МИНОБРНАУКИ РОССИИ

Федеральное государственное бюджетное образовательное учреждение высшего образования

НИЖЕГОРОДСКИЙ ГОСУДАРСТВЕННЫЙ ТЕХНИЧЕСКИЙ

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Институт радиоэлектроники и информационных технологий

Кафедра «Вычислительные системы и технологии»

Сети и телекоммуникации

Отчет

по лабораторной работе №2

Маршрутизация в IP сетях

ПРОВЕРИЛ:

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Задание:

1. Смоделировать сеть
2. Расставить IP адреса и маски (у роутеров на интерфейсах ip адреса – из начала диапазона)
3. Добавить маршруты для прохождения пакетов между всеми частями сети (ipforwarding)
4. сделать несколько маршрутов специфичных, показать, как это работает (удаляя и добавляя маршрут)
5. показать пример удаления маршрута с демонстрацией отсутствия ping

2 Вариант

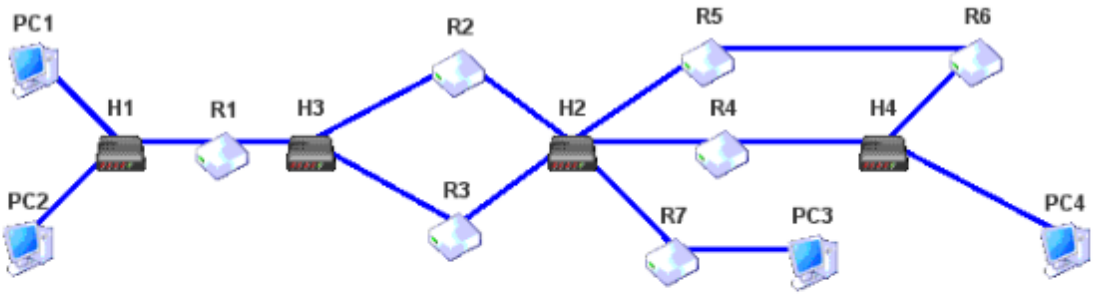
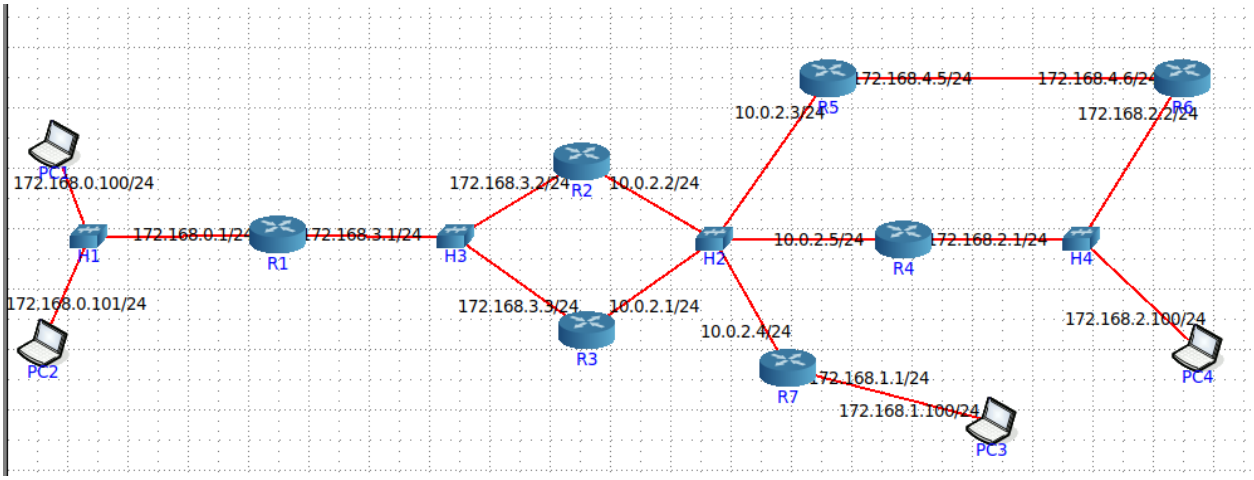


Рис. 2.3. Структура исследуемой сетевой архитектуры - вариант №2

- Файл со схемой сети: lab2_var2.jfst.
- Сеть между маршрутизаторами R1, R2 и R3: 172.168.3.0.
- Сеть между маршрутизаторами R5 и R6: 172.168.4.0.
- Компьютер PC1 имеет IP-адрес 172.168.0.100.
- Компьютер PC3 имеет IP-адрес 172.168.1.100.
- Компьютер PC4 имеет IP-адрес: 172.168.2.100.
- Обозначения в задании: K1 – PC1, K2 – PC3, K3 – PC4.

Ход работы:

Смоделирую сеть из задания:



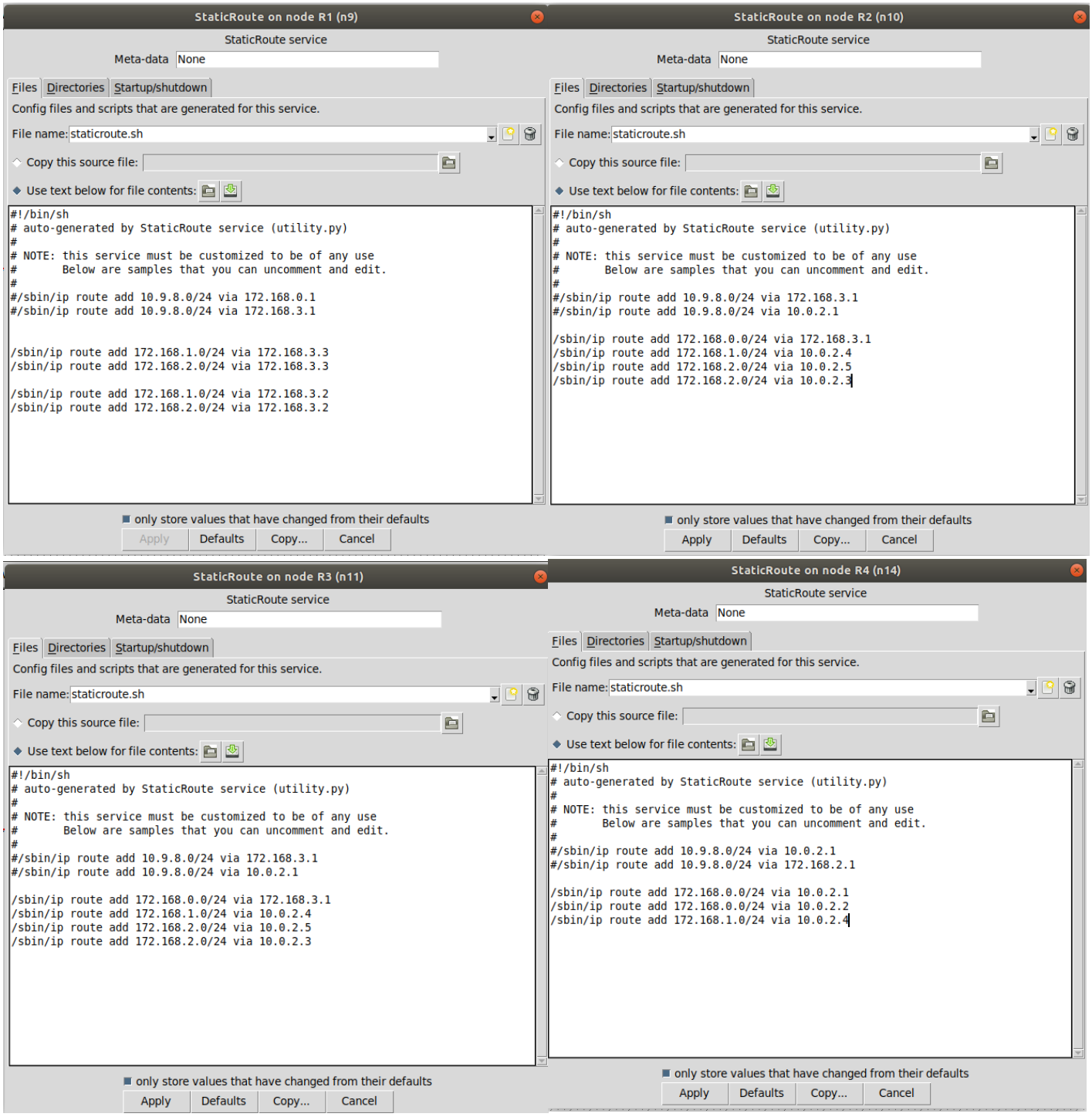
IP адреса:

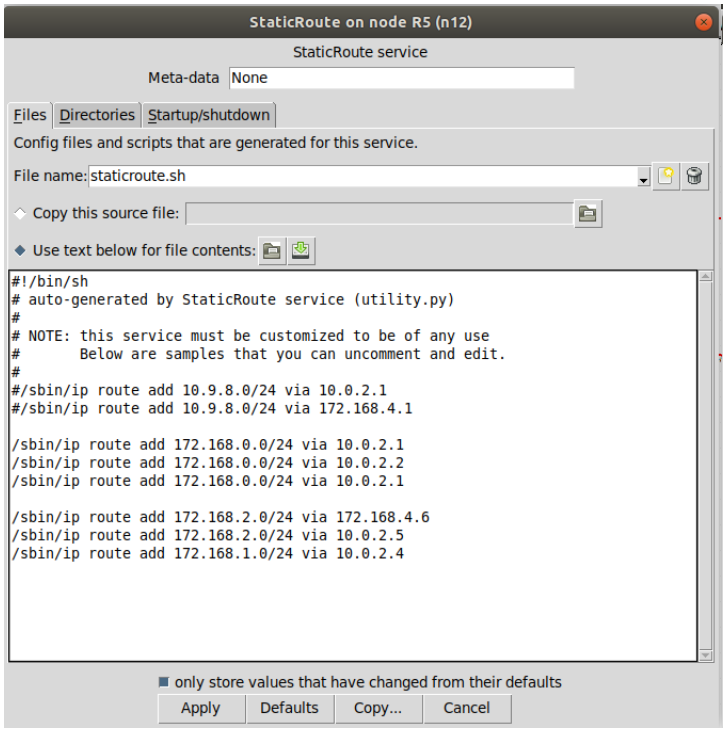
Компьютеры:
PC1 = 172.168.0.100/24
PC2 = 172.168.0.101/24 (пусть будет в одной подсети с PC1, как контрольный)
PC3 = 172.168.1.100/24
PC4 = 172.168.2.100/24

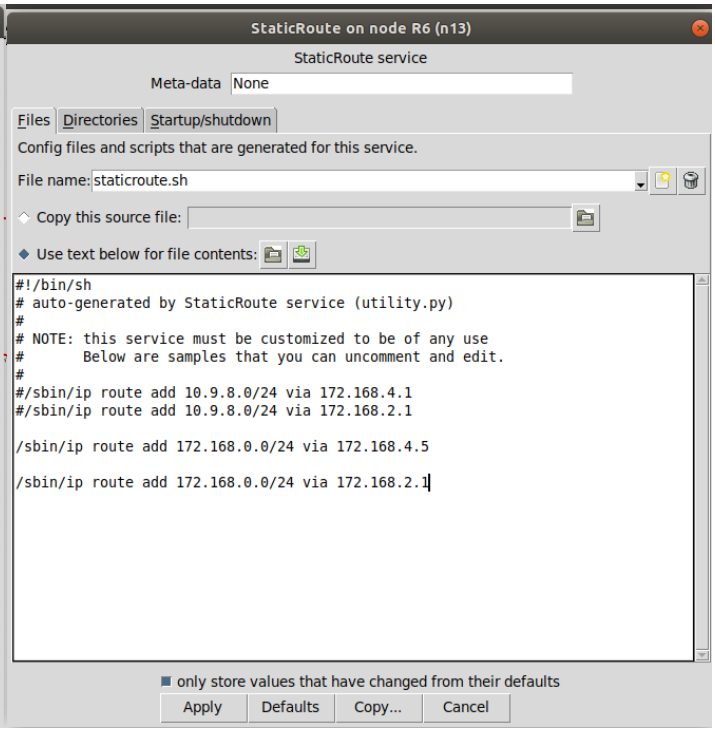
Маршрутизаторы:

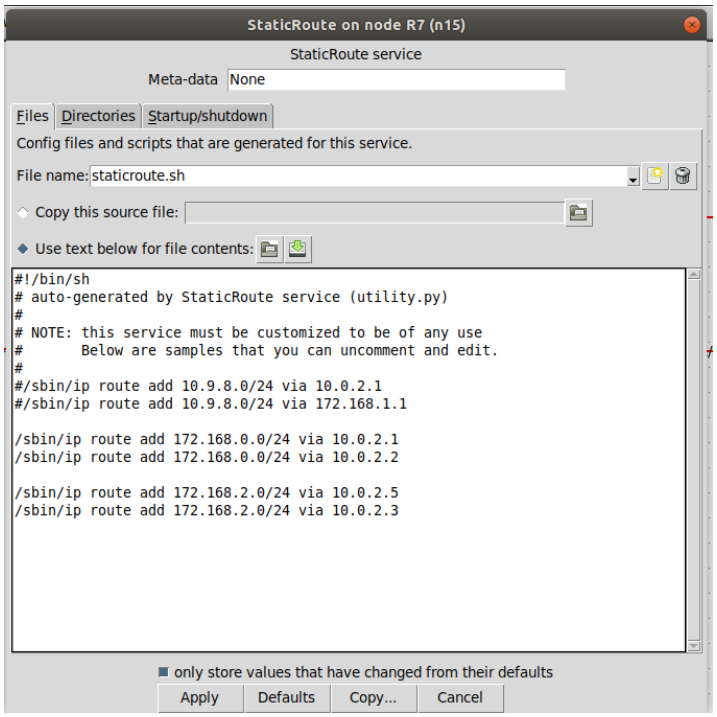
Маршрутизатор	IPv4 (Интерфейс eth0)	IPv4 (Интерфейс eth1)	Одна сеть с ... (eth0)	Одна сеть с ... (eth1)
R1	172.168.0.1/24	172.168.3.1/24	PC1, PC2	R2, R3
R2	172.168.3.2/24	10.0.2.2/24	R2, R3	R3, R4, R5, R7
R3	172.168.3.3/24	10.0.2.1/24	R2, R3	R2, R4, R5, R7
R4	10.0.2.5/24	172.168.2.1/24	R2, R3, R5, R7	R6, PC4
R5	10.0.2.3/24	172.168.4.5/24	R2, R3, R4, R7	R6
R6	172.168.4.6/24	172.168.2.2/24	R5	R4, PC4
R7	10.0.2.4/24	172.168.1.1/24	R2, R3, R4, R5	PC3

Добавлю маршруты роутерам:




StaticRoute on node R5 (n12)
StaticRoute service
Meta-data None
Files Directories Startup/shutdown
Config files and scripts that are generated for this service.
File name: staticroute.sh
Copy this source file:
Use text below for file contents:
#!/bin/sh
auto-generated by StaticRoute service (utility.py)
#
NOTE: this service must be customized to be of any use
Below are samples that you can uncomment and edit.
#
#/sbin/ip route add 10.9.8.0/24 via 10.0.2.1
#/sbin/ip route add 10.9.8.0/24 via 172.168.4.1
/sbin/ip route add 172.168.0.0/24 via 10.0.2.1
/sbin/ip route add 172.168.0.0/24 via 10.0.2.2
/sbin/ip route add 172.168.0.0/24 via 10.0.2.1
/sbin/ip route add 172.168.2.0/24 via 172.168.4.6
/sbin/ip route add 172.168.2.0/24 via 10.0.2.5
/sbin/ip route add 172.168.1.0/24 via 10.0.2.4
only store values that have changed from their defaults
Apply Defaults Copy... Cancel


StaticRoute on node R6 (n13)
StaticRoute service
Meta-data None
Files Directories Startup/shutdown
Config files and scripts that are generated for this service.
File name: staticroute.sh
Copy this source file:
Use text below for file contents:
#!/bin/sh
auto-generated by StaticRoute service (utility.py)
#
NOTE: this service must be customized to be of any use
Below are samples that you can uncomment and edit.
#
#/sbin/ip route add 10.9.8.0/24 via 172.168.4.1
#/sbin/ip route add 10.9.8.0/24 via 172.168.2.1
/sbin/ip route add 172.168.0.0/24 via 172.168.4.5
/sbin/ip route add 172.168.0.0/24 via 172.168.2.1
only store values that have changed from their defaults
Apply Defaults Copy... Cancel


StaticRoute on node R7 (n15)
StaticRoute service
Meta-data None
Files Directories Startup/shutdown
Config files and scripts that are generated for this service.
File name: staticroute.sh
Copy this source file:
Use text below for file contents:
#!/bin/sh
auto-generated by StaticRoute service (utility.py)
#
NOTE: this service must be customized to be of any use
Below are samples that you can uncomment and edit.
#
#/sbin/ip route add 10.9.8.0/24 via 10.0.2.1
#/sbin/ip route add 10.9.8.0/24 via 172.168.1.1
/sbin/ip route add 172.168.0.0/24 via 10.0.2.1
/sbin/ip route add 172.168.0.0/24 via 10.0.2.2
/sbin/ip route add 172.168.2.0/24 via 10.0.2.5
/sbin/ip route add 172.168.2.0/24 via 10.0.2.3
only store values that have changed from their defaults
Apply Defaults Copy... Cancel

Проверю, проходит ли ping:

PC1:

```
root@PC1:/tmp/pycore.45077/PC1.conf# ping 172.168.0.101
PING 172.168.0.101 (172.168.0.101) 56(84) bytes of data.
64 bytes from 172.168.0.101: icmp_seq=1 ttl=64 time=0.051 ms
64 bytes from 172.168.0.101: icmp_seq=2 ttl=64 time=0.046 ms
64 bytes from 172.168.0.101: icmp_seq=3 ttl=64 time=0.032 ms
^C
--- 172.168.0.101 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2025ms
rtt min/avg/max/mdev = 0.032/0.043/0.051/0.008 ms
```

```
root@PC1:/tmp/pycore.45077/PC1.conf# ping 172.168.1.100
PING 172.168.1.100 (172.168.1.100) 56(84) bytes of data.
64 bytes from 172.168.1.100: icmp_seq=1 ttl=61 time=0.129 ms
64 bytes from 172.168.1.100: icmp_seq=2 ttl=61 time=0.074 ms
64 bytes from 172.168.1.100: icmp_seq=3 ttl=61 time=0.088 ms
^C
--- 172.168.1.100 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2039ms
rtt min/avg/max/mdev = 0.074/0.097/0.129/0.023 ms
```

```
root@PC1:/tmp/pycore.45077/PC1.conf# ping 172.168.2.100
PING 172.168.2.100 (172.168.2.100) 56(84) bytes of data.
64 bytes from 172.168.2.100: icmp_seq=1 ttl=61 time=0.119 ms
64 bytes from 172.168.2.100: icmp_seq=2 ttl=61 time=0.136 ms
^C
--- 172.168.2.100 ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1011ms
rtt min/avg/max/mdev = 0.119/0.127/0.136/0.014 ms
root@PC1:/tmp/pycore.45077/PC1.conf#
```

PC3:

```
root@PC3:/tmp/pycore.45077/PC3.conf# ping 172.168.0.100
PING 172.168.0.100 (172.168.0.100) 56(84) bytes of data.
64 bytes from 172.168.0.100: icmp_seq=1 ttl=61 time=0.056 ms
64 bytes from 172.168.0.100: icmp_seq=2 ttl=61 time=0.064 ms
64 bytes from 172.168.0.100: icmp_seq=3 ttl=61 time=0.078 ms
^C
--- 172.168.0.100 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2054ms
rtt min/avg/max/mdev = 0.056/0.066/0.078/0.009 ms
```

```
root@PC3:/tmp/pycore.45077/PC3.conf# ping 172.168.2.100
PING 172.168.2.100 (172.168.2.100) 56(84) bytes of data.
64 bytes from 172.168.2.100: icmp_seq=1 ttl=62 time=0.069 ms
64 bytes from 172.168.2.100: icmp_seq=2 ttl=62 time=0.052 ms
64 bytes from 172.168.2.100: icmp_seq=3 ttl=62 time=0.105 ms
^C
--- 172.168.2.100 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2028ms
rtt min/avg/max/mdev = 0.052/0.075/0.105/0.023 ms
root@PC3:/tmp/pycore.45077/PC3.conf#
```

PC4:

```
root@PC4:/tmp/pycore.45077/PC4.conf# ping 172.168.0.100
PING 172.168.0.100 (172.168.0.100) 56(84) bytes of data.
64 bytes from 172.168.0.100: icmp_seq=1 ttl=61 time=0.067 ms
64 bytes from 172.168.0.100: icmp_seq=2 ttl=61 time=0.094 ms
^C
--- 172.168.0.100 ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1001ms
rtt min/avg/max/mdev = 0.067/0.080/0.094/0.016 ms
```

```
root@PC4:/tmp/pycore.45077/PC4.conf# ping 172.168.1.100
PING 172.168.1.100 (172.168.1.100) 56(84) bytes of data.
64 bytes from 172.168.1.100: icmp_seq=1 ttl=62 time=0.051 ms
64 bytes from 172.168.1.100: icmp_seq=2 ttl=62 time=0.074 ms
64 bytes from 172.168.1.100: icmp_seq=3 ttl=62 time=0.052 ms
^C
--- 172.168.1.100 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2039ms
rtt min/avg/max/mdev = 0.051/0.059/0.074/0.010 ms
root@PC4:/tmp/pycore.45077/PC4.conf#
```

Проверим ping, удаляя и добавляя маршруты:

```
root@R1:/tmp/pycore.45077/R1.conf# ip route del 172.168.1.0 via 172.168.3.3
RTNETLINK answers: No such process
root@R1:/tmp/pycore.45077/R1.conf# ip route del 172.168.1.0/24 via 172.168.3.3
root@R1:/tmp/pycore.45077/R1.conf# ip route add 172.168.1.0/24 via 172.168.3.3
root@R1:/tmp/pycore.45077/R1.conf#
```

Ping PC1 – PC3 до удаления маршрута и после удаления маршрута (ping проходит, т.к. есть запасной маршрут).

```
root@PC1:/tmp/pycore.45077/PC1.conf# ping 172.168.1.100
PING 172.168.1.100 (172.168.1.100) 56(84) bytes of data.
64 bytes from 172.168.1.100: icmp_seq=1 ttl=61 time=0.623 ms
64 bytes from 172.168.1.100: icmp_seq=2 ttl=61 time=0.196 ms
64 bytes from 172.168.1.100: icmp_seq=3 ttl=61 time=0.190 ms
64 bytes from 172.168.1.100: icmp_seq=4 ttl=61 time=0.249 ms
64 bytes from 172.168.1.100: icmp_seq=5 ttl=61 time=0.554 ms
64 bytes from 172.168.1.100: icmp_seq=6 ttl=61 time=0.073 ms
64 bytes from 172.168.1.100: icmp_seq=7 ttl=61 time=0.099 ms
^C
--- 172.168.1.100 ping statistics ---
7 packets transmitted, 7 received, 0% packet loss, time 6128ms
rtt min/avg/max/mdev = 0.073/0.283/0.623/0.202 ms
root@PC1:/tmp/pycore.45077/PC1.conf# ping 172.168.1.100
PING 172.168.1.100 (172.168.1.100) 56(84) bytes of data.
64 bytes from 172.168.1.100: icmp_seq=1 ttl=61 time=0.063 ms
64 bytes from 172.168.1.100: icmp_seq=2 ttl=61 time=0.611 ms
64 bytes from 172.168.1.100: icmp_seq=3 ttl=61 time=0.159 ms
64 bytes from 172.168.1.100: icmp_seq=4 ttl=61 time=0.104 ms
^C
--- 172.168.1.100 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3052ms
rtt min/avg/max/mdev = 0.063/0.234/0.611/0.220 ms
root@PC1:/tmp/pycore.45077/PC1.conf#
```

```
Терминал
Файл  Правка  Вид  Поиск  Терминал  Справка
root@R1:/tmp/pycore.45077/R1.conf# ip route show
172.168.0.0/24 dev eth0 proto kernel scope link src 172.168.0.1
172.168.1.0/24 via 172.168.3.3 dev eth1
172.168.1.0/24 via 172.168.3.2 dev eth1 metric 5
172.168.2.0/24 via 172.168.3.3 dev eth1
172.168.2.0/24 via 172.168.3.2 dev eth1 metric 5
172.168.3.0/24 dev eth1 proto kernel scope link src 172.168.3.1
<1.conf# ip route del 172.168.1.0/24 via 172.168.3.2
root@R1:/tmp/pycore.45077/R1.conf#
```