

Лабораторная работа 10

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Задача

1. Продемонстрируйте навыки работы по управлению модулями ядра (см. раз- дел 10.4.1).

1. Продемонстрируйте навыки работы по управлению модулями ядра (см. раздел 10.4.1).
2. Продемонстрируйте навыки работы по загрузке модулей ядра с параметрами (см. раздел 10.4.2).

Выполнение

```

Kernel driver in use: pcieport
00:02.7 PCI bridge: Red Hat, Inc. QEMU PCIe Root port
Kernel driver in use: pcieport
00:03.0 PCI bridge: Red Hat, Inc. QEMU PCIe Root port
Kernel driver in use: pcieport
00:03.1 PCI bridge: Red Hat, Inc. QEMU PCIe Root port
Kernel driver in use: pcieport
00:03.2 PCI bridge: Red Hat, Inc. QEMU PCIe Root port
Kernel driver in use: pcieport
00:03.3 PCI bridge: Red Hat, Inc. QEMU PCIe Root port
Kernel driver in use: pcieport
00:03.4 PCI bridge: Red Hat, Inc. QEMU PCIe Root port
Kernel driver in use: pcieport
00:03.5 PCI bridge: Red Hat, Inc. QEMU PCIe Root port
Kernel driver in use: pcieport
00:1b.0 Audio device: Intel Corporation 82801I (ICH9 Family) HD Audio Controller (rev 03)
Subsystem: Red Hat, Inc. QEMU Virtual Machine
Kernel driver in use: snd_hda_intel
Kernel modules: snd_hda_intel
00:1f.0 ISA bridge: Intel Corporation 82801IB (ICH9) LPC Interface Controller (rev 02)
Subsystem: Red Hat, Inc. QEMU Virtual Machine
Kernel driver in use: lpc_ich
Kernel modules: lpc_ich
00:1f.2 SATA controller: Intel Corporation 82801IR/IO/1H (ICH9R/DO/DH) 6 port SATA Controller [AHCI mode] (rev 02)
Subsystem: Red Hat, Inc. QEMU Virtual Machine
Kernel driver in use: ahci
Kernel modules: ahci
00:1f.3 SMBus: Intel Corporation 82801I (ICH9 Family) SMBus Controller (rev 02)
Subsystem: Red Hat, Inc. QEMU Virtual Machine
Kernel driver in use: i801_smbus
Kernel modules: i2c_i801
01:00.0 Ethernet controller: Red Hat, Inc. Virtio network device (rev 01)
Subsystem: Red Hat, Inc. Device 1100
Kernel driver in use: virtio-pci
02:00.0 USB controller: Red Hat, Inc. QEMU XHCI Host Controller (rev 01)
Subsystem: Red Hat, Inc. Device 1100
Kernel driver in use: xhci_hcd
03:00.0 Communication controller: Red Hat, Inc. Virtio console (rev 01)
Subsystem: Red Hat, Inc. Device 1100
Kernel driver in use: virtio-pci
04:00.0 SCSI storage controller: Red Hat, Inc. Virtio block device (rev 01)
Subsystem: Red Hat, Inc. Device 1100
Kernel driver in use: virtio-pci
05:00.0 Unclassified device [00ff]: Red Hat, Inc. Virtio memory balloon (rev 01)
Subsystem: Red Hat, Inc. Device 1100
Kernel driver in use: virtio-pci
06:00.0 Unclassified device [00ff]: Red Hat, Inc. Virtio RNG (rev 01)
Subsystem: Red Hat, Inc. Device 1100
Kernel driver in use: virtio-pci

```

lsmod

```
[root@dmgeneralov ~]# lsmod | sort | head -35
ahci                48960      0
cdrom               81920      1 sr_mod
cec                53248      1 drm_kms_helper
crc32c_intel        24576      1
crc32_pclmul        16384      0
crt10dif_pclmul     16384      1
dm_log              20480      2 dm_region_hash,dm_mirror
dm_mirror           28672      0
dm_mod              180224     9 dm_log,dm_mirror
dm_region_hash      24576      1 dm_mirror
drm                 634880     3 drm_kms_helper,virtio_gpu
drm_kms_helper      311296     3 virtio_gpu
failover            16384      1 net_failover
fb_sys_fops         16384      1 drm_kms_helper
fuse                172032     1
ghash_clmulni_intel 16384      0
i2c_i801            36864      0
i2c_smbus           20480      1 i2c_i801
intel_pmc_core       53248      0
intel_pmc_core_pltdrv 16384      0
intel_rapl_common    28672      1 intel_rapl_msr
intel_rapl_msr       20480      0
ip_set              61440      0
irqbypass           16384      1 kvm
itCO_vendor_support 16384      1 itCO_wdt
itCO_wdt            16384      0
joydev              28672      0
kvm                 1056768    1 kvm_intel
kvm_intel            364544     0
ledtrig_audio        16384      1 snd_hda_codec_generic
libahci              45056      1 ahci
libata              299008     2 libahci,ahci
libcrc32c            16384      4 nf_conntrack,nf_nat,nf_tables,xfs
lpc_ich              28672      0
Module              Size      Used by
[root@dmgeneralov ~]# _
```

modprobe

```
Module              Size Used by
[root@dmgeneralov ~]# lsmod | grep 'ext4'
[root@dmgeneralov ~]# modprobe ext4
[root@dmgeneralov ~]# lsmod | grep 'ext4'
ext4                946176 0
mbcache             16384 1 ext4
jbd2                 167936 1 ext4
[root@dmgeneralov ~]# modinfo ext4
filename:           /lib/modules/5.14.0-70.13.1.el9_0.x86_64/kernel/fs/ext4/ext4.ko.xz
softdep:            pre: crc32c
license:            GPL
description:        Fourth Extended Filesystem
author:             Remy Card, Stephen Tweedie, Andrew Morton, Andreas Dilger, Theodore Ts'o and others
alias:              fs-ext4
alias:              ext3
alias:              fs-ext3
alias:              ext2
alias:              fs-ext2
rhelversion:        9.0
srcversion:          DD15A03ED97F00F72169C04
depends:             mbcache, jbd2
retpoline:          Y
intree:             Y
name:               ext4
vermagic:           5.14.0-70.13.1.el9_0.x86_64 SMP preempt mod_unload modversions
sig_id:             PKCS#7
signer:             Rocky kernel signing key
sig_key:            15:90:40:E7:99:52:3B:6B:3E:79:63:85:B0:0B:5F:5C:FF:2D:2B:97
sig_hashalgo:       sha256
signature:          7B:13:83:0E:70:03:7A:A9:5B:A0:E7:DD:4A:C5:FB:E2:40:12:09:34:
3A:2F:51:AF:02:3F:E4:06:0A:4C:29:57:EC:01:F1:1A:67:CD:7D:E7:
BC:B0:DA:79:EA:02:69:17:75:25:71:3F:D1:02:7F:01:B3:CE:CF:92:
04:CD:30:74:BC:90:D9:F2:D7:DD:3D:3D:2A:48:97:57:DE:0C:D1:99:
B8:96:B5:D6:9E:39:06:02:1E:00:F0:F1:46:1C:5E:4D:7C:6B:EB:73:
0F:07:DC:C0:AC:52:DD:B7:50:1C:DA:90:50:2C:0D:5F:0F:DA:29:BA:
22:83:56:17:E4:79:23:23:32:94:AD:4D:C3:13:BD:C4:64:2D:5C:EA:
F4:3A:F2:3F:EA:91:70:6E:29:2C:D9:D3:A3:4C:B5:94:34:87:2E:00:
2E:C3:CF:D9:3E:94:F1:3A:CF:44:B3:F6:C3:07:D6:D5:D7:05:E8:FB:
AF:99:EF:9D:DE:67:C8:34:12:89:9E:6D:E1:3D:AD:6E:2C:45:D0:9F:
63:70:61:C1:C3:24:AA:BA:BE:2B:6A:30:BD:09:F8:7E:AA:E2:F3:E7:
21:D5:60:00:6E:C5:B4:2F:3B:CF:5F:14:A1:0D:E1:6C:65:DA:97:52:
59:0A:0E:44:65:2D:00:1B:05:D9:EC:03:20:0B:90:E0:54:AF:60:CE:
5E:1B:DC:0F:59:33:BE:65:D0:AF:35:0D:37:3D:CC:1B:C4:16:23:63:
F0:7A:60:6A:DE:97:99:ED:CB:0F:B5:19:F6:E3:94:96:99:EB:F9:2C:
DC:D4:44:EB:3F:1D:71:02:9C:4A:94:E7:45:9E:45:BD:68:AB:33:A7:
EF:62:D0:5E:E9:70:23:6E:70:F7:04:9B:A3:48:76:88:A1:6F:4E:BD:
B7:F7:73:00:E2:BE:A0:23:9D:DB:34:1F:74:7A:2F:2A:BB:B2:04:61:
1D:27:B3:22:F0:0D:D5:B9:43:02:7E:0E:38:1D:70:00:24:60:16:00:
77:3C:7E:3E
```



```
[root@dmgeneralov ~]# modprobe -r ext4
modprobe: FATAL: Module crc32c_intel is in use.
[root@dmgeneralov ~]# modprobe -r ext4
[root@dmgeneralov ~]# modprobe -r xfs
modprobe: FATAL: Module xfs is in use.
[root@dmgeneralov ~]# modprobe -r xfs
modprobe: FATAL: Module xfs is in use.
[root@dmgeneralov ~]# modprobe -r xfs
modprobe: FATAL: Module xfs is in use.
[root@dmgeneralov ~]# modprobe -r xfs
modprobe: FATAL: Module xfs is in use.
[root@dmgeneralov ~]# modprobe -r xfs
modprobe: FATAL: Module xfs is in use.
[root@dmgeneralov ~]# _
```

Рис. 4: modprobe -r

```

bluetooth 737288 0
rfkill 32768 2 bluetooth
[root@dmgeneralov ~]# modinfo bluetooth | grep "param"
[root@dmgeneralov ~]# modinfo bluetooth | grep "aram"
[root@dmgeneralov ~]# modinfo bluetooth | grep "prop"
[root@dmgeneralov ~]# modinfo bluetooth | grep "rop"
[root@dmgeneralov ~]# modinfo bluetooth
filename: /lib/modules/5.14.0-70.13.1.el9_0.x86_64/kernel/net/bluetooth/bluetooth.ko.xz
alias: net-pf-31
license: GPL
version: 2.22
description: Bluetooth Core ver 2.22
author: Marcel Holtmann <marcel@holtmann.org>
rhelversion: 9.8
srcversion: 184B847528C94338F8A0288
depends: rfkill
retpoline: Y
intree: Y
name: bluetooth
vermagic: 5.14.0-70.13.1.el9_0.x86_64 SMP preempt mod_unload modversions
sig_id: PKCS#7
signer: Rocky kernel signing key
sig_key: 15:98:48:E7:99:52:3B:6B:3E:79:63:85:B8:8B:5F:5C:FF:2D:2B:97
sig_hashalgo: sha256
signature: A8:5A:63:D8:9C:28:32:5B:49:22:88:34:A7:16:DA:0B:C7:39:61:B5:
EA:6D:8D:F1:4D:33:72:4E:C3:2A:CD:03:9C:CE:64:FA:0B:7A:4C:5B:
B8:02:99:26:D1:DC:EF:0F:A9:D4:6C:E1:07:20:1B:0B:37:5C:AE:A6:
48:1E:AD:BC:79:85:92:D5:2C:68:CF:98:4A:F9:A5:FC:81:FD:6E:21:
96:29:58:B4:A6:3C:ED:5E:00:4F:EB:D1:06:0F:61:5C:0F:A1:E9:68:
D8:29:87:13:48:22:D5:6D:7C:25:3A:4C:6A:D3:9A:01:B2:E4:CE:8F:
8F:2F:07:E2:3D:D8:DC:84:1D:78:F7:FB:98:A8:8D:AF:A8:BD:63:AF:
57:EB:48:D1:B9:1F:8D:2D:5A:B3:4B:01:52:35:5E:68:4D:B9:59:C3:
35:9C:9F:67:64:1A:C9:56:07:28:19:D6:7C:B9:A4:AD:23:61:E1:B5:
E7:00:6A:73:4F:FC:39:01:54:BF:A5:18:08:78:74:17:18:CE:5E:1E:
58:47:8D:14:17:C2:9E:CC:3E:BC:CE:A5:03:81:3E:35:08:F5:A3:E9:
E7:41:F5:E9:F1:74:C6:D8:00:58:F4:66:5B:19:21:82:D7:C1:7D:8D:
F8:F9:48:BE:63:4C:2D:2A:2B:4D:78:F3:83:85:DC:21:0F:D0:4B:C8:
49:75:76:7B:CF:44:FC:3D:98:F5:A3:3E:BC:1C:31:C2:A8:B5:EA:B9:
BF:57:02:D1:C3:21:CA:96:B2:CB:2B:DE:B2:74:16:C7:18:6E:2E:A5:
BB:7A:1D:A4:5F:79:AF:7F:94:9E:7C:9B:92:00:29:9B:76:D2:3B:64:
18:B6:3F:95:63:CC:E1:72:6C:0B:46:4A:05:56:24:28:A4:A4:E5:31:
45:92:3F:1E:68:68:A6:27:C4:92:80:57:6F:DD:24:87:85:A7:C3:42:
0A:A0:74:CF:AD:59:BA:11:95:84:3E:5B:59:EE:99:7A:9A:2A:3D:74:
BE:84:14:A8
param: disable_esco:Disable eSCO connection creation (bool)
param: disable_ertm:Disable enhanced retransmission mode (bool)
param: enable_ecred:Enable enhanced credit flow control mode (bool)
[root@dmgeneralov ~]# modprobe -r bluetooth
[15664.844934] NET: Unregistered PF_BLUETOOTH protocol family

```

```

systemd                                x86_64                250-12.e19_1
systemd-libs                           x86_64                250-12.e19_1
systemd-pam                            x86_64                250-12.e19_1
systemd-rpm-macros                     noarch                250-12.e19_1
systemd-udev                           x86_64                250-12.e19_1
teamd                                   x86_64                1.31-14.e19
tpm2-tss                               x86_64                3.0.3-8.e19
tzdata                                 noarch                2022g-1.e19_1
util-linux                             x86_64                2.37.4-9.e19
util-linux-core                        x86_64                2.37.4-9.e19
vim-minimal                            x86_64                2:8.2.2637-16.e19_0.3
which                                   x86_64                2.21-28.e19
yum                                     noarch                4.12.0-4.e19
zlib                                    x86_64                1.2.11-34.e19
Installing dependencies:
freetype                               x86_64                2.10.4-9.e19
graphite2                              x86_64                1.3.14-9.e19
grub2-tools-efi                       x86_64                1:2.06-46.e19.rocky.0.1
grub2-tools-extra                     x86_64                1:2.06-46.e19.rocky.0.1
harfbuzz                               x86_64                2.7.4-8.e19
kernel-core                           x86_64                5.14.0-162.6.1.e19_1.0.1
kernel-modules                        x86_64                5.14.0-162.6.1.e19_1.0.1
libevent                              x86_64                2.1.12-6.e19
libpng                                 x86_64                2:1.6.37-12.e19
openldap-compat                       x86_64                2.6.2-3.e19
python3-gobject-base-noarch           noarch                3.40.1-6.e19

```

Transaction Summary

```
=====
```

Install 12 Packages

Upgrade 190 Packages

Total download size: 467 M

Is this ok [y/N]: ^COperation aborted.

```
[root@dmgeneralov ~]# uname -r
```

```
5.14.0-70.13.1.e19_0.x86_64
```

```
[root@dmgeneralov ~]# dnf upgrade --refresh
```

```
Rocky Linux 9 - BaseOS
```

```
^CRocky Linux 9 - AppStream
```

```
[ ==
```

```
Rocky Linux 9 - AppStream
```

```
Error: Failed to download metadata for repo 'appstream': Cannot prepare internal mirrorlist: Interrupt
```

```
[root@dmgeneralov ~]# uname -r
```

```
5.14.0-70.13.1.e19_0.x86_64
```

```
[root@dmgeneralov ~]# dnf list kernel
```

```
Last metadata expiration check: 0:00:05 ago on Sat 10 Dec 2022 02:29:39 PM MSK.
```

```
Installed Packages
```

```
kernel.x86_64                                5.14.0-70.13.1.e19_0
```

```
Available Packages
```

```
kernel.x86_64                                5.14.0-162.6.1.e19_1.0.1
```

```
Rocky Linux 9.1 (Blue Onyx)  
Kernel 5.14.0-162.6.1.el9_1.0.1.x86_64 on an x86_64  
  
dmgeneralov login:
```

Рис. 7: uname

Я получил опыт работы с модулями ядра.