

МИНИСТЕРСТВО НАУКИ И ВЫСШЕГО ОБРАЗОВАНИЯ РОССИЙСКОЙ
ФЕДЕРАЦИИ

Федеральное государственное автономное образовательное учреждение
высшего образования

«КРЫМСКИЙ ФЕДЕРАЛЬНЫЙ УНИВЕРСИТЕТ им. В. И. ВЕРНАДСКОГО»
ФИЗИКО-ТЕХНИЧЕСКИЙ ИНСТИТУТ

Кафедра компьютерной инженерии и моделирования

Менеджер томов в Linux и программный RAID

Отчет по лабораторной работе 8

по дисциплине «Системное программное обеспечение»

студента 3 курса группы ИВТ-б-о-202

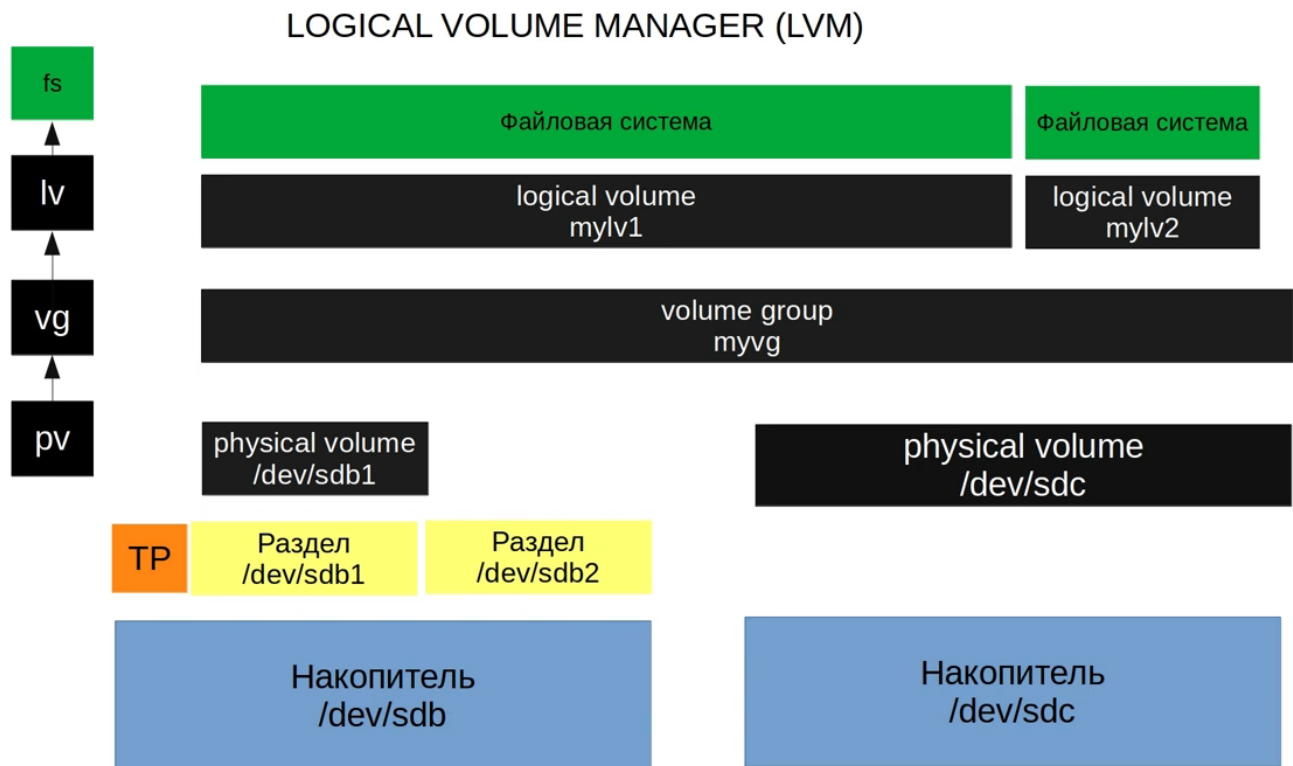
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Лабораторная работа №8. Менеджер томов в Linux и программный RAID

Цель работы: Получение навыков использования менеджеров томов для управления устройствами ввода-вывода и дисковым пространством, знакомство с программным RAID



```

(root@kali)-[/home/kali]
# fdisk /dev/sdb

Welcome to fdisk (util-linux 2.38.1).
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 (MBR) disklabel with disk identifier 0x47240712.

Command (m for help): g
Created a new GPT disklabel (GUID: 49BE6D66-5943-1542-A57C-AB73F9D37F55).

Command (m for help): n
Partition number (1-128, default 1):
First sector (2048-20971486, default 2048):
Last sector, +/-sectors or +/-size{K,M,G,T,P} (2048-20971486, default 20969471): +300M

Created a new partition 1 of type 'Linux filesystem' and of size 300 MiB.

Command (m for help): n
Partition number (2-128, default 2):
First sector (616448-20971486, default 616448):
Last sector, +/-sectors or +/-size{K,M,G,T,P} (616448-20971486, default 20969471): +700M

Created a new partition 2 of type 'Linux filesystem' and of size 700 MiB.

Command (m for help): p
Disk /dev/sdb: 10 GiB, 10737418240 bytes, 20971520 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: gpt
Disk identifier: 49BE6D66-5943-1542-A57C-AB73F9D37F55

Device      Start      End Sectors  Size Type
/dev/sdb1   2048    616447   614400    300M Linux filesystem
/dev/sdb2  616448 2050047 1433600    700M Linux filesystem

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

```

```

(root@kali)-[/home/kali]
# lsblk -f
NAME      FSTYPE FSVER LABEL UUID                                 FSAVAIL FSUSE% MOUNTPOINTS
sda
└─sda1 ext4    1.0   root  1842db13-cb07-4ed0-9bd6-56e19c5665a2    61.1G   17% /
sdb
└─sdb1
└─sdb2
sr0

```

1. Создать физические тома на существующих устройствах ввода-вывода

```
(root@kali)-[/home/kali]
# pvcreate /dev/sdb1
Physical volume "/dev/sdb1" successfully created.

(root@kali)-[/home/kali]
# pvcreate /dev/sdb2
Physical volume "/dev/sdb2" successfully created.

(root@kali)-[/home/kali]
# pvdisplay
"/dev/sdb1" is a new physical volume of "300.00 MiB"
— NEW Physical volume —
PV Name          /dev/sdb1
VG Name
PV Size          300.00 MiB
Allocatable      NO
PE Size          0
Total PE         0
Free PE          0
Allocated PE     0
PV UUID          53m3lS-kiI4-5kPX-ct9Z-Od5u-JFG9-ReH4tC

"/dev/sdb2" is a new physical volume of "700.00 MiB"
— NEW Physical volume —
PV Name          /dev/sdb2
VG Name
PV Size          700.00 MiB
Allocatable      NO
PE Size          0
Total PE         0
Free PE          0
Allocated PE     0
PV UUID          bFEQbL-QDdG-Frmr-vWs3-Lh0Q-sjQm-FtKWHa
```

2. Создать группу томов.

```
(root@kali)-[/home/kali]
# vgcreate myvg /dev/sdb1 /dev/sdb2
Volume group "myvg" successfully created

(root@kali)-[/home/kali]
# vgs
  Volume group
  VG Name          myvg
  System ID
  Format           lvm2
  Metadata Areas   2
  Metadata Sequence No 1
  VG Access        read/write
  VG Status        resizable
  MAX LV           0
  Cur LV           0
  Open LV          0
  Max PV           0
  Cur PV           2
  Act PV           2
  VG Size          992.00 MiB
  PE Size          4.00 MiB
  Total PE         248
  Alloc PE / Size  0 / 0
  Free PE / Size   248 / 992.00 MiB
  VG UUID          TP4xZA-8Ni3-abY5-idD1-KC8L-JLRK-6Mc6b7
```

3. Добавить в группу несколько логических томов различного размера

```
(root@kali)-[/home/kali]
# lvcreate myvg -n mylv_1 -L 200M
Logical volume "mylv_1" created.

(root@kali)-[/home/kali]
# lvcreate myvg -n mylv_2 -L 100M
Logical volume "mylv_2" created.

(root@kali)-[/home/kali]
# lvcreate myvg -n mylv_3 -L 100M
Logical volume "mylv_3" created.
```

```
(root@kali)-[/home/kali]
```

```
# lvsdisplay
```

```
— Logical volume —
```

```
LV Path          /dev/myvg/mylv_1
LV Name           mylv_1
VG Name           myvg
LV UUID           cT0Hpq-Qdkh-qLau-Z4ET-bJ8Z-LTEs-KFiXpw
LV Write Access   read/write
LV Creation host, time kali, 2023-05-24 11:29:47 -0400
LV Status         available
# open            0
LV Size           200.00 MiB
Current LE        50
Segments          1
Allocation        inherit
Read ahead sectors auto
- currently set to 256
Block device      254:0
```

```
— Logical volume —
```

```
LV Path          /dev/myvg/mylv_2
LV Name           mylv_2
VG Name           myvg
LV UUID           IcuUm0-4bdp-3u8y-tiNV-Uiad-CsYv-OLMv7S
LV Write Access   read/write
LV Creation host, time kali, 2023-05-24 11:29:57 -0400
LV Status         available
# open            0
LV Size           100.00 MiB
Current LE        25
Segments          1
Allocation        inherit
Read ahead sectors auto
- currently set to 256
Block device      254:1
```

```
— Logical volume —
```

```
LV Path          /dev/myvg/mylv_3
LV Name           mylv_3
VG Name           myvg
LV UUID           V5945j-LvhX-kiVq-lKmc-6T6k-WGiy-SRkdP1
LV Write Access   read/write
LV Creation host, time kali, 2023-05-24 11:30:22 -0400
LV Status         available
# open            0
LV Size           100.00 MiB
Current LE        25
Segments          1
Allocation        inherit
Read ahead sectors auto
- currently set to 256
Block device      254:2
```

4. Создать файловую систему на логическом томе

```
(root@kali)-[/home/kali]
# lsblk
NAME                MAJ:MIN RM  SIZE RO TYPE MOUNTPOINTS
sda                  8:0    0 80.1G  0 disk
└─sda1               8:1    0 80.1G  0 part /
sdb                  8:16    0   10G  0 disk
├─sdb1              8:17    0  300M  0 part
│ └─myvg-mylv_1     254:0    0  200M  0 lvm
└─sdb2              8:18    0  700M  0 part
   ├──myvg-mylv_2   254:1    0  100M  0 lvm
   └─myvg-mylv_3    254:2    0  100M  0 lvm
sr0                 11:0    1 1024M  0 rom

(root@kali)-[/home/kali]
# mkfs.ext4 /dev/myvg/mylv_1
mke2fs 1.46.6 (1-Feb-2023)
Creating filesystem with 204800 1k blocks and 51200 inodes
Filesystem UUID: a51b2351-9c95-4943-98a7-c21c96f6b68f
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@kali)-[/home/kali]
# lsblk -f
NAME                FSTYPE FSVER LABEL UUID                                 FSAVAIL FSUSE% MOUNTPOINTS
sda
└─sda1              ext4    1.0   root 1842db13-cb07-4ed0-9bd6-56e19c5665a2    61.1G   17% /
sdb
├─sdb1              LVM2_m  LVM2                    53m3lS-kiI4-5kPX-ct9Z-Od5u-JFG9-ReH4tC
│ └─myvg-mylv_1     ext4    1.0                    a51b2351-9c95-4943-98a7-c21c96f6b68f
└─sdb2              LVM2_m  LVM2                    bFEQbL-QDdG-Frmr-vWs3-Lh0Q-sjQm-FtKWHa
   ├──myvg-mylv_2
   └─myvg-mylv_3

sr0
```


Удалил ненужные логические тома

```
(root@kali)-[/home/kali]
# lsblk -f
NAME        FSTYPE FSVER LABEL UUID                                 FSAVAIL FSUSE% MOUNTPOINTS
sda
└─sda1      ext4    1.0    root  1842db13-cb07-4ed0-9bd6-56e19c5665a2  61.1G   17% /
sdb
├─sdb1      LVM2_m  LVM2    53m3lS-kiI4-5kPX-ct9Z-Od5u-JFG9-ReH4tC
│ └─myvg-myLV_1
│     ext4    1.0    a51b2351-9c95-4943-98a7-c21c96f6b68f
└─sdb2      LVM2_m  LVM2    bFEQbL-QDdG-Frmr-vWs3-Lh0Q-sjQm-FtKWHa
    └─myvg-myLV_2
        myvg-myLV_3

sr0

(root@kali)-[/home/kali]
# lvremove /dev/myvg/myLV_2
Do you really want to remove active logical volume myvg/myLV_2? [y/n]: y
Logical volume "myLV_2" successfully removed.

(root@kali)-[/home/kali]
# lvremove /dev/myvg/myLV_3
Do you really want to remove active logical volume myvg/myLV_3? [y/n]: y
Logical volume "myLV_3" successfully removed.

(root@kali)-[/home/kali]
# lsblk -f
NAME        FSTYPE FSVER LABEL UUID                                 FSAVAIL FSUSE% MOUNTPOINTS
sda
└─sda1      ext4    1.0    root  1842db13-cb07-4ed0-9bd6-56e19c5665a2  61.1G   17% /
sdb
├─sdb1      LVM2_mem LVM2 001    53m3lS-kiI4-5kPX-ct9Z-Od5u-JFG9-ReH4tC
│ └─myvg-myLV_1
│     ext4    1.0    a51b2351-9c95-4943-98a7-c21c96f6b68f
└─sdb2      LVM2_mem LVM2 001    bFEQbL-QDdG-Frmr-vWs3-Lh0Q-sjQm-FtKWHa

sr0

(root@kali)-[/home/kali]
#
```

5. Добавить еще один физический том в группу томов.

```
(root@kali)-[/home/kali]
# lsblk -f
NAME      FSTYPE     FSVER      LABEL UUID                                FSAVAIL FSUSE% MOUNTPOINTS
sda
└─sda1 ext4        1.0        root  1842db13-cb07-4ed0-9bd6-56e19c5665a2    61.1G   17% /
sdb
└─sdb1 LVM2_mem    LVM2 001      S5Rw1N-LWC9-EVfP-k4of-by92-3ABe-RbZA1g
   └─myvg-mylv_1
      └─ext4        1.0          5ab422bc-e7b4-489a-8f45-35071878cf18
         └─myvg-mylv_2

sdc
sr0

KALI LINUX

NAME      MAJ:MIN RM  SIZE RO TYPE MOUNTPOINTS
sda      8:0    0 80.1G  0 disk
└─sda1    8:1    0 80.1G  0 part /
sdb      8:16   0   10G  0 disk
└─sdb1    8:17   0    1G  0 part
   └─myvg-mylv_1 254:0   0  200M  0 lvm
      └─myvg-mylv_2 254:1   0  300M  0 lvm
sdc      8:32   0   100M  0 disk
sr0     11:0   1 1024M  0 rom

(root@kali)-[/home/kali]
```

6. Расширить существующий логический том за счёт добавленного физического тома

```
(root@kali)-[/home/kali]
# vgextend myvg /dev/sdc
Physical volume "/dev/sdc" successfully created.
Volume group "myvg" successfully extended

(root@kali)-[/home/kali]
# vgs
  Volume group
  --
VG Name          myvg
System ID
Format           lvm2
Metadata Areas   2
Metadata Sequence No 4
VG Access        read/write
VG Status        resizable
MAX LV           0
Cur LV          2
Open LV          0
Max PV           0
Cur PV          2
Act PV           2
VG Size          <1.09 GiB
PE Size          4.00 MiB
Total PE         279
Alloc PE / Size  125 / 500.00 MiB
Free PE / Size   154 / 616.00 MiB
VG UUID          Ljkbkf-seag-HsBv-nAqV-1Coz-gSoR-Te7IFW
```

7. Расширить файловую систему на логическом томе.

```
(root@kali)-[/home/kali]
# lvextend myvg/mylv_1 -L +200M
Size of logical volume myvg/mylv_1 changed from 200.00 MiB (50 extents) to 400.00 MiB (100 extents).
Logical volume myvg/mylv_1 successfully resized.
```

```
(root@kali)-[/home/kali]
# lvdisplay
--- Logical volume ---
LV Path                /dev/myvg/mylv_1
LV Name                 mylv_1
VG Name                 myvg
LV UUID                 Bbwo0Q-6V3o-ub4Z-V86W-NPLT-J9sZ-teQMma
LV Write Access         read/write
LV Creation host, time  kali, 2023-05-24 12:00:18 -0400
LV Status                available
# open                  0
LV Size                 400.00 MiB
Current LE              100
Segments                2
Allocation               inherit
Read ahead sectors      auto
- currently set to     256
Block device            254:0
```

```
(root@kali)-[/home/kali]
# resize2fs /dev/myvg/mylv_1
resize2fs 1.46.6 (1-Feb-2023)
Resizing the filesystem on /dev/myvg/mylv_1 to 409600 (1k) blocks.
The filesystem on /dev/myvg/mylv_1 is now 409600 (1k) blocks long.
```

8. Создать моментальный снимок логического тома.

```
(root@kali)-[/home/kali]
# lvs
LV      VG      Attr      LSize   Pool Origin Data%  Meta%  Move Log Cpy%Sync Convert
mylv_1  myvg  -wi-a----- 400.00m
mylv_2  myvg  -wi-a----- 300.00m
```

```
(root@kali)-[/home/kali]
# lvcreate -s -n mysnapshot -L 200M myvg/mylv_1
Logical volume "mysnapshot" created.
```

```
(root@kali)-[/home/kali]
# lvs
LV          VG      Attr      LSize   Pool Origin Data%  Meta%  Move Log Cpy%Sync Convert
mylv_1      myvg  owi-a-s--- 400.00m
mylv_2      myvg  -wi-a----- 300.00m
mysnapshot  myvg  swi-a-s--- 200.00m                mylv_1 0.00
```

9. Выполнить резервную копию логического тома при помощи моментального снимка.

```
(root@kali)-[/home/kali]
# lvs
LV          VG      Attr      LSize   Pool Origin Data%  Meta%  Move Log Cpy%S
ync Convert
mylv_1      myvg   owi-a-s— 400.00m
mylv_2      myvg   -wi-a—   300.00m
mysnapshot  myvg   swi-a-s— 200.00m      mylv_1 12.59
```

```
(root@kali)-[/home/kali]
# mount /dev/myvg/mysnapshot /mnt/mysnapshot
```

```
(root@kali)-[/home/kali]
# cd /mnt/mysnapshot
```

```
(root@kali)-[/mnt/mysnapshot]
# ls
lost+found
```

```
(root@kali)-[/mnt/mysnapshot]
# lsblk
```

NAME	MAJ:MIN	RM	SIZE	RO	TYPE	MOUNTPOINTS
sda	8:0	0	80.1G	0	disk	
└─sda1	8:1	0	80.1G	0	part	/
sdb	8:16	0	100M	0	disk	
sdc	8:32	0	10G	0	disk	
└─sdc1	8:33	0	1G	0	part	
├─myvg-mylv_1-real	254:0	0	400M	0	lvm	
├─myvg-mylv_1	254:1	0	400M	0	lvm	
├─myvg-mysnapshot	254:3	0	400M	0	lvm	/mnt/mysnapshot
├─myvg-mysnapshot-cow	254:2	0	200M	0	lvm	
└─myvg-mysnapshot	254:3	0	400M	0	lvm	/mnt/mysnapshot
└─myvg-mylv_2	254:4	0	300M	0	lvm	
sr0	11:0	1	1024M	0	rom	

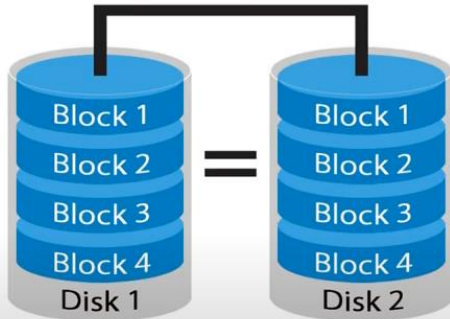
```
(root@kali)-[/mnt/mysnapshot]
# cp /mnt/mysnapshot /home/kali
cp: -r not specified; omitting directory '/mnt/mysnapshot'
```

```
(root@kali)-[/mnt/mysnapshot]
# cp -r /mnt/mysnapshot /home/kali
```

```
(root@kali)-[/mnt/mysnapshot]
#
```

RAID - Redundant Array of Independent Disks

RAID 1
mirror



RAID 1
mirror

*условная схема



10. Создать программный RAID массив 0 типа из двух логических томов, создать на полученном устройстве файловую систему

```
(root@kali)-[/home/kali/mysnapshot]
# lsblk
NAME                                MAJ:MIN RM  SIZE RO TYPE MOUNTPOINTS
sda                                  8:0      0  80.1G  0 disk
├─sda1                              8:1      0  80.1G  0 part /
sdb                                  8:16     0   100M  0 disk
sdc                                  8:32     0    10G  0 disk
├─sdc1                              8:33     0     1G  0 part
│   └─myvg-mylv_1-real              254:0     0   400M  0 lvm
│       └─myvg-mylv_1              254:1     0   400M  0 lvm
│           └─myvg-mysnapshot       254:3     0   400M  0 lvm
│               └─myvg-mysnapshot-cow 254:2     0   200M  0 lvm
│                   └─myvg-mysnapshot 254:3     0   400M  0 lvm
│                       └─myvg-mylv_2 254:4     0   400M  0 lvm
└─sr0                               11:0     1 1024M  0 rom

Home

(root@kali)-[/home/kali/mysnapshot]
# mdadm --create /dev/md0 --level=0 --raid-devices=2 /dev/myvg/mylv_1 /dev/myvg/mylv_2
mdadm: /dev/myvg/mylv_1 appears to contain an ext2fs file system
       size=409600K mtime=Wed May 24 12:39:55 2023
Continue creating array?
Continue creating array? (y/n) y
mdadm: Defaulting to version 1.2 metadata
mdadm: array /dev/md0 started.

(root@kali)-[/home/kali/mysnapshot]
# lsblk
NAME                                MAJ:MIN RM  SIZE RO TYPE MOUNTPOINTS
sda                                  8:0      0  80.1G  0 disk
├─sda1                              8:1      0  80.1G  0 part /
sdb                                  8:16     0   100M  0 disk
sdc                                  8:32     0    10G  0 disk
├─sdc1                              8:33     0     1G  0 part
│   └─myvg-mylv_1-real              254:0     0   400M  0 lvm
│       └─myvg-mylv_1              254:1     0   400M  0 lvm
│           └─md0                  9:0      0   796M  0 raid0
│               └─myvg-mysnapshot       254:3     0   400M  0 lvm
│                   └─myvg-mysnapshot-cow 254:2     0   200M  0 lvm
│                       └─myvg-mysnapshot 254:3     0   400M  0 lvm
│                           └─myvg-mylv_2 254:4     0   400M  0 lvm
│                               └─md0      9:0      0   796M  0 raid0
└─sr0                               11:0     1 1024M  0 rom
```

```
(root@kali)-[/home/kali/mysnapshot]
# mkfs.ext4 /dev/md0
mke2fs 1.46.6 (1-Feb-2023)
Creating filesystem with 203776 4k blocks and 50960 inodes
Filesystem UUID: 2eef4f4f-d961-441f-a086-19ee61ea5514
Superblock backups stored on blocks:
    32768, 98304, 163840

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

419 MB Vol...
```

```
(root@kali)-[/home/kali/mysnapshot]
# lsblk -f
```

NAME	FSTYPE	FSVER	LABEL	UUID	FSAVAIL	FSUSE%	MOUNTPOINTS
sda							
└─sda1	ext4	1.0	root	1842db13-cb07-4ed0-9bd6-56e19c5665a2	61G	17%	/
sdb	LVM2_m	LVM2		B4ziMI-Dwzo-04Ab-pgUD-gwEC-4IXI-pNSQ2R			
sdc							
└─sdc1	LVM2_m	LVM2		S5Rw1N-LWC9-EVfP-k4of-by92-3ABe-RbZA1g			
└─myvg-mylv_1-real							
└─myvg-mylv_1							
└─myvg-mylv_1	linux_	1.2	kali:0	b1ee3d16-8dd7-f319-5cd1-49c38d6097e1			
└─md0	ext4	1.0		2eef4f4f-d961-441f-a086-19ee61ea5514			
└─myvg-mysnapshot							
└─md0	ext4	1.0		5ab422bc-e7b4-489a-8f45-35071878cf18			
└─myvg-mysnapshot-cow							
└─myvg-mysnapshot							
└─md0	ext4	1.0		5ab422bc-e7b4-489a-8f45-35071878cf18			
└─myvg-mylv_2							
└─myvg-mylv_2	linux_	1.2	kali:0	b1ee3d16-8dd7-f319-5cd1-49c38d6097e1			
└─md0	ext4	1.0		2eef4f4f-d961-441f-a086-19ee61ea5514			
sr0							

11. Создать программный RAID массив 1 типа из двух логических устройств.

Создать файловую систему, проверить статус массива.

```
(root@kali)-[/home/kali/mysnapshot]
# lsblk
NAME                                MAJ:MIN RM  SIZE RO TYPE MOUNTPOINTS
sda                                  8:0      0  80.1G  0 disk
├─sda1                               8:1      0  80.1G  0 part /
├─sdb                               8:16     0   100M  0 disk
├─sdc                               8:32     0    10G  0 disk
├─sdc1                              8:33     0     1G  0 part
│   └─myvg-mylv_1-real              254:0     0   400M  0 lvm
│       └─myvg-mylv_1              254:1     0   400M  0 lvm
│           └─md0                  9:0      0   796M  0 raid0
│               └─myvg-mysnapshot  254:3     0   400M  0 lvm
│                   └─myvg-mysnapshot-cow 254:2     0   200M  0 lvm
│                       └─myvg-mysnapshot 254:3     0   400M  0 lvm
│                           └─myvg-mylv_2 254:4     0   400M  0 lvm
│                               └─md0      9:0      0   796M  0 raid0
└─sr0                               11:0     1  1024M  0 rom

(root@kali)-[/home/kali/mysnapshot]
# lvcreate myvg -n mylv_4 -L 20M
Logical volume "mylv_4" created.

(root@kali)-[/home/kali/mysnapshot]
# lvcreate myvg -n mylv_3 -L 20M
Logical volume "mylv_3" created.

(root@kali)-[/home/kali/mysnapshot]
# mdadm --create /dev/md1 --level=1 --raid-devices=2 /dev/myvg/mylv_3 /dev/myvg/mylv_4
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
Continue creating array? y
mdadm: Defaulting to version 1.2 metadata
mdadm: array /dev/md1 started.

(root@kali)-[/home/kali/mysnapshot]
# mkfs.ext4 /dev/md1
mke2fs 1.46.6 (1-Feb-2023)
Creating filesystem with 19456 1k blocks and 4872 inodes
Filesystem UUID: 4098ab19-92b6-4428-8f02-b30e33219319
Superblock backups stored on blocks:
    8193

Allocating group tables: done
Writing inode tables: done
Creating journal (1024 blocks): done
Writing superblocks and filesystem accounting information: done
```

(root@kali)-[/home/kali/mysnapshot]

lsblk

NAME	MAJ:MIN	RM	SIZE	RO	TYPE	MOUNTPOINTS
sda	8:0	0	80.1G	0	disk	
└─sda1	8:1	0	80.1G	0	part	/
sdb	8:16	0	100M	0	disk	
└─myvg-mylv_3	254:6	0	20M	0	lvm	
└─md1	9:1	0	19M	0	raid1	
sdc	8:32	0	10G	0	disk	
└─sdc1	8:33	0	1G	0	part	
└─myvg-mylv_1-real	254:0	0	400M	0	lvm	
└─myvg-mylv_1	254:1	0	400M	0	lvm	
└─md0	9:0	0	796M	0	raid0	
└─myvg-mysnapshot	254:3	0	400M	0	lvm	
└─myvg-mysnapshot-cow	254:2	0	200M	0	lvm	
└─myvg-mysnapshot	254:3	0	400M	0	lvm	
└─myvg-mylv_2	254:4	0	400M	0	lvm	
└─md0	9:0	0	796M	0	raid0	
└─myvg-mylv_4	254:5	0	20M	0	lvm	
└─md1	9:1	0	19M	0	raid1	
sr0	11:0	1	1024M	0	rom	

12. Обеспечить автоматическое монтирование массивов при старте системы

```
(root@kali)-[/mnt]
# nano /etc/fstab

(root@kali)-[/mnt]
# lsblk
```

NAME	MAJ:MIN	RM	SIZE	RO	TYPE	MOUNTPOINTS
sda	8:0	0	80.1G	0	disk	
└─sda1	8:1	0	80.1G	0	part	/
sdb	8:16	0	100M	0	disk	
└─myvg-mylv_3	254:6	0	20M	0	lvm	
└─md1	9:1	0	19M	0	raid1	
sdc	8:32	0	10G	0	disk	
└─sdc1	8:33	0	1G	0	part	
└─myvg-mylv_1-real	254:0	0	400M	0	lvm	
└─myvg-mylv_1	254:1	0	400M	0	lvm	
└─md0	9:0	0	796M	0	raid0	
└─myvg-mysnapshot	254:3	0	400M	0	lvm	
└─myvg-mysnapshot-cow	254:2	0	200M	0	lvm	
└─myvg-mysnapshot	254:3	0	400M	0	lvm	
└─myvg-mylv_2	254:4	0	400M	0	lvm	
└─md0	9:0	0	796M	0	raid0	
└─myvg-mylv_4	254:5	0	20M	0	lvm	
└─md1	9:1	0	19M	0	raid1	
sr0	11:0	1	1024M	0	rom	

```
File Actions Edit View Help
GNU nano 7.2 /etc/fstab
UUID=1842db13-cb07-4ed0-9bd6-56e19c5665a2 / ext4 defaults,errors=remount-ro
/swapfile none swap defaults 0 0
/dev/md0 /mnt/md0 ext4 defaults 0 0
/dev/md1 /mnt/md1 ext4 defaults 0 0
```

```
(root@kali)-[/mnt]
# systemctl daemon-reload start
Too many arguments.
```

```
(root@kali)-[/mnt]
# mount -a
```

```
(root@kali)-[/mnt]
# lsblk
```

NAME	MAJ:MIN	RM	SIZE	RO	TYPE	MOUNTPOINTS
sda	8:0	0	80.1G	0	disk	
└─sda1	8:1	0	80.1G	0	part	/
sdb	8:16	0	100M	0	disk	
└─myvg-mylv_3	254:6	0	20M	0	lvm	
└─md1	9:1	0	19M	0	raid1	/mnt/md1
sdc	8:32	0	10G	0	disk	
└─sdc1	8:33	0	1G	0	part	
└─myvg-mylv_1-real	254:0	0	400M	0	lvm	
└─myvg-mylv_1	254:1	0	400M	0	lvm	
└─md0	9:0	0	796M	0	raid0	/mnt/md0
└─myvg-mysnapshot	254:3	0	400M	0	lvm	
└─myvg-mysnapshot-cow	254:2	0	200M	0	lvm	
└─myvg-mysnapshot	254:3	0	400M	0	lvm	
└─myvg-mylv_2	254:4	0	400M	0	lvm	
└─md0	9:0	0	796M	0	raid0	/mnt/md0
└─myvg-mylv_4	254:5	0	20M	0	lvm	
└─md1	9:1	0	19M	0	raid1	/mnt/md1
sr0	11:0	1	1024M	0	rom	

```
(root@kali)-[/mnt]
#
```


Вывод: В ходе данной лабораторной работе я создал виртуальный диск, на котором потом произвёл разметку диска с помощью cfdisk. Затем произвёл создания файловых систем: ext2, ext3, ext4, xfs, btrfs, zfs, fat32 и ntfs. После создания файловых систем – смонтировал их. Настроил автоматическое монтирование при запуске системы в fstab. Также создал и подключил файл подкачки. Написал на bash скрипты, которые тестируют запись и чтение маленьких и больших файлов. И скрипт, который создаёт и производит поиск 1000 каталогов. Измерил время выполнения всех скриптов на разных файловых системах и предоставил графики для отображения статистики.