

Операционные системы

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

Аннагулыев Арслан

14 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

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

Рис. 1: Выполнение примеров

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

Рис. 2: Выполнение примеров

```
hamzaismail@hamzaismail:~$ touch may
hamzaismail@hamzaismail:~$ ls -l may
-rw-r--r--. 1 hamzaismail hamzaismail 0 map 14 12:20 may
hamzaismail@hamzaismail:~$ chmod u+x may
hamzaismail@hamzaismail:~$ ls -l may
-rwxr--r--. 1 hamzaismail hamzaismail 0 map 14 12:20 may
hamzaismail@hamzaismail:~$ chmod u-x may
hamzaismail@hamzaismail:~$ ls -l may
-rw-r--r--. 1 hamzaismail hamzaismail 0 map 14 12:20 may
hamzaismail@hamzaismail:~$ chmod g-r,o-r monthly
hamzaismail@hamzaismail:~$ chmod g+w abc1
hamzaismail@hamzaismail:~$
```

Рис. 3: Выполнение примеров

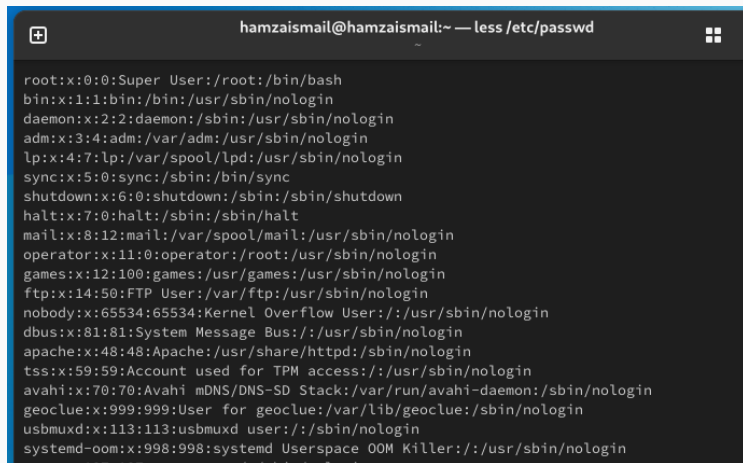
Создание директорий и копирование файлов

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

Рис. 4: Работа с каталогами

Работа с командой chmod

```
hamzaismail@hamzaismail:~$ mkdir australia play
hamzaismail@hamzaismail:~$ touch my_os feathers
hamzaismail@hamzaismail:~$ chmod 744 australia/
hamzaismail@hamzaismail:~$ chmod 711 play/
hamzaismail@hamzaismail:~$ chmod 544 my_os
hamzaismail@hamzaismail:~$ chmod 664 feathers
hamzaismail@hamzaismail:~$ ls -l
итого 0
-rw-rw-r--. 1 hamzaismail hamzaismail  0 мар 14 12:21 abc1
drwxr--r--. 1 hamzaismail hamzaismail  0 мар 14 12:21 australia
-rw-rw-r--. 1 hamzaismail hamzaismail  0 мар 14 12:21 feathers
drwxr-xr-x. 1 hamzaismail hamzaismail 74 фев 25 17:48 git-extended
-rw-r--r--. 1 hamzaismail hamzaismail  0 мар 14 12:20 may
drwx--x--x. 1 hamzaismail hamzaismail 24 мар 14 12:19 monthly
-r-xr--r--. 1 hamzaismail hamzaismail  0 мар 14 12:21 my_os
drwx--x--x. 1 hamzaismail hamzaismail  0 мар 14 12:21 play
drwxr-xr-x. 1 hamzaismail hamzaismail 14 мар 14 12:20 reports
drwxr-xr-x. 1 hamzaismail hamzaismail 60 фев 25 17:54 site
drwxr-xr-x. 1 hamzaismail hamzaismail 28 мар 14 12:21 ski.plases
drwx-----. 1 hamzaismail hamzaismail  8 фев 25 17:55 snap
drwxr-xr-x. 1 hamzaismail hamzaismail 10 фев 25 17:38 work
drwxr-xr-x. 1 hamzaismail hamzaismail  0 фев 25 17:04 Видео
drwxr-xr-x. 1 hamzaismail hamzaismail  0 фев 25 17:04 Документы
drwxr-xr-x. 1 hamzaismail hamzaismail  0 фев 25 17:04 Загрузки
drwxr-xr-x. 1 hamzaismail hamzaismail  0 фев 25 17:04 Изображения
drwxr-xr-x. 1 hamzaismail hamzaismail  0 фев 25 17:04 Музыка
drwxr-xr-x. 1 hamzaismail hamzaismail  0 фев 25 17:04 Общедоступные
drwxr-xr-x. 1 hamzaismail hamzaismail  0 фев 25 17:04 'Рабочий стол'
drwxr-xr-x. 1 hamzaismail hamzaismail  0 фев 25 17:04 Шаблоны
hamzaismail@hamzaismail:~$
```

A terminal window titled "hamzaismail@hamzaismail:~ — less /etc/passwd" displays the contents of the /etc/passwd file. The window has a dark blue header bar with a plus icon on the left and a window control icon on the right. The text is white on a dark background. The file content lists system and user accounts with their IDs, names, shells, and home directories.

```
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
systemd-107:107:systemd-107:/sbin/nologin
```

Рис. 6: Файл /etc/passwd

Работа с файлами и правами доступа

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

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:

        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
    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

    32
        Checking canceled by user request

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

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

```
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.

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

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.