Лабораторная работа №14

Партиции, файловые системы, монтирование

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Цель работы

Основная цель

Получить навыки создания разделов, файловых систем и монтирования в Linux с использованием утилит **fdisk**, **gdisk**, **mkfs**, **mkswap** и конфигурации **/etc/fstab**.

Ход выполнения работы

Создание разделов MBR с помощью fdisk

```
mlabsi@mlabsi:~$ su
Password:
root@mlabsi:/home/mlabsi#
root@mlabsi:/home/mlabsi# fdisk -l
Disk /dev/sda: 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


Disk /dev/sdc: 40 GiB, 42949672960 bytes, 83886080 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: 1551DC2F-F63F-4E8C-A894-4E6A0539D68C

Device       Start      End  Sectors Size Type
/dev/sdc1     2048     4095     2048   1M BIOS boot
/dev/sdc2     4096  2101247  2097152   1G Linux extended boot
/dev/sdc3  2101248 83884031 81782784  39G Linux LVM


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
```

Основные действия

```
root@mlabsi:/home/mlabsi# fdisk /dev/sda

Welcome to fdisk (util-linux 2.40.2).
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 0x289031a7.

Command (m for help): m

Help:

  DOS (MBR)
   a   toggle a bootable flag
   b   edit nested BSD disklabel
   c   toggle the dos compatibility flag

  Generic
   d   delete a partition
   F   list free unpartitioned space
   l   list known partition types
   n   add a new partition
   p   print the partition table
   t   change a partition type
   v   verify the partition table
   i   print information about a partition
   e   resize a partition

  Misc
   m   print this menu
   u   change display/entry units
   x   extra functionality (experts only)
```

Создание основного раздела 300 MiB

```
Command (m for help): p

Disk /dev/sda: 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: 0x289031a7

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 (2048-3145727, 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.

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

root@mlabsi:/home/mlabsi#
```

Результат

```
root@mlabsi:/home/mlabsi#
root@mlabsi:/home/mlabsi# fdisk /dev/sda -l
Disk /dev/sda: 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: 0x289031a7

Device     Boot Start    End Sectors  Size Id Type
/dev/sda1        2048 616447  614400  300M 83 Linux
root@mlabsi:/home/mlabsi# cat /proc/partitions
major minor  #blocks  name

   8        0    1572864 sda
   8        1     307200 sda1
   8       32   41943040 sdc
   8       33       1024 sdc1
   8       34    1048576 sdc2
   8       35   40891392 sdc3
   8       16    1572864 sdb
  11        0    1048575 sr0
 253        0   36753408 dm-0
 253        1    4136960 dm-1
root@mlabsi:/home/mlabsi# partprobe /dev/sda
root@mlabsi:/home/mlabsi#
```

Extended + Logical

```
root@mlabsi:/home/mlabsi# fdisk /dev/sda

Welcome to fdisk (util-linux 2.40.2).
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 (1 primary, 0 extended, 3 free)
   e   extended (container for logical partitions)
Select (default p): e
Partition number (2-4, default 2):
First sector (616448-3145727, default 616448):
Last sector, +/-sectors or +/-size{K,M,G,T,P} (616448-3145727, default 3145727):

Created a new partition 2 of type 'Extended' and of size 1.2 GiB.

Command (m for help): n
All space for primary partitions is in use.
Adding logical partition 5
First sector (618496-3145727, default 618496):
Last sector, +/-sectors or +/-size{K,M,G,T,P} (618496-3145727, default 3145727): +300M

Created a new partition 5 of type 'Linux' and of size 300 MiB.

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

root@mlabsi:/home/mlabsi#
```

Создание swap раздела

```
root@mlabsi:/home/mlabsi# fdisk /dev/sda

Welcome to fdisk (util-linux 2.40.2).
Changes will remain in memory only, until you decide to write them.
Be careful before using the write command.


Command (m for help): n
All space for primary partitions is in use.
Adding logical partition 6
First sector (1234944-3145727, default 1234944):
Last sector, +/-sectors or +/-size{K,M,G,T,P} (1234944-3145727, default 3145727): +300M

Created a new partition 6 of type 'Linux' and of size 300 MiB.

Command (m for help): t
Partition number (1,2,5,6, default 6):
Hex code or alias (type L to list all): 82

Changed type of partition 'Linux' to 'Linux swap / Solaris'.

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

root@mlabsi:/home/mlabsi#
```

Рис. 7: Создание swap-раздела

Итоговая структура

```
root@mlabsi:/home/mlabsi# fdisk /dev/sda -l
Disk /dev/sda: 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: 0x289031a7

Device     Boot   Start     End Sectors  Size Id Type
/dev/sda1          2048  616447  614400  300M 83 Linux
/dev/sda2        616448 3145727 2529280  1.2G  5 Extended
/dev/sda5        618496 1232895  614400  300M 83 Linux
/dev/sda6       1234944 1849343  614400  300M 82 Linux swap / Solaris
root@mlabsi:/home/mlabsi# mkswap /dev/sda6
Setting up swapspace version 1, size = 300 MiB (314568704 bytes)
no label, UUID=ba055666-7c53-4874-91c5-1fc19d82be06
root@mlabsi:/home/mlabsi# swapon /dev/sda6
root@mlabsi:/home/mlabsi# free -m
               total        used        free      shared  buff/cache   available
Mem:            3652        1419         892          18        1597        2233
Swap:           4339           0        4339
root@mlabsi:/home/mlabsi#
```

Рис. 8: Разделы sda1, sda2, sda5, sda6

Создание таблицы GPT

```
root@mlabsi:/home/mlabsi#
root@mlabsi:/home/mlabsi# gdisk -l /dev/sdb
GPT fdisk (gdisk) version 1.0.10

Partition table scan:
  MBR: not present
  BSD: not present
  APM: not present
  GPT: not present

Creating new GPT entries in memory.
Disk /dev/sdb: 3145728 sectors, 1.5 GiB
Model: VBOX HARDDISK
Sector size (logical/physical): 512/512 bytes
Disk identifier (GUID): 5C8A7EA0-0F8F-47FA-ACBD-21187798CC97
Partition table holds up to 128 entries
Main partition table begins at sector 2 and ends at sector 33
First usable sector is 34, last usable sector is 3145694
Partitions will be aligned on 2048-sector boundaries
Total free space is 3145661 sectors (1.5 GiB)

Number  Start (sector)    End (sector)  Size       Code  Name
root@mlabsi:/home/mlabsi#
```

Создание GPT-раздела 300 MiB

```
Creating new GPT entries in memory.

Command (? for help): n
Partition number (1-128, default 1):
First sector (34-3145694, default = 2048) or {+-}size{KMGTP}:
Last sector (2048-3145694, default = 3143679) or {+-}size{KMGTP}: +300M
Current type is 8300 (Linux filesystem)
Hex code or GUID (L to show codes, Enter = 8300):
Changed type of partition to 'Linux filesystem'

Command (? for help): p
Disk /dev/sdb: 3145728 sectors, 1.5 GiB
Model: VBOX HARDDISK
Sector size (logical/physical): 512/512 bytes
Disk identifier (GUID): 965B19DF-CDA3-4800-90A1-3B53F0396DE3
Partition table holds up to 128 entries
Main partition table begins at sector 2 and ends at sector 33
First usable sector is 34, last usable sector is 3145694
Partitions will be aligned on 2048-sector boundaries
Total free space is 2531261 sectors (1.2 GiB)

Number  Start (sector)    End (sector)  Size       Code  Name
   1            2048          616447   300.0 MiB   8300  Linux filesystem

Command (? for help): w

Final checks complete. About to write GPT data. THIS WILL OVERWRITE EXISTING
PARTITIONS!!

Do you want to proceed? (Y/N): Y
```

Проверка результата

```
   8        5     307200 sda5
   8        6     307200 sda6
   8       32   41943040 sdc
   8       33       1024 sdc1
   8       34    1048576 sdc2
   8       35   40891392 sdc3
   8       16    1572864 sdb
   8       17     307200 sdb1
  11        0    1048575 sr0
 253        0   36753408 dm-0
 253        1    4136960 dm-1
root@mlabsi:/home/mlabsi# gdisk /dev/sdb -l
GPT fdisk (gdisk) version 1.0.10

Partition table scan:
  MBR: protective
  BSD: not present
  APM: not present
  GPT: present

Found valid GPT with protective MBR; using GPT.
Disk /dev/sdb: 3145728 sectors, 1.5 GiB
Model: VBOX HARDDISK
Sector size (logical/physical): 512/512 bytes
Disk identifier (GUID): 965B19DF-CDA3-4800-90A1-3B53F0396DE3
Partition table holds up to 128 entries
Main partition table begins at sector 2 and ends at sector 33
First usable sector is 34, last usable sector is 3145694
Partitions will be aligned on 2048-sector boundaries
Total free space is 2531261 sectors (1.2 GiB)

Number  Start (sector)    End (sector)  Size       Code  Name
   1            2048          616447   300.0 MiB   8300  Linux filesystem
root@mlabsi:/home/mlabsi#
```

XFS → /dev/sda1

```
root@mlabsi:/home/mlabsi#
root@mlabsi:/home/mlabsi# mkfs.xfs /dev/sda1
meta-data=/dev/sda1              isize=512    agcount=4, agsize=19200 blks
         =                       sectsz=512   attr=2, projid32bit=1
         =                       crc=1        finobt=1, sparse=1, rmapbt=1
         =                       reflink=1    bigtime=1 inobtcount=1 nrext64=1
         =                       exchange=0
data     =                       bsize=4096   blocks=76800, 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@mlabsi:/home/mlabsi# xfs_admin -L xfsdisk /dev/sda1
writing all SBs
new label = "xfsdisk"
root@mlabsi:/home/mlabsi# mkfs.ext4 /dev/sda5
mke2fs 1.47.1 (20-May-2024)
Creating filesystem with 307200 1k blocks and 76912 inodes
Filesystem UUID: 467e3e91-628e-4321-b38b-c2f17511e114
Superblock backups stored on blocks:
        8193, 24577, 40961, 57345, 73729, 204801, 221185

Allocating group tables: done
Writing inode tables: done
Creating journal (8192 blocks): done
Writing superblocks and filesystem accounting information: done

root@mlabsi:/home/mlabsi# tune2fs -L ext4disk /dev/sda5
tune2fs 1.47.1 (20-May-2024)
root@mlabsi:/home/mlabsi# tune2fs -o acl,user_xattr /dev/sda5
tune2fs 1.47.1 (20-May-2024)
root@mlabsi:/home/mlabsi#
```

```
root@mlabsi:/home/mlabsi#
root@mlabsi:/home/mlabsi# mkdir -p /mnt/tmp
root@mlabsi:/home/mlabsi# mount /dev/sda5 /mnt/tmp
root@mlabsi:/home/mlabsi# mount | grep mnt
/dev/sda5 on /mnt/tmp type ext4 (rw,relatime,seclabel)
root@mlabsi:/home/mlabsi# umount /dev/sda5
root@mlabsi:/home/mlabsi# mount | grep mnt
root@mlabsi:/home/mlabsi#
```

Рис. 13: Создание EXT4-раздела

Ручное монтирование

```
root@mlabsi:/home/mlabsi# mkdir /mnt/data
root@mlabsi:/home/mlabsi# blkid
/dev/mapper/rl_vbox-swap: UUID="b51e98a0-6553-4626-8a2a-7a339e0f9743" TYPE="swap"
/dev/sdb1: PARTLABEL="Linux filesystem" PARTUUID="e638b51f-ed3d-4536-8ab9-cc88afa02807"
/dev/mapper/rl_vbox-root: UUID="cf4bb135-541a-4e7a-8082-35d958a42b2b" BLOCK_SIZE="512" TYPE="xfs"
/dev/sdc2: UUID="02771a7b-5627-4df3-9ccf-b78a4be9370b" BLOCK_SIZE="512" TYPE="xfs" PARTUUID="f8fc2e85-2851-41
eb-8990-2cea069f181c"
/dev/sdc3: UUID="yJUhBD-2b3t-lDcx-SHwX-Ao9e-WOvq-qIDIdl" TYPE="LVM2_member" PARTUUID="bd5675da-5ecf-497f-b1ae
-8920579e7dd7"
/dev/sdc1: PARTUUID="698bb588-cb36-40c1-92c6-bb642dd0c32f"
/dev/sda2: PTTYPE="dos" PARTUUID="289031a7-02"
/dev/sda5: LABEL="ext4disk" UUID="467e3e91-628e-4321-b38b-c2f17511e114" BLOCK_SIZE="1024" TYPE="ext4" PARTUUI
D="289031a7-05"
/dev/sda1: LABEL="xfsdisk" UUID="0b45920a-ec44-4ec4-b009-fc451d0d38ed" BLOCK_SIZE="512" TYPE="xfs" PARTUUID="
289031a7-01"
/dev/sda6: UUID="ba055666-7c53-4874-91c5-1fc19d82be06" TYPE="swap" PARTUUID="289031a7-06"
root@mlabsi:/home/mlabsi# blkid /dev/sda1
/dev/sda1: LABEL="xfsdisk" UUID="0b45920a-ec44-4ec4-b009-fc451d0d38ed" BLOCK_SIZE="512" TYPE="xfs" PARTUUID="
289031a7-01"
root@mlabsi:/home/mlabsi#
```

Рис. 14: Ручное монтирование EXT4

Получение UUID

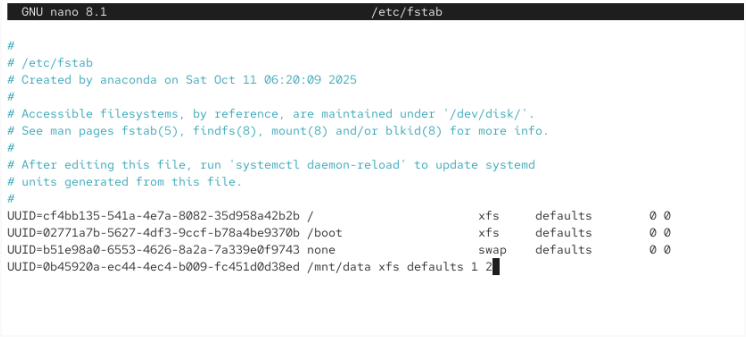

Рис. 15: Просмотр UUID

Самостоятельная работа

Создание дополнительных GPT-разделов

```
Disk /dev/sdb: 3145728 sectors, 1.5 GiB
Model: VBOX HARDDISK
Sector size (logical/physical): 512/512 bytes
Disk identifier (GUID): 965B19DF-CDA3-4800-90A1-3B53F0396DE3
Partition table holds up to 128 entries
Main partition table begins at sector 2 and ends at sector 33
First usable sector is 34, last usable sector is 3145694
Partitions will be aligned on 2048-sector boundaries
Total free space is 2531261 sectors (1.2 GiB)

Number  Start (sector)    End (sector)  Size       Code  Name
   1            2048          616447   300.0 MiB   8300  Linux filesystem

Command (? for help): n
Partition number (2-128, default 2):
First sector (34-3145694, default = 616448) or {+-}size{KMGTP}:
Last sector (616448-3145694, default = 3143679) or {+-}size{KMGTP}: +300M
Current type is 8300 (Linux filesystem)
Hex code or GUID (L to show codes, Enter = 8300):
Changed type of partition to 'Linux filesystem'

Command (? for help): n
Partition number (3-128, default 3):
First sector (34-3145694, default = 1230848) or {+-}size{KMGTP}:
Last sector (1230848-3145694, default = 3143679) or {+-}size{KMGTP}: +300M
Current type is 8300 (Linux filesystem)
Hex code or GUID (L to show codes, Enter = 8300): 8200
Changed type of partition to 'Linux swap'

Command (? for help): w

Final checks complete. About to write GPT data. THIS WILL OVERWRITE EXISTING
PARTITIONS!!

Do you want to proceed? (Y/N): Y
```

Создание записей в fstab

```
 GNU nano 8.1                                  /etc/fstab

#
# /etc/fstab
# Created by anaconda on Sat Oct 11 06:20:09 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=cf4bb135-541a-4e7a-8082-35d958a42b2b /                       xfs     defaults        0 0
UUID=02771a7b-5627-4df3-9ccf-b78a4be9370b /boot                   xfs     defaults        0 0
UUID=b51e98a0-6553-4626-8a2a-7a339e0f9743 none                    swap    defaults        0 0
UUID=0b45920a-ec44-4ec4-b009-fc451d0d38ed /mnt/data xfs defaults 1 2
UUID=0d590188-3f0c-4374-8d4d-84ca075c37db /mnt/data-ext ext4 defaults 1 2
UUID=eab0e188-e839-4809-bd1b-b5e8b7d8639a none swap defaults 0 0
```

Рис. 18: Настройка fstab

Проверка после перезагрузки

```
mlabsi@mlabsi:~$
mlabsi@mlabsi:~$ df -h
Filesystem                Size  Used Avail Use% Mounted on
/dev/mapper/rl_vbox-root   35G  5.9G   30G  17% /
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/sdb1                 236M   20M  217M   9% /mnt/data
/dev/sda2                 960M  377M  584M  40% /boot
/dev/sdc2                 272M   14K  253M   1% /mnt/data-ext
tmpfs                     366M   76K  366M   1% /run/user/42
tmpfs                     366M  140K  366M   1% /run/user/1000
mlabsi@mlabsi:~$ free -m
               total        used        free      shared  buff/cache   available
Mem:            3652        1294        1923          17         667        2358
Swap:           4339           0        4339
mlabsi@mlabsi:~$
```

Рис. 19: Проверка результата

Заключение

Заключение

Были освоены операции разметки дисков (MBR, GPT), создание основных и логических разделов, форматирование файловых систем **XFS** и **EXT4**, настройка области подкачки и автоматического монтирования через **/etc/fstab**. Полученные навыки позволяют выполнять базовое администрирование дисковой подсистемы Linux.