

Операционные системы

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

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Содержание i

1. Цели и задачи работы
2. Процесс выполнения лабораторной работы
3. Выводы по проделанной работе

1. Цели и задачи работы

1.1 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.

1.2 Задачи лабораторной работы

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

2. Процесс выполнения лабораторной работы

2.1 Выполнение примеров

```
frhalolova@frhalilova:~$  
frhalolova@frhalilova:~$ cd  
frhalolova@frhalilova:~$ touch abc1  
frhalolova@frhalilova:~$ cp abc1 april  
frhalolova@frhalilova:~$ cp abc1 may  
frhalolova@frhalilova:~$ mkdir monthly  
frhalolova@frhalilova:~$ cp april may monthly/  
frhalolova@frhalilova:~$ cp monthly/may monthly/june  
frhalolova@frhalilova:~$ ls monthly/  
april june may  
frhalolova@frhalilova:~$ mkdir monthly.00  
frhalolova@frhalilova:~$ cp -r monthly monthly.00  
frhalolova@frhalilova:~$ cp -r monthly.00/ /tmp  
frhalolova@frhalilova:~$ █
```

Рисунок 1: Выполнение примеров

2.2 Выполнение примеров

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

Рисунок 2: Выполнение примеров

2.3 Выполнение примеров

```
frhalolova@frhalilova:~$ cd  
frhalolova@frhalilova:~$ touch may  
frhalolova@frhalilova:~$ ls -l may  
-rw-r--r--. 1 frhalolova frhalolova 0 Nov 13 19:03 may  
frhalolova@frhalilova:~$ chmod u+x may  
frhalolova@frhalilova:~$ ls -l may  
-rwxr--r--. 1 frhalolova frhalolova 0 Nov 13 19:03 may  
frhalolova@frhalilova:~$ chmod u-x may  
frhalolova@frhalilova:~$ ls -l may  
-rw-r--r--. 1 frhalolova frhalolova 0 Nov 13 19:03 may  
frhalolova@frhalilova:~$ cd  
frhalolova@frhalilova:~$ mkdir monthly  
mkdir: cannot create directory ‘monthly’: File exists  
frhalolova@frhalilova:~$ chmod g-r,o-r monthly  
frhalolova@frhalilova:~$ cd  
frhalolova@frhalilova:~$ touch abc1  
frhalolova@frhalilova:~$ chmod g+w abc1  
frhalolova@frhalilova:~$
```

Рисунок 3: Выполнение примеров

2.4 Создание директорий и копирование файлов

```
frhalolova@frhalilova:~$ cp /usr/include/
gdb/      gnumake.h  kf6/      KF6/      python3.13/ qt5/      qt6/
frhalolova@frhalilova:~$ cp /usr/include/gnumake.h ~
frhalolova@frhalilova:~$ mv gnumake.h equipment
frhalolova@frhalilova:~$ mkdir ski.plasws
frhalolova@frhalilova:~$ mkdir ski.plases
frhalolova@frhalilova:~$ rmdir ski.plasws
frhalolova@frhalilova:~$ mv equipment ski.plases/
frhalolova@frhalilova:~$ mv ski.plases/equipment ski.plases/equiplist
frhalolova@frhalilova:~$ touch abc1
frhalolova@frhalilova:~$ cp abc1 ski.plases/equiplist2
frhalolova@frhalilova:~$ cd ski.plases/
frhalolova@frhalilova:~/ski.plases$ mkdir equipment
frhalolova@frhalilova:~/ski.plases$ mv equiplist equipment/
frhalolova@frhalilova:~/ski.plases$ mv equiplist2 equipment/
frhalolova@frhalilova:~/ski.plases$ cd
frhalolova@frhalilova:~$ mkdir newdir
frhalolova@frhalilova:~$ mv newdir/ ski.plases/
frhalolova@frhalilova:~$ mv ski.plases/newdir/ ski.plases/plans
frhalolova@frhalilova:~$ █
```

Рисунок 4: Работа с каталогами

2.5 Работа с командой chmod

```
frhalolova@frhalilova:~$  
frhalolova@frhalilova:~$ mkdir australia play  
frhalolova@frhalilova:~$ touch my_os feathers  
frhalolova@frhalilova:~$ chmod 744 australia/  
frhalolova@frhalilova:~$ chmod 711 play/  
frhalolova@frhalilova:~$ chmod 544 my_os  
frhalolova@frhalilova:~$ chmod 664 feathers  
frhalolova@frhalilova:~$ ls -l  
total 0  
-rw-rw-r--. 1 frhalolova frhalolova 0 Nov 13 19:07 abc1  
drwxr--r--. 1 frhalolova frhalolova 0 Nov 13 19:08 australia  
drwxr-xr-x. 1 frhalolova frhalolova 0 Nov 12 16:28 Desktop  
drwxr-xr-x. 1 frhalolova frhalolova 0 Nov 12 16:28 Documents  
drwxr-xr-x. 1 frhalolova frhalolova 0 Nov 12 16:28 Downloads  
-rw-rw-r--. 1 frhalolova frhalolova 0 Nov 13 19:08 feathers  
drwxr-xr-x. 1 frhalolova frhalolova 128 Nov 12 18:37 git-extended  
-rw-r--r--. 1 frhalolova frhalolova 0 Nov 13 19:03 may  
drwx--x--x. 1 frhalolova frhalolova 24 Nov 13 18:56 monthly  
drwxr-xr-x. 1 frhalolova frhalolova 0 Nov 12 16:28 Music  
-r-xr--r--. 1 frhalolova frhalolova 0 Nov 13 19:08 my_os  
drwxr-xr-x. 1 frhalolova frhalolova 0 Nov 12 16:28 Pictures  
drwx--x--x. 1 frhalolova frhalolova 0 Nov 13 19:08 play  
drwxr-xr-x. 1 frhalolova frhalolova 0 Nov 12 16:28 Public  
drwxr-xr-x. 1 frhalolova frhalolova 14 Nov 13 19:02 reports  
drwxr-xr-x. 1 frhalolova frhalolova 28 Nov 13 19:08 ski.plases  
drwxr-xr-x. 1 frhalolova frhalolova 0 Nov 12 16:28 Templates  
drwxr-xr-x. 1 frhalolova frhalolova 0 Nov 12 16:28 Videos  
drwxr-xr-x. 1 frhalolova frhalolova 10 Nov 12 16:47 work
```

2.6 Файл /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
tss:x:59:59:Account used for TPM access:/::/usr/bin/nologin
dbus:x:81:81:System Message Bus:/::/usr/bin/nologin
systemd-oom:x:999:999:systemd Userspace OOM Killer:/::/usr/bin/nologin
polkitd:x:114:114:User for polkitd:/::/sbin/nologin
systemd-coredump:x:998:998:systemd Core Dumper:/::/usr/bin/nologin
systemd-timesync:x:997:997:systemd Time Synchronization:/::/usr/bin/nologin
chrony:x:996:996:chrony system user:/var/lib/chrony:/sbin/nologin
systemd-network:x:192:192:systemd Network Management:/::/usr/bin/nologin
systemd-resolve:x:193:193:systemd Resolver:/::/usr/bin/nologin
avahi:x:70:70:Avahi mDNS/DNS-SD Stack:/var/run/avahi-daemon:/sbin/nologin
geoclue:x:994:994:User for geoclue:/var/lib/geoclue:/sbin/nologin
unbound:x:992:992:Unbound DNS resolver:/var/lib/unbound:/sbin/nologin
clevis:x:991:991:Clevis Decryption Framework unprivileged user:/var/cache/clevis:/usr/bin/nologin
usbmuxd:x:113:113:usbmuxd user:/::/usr/bin/nologin
```

Рисунок 6: Файл /etc/passwd

2.7 Работа с файлами и правами доступа

```
frhalilova@frhalilova:~$ cp feathers file.old
frhalilova@frhalilova:~$ mv file.old play
frhalilova@frhalilova:~$ mkdir fun
frhalilova@frhalilova:~$ cp -R play/ fun
frhalilova@frhalilova:~$ mv fun play/games
frhalilova@frhalilova:~$ chmod u-r feathers
frhalilova@frhalilova:~$ cat feathers
cat: feathers: Permission denied
frhalilova@frhalilova:~$ cp feathers feathers2
cp: cannot open 'feathers' for reading: Permission denied
frhalilova@frhalilova:~$ chmod u+r feathers
frhalilova@frhalilova:~$ chmod u-x play/
frhalilova@frhalilova:~$ cd play/
bash: cd: play/: Permission denied
frhalilova@frhalilova:~$ chmod +x play/
frhalilova@frhalilova:~$ █
```

Рисунок 7: Работа с файлами и правами доступа

2.8 Справка по командам

```
frhalilova@frhalilova:~ — 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
```

2.9 Справка по командам

```
frhalolova@frhalilova:~ — 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-bfc24057f7bd 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
```

2.10 Справка по командам

```
frhalolova@frhalolova:~ — 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.fstype)
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.

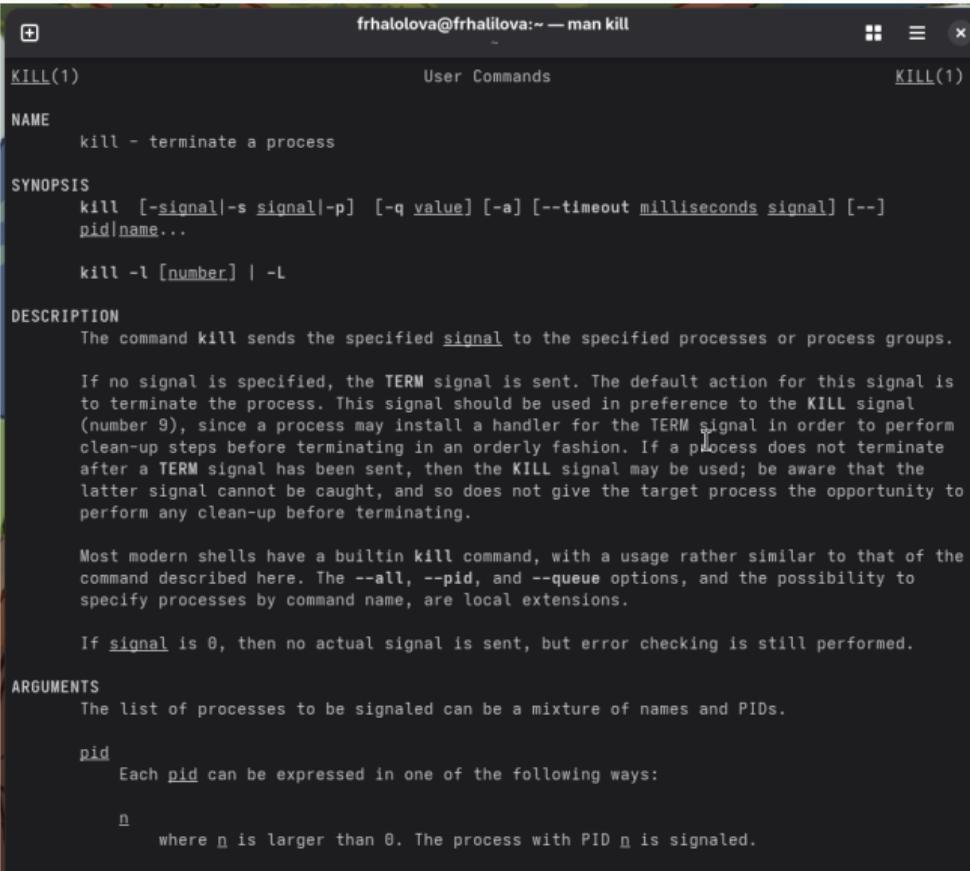
OPTIONS
-t, --type type
Specify the type of filesystem to be built. If not specified, the default filesystem
type (currently ext2) is used.

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
Print help information and exit.
```

2.11 Справка по командам



The screenshot shows a terminal window with the title "frhalilova@frhalilova:~ — man kill". The terminal displays the man page for the "kill" command. The page includes sections for NAME, SYNOPSIS, DESCRIPTION, ARGUMENTS, and EXAMPLES. It describes how to send signals to processes and provides details about signal types and process selection.

```
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.
```

3. Выводы по проделанной работе

3.1 Вывод

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.