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- Tech
- Linux tags:
- linux
- nethserver
- raid
- lvm
- capacity

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THIS ARTICLE IS STILL IN BETA STAGE! (although the first tests gave encouraging results) Use the informations at AT YOUR OWN RISK. I am not responsible of any damage to you system, data loss or any other occurrence.

## Nethserver 6.x - Expanding capacity by adding two new disks in mirror

Let's assume that you intalled Nethserver on two disks in mirror and later in use you realize you lack of space in them.

The intent of this guide is to add two disks, also in mirror, ang expand the root LVM volume on them.

So the original disks are `sda` and `sdb` (50GB each in this example), while the new disks to add are `sdc` and `sdd` (100GB each in this example).

The system base is an unattended NethServer 6.x installation.

### Disks layout

Let's assume the system is configured ad follow:

4 disks: `sda`, `sdb`, `sdc` and `sdd`:

`sda` and `sdb` are the disks containing the OS

`md1` is the RAID 1 on `sda1` and `sdb1` for the boot partition

`md2` is the RAID 1 on `sda2` and `sdb2` for the root partition

You can list all disks using this command:

```
fdisk -l
```

You can list all configured software raid using this command:

```
cat /proc/mdstat
```

We are going to create a new md3 raid on `sdcl` and `sddl`.

## Install required packages

Login to shell using with root, then install parted:

```
yum -y install parted
```

## Create disks partitions

Create the partition:

```
parted -s -a optimal /dev/sdc mklabel gpt
parted -s -a optimal /dev/sdc mkpart primary 0% 100%
parted -s -a optimal /dev/sdd mklabel gpt
parted -s -a optimal /dev/sdd mkpart primary 0% 100%
```

## Create RAID 1

Create the RAID on `sdcl` and `sddl`, execute:

```
mdadm --create --verbose /dev/md3 --level=1 --raid-devices=2 /dev/sdc1 /dev/sdd1
```

The system will output something like this:

```
mdadm: Note: this array has metadata at the start and
may not be suitable as a boot device.  If you plan to
store '/boot' on this device please ensure that
your boot-loader understands md/v1.x metadata, or use
--metadata=0.90
mdadm: size set to 104790016K
Continue creating array? y
```

Answer **y** to the question, then the system will proceed to start the new array.

## Configure the system for automount

Save mdadm configuration to make changes persistent:

```
cat << EOF > /etc/mdadm.conf
MAILADDR root
AUTO +imsm +1.x -all
EOF
mdadm --detail --scan >> /etc/mdadm.conf
```

## Create new LVM physical volume

Execute:

```
pvcreate /dev/md3
```

The output should be something like:

```
Physical volume "/dev/md3" successfully created
```

## Extend LVM logical volume *lv\_root*

First, add the new physical volume to the volume group, executing:

```
vgextend /dev/VolGroup /dev/md3
```

The output should be something like:

```
Volume group "VolGroup" successfully extended
```

Second, extend the volume group to use the new physical volume, executing:

```
lvextend -l +100%FREE /dev/VolGroup/lv_root
```

The output should be something like:

```
Size of logical volume VolGroup/lv_root changed from 47.47 GiB (1519 extents) to 147.38 GiB
Logical volume lv_root successfully resized.
```

Finally, extend the file system (this may take a while), executing:

```
resize2fs /dev/VolGroup/lv_root
```

The output should be something like:

```
The filesystem on /dev/VolGroup/lv_root is now 38633472 blocks long.
```

Enjoy.

## BEFORE

```
[root@ns6-extend ~]# cat /etc/fstab
#-----
# BE CAREFUL WHEN MODIFYING THIS FILE! It is updated automatically
# by the NethServer software. A few entries are updated during
# the template processing of the file and white space is removed,
# but otherwise changes to the file are preserved.
```

```
#-----
/dev/mapper/VolGroup-lv_root / ext4 defaults,acl,user_xattr 1 1
UUID=9baac90a-1683-47c6-96b4-61d91974e3ef /boot ext3 defaults 1 2
/dev/mapper/VolGroup-lv_swap swap swap defaults 0 0
tmpfs /dev/shm tmpfs defaults 0 0
devpts /dev/pts devpts gid=5,mode=620 0 0
sysfs /sys sysfs defaults 0 0
proc /proc proc defaults 0 0
[root@ns6-extend ~]# fdisk -l
```

```
Disk /dev/sda: 53.7 GB, 53687091200 bytes
255 heads, 63 sectors/track, 6527 cylinders
Units = cylinders of 16065 * 512 = 8225280 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk identifier: 0x000d06c4
```

Device	Boot	Start	End	Blocks	Id	System
/dev/sda1	*	1	66	524288	fd	Linux raid autodetect
Partition 1 does not end on cylinder boundary.						
/dev/sda2		66	6528	51903488	fd	Linux raid autodetect

```
Disk /dev/sdb: 53.7 GB, 53687091200 bytes
255 heads, 63 sectors/track, 6527 cylinders
Units = cylinders of 16065 * 512 = 8225280 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk identifier: 0x000f1f56
```

Device	Boot	Start	End	Blocks	Id	System
/dev/sdb1	*	1	66	524288	fd	Linux raid autodetect
Partition 1 does not end on cylinder boundary.						
/dev/sdb2		66	6528	51903488	fd	Linux raid autodetect

```
Disk /dev/sdc: 107.4 GB, 107374182400 bytes
255 heads, 63 sectors/track, 13054 cylinders
Units = cylinders of 16065 * 512 = 8225280 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk identifier: 0x00000000
```

```
Disk /dev/sdd: 107.4 GB, 107374182400 bytes
255 heads, 63 sectors/track, 13054 cylinders
Units = cylinders of 16065 * 512 = 8225280 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk identifier: 0x00000000
```

```
Disk /dev/md2: 53.1 GB, 53115617280 bytes
2 heads, 4 sectors/track, 12967680 cylinders
Units = cylinders of 8 * 512 = 4096 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk identifier: 0x00000000
```

```
Disk /dev/mapper/VolGroup-lv_swap: 2113 MB, 2113929216 bytes
255 heads, 63 sectors/track, 257 cylinders
Units = cylinders of 16065 * 512 = 8225280 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk identifier: 0x00000000
```

```
Disk /dev/mapper/VolGroup-lv_root: 51.0 GB, 50969182208 bytes
```

255 heads, 63 sectors/track, 6196 cylinders  
Units = cylinders of 16065 \* 512 = 8225280 bytes  
Sector size (logical/physical): 512 bytes / 512 bytes  
I/O size (minimum/optimal): 512 bytes / 512 bytes  
Disk identifier: 0x00000000

Disk /dev/md1: 536 MB, 536805376 bytes  
2 heads, 4 sectors/track, 131056 cylinders  
Units = cylinders of 8 \* 512 = 4096 bytes  
Sector size (logical/physical): 512 bytes / 512 bytes  
I/O size (minimum/optimal): 512 bytes / 512 bytes  
Disk identifier: 0x00000000

```
[root@ns6-extend ~]# cat /proc/mdstat
Personalities : [raid1]
md1 : active raid1 sda1[0] sdb1[1]
      524224 blocks super 1.0 [2/2] [UU]

md2 : active raid1 sdb2[1] sda2[0]
      51870720 blocks super 1.1 [2/2] [UU]
      bitmap: 1/1 pages [4KB], 65536KB chunk
```

unused devices: <none>

```
[root@ns6-extend ~]# cat /etc/mdadm.conf
# mdadm.conf written out by anaconda
MAILADDR root
AUTO +imsm +1.x -all
ARRAY /dev/md1 level=raid1 num-devices=2 UUID=bc4842ad:edf14f2a:c0a51a01:69a36f1d
ARRAY /dev/md2 level=raid1 num-devices=2 UUID=f10240ed:53a59773:6a28bb8f:c3910006
```

```
[root@ns6-extend ~]# pvdisplay
--- Physical volume ---
PV Name                /dev/md2
VG Name                VolGroup
PV Size                49.47 GiB / not usable 31.00 MiB
Allocatable            yes (but full)
PE Size                32.00 MiB
Total PE               1582
Free PE                0
Allocated PE           1582
PV UUID                YagK22-RPpp-Vv9t-ZqcH-w8Bf-3cC3-9SzziS
```

```
[root@ns6-extend ~]# vgdisplay
--- Volume group ---
VG Name                VolGroup
System ID
Format                lvm2
Metadata Areas         1
Metadata Sequence No  3
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                49.44 GiB
PE Size                32.00 MiB
Total PE               1582
Alloc PE / Size        1582 / 49.44 GiB
Free PE / Size         0 / 0
VG UUID                F0zUVL-JWzi-vSry-oFUn-1Qq3-E7tA-mNjdyv
```

```
[root@ns6-extend ~]# lvdisplay
--- Logical volume ---
LV Path                /dev/VolGroup/lv_swap
```

```

LV Name                lv_swap
VG Name                VolGroup
LV UUID                T7tDyf-gR6H-lAas-B8f1-7y4x-5zxq-uNJjjL
LV Write Access        read/write
LV Creation host, time localhost.localdomain, 2019-05-15 18:18:17 +0200
LV Status              available
# open                 1
LV Size                1.97 GiB
Current LE             63
Segments               1
Allocation             inherit
Read ahead sectors    auto
- currently set to    256
Block device          253:0

```

--- Logical volume ---

```

LV Path                /dev/VolGroup/lv_root
LV Name                lv_root
VG Name                VolGroup
LV UUID                bejl2n-2R4l-n3ZG-uznX-4E7l-WUW2-4OLXgn
LV Write Access        read/write
LV Creation host, time localhost.localdomain, 2019-05-15 18:18:18 +0200
LV Status              available
# open                 1
LV Size                47.47 GiB
Current LE             1519
Segments               1
Allocation             inherit
Read ahead sectors    auto
- currently set to    256
Block device          253:1

```

## AFTER

```

[root@ns6-extend ~]# cat /etc/fstab
#-----
# BE CAREFUL WHEN MODIFYING THIS FILE! It is updated automatically
# by the NethServer software. A few entries are updated during
# the template processing of the file and white space is removed,
# but otherwise changes to the file are preserved.
#-----
/dev/mapper/VolGroup-lv_root    /          ext4    defaults,acl,user_xattr 1 1
UUID=9baac90a-1683-47c6-96b4-61d91974e3ef    /boot     ext3    defaults                    1 2
/dev/mapper/VolGroup-lv_swap    swap       swap    defaults                    0 0
tmpfs    /dev/shm    tmpfs    defaults                    0 0
devpts   /dev/pts    devpts   gid=5,mode=620              0 0
sysfs    /sys        sysfs    defaults                    0 0
proc     /proc       proc     defaults                    0 0
[root@ns6-extend ~]# fdisk -l

```

```

Disk /dev/sda: 53.7 GB, 53687091200 bytes
255 heads, 63 sectors/track, 6527 cylinders
Units = cylinders of 16065 * 512 = 8225280 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk identifier: 0x000d06c4

```

Device	Boot	Start	End	Blocks	Id	System
/dev/sda1	*	1	66	524288	fd	Linux raid autodetect
Partition 1 does not end on cylinder boundary.						
/dev/sda2		66	6528	51903488	fd	Linux raid autodetect

```

Disk /dev/sdb: 53.7 GB, 53687091200 bytes
255 heads, 63 sectors/track, 6527 cylinders
Units = cylinders of 16065 * 512 = 8225280 bytes

```

Sector size (logical/physical): 512 bytes / 512 bytes  
I/O size (minimum/optimal): 512 bytes / 512 bytes  
Disk identifier: 0x000f1f56

Device	Boot	Start	End	Blocks	Id	System
/dev/sdb1	*	1	66	524288	fd	Linux raid autodetect
Partition 1 does not end on cylinder boundary.						
/dev/sdb2		66	6528	51903488	fd	Linux raid autodetect

WARNING: GPT (GUID Partition Table) detected on '/dev/sdc'! The util fdisk doesn't support GP'

Disk /dev/sdc: 107.4 GB, 107374182400 bytes  
255 heads, 63 sectors/track, 13054 cylinders  
Units = cylinders of 16065 \* 512 = 8225280 bytes  
Sector size (logical/physical): 512 bytes / 512 bytes  
I/O size (minimum/optimal): 512 bytes / 512 bytes  
Disk identifier: 0x00000000

Device	Boot	Start	End	Blocks	Id	System
/dev/sdc1		1	13055	104857599+	ee	GPT

WARNING: GPT (GUID Partition Table) detected on '/dev/sdd'! The util fdisk doesn't support GP'

Disk /dev/sdd: 107.4 GB, 107374182400 bytes  
255 heads, 63 sectors/track, 13054 cylinders  
Units = cylinders of 16065 \* 512 = 8225280 bytes  
Sector size (logical/physical): 512 bytes / 512 bytes  
I/O size (minimum/optimal): 512 bytes / 512 bytes  
Disk identifier: 0x00000000

Device	Boot	Start	End	Blocks	Id	System
/dev/sdd1		1	13055	104857599+	ee	GPT

Disk /dev/md2: 53.1 GB, 53115617280 bytes  
2 heads, 4 sectors/track, 12967680 cylinders  
Units = cylinders of 8 \* 512 = 4096 bytes  
Sector size (logical/physical): 512 bytes / 512 bytes  
I/O size (minimum/optimal): 512 bytes / 512 bytes  
Disk identifier: 0x00000000

Disk /dev/mapper/VolGroup-lv\_swap: 2113 MB, 2113929216 bytes  
255 heads, 63 sectors/track, 257 cylinders  
Units = cylinders of 16065 \* 512 = 8225280 bytes  
Sector size (logical/physical): 512 bytes / 512 bytes  
I/O size (minimum/optimal): 512 bytes / 512 bytes  
Disk identifier: 0x00000000

Disk /dev/mapper/VolGroup-lv\_root: 158.2 GB, 158242701312 bytes  
255 heads, 63 sectors/track, 19238 cylinders  
Units = cylinders of 16065 \* 512 = 8225280 bytes  
Sector size (logical/physical): 512 bytes / 512 bytes  
I/O size (minimum/optimal): 512 bytes / 512 bytes  
Disk identifier: 0x00000000

Disk /dev/md1: 536 MB, 536805376 bytes  
2 heads, 4 sectors/track, 131056 cylinders  
Units = cylinders of 8 \* 512 = 4096 bytes  
Sector size (logical/physical): 512 bytes / 512 bytes  
I/O size (minimum/optimal): 512 bytes / 512 bytes  
Disk identifier: 0x00000000

```
Disk /dev/md3: 107.3 GB, 107304976384 bytes
2 heads, 4 sectors/track, 26197504 cylinders
Units = cylinders of 8 * 512 = 4096 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk identifier: 0x00000000
```

```
[root@ns6-extend ~]# cat /proc/mdstat
Personalities : [raid1]
md3 : active raid1 sdd1[1] sdc1[0]
      104790016 blocks super 1.2 [2/2] [UU]
      [=====>.....] resync = 40.5% (42496256/104790016) finish=5.2min speed=196334K
md1 : active raid1 sda1[0] sdb1[1]
      524224 blocks super 1.0 [2/2] [UU]
md2 : active raid1 sdb2[1] sda2[0]
      51870720 blocks super 1.1 [2/2] [UU]
      bitmap: 0/1 pages [0KB], 65536KB chunk
```

```
unused devices: <none>
```

```
[root@ns6-extend ~]# cat /etc/mdadm.conf
MAILADDR root
AUTO +imsm +1.x -all
ARRAY /dev/md2 metadata=1.1 name=localhost.localdomain:2 UUID=f10240ed:53a59773:6a28bb8f:c391
ARRAY /dev/md1 metadata=1.0 name=localhost.localdomain:1 UUID=bc4842ad:edf14f2a:c0a51a01:69a3
ARRAY /dev/md3 metadata=1.2 name=ns6-extend.danielelolli.it:3 UUID=0711509f:7bf8a53f:dcacee90
```

```
[root@ns6-extend ~]# pvdisplay
--- Physical volume ---
PV Name                /dev/md2
VG Name                VolGroup
PV Size                49.47 GiB / not usable 31.00 MiB
Allocatable           yes (but full)
PE Size                32.00 MiB
Total PE               1582
Free PE                0
Allocated PE           1582
PV UUID                YagK22-RPpp-Vv9t-ZqcH-w8Bf-3cC3-9Szzis
```

```
--- Physical volume ---
PV Name                /dev/md3
VG Name                VolGroup
PV Size                99.94 GiB / not usable 30.00 MiB
Allocatable           yes (but full)
PE Size                32.00 MiB
Total PE               3197
Free PE                0
Allocated PE           3197
PV UUID                whvLth-CxyH-2NDn-WEMF-q33B-uYsZ-99rsz1
```

```
[root@ns6-extend ~]# vgdisplay
--- Volume group ---
VG Name                VolGroup
System ID
Format                lvm2
Metadata Areas         2
Metadata Sequence No  5
VG Access               read/write
VG Status               resizable
MAX LV                 0
Cur LV                 2
Open LV                 2
Max PV                 0
Cur PV                 2
Act PV                 2
VG Size                149.34 GiB
PE Size                32.00 MiB
```



```
Total PE                4779
Alloc PE / Size         4779 / 149.34 GiB
Free PE / Size          0 / 0
VG UUID                 F0zUVL-JWzi-vSry-oFUn-1Qq3-E7tA-mNjdyv
```

```
[root@ns6-extend ~]# lvs
--- Logical volume ---
LV Path                /dev/VolGroup/lv_swap
LV Name                lv_swap
VG Name                VolGroup
LV UUID                T7tDyf-gR6H-lAas-B8f1-7y4x-5zxq-uNJjL
LV Write Access        read/write
LV Creation host, time localhost.localdomain, 2019-05-15 18:18:17 +0200
LV Status              available
# open                 1
LV Size                1.97 GiB
Current LE             63
Segments              1
Allocation             inherit
Read ahead sectors    auto
- currently set to    256
Block device          253:0

--- Logical volume ---
LV Path                /dev/VolGroup/lv_root
LV Name                lv_root
VG Name                VolGroup
LV UUID                bejl2n-2R4l-n3ZG-uznX-4E7l-WUW2-4OLXgn
LV Write Access        read/write
LV Creation host, time localhost.localdomain, 2019-05-15 18:18:18 +0200
LV Status              available
# open                 1
LV Size                147.38 GiB
Current LE             4716
Segments              2
Allocation             inherit
Read ahead sectors    auto
- currently set to    256
Block device          253:1
```

*Source for mirror creation:*

[https://wiki.nethserver.org/doku.php?id=howto\\_manually\\_create\\_raid1](https://wiki.nethserver.org/doku.php?id=howto_manually_create_raid1)

*Source for LVM expansion:*

<https://fdiforms.zendesk.com/hc/en-us/articles/217903228-Expanding-disk-space-via-LVM-partitions>

*Hints:*

<https://www.linuxquestions.org/questions/linux-general-1/using-parted-command-to-create-lvm-partitions-4175533903/>