

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

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Цели и задачи работы

Цель лабораторной работы

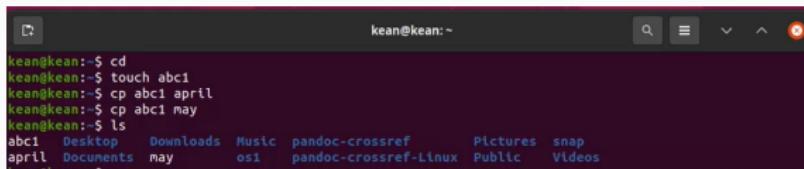
Ознакомление с файловой системой Linux, её структурой, именами и содержанием каталогов. Приобретение практических навыков по применению команд для работы с файлами и каталогами, по управлению процессами (и работами), по проверке использования диска и обслуживанию файловой системы.

Задачи лабораторной работы

1. Выполните все примеры, приведённые в первой части описания лабораторной работы.
2. Выполните следующие действия, зафиксировав в отчёте по лабораторной работе используемые при этом команды и результаты их выполнения:
3. Определите опции команды chmod, необходимые для того, чтобы присвоить перечисленным ниже файлам выделенные права доступа, считая, что в начале таких прав нет:
4. Проделайте приведённые ниже упражнения, записывая в отчёт по лабораторной работе используемые при этом команды:
5. Прочтайте man по командам mount, fsck, mkfs, kill и кратко их охарактеризуйте, приведя примеры.

Процесс выполнения лабораторной работы

Копирование файлов и каталогов



```
kean@kean:~$ cd
kean@kean:~$ touch abc1
kean@kean:~$ cp abc1 april
kean@kean:~$ cp abc1 may
kean@kean:~$ ls
abc1  Desktop  Downloads  Music  pandoc-crossref  Pictures  snap
april  Documents  May      osi    pandoc-crossref-Linux  Public   Videos
```

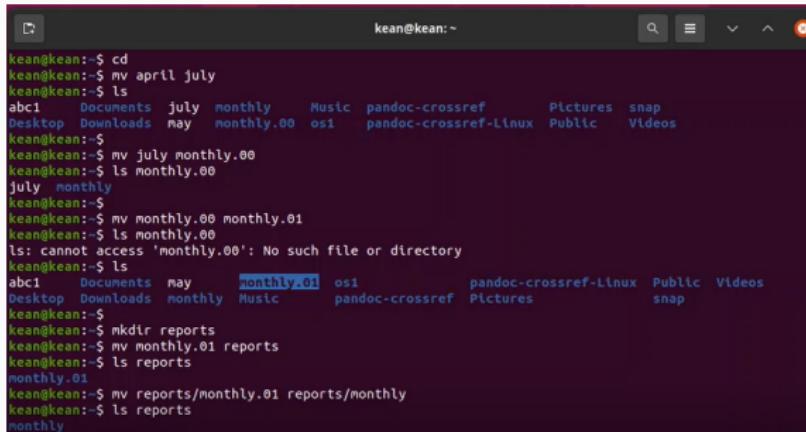
Рис. 1: Копирование файлов и каталогов

Копирование файлов и каталогов

```
kean@kean:~$ mkdir monthly
kean@kean:~$ cp april may monthly
kean@kean:~$ ls -/monthly
april may
kean@kean:~$ cp monthly/may monthly/june
kean@kean:~$ ls monthly
april june may
kean@kean:~$ 
kean@kean:~$ mkdir monthly.00
kean@kean:~$ cp -r monthly monthly.00
kean@kean:~$ ls monthly.00
ls: cannot access 'monthly.00': No such file or directory
kean@kean:~$ ls monthly.00
monthly
kean@kean:~$ cp -r monthly.00 /tmp
kean@kean:~$ ls /tmp
monthly.00
mozilla_kean0
snap.snap-store
systemd-private-9da9aab0dd924c38be25db9415b450b9-colord.service-uuEFE1
systemd-private-9da9aab0dd924c38be25db9415b450b9-haveged.service-tbyRyh
systemd-private-9da9aab0dd924c38be25db9415b450b9-ModemManager.service-ugYnaf
systemd-private-9da9aab0dd924c38be25db9415b450b9-switcheroo-control.service-lhlwlg
systemd-private-9da9aab0dd924c38be25db9415b450b9-systemd-logind.service-046Dff
systemd-private-9da9aab0dd924c38be25db9415b450b9-systemd-resolved.service-0cHfsl
systemd-private-9da9aab0dd924c38be25db9415b450b9-timesyncd.service-42Plaf
systemd-private-9da9aab0dd924c38be25db9415b450b9-upower.service-S19F9F
tracker-extract-files.1000
tracker-extract-files.125
tracker-extract-files.126
```

Рис. 2: Копирование файлов и каталогов

Перемещение и переименование файлов и каталогов



```
kean@kean:~$ cd
kean@kean:~$ mv april july
kean@kean:~$ ls
abc1  Documents  july  monthly  Music  pandoc-crossref      Pictures  snap
Desktop  Downloads  may  monthly.00  os1  pandoc-crossref-linux  Public   Videos
kean@kean:~$ 
kean@kean:~$ mv july monthly.00
kean@kean:~$ ls monthly.00
july  monthly
kean@kean:~$ 
kean@kean:~$ mv monthly.00 monthly.01
kean@kean:~$ ls monthly.00
ls: cannot access 'monthly.00': No such file or directory
kean@kean:~$ ls
abc1  Documents  may  monthly.01  os1  pandoc-crossref-Linux  Public   Videos
Desktop  Downloads  monthly  Music  pandoc-crossref  Pictures      snap
kean@kean:~$ 
kean@kean:~$ mkdir reports
kean@kean:~$ mv monthly.01 reports
kean@kean:~$ ls reports
monthly.01
kean@kean:~$ mv reports/monthly.01 reports/monthly
kean@kean:~$ ls reports
monthly
```

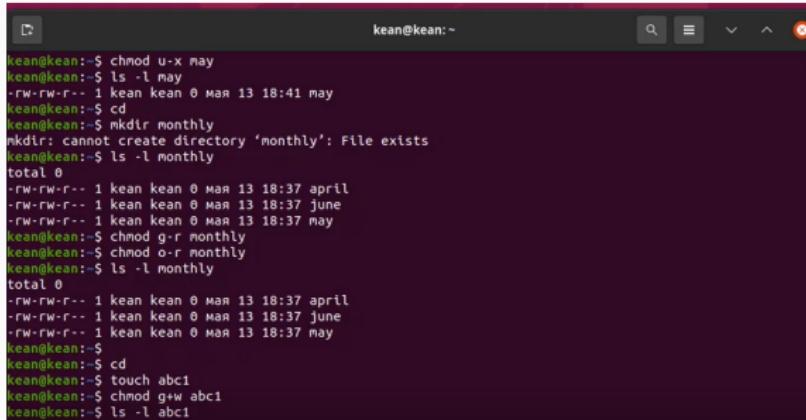
Рис. 3: Перемещение и переименование файлов и каталогов

Изменение прав доступа

```
kean@kean:~$ cd  
kean@kean:~$ touch may  
kean@kean:~$ ls -l may  
-rw-rw-r-- 1 kean kean 0 мая 13 18:41 may  
kean@kean:~$ chmod u+x may  
kean@kean:~$ ls -l may  
-rwxrwxr-- 1 kean kean 0 мая 13 18:41 may
```

Рис. 4: Изменение прав доступа

Изменение прав доступа



A screenshot of a terminal window titled "kean@kean:~". The terminal displays a series of commands and their outputs related to file permissions:

```
kean@kean:~$ chmod u-x may
kean@kean:~$ ls -l may
-rw-rw-r-- 1 kean kean 0 май 13 18:41 may
kean@kean:~$ cd
kean@kean:~$ mkdir monthly
mkdir: cannot create directory 'monthly': File exists
kean@kean:~$ ls -l monthly
total 0
-rw-rw-r-- 1 kean kean 0 мая 13 18:37 april
-rw-rw-r-- 1 kean kean 0 мая 13 18:37 june
-rw-rw-r-- 1 kean kean 0 мая 13 18:37 may
kean@kean:~$ chmod g-r monthly
kean@kean:~$ chmod o-r monthly
kean@kean:~$ ls -l monthly
total 0
-rw-rw-r-- 1 kean kean 0 мая 13 18:37 april
-rw-rw-r-- 1 kean kean 0 мая 13 18:37 june
-rw-rw-r-- 1 kean kean 0 мая 13 18:37 may
kean@kean:~$ 
kean@kean:~$ cd
kean@kean:~$ touch abc1
kean@kean:~$ chmod g+w abc1
kean@kean:~$ ls -l abc1
```

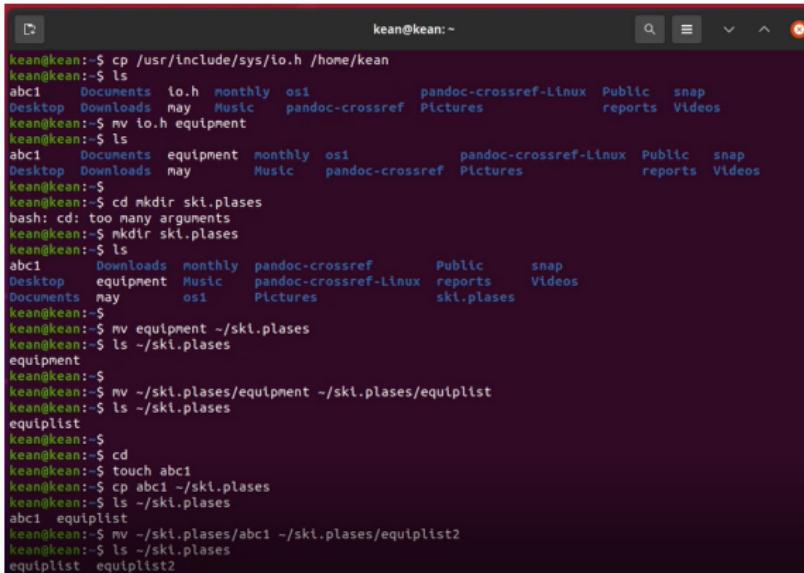
Рис. 5: Изменение прав доступа

sudo apt-get install libc6-dev-i386

```
kean@kean:~$ sudo apt-get install libc6-dev-i386
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following packages were automatically installed and are no longer required:
  appmenu-gtk-module-common libappmenu-gtk3-parser0 libbprint-2-todi libl1vm10
  linux-headers-5.4.0-42 linux-headers-5.4.0-42-generic linux-image-5.4.0-42-generic
  linux-modules-5.4.0-42-generic linux-modules-extra-5.4.0-42-generic
Use 'sudo apt autoremove' to remove them.
The following additional packages will be installed:
  gcc-9-multilib gcc-multilib lib32asan5 lib32atomic1 lib32gcc-9-dev lib32gcc-s1 lib32gomp1
  lib32l1m1 lib32quadmath0 lib32stdc++6 lib32ubsan1 libc6-dev-x32 libc6-i386 libc6-x32 libx32asan5
  libx32atomic1 libx32gcc-9-dev libx32gcc-s1 libx32gomp1 libx32l1m1 libx32quadmath0 libx32stdc++6
  libx32ubsan1
The following NEW packages will be installed:
  gcc-9-multilib gcc-multilib lib32asan5 lib32atomic1 lib32gcc-9-dev lib32gcc-s1 lib32gomp1
  lib32l1m1 lib32quadmath0 lib32stdc++6 lib32ubsan1 libc6-dev-i386 libc6-dev-x32 libc6-i386
  libc6-x32 libx32asan5 libx32atomic1 libx32gcc-9-dev libx32gcc-s1 libx32gomp1 libx32l1m1
  libx32quadmath0 libx32stdc++6 libx32ubsan1
0 upgraded, 24 newly installed, 0 to remove and 12 not upgraded.
Need to get 16,5 MB of archives.
After this operation, 81,1 MB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://ru.archive.ubuntu.com/ubuntu focal-updates/main amd64 libc6-i386 amd64 2.31-0ubuntu9.2 [2 723 kB]
Get:2 http://ru.archive.ubuntu.com/ubuntu focal-updates/main amd64 libc6-dev-i386 amd64 2.31-0ubuntu9.2 [1 962 kB]
Get:3 http://ru.archive.ubuntu.com/ubuntu focal-updates/main amd64 libc6-x32 amd64 2.31-0ubuntu9.2 [2 778 kB]
Get:4 http://ru.archive.ubuntu.com/ubuntu focal-updates/main amd64 libc6-dev-x32 amd64 2.31-0ubuntu9.2 [1 977 kB]
Get:5 http://ru.archive.ubuntu.com/ubuntu focal-updates/main amd64 lib32gcc-s1 amd64 10.2.0-5ubuntu1-
```

Рис. 6: sudo apt-get install libc6-dev-i386

КОМАНДЫ



A screenshot of a terminal window titled "kean@kean:~". The terminal displays a series of Linux commands entered by the user "kean". The commands involve copying files from the system include directory to a local directory, moving files between directories, creating a new directory, and renaming files. The terminal also shows the user navigating through their home directory and creating symbolic links.

```
kean@kean:~$ cp /usr/include/sys/io.h /home/kean
kean@kean:~$ ls
abc1  Documents  io.h  monthly  osi      pandoc-crossref-Linux  Public    snap
Desktop  Downloads  may   Music     pandoc-crossref  Pictures       reports  Videos
kean@kean:~$ mv io.h equipment
kean@kean:~$ ls
abc1  Documents  equipment  monthly  osi      pandoc-crossref-Linux  Public    snap
Desktop  Downloads  may     Music    pandoc-crossref  Pictures       reports  Videos
kean@kean:~$ cd mkdir ski.plases
bash: cd: too many arguments
kean@kean:~$ mkdir ski.plases
kean@kean:~$ ls
abc1  Downloads  monthly  pandoc-crossref      Public    snap
Desktop  equipment  Music    pandoc-crossref-Linux  reports  Videos
Documents  may     osi      Pictures           ski.plases
kean@kean:~$ mv equipment ~/ski.plases
kean@kean:~$ ls ~/ski.plases
equipment
kean@kean:~$ mv ~/ski.plases/equipment ~/ski.plases/equiplist
kean@kean:~$ ls ~/ski.plases
equiplist
kean@kean:~$ cd
kean@kean:~$ touch abc1
kean@kean:~$ cp abc1 ~/ski.plases
kean@kean:~$ ls ~/ski.plases
abc1  equiplist
kean@kean:~$ mv ~/ski.plases/abc1 ~/ski.plases/equiplist2
kean@kean:~$ ls ~/ski.plases
equiplist  equiplist2
```

Рис. 7: команды

КОМАНДЫ

```
kean@kean:~/ski.places$ cd
kean@kean:~$ ls
abc1  Documents  may      Music  pandoc-crossref      Pictures  reports  snap
Desktop  Downloads  monthly  osi    pandoc-crossref-Linux  Public    ski.places  Videos
kean@kean:~$ mkdir newdir
kean@kean:~$ mv ~/newdir ~/ski.places
kean@kean:~$ ls ~/ski.places
ls: cannot access '/home/kean/ski.places': No such file or directory
kean@kean:~$ cd ~/ski.places
kean@kean:~/ski.places$ ls
equipment  newdir
kean@kean:~/ski.places$ cd
kean@kean:~$ mv ~/ski.places/newdir ~/ski.places/plans
kean@kean:~$ ls ~/ski.places
equipment  plans
```

Рис. 8: команды

Определите опции команды chmod

```
kean@kean:~$ mkdir australia
kean@kean:~$ ls -al australia
total 8
drwxrwxr-x 2 kean kean 4096 май 13 19:15 .
drwxrwxr-x 30 kean kean 4096 май 13 19:15 ..
kean@kean:~$ chmod u+r+w+x australia
kean@kean:~$ chmod g-r-w-x australia
kean@kean:~$ chmod o+r-w-x australia
kean@kean:~$ ls -al australia
total 8
drwxr--r-- 2 kean kean 4096 май 13 19:15 .
drwxrwxr-x 30 kean kean 4096 май 13 19:15 ..
kean@kean:~$ 
kean@kean:~$ mkdir play
kean@kean:~$ ls -al play
total 8
drwxrwxr-x 2 kean kean 4096 май 13 19:16 .
drwxrwxr-x 31 kean kean 4096 май 13 19:16 ..
kean@kean:~$ chmod u+r+w+x play
kean@kean:~$ chmod g-r-w+x play
kean@kean:~$ chmod o-r-w+x play
kean@kean:~$ ls -al play
total 8
drwx--x--x 2 kean kean 4096 май 13 19:16 .
drwxrwxr-x 31 kean kean 4096 май 13 19:16 ..
```

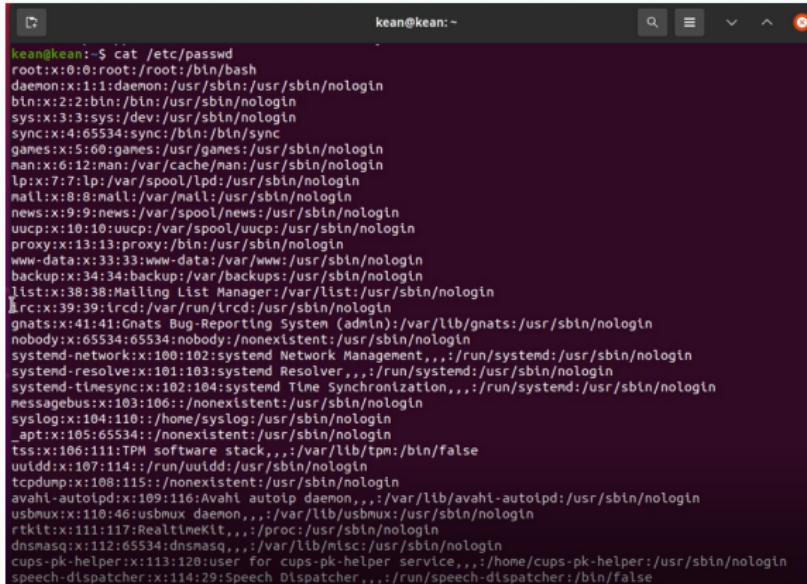
Рис. 9: Определите опции команды chmod

Определите опции команды chmod

```
kean@kean:~$ touch my_os
kean@kean:~$ ls -al my_os
-rw-rw-r-- 1 kean kean 0 май 13 19:17 my_os
kean@kean:~$ chmod u+r-w+x my_os
kean@kean:~$ chmod g+r-w-x my_os
kean@kean:~$ chmod o+r-w-x my_os
kean@kean:~$ ls -al my_os
-rwxr--r-- 1 kean kean 0 май 13 19:17 my_os
kean@kean:~$ 
kean@kean:~$ touch feathers
kean@kean:~$ ls -l feathers
-rw-rw-r-- 1 kean kean 0 май 13 19:19 feathers
```

Рис. 10: Определите опции команды chmod

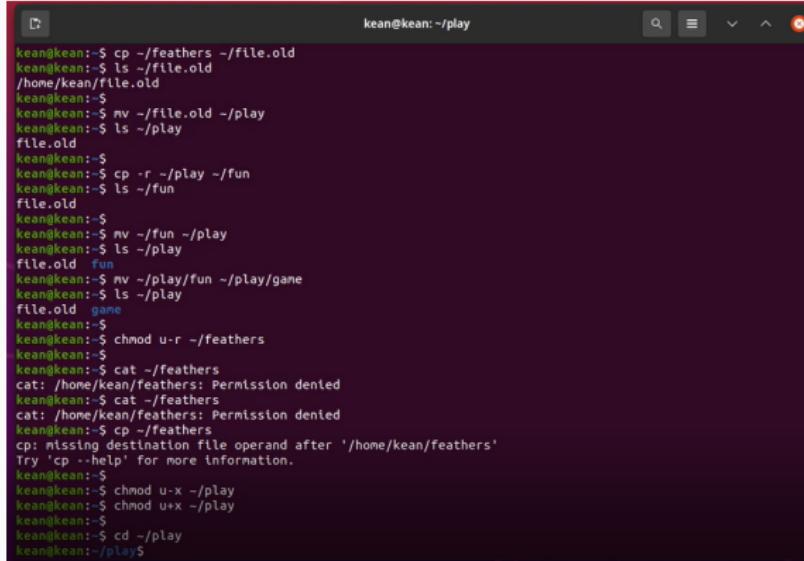
КОМАНДЫ



```
kean@kean:~$ cat /etc/passwd
root:x:0:0:root:/bin/bash
daemon:x:1:1:daemon:/usr/sbin/nologin
bin:x:2:2:bin:/usr/sbin/nologin
sys:x:3:3:sys:/dev:/usr/sbin/nologin
sync:x:4:65534:sync:/bin:/sync
games:x:5:60:games:/usr/games:/usr/sbin/nologin
man:x:6:12:man:/var/cache/man:/usr/sbin/nologin
lp:x:7:7:lp:/var/spool/lpd:/usr/sbin/nologin
mail:x:8:8:mail:/var/mail:/usr/sbin/nologin
news:x:9:9:news:/var/spool/news:/usr/sbin/nologin
uucp:x:10:10:uucp:/var/spool/uucp:/usr/sbin/nologin
proxy:x:13:13:proxy:/bin:/usr/sbin/nologin
www-data:x:33:33:www-data:/var/www:/usr/sbin/nologin
backup:x:34:34:backup:/var/backups:/usr/sbin/nologin
list:x:38:38:Mailing List Manager:/var/list:/usr/sbin/nologin
lrc:x:39:39:ircd:/var/run/ircd:/usr/sbin/nologin
gnats:x:41:41:Gnats Bug-Reporting System (admin):/var/lib/gnats:/usr/sbin/nologin
nobody:x:65534:65534:nobody:/nonexistent:/usr/sbin/nologin
systemd-network:x:100:102:system Network Management,,,:/run/systemd:/usr/sbin/nologin
systemd-resolve:x:101:103:systemd Resolver,,,:/run/systemd:/usr/sbin/nologin
systemd-timesync:x:102:104:system Time Synchronization,,,:/run/systemd:/usr/sbin/nologin
messagebus:x:103:106:/nonexistent:/usr/sbin/nologin
syslog:x:104:110:/home/syslog:/usr/sbin/nologin
_apt:x:105:65534:/nonexistent:/usr/sbin/nologin
tss:x:106:111:TPM software stack,,,:/var/lib/tpm:/bin/false
uuidd:x:107:114:/run/uuid:/usr/sbin/nologin
tcpdump:x:108:115:/nonexistent:/usr/sbin/nologin
avahi-autolpdp:x:109:116:Avahi autolp daemon,,,:/var/lib/avahi-autolpdp:/usr/sbin/nologin
usbmuxd:x:110:46:usbmux daemon,,,:/var/lib/usbmuxd:/usr/sbin/nologin
rtkit:x:111:117:RealtimeKit,,,:/proc:/usr/sbin/nologin
dnsmasq:x:112:65534:dnsmasq,,,:/var/lib/misc:/usr/sbin/nologin
cups-pk-helper:x:113:120:user for cups-pk-helper service,,,:/home/cups-pk-helper:/usr/sbin/nologin
speech-dispatcher:x:114:29:Speech Dispatcher,,,:/run/speech-dispatcher:/bin/false
```

Рис. 11: команды

КОМАНДЫ



A screenshot of a terminal window titled "kean@kean: ~/play". The terminal displays a series of Linux commands entered by the user "kean". The commands include copying files, moving files, changing file permissions, and attempting to execute files. Some commands result in permission denied errors or usage help messages.

```
kean@kean:~$ cp ~/feathers ~/file.old
kean@kean:~$ ls ~/file.old
/home/kean/file.old
kean@kean:~$ mv ~/file.old ~/play
kean@kean:~$ ls ~/play
file.old
kean@kean:~$ cp -r ~/play ~/fun
kean@kean:~$ ls ~/fun
file.old fun
kean@kean:~$ mv ~/fun ~/play
kean@kean:~$ ls ~/play
file.old game
kean@kean:~$ mv ~/play/fun ~/play/game
kean@kean:~$ ls ~/play
file.old game
kean@kean:~$ chmod u-r ~/feathers
kean@kean:~$ cat ~/feathers
cat: /home/kean/feathers: Permission denied
kean@kean:~$ cat ~/feathers
cat: /home/kean/feathers: Permission denied
kean@kean:~$ cp ~/feathers
cp: missing destination file operand after '/home/kean/feathers'
Try 'cp --help' for more information.
kean@kean:~$ chmod u-x ~/play
kean@kean:~$ chmod u+x ~/play
kean@kean:~$ cd ~/play
kean@kean:~/play$
```

Рис. 12: команды

man по командам mount, fsck, mkfs, kill

```
kean@kean:~$ man mount  
kean@kean:~$ man fsck  
kean@kean:~$ man mkfs  
kean@kean:~$ man kill  
kean@kean:~$ █
```

Рис. 13: man по командам mount, fsck, mkfs, kill

man mount

```
kean@kean:~          System Administration          MOUNT(8)

NAME
    mount - mount a filesystem

SYNOPSIS
    mount [-l|-h|-V]
    mount -a [-fFnrsvw] [-t fstype] [-o optlist]
    mount [-fnrsvw] [-o options] device|dir
    mount [-fnrsvw] [-t fstype] [-o options] device dir

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 another 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)

Рис. 14: mount

man fsck

```
kean@kean:~                                         FSCK(8)
                                                System Administration
FSCK(8)                                         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 an filesystem label or UUID specifier (e.g. UUID=8868abf6-88c5-4a83-98bb-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 code 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 code returned when multiple filesystems are checked is the bit-wise OR of the exit codes for each filesystem that is checked.

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

Рис. 15: fsck

man mkfs

```
kean@kean:~          kean@kean:~          MKFS(8)
MKFS(8)           System Administration          MKFS(8)

NAME
    mkfs - build a Linux filesystem

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

DESCRIPTION
    This mkfs front-end 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 code 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.

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

Рис. 16: mkfs

man kill

```
kean@kean:~                                         User Commands                                         KILL(1)

KILL(1)                                              kill - send a signal to a process

NAME
    kill - send a signal to a process

SYNOPSIS
    kill [options] <pid> [...]

DESCRIPTION
    The default signal for kill is TERM. Use -l or -L to list available signals. Particularly
    useful signals include HUP, INT, KILL, STOP, CONT, and 0. Alternate signals may be specified
    in three ways: -, -SIGKILL or -KILL. Negative PID values may be used to choose whole process
    groups; see the PGID column in ps command output. A PID of -1 is special; it indicates all
    processes except the kill process itself and init.

OPTIONS
    <pid> [...]
        Send signal to every <pid> listed.

    -<signal>
    -s <signal>
    --signal <signals>
        Specify the signal to be sent. The signal can be specified by using name or number.
        The behavior of signals is explained in signal\(7\) manual page.

    -l, --list [<signal>]
        List signal names. This option has optional argument, which will convert signal number
        to signal name, or other way round.

    -L, --table
        List signal names in a nice table.

NOTES
    Your shell (command line interpreter) may have a built-in kill command. You may need to
    Manual page kill(1) line 1 (press h for help or q to quit).
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Рис. 17: kill

Выводы по проделанной работе

Вывод

Познакомился с файловой системой Linux. Приобрел практические навыки использования команд для работы и обслуживания системных файлов.