

# Лабораторная работа №10

## Управление модулями ядра Linux

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## Цель работы

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Получить навыки работы с модулями ядра Linux:  
\* просмотр устройств и связанных модулей;  
\* загрузка и выгрузка модулей;  
\* просмотр информации о модулях;  
\* обновление версии ядра.

## Выполнение лабораторной работы

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# Инвентаризация устройств

The screenshot shows a terminal window with three tabs. The active tab displays the output of the command `lsblk -k`. The output lists various storage devices, including their names, sizes, and file systems. The window has a dark theme with light-colored text. The bottom of the window features a menu bar with standard file operations like Help, Exit, Write Out, Read File, Where Is, Replace, Cut, Paste, Execute, Justify, Location, Go To Line, Undo, Redo, Set Mark, Copy, To Bracket, and Where Was.

```
root@localhost:/etc/yum.repos.d - sudo -i
spborisenkova@localhost:~/net-adminka/net-admin/labs/lab1
GNU nano 8.1
[baseos]
name=Rocky Linux $releasever - BaseOS
mirrorlist=https://mirrors.rockylinux.org/mirrorlist?arch=$basearch&repo=BaseOS-$releasever$rltype
#baseurl=http://dl.rockylinux.org/$contentdir/$releasever/BaseOS/$basearch/os/
gpgcheck=1
enabled=1
countme=1
metadata_expire=6h
gpgkey=file:///etc/pki/rpm-gpg/RPM-GPG-KEY-Rocky-10

[baseos-debuginfo]
name=Rocky Linux $releasever - BaseOS - Debug
mirrorlist=https://mirrors.rockylinux.org/mirrorlist?arch=$basearch&repo=BaseOS-$releasever-debug$rltype
#baseurl=http://dl.rockylinux.org/$contentdir/$releasever/BaseOS/$basearch/debug/tree/
gpgcheck=1
enabled=0
metadata_expire=6h
gpgkey=file:///etc/pki/rpm-gpg/RPM-GPG-KEY-Rocky-10

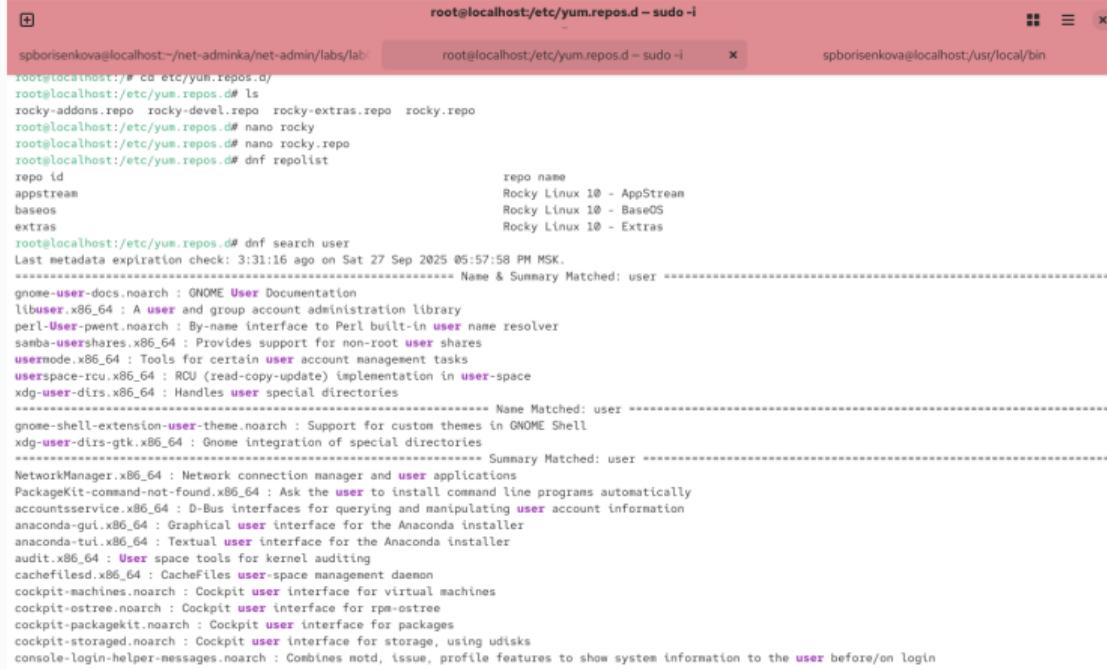
[baseos-source]
name=Rocky Linux $releasever - BaseOS - Source
mirrorlist=https://mirrors.rockylinux.org/mirrorlist?arch=source&repo=BaseOS-$releasever-source$rltype
#baseurl=http://dl.rockylinux.org/$contentdir/$releasever/BaseOS/source/tree/
gpgcheck=1
enabled=0
metadata_expire=6h
gpgkey=file:///etc/pki/rpm-gpg/RPM-GPG-KEY-Rocky-10

[appstream]
name=Rocky Linux $releasever - AppStream
mirrorlist=https://mirrors.rockylinux.org/mirrorlist?arch=$basearch&repo=AppStream-$releasever$rltype

^G Help      ^C Write Out    ^F Where Is     ^K Cut          ^T Execute      ^C Location     M-U Undo
^X Exit      ^R Read File   ^A Replace     ^U Paste        ^J Justify      ^L Go To Line   M-E Redo
                                         ^M Set Mark    M-B Copy      ^V To Bracket  M-B Where Was
```

Рис. 1: Вывод `lsblk -k`

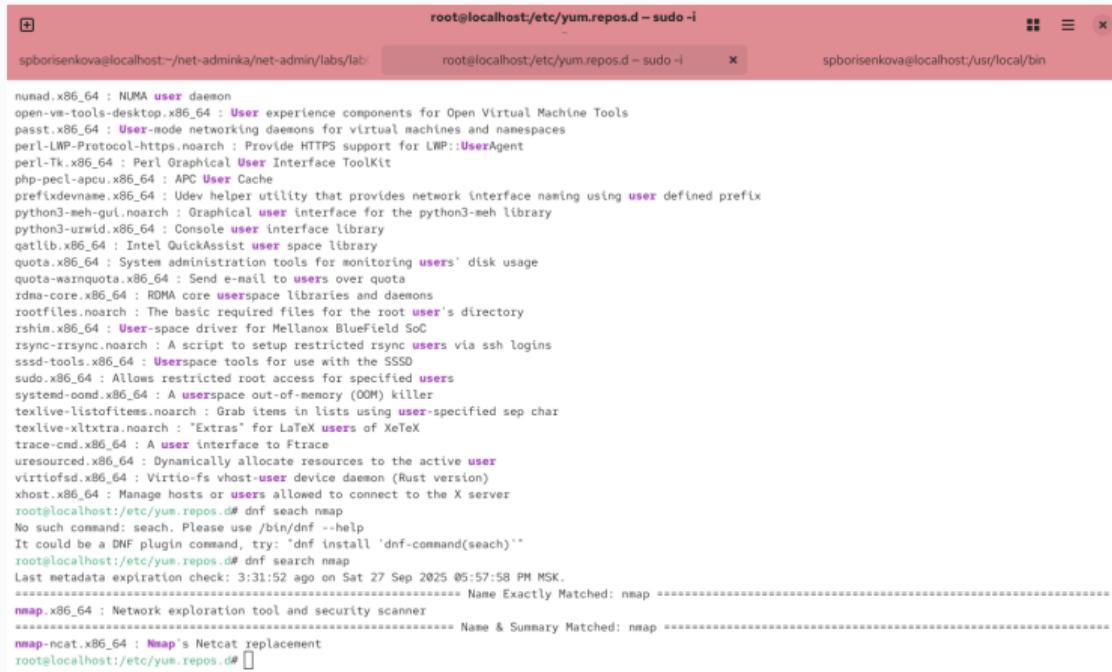
# Проверка и загрузка модуля ext4



```
root@localhost:/etc/yum.repos.d - sudo -i
spborisenkova@localhost:~/net-adminka/net-admin/labs/lab1
root@localhost:/etc/yum.repos.d# ls
rocky-addons.repo  rocky-devel.repo  rocky-extras.repo  rocky.repo
root@localhost:/etc/yum.repos.d# nano rocky
root@localhost:/etc/yum.repos.d# nano rocky.repo
root@localhost:/etc/yum.repos.d# dnf repolist
repo id                                repo name
appstream                               Rocky Linux 10 - AppStream
baseos                                  Rocky Linux 10 - BaseOS
extras                                   Rocky Linux 10 - Extras
root@localhost:/etc/yum.repos.d# dnf search user
Last metadata expiration check: 3:31:16 ago on Sat 27 Sep 2025 05:57:58 PM MSK.
=====
Name & Summary Matched: user
=====
gnome-user-docs.noarch : GNOME User Documentation
libuser.x86_64 : A user and group account administration library
perl-User-pwent.noarch : By-name interface to Perl built-in user name resolver
samba-usershares.x86_64 : Provides support for non-root user shares
usermode.x86_64 : Tools for certain user account management tasks
userspace-rcu.x86_64 : RCU (read-copy-update) implementation in user-space
xdg-user-dirs.x86_64 : Handles user special directories
=====
Name Matched: user
=====
gnome-shell-extension-user-theme.noarch : Support for custom themes in GNOME Shell
xdg-user-dirs-gtk.x86_64 : Gnome integration of special directories
=====
Summary Matched: user
=====
NetworkManager.x86_64 : Network connection manager and user applications
PackageKit-command-not-found.x86_64 : Ask the user to install command line programs automatically
accounts-service.x86_64 : D-Bus interfaces for querying and manipulating user account information
anaconda-gui.x86_64 : Graphical user interface for the Anaconda installer
anaconda-tui.x86_64 : Textual user interface for the Anaconda installer
audit.x86_64 : User space tools for kernel auditing
cachefilesd.x86_64 : CacheFiles user-space management daemon
cockpit-machines.noarch : Cockpit user interface for virtual machines
cockpit-ostree.noarch : Cockpit user interface for rpm-ostree
cockpit-packagekit.noarch : Cockpit user interface for packages
cockpit-storaged.noarch : Cockpit user interface for storage, using udisks
console-login-helper-messages.noarch : Combines motd, issue, profile features to show system information to the user before/on login
```

Рис. 2: Загрузка и проверка модуля ext4

# Информация о модуле ext4



```
root@localhost:/etc/yum.repos.d - sudo -i
spborisenkova@localhost:~/net-adminka/net-admin/labs/lab1
root@localhost:/etc/yum.repos.d - sudo -i
spborisenkova@localhost:/usr/local/bin

numad.x86_64 : NUMA user daemon
open-vm-tools-desktop.x86_64 : User experience components for Open Virtual Machine Tools
passt.x86_64 : User-mode networking daemons for virtual machines and namespaces
perl-LWP-Protocol-https.noarch : Provide HTTPS support for LWP::UserAgent
perl-Tk.x86_64 : Perl Graphical User Interface Toolkit
php-pecl-apcu.x86_64 : APC User Cache
prefixxdevname.x86_64 : Udev helper utility that provides network interface naming using user defined prefix
python3-meh-qml.noarch : Graphical user interface for the python3-meh library
python3-urwid.x86_64 : Console user interface library
qtlib.x86_64 : Intel QuickAssist user space library
quota.x86_64 : System administration tools for monitoring users' disk usage
quota-warnquota.x86_64 : Send e-mail to users over quota
rdma-core.x86_64 : RDMA core userspace libraries and daemons
rootfiles.noarch : The basic required files for the root user's directory
rshim.x86_64 : User-space driver for Mellanox Bluefield SoC
rsync-rsync.noarch : A script to setup restricted rsync users via ssh logins
sssd-tools.x86_64 : Userspace tools for use with the SSSD
sudo.x86_64 : Allows restricted root access for specified users
systemd-cmdline.x86_64 : A userspace out-of-memory (OOM) killer
texlive-listofitems.noarch : Grab items in lists using user-specified sep char
texlive-vltxtra.noarch : "Extras" for LaTeX users of XeTeX
trace-cmd.x86_64 : A user interface to Ftrace
uresourced.x86_64 : Dynamically allocate resources to the active user
virtiofsd.x86_64 : Virtio-fs vhost-user device daemon (Rust version)
xhost.x86_64 : Manage hosts or users allowed to connect to the X server
root@localhost:/etc/yum.repos.d# dnf search nmap
No such command: search. Please use /bin/dnf --help
It could be a DNF plugin command, try: "dnf install 'dnf-command(search)'"
root@localhost:/etc/yum.repos.d# dnf search nmap
Last metadata expiration check: 3:31:52 ago on Sat 27 Sep 2025 05:57:58 PM MSK.
=====
===== Name Exactly Matched: nmap =====
nmap.x86_64 : Network exploration tool and security scanner
=====
===== Name & Summary Matched: nmap =====
nmap-ncat.x86_64 : Nmap's Netcat replacement
root@localhost:/etc/yum.repos.d#
```

Рис. 3: Информация о модуле ext4

# Выгрузка модуля

```
root@localhost:/etc/yum.repos.d - sudo -i
spborisenkova@localhost:~/net-adminka/net-admin/labs/lab1
root@localhost:/etc/yum.repos.d - sudo -i
spborisenkova@localhost:/usr/local/bin

nmap-x86_64 : Nmap's Netcat replacement
root@localhost:/etc/yum.repos.d# dnf install nmap
Last metadata expiration check: 3:32:11 ago on Sat 27 Sep 2025 05:57:58 PM MSK.
Dependencies resolved.

=====
| Package           | Architecture | Version      | Repository | Size |
|=====             |              |              |            |       |
| Installing:      |              |              |            |       |
|   nmap           | x86_64      | 4:7.92-3.el10 | appstream | 5.6 M |
|=====             |              |              |            |       |
| Transaction Summary |          |
|=====             |              |
| Install 1 Package |          |
|=====             |              |
Total download size: 5.6 M
Installed size: 24 M
Is this ok [y/N]: y
Downloading Packages:
nmap-7.92-3.el10.x86_64.rpm                                         16 MB/s | 5.6 MB  00:00
Total                                                               6.0 MB/s | 5.6 MB  00:00
=====
| Total             |          |
| Running transaction check |          |
| Transaction check succeeded. |          |
| Running transaction test |          |
| Transaction test succeeded. |          |
| Running transaction |          |
|   Preparing       : |          |
|     Installing    : nmap-4:7.92-3.el10.x86_64 |          |
|     Running scriptlet: nmap-4:7.92-3.el10.x86_64 |          |
|   1/1             |          |
|   1/1             |          |
|   1/1             |          |
Installed:
  nmap-4:7.92-3.el10.x86_64

Complete!
root@localhost:/etc/yum.repos.d# 
```

Рис. 4: Выгрузка ext4 и ошибка при удалении xfs

## Модули с параметрами (Bluetooth)

```
root@localhost:/etc/yum.repos.d - sudo -i
spborisenkova@localhost:~/net-adminka/net-admin/labs/lab1
root@localhost:/etc/yum.repos.d - sudo -i
spborisenkova@localhost:/usr/local/bin

Installing : nmap-4:7.92-3.el10.x86_64
Running scriptlet: nmap-4:7.92-3.el10.x86_64
1/1
1/1

Installed:
nmap-4:7.92-3.el10.x86_64

Complete!
root@localhost:/etc/yum.repos.d# dnf remove nmap
Dependencies resolved.
=====
Package          Architecture Version       Repository      Size
Removing:
nmap            x86_64      4:7.92-3.el10 @appstream   24 M

Transaction Summary
=====
Remove 1 Package

Freed space: 24 M
Is this ok [y/N]: y
Running transaction check
Transaction check succeeded.
Running transaction test
Transaction test succeeded.
Running transaction
Preparing :
Erasing    : nmap-4:7.92-3.el10.x86_64
Running scriptlet: nmap-4:7.92-3.el10.x86_64
1/1
1/1
1/1

Removed:
nmap-4:7.92-3.el10.x86_64

Complete!
root@localhost:/etc/yum.repos.d#
```

Рис. 5: Загрузка bluetooth

# Параметры Bluetooth



```
root@localhost:/etc/yum.repos.d - sudo -i
spborisenkova@localhost:~/net-adminka/net-admin/labs/lab1
root@localhost:/etc/yum.repos.d - sudo -i
spborisenkova@localhost:/usr/local/bin

Running transaction
Preparing : 1/1
Erasing   : nmap-4:7.92-3.el10.x86_64 1/1
Running scriptlet: nmap-4:7.92-3.el10.x86_64 1/1

Removed:
nmap-4:7.92-3.el10.x86_64

Complete!
root@localhost:/etc/yum.repos.d# dnf groups list
Last metadata expiration check: 3:34:01 ago on Sat 27 Sep 2025 05:57:58 PM MSK.
Available Environment Groups:
  Server
  Minimal Install
  Workstation
  Custom Operating System
  Virtualization Host
Installed Environment Groups:
  Server with GUI
Installed Groups:
  Container Management
  Headless Management
Available Groups:
  Legacy UNIX Compatibility
  Smart Card Support
  Console Internet Tools
  Development Tools
  .NET Development
  Graphical Administration Tools
  Network Servers
  RPM Development Tools
  Scientific Support
  Security Tools
  System Tools
root@localhost:/etc/yum.repos.d#
```

Рис. 6: Информация о модуле bluetooth

# Обновление

The screenshot shows a terminal window with three tabs. The active tab is titled 'root@localhost:/etc/yum.repos.d - sudo -i'. It displays the output of a package update command:

```
Dependencies resolved.
Nothing to do.
Complete!
root@localhost:/etc/yum.repos.d# dnf history undo
No transaction ID or package name given.
Error: No transaction ID or package name given.
root@localhost:/etc/yum.repos.d# dnf list lynx
Last metadata expiration check: 3:35:58 ago on Sat 27 Sep 2025 05:57:58 PM MSK.
Available Packages
lynx.x86_64          2.9.0-6.el10           appstream
root@localhost:/etc/yum.repos.d# dnf install lynx --downloadonly
Last metadata expiration check: 3:36:10 ago on Sat 27 Sep 2025 05:57:58 PM MSK.
Dependencies resolved.
-----
Package          Architecture      Version       Repository      Size
-----
Installing:
lynx            x86_64          2.9.0-6.el10   appstream      1.6 M
-----
Transaction Summary
-----
Install 1 Package

Total download size: 1.6 M
Installed size: 6.0 M
DNF will only download packages for the transaction.
Is this ok [y/N]: y
Downloading Packages:
lynx-2.9.0-6.el10.x86_64.rpm          3.6 MB/s | 1.6 MB  00:00
-----
Total
Complete!
The downloaded packages were saved in cache until the next successful transaction.
You can remove cached packages by executing 'dnf clean packages'.
root@localhost:/etc/yum.repos.d#
```

Рис. 7: Обновление пакетов и ядра

# Проверка новой версии ядра



The screenshot shows a terminal window with the following session:

```
root@localhost:/var/cache/dnf/appstream-8f18e4146890fdfc/packages - sudo -i
spborisenkova@localhost:~/net-adminka/net-admin/labs/lab1 root@localhost:/var/cache/dnf/appstream-8f18e4146890fdfc: ~ x spborisenkova@localhost:/usr/local/bin

root@localhost:/var/cache/dnf/appstream-8f18e4146890fdfc# cd packages/
root@localhost:/var/cache/dnf/appstream-8f18e4146890fdfc/packages# ls
lynx-2.9.0-6.el10.x86_64.rpm
root@localhost:/var/cache/dnf/appstream-8f18e4146890fdfc/packages# rpm -Uhv lynx-2.9.0-6.el10.x86_64.rpm
Verifying...
Preparing...
Updating / installing...
  1:lynx-2.9.0-6.el10 ################################################ [100%]
root@localhost:/var/cache/dnf/appstream-8f18e4146890fdfc/packages# which lynx
/bin/lynx
root@localhost:/var/cache/dnf/appstream-8f18e4146890fdfc/packages# rpm -qf $(which lynx)
lynx-2.9.0-6.el10.x86_64
root@localhost:/var/cache/dnf/appstream-8f18e4146890fdfc/packages# rpm -qi lynx
Name        : lynx
Version     : 2.9.0
Release     : 6.el10
Architecture: x86_64
Install Date: Sat 27 Sep 2025 09:36:08 PM MSK
Group       : Unspecified
Size        : 6283241
License     : GPL-2.0-only
Signature   : RSA/SHA256, Thu 22 May 2025 11:34:29 PM MSK, Key ID 5b106c736fedfc85
Source RPM  : lynx-2.9.0-6.el10.src.rpm
Build Date  : Fri 01 Nov 2024 01:03:33 PM MSK
Build Host  : pb-913aa2bb-e2a2-4928-a48c-b613e15933c9-b-x86-64
Packager   : Rocky Linux Build System (Peridot) <releng@rockylinux.org>
Vendor     : Rocky Enterprise Software Foundation
URL        : https://lynx.invisible-island.net/
Summary    : A text-based Web browser
Description :
Lynx is a text-based Web browser. Lynx does not display any images,
but it does support frames, tables, and most other HTML tags. One
advantage Lynx has over graphical browsers is speed; Lynx starts and
exits quickly and swiftly displays web pages.
root@localhost:/var/cache/dnf/appstream-8f18e4146890fdfc/packages# 
```

Рис. 8: Проверка версии ядра после перезагрузки

## Контрольные вопросы

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- текущая версия ядра — `uname -r`;
- загруженные модули — `lsmod`;
- загрузка / выгрузка — `modprobe`, `modprobe -r`;
- параметры модуля — `modinfo`.

## Вывод

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## Вывод

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Были получены практические навыки работы с модулями ядра Linux:

- определение устройств и связанных модулей;
- загрузка и выгрузка модулей;
- просмотр параметров модулей;
- обновление ядра.