

Лабораторная работа №15

Управление логическими томами

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Цель работы

Цель лабораторной работы

Получить практические навыки создания, управления и масштабирования логических томов в Linux с использованием LVM.

Ход выполнения

Создание физического тома

```
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): 1
First sector (2048-3145727, default 2048):
Last sector, +/-sectors or +/-size{K,M,G,T,P} (2048-3145727, default 3145727): +300M

Created a new partition 1 of type 'Linux' and of size 300 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@admazurkevich:/home/admazurkevich# partprobe /dev/sdb
root@admazurkevich:/home/admazurkevich# pvcreate /dev/sdb1
  Physical volume "/dev/sdb1" successfully created.
root@admazurkevich:/home/admazurkevich# pvs
  PV          VG      Fmt Attr PSize  PFree
  /dev/sda3    rl_vbox lvm2 a--  <39.00g     0
  /dev/sdb1          lvm2 ---  300.00m 300.00m
root@admazurkevich:/home/admazurkevich#
```

Создание физического тома

```
root@admazurkevich:/home/admazurkevich#  
root@admazurkevich:/home/admazurkevich# pvs  
PV          VG      Fmt Attr PSize   PFree  
/dev/sda3    rl_vbox lvm2 a-- <39.00g     0  
/dev/sdb1        lvm2 --- 300.00m 300.00m  
root@admazurkevich:/home/admazurkevich# vgcreate vgdata /dev/sdb1  
Volume group "vgdata" successfully created  
root@admazurkevich:/home/admazurkevich# vgs  
VG          #PV #LV #SN Attr   VSize   VFree  
rl_vbox     1   2   0 wz--n- <39.00g     0  
vgdata      1   0   0 wz--n- 296.00m 296.00m  
root@admazurkevich:/home/admazurkevich# pvs  
PV          VG      Fmt Attr PSize   PFree  
/dev/sda3    rl_vbox lvm2 a-- <39.00g     0  
/dev/sdb1    vgdata  lvm2 a-- 296.00m 296.00m  
root@admazurkevich:/home/admazurkevich#
```

Рис. 2: Физический том /dev/sdb1

Создание группы томов

```
root@admazurkevich:/home/admazurkevich# lvcreate -n lvdata -l 50%FREE vgdata
Logical volume "lvdata" created.
root@admazurkevich:/home/admazurkevich# lvs
  LV   VG     Attr       LSize  Pool Origin Data%  Meta%  Move Log Cpy%Sync Convert
  root  rl_vbox -wi-ao----  35.05g
  swap  rl_vbox -wi-ao----  <3.95g
  lvdata vgdata -wi-a----- 148.00m
root@admazurkevich:/home/admazurkevich# mkfs.ext4 /dev/vgdata/lvdata
mke2fs 1.47.1 (20-May-2024)
Creating filesystem with 151552 1k blocks and 37848 inodes
Filesystem UUID: dbec4a19-4e00-485a-bedd-c727373ef240
Superblock backups stored on blocks:
          8193, 24577, 40961, 57345, 73729

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

root@admazurkevich:/home/admazurkevich# mkdir -p /mnt/data
root@admazurkevich:/home/admazurkevich#
```

Рис. 3: Создание VG vgdata

Создание логического тома

```
GNU nano 8.1                               /etc/fstab

#
# /etc/fstab
# Created by anaconda on Tue Sep  9 17:21:22 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.
#
UUID=545c5a15-4989-4cc0-ae18-f090649fd991 /          xfs    defaults      0  0
UUID=3e4d95ea-28f8-4363-bb2f-9248dcacfce9 /boot       xfs    defaults      0  0
UUID=bfed141b-af25-4a45-8f41-0eb8866bcfd3 none       swap   defaults      0  0
/dev/vgdata/lvdata        /mnt/data      ext4  defaults      1  2

#UUID=e06ff9c9-d49b-4a0a-858b-7a982361a83e /mnt/data xfs defaults 1 2
#UUID=5b29e34b-432b-45a9-9225-a7d9460745b9 /mnt/data-ext ext4 defaults 1 2
#UUID=0a09f865-107e-42e9-8e3f-d17d1ee2dac6 none swap defaults 0 0
```

Рис. 4: Создание ФС ext4 на lvdata

Монтирование файловой системы

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

Рис. 5: Проверка монтирования /mnt/data

Расширение LVM

```
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 'Linux' to 'Linux LVM'.

Command (m for help): p
Disk /dev/sdb: 1.5 GiB, 1610612736 bytes, 3145728 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: 0xb6d11d99

      Device    Boot   Start     End Sectors  Size Id Type
/dev/sdb1        2048  616447  614400  300M 8e Linux LVM
/dev/sdb2      616448 1230847  614400  300M 8e Linux LVM

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

root@admazurkevich:/home/admazurkevich#
```

Рис. 6: Создание раздела /dev/sdb2

Расширение группы томов

```
root@admazurkevich:/home/admazurkevich# 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@admazurkevich:/home/admazurkevich# vgextend vgdata /dev/sdb2
  Volume group "vgdata" successfully extended
root@admazurkevich:/home/admazurkevich# vgs
  VG     #PV #LV #SN Attr   VSize   VFree
  rl_vbox  1   2   0 wz--n- <39.00g      0
  vgdata   2   1   0 wz--n- 592.00m 444.00m
root@admazurkevich:/home/admazurkevich# lvs
  LV   VG     Attr       LSize  Pool Origin  Data%  Meta%  Move Log Cpy%Sync Convert
  root  rl_vbox -wi-ao---- 35.05g
  swap  rl_vbox -wi-ao---- <3.95g
  lvdata vgdata -wi-ao---- 148.00m
root@admazurkevich:/home/admazurkevich# df -h
Filesystem            Size  Used Avail Use% Mounted on
/dev/mapper/rl_vbox-root 35G  6.1G  29G  18% /
devtmpfs              4.0M    0  4.0M   0% /dev
tmpfs                 1.8G  84K  1.8G   1% /dev/shm
tmpfs                 731M  9.3M  722M   2% /run
tmpfs                 1.0M    0  1.0M   0% /run/credentials/systemd-journald.service
/dev/sda2              960M  377M  584M  40% /boot
tmpfs                 366M  140K  366M   1% /run/user/1000
tmpfs                 366M   60K  366M   1% /run/user/0
/dev/mapper/vgdata-lvdata 134M  14K  123M   1% /mnt/data
root@admazurkevich:/home/admazurkevich#
```

Рис. 7: Расширенная VG vgdata

Увеличение логического тома

```
root@admazurkevich:/home/admazurkevich# 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 148.00 MiB (37 extents) to 372.00 MiB (93 extents).
Extending file system ext4 to 372.00 MiB (390070272 bytes) on vgdata/lvdata...
resize2fs /dev/vgdata/lvdata
resize2fs 1.47.1 (20-May-2024)
Filesystem at /dev/vgdata/lvdata is mounted on /mnt/data; on-line resizing required
old_desc_blocks = 2, new_desc_blocks = 3
The filesystem on /dev/vgdata/lvdata is now 380928 (1k) blocks long.

resize2fs done
Extended file system ext4 on vgdata/lvdata.
Logical volume vgdata/lvdata successfully resized.
root@admazurkevich:/home/admazurkevich# lvs
  LV      VG     Attr       LSize   Pool Origin Data%  Meta%  Move Log Cpy%Sync Convert
  root    rl_vbox -wi-ao---- 35.05g
  swap    rl_vbox -wi-ao---- <3.95g
  lvdata  vgdata  -wi-ao---- 372.00m
root@admazurkevich:/home/admazurkevich# df -h
Filesystem           Size  Used Avail Use% Mounted on
/dev/mapper/rl_vbox-root  35G  29G  18% /
devtmpfs              4.0M    0  4.0M  0% /dev
tmpfs                 1.8G  84K  1.8G  1% /dev/shm
tmpfs                 731M  9.3M  722M  2% /run
tmpfs                 1.0M    0  1.0M  0% /run/credentials/systemd-journald.service
/dev/sda2              960M 377M  584M  40% /boot
tmpfs                 366M  140K  366M  1% /run/user/1000
tmpfs                 366M   60K  366M  1% /run/user/0
/dev/mapper/vgdata-lvdata 344M  14K  324M  1% /mnt/data
root@admazurkevich:/home/admazurkevich#
```

Рис. 8: Расширение lvdata

Уменьшение логического тома

```
Resizing the filesystem on /dev/vgdata/lvdata to 229376 (1k) blocks.
The filesystem on /dev/vgdata/lvdata is now 229376 (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.
remount done
Reduced file system ext4 on vgdata/lvdata.
Size of logical volume vgdata/lvdata changed from 372.00 MiB (93 extents) to 224.00 MiB (56 extents).
Logical volume vgdata/lvdata successfully resized.
root@admazurkevich:/home/admazurkevich# lvs
  LV   VG   Attr   LSize  Origin  Data%  Meta%  Move Log Cpy%Sync Convert
  root  rl_vbox -wi-ao---- 35.05g
  swap  rl_vbox -wi-ao---- <3.95g
  lvdata vgdata -wi-ao---- 224.00m
root@admazurkevich:/home/admazurkevich# df -h
Filesystem           Size  Used Avail Use% Mounted on
/dev/mapper/rl_vbox-root  35G  29G  4.0M  18% /
devtmpfs              4.0M    0  4.0M  0% /dev
tmpfs                 1.8G  84K  1.8G  1% /dev/shm
tmpfs                 731M  9.3M  722M  2% /run
tmpfs                 1.0M    0  1.0M  0% /run/credentials/systemd-journald.service
/dev/sda2              960M  377M  584M  40% /boot
tmpfs                 366M  140K  366M  1% /run/user/1000
tmpfs                 366M  60K  366M  1% /run/user/0
/dev/mapper/vgdata-lvdata 205M  14K  191M  1% /mnt/data
root@admazurkevich:/home/admazurkevich#
```

Рис. 9: Уменьшение размера lvdata

Самостоятельная работа

Разметка диска /dev/sdc

```
The signature will be removed by a 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 'Linux' to 'Linux LVM'.

Command (m for help): p
Disk /dev/sdc: 1.5 GiB, 1610612736 bytes, 3145728 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: 0xe702655f

Device      Boot   Start     End Sectors  Size Id Type
/dev/sdc1        2048 1230847 1228800  600M 8e Linux LVM
/dev/sdc2       1230848 2152447  921600  450M 8e Linux LVM

Filesystem/RAID signature on partition 2 will be wiped.

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

```
root@admazurkevich:/home/admazurkevich#
```

Создание PV и VG

```
Device     Boot   Start    End Sectors  Size Id Type
/dev/sdc1          2048 1230847 1228800 600M 8e Linux LVM
/dev/sdc2          1230848 2152447 921600 450M 8e Linux LVM
root@admazurkevich:/home/admazurkevich#
root@admazurkevich:/home/admazurkevich#
root@admazurkevich:/home/admazurkevich# pvcreate /dev/sdc1
Physical volume "/dev/sdc1" successfully created.
root@admazurkevich:/home/admazurkevich# vgcreate vggroup /dev/sdc1
Volume group "vggroup" successfully created
root@admazurkevich:/home/admazurkevich# lvcreate -n lvgroup -l 100%FREE vggroup
Logical volume "lvgroup" created.
root@admazurkevich:/home/admazurkevich# mkfs.xfs /dev/vggroup/lvgroup
meta-data=/dev/vggroup/lvgroup isize=512    agcount=4, agsize=38144 blks
              =                     sectsz=512  attr=2, projid32bit=1
              =                     crc=1    finobt=1, sparse=1, rmapbt=1
              =                     reflink=1 bigtime=1 inobtcount=1 nnext64=1
              =                     exchange=0
data        =             bsize=4096   blocks=152576, imaxpct=25
              =             sunit=0    swidth=0 blks
naming      =version 2           bsize=4096   ascii-ci=0, ftype=1, parent=0
log         =internal log       bsize=4096   blocks=16384, version=2
              =             sectsz=512  sunit=0 blks, lazy-count=1
realtime    =none               extsz=4096   blocks=0, rtextents=0
root@admazurkevich:/home/admazurkevich#
```

Рис. 11: Создание PV /dev/sdc1

Создание LV lvgroup

```
root@admazurkevich:/home/admazurkevich# pvs
  PV      VG  Fmt Attr PSize  PFree
  /dev/sda3  rl_vbox lvm2 a-- <39.00g    0
  /dev/sdb1  vgdata  lvm2 a-- 296.00m 72.00m
  /dev/sdb2  vgdata  lvm2 a-- 296.00m 296.00m
  /dev/sdc1  vggroun lvm2 a-- 596.00m    0
root@admazurkevich:/home/admazurkevich# vgs
  VG      #PV #LV #SN Attr   VSize   VFree
  rl_vbox  1   2   0 wz--n- <39.00g    0
  vgdata   2   1   0 wz--n- 592.00m 368.00m
  vggroun  1   1   0 wz--n- 596.00m    0
root@admazurkevich:/home/admazurkevich# lvs
  LV      VG      Attr       LSize  Pool Origin Data%  Meta%  Move Log Cpy%Sync Convert
  root    rl_vbox -wi-ao---- 35.05g
  swap    rl_vbox -wi-ao---- <3.95g
  lvdata  vgdata  -wi-ao---- 224.00m
  lvgroup vggroun -wi-a----- 596.00m
root@admazurkevich:/home/admazurkevich#
```

Рис. 12: Создание VG и LV

Монтирование lvgroup

```
GNU nano 8.1                               /etc/fstab

#
# /etc/fstab
# Created by anaconda on Tue Sep  9 17:21:22 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.
#
UUID=545c5a15-4989-4cc0-ae18-f090649fd991 /          xfs    defaults    0 0
UUID=3e4d95ea-28f8-4363-bb2f-9248dcacfce9 /boot      xfs    defaults    0 0
UUID=bfed141b-af25-4a45-8f41-0eb8866bcfd3 none      swap   defaults    0 0
/dev/vgdata/lvdata        /mnt/data      ext4   defaults    1 2
/dev/vggroup/lvgroup      /mnt/groups    xfs    defaults    1 2

#UUID=e06ff9c9-d49b-4a0a-858b-7a982361a83e /mnt/data xfs defaults 1 2
#UUID=5b29e34b-432b-45a9-9225-a7d9460745b9 /mnt/data-ext ext4 defaults 1 2
#UUID=0a09f865-107e-42e9-8e3f-d17d1ee2dac6 none swap defaults 0 0
```

Рис. 13: Конфигурация fstab

Монтирование и проверка

```
root@admazurkevich:/home/admazurkevich# 
root@admazurkevich:/home/admazurkevich# mount | grep mnt
/dev/mapper/vggroup-lvgroup on /mnt/groups type xfs (rw,relatime,seclabel,attr2,inode64,logbufs=8,logbsize=32k,noq
uota)
/dev/mapper/vgdata-lvdata on /mnt/data type ext4 (rw,relatime,seclabel)
root@admazurkevich:/home/admazurkevich#
root@admazurkevich:/home/admazurkevich# df -h
Filesystem            Size  Used Avail Use% Mounted on
/dev/mapper/rl_vbox-root    35G  6.1G  29G  18% /
devtmpfs                 4.0M     0  4.0M   0% /dev
tmpfs                     1.8G   84K  1.8G   1% /dev/shm
tmpfs                     731M   9.3M  722M   2% /run
tmpfs                     1.0M     0  1.0M   0% /run/credentials/systemd-journald.service
/dev/mapper/vggroup-lvgroup 532M   41M  492M   8% /mnt/groups
/dev/sda2                  960M  377M  584M  40% /boot
/dev/mapper/vgdata-lvdata   205M   14K  191M   1% /mnt/data
tmpfs                      366M  140K  366M   1% /run/user/1000
tmpfs                      366M   60K  366M   1% /run/user/0
root@admazurkevich:/home/admazurkevich#
```

Рис. 14: Монтирование lvgroup

Расширение LV и XFS

```
root@admazurkevich:/home/admazurkevich# pvcreate /dev/sdc2
Physical volume "/dev/sdc2" successfully created.
root@admazurkevich:/home/admazurkevich# vgextend vgggroup /dev/sdc2
Volume group "vggroup" successfully extended
root@admazurkevich:/home/admazurkevich# lvextend -r -l +100%FREE /dev/vggroup/lvgroup
File system xfs found on vgggroup/lvgroup mounted at /mnt/groups.
Size of logical volume vgggroup/lvgroup changed from 596.00 MiB (149 extents) to <1.02 GiB (261 extents).
Extending file system xfs to <1.02 GiB (1094713344 bytes) on vgggroup/lvgroup...
xfs_growfs /dev/vggroup/lvgroup
meta-data=/dev/mapper/vgggroup-lvgroup isize=512    agcount=4, agsize=38144 blks
              =                      sectsz=512  attr=2, projid32bit=1
              =                      crc=1    finobt=1, sparse=1, rmapbt=1
              =                      reflink=1   bigtime=1 inobtcount=1 nnext64=1
              =                      exchange=0
data        =                      bsize=4096   blocks=152576, imaxpct=25
              =                      sunit=0    swidth=0 blks
naming      =version 2           bsize=4096   ascii-ci=0, ftype=1, parent=0
log         =internal log       bsize=4096   blocks=16384, version=2
              =
realtime    =none               extsz=4096   blocks=0, rtextents=0
data blocks changed from 152576 to 267264
xfs_growfs done
Extended file system xfs on vgggroup/lvgroup.
Logical volume vgggroup/lvgroup successfully resized.
root@admazurkevich:/home/admazurkevich#
```

Рис. 15: Расширение XFS

Итоговая проверка

```
root@admazurkevich:/home/admazurkevich# 
root@admazurkevich:/home/admazurkevich# pvs
  PV      VG  Fmt Attr PSize  PFree
  /dev/sda3  rl_vbox lvm2 a-- <39.00g    0
  /dev/sdb1  vgdata  lvm2 a-- 296.00m 72.00m
  /dev/sdb2  vgdata  lvm2 a-- 296.00m 296.00m
  /dev/sdc1  vggroupl  lvm2 a-- 596.00m    0
  /dev/sdc2  vggroupl  lvm2 a-- 448.00m    0
root@admazurkevich:/home/admazurkevich# vgs
  VG      #PV #LV #SN Attr   VSize   VFree
  rl_vbox  1   2   0 wz--n- <39.00g    0
  vgdata   2   1   0 wz--n- 592.00m 368.00m
  vggroupl 2   1   0 wz--n- <1.02g    0
root@admazurkevich:/home/admazurkevich# lvs
  LV      VG      Attr       LSize   Pool Origin Data%  Meta%  Move Log Cpy%Sync Convert
  root    rl_vbox -wi-ao---- 35.05g
  swap    rl_vbox -wi-ao---- <3.95g
  lvdata  vgdata -wi-ao---- 224.00m
  lvgroup vggroupl -wi-ao---- <1.02g
root@admazurkevich:/home/admazurkevich# df -h
Filesystem            Size  Used Avail Use% Mounted on
/dev/mapper/rl_vbox-root  35G  6.1G  29G  18% /
devtmpfs              4.0M    0  4.0M  0% /dev
tmpfs                 1.8G  84K  1.8G  1% /dev/shm
tmpfs                 731M  9.3M  722M  2% /run
tmpfs                 1.0M    0  1.0M  0% /run/credentials/systemd-journald.service
/dev/mapper/vggroupl-lvgroup 980M  50M  931M  6% /mnt/groups
/dev/sda2              960M 377M  584M  40% /boot
/dev/mapper/vgdata-lvdata 205M  14K  191M  1% /mnt/data
tmpfs                 366M 140K  366M  1% /run/user/1000
tmpfs                 366M  60K  366M  1% /run/user/0
root@admazurkevich:/home/admazurkevich#
```

Рис. 16: Итоговая проверка систем

Выводы по проделанной работе

Вывод

В ходе лабораторной работы были изучены и выполнены основные операции по созданию и управлению логическими томами LVM: разметка дисков, создание PV, VG и LV, работа с ext4 и XFS, а также динамическое изменение размеров томов и файловых систем. Полученные навыки позволяют уверенно работать с гибкой системой хранения данных, применяемой в серверных и корпоративных инфраструктурах.