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

Настройка DHCP в случае IPv4

Топология сети

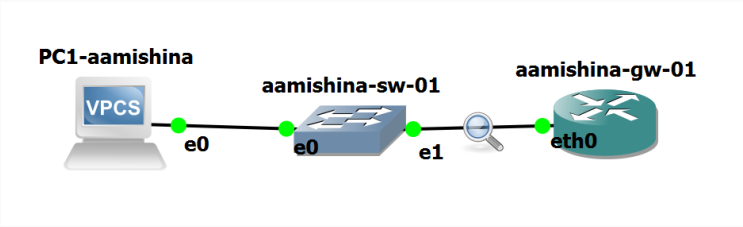

Рис. 1: Топология моделируемой сети в GNS3

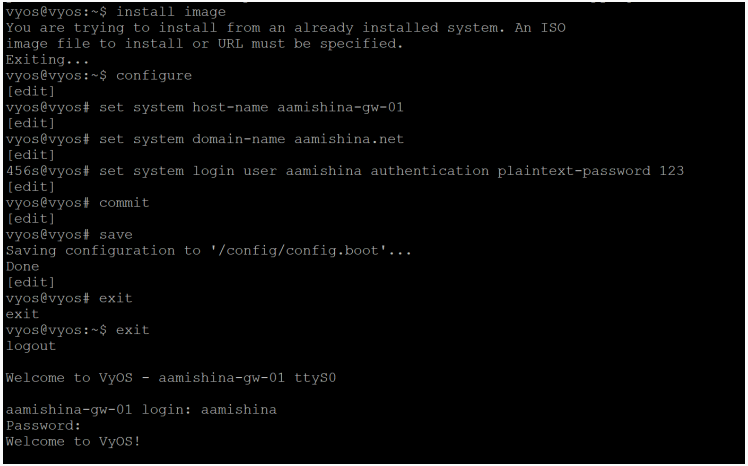

Рис. 2: Настройка образа VyOS. Вход в систему под созданным пользователем

Системный пользователь

```
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

Статистика

```
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

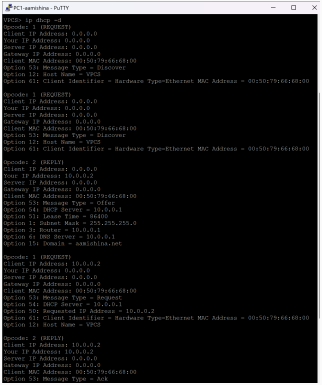

Рис. 6: Настройка PC1

```
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

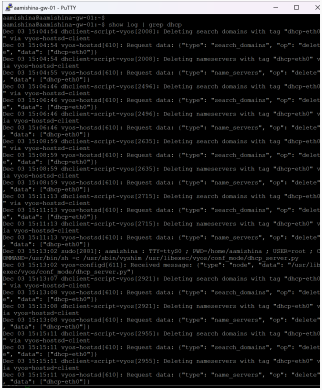

Рис. 9: Журнал работы DHCP-сервера

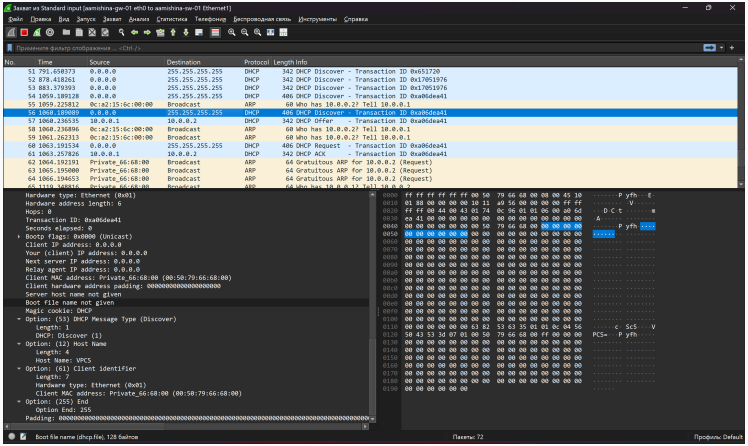

Рис. 10: Захваченные пакеты в Wireshark

Настройка DHCP в случае IPv6

Установка

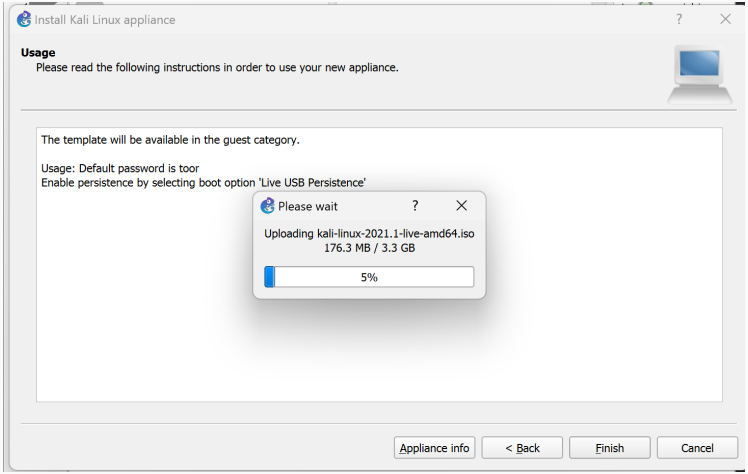

Рис. 11: Установка Kali Linux

Топология

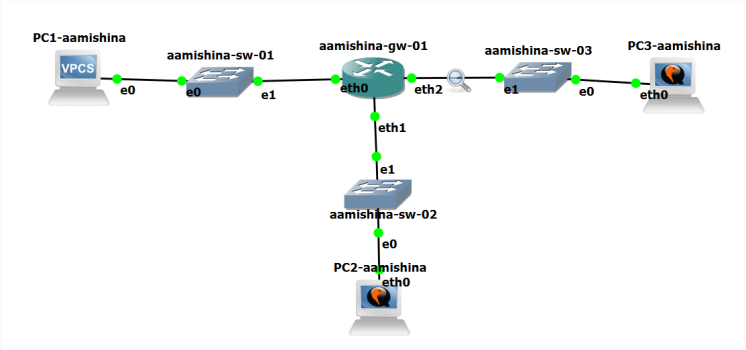

Рис. 12: Топология моделируемой сети

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

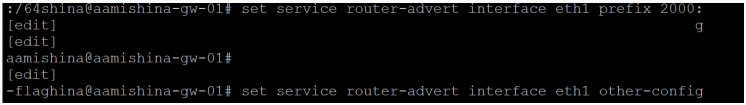

Рис. 14: Настройка RA

```
na-statelessmishina-gw-01# set service dhcpv6-server shared-network-name aamishi
[edit]
na-stateless subnet 2000::0/64 service dhcpv6-server shared-network-name aamishi
[edit]
na-stateless common-options name-server 2000::1erver 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

Рис. 16: Результат настройки DHCPv6 без отслеживания состояния

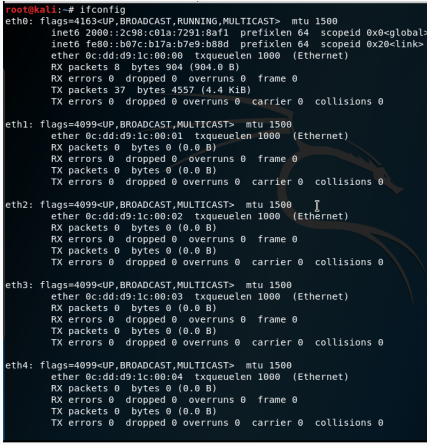

Рис. 17: ifconfig нп PC2

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

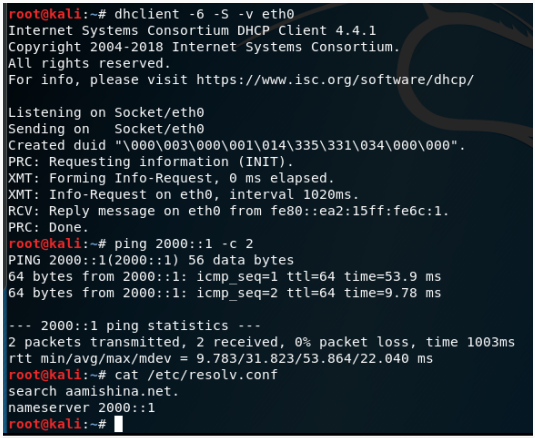

Рис. 19: Получение адреса по DHCPv6. Пингование моршрутизатора

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 dhcpv6 server leases
IPv6 address    State    Last communication    Lease expiration    Remaining
Type    Pool    IAID_DUID
--------------  -------  --------------------  ------------------  -----------
------  ------  -----------
[edit]
aamishina@aamishina-gw-01#
```

Рис. 20: Просмотр выданных адресов

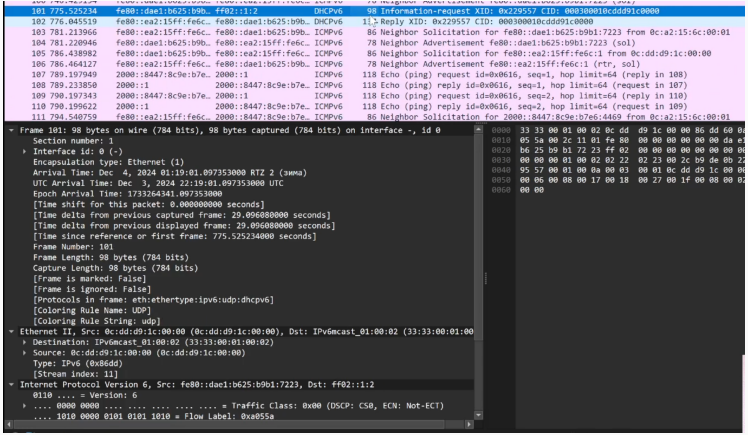

Рис. 21: Захваченный трафик

```
[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

```
aamishina@aamishina-gw-01:~$ configure
[edit]
na-statefulamishina-gw-01# set service dhcpv6-server shared-network-name aamishi
[edit]
na-stateful subnet 2001::0/64t service dhcpv6-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

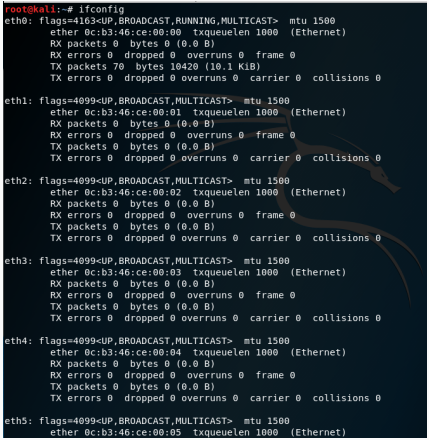

Рис. 25: Команда ifconfig в терминале PC3

Получение адреса

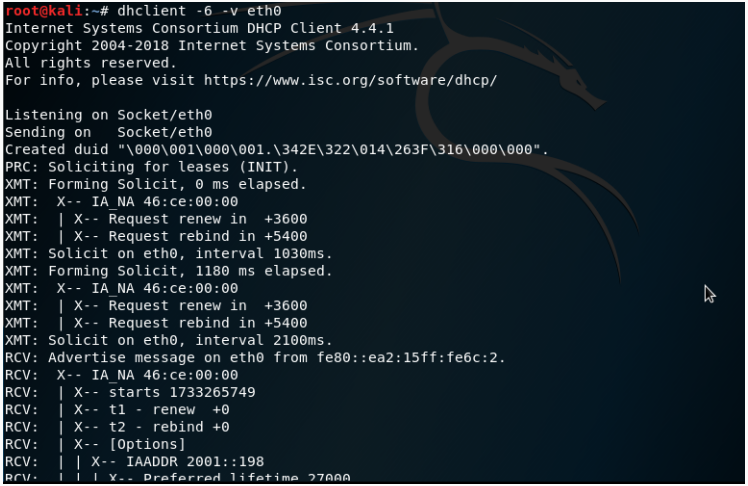

Рис. 26: Получение адреса по DHCPv6

ifconfig

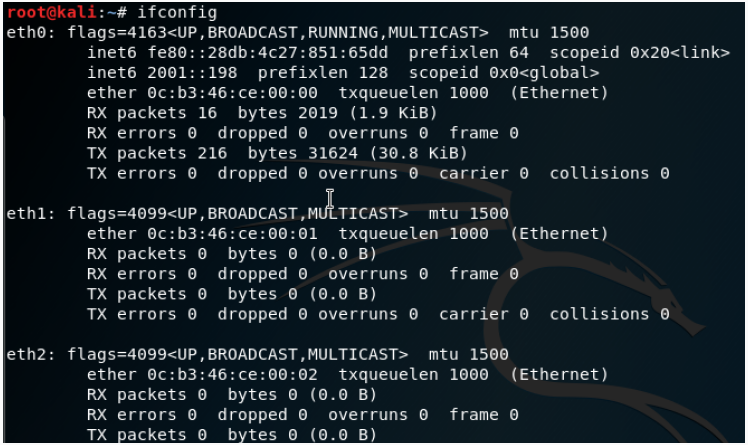

Рис. 27: Команда ifconfig в терминале PC3

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 dhcpv6 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
mporary  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

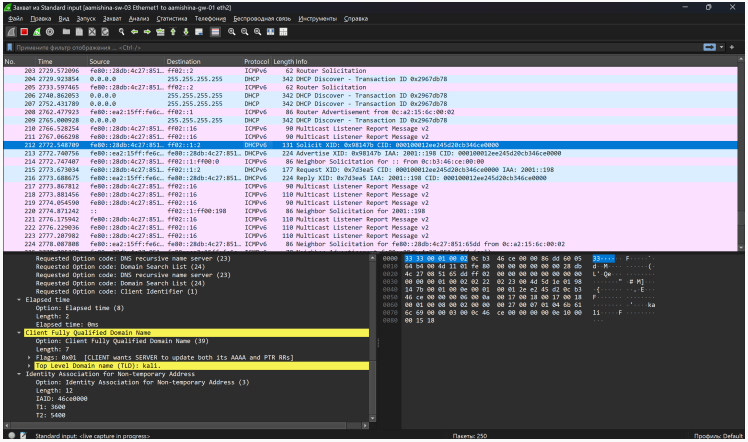

Рис. 30: Информация по захваченным пакетам

Выводы

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