Лабораторная работа №7

Тема «Адресация IPv4 и IPv6.Настройка DHCP» по дисциплине «Сетевые технологии»

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«<u>20</u>» октября 20<u>23</u>г.

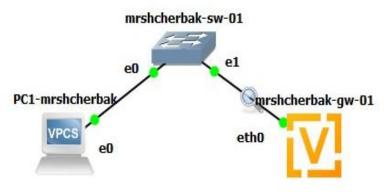
Цель работы

Получение навыков настройки службы DHCP на сетевом оборудовании для распределения адресов IPv4 и IPv6.

Выполнение работы

Настройка DHCP в случае IPv4





Настроила VyOS на маршрутизаторе, заменила системного пользователя.

```
mrshcherbak-gw-01 - PuTTY
                                                                          mrshcherbak@mrshcherbak-gw-01:~$ configure
WARNING: You are currently configuring a live-ISO environment, changes will not
persist until installed
[edit]
mrshcherbak@mrshcherbak-qw-01# delete system login user vyos
editl
mrshcherbak@mrshcherbak-gw-01# commit
mrshcherbak@mrshcherbak-gw-01# save
Saving configuration to '/config/config.boot'...
[edit]
mrshcherbak@mrshcherbak-gw-01# set interfaces ethernet eth0 address 10.0.0.1/24
mrshcherbak@mrshcherbak-gw-01# set service dhcp-server shared-network-name mrshc
herbak domain-name mrshcherbak.net
[edit]
mrshcherbak@mrshcherbak-gw-01# set service dhcp-server shared-network-name mrshc
herbak name-server 10.0.0.1
editl
mrshcherbak@mrshcherbak-gw-01# set service dhcp-server shared-network-name mrshc
herbak subnet 10.0.0.0/24 default-router 10.0.0.1
mrshcherbak@mrshcherbak-gw-01#
editl
mrshcherbak@mrshcherbak-gw-01# set service dhcp-server shared-network-name mrshc
herbak subnet 10.0.0.0/24 range hosts start 10.0.0.2
editl
mrshcherbak@mrshcherbak-qw-01# set service dhcp-server shared-network-name mrshc
herbak subnet 10.0.0.0/24 range hosts stop 10.0.0.253
[edit]
mrshcherbak@mrshcherbak-gw-01# commit
mrshcherbak@mrshcherbak-gw-01# save
Saving configuration to '/config/config.boot'...
Done
[edit]
mrshcherbak@mrshcherbak-gw-01# exit
mrshcherbak@mrshcherbak-gw-01:~$
```

Настроила IPv4 и DHCP на маршрутизаторе для пользователя, создала разделяемую сеть "mrshcherbak" с подсетью 10.0.0.0/24 и диапазоном адресов 10.0.0.2—10.0.0.253.

Просмотр статистики DHCP-сервера и выданных адресов

```
mrshcherbak@mrshcherbak-gw-01:~$ show dhop server statistics

Pool Size Leases Available Usage

mrshcherbak 252 0 252 0%

mrshcherbak@mrshcherbak-gw-01:~$ show dhop server leases

IP address Hardware address State Lease start Lease expiration Remaining P

ool Hostname

mrshcherbak@mrshcherbak-gw-01:~$

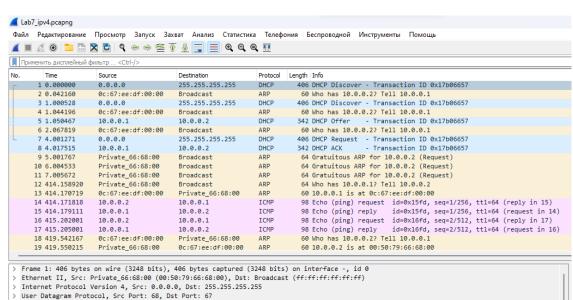
mrshcherbak@mrshcherbak-gw-01:~$
```

```
PC1-mrshcherbak - PuTTY
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 = mrshcherbak.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
Option 53: Message Type = Ack
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 = mrshcherbak.net
IP 10.0.0.2/24 GW 10.0.0.1
VPCS>
```

Настроила РС1, просмотрев DHCP запросы и ответы, клиент получил IP 10.0.0.2, настроен с шлюзом 10.0.0.1, DNS 10.0.0.1, маской 255.255.255.0 и доменом mrshcherbak.net.

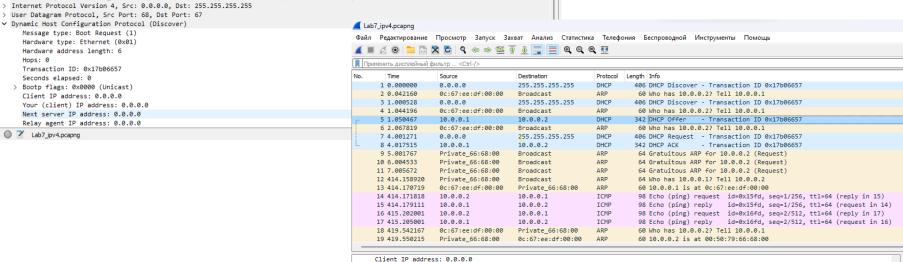
Проверила конфигурацию IPv4 на узле, пропинговала маршрутизатор

```
VPCS> show ip
NAME
            : VPCS[1]
IP/MASK
            : 10.0.0.2/24
GATEWAY
            : 10.0.0.1
            : 10.0.0.1
DHCP SERVER : 10.0.0.1
DHCP LEASE : 86148, 86400/43200/75600
DOMAIN NAME : mrshcherbak.net
MAC
            : 00:50:79:66:68:00
LPORT
            : 20010
RHOST: PORT : 127.0.0.1:20011
MTU
            : 1500
VPCS> ping 10.0.0.1 -c 2
84 bytes from 10.0.0.1 icmp seq=1 tt1=64 time=7.770 ms
84 bytes from 10.0.0.1 icmp seq=2 ttl=64 time=3.285 ms
```



Просмотр Wireshark (DHCP Discover)

Пакеты: 19 • Показа



Your (client) IP address: 10.0.0.2 Next server IP address: 0.0.0.0 Relav agent IP address: 0.0.0.0

Байты 86-149: Server host name (dhcp.server)

Client MAC address: Private 66:68:00 (00:50:79:66:68:00)

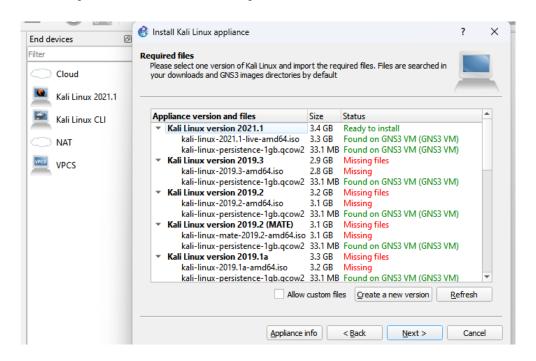
Просмотр Wireshark (DHCP Offer)

Просмотр Wireshark (DHCP ACK)

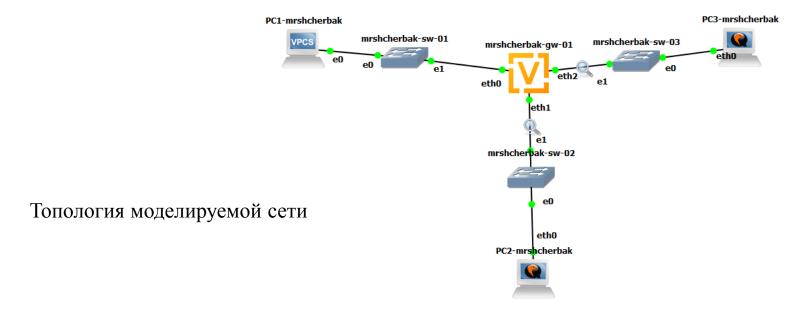
Проверила статистику DHCP-сервера на маршрутизаторе с помощью команд show dhcp server statistics и show dhcp server leases, а также просмотрела журнал событий DHCP через команду show log | grep dhcp.

```
Lease expiration
                                                                                     Remainin
                                           2023/10/19 09:48:42 2023/10/20 09:48:42 23:50:14
                                vyos : TTY=ttyS0 ; PWD=/home/vyos ; USER=root ; COMMAND=/usr/libex
                                vyos : TTY=ttyS0 ; PWD=/home/vyos ; USER=root ; COMMAND=/usr/libex
Oct 19 09:41:14 sudo[2727]: mrshcherbak : TTY=ttyS0 ; PWD=/home/mrshcherbak ; USER=root ; COMMAND=
/usr/bin/sh -c /usr/sbin/vyshim /usr/libexec/vyos/conf mode/dhcp server.py
Oct 19 09:41:14 vyos-configd[321]: Received message: {"type": "node", "data": "/usr/libexec/vyos/c
onf mode/dhcp server.py"}
Oct 19 09:41:15 sh[2740]: touch: cannot touch '/config/dhcpd.leases': No such file or directory
Oct 19 09:41:15 systemd[1]: isc-dhcp-server.service: Control process exited, code=exited, status=1
FAILURE
Oct 19 09:41:15 systemd[1]: isc-dhcp-server.service: Failed with result 'exit-code'.
Oct 19 09:41:15 systemd[1]: isc-dhcp-server.service: Service RestartSec=100ms expired.
```

Настройка DHCP в случае IPv6



Добавление Kali Linux в перечень устройств в GNS3



```
mrshcherbak@mrshcherbak-gw-01# set interfaces ethernet ethl address 2000::1/64
[edit]
mrshcherbak@mrshcherbak-gw-01# set interfaces ethernet eth2 address 2001::1/64
mrshcherbak@mrshcherbak-gw-01# show interfaces
ethernet eth0 {
     hw-id 0c:63:e2:4a:00:00
ethernet eth1 {
     address 2000::1/64
     hw-id 0c:63:e2:4a:00:01
ethernet eth2 {
     address 2001::1/64
     hw-id 0c:63:e2:4a:00:02
loopback lo {
[edit]
mrshcherbak@mrshcherbak-gw-01# commit
mrshcherbak@mrshcherbak-gw-01# save
Saving configuration to '/config/config.boot'...
[edit]
mrshcherbak@mrshcherbak-gw-01#
```

mrshcherbak-gw-01 - PuTTY

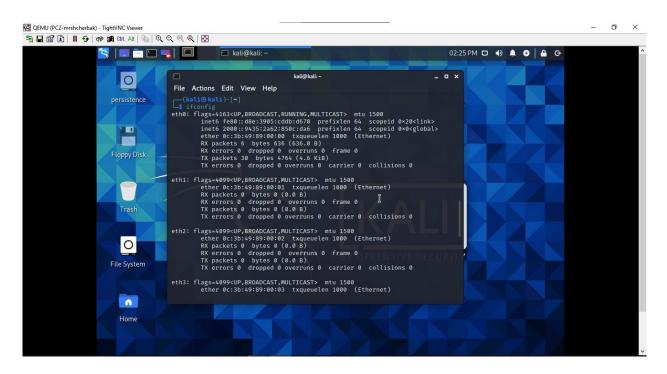
```
[edit]
mrshcherbak@mrshcherbak-gw-01# set service dhcpv6-server shared-network-name mrs
hcherbak-stateless
[edit]
mrshcherbak@mrshcherbak-gw-01# set service dhcpv6-server shared-network-name mrs
hcherbak-stateless subnet 2000::0/64
[edit]
mrshcherbak@mrshcherbak-gw-01# set service dhcpv6-server shared-network-name mrs
hcherbak-stateless common-options name-server 2000::1
mrshcherbak@mrshcherbak-gw-01# set service dhcpv6-server shared-network-name mrs
hcherbak-stateless common-options domain-search mrshcherbak.net
mrshcherbak@mrshcherbak-gw-01# commit
[edit]
mrshcherbak@mrshcherbak-gw-01# save
Saving configuration to '/config/config.boot' ...
[edit]
```

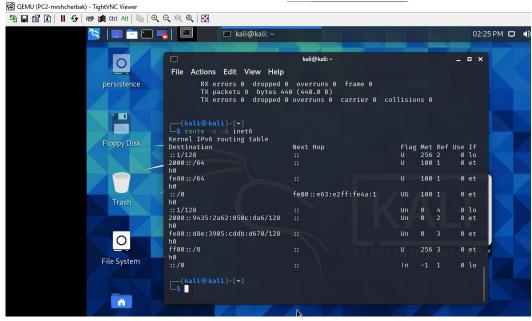
Настройка адресации IPv6 на маршрутизаторе

Настроила DHCPv6 без отслеживания состояния

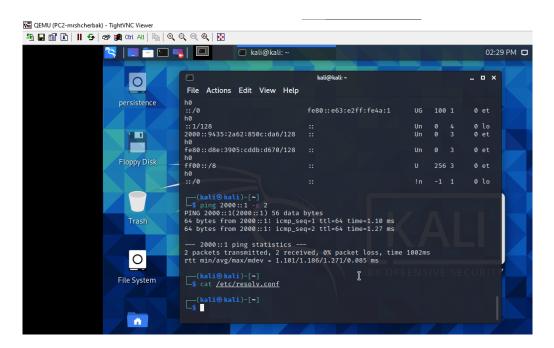
mrshcherbak-gw-01 - PuTTY

```
mrshcherbak@mrshcherbak-gw-01# run show configuration
interfaces {
    ethernet eth0 {
       hw-id 0c:63:e2:4a:00:00
    ethernet eth1 {
       address 2000::1/64
       hw-id 0c:63:e2:4a:00:01
    ethernet eth2 {
       address 2001::1/64
       hw-id 0c:63:e2:4a:00:02
    loopback lo {
service {
    dhcpv6-server {
       shared-network-name mrshcherbak-stateless {
           common-options {
                domain-search mrshcherbak.net
                name-server 2000::1
           subnet 2000::0/64 {
    router-advert {
       interface ethl {
           other-config-flag
           prefix 2000::/64 {
```





На узле PC2 проверила настройки сети с помощью команд «ifconfig» и «route -n -A inet6»



На узле PC2 пропинговала маршрутизатор с помощью команды «ping 2000::1 -c 2» и проверила настройки DNS с помощью команды «cat /etc/resolv.conf»

Получение адреса по DHCPv6

-(kali⊕kali)-[~]

—\$ sudo dhclient -6 -5 -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\0020\272\000\000".

PRC: Requesting information (INIT).
XMT: Forming Info-Request, 0 ms elapsed.
XMT: Info-Request on eth0, interval 1010ms.
RCV: Reply message on eth0 from fe80::e3e:96ff:fe12:1.
PRC: Done.

Вновь пропинговала от узла PC2 маршрутизатор, проверила настройки DNS

Просмотр статистики DHCP-сервера и выданных адресов

Transaction ID: 0xcleef3

Option: Option Request (6)

Option: Client Identifier (1)

Option: Elapsed time (8)

DUID: 00044bc2449565d949b83cd30bd08880d7a4
DUID Type: Universally Unique IDentifier (UUID) (4)

UUID: 4bc2449565d949b83cd30bd08880d7a4

Requested Option code: DNS recursive name server (23)
Requested Option code: Domain Search List (24)
Requested Option code: NTP Server (56)

Requested Option code: Simple Network Time Protocol Server (31)

→ Option Request

Length: 8

Client Identifier

Length: 18

Length: 2 Elapsed time: 970ms

Elapsed time

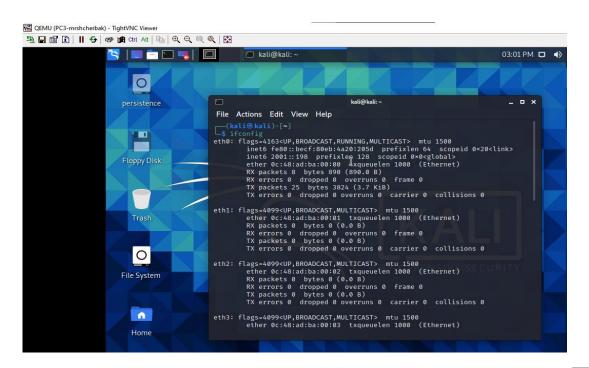
Margarita_2.pcapng Файл Редактирование Просмотр Запуск Захват Анализ Статистика Телефония Беспроводной Инструменты Помощь Применить дисплейный фильтр ... <Ctrl-/> Time Source Destination Protocol Length Info 25 755.917903 fe80::d8e:3905:cddb... ff02::1:2 DHCPv6 106 Information-request XID: 0xcleef3 CID: 00044bc2449565 26 755.929601 fe80::d8e:3905:cddb... ff02::16 ICMPv6 110 Multicast Listener Report Message v2 27 756.033567 fe80::d8e:3905:cddb... ff02::16 ICMPv6 110 Multicast Listener Report Message v2 28 756.508161 :: ff02::1:ff0c:da6 ICMPv6 86 Neighbor Solicitation for 2000::9435:2a62:850c:da6 29 756.858011 fe80::d8e:3905:cddb... ff02::16 ICMPv6 110 Multicast Listener Report Message v2 30 756.896467 fe80::d8e:3905:cddb... ff02::1:2 DHCPv6 106 Information-request XID: 0xcleef3 CID: 00044bc2449565 31 757.032776 0.0.0.0 255.255.255.255 DHCP 324 DHCP Discover - Transaction ID 0x38a6ba9d 32 758.781530 fe80::d8e:3905:cddb... ff02::1:2 DHCPv6 106 Information-request XID: 0xcleef3 CID: 00044bc2449565 96 Naighbon Calisitation for food, 1963, 1964, foda, 1 for 22 761 145000 food..doo.200E.cddb food..oc2.o2ff.foda TCMDuc > Frame 30: 106 bytes on wire (848 bits), 106 bytes captured (848 bits) on interface -, id 0 > Ethernet II, Src: 0c:3b:49:89:00:00 (0c:3b:49:89:00:00), Dst: IPv6mcast 01:00:02 (33:33:00:01:00:02) > Internet Protocol Version 6, Src: fe80::d8e:3905:cddb:d670, Dst: ff02::1:2 > User Datagram Protocol, Src Port: 546, Dst Port: 547 ✓ DHCPv6 Message type: Information-request (11)

Просмотр Wireshark (Information-request)

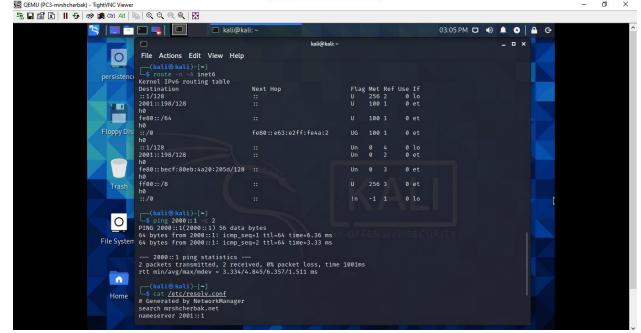
На маршрутизаторе настроила DHCPv6 с отслеживанием состояния

```
mrshcherbak@mrshcherbak-gw-01# set service router-advert interface eth2 managed-
flag
[edit]
mrshcherbak@mrshcherbak-qw-01# set service dhcpv6-server shared-network-name mrs
hcherbak-stateful
[edit]
mrshcherbak@mrshcherbak-gw-01# set service dhcpv6-server shared-network-name mrs
hcherbak-stateful subnet 2001::0/64
[edit]
mrshcherbak@mrshcherbak-gw-01# set service dhcpv6-server shared-network-name mrs
hcherbak-stateful subnet 2001::0/64 name-server 2001::1
[edit]
mrshcherbak@mrshcherbak-gw-01# set service dhcpv6-server shared-network-name mrs
hcherbak-stateful subnet 2001::0/64 domain-search mrshcherbak.net
[edit]
mrshcherbak@mrshcherbak-qw-01# set service dhcpv6-server shared-network-name mrs
hcherbak-stateful subnet 2001::0/64 address-range start 2001::100 stop 2001::199
[edit]
mrshcherbak@mrshcherbak-gw-01# commit
[edit]
mrshcherbak@mrshcherbak-gw-01# save
Saving configuration to '/config/config.boot'...
Done
[edit]
mrshcherbak@mrshcherbak-gw-01#
```

Просмотр статистики DHCP-сервера и выданных адресов

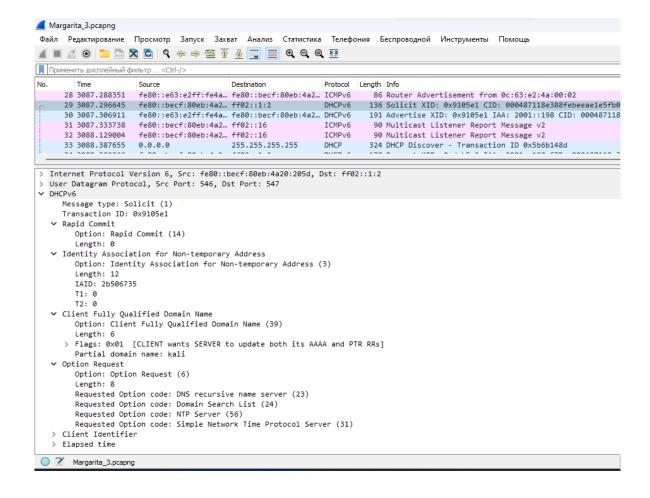


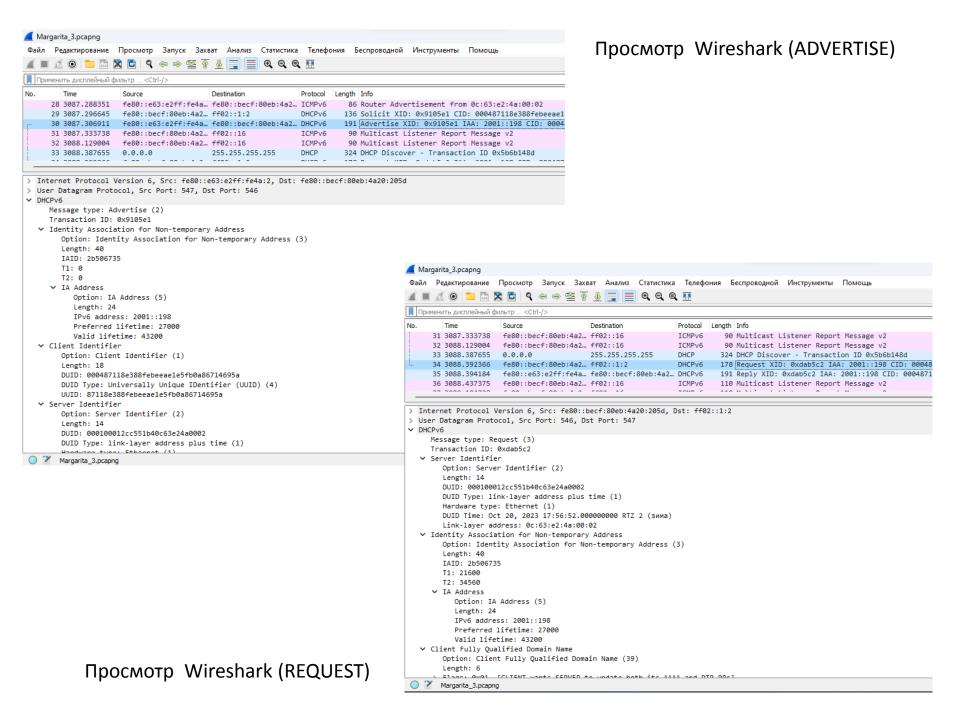
Проверила и настроила сеть с DNS на PC3 через "ifconfig," "route -n -A inet6," "cat /etc/resolv.conf" (вывод был пустым), получила DHCPv6 адрес "dhclient -6 -v eth0," успешно пропинговала маршрутизатор и проверила DNS.

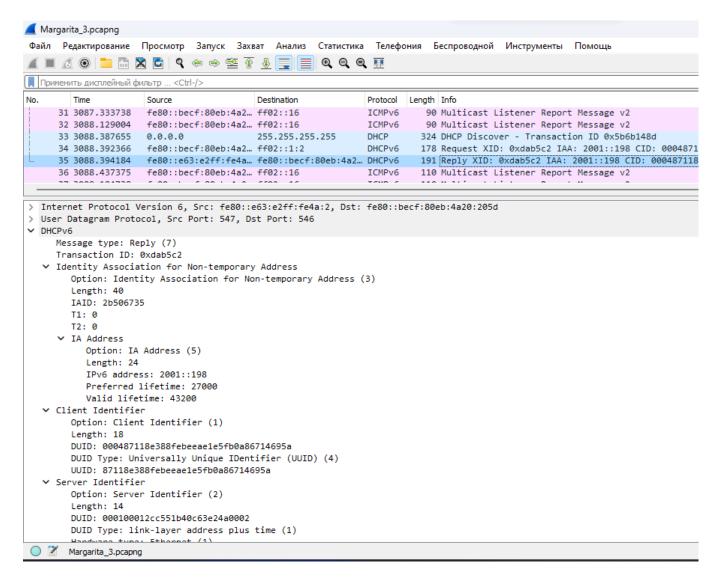


Просмотр статистики DHCP-сервера и выданных адресов

Просмотр Wireshark (SOLICIT)







Вывод: таким образом, в ходе выполнения л/р №7 я получила навыки настройки службы DHCP на сетевом оборудовании для распределения адресов IPv4 и IPv6.