

Федеральное государственное бюджетное общеобразовательное
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(СибГУТИ)

Кафедра вычислительных систем

ПРАКТИЧЕСКОЕ ЗАДАНИЕ № 6

«Маршрутизация пакетов в локальных сетях»

Выполнил:

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1. Настроила конфигурацию. Мне представлена подсеть 10.10.1.0/24, тогда 4 подсети будут: 10.10.1.0-10.10.1.63
10.10.1.64-10.10.1.127
10.10.1.128-10.10.1.191
10.10.1.192-10.10.1.255.
2. Настроила все машины и адаптеры на статические IP адреса.

Имя	IPv4 префикс	IPv6
VirtualBox Host-Only Ethernet Adapter	10.10.1.1/26	
VirtualBox Host-Only Ethernet Adapter #2	10.10.1.65/26	
VirtualBox Host-Only Ethernet Adapter #3	10.10.1.129/26	
VirtualBox Host-Only Ethernet Adapter #4	10.10.1.193/24	

```
GNU nano 2.7.4                                Файл: interfaces

# This file describes the network interfaces available on your system
# and how to activate them. For more information, see interfaces(5).

source /etc/network/interfaces.d/*

# The loopback network interface
auto lo
iface lo inet loopback

auto eth0
iface eth0 inet static
    address 10.10.1.3
    netmask 255.255.255.192
    up ip route add 10.10.1.65/26 via 10.10.1.2 dev eth0
    up ip route add 10.10.1.129/26 via 10.10.1.2 via eth0

auto eth1
iface eth1 inet static
    address 10.10.1.195
    netmask 255.255.255.192_

[ Записано 20 строк ]
Помощь      Записать  Поиск      Вырезать   Выводить   ТекПозиц   ПредСтр
Выход       ЧитФайл   Замена    Отмен. выр  Словарь    К строке   СледСтр
```

```
[admin@MikroTik] > /ip address print
Columns: ADDRESS, NETWORK, INTERFACE
# ADDRESS      NETWORK      INTERFACE
0 10.10.1.2/26   10.10.1.0    ether3
1 10.10.1.67/26  10.10.1.64   ether4

[admin@MikroTik] > /ip address print
Columns: ADDRESS, NETWORK, INTERFACE
# ADDRESS      NETWORK      INTERFACE
0 10.10.1.131/26 10.10.1.128  ether2
1 10.10.1.66/26  10.10.1.64   ether1
```

```
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 08:00:27:57:c6:d2 brd ff:ff:ff:ff:ff:ff
    inet 169.254.11.164/16 brd 169.254.255.255 scope link enp0s3:avahi
        valid_lft forever preferred_lft forever
    inet 10.10.1.130/26 brd 10.10.1.191 scope global enp0s3
        valid_lft forever preferred_lft forever
    inet6 fe80::a00:27ff:fe57:c6d2/64 scope link
        valid_lft forever preferred_lft forever
3: enp0s8: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 08:00:27:00:ca:2f brd ff:ff:ff:ff:ff:ff
    inet 169.254.6.138/16 brd 169.254.255.255 scope link enp0s8:avahi
        valid_lft forever preferred_lft forever
    inet 10.10.1.194/26 brd 10.10.1.255 scope global enp0s8
        valid_lft forever preferred_lft forever
    inet6 fe80::a00:27ff:fe00:ca2f/64 scope link
        valid_lft forever preferred_lft forever
```

Далее были настроены IP route, чтобы любой узел пинговал любой другой.
AstraLinux:

```
user@astra:~$ ping 10.10.1.67
PING 10.10.1.67 (10.10.1.67) 56(84) bytes of data.
64 bytes from 10.10.1.67: icmp_seq=1 ttl=64 time=0.702 ms
64 bytes from 10.10.1.67: icmp_seq=2 ttl=64 time=0.591 ms
64 bytes from 10.10.1.67: icmp_seq=3 ttl=64 time=0.573 ms
64 bytes from 10.10.1.67: icmp_seq=4 ttl=64 time=0.523 ms
^C
--- 10.10.1.67 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3047ms
rtt min/avg/max/mdev = 0.523/0.597/0.702/0.067 ms
user@astra:~$ ping 10.10.1.66
PING 10.10.1.66 (10.10.1.66) 56(84) bytes of data.
64 bytes from 10.10.1.66: icmp_seq=1 ttl=63 time=1.05 ms
64 bytes from 10.10.1.66: icmp_seq=2 ttl=63 time=1.16 ms
64 bytes from 10.10.1.66: icmp_seq=3 ttl=63 time=0.987 ms
64 bytes from 10.10.1.66: icmp_seq=4 ttl=63 time=0.932 ms
64 bytes from 10.10.1.66: icmp_seq=5 ttl=63 time=1.03 ms
64 bytes from 10.10.1.66: icmp_seq=6 ttl=63 time=0.986 ms
^C
--- 10.10.1.66 ping statistics ---
7 packets transmitted, 7 received, 0% packet loss, time 6011ms
rtt min/avg/max/mdev = 0.932/1.034/1.160/0.073 ms
user@astra:~$ ping 10.10.1.130
PING 10.10.1.130 (10.10.1.130) 56(84) bytes of data.
64 bytes from 10.10.1.130: icmp_seq=1 ttl=62 time=1.69 ms
64 bytes from 10.10.1.130: icmp_seq=2 ttl=62 time=1.64 ms
64 bytes from 10.10.1.130: icmp_seq=3 ttl=62 time=1.59 ms
64 bytes from 10.10.1.130: icmp_seq=4 ttl=62 time=1.54 ms
64 bytes from 10.10.1.130: icmp_seq=5 ttl=62 time=1.81 ms
64 bytes from 10.10.1.130: icmp_seq=6 ttl=62 time=1.71 ms
^C
--- 10.10.1.130 ping statistics ---
6 packets transmitted, 6 received, 0% packet loss, time 5009ms
rtt min/avg/max/mdev = 1.547/1.668/1.813/0.092 ms
user@astra:~$
```

БазальтОС:

```
[root@host-102 rc.d]# ping 10.10.1.3
PING 10.10.1.3 (10.10.1.3) 56(84) bytes of data.
64 bytes from 10.10.1.3: icmp_seq=1 ttl=62 time=1.92 ms
64 bytes from 10.10.1.3: icmp_seq=2 ttl=62 time=1.88 ms
64 bytes from 10.10.1.3: icmp_seq=3 ttl=62 time=1.33 ms
^C
--- 10.10.1.3 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2002ms
rtt min/avg/max/mdev = 1.334/1.709/1.920/0.266 ms
[root@host-102 rc.d]# ping 10.10.1.67
PING 10.10.1.67 (10.10.1.67) 56(84) bytes of data.
64 bytes from 10.10.1.67: icmp_seq=1 ttl=63 time=1.11 ms
64 bytes from 10.10.1.67: icmp_seq=2 ttl=63 time=1.01 ms
64 bytes from 10.10.1.67: icmp_seq=3 ttl=63 time=1.04 ms
^C
--- 10.10.1.67 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2003ms
rtt min/avg/max/mdev = 1.010/1.052/1.110/0.042 ms
[root@host-102 rc.d]# ping 10.10.1.66
PING 10.10.1.66 (10.10.1.66) 56(84) bytes of data.
64 bytes from 10.10.1.66: icmp_seq=1 ttl=64 time=0.783 ms
64 bytes from 10.10.1.66: icmp_seq=2 ttl=64 time=0.552 ms
64 bytes from 10.10.1.66: icmp_seq=3 ttl=64 time=0.516 ms
64 bytes from 10.10.1.66: icmp_seq=4 ttl=64 time=0.461 ms
^C
--- 10.10.1.66 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3057ms
rtt min/avg/max/mdev = 0.461/0.578/0.783/0.122 ms
```

Mikrotik1:

```
[admin@MikroTik] > ping 10.10.1.130
```

SEQ	HOST	SIZE	TTL	TIME	STATUS
0	10.10.1.130	56	64	516us	
1	10.10.1.130	56	64	504us	
2	10.10.1.130	56	64	565us	

sent=3 received=3 packet-loss=0% min-rtt=504us avg-rtt=528us
max-rtt=565us

```
[admin@MikroTik] > ping 10.10.1.3
```

SEQ	HOST	SIZE	TTL	TIME	STATUS
0	10.10.1.3	56	63	1ms431us	
1	10.10.1.3	56	63	1ms62us	
2	10.10.1.3	56	63	1ms141us	

sent=3 received=3 packet-loss=0% min-rtt=1ms62us avg-rtt=1ms211us
max-rtt=1ms431us

```
[admin@MikroTik] > ping 10.10.1.66
```

SEQ	HOST	SIZE	TTL	TIME	STATUS
0	10.10.1.66	56	64	48us	
1	10.10.1.66	56	64	45us	
2	10.10.1.66	56	64	56us	

sent=3 received=3 packet-loss=0% min-rtt=45us avg-rtt=49us max-rtt=56us

Mikrotik2:

```
[admin@MikroTik] > ping 10.10.1.3
```

SEQ	HOST	SIZE	TTL	TIME	STATUS
0	10.10.1.3	56	64	645us	
1	10.10.1.3	56	64	624us	
2	10.10.1.3	56	64	797us	
3	10.10.1.3	56	64	760us	

sent=4 received=4 packet-loss=0% min-rtt=624us avg-rtt=706us
max-rtt=797us

```
[admin@MikroTik] > ping 10.10.1.131
```

SEQ	HOST	SIZE	TTL	TIME	STATUS
0	10.10.1.131	56	64	626us	
1	10.10.1.131	56	64	615us	
2	10.10.1.131	56	64	661us	

sent=3 received=3 packet-loss=0% min-rtt=615us avg-rtt=634us
max-rtt=661us

```
[admin@MikroTik] > ping 10.10.1.130
```

SEQ	HOST	SIZE	TTL	TIME	STATUS
0	10.10.1.130	56	63	1ms263us	
1	10.10.1.130	56	63	1ms79us	

sent=2 received=2 packet-loss=0% min-rtt=1ms79us avg-rtt=1ms171us
max-rtt=1ms263us

- Мне выделен префикс IPv6 fd00:2004:12::/48, тогда префикс 4 подсетей:
fd00:2004:12::/50 fd00:2004:12:4000::/50
fd00:2004:12:8000::/50
fd00:2004:12:c000::/50
Router Advertisement на mikrotik требует, чтобы префиксы имели длину /64, поэтому подсети будут:
fd00:2004:12::/64 fd00:2004:12:1::/64
fd00:2004:12:2::/64
fd00:2004:12:3::/64.


```
[admin@MikroTik] > /ipv6 address add address=fd00:2004:12::1/50 advertise=yes interface=ether3
failure: cannot advertise address with prefix length not equal to 64 (use advertise=no)
[admin@MikroTik] > /ipv6 address print
Flags: D - DYNAMIC; L - LINK-LOCAL
Columns: ADDRESS, INTERFACE, ADVERTISEISE
# ADDRESS INTERFACE ADVERTISEISE
0 D ::1/128 lo no
1 DL fe80::a00:27ff:fe61:2f02/64 ether3 no
2 DL fe80::a00:27ff:fe12:3316/64 ether4 no
[admin@MikroTik] > /ipv6 address add address=fd00:2004:12:1::/64 advertise=yes interface=ether3
[admin@MikroTik] >
```

AstraLinux получила префикс из 1 подсети от MikroTik1:

```
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 08:00:27:1a:4e:02 brd ff:ff:ff:ff:ff:ff
    inet 10.10.1.3/26 brd 10.10.1.63 scope global eth0
        valid_lft forever preferred_lft forever
    inet6 fd00:2004:12:1:a00:27ff:fe1a:4e02/64 scope global mngtmpaddr dynamic
        valid_lft 11sec preferred_lft 3sec
    inet6 fe80::a00:27ff:fe1a:4e02/64 scope link
        valid_lft forever preferred_lft forever
[admin@MikroTik] > /ipv6 address print
Flags: D - DYNAMIC; G - GLOBAL, L - LINK-LOCAL
Columns: ADDRESS, INTERFACE, ADVERTISEISE
# ADDRESS INTERFACE ADVERTISEISE
0 G fd00:2004:12:2::/64 ether2 yes
1 D ::1/128 lo no
2 DL fe80::a00:27ff:fe4f:33d6/64 ether1 no
3 DL fe80::a00:27ff:febe:c82b/64 ether2 no
[admin@MikroTik] > /ipv6 nd add interface=ether2 ra-interval=20s-60s
[admin@MikroTik] >
```

БазальтОС получил префикс из 2 подсети от Mikrotika2:

```
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 08:00:27:57:c6:d2 brd ff:ff:ff:ff:ff:ff
    inet 169.254.11.164/16 brd 169.254.255.255 scope link enp0s3:avahi
        valid_lft forever preferred_lft forever
    inet 10.10.1.130/26 brd 10.10.1.191 scope global enp0s3
        valid_lft forever preferred_lft forever
    inet6 fd00:2004:12:2:a00:27ff:fe57:c6d2/64 scope global dynamic mngtmpaddr
        valid_lft 2591988sec preferred_lft 604788sec
    inet6 fe80::a00:27ff:fe57:c6d2/64 scope link
        valid_lft forever preferred_lft forever
```