

Анализ файловой структуры UNIX. Команды для работы с файлами и каталогами

Алькамаль Ибрахим Мохсейн Мохаммед Али¹

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¹Российский Университет Дружбы Народов

Цели и задачи работы

Цель лабораторной работы

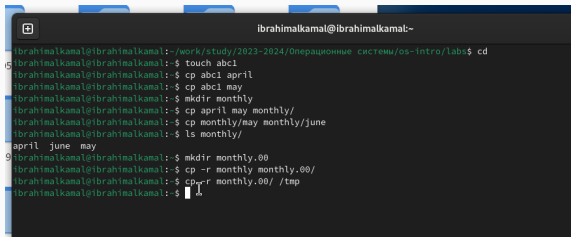
Ознакомление с файловой системой Linux, её структурой, именами и содержанием каталогов. Приобретение практических навыков по применению команд для работы с файлами и каталогами, по управлению процессами, по проверке использования диска и обслуживанию файловой системы.

Задачи лабораторной работы

- 1 Выполнить приимеры
- 2 Выполнить дествия по работе с каталогами и файлами
- 3 Выполнить действия с правами доступа
- 4 Получить дополнительные сведения при помощи справки по командам.

Процесс выполнения лабораторной работы

Выполнение примеров



```
ibrahimalkamal@ibrahimalkamal:~/work/study/2023-2024/Операционные системы/os-intro/labs$ cd
ibrahimalkamal@ibrahimalkamal:~$ touch abc1
ibrahimalkamal@ibrahimalkamal:~$ cp abc1 april
ibrahimalkamal@ibrahimalkamal:~$ cp abc1 may
ibrahimalkamal@ibrahimalkamal:~$ mkdir monthly
ibrahimalkamal@ibrahimalkamal:~$ cp april may monthly/
ibrahimalkamal@ibrahimalkamal:~$ cp monthly/may monthly/june
ibrahimalkamal@ibrahimalkamal:~$ ls monthly/
april  june  may
ibrahimalkamal@ibrahimalkamal:~$ mkdir monthly.00
ibrahimalkamal@ibrahimalkamal:~$ cp -r monthly monthly.00/
ibrahimalkamal@ibrahimalkamal:~$ cp -r monthly.00/ /tmp
ibrahimalkamal@ibrahimalkamal:~$
```

Рис. 1: Выполнение примеров

Выполнение примеров

```
ibrahimkamel@ibrahimkamel:~$  
ibrahimkamel@ibrahimkamel:~$  
ibrahimkamel@ibrahimkamel:~$ mv april july  
ibrahimkamel@ibrahimkamel:~$ mv july monthly.00/  
ibrahimkamel@ibrahimkamel:~$ ls monthly.00/  
13 july  monthly  
ibrahimkamel@ibrahimkamel:~$ mv monthly.00/ monthly.01  
ibrahimkamel@ibrahimkamel:~$ mkdir reports  
ibrahimkamel@ibrahimkamel:~$ mv monthly.01/ reports/  
ibrahimkamel@ibrahimkamel:~$ mv reports/monthly.01/ reports/monthly  
ibrahimkamel@ibrahimkamel:~$
```

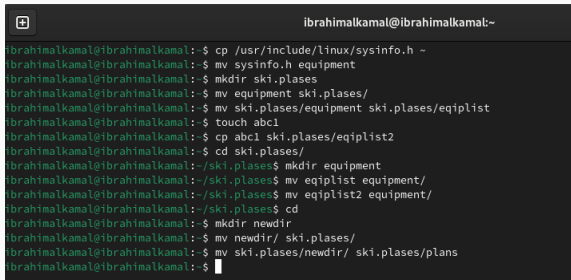
Рис. 2: Выполнение примеров

Выполнение примеров

```
ibrahimalkamal@ibrahimalkamal:~$  
ibrahimalkamal@ibrahimalkamal:~$ cd  
ibrahimalkamal@ibrahimalkamal:~$ touch may  
ibrahimalkamal@ibrahimalkamal:~$ ls -l may  
-rw-r--r--. 1 ibrahimalkamal ibrahimalkamal 0 июн 22 15:15 may  
ibrahimalkamal@ibrahimalkamal:~$ chmod +x may  
ibrahimalkamal@ibrahimalkamal:~$ ls -l may  
-rwxr-xr-x. 1 ibrahimalkamal ibrahimalkamal 0 июн 22 15:15 may  
ibrahimalkamal@ibrahimalkamal:~$ chmod -x may  
ibrahimalkamal@ibrahimalkamal:~$ ls -l may  
-rw-r--r--. 1 ibrahimalkamal ibrahimalkamal 0 июн 22 15:15 may  
ibrahimalkamal@ibrahimalkamal:~$ chmod g-r,o-r monthly/  
ibrahimalkamal@ibrahimalkamal:~$ chmod g+w abc1  
ibrahimalkamal@ibrahimalkamal:~$
```

Рис. 3: Выполнение примеров

Создание директорий и копирование файлов



```
ibrahimalkamal@ibrahimalkamal:~  
ibrahimalkamal@ibrahimalkamal:~$ cp /usr/include/linux/sysinfo.h ~  
ibrahimalkamal@ibrahimalkamal:~$ mv sysinfo.h equipment  
ibrahimalkamal@ibrahimalkamal:~$ mkdir ski.plases  
ibrahimalkamal@ibrahimalkamal:~$ mv equipment ski.plases/  
ibrahimalkamal@ibrahimalkamal:~$ mv ski.plases/equipment ski.plases/equiplist  
ibrahimalkamal@ibrahimalkamal:~$ touch abc1  
ibrahimalkamal@ibrahimalkamal:~$ cp abc1 ski.plases/equiplist2  
ibrahimalkamal@ibrahimalkamal:~$ cd ski.plases/  
ibrahimalkamal@ibrahimalkamal:~/ski.plases$ mkdir equipment  
ibrahimalkamal@ibrahimalkamal:~/ski.plases$ mv equiplist equipment/  
ibrahimalkamal@ibrahimalkamal:~/ski.plases$ mv equiplist2 equipment/  
ibrahimalkamal@ibrahimalkamal:~/ski.plases$ cd  
ibrahimalkamal@ibrahimalkamal:~$ mkdir newdir  
ibrahimalkamal@ibrahimalkamal:~$ mv newdir/ ski.plases/  
ibrahimalkamal@ibrahimalkamal:~$ mv ski.plases/newdir/ ski.plases/plans  
ibrahimalkamal@ibrahimalkamal:~$
```

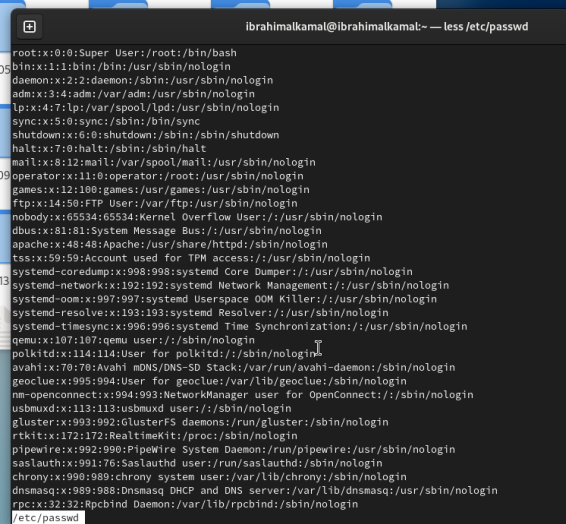
Рис. 4: Работа с каталогами

Работа с командой chmod

```
ibrahimalkamal@ibrahimalkamal:~$  
ibrahimalkamal@ibrahimalkamal:~$ mkdir australia  
ibrahimalkamal@ibrahimalkamal:~$ mkdir play  
ibrahimalkamal@ibrahimalkamal:~$ touch my_os feathers  
ibrahimalkamal@ibrahimalkamal:~$ chmod 744 australia/  
ibrahimalkamal@ibrahimalkamal:~$ chmod 711 play/  
ibrahimalkamal@ibrahimalkamal:~$ chmod 544 my_os  
ibrahimalkamal@ibrahimalkamal:~$ chmod 664 feathers  
ibrahimalkamal@ibrahimalkamal:~$ ls -l  
итого 0  
-rw-rw-r--. 1 ibrahimalkamal ibrahimalkamal 0 июн 22 15:17 abc1  
drwxr--r--. 1 ibrahimalkamal ibrahimalkamal 0 июн 22 15:22 australia  
-rw-rw-r--. 1 ibrahimalkamal ibrahimalkamal 0 июн 22 15:22 feathers  
drwxr-xr-x. 1 ibrahimalkamal ibrahimalkamal 74 июн 22 14:21 git-extended  
-rw-r--r--. 1 ibrahimalkamal ibrahimalkamal 0 июн 22 15:15 may  
drwx--x--x. 1 ibrahimalkamal ibrahimalkamal 24 июн 22 15:12 monthly  
-r-xr--r--. 1 ibrahimalkamal ibrahimalkamal 0 июн 22 15:22 my_os  
drwx--x--x. 1 ibrahimalkamal ibrahimalkamal 0 июн 22 15:22 play  
drwxr-xr-x. 1 ibrahimalkamal ibrahimalkamal 14 июн 22 15:15 reports  
drwxr-xr-x. 1 ibrahimalkamal ibrahimalkamal 28 июн 22 15:18 ski.places  
drwxr-xr-x. 1 ibrahimalkamal ibrahimalkamal 10 июн 22 13:50 work  
drwxr-xr-x. 1 ibrahimalkamal ibrahimalkamal 0 июн 22 13:38 Видео  
drwxr-xr-x. 1 ibrahimalkamal ibrahimalkamal 0 июн 22 13:38 Документы  
drwxr-xr-x. 1 ibrahimalkamal ibrahimalkamal 0 июн 22 13:38 Загрузки  
drwxr-xr-x. 1 ibrahimalkamal ibrahimalkamal 0 июн 22 13:38 Изображения  
drwxr-xr-x. 1 ibrahimalkamal ibrahimalkamal 0 июн 22 13:38 Музыка  
drwxr-xr-x. 1 ibrahimalkamal ibrahimalkamal 0 июн 22 13:38 Общедоступные  
drwxr-xr-x. 1 ibrahimalkamal ibrahimalkamal 0 июн 22 13:38 'Рабочий стол'  
drwxr-xr-x. 1 ibrahimalkamal ibrahimalkamal 0 июн 22 13:38 Шаблоны  
ibrahimalkamal@ibrahimalkamal:~$
```

Рис. 5: Настройка прав доступа

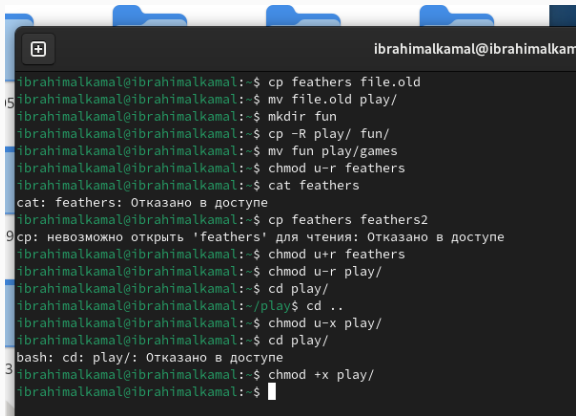
Файл /etc/passwd



```
ibrahimalkamal@ibrahimalkamal:~ — less /etc/passwd
root:x:0:0:Super User:/root:/bin/bash
bin:x:1:1:bin:/bin:/usr/sbin/nologin
daemon:x:2:2:daemon:/sbin:/usr/sbin/nologin
adm:x:3:4:adm:/var/adm:/usr/sbin/nologin
lp:x:4:7:lp:/var/spool/lpd:/usr/sbin/nologin
sync:x:5:0:sync:/sbin:/bin/sync
shutdown:x:6:0:shutdown:/sbin:/sbin/shutdown
halt:x:7:0:halt:/sbin:/sbin/halt
mail:x:8:12:mail:/var/spool/mail:/usr/sbin/nologin
operator:x:11:0:operator:/root:/usr/sbin/nologin
games:x:12:100:games:/usr/games:/usr/sbin/nologin
ftp:x:14:50:FTP User:/var/ftp:/usr/sbin/nologin
nobody:x:65534:65534:Kernel Overflow User:/:/usr/sbin/nologin
dbus:x:81:81:System Message Bus:/:/usr/sbin/nologin
apache:x:48:48:Apache:/usr/share/httpd:/sbin/nologin
tss:x:59:59:Account used for TPM access:/:/usr/sbin/nologin
systemd-coredump:x:998:998:systemd Core Dumper:/:/usr/sbin/nologin
systemd-network:x:192:192:systemd Network Management:/:/usr/sbin/nologin
systemd-oom:x:997:997:systemd Userspace OOM Killer:/:/usr/sbin/nologin
systemd-resolve:x:193:193:systemd Resolver:/:/usr/sbin/nologin
systemd-timesync:x:996:996:systemd Time Synchronization:/:/usr/sbin/nologin
qemu:x:107:107:qemu user:/:/sbin/nologin
polkitd:x:114:114:User for polkitd:/:/sbin/nologin
avahi:x:70:70:Avahi mDNS/DNS-SD Stack:/var/run/avahi-daemon:/sbin/nologin
geoclue:x:995:994:User for geoclue:/var/lib/geoclue:/sbin/nologin
nm-openconnect:x:994:993:NetworkManager user for OpenConnect:/:/sbin/nologin
usbmuxd:x:113:113:usbmuxd user:/:/sbin/nologin
gluster:x:993:992:GlusterFS daemons:/run/gluster:/sbin/nologin
rtkit:x:172:172:RealtimeKit:/proc:/sbin/nologin
pipewire:x:992:990:PipeWire System Daemon:/run/pipewire:/usr/sbin/nologin
sasauth:x:991:76:Sasauthd user:/run/sasauthd:/sbin/nologin
chrony:x:990:989:chrony system user:/var/lib/chrony:/sbin/nologin
dnsmasq:x:989:988:Dnsmasq DHCP and DNS server:/var/lib/dnsmasq:/usr/sbin/nologin
rpc:x:32:32:Rpcbind Daemon:/var/lib/rpcbind:/sbin/nologin
/etc/passwd
```

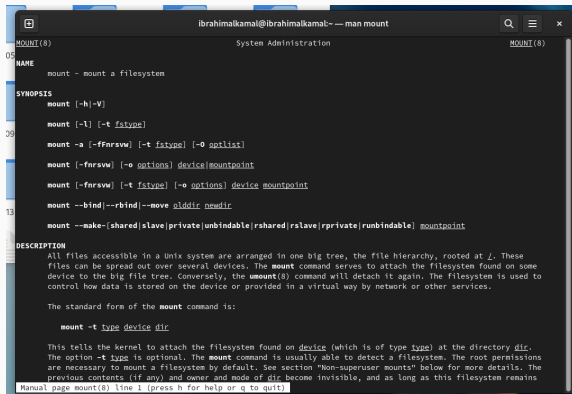
Рис. 6: Файл /etc/passwd

Работа с файлами и правами доступа

A terminal window with a dark background and light text. The window title is 'ibrahimalkamal@ibrahimalkamal'. The prompt is 'ibrahimalkamal@ibrahimalkamal:~\$'. The user enters several commands: 'cp feathers file.old', 'mv file.old play/', 'mkdir fun', 'cp -R play/ fun/', 'mv fun play/games', 'chmod u-r feathers', 'cat feathers', 'cp feathers feathers2', 'chmod u+r feathers', 'chmod u-r play/', 'cd play/', 'cd ..', 'chmod u-x play/', 'cd play/', and 'chmod +x play/'. The output shows a permission denied error for 'cat feathers' and 'cd play/'.

```
ibrahimalkamal@ibrahimalkamal:~$ cp feathers file.old
ibrahimalkamal@ibrahimalkamal:~$ mv file.old play/
ibrahimalkamal@ibrahimalkamal:~$ mkdir fun
ibrahimalkamal@ibrahimalkamal:~$ cp -R play/ fun/
ibrahimalkamal@ibrahimalkamal:~$ mv fun play/games
ibrahimalkamal@ibrahimalkamal:~$ chmod u-r feathers
ibrahimalkamal@ibrahimalkamal:~$ cat feathers
cat: feathers: Отказано в доступе
ibrahimalkamal@ibrahimalkamal:~$ cp feathers feathers2
ibrahimalkamal@ibrahimalkamal:~$ chmod u+r feathers
ibrahimalkamal@ibrahimalkamal:~$ chmod u-r play/
ibrahimalkamal@ibrahimalkamal:~$ cd play/
ibrahimalkamal@ibrahimalkamal:~/play$ cd ..
ibrahimalkamal@ibrahimalkamal:~$ chmod u-x play/
ibrahimalkamal@ibrahimalkamal:~$ cd play/
bash: cd: play/: Отказано в доступе
ibrahimalkamal@ibrahimalkamal:~$ chmod +x play/
ibrahimalkamal@ibrahimalkamal:~$
```

Рис. 7: Работа с файлами и правами доступа



```
ibrahimalkamal@ibrahimalkamal:~ -- man mount
NAME
    mount - mount a filesystem

SYNOPSIS
    mount [-h|-V]
    mount [-l] [-t fstype]
    mount -a [-ffnrsvw] [-t fstype] [-O optlist]
    mount [-fnrsvw] [-o options] device|mountpoint
    mount [-fnrsvw] [-t fstype] [-o options] device mountpoint
    mount --bind|--rbind|--move olddir newdir
    mount --make-[shared|slave|private|unbindable|rshared|rslave|rprivate|runbindable] mountpoint

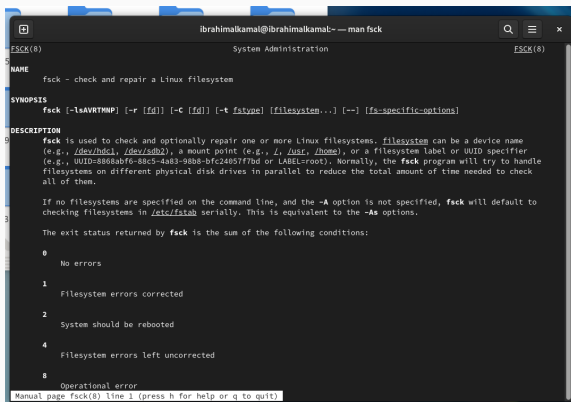
DESCRIPTION
    All files accessible in a Unix system are arranged in one big tree, the file hierarchy, rooted at /. These
    files can be spread out over several devices. The mount command serves to attach the filesystem found on some
    device to the big file tree. Conversely, the umount(8) command will detach it again. The filesystem is used to
    control how data is stored on the device or provided in a virtual way by network or other services.

    The standard form of the mount command is:

        mount -t type device dir

    This tells the kernel to attach the filesystem found on device (which is of type type) at the directory dir.
    The option -t type is optional. The mount command is usually able to detect a filesystem. The root permissions
    are necessary to mount a filesystem by default. See section "Non-superuser mounts" below for more details. The
    previous contents (if any) and owner and mode of dir become 'invisible', and as long as this filesystem remains
    Manual page mount(8) line 1 (press h for help or q to quit)
```

Рис. 8: Команда mount



```
ibrahimkamat@ibrahimkamat:~$ man fsck
fsck(8)                                System Administration          fsck(8)

NAME
    fsck - check and repair a Linux filesystem

SYNOPSIS
    fsck [-lsAVRTMNP] [-r [fd]] [-t [fd]] [-t fstype] [filesystem...] [--] [fs-specific-options]

DESCRIPTION
    fsck is used to check and optionally repair one or more Linux filesystems. filesystem can be a device name
    (e.g., /dev/hdc1, /dev/sdb2), a mount point (e.g., /, /usr, /home), or a filesystem label or UUID specifier
    (e.g., UUID=8868abf6-88c5-4a83-98b8-bfc2405777bd or LABEL=root). Normally, the fsck program will try to handle
    filesystems on different physical disk drives in parallel to reduce the total amount of time needed to check
    all of them.

    If no filesystems are specified on the command line, and the -A option is not specified, fsck will default to
    checking filesystems in /etc/fstab serially. This is equivalent to the -As options.

    The exit status returned by fsck is the sum of the following conditions:

    0      No errors

    1      Filesystem errors corrected

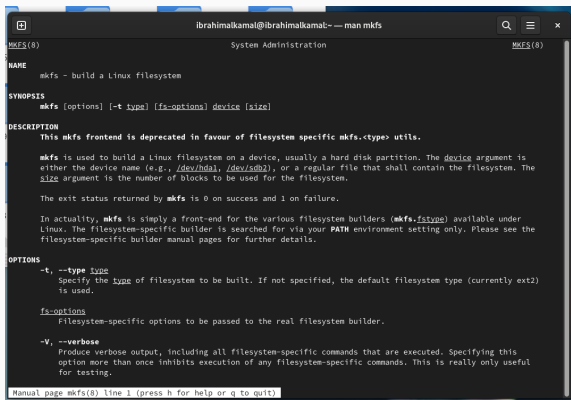
    2      System should be rebooted

    4      Filesystem errors left uncorrected

    8      Operational error

Manual page fsck(8) line 1 (press h for help or q to quit)
```

Рис. 9: Команда fsck



```
ibrahimalkamal@ibrahimalkamal:~$ man mkfs
mkfs(8)                                System Administration              mkfs(8)

NAME
  mkfs - build a Linux filesystem

SYNOPSIS
  mkfs [options] [-t type] [fs-options] device [size]

DESCRIPTION
  This mkfs frontend is deprecated in favour of filesystem specific mkfs.<type> utils.

  mkfs is used to build a Linux filesystem on a device, usually a hard disk partition. The device argument is
  either the device name (e.g., /dev/hda1, /dev/sdb2), or a regular file that shall contain the filesystem. The
  size argument is the number of blocks to be used for the filesystem.

  The exit status returned by mkfs is 0 on success and 1 on failure.

  In actuality, mkfs is simply a front-end for the various filesystem builders (mkfs.<type>) available under
  Linux. The filesystem-specific builder is searched for via your PATH environment setting only. Please see the
  filesystem-specific builder manual pages for further details.

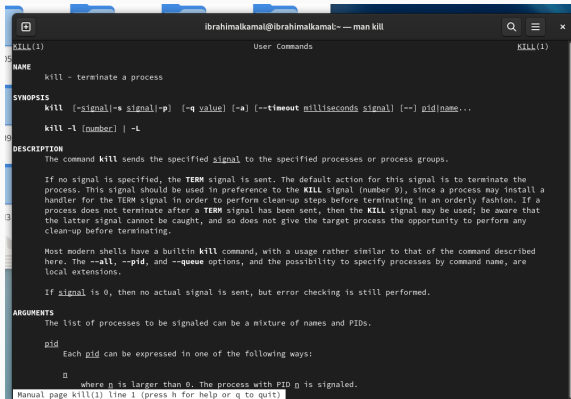
OPTIONS
  -t, --type type
    Specify the type of filesystem to be built. If not specified, the default filesystem type (currently ext2)
    is used.

  fs-options
    Filesystem-specific options to be passed to the real filesystem builder.

  -V, --verbose
    Produce verbose output, including all filesystem-specific commands that are executed. Specifying this
    option more than once inhibits execution of any filesystem-specific commands. This is really only useful
    for testing.

Manual page mkfs(8) line 1 (press h for help or q to quit)
```

Рис. 10: Команда mkfs



```
ibrahimalkamal@ibrahimalkamal:~$ man kill
kill(1)                                User Commands                                kill(1)
NAME
    kill - terminate a process

SYNOPSIS
    kill [-signal[-s signal][-p] [-q value] [-a] [--timeout milliseconds signal] [--] pid/name...
    kill -l [number] | -L

DESCRIPTION
    The command kill sends the specified signal to the specified processes or process groups.

    If no signal is specified, the TERM signal is sent. The default action for this signal is to terminate the process. This signal should be used in preference to the KILL signal (number 9), since a process may install a handler for the TERM signal in order to perform clean-up steps before terminating in an orderly fashion. If a process does not terminate after a TERM signal has been sent, then the KILL signal may be used; be aware that the latter signal cannot be caught, and so does not give the target process the opportunity to perform any clean-up before terminating.

    Most modern shells have a builtin kill command, with a usage rather similar to that of the command described here. The --all, --pid, and --queue options, and the possibility to specify processes by command name, are local extensions.

    If signal is 0, then no actual signal is sent, but error checking is still performed.

ARGUMENTS
    The list of processes to be signaled can be a mixture of names and PIDs.

    pid
        Each pid can be expressed in one of the following ways:

        n
            where n is larger than 0. The process with PID n is signaled.

Manual page kill(1) line 1 (press h for help or q to quit)
```

Рис. 11: Команда kill

Выводы по проделанной работе

В ходе данной работы мы ознакомились с файловой системой Linux, её структурой, именами и содержанием каталогов. Научились совершать базовые операции с файлами, управлять правами их доступа для пользователя и групп. Ознакомились с Анализом файловой системы. А также получили базовые навыки по проверке использования диска и обслуживанию файловой системы.