

Отчёт по лабораторной работе №12

Управление сетями

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Цель работы

Цель

Получить навыки настройки сетей в Linux

Выполнение лабораторной работы

Выполнение лабораторной работы

##Сетевые подключения

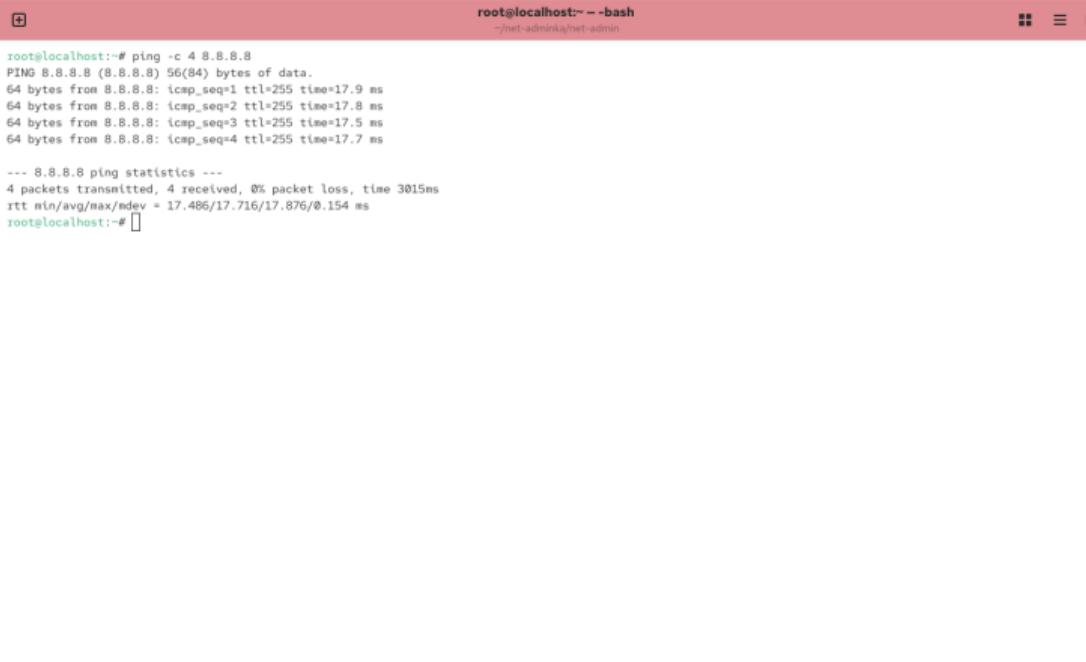


The screenshot shows a terminal window with a red header bar containing the text "root@localhost:~ - bash" and "net-adminka/net-admin". The terminal itself displays a command-line session:

```
spborisenkova@localhost:~/net-adminka/net-admin$ su -
Password:
Last login: Sat Sep 13 19:40:57 MSK 2025 on pts/0
root@localhost:~# ip -s link
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN mode DEFAULT group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
        RX: bytes packets errors dropped missed mcast
            2514      24      0      0      0      0
        TX: bytes packets errors dropped carrier collisions
            2514      24      0      0      0      0
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP mode DEFAULT group default qlen 1000
    link/ether 00:00:27:52:82:81 brd ff:ff:ff:ff:ff:ff
        RX: bytes packets errors dropped missed mcast
            35890555  33508     0      0      0      118
        TX: bytes packets errors dropped carrier collisions
            2533331  11916     0      0      0      0
        altname enx000027528281
root@localhost:~# ip root show
Object 'root' is unknown, try "ip help".
root@localhost:~# ip route show
default via 10.0.2.2 dev enp0s3 proto dhcp src 10.0.2.15 metric 100
10.0.2.0/24 dev enp0s3 proto kernel scope link src 10.0.2.15 metric 100
root@localhost:~# ip addr show
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
        inet 127.0.0.1/8 scope host lo
            valid_lft forever preferred_lft forever
        inet6 ::1/128 scope host noprefixroute
            valid_lft forever preferred_lft forever
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 00:00:27:52:82:81 brd ff:ff:ff:ff:ff:ff
        altname enx000027528281
        inet 10.0.2.15/24 brd 10.0.2.255 scope global dynamic noprefixroute enp0s3
            valid_lft 46742sec preferred_lft 46742sec
        inet6 fd17:625c:037:2:a00:27ff:fe52:8281/64 scope global dynamic noprefixroute
            valid_lft 86340sec preferred_lft 14340sec
        inet6 fe80::a00:27ff:fe52:8281/64 scope link noprefixroute
            valid_lft 144sec preferred_lft 144sec
```

Рис. 1: Запуск терминала и получение полномочий администратора

Отправка пакетов



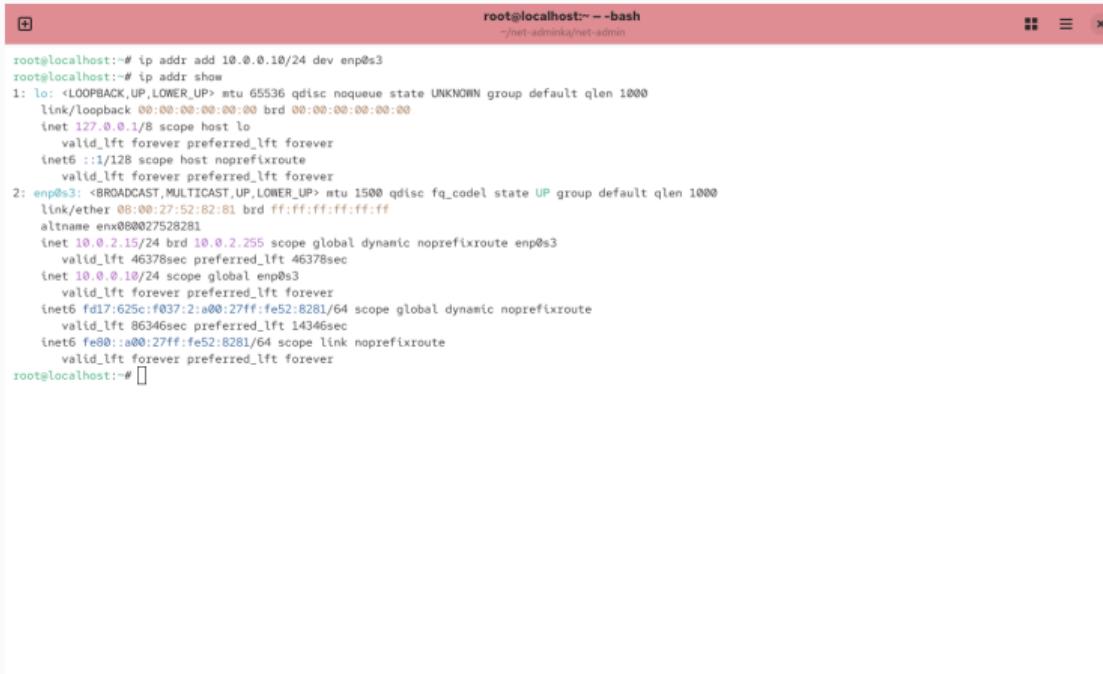
The screenshot shows a terminal window with a red header bar. The header bar contains the text "root@localhost:~ - bash" and the path "/-/net-adminka/net-admin". The main window area displays the following command and its output:

```
root@localhost:~# ping -c 4 8.8.8.8
PING 8.8.8.8 (8.8.8.8) 56(84) bytes of data.
64 bytes from 8.8.8.8: icmp_seq=1 ttl=255 time=17.9 ms
64 bytes from 8.8.8.8: icmp_seq=2 ttl=255 time=17.8 ms
64 bytes from 8.8.8.8: icmp_seq=3 ttl=255 time=17.5 ms
64 bytes from 8.8.8.8: icmp_seq=4 ttl=255 time=17.7 ms

--- 8.8.8.8 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3015ms
rtt min/avg/max/mdev = 17.406/17.716/17.876/0.154 ms
root@localhost:~#
```

Рис. 2: Отправка четырёх пакетов на IP-адрес 8.8.8.8

Дополнительный адрес



root@localhost:~# ip addr add 10.0.0.10/24 dev enp0s3
root@localhost:~# ip addr show
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
 link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
 inet 127.0.0.1/8 scope host lo
 valid_lft forever preferred_lft forever
 inet6 ::1/128 scope host noprefixroute
 valid_lft forever preferred_lft forever
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
 link/ether 00:00:27:52:82:61 brd ff:ff:ff:ff:ff:ff
 altname enx000027528261
 inet 10.0.2.15/24 brd 10.0.2.255 scope global dynamic noprefixroute enp0s3
 valid_lft 46378sec preferred_lft 46378sec
 inet 10.0.0.10/24 scope global enp0s3
 valid_lft forever preferred_lft forever
 inet6 fd17:625c:f037:2:a00:27ff:fe52:8261/64 scope global dynamic noprefixroute
 valid_lft 86346sec preferred_lft 14346sec
 inet6 fe80::a00:27ff:fe52:8261/64 scope link noprefixroute
 valid_lft forever preferred_lft forever

Рис. 3: Добавление дополнительного адреса

Утилита ip



The screenshot shows a terminal window with a red header bar. The header bar contains the text "root@localhost:~ - bash" and the path "/-/net-adminka/net-admin". The main area of the terminal displays the usage information for the ip command. The text is as follows:

```
root@localhost:~# ip
Usage: ip [ OPTIONS ] OBJECT { COMMAND | help }
      ip [ -force ] -batch filename
where OBJECT := { address | addrlabel | fou | help | tla | ioam | l2tp | link |
                  macsec | maddress | monitor | mptcp | mroute | mrule |
                  neighbor | neighbour | netconf | netsns | nexthop | ntable |
                  ntbl | route | rule | sr | stats | tap | tcpmetrics |
                  token | tunnel | tuntap | vrf | xfrm }
OPTIONS := { -V[ersion] | -s[tatistics] | -d[etails] | -r[esolve] |
             -h[uman-readable] | -e(c | -j[son] | -p[retty] |
             -f[amily] { inet | inet6 | mpls | bridge | link } |
             -4 | -6 | -M | -B | -Ø |
             -loops { maxnum-addr-flush-attempts } | -echo | -br[ief] |
             -o[neline] | -t[imestamp] | -ts[hort] | -b[atch] [filename] |
             -rc[vbuf] [size] | -n[etns] name | -N[umeric] | -a[ll] |
             -c[olor] }
```

At the bottom of the terminal window, there is a small square icon with a plus sign inside it.

Рис. 4: вывод информации от утилиты ip

ifconfig



The screenshot shows a terminal window with a red header bar containing the text "root@localhost:~ - bash" and the path "/-/net-adminka/net-admin". The terminal window displays the output of the "ifconfig" command run by a root user. The output lists two network interfaces: "enp0s3" and "lo".

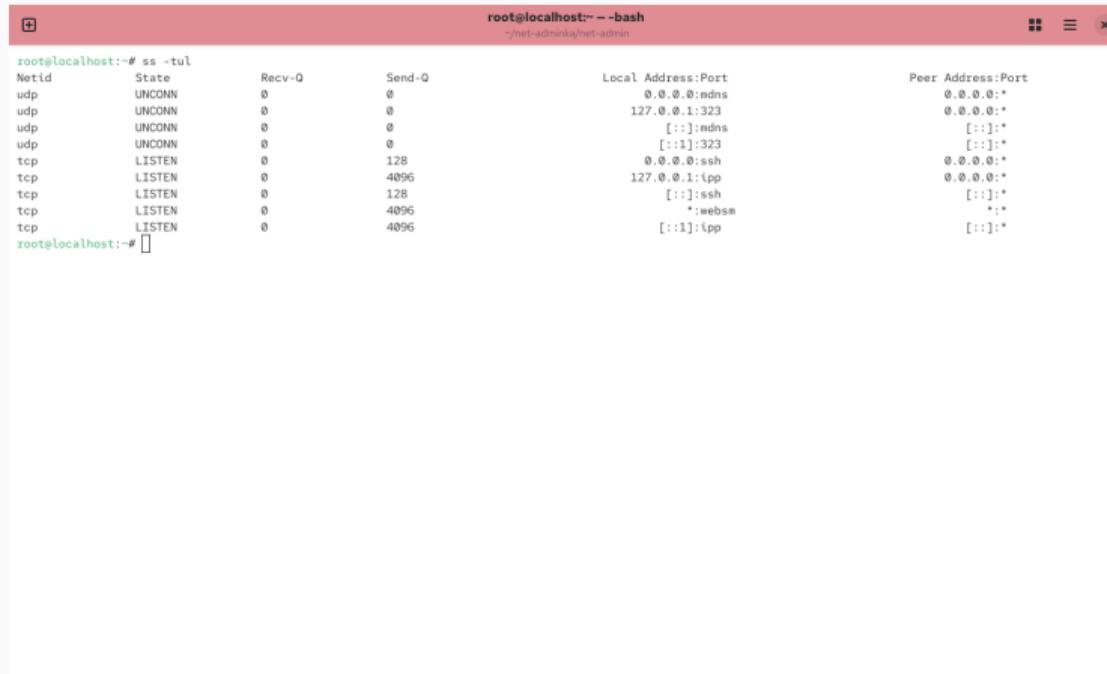
```
root@localhost:~# ifconfig
enp0s3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 10.0.2.15  netmask 255.255.255.0  broadcast 10.0.2.255
                inet6 fe80::a00:27ff:fe52:8281  prefixlen 64  scopeid 0x20<link>
        ether 08:00:27:52:82:81  txqueuelen 1000  (Ethernet)
                RX packets 34812  bytes 37105211 (35.3 MB)
                RX errors 0  dropped 0  overruns 0  frame 0
                TX packets 12455  bytes 2622238 (2.5 MB)
                TX errors 0  dropped 0  overruns 0  carrier 0  collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING>  mtu 65536
        inet 127.0.0.1  netmask 255.0.0.0
                inet6 ::1  prefixlen 128  scopeid 0x10<host>
        loop  txqueuelen 1000  (Local Loopback)
                RX packets 24  bytes 2514 (2.4 KiB)
                RX errors 0  dropped 0  overruns 0  frame 0
                TX packets 24  bytes 2514 (2.4 KiB)
                TX errors 0  dropped 0  overruns 0  carrier 0  collisions 0

root@localhost:~#
```

Рис. 5: 1.5. Вывод информации после команды ifconfig.

UDP & TCP

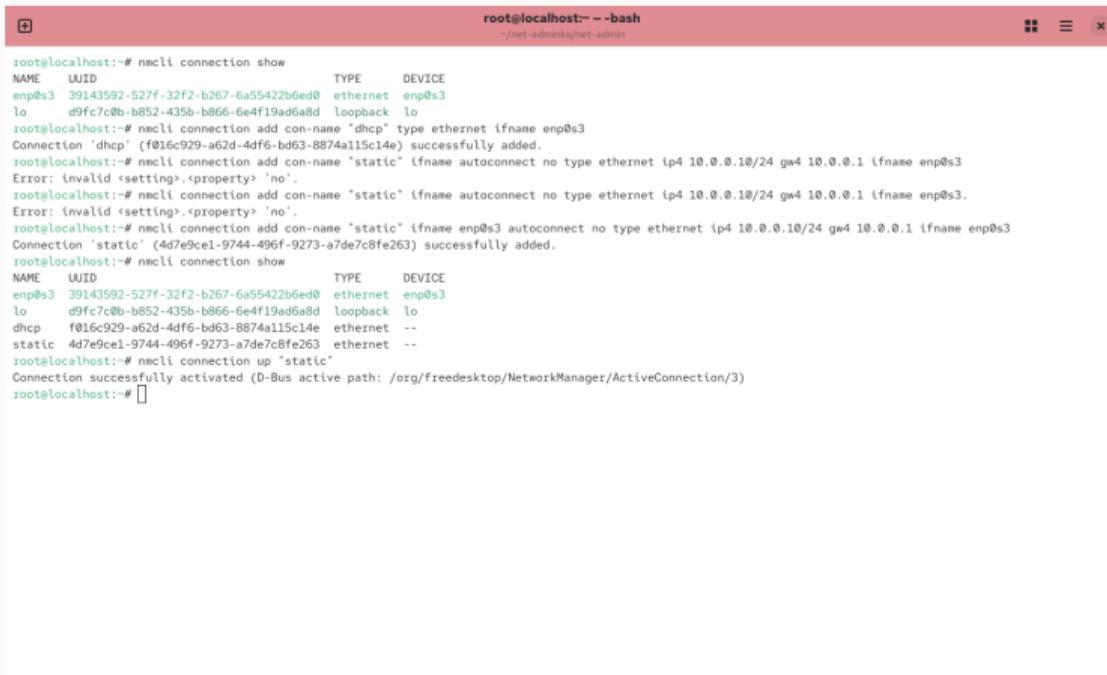


The screenshot shows a terminal window with a red header bar containing the text "root@localhost:~ - bash" and the path "/net-adminka/net-admin". The terminal displays the output of the command "ss -tul". The output lists various network connections, primarily TCP, showing their Netid, State, Recv-Q, Send-Q, Local Address:Port, and Peer Address:Port.

| Netid | State | Recv-Q | Send-Q | Local Address:Port | Peer Address:Port |
|-------|--------|--------|--------|--------------------|-------------------|
| udp | UNCONN | 0 | 0 | 0.0.0.0:ndns | 0.0.0.0:* |
| udp | UNCONN | 0 | 0 | 127.0.0.1:323 | 0.0.0.0:* |
| udp | UNCONN | 0 | 0 | [::]:ndns | [::]:* |
| udp | UNCONN | 0 | 0 | [::1]:323 | [::]:* |
| tcp | LISTEN | 0 | 128 | 0.0.0.0:ssh | 0.0.0.0:* |
| tcp | LISTEN | 0 | 4096 | 127.0.0.1:tcp | 0.0.0.0:* |
| tcp | LISTEN | 0 | 128 | [::]:ssh | [::]:* |
| tcp | LISTEN | 0 | 4096 | *:websm | * |
| tcp | LISTEN | 0 | 4096 | [::1]:ipp | [::]:* |

Рис. 6: Вывод списка всех прослушиваемых системой портов

Соединения

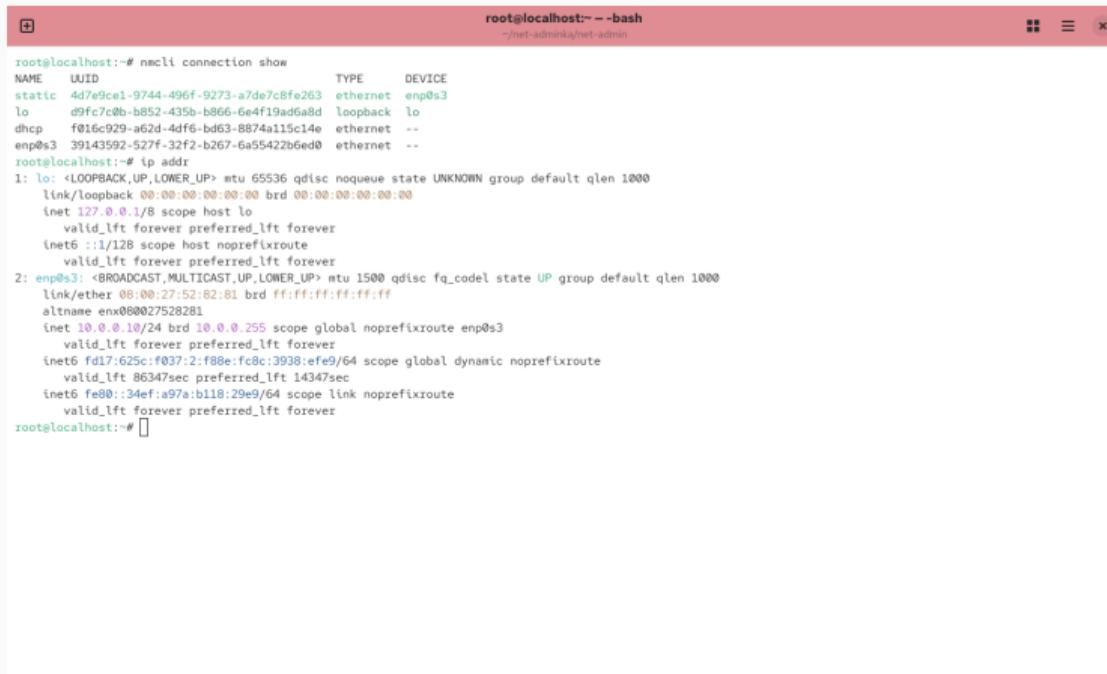


The screenshot shows a terminal window with a red header bar containing the text "root@localhost:~ - bash" and the path "/net-admin/Net-admin". The terminal displays the following command-line session:

```
root@localhost:~# nmcli connection show
NAME      UUID              TYPE      DEVICE
enp0s3    39143592-527f-32f2-b267-6a55422b6ed0  ethernet  enp0s3
lo        d9fc7c0b-b852-435b-b866-6e4f19ad6a8d  loopback  lo
root@localhost:~# nmcli connection add con-name "dhcp" type ethernet ifname enp0s3
Connection 'dhcp' (f016c929-a62d-4df6-bd63-8874a115c14e) successfully added.
root@localhost:~# nmcli connection add con-name "static" ifname autoconnect no type ethernet ip4 10.0.0.10/24 gw4 10.0.0.1 ifname enp0s3
Error: invalid <setting>.property: 'no'.
root@localhost:~# nmcli connection add con-name "static" ifname autoconnect no type ethernet ip4 10.0.0.10/24 gw4 10.0.0.1 ifname enp0s3.
Error: invalid <setting>.property: 'no'.
root@localhost:~# nmcli connection add con-name "static" ifname enp0s3 autoconnect no type ethernet ip4 10.0.0.10/24 gw4 10.0.0.1 ifname enp0s3
Connection 'static' (4d7e9ce1-9744-496f-9273-a7de7c8fe263) successfully added.
root@localhost:~# nmcli connection show
NAME      UUID              TYPE      DEVICE
enp0s3    39143592-527f-32f2-b267-6a55422b6ed0  ethernet  enp0s3
lo        d9fc7c0b-b852-435b-b866-6e4f19ad6a8d  loopback  lo
dhcp     f016c929-a62d-4df6-bd63-8874a115c14e  ethernet  --
static   4d7e9ce1-9744-496f-9273-a7de7c8fe263  ethernet  --
root@localhost:~# nmcli connection up "static"
Connection successfully activated (D-Bus active path: /org/freedesktop/NetworkManager/ActiveConnection/3)
root@localhost:~#
```

Рис. 7: Вывод на экран информации о текущих соединениях

Проверка переключения



The screenshot shows a terminal window titled "root@localhost:~ - bash" with the command "/net-admin/Net-admin". The terminal displays the output of the "nmcli connection show" command, listing network connections and their details. It also shows the output of the "ip addr" command, providing detailed information about network interfaces like lo and enp0s3.

```
root@localhost:~# nmcli connection show
NAME      UUID                                  TYPE      DEVICE
static    4d7e9ce1-9744-496f-9273-a7de7c8fe263  ethernet  enp0s3
lo        d9fc7c8b-b852-435b-b866-6e4f19ad6a8d  loopback  lo
dhcp     f016c929-a62d-4df6-bd63-8874a115c14e  ethernet  --
enp0s3   39143592-527f-32f2-b267-6a55422b6ed0  ethernet  --
root@localhost:~# ip addr
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
        inet 127.0.0.1/8 scope host lo
            valid_lft forever preferred_lft forever
    link/ether 00:00:27:52:82:81 brd ff:ff:ff:ff:ff:ff
        altname enx000027528281
        inet 10.0.0.10/24 brd 10.0.0.255 scope global noprefixroute enp0s3
            valid_lft forever preferred_lft forever
        inet6 fd17:625c:f037:2:f88e:fc8c:3988:eфе/64 scope global dynamic noprefixroute
            valid_lft 86347sec preferred_lft 14347sec
        inet6 fe80::34ef:a97a:b118:29e9/64 scope link noprefixroute
            valid_lft forever preferred_lft forever
root@localhost:~#
```

Рис. 8: Проверка переключения

Соединение dhcp

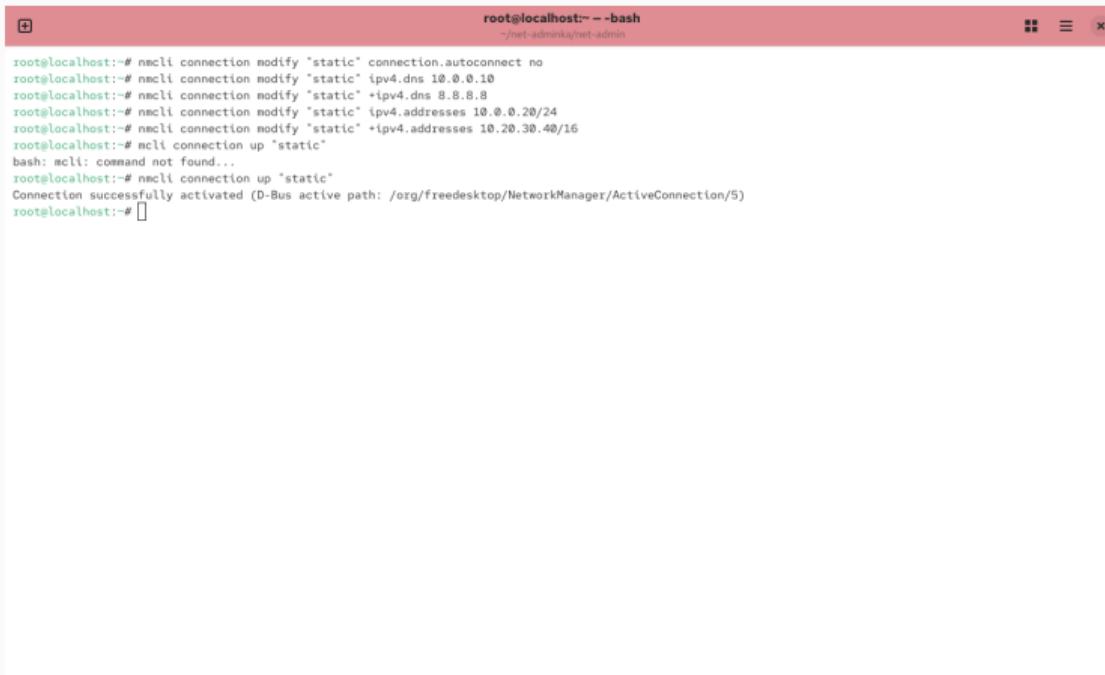


The screenshot shows a terminal window titled "root@localhost:~ - bash" with the command prompt "root@localhost:~#". The window contains the following text:

```
root@localhost:~# nmcli connection up "dhcp"
Connection successfully activated (D-Bus active path: /org/freedesktop/NetworkManager/ActiveConnection/4)
root@localhost:~# nmcli connection show
NAME      UUID                                  TYPE      DEVICE
dhcpc     f016c929-a62d-4df6-bd63-8874a115c14e  ethernet  enp0s3
lo        d9fe7c8b-b852-435b-b866-64ef19ad6a0d  loopback  lo
enp0s3    39143592-527f-32f2-b267-6a5422b6ed0  ethernet  --
static    4d7e9ce1-9744-496f-9273-a7de7c8fe263  ethernet  --
root@localhost:~# ip addr
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host noprefixroute
        valid_lft forever preferred_lft forever
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 08:00:27:52:82:81 brd ff:ff:ff:ff:ff:ff
    altname enx080027528281
    inet 10.0.2.15/24 brd 10.0.2.255 scope global dynamic noprefixroute enp0s3
        valid_lft 86384sec preferred_lft 86384sec
    inet6 fd17:625c:f037:2:82ae:4966:76ca:1a5c/64 scope global dynamic noprefixroute
        valid_lft 86385sec preferred_lft 14385sec
    inet6 fe80::4a82:c95d:f726:334/64 scope link noprefixroute
        valid_lft forever preferred_lft forever
root@localhost:~#
```

Рис. 9: Возвращение к соединению dhcp и последующая проверка успешности переключения.

Статическое соединение



The screenshot shows a terminal window with a red header bar containing the title 'root@localhost:~ - bash' and the path '/net-admin/iface/net-admin'. The terminal window itself has a light gray background and displays the following command-line session:

```
root@localhost:~# nmcli connection modify "static" connection.autoconnect no
root@localhost:~# nmcli connection modify "static" ipv4.dns 10.0.0.10
root@localhost:~# nmcli connection modify "static" +ipv4.dns 8.8.8.8
root@localhost:~# nmcli connection modify "static" ipv4.addresses 10.0.0.20/24
root@localhost:~# nmcli connection modify "static" +ipv4.addresses 10.20.30.40/16
root@localhost:~# nmcli connection up "static"
bash: mcli: command not found...
root@localhost:~# nmcli connection up "static"
Connection successfully activated (D-Bus active path: /org/freedesktop/NetworkManager/ActiveConnection/5)
root@localhost:~#
```

Рис. 10: Отключение автоподключения статического соединения

Настройки сетевых соединений

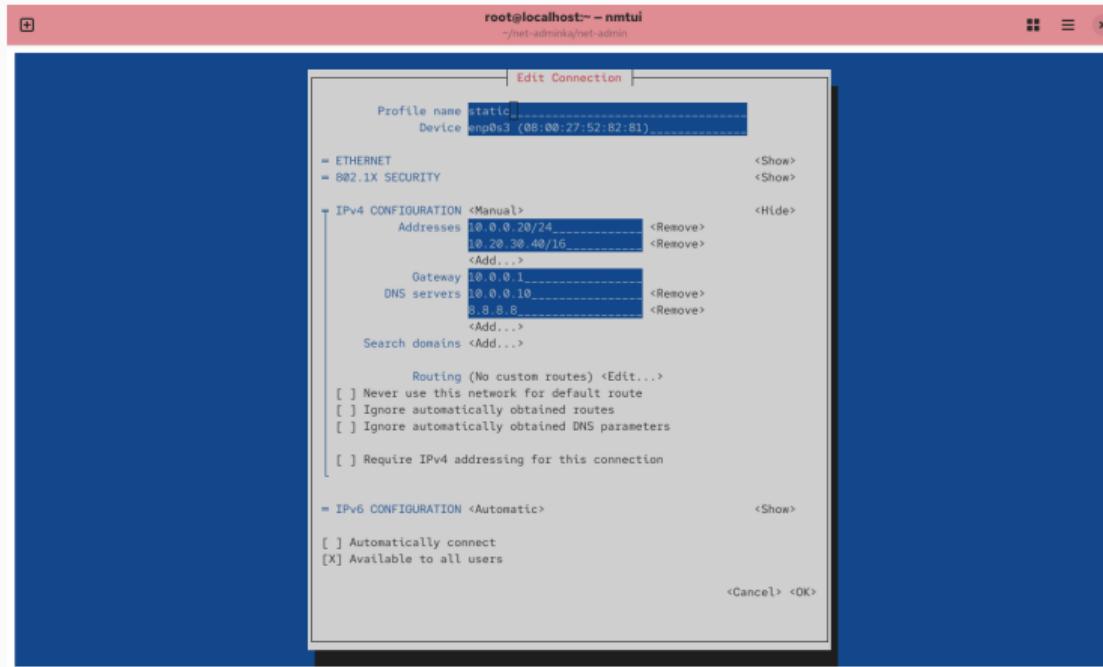


Рис. 11: Просмотр настроек сетевых соединений

##Первоначальное сетевое соединение

Вывод

Вывод

В ходе работы были изучены методы настройки сетей