

# Лабораторная работа №6

Сетевые технологии

---

Мишина А. А.

23 ноября 2024

## Цель работы

---

Изучение принципов распределения и настройки адресного пространства на устройствах сети.

## Выполнение лабораторной работы

---

## Разбиение сети на подсети

---

## Разбиение IPv4-сети на подсети

---

- Разбить сеть на 3 подсети с 126, 62, 62 узлами.
- **11111111.11111111.11111111.10000000 = 255.255.255.128**
- Диапазон адресов для данной подсети: **172.16.20.1 - 172.16.20.126**.
- Для двух других подсетей: **11111111.11111111.11111111.11000000 = 255.255.255.192**.
- Диапазон адресов для второй подсети: **172.16.20.129 - 172.16.20.190**.
- Диапазон адресов для третьей подсети: **172.16.20.193 - 172.16.20.254**.

## Разбиение IPv4-сети на подсети

---

## Разбиение IPv4-сети на подсети

---

## Разбиение IPv6-сети на подсети

---

- С использованием идентификатора подсети.

2001:db8:c0de:0003::/64

2001:db8:c0de:0002::/64

- С использованием идентификатора интерфейса.

2001:db8:c0de:0000:1000/68

2001:db8:c0de:0000:2000/68

## Разбиение IPv6-сети на подсети

---

- С использованием идентификатора интерфейса.

2a02:6b8:0000:0000:1000::/68

2a02:6b8:0000:0000:2000::/68

## Настройка двойного стека адресации IPv4 и IPv6 в локальной сети

---

# Выполнение лабораторной работы

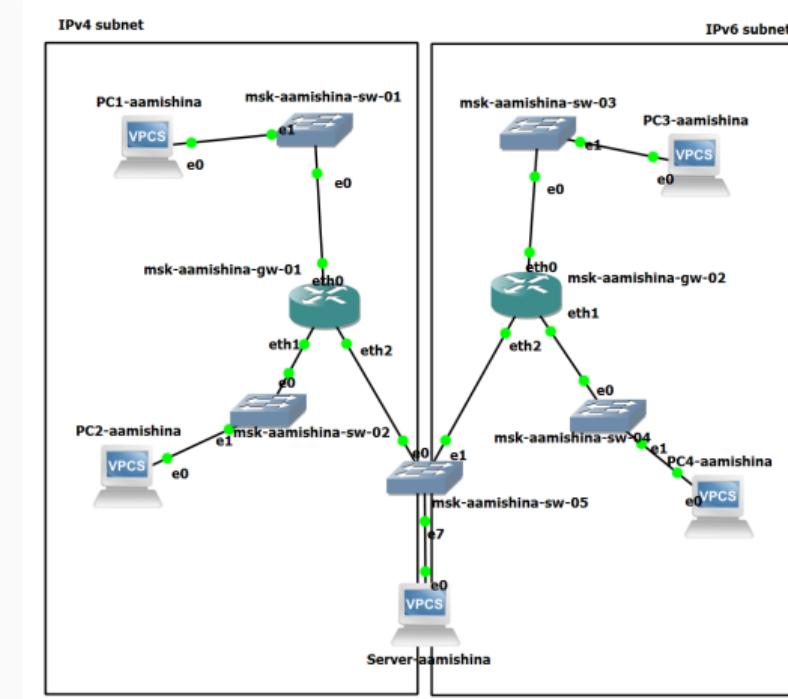


Рис. 1: Топология сети с двумя локальными подсетями в GNS3

# Выполнение лабораторной работы

```
PCI-aamishina - PuTTY

Welcome to Virtual PC Simulator, version 0.8.3
Dedicated to Daling.
Build time: Sep 9 2023 11:15:00
Copyright (c) 2007-2015, Paul Meng (mirnshi@gmail.com)
All rights reserved.

VPCS is free software, distributed under the terms of the "BSD" licence.
Source code and license can be found at vpcs.sf.net.
For more information, please visit wiki.freecode.com.cn.

Press '?' to get help.

Executing the startup file

Hostname is too long. (Maximum 12 characters)

VPCS> ip 172.16.20.10/25 172.16.20.1
Checking for duplicate address...
VPCS : 172.16.20.10 255.255.255.128 gateway 172.16.20.1

VPCS> save
Saving startup configuration to startup.vpc
. done

VPCS> show ip

NAME      : VPCS[1]
IP/MASK   : 172.16.20.10/25
GATEWAY   : 172.16.20.1
DNS       :
MAC       : 00:50:79:66:68:00
LPORT     : 20022
RHOST:PORT : 127.0.0.1:20023
MTU       : 1500

VPCS> shop ipv6
Bad command: "shop ipv6". Use ? for help.

VPCS> show ipv6

NAME      : VPCS[1]
LINK-LOCAL SCOPE : fe80::250:79ff:fe66:6800/64
GLOBAL SCOPE   :
DNS       :
ROUTER LINK-LAYER :
MAC       : 00:50:79:66:68:00
LPORT     : 20022
RHOST:PORT   : 127.0.0.1:20023
MTU       : 1500

VPCS>
```

# Выполнение лабораторной работы

```
Welcome to Virtual PC Simulator, version 0.8.3
Dedicated to Daling.
Build time: Sep 9 2023 11:15:00
Copyright (c) 2007-2015, Paul Meng (mirnshl@gmail.com)
All rights reserved.

VPCS is free software, distributed under the terms of the "BSD" licence.
Source code and license can be found at vpcs.sf.net.
For more information, please visit wiki.freecode.com.cn.

Press '?' to get help.

Executing the startup file

Hostname is too long. (Maximum 12 characters)

VPCS> ip 172.16.20.138/25 172.16.20.129
Checking for duplicate address...
VPCS : 172.16.20.138 255.255.255.128 gateway 172.16.20.129

VPCS> save
Saving startup configuration to startup.vpc
. done

VPCS> show ip

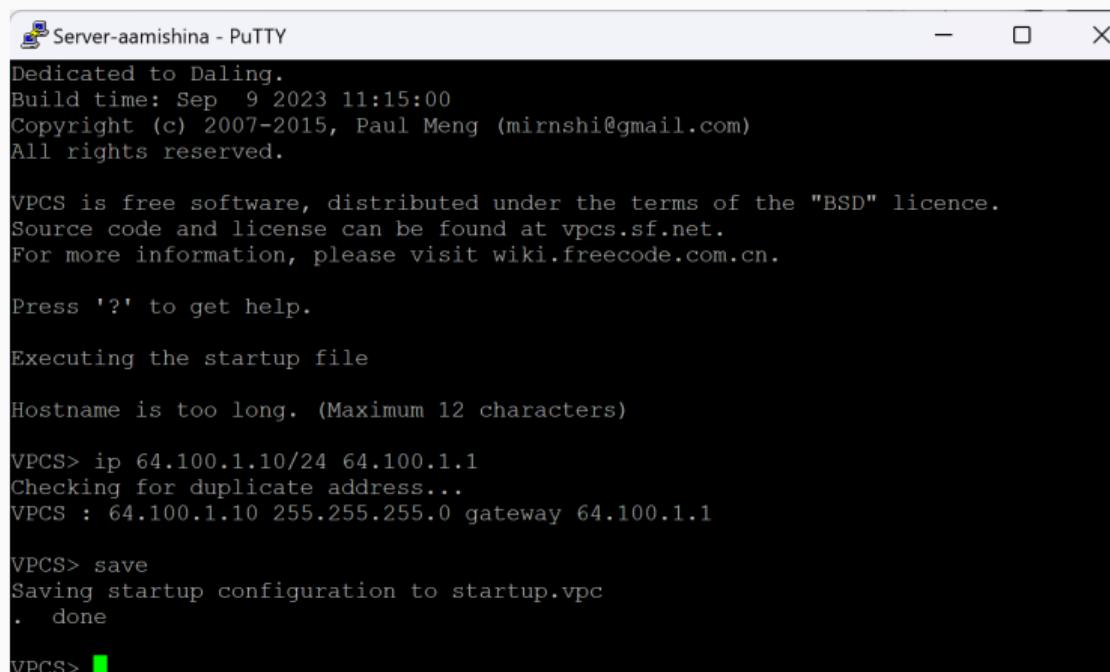
NAME      : VPCS[1]
IP/MASK   : 172.16.20.138/25
GATEWAY   : 172.16.20.129
DNS       :
MAC       : 00:50:79:66:68:01
LPORT     : 20024
RHOST:PORT : 127.0.0.1:20025
MTU       : 1500

VPCS> show ipv6

NAME      : VPCS[1]
LINK-LOCAL SCOPE : fe80::250:79ff:fe66:6801/64
GLOBAL SCOPE   :
DNS       :
ROUTER LINK-LAYER :
MAC       : 00:50:79:66:68:01
LPORT     : 20024
RHOST:PORT   : 127.0.0.1:20025
MTU       : 1500

VPCS>
```

# Выполнение лабораторной работы



Dedicated to Daling.  
Build time: Sep 9 2023 11:15:00  
Copyright (c) 2007-2015, Paul Meng (mirnshi@gmail.com)  
All rights reserved.

VPCS is free software, distributed under the terms of the "BSD" licence.  
Source code and license can be found at vpcs.sf.net.  
For more information, please visit wiki.freecode.com.cn.

Press '?' to get help.

Executing the startup file

Hostname is too long. (Maximum 12 characters)

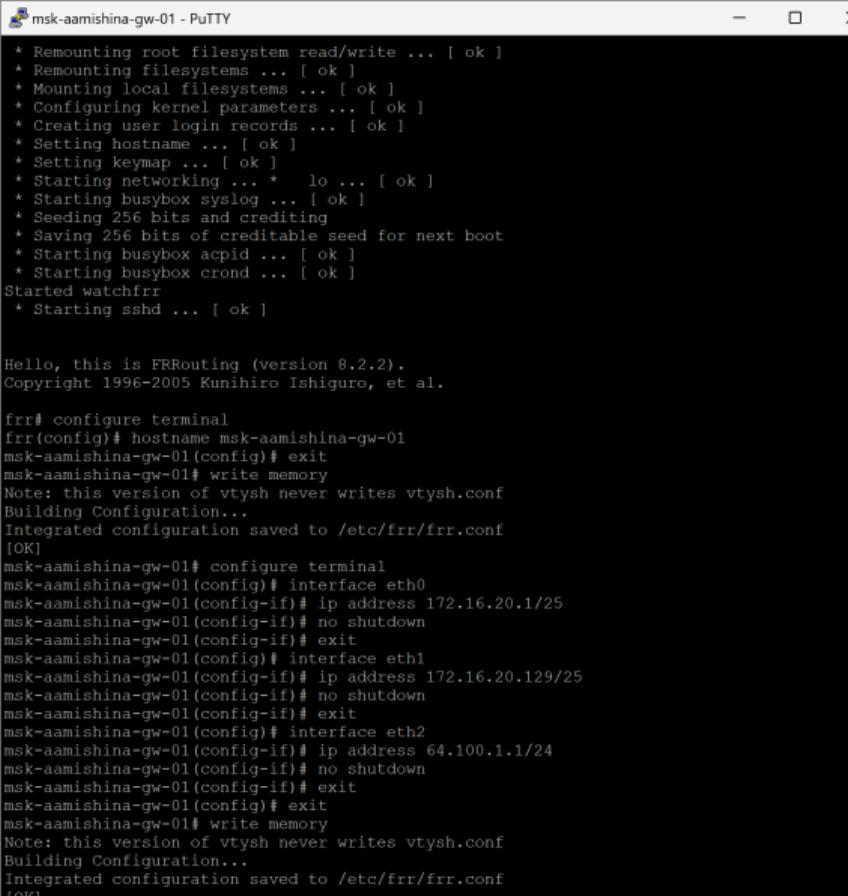
VPCS> ip 64.100.1.10/24 64.100.1.1  
Checking for duplicate address...  
VPCS : 64.100.1.10 255.255.255.0 gateway 64.100.1.1

VPCS> save  
Saving startup configuration to startup.vpc  
. done

VPCS> █

Рис. 4: Настройка IPv4-адресации на сервере

# Выполнение лабораторной работы



The screenshot shows a PuTTY terminal window titled "msk-aamishina-gw-01 - PuTTY". The session is running a Busybox-based Linux system. The terminal output shows the following sequence of events:

- The system performs initial boot steps: remounting root, mounting local filesystems, configuring kernel parameters, creating user login records, setting hostname, setting keymap, starting networking, and starting busybox syslog.
- It then starts the busybox cron daemon.
- The "watchfr" service is started.
- The SSH daemon ("sshd") is started.
- A welcome message from FRRouting (version 8.2.2) is displayed, noting it was first released in 1996.
- The user enters configuration mode ("configure terminal") and sets the host name to "msk-aamishina-gw-01".
- The configuration is saved to memory.
- A note states that the current version of vtysh does not write vtysh.conf.
- The configuration is built.
- The user configures the "eth0" interface with IP address 172.16.20.1/25 and disables shutdown.
- The configuration is saved to /etc/frr/frr.conf.
- The user configures the "eth1" interface with IP address 172.16.20.129/25 and disables shutdown.
- The configuration is saved to /etc/frr/frr.conf.
- The user configures the "eth2" interface with IP address 64.100.1.1/24 and disables shutdown.
- The configuration is saved to /etc/frr/frr.conf.
- A note states that the current version of vtysh does not write vtysh.conf.
- The configuration is built.
- The configuration is saved to /etc/frr/frr.conf.

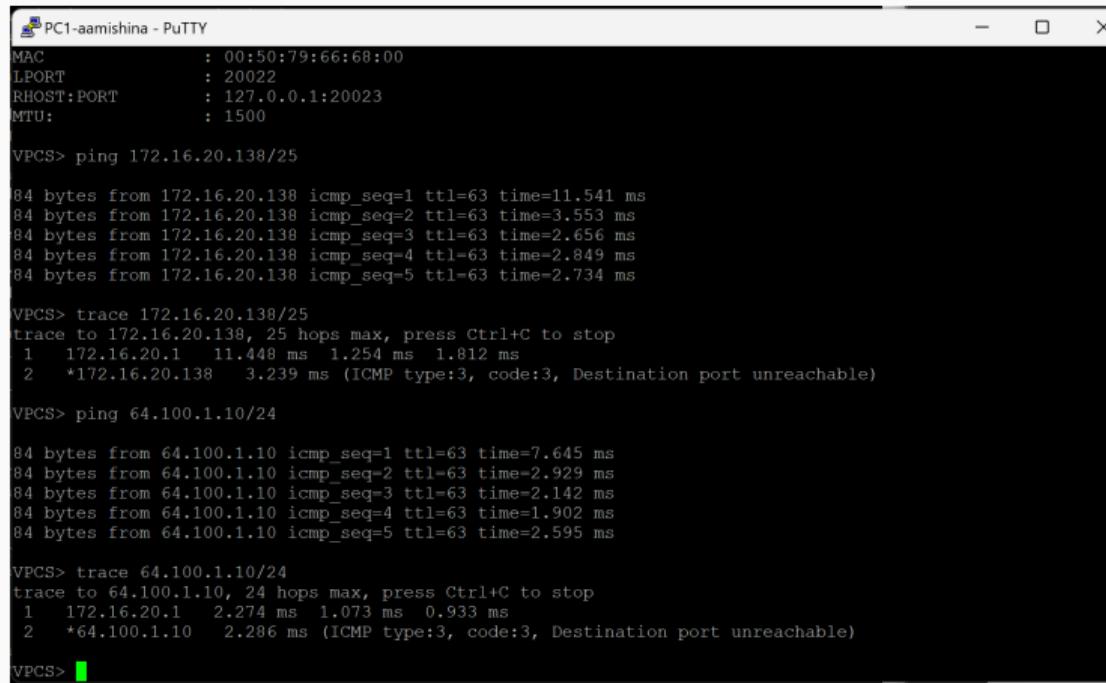
# Выполнение лабораторной работы

```
msk-aamishina-gw-01# show running-config
Building configuration...

Current configuration:
!
frr version 8.2.2
frr defaults traditional
hostname frr
hostname msk-aamishina-gw-01
service integrated-vtysh-config
!
interface eth0
    ip address 172.16.20.1/25
exit
!
interface eth1
    ip address 172.16.20.129/25
exit
!
interface eth2
    ip address 64.100.1.1/24
exit
!
end
msk-aamishina-gw-01# show interface brief
Interface      Status   VRF      Addresses
-----  -----  -----
eth0          up      default   172.16.20.1/25
eth1          up      default   172.16.20.129/25
eth2          up      default   64.100.1.1/24
eth3          down     default
eth4          down     default
eth5          down     default
eth6          down     default
eth7          down     default
lo            up      default
pimreg        up      default

msk-aamishina-qw-01#
```

# Выполнение лабораторной работы



PC1-aamishina - PuTTY

```
MAC : 00:50:79:66:68:00
LPORT : 20022
RHOST:PORT : 127.0.0.1:20023
MTU: : 1500

VPCS> ping 172.16.20.138/25
84 bytes from 172.16.20.138 icmp_seq=1 ttl=63 time=11.541 ms
84 bytes from 172.16.20.138 icmp_seq=2 ttl=63 time=3.553 ms
84 bytes from 172.16.20.138 icmp_seq=3 ttl=63 time=2.656 ms
84 bytes from 172.16.20.138 icmp_seq=4 ttl=63 time=2.849 ms
84 bytes from 172.16.20.138 icmp_seq=5 ttl=63 time=2.734 ms

VPCS> trace 172.16.20.138/25
trace to 172.16.20.138, 25 hops max, press Ctrl+C to stop
 1  172.16.20.1   11.448 ms  1.254 ms  1.812 ms
 2  *172.16.20.138   3.239 ms (ICMP type:3, code:3, Destination port unreachable)

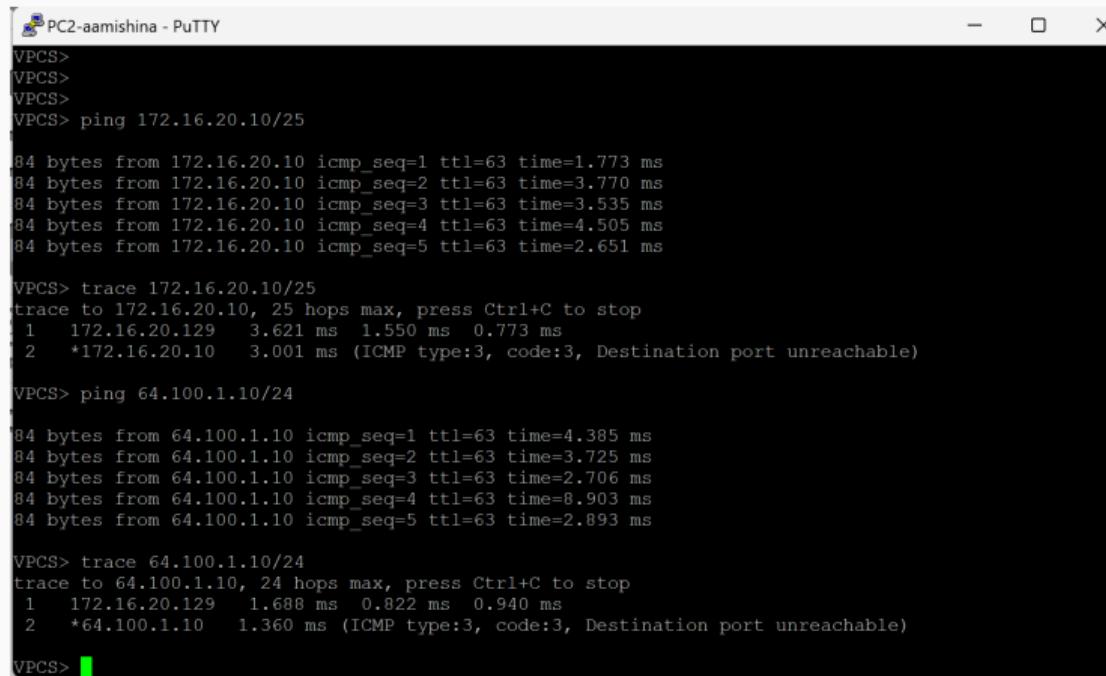
VPCS> ping 64.100.1.10/24
84 bytes from 64.100.1.10 icmp_seq=1 ttl=63 time=7.645 ms
84 bytes from 64.100.1.10 icmp_seq=2 ttl=63 time=2.929 ms
84 bytes from 64.100.1.10 icmp_seq=3 ttl=63 time=2.142 ms
84 bytes from 64.100.1.10 icmp_seq=4 ttl=63 time=1.902 ms
84 bytes from 64.100.1.10 icmp_seq=5 ttl=63 time=2.595 ms

VPCS> trace 64.100.1.10/24
trace to 64.100.1.10, 24 hops max, press Ctrl+C to stop
 1  172.16.20.1   2.274 ms  1.073 ms  0.933 ms
 2  *64.100.1.10   2.286 ms (ICMP type:3, code:3, Destination port unreachable)

VPCS>
```

Рис. 7: Проверка подключения с PC-1

# Выполнение лабораторной работы



```
PC2-aamishina - PuTTY
VPCS>
VPCS>
VPCS>
VPCS> ping 172.16.20.10/25
84 bytes from 172.16.20.10 icmp_seq=1 ttl=63 time=1.773 ms
84 bytes from 172.16.20.10 icmp_seq=2 ttl=63 time=3.770 ms
84 bytes from 172.16.20.10 icmp_seq=3 ttl=63 time=3.535 ms
84 bytes from 172.16.20.10 icmp_seq=4 ttl=63 time=4.505 ms
84 bytes from 172.16.20.10 icmp_seq=5 ttl=63 time=2.651 ms

VPCS> trace 172.16.20.10/25
trace to 172.16.20.10, 25 hops max, press Ctrl+C to stop
 1  172.16.20.129  3.621 ms  1.550 ms  0.773 ms
 2  *172.16.20.10  3.001 ms (ICMP type:3, code:3, Destination port unreachable)

VPCS> ping 64.100.1.10/24
84 bytes from 64.100.1.10 icmp_seq=1 ttl=63 time=4.385 ms
84 bytes from 64.100.1.10 icmp_seq=2 ttl=63 time=3.725 ms
84 bytes from 64.100.1.10 icmp_seq=3 ttl=63 time=2.706 ms
84 bytes from 64.100.1.10 icmp_seq=4 ttl=63 time=8.903 ms
84 bytes from 64.100.1.10 icmp_seq=5 ttl=63 time=2.893 ms

VPCS> trace 64.100.1.10/24
trace to 64.100.1.10, 24 hops max, press Ctrl+C to stop
 1  172.16.20.129  1.688 ms  0.822 ms  0.940 ms
 2  *64.100.1.10  1.360 ms (ICMP type:3, code:3, Destination port unreachable)

VPCS>
```

Рис. 8: Проверка подключения с PC-2

# Выполнение лабораторной работы

```
PC3-aamishina - PuTTY

Welcome to Virtual PC Simulator, version 0.8.3
Dedicated to Daling.
Build time: Sep 9 2023 11:15:00
Copyright (c) 2007-2015, Paul Meng (mirnshi@gmail.com)
All rights reserved.

VPCS is free software, distributed under the terms of the "BSD" licence.
Source code and license can be found at vpcs.sf.net.
For more information, please visit wiki.freecode.com.cn.

Press '?' to get help.

Executing the startup file

Hostname is too long. (Maximum 12 characters)

VPCS> ip 2001:db8:c0de:12::a/64
PCL : 2001:db8:c0de:12::a/64

VPCS> save
Saving startup configuration to startup.vpc
. done

VPCS> show ip

NAME      : VPCS[1]
IP/MASK   : 0.0.0.0/0
GATEWAY   : 0.0.0.0
DNS       :
MAC       : 00:50:79:66:68:02
LPORT     : 20026
RHOST:PORT : 127.0.0.1:20027
MTU       : 1500

VPCS> show ipv6

NAME      : VPCS[1]
LINK-LOCAL SCOPE : fe80::250:79ff:fe66:6802/64
GLOBAL SCOPE   : 2001:db8:c0de:12::a/64
DNS       :
ROUTER LINK-LAYER :
MAC       : 00:50:79:66:68:02
LPORT     : 20026
RHOST:PORT   : 127.0.0.1:20027
MTU       : 1500

VPCS>
```

# Выполнение лабораторной работы



```
PC4-aamishina - PuTTY

Welcome to Virtual PC Simulator, version 0.8.3
Dedicated to Daling.
Build time: Sep 9 2023 11:15:00
Copyright (c) 2007-2015, Paul Meng (mirnshi@gmail.com)
All rights reserved.

VPCS is free software, distributed under the terms of the "BSD" licence.
Source code and license can be found at vpcs.sf.net.
For more information, please visit wiki.freecode.com.cn.

Press '?' to get help.

Executing the startup file

Hostname is too long. (Maximum 12 characters)

VPCS> ip 2001:db8:c0de:13::a/64
PC1 : 2001:db8:c0de:13::a/64

VPCS> save
Saving startup configuration to startup.vpc
. done

VPCS> show ip

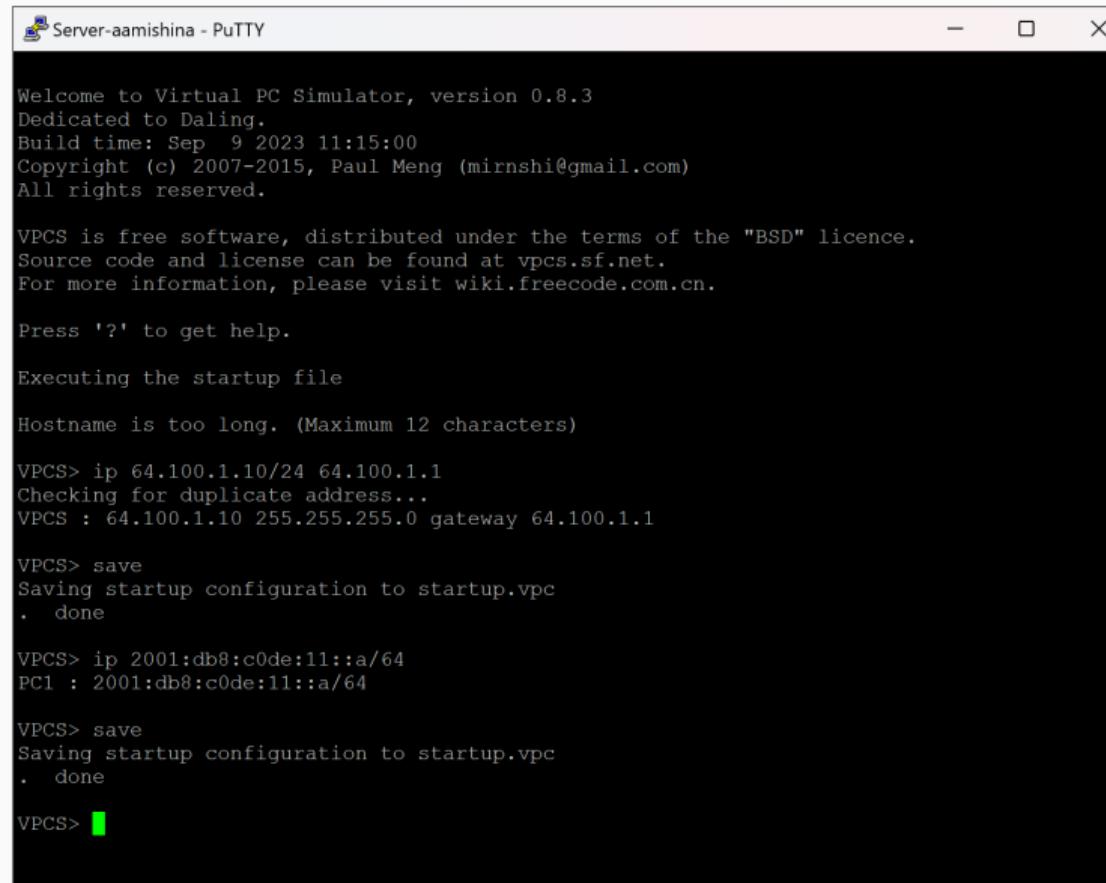
NAME      : VPCS[1]
IP/MASK   : 0.0.0.0/0
GATEWAY   : 0.0.0.0
DNS       :
MAC       : 00:50:79:66:68:03
LPORT     : 20028
RHOST:PORT : 127.0.0.1:20029
MTU       : 1500

VPCS> show ipv6

NAME      : VPCS[1]
LINK-LOCAL SCOPE : fe80::250:79ff:fe66:6803/64
GLOBAL SCOPE   : 2001:db8:c0de:13::a/64
DNS       :
ROUTER LINK-LAYER :
MAC       : 00:50:79:66:68:03
LPORT     : 20028
RHOST:PORT : 127.0.0.1:20029
MTU       : 1500

VPCS>
```

# Выполнение лабораторной работы



Server-aamishina - PuTTY

```
Welcome to Virtual PC Simulator, version 0.8.3
Dedicated to Daling.
Build time: Sep 9 2023 11:15:00
Copyright (c) 2007-2015, Paul Meng (mirnshi@gmail.com)
All rights reserved.

VPCS is free software, distributed under the terms of the "BSD" licence.
Source code and license can be found at vpcs.sf.net.
For more information, please visit wiki.freecode.com.cn.

Press '?' to get help.

Executing the startup file

Hostname is too long. (Maximum 12 characters)

VPCS> ip 64.100.1.10/24 64.100.1.1
Checking for duplicate address...
VPCS : 64.100.1.10 255.255.255.0 gateway 64.100.1.1

VPCS> save
Saving startup configuration to startup.vpc
. done

VPCS> ip 2001:db8:c0de:11::a/64
PC1 : 2001:db8:c0de:11::a/64

VPCS> save
Saving startup configuration to startup.vpc
. done

VPCS> 
```

# Выполнение лабораторной работы



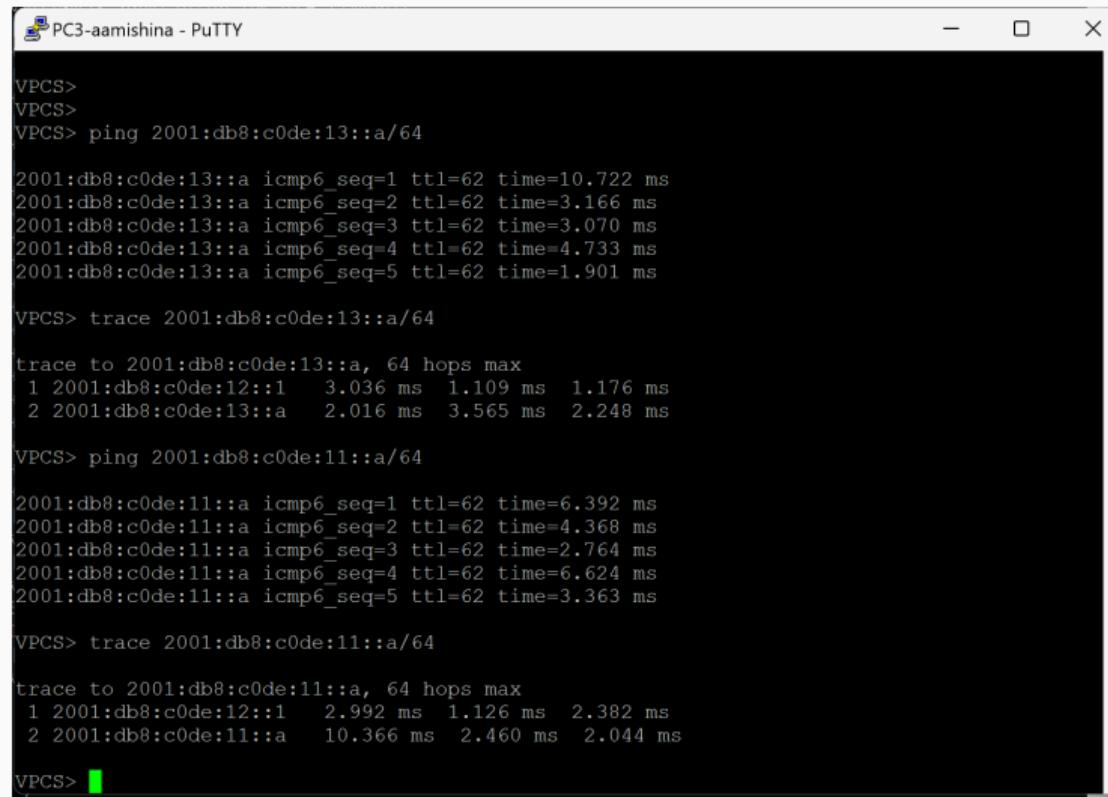
The screenshot shows a PuTTY terminal window titled "msk-aamishina-gw-02 - PuTTY". The session is connected to a VyOS router. The terminal displays the following sequence of events:

- System boot logs from systemd, including detecting kvm virtualization, setting the hostname to <vyos>, and starting various services like the Journal Audit Socket and udev Control Socket.
- A welcome message for VyOS: "Welcome to VyOS - vyos ttyS0".
- Login prompt: "vyos login: vyos".
- Password prompt: "Password:".
- Welcome message: "Welcome to VyOS!".
- A banner message: "Check out project news at <https://blog.vyos.io> and feel free to report bugs at <https://vyos.dev>".
- A note about changing the banner: "You can change this banner using \"set system login banner post-login\" command."
- An informational message about VyOS components: "VyOS is a free software distribution that includes multiple components, you can check individual component licenses under /usr/share/doc/\*copyright".
- The command "vyos@vyos:~\$ install image" is run, followed by a note that the user is trying to install from an already installed system and must specify an ISO image file or URL.
- The command "exit" is run.
- The configuration mode command "vyos@vyos:~\$ configure" is run.
- The host name is set to "msk-aamishina-gw-02": "vyos@vyos# set system host-name msk-aamishina-gw-02".
- The configuration is saved: "vyos@vyos# save".
- The configuration is committed: "vyos@vyos# commit".
- The configuration is compared: "vyos@vyos# compare".
- The system is edited: "vyos@vyos# edit system".
- The host name is specified: ">host-name msk-aamishina-gw-02".
- The configuration is saved again: "vyos@vyos# save".
- The configuration is committed again: "vyos@vyos# commit".
- The configuration is saved one last time: "vyos@vyos# save".
- The configuration is loaded: "Saving configuration to '/config/config.boot'...".
- The configuration is done: "Done".
- The configuration is edited again: "vyos@vyos# edit".
- The configuration is exited: "vyos@vyos# exit".
- The configuration is exited again: "exit".
- The configuration is rebooted: "vyos@vyos:~\$ reboot".
- A confirmation prompt: "Are you sure you want to reboot this system? [y/N] y".

# Выполнение лабораторной работы

```
msk-aamishina-gw-02 - PuTTY
[edit]
b8:c0de:13::/64ina-gw-02# set service router-advert interface eth1 prefix 2001:d
[edit]
:1/64msk-aamishina-gw-02# set interfaces ethernet eth2 address 2001:db8:c0de:11:
[edit]
b8:c0de:11::/64ina-gw-02# set service router-advert interface eth2 prefix 2001:d
[edit]
vyos@msk-aamishina-gw-02# compare
[edit interfaces ethernet eth0]
+address 2001:db8:c0de:12::1/64
[edit interfaces ethernet eth1]
+address 2001:db8:c0de:13::1/64
[edit interfaces ethernet eth2]
+address 2001:db8:c0de:11::1/64
[edit service]
+router-advert {
+    interface eth0 {
+        prefix 2001:db8:c0de:12::/64 {
+        }
+    }
+    interface eth1 {
+        prefix 2001:db8:c0de:13::/64 {
+        }
+    }
+    interface eth2 {
+        prefix 2001:db8:c0de:11::/64 {
+        }
+    }
+}
[edit]
vyos@msk-aamishina-gw-02# commit
[edit]
vyos@msk-aamishina-gw-02# save
Saving configuration to '/config/config.boot'...
Done
[edit]
vyos@msk-aamishina-gw-02# show interfaces
ethernet eth0 {
    address dhcp
    address 2001:db8:c0de:12::1/64
    hw-id 0c:c7:9c:68:00:00
}
ethernet eth1 (
    address 2001:db8:c0de:13::1/64
    hw-id 0c:c7:9c:68:00:01
)
ethernet eth2 (
    address 2001:db8:c0de:11::1/64
    hw-id 0c:c7:9c:68:00:02
)
loopback lo {
}
[edit]
```

# Выполнение лабораторной работы



```
PC3-aamishina - PuTTY

VPCS>
VPCS>
VPCS> ping 2001:db8:c0de:13::a/64

2001:db8:c0de:13::a icmp6_seq=1 ttl=62 time=10.722 ms
2001:db8:c0de:13::a icmp6_seq=2 ttl=62 time=3.166 ms
2001:db8:c0de:13::a icmp6_seq=3 ttl=62 time=3.070 ms
2001:db8:c0de:13::a icmp6_seq=4 ttl=62 time=4.733 ms
2001:db8:c0de:13::a icmp6_seq=5 ttl=62 time=1.901 ms

VPCS> trace 2001:db8:c0de:13::a/64

trace to 2001:db8:c0de:13::a, 64 hops max
 1 2001:db8:c0de:12::1    3.036 ms   1.109 ms   1.176 ms
 2 2001:db8:c0de:13::a    2.016 ms   3.565 ms   2.248 ms

VPCS> ping 2001:db8:c0de:11::a/64

2001:db8:c0de:11::a icmp6_seq=1 ttl=62 time=6.392 ms
2001:db8:c0de:11::a icmp6_seq=2 ttl=62 time=4.368 ms
2001:db8:c0de:11::a icmp6_seq=3 ttl=62 time=2.764 ms
2001:db8:c0de:11::a icmp6_seq=4 ttl=62 time=6.624 ms
2001:db8:c0de:11::a icmp6_seq=5 ttl=62 time=3.363 ms

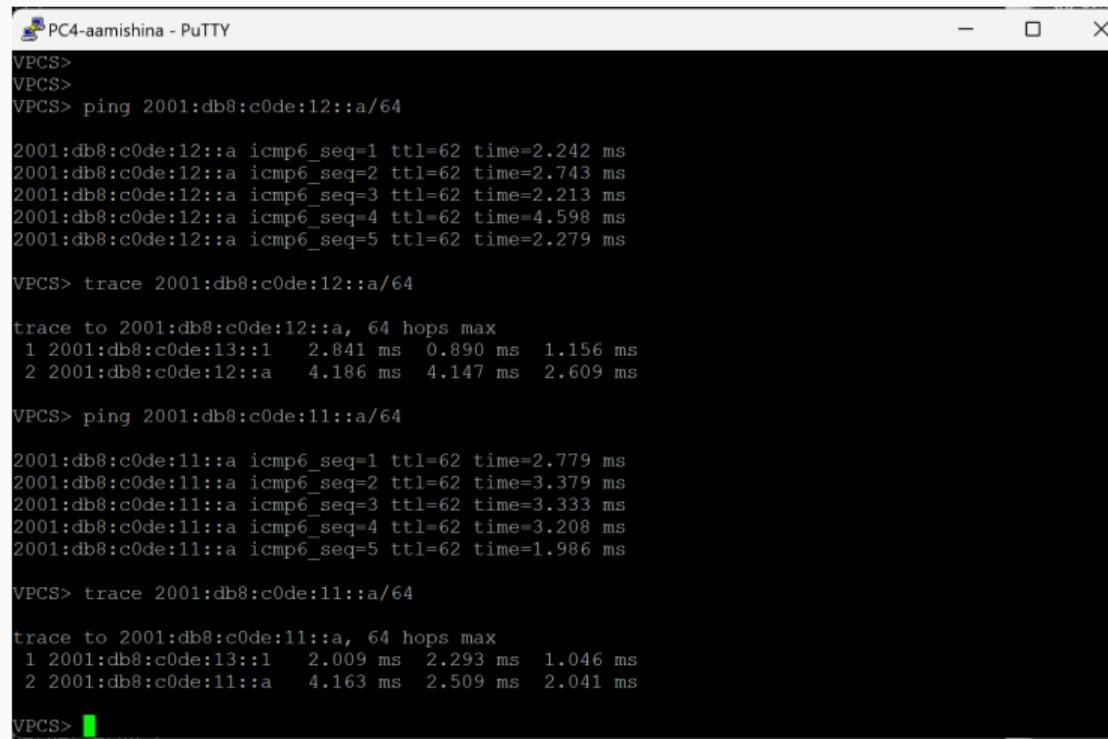
VPCS> trace 2001:db8:c0de:11::a/64

trace to 2001:db8:c0de:11::a, 64 hops max
 1 2001:db8:c0de:12::1    2.992 ms   1.126 ms   2.382 ms
 2 2001:db8:c0de:11::a    10.366 ms   2.460 ms   2.044 ms

VPCS>
```

Рис. 14: Проверка подключения с PC-3

# Выполнение лабораторной работы



PC4-aamishina - PuTTY

VPCS>

VPCS>

VPCS> ping 2001:db8:c0de:12::a/64

2001:db8:c0de:12::a icmp6\_seq=1 ttl=62 time=2.242 ms  
2001:db8:c0de:12::a icmp6\_seq=2 ttl=62 time=2.743 ms  
2001:db8:c0de:12::a icmp6\_seq=3 ttl=62 time=2.213 ms  
2001:db8:c0de:12::a icmp6\_seq=4 ttl=62 time=4.598 ms  
2001:db8:c0de:12::a icmp6\_seq=5 ttl=62 time=2.279 ms

VPCS> trace 2001:db8:c0de:12::a/64

trace to 2001:db8:c0de:12::a, 64 hops max  
1 2001:db8:c0de:13::1 2.841 ms 0.890 ms 1.156 ms  
2 2001:db8:c0de:12::a 4.186 ms 4.147 ms 2.609 ms

VPCS> ping 2001:db8:c0de:11::a/64

2001:db8:c0de:11::a icmp6\_seq=1 ttl=62 time=2.779 ms  
2001:db8:c0de:11::a icmp6\_seq=2 ttl=62 time=3.379 ms  
2001:db8:c0de:11::a icmp6\_seq=3 ttl=62 time=3.333 ms  
2001:db8:c0de:11::a icmp6\_seq=4 ttl=62 time=3.208 ms  
2001:db8:c0de:11::a icmp6\_seq=5 ttl=62 time=1.986 ms

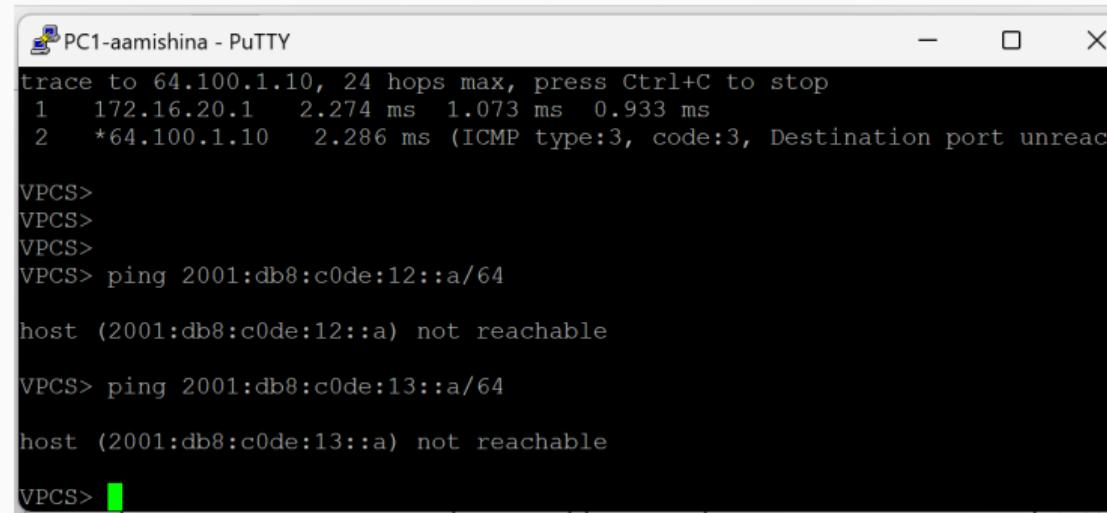
VPCS> trace 2001:db8:c0de:11::a/64

trace to 2001:db8:c0de:11::a, 64 hops max  
1 2001:db8:c0de:13::1 2.009 ms 2.293 ms 1.046 ms  
2 2001:db8:c0de:11::a 4.163 ms 2.509 ms 2.041 ms

VPCS>

Рис. 15: Проверка подключения с PC-4

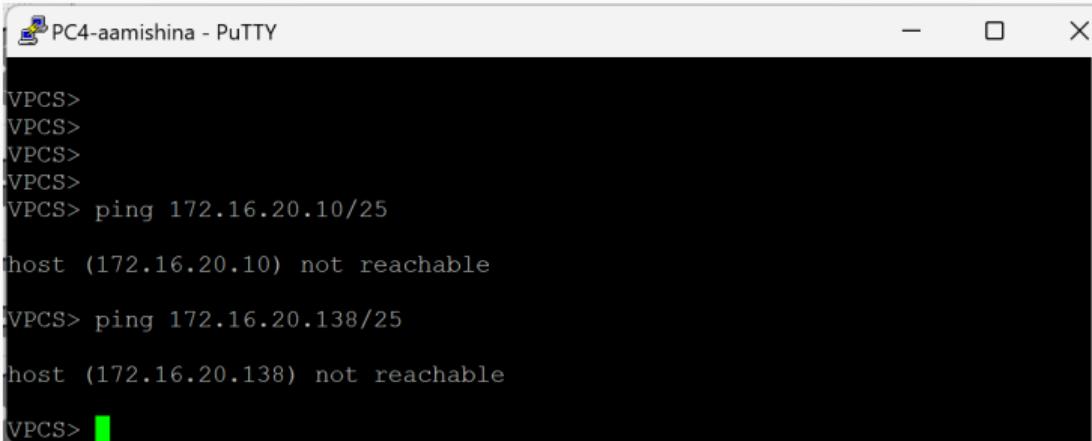
# Выполнение лабораторной работы



trace to 64.100.1.10, 24 hops max, press Ctrl+C to stop  
1 172.16.20.1 2.274 ms 1.073 ms 0.933 ms  
2 \*64.100.1.10 2.286 ms (ICMP type:3, code:3, Destination port unreach  
  
VPCS>  
VPCS>  
VPCS>  
VPCS> ping 2001:db8:c0de:12::a/64  
  
host (2001:db8:c0de:12::a) not reachable  
  
VPCS> ping 2001:db8:c0de:13::a/64  
  
host (2001:db8:c0de:13::a) not reachable  
  
VPCS>

Рис. 16: Проверка доступности устройств из подсети IPv4 для устройств из подсети IPv6

## Выполнение лабораторной работы



```
PC4-aamishina - PuTTY

VPCS>
VPCS>
VPCS>
VPCS>
VPCS> ping 172.16.20.10/25
host (172.16.20.10) not reachable
VPCS> ping 172.16.20.138/25
host (172.16.20.138) not reachable
VPCS>
```

Рис. 17: Проверка доступности устройств из подсети IPv6 для устройств из подсети IPv4

# Выполнение лабораторной работы

Захват из Standard input [Server-aamishina Ethernet0 to msk-aamishina-sw-05 Ethernet7]

Файл Правка Вид Запуск Захват Анализ Статистика Телефония Беспроводная связь Инструменты Справка

Примените фильтр отображения ... <Ctrl-/>

| No. | Time        | Source                        | Destination    | Protocol | Length | Info  |
|-----|-------------|-------------------------------|----------------|----------|--------|---|
| 1   | 0.000000    | ::                            | ff02::16       | ICMPv6   | 130    | Multicast Listener Report Message v2            |
| 2   | 0.229938    | ::                            | ff02::1:ff68:2 | ICMPv6   | 86     | Neighbor Solicitation for fe80:ec7:9cff:fe68:2  |
| 3   | 0.661124    | ::                            | ff02::16       | ICMPv6   | 130    | Multicast Listener Report Message v2            |
| 4   | 1.241315    | fe80::ec7:9cff:fe68::ff02::16 |                | ICMPv6   | 150    | Multicast Listener Report Message v2            |
| 5   | 1.242235    | fe80::ec7:9cff:fe68::ff02::16 |                | ICMPv6   | 90     | Multicast Listener Report Message v2            |
| 6   | 1.444410    | fe80::ec7:9cff:fe68::ff02::16 |                | ICMPv6   | 150    | Multicast Listener Report Message v2            |
| 7   | 1.661703    | fe80::ec7:9cff:fe68::ff02::16 |                | ICMPv6   | 90     | Multicast Listener Report Message v2            |
| 8   | 158.071700  | Private_66:68:04              | Broadcast      | ARP      | 64     | Gratuitous ARP for 64.100.1.10 (Request)        |
| 9   | 159.072827  | Private_66:68:04              | Broadcast      | ARP      | 64     | Gratuitous ARP for 64.100.1.10 (Request)        |
| 10  | 160.074727  | Private_66:68:04              | Broadcast      | ARP      | 64     | Gratuitous ARP for 64.100.1.10 (Request)        |
| 11  | 1663.953945 | ::                            | ff02::16       | ICMPv6   | 130    | Multicast Listener Report Message v2            |
| 12  | 1664.123972 | ::                            | ff02::16       | ICMPv6   | 130    | Multicast Listener Report Message v2            |
| 13  | 1664.203513 | ::                            | ff02::1:ff10:2 | ICMPv6   | 86     | Neighbor Solicitation for fe80::e77:b6ff:fe10:2 |
| 14  | 1665.258933 | fe80::e77:b6ff:fe10::ff02::16 |                | ICMPv6   | 150    | Multicast Listener Report Message v2            |
| 15  | 1665.284152 | fe80::e77:b6ff:fe10::ff02::16 |                | ICMPv6   | 90     | Multicast Listener Report Message v2            |

[Frame is marked: False]  
[Frame is ignored: False]  
[Protocols in frame: eth:ethertype:arp]  
[Coloring Rule Name: ARP]  
[Coloring Rule String: arp]

▼ Ethernet II, Src: Private\_66:68:04 (00:50:79:66:68:04), Dst: Broadcast (ff:ff:ff:ff:ff:ff)  
  Destination: Broadcast (ff:ff:ff:ff:ff:ff)  
    .... .1. .... .... .... = LG bit: Locally administered address (this is NOT the fact.)  
    .... .1. .... .... .... = IG bit: Group address (multicast/broadcast)  
  Source: Private\_66:68:04 (00:50:79:66:68:04)  
    .... .0. .... .... .... = LG bit: Globally unique address (factory default)  
    .... .0. .... .... .... = IG bit: Individual address (unicast)  
  Type: ARP (0x0806)  
  [Stream index: 2]  
  Padding: 00000000000000000000000000000000  
  Frame check sequence: 0x00000000 [unverified]  
  [FCS Status: Unverified]

▼ Address Resolution Protocol (request/gratuitous ARP)  
  Hardware type: Ethernet (1)  
  Protocol type: IPv4 (0x0800)  
  Hardware size: 6  
  Protocol size: 4  
  Opcode: request (1)  
  [Is gratuitous: True]  
  Sender MAC address: Private\_66:68:04 (00:50:79:66:68:04)  
  Sender IP address: 64.100.1.10  
  Target MAC address: Broadcast (ff:ff:ff:ff:ff:ff)  
  Target IP address: 64.100.1.10

8000 ff ff ff ff ff ff 0  
0010 08 00 06 04 00 01 0  
0020 ff ff ff ff ff ff 4  
0030 00 00 00 00 00 00 0

# Выполнение лабораторной работы

Захват из Standard input [Server-aamishina Ethernet0 to msk-aamishina-sw-05 Ethernet7]

Файл Дравка Вид Запуск Захват Анализ Статистика Телефония Беспроводная связь Инструменты Справка

Примените фильтр отображения ... <Ctrl+>

| No.  | Time   | Source                         | Destination       | Protocol | Length Info  |
|------|--|--------------------------------|-------------------|----------|--|
| 14   | 1665.258933  | fe80::e77:b6ff:fe10.. ff02::16 |                   | ICMPv6   | 150 Multicast Listener Report Message v2                           |
| 15   | 1665.284152  | fe80::e77:b6ff:fe10.. ff02::16 |                   | ICMPv6   | 90 Multicast Listener Report Message v2                            |
| 16   | 1665.974467  | fe80::e77:b6ff:fe10.. ff02::16 |                   | ICMPv6   | 150 Multicast Listener Report Message v2                           |
| 17   | 1666.133615  | fe80::e77:b6ff:fe10.. ff02::16 |                   | ICMPv6   | 90 Multicast Listener Report Message v2                            |
| 18   | 2187.429259  | 0c:77:b6:10:00:02              | Broadcast         | ARP      | 60 Who has 64.100.1.10? Tell 64.100.1.1                            |
| 19   | 2187.429784  | Private_66:68:04               | 0c:77:b6:10:00:02 | ARP      | 60 64.100.1.10 is at 00:50:79:66:68:04                             |
| → 20 | 2187.430211  | 172.16.20.10                   | 64.100.1.10       | ICMP     | 98 Echo (ping) request id=0x5a88, seq=1/256, ttl=63 (reply in 21)  |
| ← 21 | 2187.430736  | 64.100.1.10                    | 172.16.20.10      | ICMP     | 98 Echo (ping) reply id=0x5a88, seq=1/256, ttl=64 (request in 20)  |
| 22   | 2188.437158  | 172.16.20.10                   | 64.100.1.10       | ICMP     | 98 Echo (ping) request id=0xb588, seq=2/512, ttl=63 (reply in 23)  |
| 23   | 2188.437408  | 64.100.1.10                    | 172.16.20.10      | ICMP     | 98 Echo (ping) reply id=0xb588, seq=2/512, ttl=64 (request in 22)  |
| 24   | 2189.439947  | 172.16.20.10                   | 64.100.1.10       | ICMP     | 98 Echo (ping) request id=0xc588, seq=3/768, ttl=63 (reply in 25)  |
| 25   | 2189.440384  | 64.100.1.10                    | 172.16.20.10      | ICMP     | 98 Echo (ping) reply id=0xc588, seq=3/768, ttl=64 (request in 24)  |
| 26   | 2190.444847  | 172.16.20.10                   | 64.100.1.10       | ICMP     | 98 Echo (ping) request id=0xd588, seq=4/1024, ttl=63 (reply in 27) |
| 27   | 2190.444294  | 64.100.1.10                    | 172.16.20.10      | ICMP     | 98 Echo (ping) reply id=0xd588, seq=4/1024, ttl=64 (request in 26) |
| 28   | 2191.447019  | 172.16.20.10                   | 64.100.1.10       | ICMP     | 98 Echo (ping) request id=0xe588, seq=5/1280, ttl=63 (reply in 29) |
| ⋮    | Ethernet II, Src: 0c:77:b6:10:00:02 (0c:77:b6:10:00:02), Dst: Private_66:68:04 (00:50:79:66:68:04) |                                |                   |          |  |
| ⋮    | Destination: Private_66:68:04 (00:50:79:66:68:04)  |                                |                   |          |  |
| ⋮    | .....0. .... = LG bit: Globally unique address (factory default)                                   |                                |                   |          |  |
| ⋮    | .....0. .... = IG bit: Individual address (unicast)  |                                |                   |          |  |
| ⋮    | Source: 0c:77:b6:10:00:02 (0c:77:b6:10:00:02)  |                                |                   |          |  |
| ⋮    | .....0. .... = LG bit: Globally unique address (factory default)                                   |                                |                   |          |  |
| ⋮    | .....0. .... = IG bit: Individual address (unicast)  |                                |                   |          |  |
| ⋮    | Type: IPv4 (0x0800)  |                                |                   |          |  |
| ⋮    | [Stream index: 6]  |                                |                   |          |  |
| ⋮    | Internet Protocol Version 4, Src: 172.16.20.10, Dst: 64.100.1.10                                   |                                |                   |          |  |
| ⋮    | 0100 .... = Version: 4   |                                |                   |          |  |
| ⋮    | .... 0101 = Header Length: 20 bytes (5)  |                                |                   |          |  |
| ⋮    | > Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)                                    |                                |                   |          |  |
| ⋮    | Total Length: 84   |                                |                   |          |  |
| ⋮    | Identification: 0x885a (34906)   |                                |                   |          |  |
| ⋮    | > 000. .... = Flags: 0x8   |                                |                   |          |  |
| ⋮    | ...0 0000 0000 0000 = Fragment Offset: 0   |                                |                   |          |  |
| ⋮    | Time to Live: 63   |                                |                   |          |  |
| ⋮    | Protocol: ICMP (1)   |                                |                   |          |  |
| ⋮    | Header Checksum: 0xfc16 [validation disabled]  |                                |                   |          |  |
| ⋮    | [Header checksum status: Unverified]   |                                |                   |          |  |
| ⋮    | Source Address: 172.16.20.10   |                                |                   |          |  |
| ⋮    | Destination Address: 64.100.1.10   |                                |                   |          |  |
| ⋮    | [Stream index: 0]  |                                |                   |          |  |
| ⋮    | Internet Control Message Protocol  |                                |                   |          |  |
| ⋮    | Type: 8 (Echo (ping) request)  |                                |                   |          |  |
| ⋮    | Code: 0  |                                |                   |          |  |
| ⋮    | Checksum: 0xc582 [correct]   |                                |                   |          |  |

29/40

# Выполнение лабораторной работы

Захват из Standard input [Server-aamishina Ethernet0 to msk-aamishina-sw-05 Ethernet7]

Файл Правка Вид Запуск Захват Анализ Статистика Телефония Беспроводная связь Инструменты Справка

Приимните фильтр отображения ... <Ctrl-/>

| No. | Time        | Source                               | Destination           | Protocol | Length Info   |
|-----|-------------|--------------------------------------|-----------------------|----------|---|
| 70  | 4061.575622 | fe80::ec7:9cff:fe68.. ff02::1        |                       | ICMPv6   | 118 Router Advertisement from 0c:c7:9c:68:00:02                         |
| 71  | 4169.721268 | fe80::ec7:9cff:fe68.. ff02::1:ff00:a |                       | ICMPv6   | 86 Neighbor Solicitation for 2001:db8:c0de:11::a from 0c:c7:9c:68:00:02 |
| 72  | 4169.721923 | 2001:db8:c0de:11::a                  | fe80::ec7:9cff:fe68.. | ICMPv6   | 86 Neighbor Advertisement 2001:db8:c0de:11::a (sol, ovr) is at 00:50:79 |
| 73  | 4169.723639 | 2001:db8:c0de:12::a                  | 2001:db8:c0de:11::a   | ICMPv6   | 118 Echo (ping) request id=0x1990, seq=1, hop limit=63 (reply in 74)    |
| 74  | 4169.723939 | 2001:db8:c0de:11::a                  | 2001:db8:c0de:12::a   | ICMPv6   | 118 Echo (ping) reply id=0x1990, seq=1, hop limit=63 (request in 73)    |
| 75  | 4170.728530 | 2001:db8:c0de:12::a                  | 2001:db8:c0de:11::a   | ICMPv6   | 118 Echo (ping) request id=0x1990, seq=2, hop limit=63 (reply in 76)    |
| 76  | 4170.729053 | 2001:db8:c0de:11::a                  | 2001:db8:c0de:12::a   | ICMPv6   | 118 Echo (ping) reply id=0x1990, seq=2, hop limit=63 (request in 75)    |
| 77  | 4171.733775 | 2001:db8:c0de:12::a                  | 2001:db8:c0de:11::a   | ICMPv6   | 118 Echo (ping) request id=0x1990, seq=3, hop limit=63 (reply in 78)    |
| 78  | 4171.734152 | 2001:db8:c0de:11::a                  | 2001:db8:c0de:12::a   | ICMPv6   | 118 Echo (ping) reply id=0x1990, seq=3, hop limit=63 (request in 77)    |
| 79  | 4172.741769 | 2001:db8:c0de:12::a                  | 2001:db8:c0de:11::a   | ICMPv6   | 118 Echo (ping) request id=0x1990, seq=4, hop limit=63 (reply in 80)    |
| 80  | 4172.741769 | 2001:db8:c0de:11::a                  | 2001:db8:c0de:12::a   | ICMPv6   | 118 Echo (ping) reply id=0x1990, seq=4, hop limit=63 (request in 79)    |
| 81  | 4173.748942 | 2001:db8:c0de:12::a                  | 2001:db8:c0de:11::a   | ICMPv6   | 118 Echo (ping) request id=0x1990, seq=5, hop limit=63 (reply in 82)    |
| 82  | 4173.749156 | 2001:db8:c0de:11::a                  | 2001:db8:c0de:12::a   | ICMPv6   | 118 Echo (ping) reply id=0x1990, seq=5, hop limit=63 (request in 81)    |
| 83  | 4178.747814 | 2001:db8:c0de:12::a                  | 2001:db8:c0de:11::a   | UDP      | 126 896 + 897 Len=64  |
| 84  | 4178.748849 | 2001:db8:c0de:11::a                  | 2001:db8:c0de:12::a   | ICMPv6   | 174 Destination Unreachable (Port unreachable)[Malformed Packet]        |

Destination: Private\_66:68:04 (00:50:79:66:68:04) = LG bit: Globally unique address (factory default)  
.....0..... = IG bit: Individual address (unicast)

Source: 0c:c7:9c:68:00:02 (0c:c7:9c:68:00:02) = LG bit: Globally unique address (factory default)  
.....0..... = IG bit: Individual address (unicast)

Type: IPv6 (0x86dd)  
[Stream index: 11]

Internet Protocol Version 6, Src: 2001:db8:c0de:12::a, Dst: 2001:db8:c0de:11::a  
0110 .... = Version: 6  
.... 0000 0000 .... .... .... = Traffic Class: 0x00 (DSCP: CS0, ECN: Not-ECT)  
.... 0000 0000 0000 0000 = Flow Label: 0x0000  
Payload Length: 64  
Next Header: ICMPv6 (58)  
Hop Limit: 63  
Source Address: 2001:db8:c0de:12::a  
Destination Address: 2001:db8:c0de:11::a  
[Stream index: 10]

Internet Control Message Protocol v6  
Type: Echo (ping) request (128)  
Code: 0  
Checksum: 0x917a [correct]  
[Checksum Status: Good]  
Identifier: 0x1990  
Sequence: 1  
[Response Int: 74]  
Data (56 bytes)  
Data: 000102030405060708090a0b0c0d0e0f101112131415161718191a1b1c1d1e1f20212223242526272829..

0000 00 50 79 66 68 04 0c c7 9c 68 00 02 80  
0010 00 00 00 48 3a 3f 20 01 0d b8 c0 de 00  
0020 00 00 00 00 00 0a 20 01 0d b8 c0 de 00  
0030 00 00 00 00 00 0a 80 00 91 7a 19 90 00  
0040 02 03 04 05 06 07 08 09 0a 0b 0c 0d 0e 00  
0050 12 13 14 15 16 17 18 19 1a 1b 1c 1d 1e 00  
0060 22 23 24 25 26 27 28 29 2a 2b 2c 2d 2e 00  
0070 32 33 34 35 36 37

## Задание для самостоятельного выполнения

---

- подсеть 1: IPv4 **10.10.1.96/27**; длина префикса - 27, маска подсети:  
255.255.255.224, broadcast: **10.10.1.127**, диапазон: **10.10.1.97 – 10.10.1.126**;  
IPv6 **2001:DB8:1:1::/64**; длина префикса - 64, диапазон: **2001:db8:1:1:0:0:0:0**  
– **2001:db8:1:1:ffff:ffff:ffff:ffff**;
- подсеть 2: IPv4 **10.10.1.16/28**; длина префикса - 28, маска подсети:  
255.255.255.240, broadcast: **10.10.1.31**, диапазон адресов: **10.10.1.17 – 10.10.1.30**;  
IPv6 **2001:DB8:1:4::/64**; длина префикса - 64, диапазон:  
**2001:db8:1:4:0:0:0:0 – 2001:db8:1:4:ffff:ffff:ffff:ffff**.

# Выполнение лабораторной работы

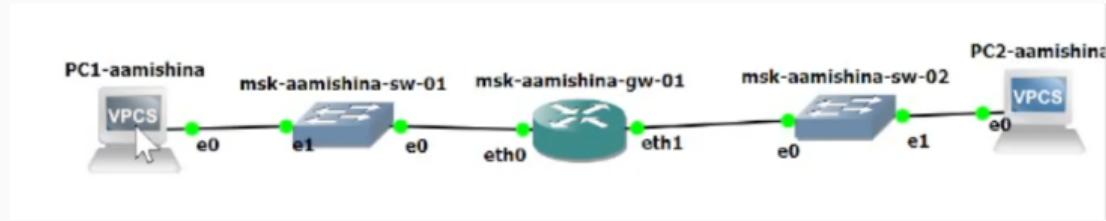


Рис. 21: Топология сети с двумя локальными подсетями

## Выполнение лабораторной работы

---

Таблица адресации:

# Выполнение лабораторной работы

```
PC1-aamishina - PuTTY

Welcome to Virtual PC Simulator, version 0.8.3
Dedicated to Daling,
Build time: Sep  9 2023 11:15:00
Copyright (c) 2007-2015, Paul Meng (mirnshi@gmail.com)
All rights reserved.

VPCS is free software, distributed under the terms of the "BSD" licence.
Source code and license can be found at vpcs.sf.net.
For more information, please visit wiki.freecode.com.cn.

Press '?' to get help.

Executing the startup file

Hostname is too long. (Maximum 12 characters)

VPCS> ip 10.10.1.99/27 10.10.1.97
Checking for duplicate address...
VPCS : 10.10.1.99 255.255.255.224 gateway 10.10.1.97

VPCS> ip 2001:db8:1::a/64
PC1 : 2001:db8:1:1::a/64

VPCS> show ip

NAME      : VPCS[1]
IP/MASK   : 10.10.1.99/27
GATEWAY   : 10.10.1.97
DNS       :
MAC       : 00:50:79:66:68:00
LPORT     : 20008
RHOST:PORT : 127.0.0.1:20009
MTU       : 1500

VPCS> show ipv6

NAME      : VPCS[1]
LINK-LOCAL SCOPE : fe80::250:79ff:fe66:6800/64
GLOBAL SCOPE   : 2001:db8:1:1::a/64
DNS       :
ROUTER LINK-LAYER :
MAC       : 00:50:79:66:68:00
LPORT     : 20008
RHOST:PORT   : 127.0.0.1:20009
MTU       : 1500

VPCS>
```

# Выполнение лабораторной работы

```
PC2-aamishina - PuTTY

Welcome to Virtual PC Simulator, version 0.8.3
Dedicated to Daling.
Build time: Sep  9 2023 11:15:00
Copyright (c) 2007-2015, Paul Meng (mirnshi@gmail.com)
All rights reserved.

VPCS is free software, distributed under the terms of the "BSD" licence.
Source code and license can be found at vpcs.sf.net.
For more information, please visit wiki.freecode.com.cn.

Press '?' to get help.

Executing the startup file

Hostname is too long. (Maximum 12 characters)

VPCS> ip 10.10.1.18/28 10.10.1.17
Checking for duplicate address...
VPCS : 10.10.1.18 255.255.255.240 gateway 10.10.1.17

VPCS> ip 2001:db8:1:4::a/64
PC1 : 2001:db8:1:4::a/64

VPCS> show ip

NAME      : VPCS[1]
IP/MASK   : 10.10.1.18/28
GATEWAY   : 10.10.1.17
DNS       :
MAC       : 00:50:79:66:68:01
LPORT     : 20010
RHOST:PORT : 127.0.0.1:20011
MTU       : 1500

VPCS> show ipv6

NAME      : VPCS[1]
LINK-LOCAL SCOPE : fe80::250:79ff:fe66:6801/64
GLOBAL SCOPE   : 2001:db8:1:4::a/64
DNS       :
ROUTER LINK-LAYER :
MAC       : 00:50:79:66:68:01
LPORT     : 20010
RHOST:PORT   : 127.0.0.1:20011
MTU       : 1500

VPCS> 
```

# Выполнение лабораторной работы

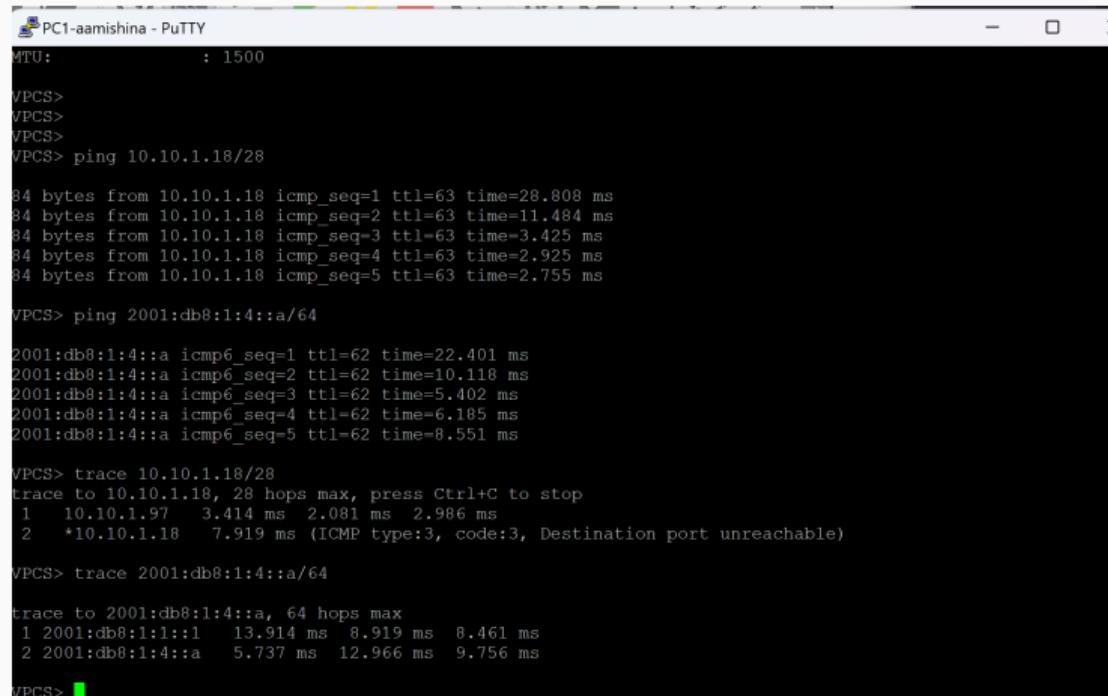
```
msk-aamishina-gw-01 - PuTTY
vyos@msk-aamishina-gw-01:~$ configure
[edit]
vyos@msk-aamishina-gw-01# set interfaces ethernet eth0 address 10.10.1.97/27
[edit]
vyos@msk-aamishina-gw-01# set interfaces ethernet eth1 address 10.10.1.17/28
[edit]
vyos@msk-aamishina-gw-01# compare
[edit interfaces ethernet eth0]
+address 10.10.1.97/27
[edit interfaces ethernet eth1]
+address 10.10.1.17/28
[edit]
vyos@msk-aamishina-gw-01# commit
[ interfaces ethernet eth0 ]
Can't configure both static IPv4 and DHCP address on the same interface

[[interfaces ethernet eth0]] failed
Commit failed
[edit]
vyos@msk-aamishina-gw-01# show interfaces
  ethernet eth0 {
    address dhcp
+    address 10.10.1.97/27
    hw-id 0c:9e:29:1f:00:00
  }
  ethernet eth1 {
    address 10.10.1.17/28
    hw-id 0c:9e:29:1f:00:01
  }
  ethernet eth2 {
    hw-id 0c:9e:29:1f:00:02
  }
  loopback lo {
}
[edit]
vyos@msk-aamishina-gw-01# delete interfaces ethernet eth0 address dhcp
[edit]
vyos@msk-aamishina-gw-01# show interfaces
  ethernet eth0 {
-    address dhcp
+    address 10.10.1.97/27
    hw-id 0c:9e:29:1f:00:00
  }
  ethernet eth1 {
    address 10.10.1.17/28
    hw-id 0c:9e:29:1f:00:01
  }
  ethernet eth2 {
    hw-id 0c:9e:29:1f:00:02
  }
  loopback lo {
}
[edit]
```

# Выполнение лабораторной работы

```
msk-aamishina-gw-01 - Putty
vyos@msk-aamishina-gw-01#
[edit]
vyos@msk-aamishina-gw-01#
[edit]
64os@msk-aamishina-gw-01# set interfaces ethernet eth0 address 2001:db8:1:1::1/
[edit]
b8:1:1::/64mishina-gw-01# set service router-advert interface eth0 prefix 2001:d
[edit]
64os@msk-aamishina-gw-01# set interfaces ethernet eth1 address 2001:db8:1:4::1/
[edit]
[edit]
b8:1:4::/64mishina-gw-01# set service router-advert interface eth1 prefix 2001:d
[edit]
vyos@msk-aamishina-gw-01# compare
[edit interfaces ethernet eth0]
+address 2001:db8:1:1::1/64
[edit interfaces ethernet eth1]
+saddress 2001:db8:1:4::1/64
[edit service]
+router-advert {
+    interface eth0 {
+        prefix 2001:db8:1:1::/64 {
+            }
+        }
+        interface eth1 {
+            prefix 2001:db8:1:4::/64 {
+                }
+            }
+        }
[edit]
vyos@msk-aamishina-gw-01# commit
[edit]
vyos@msk-aamishina-gw-01# save
Saving configuration to '/config/config.boot'...
Done
[edit]
vyos@msk-aamishina-gw-01# show interfaces
ethernet eth0 {
    address 10.10.1.97/27
    address 2001:db8:1:1::1/64
    hw-id 0c:9e:29:1f:00:00
}
ethernet eth1 {
    address 10.10.1.17/28
    address 2001:db8:1:4::1/64
    hw-id 0c:9e:29:1f:00:01
}
ethernet eth2 {
    hw-id 0c:9e:29:1f:00:02
}
loopback lo {
}
[edit]
vyos@msk-aamishina-gw-01#
```

# Выполнение лабораторной работы



```
PC1-aamishina - PuTTY
MTU:          : 1500
VPCS>
VPCS>
VPCS>
VPCS> ping 10.10.1.18/28
84 bytes from 10.10.1.18 icmp_seq=1 ttl=63 time=28.808 ms
84 bytes from 10.10.1.18 icmp_seq=2 ttl=63 time=11.484 ms
84 bytes from 10.10.1.18 icmp_seq=3 ttl=63 time=3.425 ms
84 bytes from 10.10.1.18 icmp_seq=4 ttl=63 time=2.925 ms
84 bytes from 10.10.1.18 icmp_seq=5 ttl=63 time=2.755 ms

VPCS> ping 2001:db8:1:4::a/64
2001:db8:1:4::a icmp6_seq=1 ttl=62 time=22.401 ms
2001:db8:1:4::a icmp6_seq=2 ttl=62 time=10.118 ms
2001:db8:1:4::a icmp6_seq=3 ttl=62 time=5.402 ms
2001:db8:1:4::a icmp6_seq=4 ttl=62 time=6.185 ms
2001:db8:1:4::a icmp6_seq=5 ttl=62 time=8.551 ms

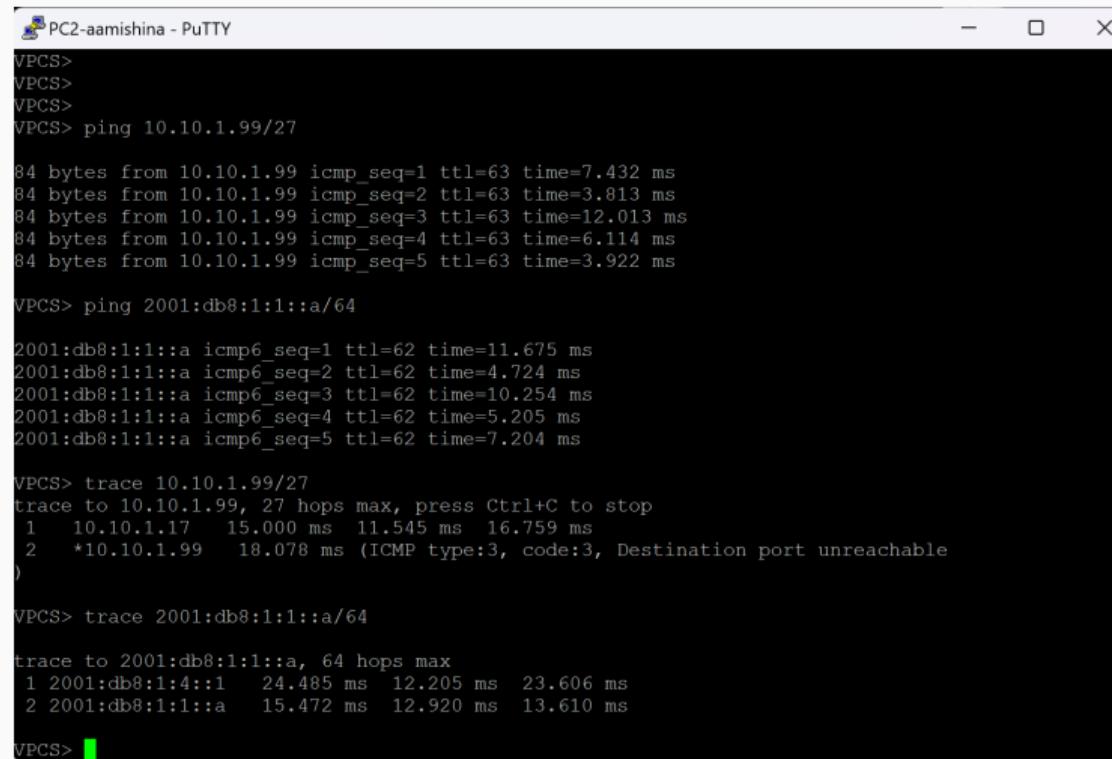
VPCS> trace 10.10.1.18/28
trace to 10.10.1.18, 28 hops max, press Ctrl+C to stop
 1  10.10.1.97    3.414 ms   2.081 ms   2.986 ms
 2  *10.10.1.18    7.919 ms (ICMP type:3, code:3, Destination port unreachable)

VPCS> trace 2001:db8:1:4::a/64
trace to 2001:db8:1:4::a, 64 hops max
 1 2001:db8:1:1::1   13.914 ms   8.919 ms   8.461 ms
 2 2001:db8:1:4::a    5.737 ms   12.966 ms   9.756 ms

VPCS>
```

Рис. 26: Проверка подключения с PC-1 на PC-2 по IPv4 и IPv6

# Выполнение лабораторной работы



PC2-aamishina - PuTTY

```
VPCS>
VPCS>
VPCS>
VPCS> ping 10.10.1.99/27

84 bytes from 10.10.1.99 icmp_seq=1 ttl=63 time=7.432 ms
84 bytes from 10.10.1.99 icmp_seq=2 ttl=63 time=3.813 ms
84 bytes from 10.10.1.99 icmp_seq=3 ttl=63 time=12.013 ms
84 bytes from 10.10.1.99 icmp_seq=4 ttl=63 time=6.114 ms
84 bytes from 10.10.1.99 icmp_seq=5 ttl=63 time=3.922 ms

VPCS> ping 2001:db8:1:1::a/64

2001:db8:1:1::a icmp6_seq=1 ttl=62 time=11.675 ms
2001:db8:1:1::a icmp6_seq=2 ttl=62 time=4.724 ms
2001:db8:1:1::a icmp6_seq=3 ttl=62 time=10.254 ms
2001:db8:1:1::a icmp6_seq=4 ttl=62 time=5.205 ms
2001:db8:1:1::a icmp6_seq=5 ttl=62 time=7.204 ms

VPCS> trace 10.10.1.99/27
trace to 10.10.1.99, 27 hops max, press Ctrl+C to stop
 1  10.10.1.17    15.000 ms   11.545 ms   16.759 ms
 2  *10.10.1.99    18.078 ms (ICMP type:3, code:3, Destination port unreachable
)

VPCS> trace 2001:db8:1:1::a/64

trace to 2001:db8:1:1::a, 64 hops max
 1 2001:db8:1:4::1    24.485 ms   12.205 ms   23.606 ms
 2 2001:db8:1:1::a    15.472 ms   12.920 ms   13.610 ms

VPCS>
```

Рис. 27: Проверка подключения с PC-2 на PC-1 по IPv4 и IPv6

## Выводы

---

В результате выполнения работы были изучены принципы распределения и настройки адресного пространства на устройствах сети.