SNA Lab 11 - Storage (HOT GROW HOT SHRINK)

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Hypervisor used: VMWare 15 with Ubuntu 18.04

Firstly, I've created a guest OS with 1 disk:

```
rsolovev@ubuntu:~$ df -h
Filesystem      Size  Used Avail Use% Mounted on
udev            960M     0  960M   0% /dev
tmpfs           197M  1.8M  195M   1% /run
/dev/sda1        20G  5.3G   14G  29% /
tmpfs           984M     0  984M   0% /dev/shm
tmpfs           5.0M  4.0K  5.0M   1% /run/lock
tmpfs           984M     0  984M   0% /sys/fs/cgroup
/dev/loop0       89M   89M     0 100% /snap/core/7270
/dev/loop1       55M   55M     0 100% /snap/core18/1066
/dev/loop2       43M   43M     0 100% /snap/gtk-common-themes/1313
/dev/loop3      150M  150M     0 100% /snap/gnome-3-28-1804/67
/dev/loop4      4.2M  4.2M     0 100% /snap/gnome-calculator/406
tmpfs           197M   32K  197M   1% /run/user/121
/dev/loop5       15M   15M     0 100% /snap/gnome-characters/296
/dev/loop6      1.0M  1.0M     0 100% /snap/gnome-logs/61
tmpfs           197M   36K  197M   1% /run/user/1000
/dev/loop7      3.8M  3.8M     0 100% /snap/gnome-system-monitor/100
rsolovev@ubuntu:~$
```

Then I've added second hard disk (same size) to vm in VMWare console:

Scan connected disks, newly added disk not shown:

```
rsolovev@ubuntu:~$ lsscsi
[2:0:0:0]    cd/dvd  NECVMWar VMware SATA CD00 1.00  /dev/sr0
[3:0:0:0]    cd/dvd  NECVMWar VMware SATA CD01 1.00  /dev/sr1
[32:0:0:0]   disk    VMware,  VMware Virtual S 1.0   /dev/sda
rsolovev@ubuntu:~$ sudo apt install scsitools
```

Rescan SCSI bus using rescan-scsi-bus tool from scsitools, verify that now it is visible:

```
Scanning for device 32 0 0 0 ...
OLD: Host: scsi32 Channel: 00 Id: 00 Lun: 00
      Vendor: VMware,  Model: VMware Virtual S Rev: 1.0
      Type:   Direct-Access                    ANSI SCSI revision: 02
Scanning for device 32 0 1 0 ...
NEW: Host: scsi32 Channel: 00 Id: 01 Lun: 00
      Vendor: VMware,  Model: VMware Virtual S Rev: 1.0
      Type:   Direct-Access                    ANSI SCSI revision: 02
1 new device(s) found.
0 device(s) removed.
rsolovev@ubuntu:~$ lsscsi
[2:0:0:0]    cd/dvd  NECVMWar VMware SATA CD00 1.00  /dev/sr0
[3:0:0:0]    cd/dvd  NECVMWar VMware SATA CD01 1.00  /dev/sr1
[32:0:0:0]   disk    VMware,  VMware Virtual S 1.0   /dev/sda
[32:0:1:0]   disk    VMware,  VMware Virtual S 1.0   /dev/sdb
rsolovev@ubuntu:~$
```

Verify using *fdisk -l* that disk is now connected:

```
Disk /dev/sda: 20 GiB, 21474836480 bytes, 41943040 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: 0x88b18128

Device     Boot Start      End  Sectors Size Id Type
/dev/sda1  *     2048 41940991 41938944  20G 83 Linux




Disk /dev/sdb: 20 GiB, 21474836480 bytes, 41943040 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
rsolovev@ubuntu:~$
```

Format newly connected drive using *fdisk* specifying type of partition=8e - Linux LVM:

```
rsolovev@ubuntu:~$ sudo fdisk /dev/sdb

Welcome to fdisk (util-linux 2.31.1).
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.
Created a new DOS disklabel with disk identifier 0x476ed116.

Command (m for help): n
Partition type
   p   primary (0 primary, 0 extended, 4 free)
   e   extended (container for logical partitions)
Select (default p): p
Partition number (1-4, default 1): 3
First sector (2048-41943039, default 2048):
Last sector, +sectors or +size{K,M,G,T,P} (2048-41943039, default 41943039):

Created a new partition 3 of type 'Linux' and of size 20 GiB.

Command (m for help): t
Selected partition 3
Hex code (type L to list all codes): 8e
Changed type of partition 'Linux' to 'Linux LVM'.

Command (m for help): p
Disk /dev/sdb: 20 GiB, 21474836480 bytes, 41943040 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: 0x476ed116

Device     Boot Start      End  Sectors Size Id Type
/dev/sdb3        2048 41943039 41940992  20G 8e Linux LVM

Command (m for help): w
The partition table has been altered.
Calling ioctl() to re-read partition table.
Syncing disks.

rsolovev@ubuntu:~$
```

Create a volume group (vg):

```
rsolovev@ubuntu:~$ sudo vgcreate vgpool /dev/sdb3
  Physical volume "/dev/sdb3" successfully created.
  Volume group "vgpool" successfully created
rsolovev@ubuntu:~$
```

Create 10Gb logical volume and format it as ext3 filesystem:

```
rsolovev@ubuntu:~$ sudo lvcreate -L 10G -n lvstuff vgpool
  Logical volume "lvstuff" created.
rsolovev@ubuntu:~$ sudo mkfs -t ext3 /dev/vgpool/lvstuff
mke2fs 1.44.1 (24-Mar-2018)
Creating filesystem with 2621440 4k blocks and 655360 inodes
Filesystem UUID: 0fbc5a00-7f49-49fc-a8ac-625f401bfad2
Superblock backups stored on blocks:
        32768, 98304, 163840, 229376, 294912, 819200, 884736, 1605632

Allocating group tables: done
Writing inode tables: done
Creating journal (16384 blocks): done
Writing superblocks and filesystem accounting information: done
```

Mount this logical volume, verify using *mount* and *df -h (shown as /dev/mapper/vgpool-lvstuff)*

```
rsolovev@ubuntu:~$ sudo mkdir /mnt/data
rsolovev@ubuntu:~$ sudo mount -t ext3 /dev/vgpool/lvstuff /mnt/data
rsolovev@ubuntu:~$ sudo mount | grep data
/dev/mapper/vgpool-lvstuff on /mnt/data type ext3 (rw,relatime)
rsolovev@ubuntu:~$ df -h
Filesystem                  Size  Used Avail Use% Mounted on
udev                        960M     0  960M   0% /dev
tmpfs                       197M  1.8M  195M   1% /run
/dev/sda1                    20G  5.4G   14G  29% /
tmpfs                       984M     0  984M   0% /dev/shm
tmpfs                       5.0M  4.0K  5.0M   1% /run/lock
tmpfs                       984M     0  984M   0% /sys/fs/cgroup
/dev/loop0                   89M   89M     0 100% /snap/core/7270
/dev/loop1                   55M   55M     0 100% /snap/core18/1066
/dev/loop2                   43M   43M     0 100% /snap/gtk-common-themes/1313
/dev/loop3                  150M  150M     0 100% /snap/gnome-3-28-1804/67
/dev/loop4                  4.2M  4.2M     0 100% /snap/gnome-calculator/406
tmpfs                       197M   32K  197M   1% /run/user/121
/dev/loop5                   15M   15M     0 100% /snap/gnome-characters/296
/dev/loop6                  1.0M  1.0M     0 100% /snap/gnome-logs/61
tmpfs                       197M   44K  197M   1% /run/user/1000
/dev/loop7                  3.8M  3.8M     0 100% /snap/gnome-system-monitor/100
/dev/mapper/vgpool-lvstuff  9.8G   23M  9.3G   1% /mnt/data
rsolovev@ubuntu:~$ sudo blkid /dev/mapper/vgpool-lvstuff
/dev/mapper/vgpool-lvstuff: UUID="0fbc5a00-7f49-49fc-a8ac-625f401bfad2" TYPE="ext3"
rsolovev@ubuntu:~$
```

As now we have mounted and working disk, we can resize it. Firstly, extend it by adding 5G additionally and extend filesystem to new size:

```
rsolovev@ubuntu:/mnt/data$ sudo lvextend -L+5G /dev/vgpool/lvstuff
  Size of logical volume vgpool/lvstuff changed from 10.00 GiB (2560 extents) to 15.00 GiB (3840 extents).
  Logical volume vgpool/lvstuff successfully resized.
rsolovev@ubuntu:/mnt/data$ sudo resize2fs /dev/vgpool/lvstuff
resize2fs 1.44.1 (24-Mar-2018)
Filesystem at /dev/vgpool/lvstuff is mounted on /mnt/data; on-line resizing required
old_desc_blocks = 1, new_desc_blocks = 1
The filesystem on /dev/vgpool/lvstuff is now 3932160 (4k) blocks long.
```

Verify that now disk is 15G instead of previous size of 10G (still */dev/mapper/vgpool-lvstuff*):

```
rsolovev@ubuntu:/mnt/data$ df -h
Filesystem                  Size  Used Avail Use% Mounted on
udev                        960M     0  960M   0% /dev
tmpfs                       197M  1.8M  195M   1% /run
/dev/sda1                    20G  5.4G   14G  29% /
tmpfs                       984M     0  984M   0% /dev/shm
tmpfs                       5.0M  4.0K  5.0M   1% /run/lock
tmpfs                       984M     0  984M   0% /sys/fs/cgroup
/dev/loop0                   89M   89M     0 100% /snap/core/7270
/dev/loop1                   55M   55M     0 100% /snap/core18/1066
/dev/loop2                   43M   43M     0 100% /snap/gtk-common-themes/1313
/dev/loop3                  150M  150M     0 100% /snap/gnome-3-28-1804/67
/dev/loop4                  4.2M  4.2M     0 100% /snap/gnome-calculator/406
tmpfs                       197M   32K  197M   1% /run/user/121
/dev/loop5                   15M   15M     0 100% /snap/gnome-characters/296
/dev/loop6                  1.0M  1.0M     0 100% /snap/gnome-logs/61
tmpfs                       197M   48K  197M   1% /run/user/1000
/dev/loop7                  3.8M  3.8M     0 100% /snap/gnome-system-monitor/100
/dev/mapper/vgpool-lvstuff   15G   26M   14G   1% /mnt/data
rsolovev@ubuntu:/mnt/data$
```

Now we can shrink logical volume following the previous steps in reverse order - resize file system -> reduce logical volume. But as online shrinkage is not supported, disk needs to be unmounted first. After that we can resize filesystem and then reduce the logical volume size:

```
rsolovev@ubuntu:~$ sudo lvreduce -L 5G /dev/vgpool/lvstuff
  WARNING: Reducing active logical volume to 5.00 GiB.
  THIS MAY DESTROY YOUR DATA (filesystem etc.)
Do you really want to reduce vgpool/lvstuff? [y/n]: y
  Size of logical volume vgpool/lvstuff changed from 15.00 GiB (3840 extents) to 5.00 GiB (1280 extents).
  Logical volume vgpool/lvstuff successfully resized.
rsolovev@ubuntu:~$ sudo  mount -t ext3 /dev/vgpool/lvstuff /mnt/data
```

After mounting volume back, verify that it is now 5G instead of previous size of 15G (alloc=5G, free=15G):

```
rsolovev@ubuntu:~$ sudo vgdisplay
  --- Volume group ---
  VG Name               vgpool
  System ID
  Format                lvm2
  Metadata Areas        1
  Metadata Sequence No  10
  VG Access             read/write
  VG Status             resizable
  MAX LV                0
  Cur LV                1
  Open LV               0
  Max PV                0
  Cur PV                1
  Act PV                1
  VG Size               <20.00 GiB
  PE Size               4.00 MiB
  Total PE              5119
  Alloc PE / Size       1280 / 5.00 GiB
  Free  PE / Size       3839 / <15.00 GiB
  VG UUID               uQ3kLx-AMtB-1BUc-EfzR-pfLc-D7XS-AoZl3o

rsolovev@ubuntu:~$
```