dev/shm
tmpfs           3.8G  8.9M  3.8G  1% /run
tmpfs           3.8G  0  3.8G  0% /sys/fs/cgroup
/dev/mapper/VolGroup0-root  10G  5.5G  4.6G  55% /
/dev/sda1       1014M  277M  738M  28% /boot
/dev/mapper/VolGroup0-var   80G  1.6G  79G  2% /var
/dev/mapper/VolGroup0-home  5.0G  2.7G  2.4G  53% /home
/dev/mapper/VolGroup0-vartmp 1014M  40M  975M  4% /var/tmp
/dev/mapper/VolGroup0-opt   183G  17G  166G  10% /opt
/dev/mapper/VolGroup0-varlog 4.0G  227M  3.8G  6% /var/log
/dev/mapper/VolGroup0-audit 10G  109M  9.9G  2% /var/log/audit
/dev/mapper/VolGroup0-tmp   50G  390M  50G  1% /tmp
shm              63M   64K   63M  1% /usr/lib/msi/containers/overlay-containers/75c47f103d920230a218ffb327cfe5d339322bff5ecee5f4f824419e983faebf/userdata/shm
overlay          10G  5.5G  4.6G  55% /usr/lib/msi/containers/overlay/5bf832397b4d01ed643d5615c487b00ec85d6f7605b52fdf95a171b71f048625/merged
tmpfs            769M  0  769M  0% /run/user/1000
```

After expansion:

```
[root@director nodeone]# df -h
Filesystem      Size  Used Avail Use% Mounted on
devtmpfs        3.8G  0  3.8G  0% /dev
tmpfs           3.8G  296K  3.8G  1% /dev/shm
tmpfs           3.8G  8.9M  3.8G  1% /run
tmpfs           3.8G  0  3.8G  0% /sys/fs/cgroup
/dev/mapper/VolGroup0-root  10G  5.5G  4.6G  55% /
/dev/sda1       1014M  277M  738M  28% /boot
/dev/mapper/VolGroup0-var   80G  1.6G  79G  2% /var
/dev/mapper/VolGroup0-home  5.0G  2.7G  2.4G  53% /home
/dev/mapper/VolGroup0-vartmp 1014M  40M  975M  4% /var/tmp
/dev/mapper/VolGroup0-opt   331G  18G  314G  6% /opt
/dev/mapper/VolGroup0-varlog 4.0G  227M  3.8G  6% /var/log
/dev/mapper/VolGroup0-audit 10G  109M  9.9G  2% /var/log/audit
/dev/mapper/VolGroup0-tmp   50G  390M  50G  1% /tmp
shm              63M   64K   63M  1% /usr/lib/msi/containers/overlay-containers/75c47f103d920230a218ffb327cfe5d339322bff5ecee5f4f824419e983faebf/userdata/shm
overlay          10G  5.5G  4.6G  55% /usr/lib/msi/containers/overlay/5bf832397b4d01ed643d5615c487b00ec85d6f7605b52fdf95a171b71f048625/merged
tmpfs            769M  0  769M  0% /run/user/1000
```

Change the Director's storage - AMI

You must be able to SSH into your Director to complete these steps.

T2 instance

1. Disable the Security Validation repo:

```
yum-config-manager --disable verodin
```

2. Install the growpart utility:

```
yum install cloud-utils-growpart
```

3. Enable the Security Validation repo:

```
yum-config-manager --enable verodin
```

4. Grow the partition `/dev/mapper/centos-root` is living on:

```
sudo growpart /dev/xvda 2
```

5. Resize the underlying physical volume:

```
pvresize /dev/xvda2
```

6. Resize the logical volume:

```
lvextend -r /dev/mapper/centos-root /dev/xvda2
```

T3 instance

You can use NVMe disk to upgrade Directors installed on T3 instances.

1. Grow the partition `/dev/mapper/centos-root` is living on:

```
growpart /dev/nvme0n1 2
```

2. Resize the underlying physical volume:

```
pvresize /dev/nvme0n1p2
```

3. Resize the logical volume:

```
lvextend -r /dev/mapper/centos-root /dev/nvme0n1p2
```

4. Grow the partition `/dev/mapper/centos-root` is living on:

```
growpart /dev/nvme0n1 2
```

5. Resize the underlying physical volume:

```
pvresize /dev/nvme0n1p2
```

6. Resize the logical volume:

```
lvextend -r /dev/mapper/centos-root /dev/nvme0n1p2
```

4.13.0.0 and earlier (CentOS 7)

Default Director requirements

The following requirements must be met for the Security Validation Director to function properly. These requirements are the same for virtual appliance and installable software Directors:

4.13.0.0 and earlier*

Specification	Director Minimum Requirement
Processor	64-bit x86 CPU with at least 4 cores
Memory	16GB
Disk Storage	160GB of free disk space for Director files and database storage
Network Interfaces	A static, routable IP address



Symlinking the Install Directory is not supported, so it is important that you dedicate enough memory to the Validation Platform.

* As of June 30, 2024, CentOS 7, the underlying operating system for Directors prior to 4.14.0.0, will be End of Life (EOL), therefore no longer supported as a base operating system for MSV Directors. Plan to upgrade to 4.14.0.0 or later on the Rocky Linux platform as soon as possible. See [Upgrade Security Validation Components to Rocky Linux 8](https://docs.mandiant.com/home/msv-upgrade-rocky-linux) (<https://docs.mandiant.com/home/msv-upgrade-rocky-linux>) for more information.

These requirements are form-factor specific and are only required when there are separate partitions:

Specification	Form Factor	Director Minimum Requirement
<code>/opt</code>	installable software	a minimum of 80GB
<code>/var/lib/pgsql</code>	installable software	a minimum of 80GB

Change the Director's storage - local

For most Directors, you can use the same procedure, whether the Director was installed from an appliance or from the installable software.

The process is three-fold: expand the disk on the virtual infrastructure, create a new partition, and then increase logical volume.



This process is completed from the command line using an account that has root access.



This process is only possible if you are on a virtual infrastructure that allows for expansion of the disk and use an LVM storage setup.

Resize the HD

This step varies based on where you installed your Director (VMware ESXi, Oracle VirtualBox, HyperV, Azure, AWS). For instructions, see the product's documentation. For example, if you used our AMI Director, you would follow these steps:

[Change the Director's Storage - AMI](#)

Create a new partition

1. Run the following command to start the partition creation process:

```
#fdisk /dev/sda
```

2. Use the following options (in the given order) to configure the partition

step	Key you press	Explanation
1.	n	new partition
2.	p	new primary
3.	3	3rd primary partition
4.	Enter	Default value for first sector
5.	Enter	Default value for last sector
6.	t	set type
7.	3	select partition 3
8.	8e	select partition type of Linux LVM
9.	w	write the partition table

```
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 (335544320-1048575999, default 335544320):
Using default value 335544320
Last sector, +sectors or +size{K,M,G} (335544320-1048575999, default 1048575999):
Using default value 1048575999
Partition 3 of type Linux and of size 340 GiB is set

Command (m for help): t
Partition number (1-3, default 3): 3
Hex code (type L to list all codes): 8e
Changed type of partition 'Linux' to '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.
[root@director nodeone]# fdisk -l

Disk /dev/sda: 536.9 GB, 536870912000 bytes, 1048576000 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: 0x000d4541

   Device Boot      Start         End      Blocks   Id  System
/dev/sda1  *        2048     2099199     1048576   83   Linux
/dev/sda2                2099200    335544319    166722560   8e   Linux LVM
/dev/sda3            335544320    1048575999    356515840   8e   Linux LVM

Disk /dev/mapper/centos-root: 162.3 GB, 162265038848 bytes, 316923904 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/mapper/centos-swap: 8455 MB, 8455716864 bytes, 16515072 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
```

Code for creating & verifying new partition

3. Verify the partition was created:

```
fdisk -l
```

4. Rescan the volume:

```
partprobe -s
```

Increase the logical volume

1. Create the physical volume:

```
pvcreate /dev/sda3
```

```
[root@director nodeone]# pvcreate /dev/sda3
Physical volume "/dev/sda3" successfully created.
```

Code & response for creating physical volume

2. Get the name of the volume group you are expanding:

```
vgdisplay
```

We expect this to be `centos` when working with the OVA Director:

```
[root@director nodeone]# vgdisplay
--- Volume group ---
VG Name                centos
System ID
Format                 lvm2
Metadata Areas         1
Metadata Sequence No   7
VG Access               read/write
VG Status               resizable
MAX LV                 0
Cur LV                 2
Open LV                 2
Max PV                  0
Cur PV                 1
Act PV                  1
VG Size                 <159.00 GiB
PE Size                 4.00 MiB
Total PE                40703
Alloc PE / Size         40703 / <159.00 GiB
Free PE / Size          0 / 0
VG UUID                 w69SSv-umo3-y2K6-Crxf-l8Rj-CITg-d6Ndpf
```

Code & response for capturing physical volume name

Extend the physical volume group:

```
vgextend centos /dev/sda3
```

```
[root@director nodeone]# vgextend centos /dev/sda3
Volume group "centos" successfully extended
```

Code & response for extending the volume group

4. Scan the new disk:

```
pvscan
```

```
[root@director nodeone]# pvscan
PV /dev/sda2   VG centos      lvm2 [<159.00 GiB / 0   free]
PV /dev/sda3   VG centos      lvm2 [<340.00 GiB / <340.00 GiB free]
Total: 2 [498.99 GiB] / in use: 2 [498.99 GiB] / in no VG: 0 [0   ]
```

Code & response for scanning the disk

5. Get the path of the logical volume:

```
lvdisplay
```

We expect this to be `/dev/centos/root` for the OVA Director:

```
[root@director nodeone]# lvdisplay
--- Logical volume ---
LV Path                /dev/centos/root
LV Name                 root
VG Name                centos
LV UUID                zXQHht-R9w3-xrKN-jNdG-tgkV-WQ1s-qlRyiz
LV Write Access        read/write
LV Creation host, time localhost, 2020-04-06 16:03:08 +0000
LV Status               available
# open                  1
LV Size                 151.12 GiB
Current LE              38687
Segments                3
Allocation              inherit
Read ahead sectors     auto
- currently set to     8192
Block device            253:0

--- Logical volume ---
LV Path                /dev/centos/swap
LV Name                 swap
VG Name                centos
LV UUID                fW6AY5-MdFO-aHp7-xAfm-wcXc-gfHW-9kByfK
LV Write Access        read/write
LV Creation host, time localhost, 2020-04-06 16:03:09 +0000
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
```

Code & response for getting the path of the logical volume

6. Extend the logical volume:

```
lvextend /dev/centos/root /dev/sda3
```

```
[root@director nodeone]# lvextend /dev/centos/root /dev/sda3
Size of logical volume centos/root changed from 151.12 GiB (38687 extents) to <491.12 GiB (125726 extents).
Logical volume centos/root successfully resized.
```

Code & response for extending the logical volume

7. Expand the disk size:

```
xfs_growfs /dev/centos/root
```

```
[root@director nodeone]# xfs_growfs /dev/centos/root
meta-data=/dev/mapper/centos-root isize=512    agcount=13, agsize=3276800 blks
         =                               sectsz=512   attr=2, projid32bit=1
         =                               crc=1       finobt=0 spinodes=0
data     =                               bsize=4096   blocks=39615488, imaxpct=25
         =                               sunit=0      swidth=0 blks
naming   =version 2                       bsize=4096   ascii-ci=0 ftype=1
log      =internal                         bsize=4096   blocks=6400, version=2
         =                               sectsz=512   sunit=0 blks, lazy-count=1
realtime =none                             extsz=4096   blocks=0, rtextents=0
data blocks changed from 39615488 to 128743424
```

Code & response for expanding the disk

8. Verify the disk is expanded:

```
df -h
```

```
[root@director nodeone]# df -h
Filesystem      Size  Used Avail Use% Mounted on
devtmpfs        7.8G   0  7.8G   0% /dev
tmpfs           7.8G   0  7.8G   0% /dev/shm
tmpfs           7.8G  8.9M  7.8G   1% /run
tmpfs           7.8G   0  7.8G   0% /sys/fs/cgroup
/dev/mapper/centos-root 492G  4.9G  487G   1% /
/dev/sda1       1014M  183M  832M  19% /boot
tmpfs           1.6G   0  1.6G   0% /run/user/1000
tmpfs           1.6G   0  1.6G   0% /run/user/0
```

Code & response for verifying disk was expanded

Change the Director's storage - AMI

You must be able to SSH into your Director to complete these steps.

T2 instance

1. Disable the Security Validation repo:

```
yum-config-manager --disable verodin
```

2. Install the growpart utility:

```
yum install cloud-utils-growpart
```

3. Enable the Security Validation repo:

```
yum-config-manager --enable verodin
```

4. Grow the partition `/dev/mapper/centos-root` is living on:

```
sudo growpart /dev/xvda 2
```

5. Resize the underlying physical volume:

```
pvresize /dev/xvda2
```

6. Resize the logical volume:

```
lvextend -r /dev/mapper/centos-root /dev/xvda2
```

T3 instance

You can use NVMe disk to upgrade Directors installed on T3 instances.

1. Grow the partition `/dev/mapper/centos-root` is living on:

```
growpart /dev/nvme0n1 2
```

2. Resize the underlying physical volume:

```
pvresize /dev/nvme0n1p2
```

3. Resize the logical volume:

```
lvextend -r /dev/mapper/centos-root /dev/nvme0n1p2
```

4. Grow the partition `/dev/mapper/centos-root` is living on:

```
growpart /dev/nvme0n1 2
```

5. Resize the underlying physical volume:

```
pvresize /dev/nvme0n1p2
```

6. Resize the logical volume:

```
lvextend -r /dev/mapper/centos-root /dev/nvme0n1p2
```