

Операционные системы

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

Микаил Кандакжи

21 марта 2025

Российский университет дружбы народов, Москва, Россия

Цели и задачи 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 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

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

Рис. 1: Выполнение примеров

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

Рис. 2: Выполнение примеров

```
mhkindzhaki@mhkindzhaki:~$ touch may
mhkindzhaki@mhkindzhaki:~$ ls -l may
-rw-r--r--. 1 mhkindzhaki mhkindzhaki 0 map 21 14:04 may
mhkindzhaki@mhkindzhaki:~$ chmod u+x may
mhkindzhaki@mhkindzhaki:~$ ls -l may
-rwxr--r--. 1 mhkindzhaki mhkindzhaki 0 map 21 14:04 may
mhkindzhaki@mhkindzhaki:~$ chmod u-x may
mhkindzhaki@mhkindzhaki:~$ ls -l may
-rw-r--r--. 1 mhkindzhaki mhkindzhaki 0 map 21 14:04 may
mhkindzhaki@mhkindzhaki:~$ chmod g-r,o-r monthly
mhkindzhaki@mhkindzhaki:~$ chmod g+w abc1
mhkindzhaki@mhkindzhaki:~$
```

Рис. 3: Выполнение примеров

Создание директорий и копирование файлов

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

Рис. 4: Работа с каталогами

Работа с командой chmod

```
mhkindzhaki@mhkindzhaki:~$ mkdir australia play
mhkindzhaki@mhkindzhaki:~$ touch my_os feathers
mhkindzhaki@mhkindzhaki:~$ chmod 744 australia/
mhkindzhaki@mhkindzhaki:~$ chmod 711 play/
mhkindzhaki@mhkindzhaki:~$ chmod 544 my_os
mhkindzhaki@mhkindzhaki:~$ chmod 664 feathers
mhkindzhaki@mhkindzhaki:~$ ls -l
итого 0
-rw-rw-r--. 1 mhkindzhaki mhkindzhaki 0 map 21 14:05 abc1
drwxr--r--. 1 mhkindzhaki mhkindzhaki 0 map 21 14:05 australia
-rw-rw-r--. 1 mhkindzhaki mhkindzhaki 0 map 21 14:05 feathers
-rw-r--r--. 1 mhkindzhaki mhkindzhaki 0 map 21 14:04 may
drwx--x--x. 1 mhkindzhaki mhkindzhaki 24 map 21 14:04 monthly
-r-xr--r--. 1 mhkindzhaki mhkindzhaki 0 map 21 14:05 my_os
drwx--x--x. 1 mhkindzhaki mhkindzhaki 0 map 21 14:05 play
drwxr-xr-x. 1 mhkindzhaki mhkindzhaki 14 map 21 14:04 reports
drwxr-xr-x. 1 mhkindzhaki mhkindzhaki 58 map 21 13:46 site
drwxr-xr-x. 1 mhkindzhaki mhkindzhaki 28 map 21 14:05 ski.places
drwx-----. 1 mhkindzhaki mhkindzhaki 8 map 21 13:46 snap
drwxr-xr-x. 1 mhkindzhaki mhkindzhaki 10 map 21 13:45 work
drwxr-xr-x. 1 mhkindzhaki mhkindzhaki 0 map 21 13:36 Видео
drwxr-xr-x. 1 mhkindzhaki mhkindzhaki 0 map 21 13:36 Документы
drwxr-xr-x. 1 mhkindzhaki mhkindzhaki 0 map 21 13:54 Загрузки
drwxr-xr-x. 1 mhkindzhaki mhkindzhaki 0 map 21 13:36 Изображения
drwxr-xr-x. 1 mhkindzhaki mhkindzhaki 0 map 21 13:36 Музыка
drwxr-xr-x. 1 mhkindzhaki mhkindzhaki 0 map 21 13:36 Общедоступные
drwxr-xr-x. 1 mhkindzhaki mhkindzhaki 0 map 21 13:36 'Рабочий стол'
drwxr-xr-x. 1 mhkindzhaki mhkindzhaki 0 map 21 13:36 Шаблоны
mhkindzhaki@mhkindzhaki:~$
```

```
mhkindzhaki@mhkindzhaki:~ — 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
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
qemu:x:107:107:qemu user:/:/sbin/nologin
polkitd:x:114:114>User for polkitd:/:/sbin/nologin
rtkit:x:172:172:RealtimeKit:/:/sbin/nologin
chrony:x:997:994:chrony system user:/var/lib/chrony:/sbin/nologin
dnsmasq:x:996:993:Dnsmasq DHCP and DNS server:/var/lib/dnsmasq:/usr/sbin/nologin
gluster:x:995:992:GlusterFS daemons:/run/gluster:/sbin/nologin
rpc:x:32:32:Rpcbind Daemon:/var/lib/rpcbind:/sbin/nologin
pipewire:x:994:991:PipeWire System Daemon:/run/pipewire:/usr/sbin/nologin
unbound:x:993:990:Unbound DNS resolver:/var/lib/unbound:/sbin/nologin
nm-openconnect:x:992:989:NetworkManager user for OpenConnect:/:/sbin/nologin
rpcuser:x:29:29:RPC Service User:/var/lib/nfs:/sbin/nologin
wsdd:x:991:988:Web Services Dynamic Discovery host daemon:/:/sbin/nologin
sssd:x:990:986>User for sssd:/run/sss:/sbin/nologin
/etc/passwd
```

Работа с файлами и правами доступа

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

Рис. 7: Работа с файлами и правами доступа

```
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:

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

```
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

    16
        Usage or syntax error

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

```

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
        Display help text and exit.

    -V, --version
    Manual page mkfs(8) line 1 (press h for help or q to quit)

```

Рис. 10: Команда mkfs

```
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

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.