

# Операционные системы

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

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16 марта 2025

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## Цели и задачи работы

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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.

- 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

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```
emcikunova@emcikunova:~/work/study/2024-2025/Операционные системы/os-intro$ cd
emcikunova@emcikunova:~$ touch abc1
emcikunova@emcikunova:~$ cp abc1 april
emcikunova@emcikunova:~$ cp abc1 may
emcikunova@emcikunova:~$ mkdir monthly
emcikunova@emcikunova:~$ cp april may monthly/
emcikunova@emcikunova:~$ cp monthly/may monthly/june
emcikunova@emcikunova:~$ ls monthly/
april  june  may
emcikunova@emcikunova:~$ mkdir monthly.00
emcikunova@emcikunova:~$ cp -r monthly monthly.00/
emcikunova@emcikunova:~$ cp -r monthly.00/ /tmp/
emcikunova@emcikunova:~$
```

Рис. 1: Выполнение примеров

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

Рис. 2: Выполнение примеров

## Выполнение примеров

```
emcikunova@emcikunova:~$  
emcikunova@emcikunova:~$ cd  
emcikunova@emcikunova:~$ touch may  
emcikunova@emcikunova:~$ ls -l may  
-rw-r--r--. 1 emcikunova emcikunova 0 map 16 12:03 may  
emcikunova@emcikunova:~$ chmod u-x may  
emcikunova@emcikunova:~$ ls -l may  
-rw-r--r--. 1 emcikunova emcikunova 0 map 16 12:03 may  
emcikunova@emcikunova:~$ chmod u+x may  
emcikunova@emcikunova:~$ ls -l may  
-rwxr--r--. 1 emcikunova emcikunova 0 map 16 12:03 may  
emcikunova@emcikunova:~$ chmod g-r monthly/  
emcikunova@emcikunova:~$ chmod g-r,o-r monthly/  
emcikunova@emcikunova:~$ chmod g+w abc1  
emcikunova@emcikunova:~$
```

Рис. 3: Выполнение примеров



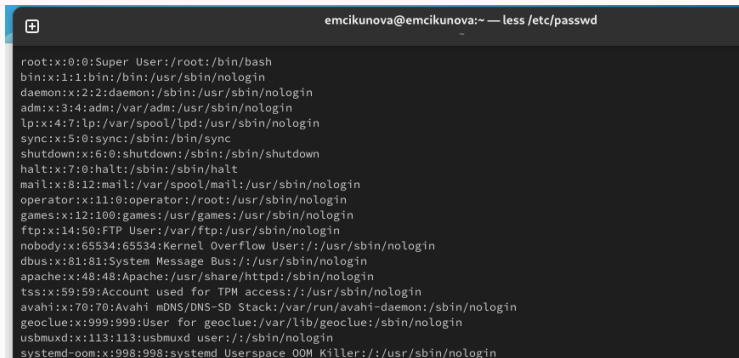
## Создание директорий и копирование файлов

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

Рис. 4: Работа с каталогами

## Работа с командой chmod

```
emcikunova@emcikunova:~$  
emcikunova@emcikunova:~$ mkdir australia play  
emcikunova@emcikunova:~$ touch my_os feathers  
emcikunova@emcikunova:~$ chmod 744 australia/  
emcikunova@emcikunova:~$ chmod 711 play/  
emcikunova@emcikunova:~$ chmod 544 my_os  
emcikunova@emcikunova:~$ chmod 664 feathers  
emcikunova@emcikunova:~$ ls -l  
итого 0  
-rw-rw-r--. 1 emcikunova emcikunova 0 map 16 11:59 abc1  
drwxr--r--. 1 emcikunova emcikunova 0 map 16 12:06 australia  
-rw-rw-r--. 1 emcikunova emcikunova 0 map 16 12:06 feathers  
drwxr-xr-x. 1 emcikunova emcikunova 74 map 1 10:51 git-extended  
-rwxr--r--. 1 emcikunova emcikunova 0 map 16 12:03 may  
drwx--x--x. 1 emcikunova emcikunova 24 map 16 11:59 monthly  
-r-xr--r--. 1 emcikunova emcikunova 0 map 16 12:06 my_os  
drwx--x--x. 1 emcikunova emcikunova 0 map 16 12:06 play  
drwxr-xr-x. 1 emcikunova emcikunova 14 map 16 12:02 reports  
drwxr-xr-x. 1 emcikunova emcikunova 46 map 1 10:56 site  
drwxr-xr-x. 1 emcikunova emcikunova 28 map 16 12:05 ski.plases  
drwx-----. 1 emcikunova emcikunova 8 map 1 10:57 snap  
drwxr-xr-x. 1 emcikunova emcikunova 10 map 1 10:27 work  
drwxr-xr-x. 1 emcikunova emcikunova 0 map 1 10:09 Видео  
drwxr-xr-x. 1 emcikunova emcikunova 0 map 1 10:09 Документы  
drwxr-xr-x. 1 emcikunova emcikunova 0 map 1 10:09 Загрузки  
drwxr-xr-x. 1 emcikunova emcikunova 0 map 1 10:09 Изображения  
drwxr-xr-x. 1 emcikunova emcikunova 0 map 1 10:09 Музыка  
drwxr-xr-x. 1 emcikunova emcikunova 0 map 1 10:09 Общедоступные  
drwxr-xr-x. 1 emcikunova emcikunova 0 map 1 10:09 'Рабочий стол'  
drwxr-xr-x. 1 emcikunova emcikunova 0 map 1 10:09 Шаблоны  
emcikunova@emcikunova:~$
```



The image shows a terminal window with a dark background. The title bar at the top reads "emcikunova@emcikunova:~ — less /etc/passwd". The terminal content displays the lines of the /etc/passwd file, each representing a system user. The format for each line is "username:x:uid:gid:full\_name:home\_directory:shell".

```
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
avahi:x:70:70:Avahi mDNS/DNS-SD Stack:/var/run/avahi-daemon:/sbin/nologin
geoclue:x:999:999:User for geoclue:/var/lib/geoclue:/sbin/nologin
usbmuxd:x:113:113:usbmuxd user:/:/sbin/nologin
systemd-oom:x:998:998:systemd Userspace OOM Killer:/:/usr/sbin/nologin
```

Рис. 6: Файл /etc/passwd

## Работа с файлами и правами доступа

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

Рис. 7: Работа с файлами и правами доступа

```
emcikunova@emcikunova:~ — man mount
MOUNT(8)                                     System Administration      MOUNT(8)

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 mounted, the pathname dir refers to the root of the filesystem on device.

    If only the directory or the device is given, for example:

        mount /dir

    then mount looks for a mountpoint (and if not found then for a device) in the /etc/fstab file. It's possible to use the --target or --source options to avoid ambiguous interpretation of the given argument. For example:

        mount --target /mountpoint

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

```
emcikunova@emcikunova:~ — man fsck
FSCK(8)                                     System Administration                                     FSCK(8)

NAME
    fsck - check and repair a Linux filesystem

SYNOPSIS
    fsck [-lsAVRTMNP] [-r [fd]] [-C [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-bfc24057ff7bd 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

    16
        Usage or syntax error

    32
        Checking canceled by user request

    128
        Shared-library error

    The exit status returned when multiple filesystems are checked is the bit-wise OR of the exit statuses for each filesystem

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

```
emcikunova@emcikunova:~ — 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.fs<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.

    -h, --help
        Display help text and exit.

    -V, --version
        Print version and exit. (Option -V will display version information only when it is the only parameter, otherwise it will work as --verbose.)

BUGS
    All generic options must precede and not be combined with filesystem-specific options. Some filesystem-specific programs do not automatically detect the device size and require the size parameter to be specified.

AUTHORS
    The mkfs command was written by Theodore T. Li.
```

```
emcikunova@emcikunova:~ — 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.

        0
            All processes in the current process group are signaled.

        -1
            All processes with a PID larger than 1 are signaled.

        -n
            where n is larger than 1. All processes in process group n are signaled. When an argument of the form '-n' is given, and it is meant to denote a process group, either a signal must be specified first, or the argument must be preceded by a '--' option, otherwise it will be taken as the signal to send.
```



## Выводы по проделанной работе

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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.