

Лабораторная работа №10

Управление модулями ядра Linux

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Цель работы

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

Инвентаризация устройств



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

GNU nano 8.1 rocky.repo
[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
```

Рис. 1: Вывод `lspci -k`

Проверка и загрузка модуля ext4

```
root@localhost/etc/yum.repos.d - sudo -i
spborisenkova@localhost:~/net-adminka/net-admin/labs/lab:
root@localhost:~# cd etc/yum.repos.d/
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-storage.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-admin/lab: root@localhost:/etc/yum.repos.d -- sudo -i x spborisenkova@localhost:/usr/local/bin

nunad.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
prefixdevname.x86_64 : Udev helper utility that provides network interface naming using user defined prefix
python3-meh-gui.noarch : Graphical user interface for the python3-meh library
python3-urwid.x86_64 : Console user interface library
qatlib.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-oomd.x86_64 : A userspace out-of-memory (OOM) killer
texlive-listofitems.noarch : Grab items in lists using user-specified sep char
texlive-xtlextra.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

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

nmap-ncat.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           Size
=====
Installing:
nmap                                   x86_64            4:7.92-3.el10    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
Running transaction check
Transaction check succeeded.
Running transaction test
Transaction test succeeded.
Running transaction
  Preparing      :
  Installing     : nmap-4:7.92-3.el10.x86_64                                1/1
  Running scriptlet: nmap-4:7.92-3.el10.x86_64                                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/lab: root@localhost:/etc/yum.repos.d - sudo -i x spborisenkova@localhost:/usr/local/bin

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

Рис. 5: Загрузка bluetooth

Параметры Bluetooth

```
root@localhost:/etc/yum.repos.d - sudo -i

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

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

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                                                    2.2 MB/s | 1.6 MB  00:00
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

```
root@localhost:/var/cache/dnf/appstream-8f18e4146890fdcf/packages - sudo -i
spborisenkova@localhost:~/net-adminka/net-admin/labs/lab: root@localhost:/var/cache/dnf/appstream-8f18e4146890fdcf/packages x spborisenkova@localhost:/usr/local/bin

root@localhost:/var/cache/dnf/appstream-8f18e4146890fdcf/packages# cd packages/
root@localhost:/var/cache/dnf/appstream-8f18e4146890fdcf/packages# ls
lynx-2.9.0-6.el10.x86_64.rpm
root@localhost:/var/cache/dnf/appstream-8f18e4146890fdcf/packages# rpm -Uhv lynx-2.9.0-6.el10.x86_64.rpm
Verifying... ##### [100%]
Preparing... ##### [100%]
Updating / installing...
 1:lynx-2.9.0-6.el10 ##### [100%]
root@localhost:/var/cache/dnf/appstream-8f18e4146890fdcf/packages# which lynx
/bin/lynx
root@localhost:/var/cache/dnf/appstream-8f18e4146890fdcf/packages# rpm -qf $(which lynx)
lynx-2.9.0-6.el10.x86_64
root@localhost:/var/cache/dnf/appstream-8f18e4146890fdcf/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-8f18e4146890fdcf/packages#
```

Рис. 8: Проверка версии ядра после перезагрузки

Контрольные вопросы

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

Вывод

Были получены практические навыки работы с модулями ядра Linux:

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