

Отчёт о лабораторной работе

Лабораторная работа 15. Управление логическими томами

Баранов Никита Дмитриевич

Содержание

1. Цель работы

Получить навыки управления логическими томами.

2. Задание

1. Продемонстрировать навыки создания физических томов на LVM (см. раздел 15.4.1).
2. Продемонстрировать навыки создания группы томов и логических томов на LVM (см. раздел 15.4.2).
3. Продемонстрировать навыки изменения размера логических томов на LVM (см. раздел 15.4.3).
4. Выполнить задание для самостоятельной работы (см. раздел 15.5)

3. Выполнение лабораторной работы

3.1 Подготовка дисков для LVM

Отмонтируем файловые системы и проверим текущее состояние монтирования (рис. [fig:001?]).

```
Activities Terminal Sep 9 15:17 en root@ndbaranov:~
[baranov@ndbaranov ~]$ su -
Password:
[root@ndbaranov ~]# nano /etc/fstab
[baranov@ndbaranov ~]# mount /mnt/data
mount: /mnt/data: not mounted.
[baranov@ndbaranov ~]# mount /mnt/data-ext
[baranov@ndbaranov ~]# mount
proc on /proc type proc (rw,nosuid,nodev,noexec,relatime)
sysfs on /sys type sysfs (rw,nosuid,nodev,noexec,relatime,seclabel)
devtmpfs on /dev type devtmpfs (rw,nosuid,seclabel,size=4096k,nr_inodes=459655,mode=755,inode64)
securityfs on /sys/kernel/security type securityfs (rw,nosuid,nodev,noexec,relatime)
tmpfs on /dev/shm type tmpfs (rw,nosuid,nodev,seclabel,inode64)
devpts on /dev/pts type devpts (rw,nosuid,noexec,relatime,seclabel,gid=5,mode=620,ptmxmode=000)
tmpfs on /run type tmpfs (rw,nosuid,nodev,seclabel,size=748592k,nr_inodes=819200,mode=755,inode64)
cgroup2 on /sys/fs/cgroup type cgroup2 (rw,nosuid,nodev,noexec,relatime,seclabel,nodelegate,memory_recursiveprot)
pstore on /sys/fs/pstore type pstore (rw,nosuid,nodev,noexec,relatime,seclabel)
bpf on /sys/fs/bpf type bpf (rw,nosuid,nodev,noexec,relatime,mode=700)
/dev/mapper/r1-root on / type xfs (rw,relatime,seclabel,attr2,inode64,logbufs=8,logbsize=32k,noquota)
selinuxfs on /sys/fs/selinux type selinuxfs (rw,nosuid,noexec,relatime)
systemd-1 on /proc/sys/fs/binfmt_misc type autofs (rw,relatime,fd=29,pgrp=1,timeout=0,minproto=5,maxproto=5,direct,pipe_ino=15774)
hugetlbfs on /dev/hugepages type hugetlbfs (rw,relatime,seclabel,pagesize=2M)
debugfs on /sys/kernel/debug type debugfs (rw,nosuid,nodev,noexec,relatime,seclabel)
mqueue on /dev/mqueue type mqueue (rw,nosuid,nodev,noexec,relatime,seclabel)
tracefs on /sys/kernel/tracing type tracefs (rw,nosuid,nodev,noexec,relatime,seclabel)
fusectl on /sys/fs/fuse/connections type fusectl (rw,nosuid,nodev,noexec,relatime)
configfs on /sys/kernel/config type configfs (rw,nosuid,nodev,noexec,relatime)
none on /run/credentials/systemd-sysctl.service type ramfs (ro,nosuid,nodev,noexec,relatime,seclabel,mode=700)
none on /run/credentials/systemd-tmpfiles-setup-dev.service type ramfs (ro,nosuid,nodev,noexec,relatime,seclabel,mode=700)
/dev/sda1 on /boot type xfs (rw,relatime,seclabel,attr2,inode64,logbufs=8,logbsize=32k,noquota)
none on /run/credentials/systemd-tmpfiles-setup.service type ramfs (ro,nosuid,nodev,noexec,relatime,seclabel,mode=700)
tmpfs on /run/user/1000 type tmpfs (rw,nosuid,nodev,relatime,seclabel,size=374292k,nr_inodes=93573,mode=700,uid=1000,gid=1000,inode64)
gvfsd-fuse on /run/user/1000/gvfs type fuse.gvfsd-fuse (rw,nosuid,nodev,relatime,user_id=1000,group_id=1000)
/dev/sr0 on /run/media/baranov/VBox_GAs_7.2.0 type iso9660 (ro,nosuid,nodev,relatime,nojoliet,check=s,map=n,blocksize=2048,uid=1000,gid=1000,dmode=500,fmode=400,uhelper=udisks2)
portal on /run/user/1000/doc type fuse.portal (rw,nosuid,nodev,relatime,user_id=1000,group_id=1000)
[root@ndbaranov ~]# fdisk /dev/sdb

Welcome to fdisk (util-linux 2.37.4).
Changes will remain in memory only, until you decide to write them.
Be careful before using the write command.

Command (m for help): p
Disk /dev/sdb: 512 MiB, 536870912 bytes, 1048576 sectors
Disk model: VBox HARDDISK
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
```

Отмонтирование файловых систем и проверка mount

Удаляем старую разметку на диске /dev/sdb и создаем новую таблицу разделов (рис. [fig:002?]).

```
Activities Terminal Sep 9 15:18 en
root@ndbaranov:~

Command (m for help): p
Disk /dev/sdb: 512 MiB, 536870912 bytes, 1048576 sectors
Disk model: VBOX HARDDISK
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: 0xb5c08ea9

Device Boot Start End Sectors Size Id Type
/dev/sdb1 2048 206847 204800 100M 83 Linux
/dev/sdb2 206848 1048575 841728 411M 5 Extended
/dev/sdb5 208896 415743 206848 101M 83 Linux
/dev/sdb6 417792 622591 204800 100M 82 Linux swap / Solaris

Command (m for help): o
Created a new DOS disklabel with disk identifier 0xeeb87fdd.

Command (m for help): p
Disk /dev/sdb: 512 MiB, 536870912 bytes, 1048576 sectors
Disk model: VBOX HARDDISK
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: 0xeeb87fdd

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

[root@ndbaranov ~]# partprobe /dev/sdb
[root@ndbaranov ~]# cat /proc/partitions
major minor #blocks name
8 0 41943040 sda
8 1 1048576 sda1
8 2 40893440 sda2
8 16 524288 sdb
8 32 524288 sdc
8 33 102400 sdc1
8 34 102400 sdc2
8 35 102400 sdc3
11 0 51898 sr0
253 0 36753408 dm-0
253 1 4136960 dm-1

[root@ndbaranov ~]# fdisk --list /dev/sdb
Disk /dev/sdb: 512 MiB, 536870912 bytes, 1048576 sectors
Disk model: VBOX HARDDISK
Units: sectors of 1 * 512 = 512 bytes
```

Создание новой таблицы разделов

3.2 Создание физического тома

Создаем раздел с типом LVM на диске /dev/sdb (рис. [fig:003?]).

```
Activities Terminal Sep 9 15:21 en
root@ndbaranov:~

[root@ndbaranov ~]# fdisk /dev/sdb

Welcome to fdisk (util-linux 2.37.4).
Changes will remain in memory only, until you decide to write them.
Be careful before using the write command.

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):
First sector (2048-1048575, default 2048):
Last sector, +/-sectors or +/-size(K,M,G,T,P) (2048-1048575, default 1048575): +100M

Created a new partition 1 of type 'Linux' and of size 100 MiB.
Partition #1 contains a xfs signature.

Do you want to remove the signature? [Y]es/[N]o: Y

The signature will be removed by a write command.

Command (m for help): t
Selected partition 1
Hex code or alias (type l to list all): 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.
Syncing disks.

[root@ndbaranov ~]# partprobe /dev/sdb
[root@ndbaranov ~]# pvcreate /dev/sdb1
Physical volume "/dev/sdb1" successfully created.
[root@ndbaranov ~]# pvs
PV          VG Fmt Attr PSize  PFree
/dev/sda2   r1  lvm2 a--  <30.00g  0
/dev/sdb1   lvm2 ---  100.00m 100.00m
[root@ndbaranov ~]#
```

Создание раздела LVM

Создаем физический том и проверяем результат (рис. [fig:003?]).

3.3 Создание группы томов и логического тома

Создаем группу томов vgdata и логический том lvdata (рис. [fig:004?]).

```
Activities Terminal Sep 9 15:24 en
root@ndbaranov:~

[root@ndbaranov ~]# pvs
PV          VG Fmt Attr PSize  PFree
/dev/sda2   r1  lvm2 a--  <39.00g  0
/dev/sdb1   lvm2 ---  100.00m 100.00m
[root@ndbaranov ~]# vgcreate vgdata /dev/sdb1
Volume group "vgdata" successfully created
[root@ndbaranov ~]# vgs
VG          #PV #LV #SN Attr   VSize  VFree
r1          1  2  0 wz--n- <39.00g  0
vgdata      1  0  0 wz--n-  96.00m 96.00m
[root@ndbaranov ~]# pvs
PV          VG Fmt Attr PSize  PFree
/dev/sda2   r1  lvm2 a--  <39.00g  0
/dev/sdb1   vgdata lvm2 a--  96.00m 96.00m
[root@ndbaranov ~]# lvcreate -n lvdata -l 50%FREE vgdata
Logical volume "lvdata" created.
[root@ndbaranov ~]# lvs
LV          VG      Attr   LSize  Pool Origin Data%  Meta%  Move Log Cpy%Sync Convert
root        r1      -wi-a- 35.05g
swap        r1      -wi-a- <3.95g
lvdata      vgdata -wi-a- 48.00m
[root@ndbaranov ~]# mkfs.ext4 /dev/vgdata/lvdata
mke2fs 1.46.5 (30-Dec-2021)
Creating filesystem with 49152 1k blocks and 12288 inodes
filesystem UUID: dbb5bc78-3983-4c5f-bfea-019dabd238d0
Superblock backups stored on blocks:
    8193, 24577, 49961

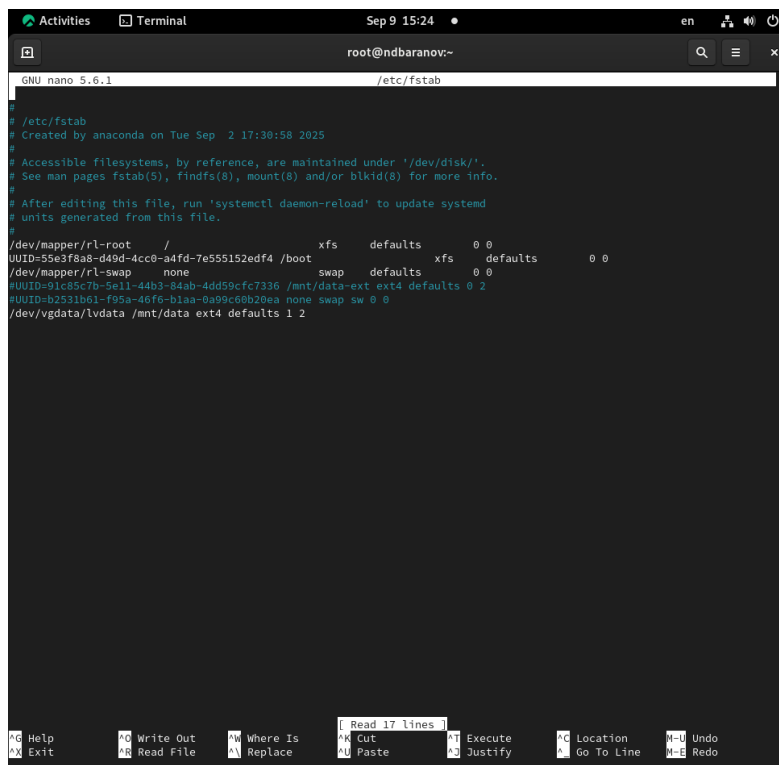
Allocating group tables: done
Writing inode tables: done
Creating journal (4096 blocks): done
Writing superblocks and filesystem accounting information: done

[root@ndbaranov ~]# mkdir -p /mnt/data
[root@ndbaranov ~]# nano /etc/fstab
[root@ndbaranov ~]# nano /etc/fstab
[root@ndbaranov ~]# mount -a
mount: (hint) your fstab has been modified, but systemd still uses
the old version; use 'systemctl daemon-reload' to reload.
[root@ndbaranov ~]# mount | grep /mnt
/dev/mapper/vgdata-lvdata on /mnt/data type ext4 (rw,relatime,seclabel)
[root@ndbaranov ~]#
```

Создание группы томов и логического тома

Создаем файловую систему ext4 на логическом томе и настраиваем автоматическое монтирование (рис. [fig:004?]).

Проверяем содержимое файла /etc/fstab (рис. [fig:005?]).



The screenshot shows a terminal window with the title bar 'Activities Terminal Sep 9 15:24'. The user is logged in as 'root@ndbaranov:~'. The terminal displays the contents of the /etc/fstab file, which was edited using the nano 5.6.1 editor. The file contains the following text:

```
GNU nano 5.6.1 /etc/fstab

# /etc/fstab
# Created by anaconda on Tue Sep  2 17:38:58 2025
#
# Accessible filesystems, by reference, are maintained under '/dev/disk/'.
# See man pages fstab(5), findfs(8), mount(8) and/or blkid(8) for more info.
#
# After editing this file, run 'systemctl daemon-reload' to update systemd
# units generated from this file.
#
/dev/mapper/rl-root / xfs defaults 0 0
UUID=55e3f8a8-d49d-4cc0-a4fd-7e555152edf4 /boot xfs defaults 0 0
/dev/mapper/rl-swap none swap defaults 0 0
#UUID=91c85c7b-5e11-44b3-84ab-4dd59cfc7336 /mnt/data-ext ext4 defaults 0 2
#UUID=b2531b61-f95a-46f6-b1aa-6a99c60b20ea none swap sw 0 0
/dev/vgdata/lvdata /mnt/data ext4 defaults 1 2
```

The bottom of the terminal shows the nano editor's command palette with various shortcuts like 'H Help', 'W Write Out', 'R Read File', 'C Cut', 'P Paste', 'E Execute', 'L Location', 'U Undo', and 'R Redo'.

Содержимое /etc/fstab

3.4 Изменение размера логических томов

Добавляем новый раздел на диске /dev/sdb и расширяем группу томов (рис. [fig:006?], [fig:007?]).

```
Activities Terminal Sep 9 15:27 en root@ndbaranov:~
[root@ndbaranov ~]# pvs
PV      VG      Fmt  Attr PSize  PFree
/dev/sda2 r1      lvm2 a--  <39.00g  0
/dev/sdb1 vgdata lvm2 a--  96.00m 48.00m
[root@ndbaranov ~]# vgs
VG      #PV #LV #SN Attr   VSize  VFree
r1       1  2  0 wz--n- <39.00g  0
vgdata   1  1  0 wz--n- 96.00m 48.00m
[root@ndbaranov ~]# fdisk /dev/sdb

Welcome to fdisk (util-linux 2.37.4).
Changes will remain in memory only, until you decide to write them.
Be careful before using the write command.

This disk is currently in use - repartitioning is probably a bad idea.
It's recommended to unmount all file systems, and swapoff all swap
partitions on this disk.

Command (m for help): n
Partition type
  p   primary (1 primary, 0 extended, 3 free)
  e   extended (container for logical partitions)
Select (default p): e
Partition number (2-4, default 2):
First sector (206848-1048575, default 206848):
Last sector, +/-sectors or +/-size(K,M,G,T,P) (206848-1048575, default 1048575): +100M

Created a new partition 2 of type 'Extended' and of size 100 MiB.

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

[root@ndbaranov ~]# fdisk /dev/sdb2

Welcome to fdisk (util-linux 2.37.4).
Changes will remain in memory only, until you decide to write them.
Be careful before using the write command.

Command (m for help): t
No partition is defined yet!

Command (m for help): q

[root@ndbaranov ~]# fdisk /dev/sdb

Welcome to fdisk (util-linux 2.37.4).
Changes will remain in memory only, until you decide to write them.
Be careful before using the write command.

Command (m for help): t
Partition number (1,2, default 2): 2
Hex code or alias (type L to list all): 8e

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

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

[root@ndbaranov ~]# partprobe /dev/sdb
[root@ndbaranov ~]# pvcreate /dev/sdb2
WARNING: dos signature detected on /dev/sdb2 at offset 510. Wipe it? [y/n]: y
Wiping dos signature on /dev/sdb2.
Physical volume "/dev/sdb2" successfully created.
[root@ndbaranov ~]# vgextend vgdata /dev/sdb2
Volume group "vgdata" successfully extended
[root@ndbaranov ~]# vgs
VG      #PV #LV #SN Attr   VSize  VFree
r1       1  2  0 wz--n- <39.00g  0
vgdata   2  1  0 wz--n- 192.00m 144.00m
[root@ndbaranov ~]# lvs
LV      VG      Attr   LSize  Pool Origin Data%  Meta%  Move Log Cpy%Sync Convert
root    r1      -wi-ao---- 35.05g
swap    r1      -wi-ao---- <3.95g
lvdata  vgdata  -wi-ao---- 48.00m
[root@ndbaranov ~]# df -h
Filesystem                Size      Used Avail Use% Mounted on
devtmpfs                   4.0M        0   4.0M   0% /dev
tmpfs                      1.8G        0   1.8G   0% /dev/shm
tmpfs                      732M    1.3M   730M   1% /run
/dev/mapper/r1-root        35G     11G    25G  30% /
/dev/sda1                  960M    446M   515M  47% /boot
tmpfs                      366M    120K   366M   1% /run/user/1000
/dev/sr0                    51M      51M     0 100% /run/media/baranov/VBox_GAS_7.2.0
/dev/mapper/vgdata-lvdata  40M     14K    37M   1% /mnt/data
[root@ndbaranov ~]#
```

Увеличиваем размер логического тома и файловой системы (рис. [fig:007?]).

Уменьшаем размер логического тома (рис. [fig:008?]).

```
Activities Terminal Sep 9 15:30 en
root@ndbaranov:~
[root@ndbaranov ~]# lvextend -r -l +50%FREE /dev/vgdata/lvdata
File system ext4 found on vgdata/lvdata mounted at /mnt/data.
Size of logical volume vgdata/lvdata changed from 48.00 MiB (12 extents) to 120.00 MiB (30 extents).
Extending file system ext4 to 120.00 MiB (125829120 bytes) on vgdata/lvdata...
resize2fs /dev/vgdata/lvdata
resize2fs 1.46.5 (30-Dec-2021)
Filesystem at /dev/vgdata/lvdata is mounted on /mnt/data; on-line resizing required
old_desc_blocks = 1, new_desc_blocks = 1
The filesystem on /dev/vgdata/lvdata is now 122880 (1k) blocks long.

resize2fs done
Extended file system ext4 on vgdata/lvdata.
Logical volume vgdata/lvdata successfully resized.
[root@ndbaranov ~]# lvs
LV VG Attr LSize Pool Origin Data% Meta% Move Log Cpy%Sync Convert
root r1 -wi-ao--- 35.05g
swap r1 -wi-ao--- <3.95g
lvdata vgdata -wi-ao--- 120.00m
[root@ndbaranov ~]# df -h
Filesystem Size Used Avail Use% Mounted on
devtmpfs 4.0M 0 4.0M 0% /dev
tmpfs 1.8G 0 1.8G 0% /dev/shm
tmpfs 732M 1.3M 730M 1% /run
/dev/mapper/rl-root 35G 11G 25G 30% /
/dev/sdal 960M 440M 515M 47% /boot
tmpfs 360M 120K 366M 1% /run/user/1000
/dev/sr0 51M 51M 0 100% /run/media/ndbaranov/VBox_GAs_7.2.0
/dev/mapper/vgdata-lvdata 107M 14K 101M 1% /mnt/data
[root@ndbaranov ~]# lvreduce -r -L -50M /dev/vgdata/lvdata
Rounding size to boundary between physical extents: 48.00 MiB.
File system ext4 found on vgdata/lvdata mounted at /mnt/data.
File system size (120.00 MiB) is larger than the requested size (72.00 MiB).
File system reduce is required using resize2fs.
File system unmount is needed for reduce.
File system fsck will be run before reduce.
Continue with ext4 file system reduce steps: unmount, fsck, resize2fs? [y/n]:y
Reducing file system ext4 to 72.00 MiB (75497472 bytes) on vgdata/lvdata...
unmount /mnt/data
unmount done
e2fsck /dev/vgdata/lvdata
/dev/vgdata/lvdata: 11/30720 files (0.0% non-contiguous), 13369/122880 blocks
e2fsck done
resize2fs /dev/vgdata/lvdata 73728k
resize2fs 1.46.5 (30-Dec-2021)
Resizing the filesystem on /dev/vgdata/lvdata to 73728 (1k) blocks.
The filesystem on /dev/vgdata/lvdata is now 73728 (1k) blocks long.

resize2fs done
remount /dev/vgdata/lvdata /mnt/data
mount: (hint) your fstab has been modified, but systemd still uses
the old version; use 'systemctl daemon-reload' to reload.
```

Уменьшение размера логического тома

Проверяем окончательный результат изменения размеров (рис. [fig:009?]).


```
Activities Terminal Sep 9 15:31 en
root@ndbaranov:~

[root@ndbaranov ~]# lvs
LV VG Attr LSize Pool Origin Data% Meta% Move Log Cpy%Sync Convert
root r1 -wi-ao---- 35.05g
swap r1 -wi-ao---- <3.95g
lvdata vgdata -wi-ao---- 72.00m
[root@ndbaranov ~]# df -h
Filesystem Size Used Avail Use% Mounted on
devtmpfs 4.0M 0 4.0M 0% /dev
tmpfs 1.8G 0 1.8G 0% /dev/shm
tmpfs 732M 1.3M 730M 1% /run
/dev/mapper/rl-root 35G 11G 25G 30% /
/dev/sda1 960M 446M 515M 47% /boot
tmpfs 366M 120K 366M 1% /run/user/1000
/dev/sr0 51M 51M 0 100% /run/media/baranov/VBox_GAs_7.2.0
/dev/mapper/vgdata-lvdata 63M 14K 58M 1% /mnt/data
[root@ndbaranov ~]#
```

Проверка результатов изменения размеров

3.5 Самостоятельная работа

Создаем новый логический том `lvgroup` размером 200 МБ с файловой системой XFS (рис. [fig:010?]).

```
Activities Terminal Sep 9 17:39 en
root@ndbaranov:~

[root@ndbaranov ~]# sudo pvcreate /dev/sdb
WARNING: adding device /dev/sdb with idname t10.ATA_VBOX_HARDDISK_VBc398f509-62474872 which is already used for mis-
sing device.
Physical volume "/dev/sdb" successfully created.
[root@ndbaranov ~]# sudo vgcreate vggroup /dev/sdb
WARNING: adding device /dev/sdb with idname t10.ATA_VBOX_HARDDISK_VBc398f509-62474872 which is already used for mis-
sing device.
Volume group "vggroup" successfully created
[root@ndbaranov ~]# sudo lvcreate -L 200M -n lvgroup vggroup
Logical volume "lvgroup" created.
[root@ndbaranov ~]# sudo mkfs.xfs /dev/vggroup/lvgroup
Filesystem should be larger than 300MB.
Log size should be at least 64MB.
Support for filesystems like this one is deprecated and they will not be supported in future releases.
meta-data=/dev/vggroup/lvgroup isize=512    agcount=4, agsize=12800 blks
       =                       sectsz=512   attr=2, projid32bit=1
       =                       crc=1        finobt=1, sparse=1, rmapbt=0
       =                       reflink=1    bigtime=1 inobtcount=1 nrext64=0
data      =                       bsize=4096   blocks=51200, imaxpct=25
       =                       sunit=0       swidth=0 blks
naming    =version 2              bsize=4096   ascii-ci=0, ftype=1
log       =internal log          bsize=4096   blocks=1368, version=2
       =                       sectsz=512   sunit=0 blks, lazy-count=1
realtime  =none                  extsz=4096   blocks=0, rtextents=0
[root@ndbaranov ~]# sudo mkdir -p /mnt/groups
[root@ndbaranov ~]# sudo mount /dev/vggroup/lvgroup /mnt/groups
[root@ndbaranov ~]# echo "/dev/vggroup/lvgroup /mnt/groups xfs defaults 0 0" | sudo tee -a /etc/fstab
/dev/vggroup/lvgroup /mnt/groups xfs defaults 0 0
[root@ndbaranov ~]# df -h /mnt/groups
Filesystem      Size  Used Avail Use% Mounted on
/dev/mapper/vggroup-lvgroup 195M  12M  184M   6% /mnt/groups
[root@ndbaranov ~]#
```

Создание логического тома для самостоятельной работы

4. Выводы

Мы получили навыки управления логическими томами.

Список литературы