

# Лабораторная работа №7

Сетевые технологии

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## Цель работы

Получить навыки настройки службы DHCP на сетевом оборудовании для распределения адресов IPv4 и IPv6.

## Выполнение лабораторной работы

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## Настройка DHCP в случае IPv4

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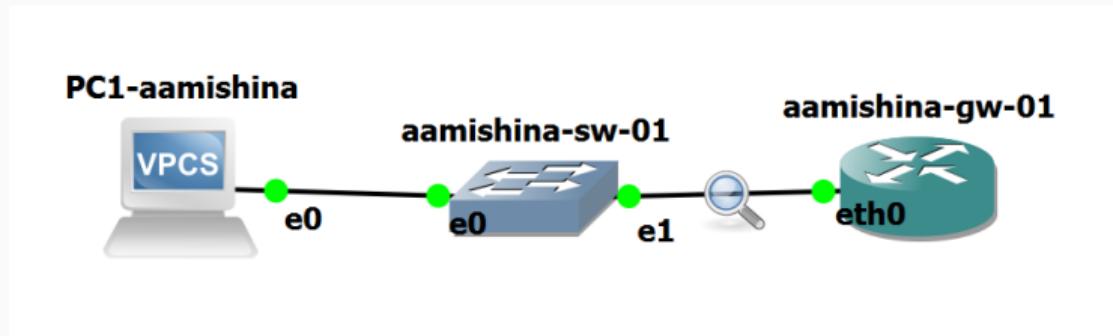


Рис. 1: Топология моделируемой сети в GNS3

```
vyos@vyos:~$ install image
You are trying to install from an already installed system. An ISO
image file to install or URL must be specified.
Exiting...
vyos@vyos:~$ configure
[edit]
vyos@vyos# set system host-name aamishina-gw-01
[edit]
vyos@vyos# set system domain-name aamishina.net
[edit]
456s@vyos# set system login user aamishina authentication plaintext-password 123
[edit]
vyos@vyos# commit
[edit]
vyos@vyos# save
Saving configuration to '/config/config.boot'...
Done
[edit]
vyos@vyos# exit
exit
vyos@vyos:~$ exit
logout

Welcome to VyOS - aamishina-gw-01 ttyS0

aamishina-gw-01 login: aamishina
Password:
Welcome to VyOS!
```

Рис. 2: Настройка образа VyOS. Вход в систему под созданным пользователем

```
aamishina@aamishina-gw-01:~$ configure
[edit]
aamishina@aamishina-gw-01# delete system login user vyos
[edit]
aamishina@aamishina-gw-01# commit
[edit]
aamishina@aamishina-gw-01# save
Saving configuration to '/config/config.boot'...
Done
[edit]
aamishina@aamishina-gw-01# █
```

Рис. 3: Удаление системного пользователя, заданного по умолчанию

# Настройка

```
aamishina@aamishina-gw-01# configure  
    Invalid command: [configure]  
  
[edit]  
aamishina@aamishina-gw-01# set interfaces ethernet eth0 address 10.0.0.1/24  
[edit]  
domain-name aamishina.net set service dhcp-server shared-network-name aamishina  
[edit]  
name-server 10.0.0.1  
  
Configuration path: service dhcp-server [shared-netrowk-name] is not valid  
Set failed  
  
[edit]  
name-server 10.0.0.1w-01# set service dhcp-server shared-network-name aamishina  
[edit]  
subnet 10.0.0.0/24 default-router 10.0.0.1-server shared-network-name aamishina  
[edit]  
subnet 10.0.0.0/24 range hosts start 10.0.0.2rver shared-network-name aamishina  
[edit]  
subnet 10.0.0.0/24 range hosts stop 10.0.0.253ver shared-network-name aamishina  
[edit]  
aamishina@aamishina-gw-01# commit
```

Рис. 4: Настройка адресации IPv4 и добавление конфигурации DHCP-сервера

```
aamishina@aamishina-gw-01:~$ show dhcp server statistics
Pool      Size     Leases   Available Usage
-----  -----
aamishina    252       0      252  0%
aamishina@aamishina-gw-01:~$ show dhcp server leases
IP address   Hardware address   State   Lease start   Lease expiration   Remaining
  Pool   Hostname
-----  -----
--  -----
aamishina@aamishina-gw-01:~$ █
```

Рис. 5: Просмотр статистики DHCP-сервера и выданных данных

```
PC1-aamishina - PuTTY
VPCS> ip dhcp -d
Opcode: 1 (REQUEST)
Client IP Address: 0.0.0.0
Your IP Address: 0.0.0.0
Server IP Address: 0.0.0.0
Gateway IP Address: 0.0.0.0
Client MAC Address: 00:50:79:66:68:00
Option 53: Message Type = Discover
Option 12: Host Name = VPCS
Option 61: Client Identifier = Hardware Type=Ethernet MAC Address = 00:50:79:66:68:00

Opcode: 1 (REQUEST)
Client IP Address: 0.0.0.0
Your IP Address: 0.0.0.0
Server IP Address: 0.0.0.0
Gateway IP Address: 0.0.0.0
Client MAC Address: 00:50:79:66:68:00
Option 53: Message Type = Discover
Option 12: Host Name = VPCS
Option 61: Client Identifier = Hardware Type=Ethernet MAC Address = 00:50:79:66:68:00

Opcode: 2 (REPLY)
Client IP Address: 0.0.0.0
Your IP Address: 10.0.0.2
Server IP Address: 0.0.0.0
Gateway IP Address: 0.0.0.0
Client MAC Address: 00:50:79:66:68:00
Option 53: Message Type = Offer
Option 54: DHCP Server = 10.0.0.1
Option 51: Lease Time = 86400
Option 1: Subnet Mask = 255.255.255.0
Option 3: Router = 10.0.0.1
Option 6: DNS Server = 10.0.0.1
Option 15: Domain = aamishina.net

Opcode: 1 (REQUEST)
Client IP Address: 10.0.0.2
Your IP Address: 0.0.0.0
Server IP Address: 0.0.0.0
Gateway IP Address: 0.0.0.0
Client MAC Address: 00:50:79:66:68:00
Option 53: Message Type = Request
Option 54: DHCP Server = 10.0.0.1
Option 50: Requested IP Address = 10.0.0.2
Option 61: Client Identifier = Hardware Type=Ethernet MAC Address = 00:50:79:66:68:00
Option 12: Host Name = VPCS

Opcode: 2 (REPLY)
Client IP Address: 10.0.0.2
Your IP Address: 10.0.0.2
Server IP Address: 0.0.0.0
Gateway IP Address: 0.0.0.0
Client MAC Address: 00:50:79:66:68:00
```

```
VPCS> show ip

NAME          : VPCS[1]
IP/MASK       : 10.0.0.2/24
GATEWAY       : 10.0.0.1
DNS           : 10.0.0.1
DHCP SERVER   : 10.0.0.1
DHCP LEASE    : 86358, 86400/43200/75600
DOMAIN NAME   : aamishina.net
MAC           : 00:50:79:66:68:00
LPORT          : 20004
RHOST:PORT    : 127.0.0.1:20005
MTU           : 1500

VPCS> ping 10.0.0.1 -c 2

84 bytes from 10.0.0.1 icmp_seq=1 ttl=64 time=1.817 ms
84 bytes from 10.0.0.1 icmp_seq=2 ttl=64 time=2.203 ms

VPCS> █
```

Рис. 7: Результат настройки PC1

## Статистика

```
aamishina@aamishina-gw-01:~$ show dhcp server statistics
Pool      Size   Leases   Available   Usage
-----  -----  -----  -----
aamishina     252        1        251  0%
aamishina@aamishina-gw-01:~$ show dhcp server leases
IP address   Hardware address   State   Lease start           Lease expiration   Remaining   Pool   Hostname
-----  -----
10.0.0.2      00:50:79:66:68:00  active  2024/12/03 15:21:36  2024/12/04 15:21:36  23:57:52  aamishina  VPCS
aamishina@aamishina-gw-01:~$
```

Рис. 8: Просмотр статистики DHCP-сервера и выданных адресов

# Журнал



```
aamishina@aamishina-gw-01:~$ aamishina@aamishina-gw-01:~$ show log | grep dhcp
Dec 03 15:04:54 dhclient-script-vyos[2008]: Deleting search domains with tag "dhcp-eth0"
" via vyos-hostsd-client
Dec 03 15:04:54 vyos-hostsd[610]: Request data: {"type": "search_domains", "op": "delete"
e", "data": ["dhcp-eth0"]}
Dec 03 15:04:54 dhclient-script-vyos[2008]: Deleting nameservers with tag "dhcp-eth0" v
ia vyos-hostsd-client
Dec 03 15:04:55 vyos-hostsd[610]: Request data: {"type": "name_servers", "op": "delete"
", "data": ["dhcp-eth0"]}
Dec 03 15:06:46 dhclient-script-vyos[2496]: Deleting search domains with tag "dhcp-eth0"
" via vyos-hostsd-client
Dec 03 15:06:46 vyos-hostsd[610]: Request data: {"type": "search_domains", "op": "delet
e", "data": ["dhcp-eth0"]}
Dec 03 15:06:46 dhclient-script-vyos[2496]: Deleting nameservers with tag "dhcp-eth0" v
ia vyos-hostsd-client
Dec 03 15:06:46 vyos-hostsd[610]: Request data: {"type": "name_servers", "op": "delete"
", "data": ["dhcp-eth0"]}
Dec 03 15:08:59 dhclient-script-vyos[2635]: Deleting search domains with tag "dhcp-eth0"
" via vyos-hostsd-client
Dec 03 15:08:59 vyos-hostsd[610]: Request data: {"type": "search_domains", "op": "delet
e", "data": ["dhcp-eth0"]}
Dec 03 15:08:59 dhclient-script-vyos[2635]: Deleting nameservers with tag "dhcp-eth0" v
ia vyos-hostsd-client
Dec 03 15:08:59 vyos-hostsd[610]: Request data: {"type": "name_servers", "op": "delete"
", "data": ["dhcp-eth0"]}
Dec 03 15:11:13 dhclient-script-vyos[2715]: Deleting search domains with tag "dhcp-eth0"
" via vyos-hostsd-client
Dec 03 15:11:13 vyos-hostsd[610]: Request data: {"type": "search_domains", "op": "delet
e", "data": ["dhcp-eth0"]}
Dec 03 15:11:13 dhclient-script-vyos[2715]: Deleting nameservers with tag "dhcp-eth0" v
ia vyos-hostsd-client
Dec 03 15:11:13 vyos-hostsd[610]: Request data: {"type": "name_servers", "op": "delete"
", "data": ["dhcp-eth0"]}
Dec 03 15:13:02 sudo(2881): aamishina : TTY=ttyS0 ; PWD=/home/aamishina ; USER=root ; C
OMMAND=/usr/bin/sh -c /usr/sbin/vyshim /usr/libexec/vyos/conf_mode/dhcp_server.py
Dec 03 15:13:02 vyos-configd[611]: Received message: {"type": "node", "data": "/usr/lib
exec/vyos/conf_mode/dhcp_server.py"}
Dec 03 15:13:07 dhclient-script-vyos[2921]: Deleting search domains with tag "dhcp-eth0"
" via vyos-hostsd-client
Dec 03 15:13:08 vyos-hostsd[610]: Request data: {"type": "search_domains", "op": "delet
e", "data": ["dhcp-eth0"]}
Dec 03 15:13:08 dhclient-script-vyos[2921]: Deleting nameservers with tag "dhcp-eth0" v
ia vyos-hostsd-client
Dec 03 15:13:08 vyos-hostsd[610]: Request data: {"type": "name_servers", "op": "delete"
", "data": ["dhcp-eth0"]}
Dec 03 15:15:11 dhclient-script-vyos[2955]: Deleting search domains with tag "dhcp-eth0"
" via vyos-hostsd-client
Dec 03 15:15:11 vyos-hostsd[610]: Request data: {"type": "search_domains", "op": "delet
e", "data": ["dhcp-eth0"]}
Dec 03 15:15:11 dhclient-script-vyos[2955]: Deleting nameservers with tag "dhcp-eth0" v
ia vyos-hostsd-client
Dec 03 15:15:11 vyos-hostsd[610]: Request data: {"type": "name_servers", "op": "delete"
", "data": ["dhcp-eth0"]}
```

## Wireshark

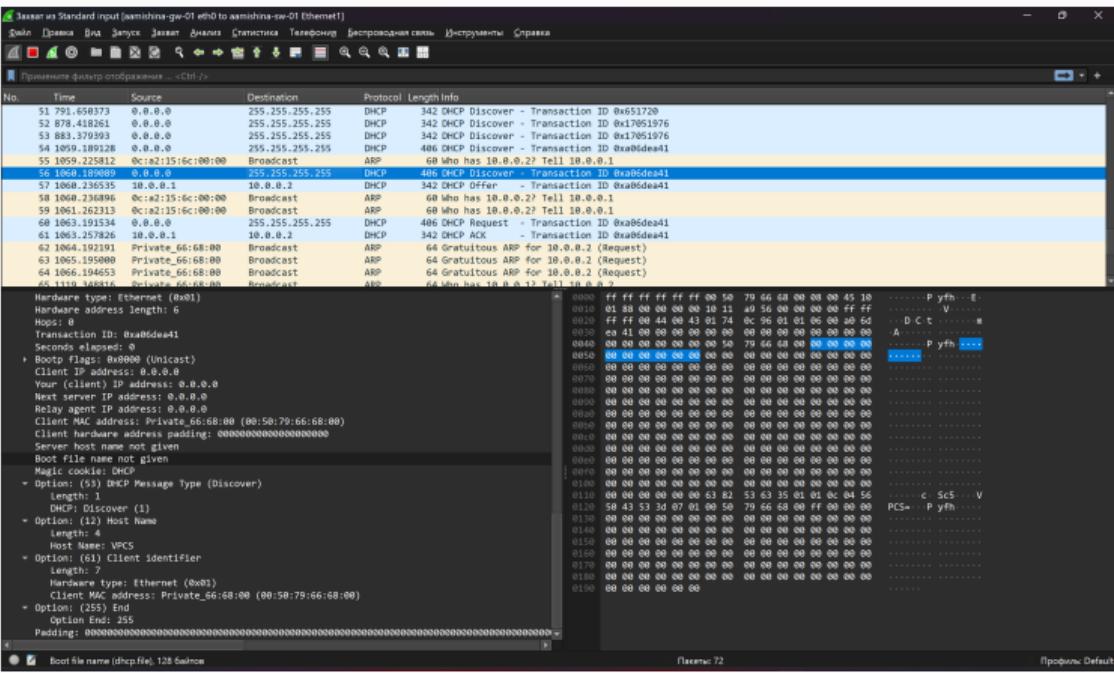


Рис. 10: Захваченные пакеты в Wireshark

## Настройка DHCP в случае IPv6

---

# Установка

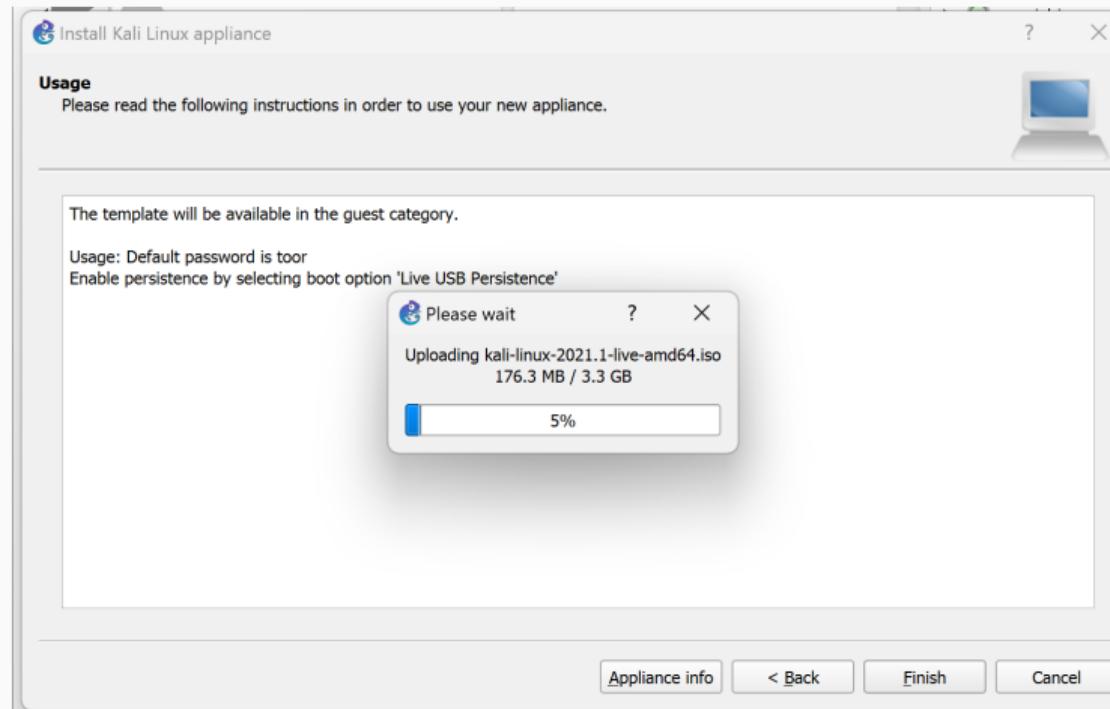


Рис. 11: Установка Kali Linux

# Топология

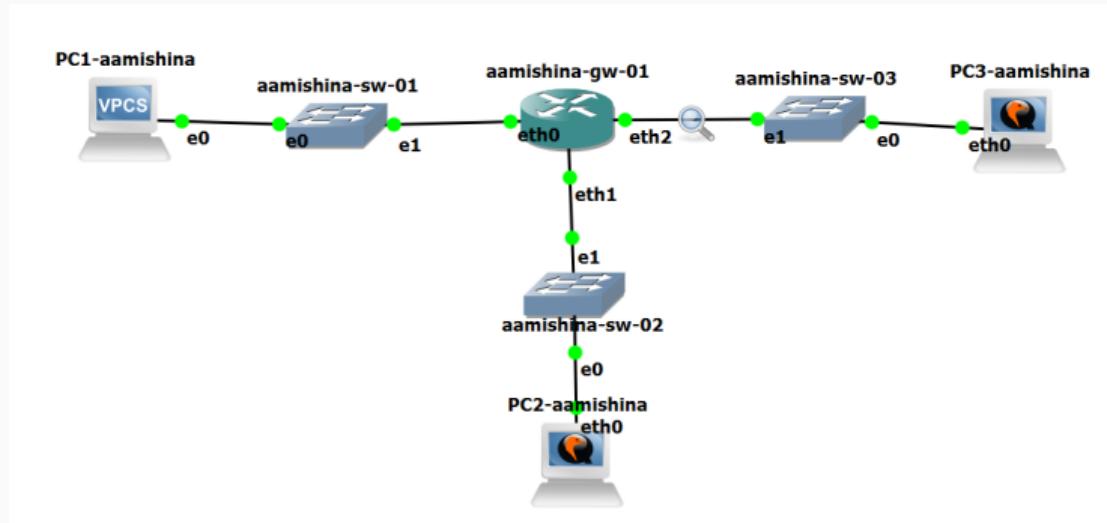


Рис. 12: Топология моделируемой сети

# Настройка

```
aamishina@aamishina-gw-01:~$ configure
[edit]
aamishina@aamishina-gw-01# set interfaces ethernet eth1 address 2000::1/64
[edit]
aamishina@aamishina-gw-01# set interfaces ethernet eth2 address 2001::1/64
[edit]
aamishina@aamishina-gw-01# show interfaces
    ethernet eth0 {
        address 10.0.0.1/24
        hw-id 0c:a2:15:6c:00:00
    }
    ethernet eth1 {
+        address 2000::1/64
+        hw-id 0c:a2:15:6c:00:01
    }
    ethernet eth2 {
+        address 2001::1/64
+        hw-id 0c:a2:15:6c:00:02
    }
    loopback lo {
}
[edit]
aamishina@aamishina-gw-01# commit
[edit]
aamishina@aamishina-gw-01# save
Saving configuration to '/config/config.boot'...
Done
[edit]
aamishina@aamishina-gw-01# █
```

Рис. 13: Настройка адресации IPv6 на маршрутизаторе

## Router Advertisements

```
:/64shina@aamishina-gw-01# set service router-advert interface eth1 prefix 2000:  
[edit]  
[edit]  
aamishina@aamishina-gw-01#  
[edit]  
-flaghina@aamishina-gw-01# set service router-advert interface eth1 other-config  
g
```

Рис. 14: Настройка RA

## Настройка

```
na-statelessmishina-gw-01# set service dhcipv6-server shared-network-name aamishi
[edit]
na-stateless subnet 2000::0/64 service dhcipv6-server shared-network-name aamishi
[edit]
na-stateless common-options name-server 2000::1server shared-network-name aamishi
[edit]
na-stateless common-options domain-search aamishina.netared-network-name aamishi
[edit]
aamishina@aamishina-gw-01# commit
[edit]
aamishina@aamishina-gw-01# save
Saving configuration to '/config/config.boot'...
Done
[edit]
aamishina@aamishina-gw-01# run show configuration
```

Рис. 15: Добавим конфигурации DHCP-сервера

# Результат



```
aamishina@aaamishina-gw-01: ~ % run show configuration
interfaces {
    ethernet eth0 {
        address 10.0.0.1/24
        hw-id 0c:a2:15:6c:00:00
    }
    ethernet eth1 {
        address 2000::1/64
        hw-id 0c:a2:15:6c:00:01
    }
    ethernet eth2 {
        address 2001::1/64
        hw-id 0c:a2:15:6c:00:02
    }
    loopback lo {
    }
}
service {
    dhcp-server {
        shared-network-name aaamishina {
            domain-name aaamishina.net
            name-server 10.0.0.1
            subnet 10.0.0.0/24 {
                default-router 10.0.0.1
                range hosts {
                    start 10.0.0.2
                    stop 10.0.0.253
                }
            }
        }
        dhcipv6-server {
            shared-network-name aaamishina-stateless {
                common-options {
                    domain-search aaamishina.net
                    name-server 2000::1
                }
                subnet 2000::0/64 {
                }
            }
        }
    router-advert {
        interface eth1 {
            other-config-flag
            prefix 2000::/64 {
            }
        }
    ssh {
    }
}
system {
    config-management {
        commit-interval 100
    }
}
```

# ifconfig

```
root@kali:~# ifconfig
eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
        inet6 2000::2c98:c01a:7291:8af1 prefixlen 64 scopeid 0x0<global>
              inet6 fe80::b07c:b17a:b7e9:b88d prefixlen 64 scopeid 0x20<link>
                ether 0c:dd:d9:1c:00:00 txqueuelen 1000 (Ethernet)
                  RX packets 8 bytes 904 (904.0 B)
                  RX errors 0 dropped 0 overruns 0 frame 0
                  TX packets 37 bytes 4557 (4.4 KiB)
                  TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

eth1: flags=4099<UP,BROADCAST,MULTICAST> mtu 1500
        ether 0c:dd:d9:1c:00:01 txqueuelen 1000 (Ethernet)
          RX packets 0 bytes 0 (0.0 B)
          RX errors 0 dropped 0 overruns 0 frame 0
          TX packets 0 bytes 0 (0.0 B)
          TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

eth2: flags=4099<UP,BROADCAST,MULTICAST> mtu 1500
        ether 0c:dd:d9:1c:00:02 txqueuelen 1000 (Ethernet)
          RX packets 0 bytes 0 (0.0 B)
          RX errors 0 dropped 0 overruns 0 frame 0
          TX packets 0 bytes 0 (0.0 B)
          TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

eth3: flags=4099<UP,BROADCAST,MULTICAST> mtu 1500
        ether 0c:dd:d9:1c:00:03 txqueuelen 1000 (Ethernet)
          RX packets 0 bytes 0 (0.0 B)
          RX errors 0 dropped 0 overruns 0 frame 0
          TX packets 0 bytes 0 (0.0 B)
          TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

eth4: flags=4099<UP,BROADCAST,MULTICAST> mtu 1500
        ether 0c:dd:d9:1c:00:04 txqueuelen 1000 (Ethernet)
          RX packets 0 bytes 0 (0.0 B)
          RX errors 0 dropped 0 overruns 0 frame 0
          TX packets 0 bytes 0 (0.0 B)
          TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

## Проверка

```
root@kali:~# route -n -A inet6
Kernel IPv6 routing table
Destination          Next Hop          Flag Met Ref Use If
::1/128              ::                U    256 2   0 lo
2000::/64             ::                U    100 2   0 eth0
fe80::/64             ::                U    100 1   0 eth0
::/0                  fe80:::ea2:15ff:fe6c:1  UG   100 1   0 eth0
::1/128              ::                UAn  0   4   0 lo
2000::2c98:c01a:7291:8af1/128  ::                UAn  0   3   0 eth0
fe80::b07c:b17a:b7e9:b88d/128  ::                UAn  0   3   0 eth0
ff00::/8              ::                U    256 3   0 eth0
::/0                  ::                !n   -1  1   0 lo
root@kali:~# ping 2000::1 -c 2
PING 2000::1(2000::1) 56 data bytes
64 bytes from 2000::1: icmp_seq=1 ttl=64 time=16.7 ms
64 bytes from 2000::1: icmp_seq=2 ttl=64 time=6.60 ms

--- 2000::1 ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1004ms
rtt min/avg/max/mdev = 6.603/11.629/16.656/5.026 ms
root@kali:~# cat /etc/resolv.conf
# Generated by NetworkManager
search aamishina.net
nameserver 2000::1
```

Рис. 18: route на PC2. Пингование маршрутизатора. Проверка настроек DNS

## Получение адреса

```
root@kali:~# dhclient -6 -S -v eth0
Internet Systems Consortium DHCP Client 4.4.1
Copyright 2004-2018 Internet Systems Consortium.
All rights reserved.
For info, please visit https://www.isc.org/software/dhcp/

Listening on Socket/eth0
Sending on  Socket/eth0
Created duid "\000\003\000\001\014\335\331\034\000\000".
PRC: Requesting information (INIT).
XMT: Forming Info-Request, 0 ms elapsed.
XMT: Info-Request on eth0, interval 1020ms.
RCV: Reply message on eth0 from fe80::ea2:15ff:fe6c:1.
PRC: Done.

root@kali:~# ping 2000::1 -c 2
PING 2000::1(2000::1) 56 data bytes
64 bytes from 2000::1: icmp_seq=1 ttl=64 time=53.9 ms
64 bytes from 2000::1: icmp_seq=2 ttl=64 time=9.78 ms

--- 2000::1 ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1003ms
rtt min/avg/max/mdev = 9.783/31.823/53.864/22.040 ms
root@kali:~# cat /etc/resolv.conf
search aamishina.net.
nameserver 2000::1
root@kali:~#
```

## Проверка

```
aamishina@aamishina-gw-01# ping 2000::2c98:c01a:7291:8af1
PING 2000::2c98:c01a:7291:8af1(2000::2c98:c01a:7291:8af1) 56 data bytes
64 bytes from 2000::2c98:c01a:7291:8af1: icmp_seq=1 ttl=64 time=9.23 ms
64 bytes from 2000::2c98:c01a:7291:8af1: icmp_seq=2 ttl=64 time=5.62 ms
64 bytes from 2000::2c98:c01a:7291:8af1: icmp_seq=3 ttl=64 time=4.41 ms
64 bytes from 2000::2c98:c01a:7291:8af1: icmp_seq=4 ttl=64 time=3.69 ms
64 bytes from 2000::2c98:c01a:7291:8af1: icmp_seq=5 ttl=64 time=2.78 ms
64 bytes from 2000::2c98:c01a:7291:8af1: icmp_seq=6 ttl=64 time=3.37 ms
64 bytes from 2000::2c98:c01a:7291:8af1: icmp_seq=7 ttl=64 time=5.16 ms
64 bytes from 2000::2c98:c01a:7291:8af1: icmp_seq=8 ttl=64 time=3.38 ms
64 bytes from 2000::2c98:c01a:7291:8af1: icmp_seq=9 ttl=64 time=3.79 ms
^C
--- 2000::2c98:c01a:7291:8af1 ping statistics ---
9 packets transmitted, 9 received, 0% packet loss, time 28ms
rtt min/avg/max/mdev = 2.783/4.602/9.231/1.844 ms
[edit]
aamishina@aamishina-gw-01# run show dhcpcv6 server leases
IPv6 address      State      Last communication      Lease expiration      Remaining
Type    Pool      IAID_DUID
-----  -----  -----
[edit]
aamishina@aamishina-gw-01#
```

Рис. 20: Просмотр выданных адресов

# Wireshark

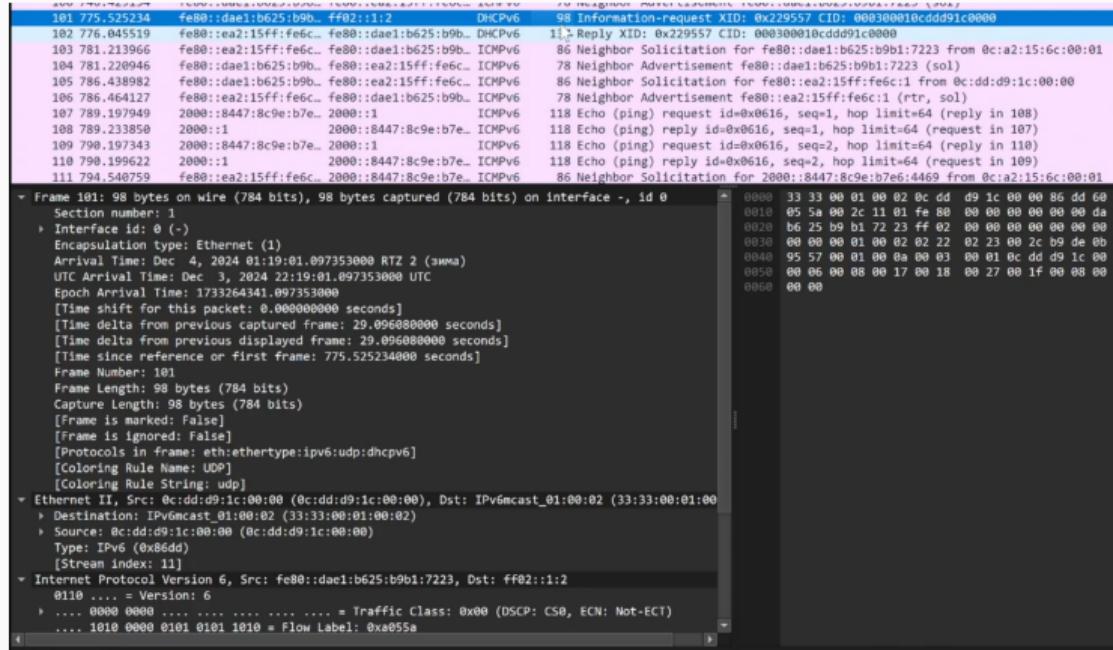


Рис. 21: Захваченный трафик

## Router Advertisements

```
[edit]
gamishina@aamishina-gw-01#  set service router-advert interface eth2 managed-fla
[edit]
aamishina@aamishina-gw-01# commit
[edit]
aamishina@aamishina-gw-01# save
```

Рис. 22: Настройка RA

# Настройка

```
aamishina@aamishina-gw-01:~$ configure
[edit]
na-statefulamishina-gw-01# set service dhcipv6-server shared-network-name aamishi
[edit]
na-stateful subnet 2001::0/64t service dhcipv6-server shared-network-name aamishi
[edit]
na-stateful subnet 2001::0/64 name-server 2001::1ver shared-network-name aamishi
[edit]
na-stateful subnet 2001::0/64 domain-search aamishina.neted-network-name aamishi
[edit]
na-stateful subnet 2001::0/64 address-range start 2001::100 stop 2001::199amishi
[edit]
aamishina@aamishina-gw-01# commit
[edit]
aamishina@aamishina-gw-01# save
Saving configuration to '/config/config.boot'...
Done
[edit]
aamishina@aamishina-gw-01# █
```

Рис. 23: Добавление конфигурации DHCP-сервера

# Результат

```
dhcpv6-server {
    shared-network-name aamishina-stateful {
        subnet 2001::0/64 {
            address-range {
                start 2001::100 {
                    stop 2001::199
                }
            }
            domain-search aamishina.net
            name-server 2001::1
        }
    }
    shared-network-name aamishina-stateless {
        common-options {
            domain-search aamishina.net
            name-server 2000::1
        }
        subnet 2000::0/64 {
        }
    }
}
router-advert {
    interface eth1 {
        other-config-flag
        prefix 2000::/64 {
        }
    }
    interface eth2 {
        managed-flag
    }
}
```

Рис. 24: Результат настройки DHCPv6 с отслеживания состояния

# ifconfig

```
root@kali:~# ifconfig
eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
      ether 0c:b3:46:ce:00:00  txqueuelen 1000  (Ethernet)
      RX packets 0  bytes 0 (0.0 B)
      RX errors 0  dropped 0  overruns 0  frame 0
      TX packets 70  bytes 10420 (10.1 KiB)
      TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

eth1: flags=4099<UP,BROADCAST,MULTICAST>  mtu 1500
      ether 0c:b3:46:ce:00:01  txqueuelen 1000  (Ethernet)
      RX packets 0  bytes 0 (0.0 B)
      RX errors 0  dropped 0  overruns 0  frame 0
      TX packets 0  bytes 0 (0.0 B)
      TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

eth2: flags=4099<UP,BROADCAST,MULTICAST>  mtu 1500
      ether 0c:b3:46:ce:00:02  txqueuelen 1000  (Ethernet)
      RX packets 0  bytes 0 (0.0 B)
      RX errors 0  dropped 0  overruns 0  frame 0
      TX packets 0  bytes 0 (0.0 B)
      TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

eth3: flags=4099<UP,BROADCAST,MULTICAST>  mtu 1500
      ether 0c:b3:46:ce:00:03  txqueuelen 1000  (Ethernet)
      RX packets 0  bytes 0 (0.0 B)
      RX errors 0  dropped 0  overruns 0  frame 0
      TX packets 0  bytes 0 (0.0 B)
      TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

eth4: flags=4099<UP,BROADCAST,MULTICAST>  mtu 1500
      ether 0c:b3:46:ce:00:04  txqueuelen 1000  (Ethernet)
      RX packets 0  bytes 0 (0.0 B)
      RX errors 0  dropped 0  overruns 0  frame 0
      TX packets 0  bytes 0 (0.0 B)
      TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

eth5: flags=4099<UP,BROADCAST,MULTICAST>  mtu 1500
      ether 0c:b3:46:ce:00:05  txqueuelen 1000  (Ethernet)
```

## Получение адреса

```
root@kali:~# dhclient -6 -v eth0
Internet Systems Consortium DHCP Client 4.4.1
Copyright 2004-2018 Internet Systems Consortium.
All rights reserved.
For info, please visit https://www.isc.org/software/dhcp/

Listening on Socket/eth0
Sending on  Socket/eth0
Created duid "\000\001\000\001.\342E\322\014\263F\316\000\000".
PRC: Soliciting for leases (INIT).
XMT: Forming Solicit, 0 ms elapsed.
XMT: X-- IA_NA 46:ce:00:00
XMT: | X-- Request renew in +3600
XMT: | X-- Request rebind in +5400
XMT: Solicit on eth0, interval 1030ms.
XMT: Forming Solicit, 1180 ms elapsed.
XMT: X-- IA_NA 46:ce:00:00
XMT: | X-- Request renew in +3600
XMT: | X-- Request rebind in +5400
XMT: Solicit on eth0, interval 2100ms.
RCV: Advertise message on eth0 from fe80::ea2:15ff:fe6c:2.
RCV: X-- IA_NA 46:ce:00:00
RCV: | X-- starts 1733265749
RCV: | X-- t1 - renew +0
RCV: | X-- t2 - rebind +0
RCV: | X-- [Options]
RCV: | | X-- IAADDR 2001::198
RCV: | | | X-- Preferred lifetime 27000
```

Рис. 26: Получение адреса по DHCPv6

## ifconfig

```
root@kali:~# ifconfig
eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
        inet6 fe80::28db:4c27:851:65dd prefixlen 64 scopeid 0x20<link>
        inet6 2001::198 prefixlen 128 scopeid 0x0<global>
        ether 0c:b3:46:ce:00:00 txqueuelen 1000 (Ethernet)
        RX packets 16 bytes 2019 (1.9 KiB)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 216 bytes 31624 (30.8 KiB)
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

    eth1: flags=4099<UP,BROADCAST,MULTICAST> mtu 1500
        ether 0c:b3:46:ce:00:01 txqueuelen 1000 (Ethernet)
        RX packets 0 bytes 0 (0.0 B)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 0 bytes 0 (0.0 B)
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

    eth2: flags=4099<UP,BROADCAST,MULTICAST> mtu 1500
        ether 0c:b3:46:ce:00:02 txqueuelen 1000 (Ethernet)
        RX packets 0 bytes 0 (0.0 B)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 0 bytes 0 (0.0 B)
```

Рис. 27: Команда ifconfig в терминале PC3

## Проверка

```
root@kali:~# route -n -A inet6
Kernel IPv6 routing table
Destination          Next Hop            Flag Met Ref Use
::1/128              ::                  U     256 2   0
2001::198/128        ::                  U     100 1   0
fe80::/64             ::                  U     100 1   0
::/0                  fe80::ea2:15ff:fe6c:2  UG    100 2   0
::1/128              ::                  UAn   0    4   0
2001::198/128        ::                  UAn   0    3   0
fe80::28db:4c27:851:65dd/128  ::                  UAn   0    3   0
ff00::/8              ::                  U     256 3   0
::/0                  ::                  !n    -1   1   0
root@kali:~# ping 2001::1 -c 2
PING 2001::1(2001::1) 56 data bytes
64 bytes from 2001::1: icmp_seq=1 ttl=64 time=40.5 ms
64 bytes from 2001::1: icmp_seq=2 ttl=64 time=6.85 ms

--- 2001::1 ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1021ms
rtt min/avg/max/mdev = 6.853/23.700/40.548/16.847 ms
root@kali:~# cat /etc/resolv.conf
# Generated by NetworkManager
search aamishina.net
nameserver 2001::1
root@kali:~#
```

Рис. 28: Команды route, ping, cat

## Проверка

```
aamishina@aamishina-gw-01# run show dhcpcv6 server leases
IPv6 address      State    Last communication    Lease expiration    Remaining    Type
      Pool          IAID_DUID
-----
2001::198      active   2024/12/03 22:42:29   2024/12/04 00:47:29  1:53:20    non-te
mportary  aamishina-stateful  00:00:ce:46:00:01:00:01:2e:e2:45:d2:0c:b3:46:ce:00:00
[edit]
aamishina@aamishina-gw-01#
```

Рис. 29: Выданные адреса

# Wireshark

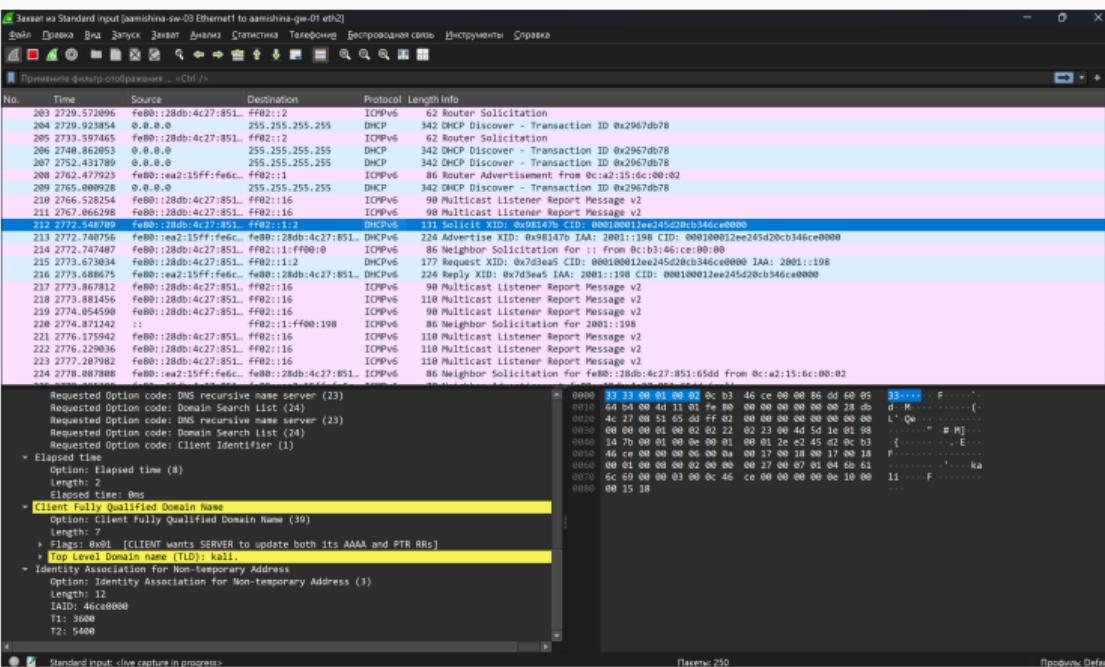


Рис. 30: Информация по захваченным пакетам

## Выводы

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В процессе выполнения лабораторной работы я получила навыки настройки службы DHCP на сетевом оборудовании для распределения адресов IPv4 и IPv6.