

Сетевые технологии

Настройка DHCP, DHCPv6, SLAAC и IPv6 в GNS3

Сейдалиев Тагьетдин Ровшенович

29 ноября 2025

Российский университет дружбы народов, Москва, Россия

Цель работы

Получить навыки настройки DHCP, DHCPv6 Stateless и Stateful, SLAAC и IPv6-адресации в виртуальной среде GNS3.

Выполнение работы

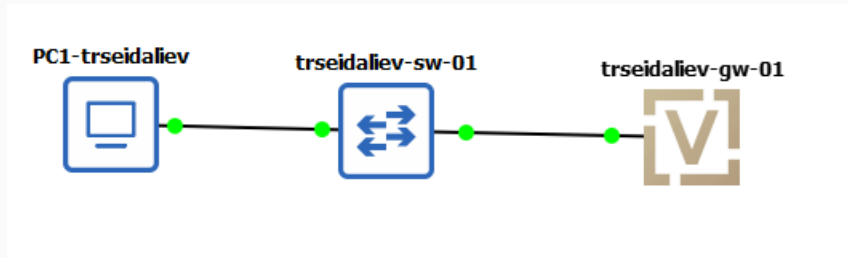
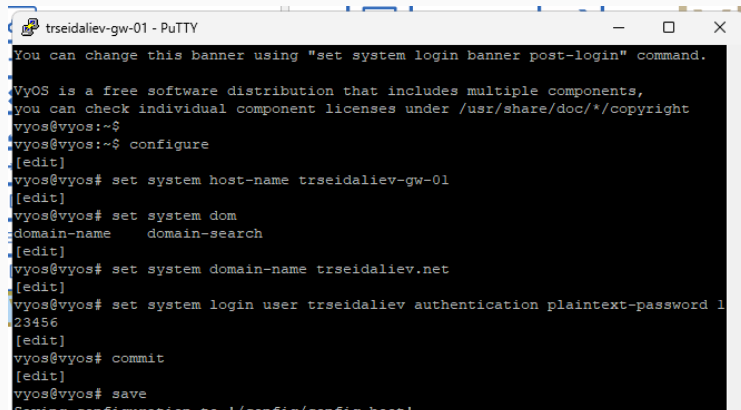


Рис. 1: Топология

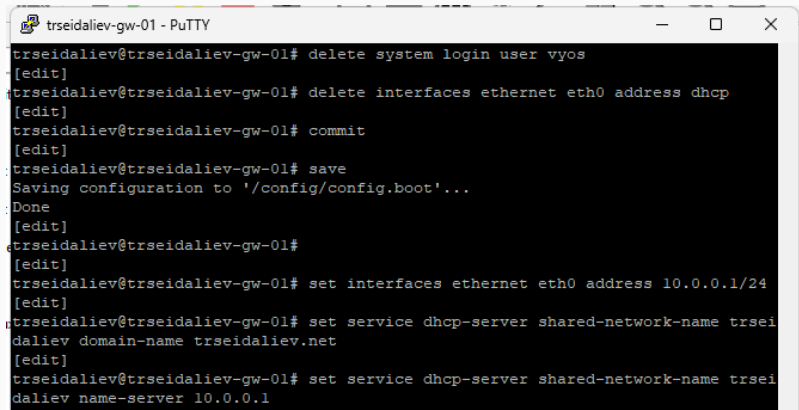
Настройка VyOS

- Смена имени хоста и доменного имени
- Создание нового пользователя
- Назначение адреса 10.0.0.1/24
- Настройка DHCP-сервера



```
trseidaliev-gw-01 - PuTTY
You can change this banner using "set system login banner post-login" command.
VyOS is a free software distribution that includes multiple components,
you can check individual component licenses under /usr/share/doc/*/copyright
vyos@vyos:~$
vyos@vyos:~$ configure
[edit]
vyos@vyos# set system host-name trseidaliev-gw-01
[edit]
vyos@vyos# set system dom
domain-name      domain-search
[edit]
vyos@vyos# set system domain-name trseidaliev.net
[edit]
vyos@vyos# set system login user trseidaliev authentication plaintext-password 1
23456
[edit]
vyos@vyos# commit
[edit]
vyos@vyos# save
Saving configuration to /var/config/confd base!
```

- Подсеть: 10.0.0.0/24
- Диапазон: 10.0.0.2–10.0.0.253
- DNS: 10.0.0.1
- Домен: trseidaliev.net



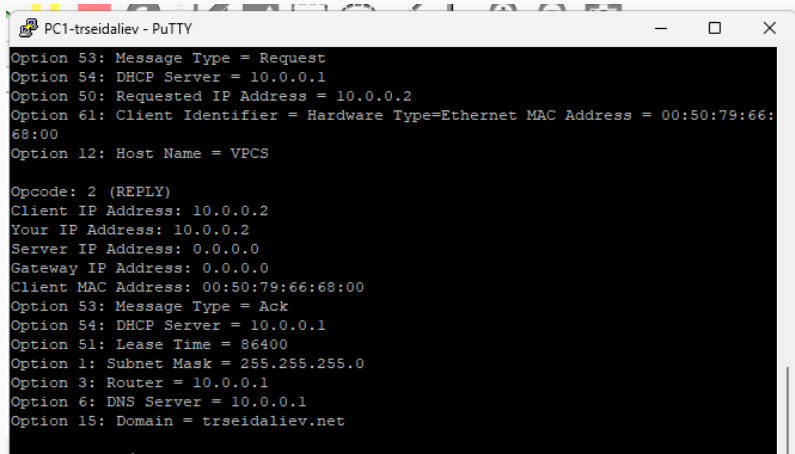
```
trseidaliev-gw-01 - PuTTY
trseidaliev@trseidaliev-gw-01# delete system login user vyos
[edit]
trseidaliev@trseidaliev-gw-01# delete interfaces ethernet eth0 address dhcp
[edit]
trseidaliev@trseidaliev-gw-01# commit
[edit]
trseidaliev@trseidaliev-gw-01# save
Saving configuration to '/config/config.boot'...
Done
[edit]
trseidaliev@trseidaliev-gw-01#
[edit]
trseidaliev@trseidaliev-gw-01# set interfaces ethernet eth0 address 10.0.0.1/24
[edit]
trseidaliev@trseidaliev-gw-01# set service dhcp-server shared-network-name trseidaliev domain-name trseidaliev.net
[edit]
trseidaliev@trseidaliev-gw-01# set service dhcp-server shared-network-name trseidaliev name-server 10.0.0.1
```

Клиент PC1

IP: 10.0.0.2/24

Gateway: 10.0.0.1

DNS: 10.0.0.1

A screenshot of a PuTTY terminal window titled "PC1-trseidaliev - PuTTY". The window displays the details of a DHCP message. The first part shows the request options: 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), and Option 12 (Host Name = VPCS). The second part shows the reply details: 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), and Option 15 (Domain = trseidaliev.net).

```
PC1-trseidaliev - PuTTY
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 = trseidaliev.net
```


Проверка работы DHCP

```
PC1-trseidaliev - PuTTY
VPCS> save
Saving startup configuration to startup.vpc
. done

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  : 86381, 86400/43200/75600
DOMAIN NAME : trseidaliev.net
MAC         : 00:50:79:66:68:00
LPORT      : 10004
RHOST:PORT  : 127.0.0.1:10005
MTU         : 1500

VPCS> ping 10.0.0.1 -c 2

84 bytes from 10.0.0.1 icmp_seq=1 ttl=64 time=1.187 ms
84 bytes from 10.0.0.1 icmp_seq=2 ttl=64 time=1.244 ms

VPCS> █
```

Последовательность обмена

- Discover
- Offer
- Request
- ACK

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	0.0.0.0	255.255.255.255	DHCP	406	DHCP Discover - Transaction ID 0x6elcaa42
2	0.000927	0c:ee:ca:cf:00:00	Broadcast	ARP	60	Who has 10.0.0.2? Tell 10.0.0.1
3	1.000419	0.0.0.0	255.255.255.255	DHCP	406	DHCP Discover - Transaction ID 0x6elcaa42
4	1.010803	10.0.0.1	10.0.0.2	DHCP	342	DHCP Offer - Transaction ID 0x6elcaa42
5	1.060904	0c:ee:ca:cf:00:00	Broadcast	ARP	60	Who has 10.0.0.2? Tell 10.0.0.1
6	2.001927	0c:ee:ca:cf:00:00	Broadcast	ARP	60	Who has 10.0.0.2? Tell 10.0.0.1
7	2.001927	0.0.0.0	255.255.255.255	DHCP	406	DHCP Request - Transaction ID 0x6elcaa42
8	4.010975	10.0.0.1	10.0.0.2	DHCP	342	DHCP ACK - Transaction ID 0x6elcaa42
9	5.001855	Private_66:68:00	Broadcast	ARP	64	Gratuitous ARP for 10.0.0.2 (Request)
10	6.002875	Private_66:68:00	Broadcast	ARP	64	Gratuitous ARP for 10.0.0.2 (Request)
11	7.003779	Private_66:68:00	Broadcast	ARP	64	Gratuitous ARP for 10.0.0.2 (Request)

Frame 7: 406 bytes on wire (3248 bits), 406 bytes captured (3248 bits) on interface -, id 0	0000	0c ee ca cf 00 00
Ethernet II, Src: Private_66:68:00 (00:50:79:66:68:00), Dst: 0c:ee:ca:cf:00:00 (0c:ee:ca:cf:00:00)	0010	01 88 00 00 00 00
Internet Protocol Version 4, Src: 0.0.0.0, Dst: 255.255.255.255	0020	ff ff 00 00 00 00
User Datagram Protocol, Src Port: 68, Dst Port: 67	0030	aa 42 00 00 00 00
Dynamic Host Configuration Protocol (Request)	0040	00 00 00 00 00 00
Message type: Boot Request (1)	0050	00 00 00 00 00 00
Hardware type: Ethernet (0x01)	0060	00 00 00 00 00 00
Hardware address length: 6	0070	00 00 00 00 00 00
Hops: 0	0080	00 00 00 00 00 00
Transaction ID: 0x6elcaa42	0090	00 00 00 00 00 00
Seconds elapsed: 0	00a0	00 00 00 00 00 00
Bootp flags: 0x0000 (Unicast)	00b0	00 00 00 00 00 00
Client IP address: 10.0.0.2	00c0	00 00 00 00 00 00
Your (client) IP address: 0.0.0.0	00d0	00 00 00 00 00 00
Next server IP address: 0.0.0.0	00e0	00 00 00 00 00 00
Relay agent IP address: 0.0.0.0	00f0	00 00 00 00 00 00
Client MAC address: Private_66:68:00 (00:50:79:66:68:00)	0100	00 00 00 00 00 00
Client hardware address padding: 00000000000000000000	0110	00 00 00 00 00 00
Server host name not given	0120	00 00 01 32 04 8a
Boot file name not given	0130	65 00 0c 04 56 56
Magic cookie: DHCP	0140	00 00 00 00 00 00
Options (53) DHCP Message Type (Request)	0150	00 00 00 00 00 00
Length: 1	0160	00 00 00 00 00 00
DHCP: Request (3)	0170	00 00 00 00 00 00
Option: (54) DHCP Server Identifier (10.0.0.1)	0180	00 00 00 00 00 00
Length: 4	0190	00 00 00 00 00 00
DHCP Server Identifier: 10.0.0.1		
Option: (50) Requested IP Address (10.0.0.2)		
Option: (61) Client identifier		
Length: 7		
Hardware address, Ethernet (0x01)		

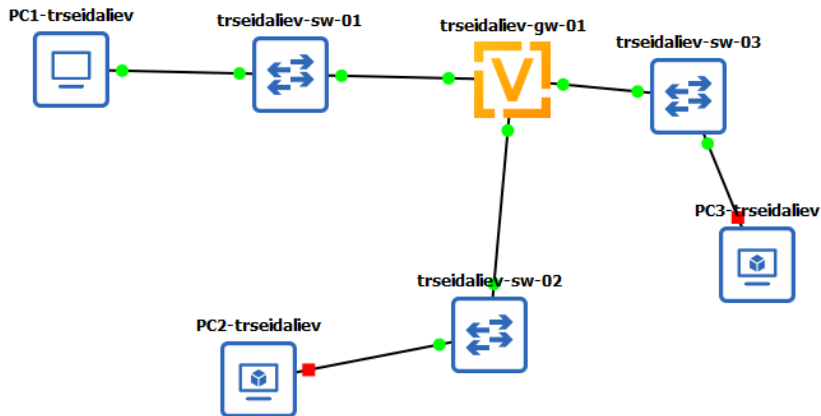
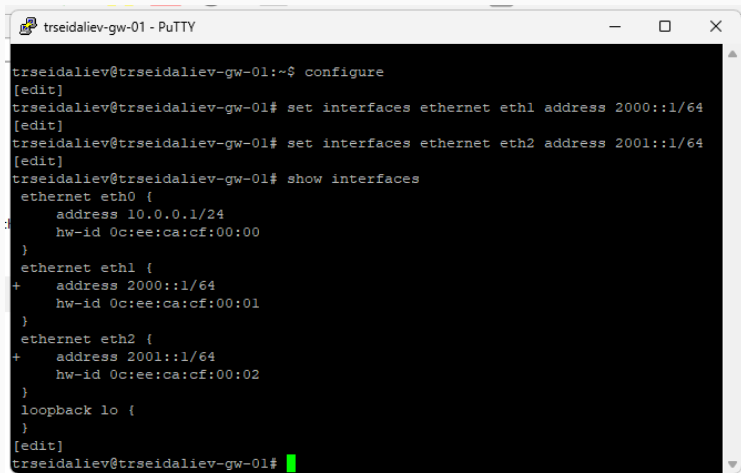


Рис. 7: Топология IPv6

Настройка адресов IPv6

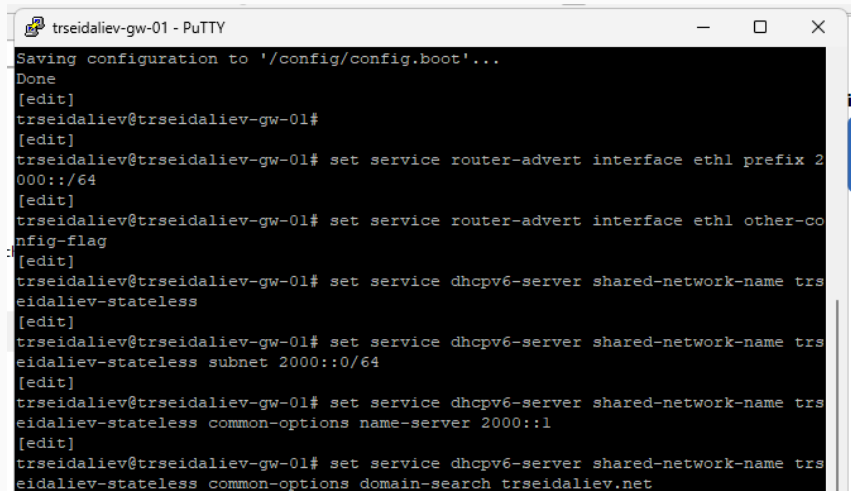
- eth1 → 2000::1/64
- eth2 → 2001::1/64



```
trseidaliev-gw-01 - PuTTY
trseidaliev@trseidaliev-gw-01:~$ configure
[edit]
trseidaliev@trseidaliev-gw-01# set interfaces ethernet eth1 address 2000::1/64
[edit]
trseidaliev@trseidaliev-gw-01# set interfaces ethernet eth2 address 2001::1/64
[edit]
trseidaliev@trseidaliev-gw-01# show interfaces
  ethernet eth0 {
    address 10.0.0.1/24
    hw-id 0c:ee:ca:cf:00:00
  }
  ethernet eth1 {
+   address 2000::1/64
    hw-id 0c:ee:ca:cf:00:01
  }
  ethernet eth2 {
+   address 2001::1/64
    hw-id 0c:ee:ca:cf:00:02
  }
  loopback lo {
  }
[edit]
trseidaliev@trseidaliev-gw-01#
```

Router Advertisement (RA)

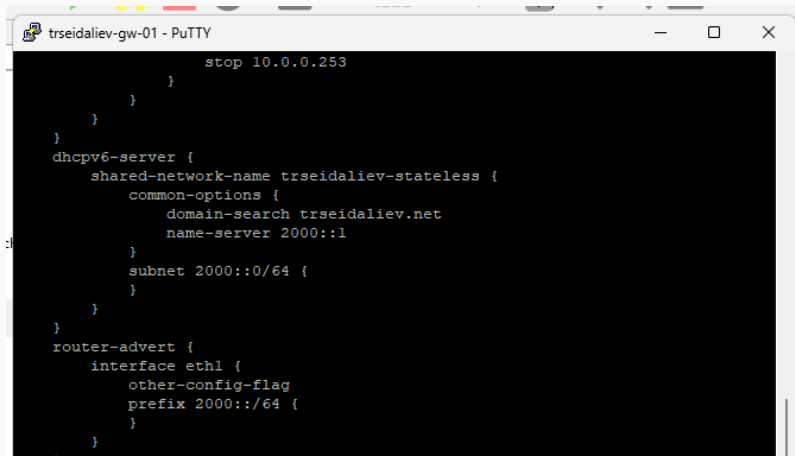
- Префикс 2000::/64
- other-config-flag: получение DNS через DHCPv6



```
trseidaliev-gw-01 - PuTTY
Saving configuration to '/config/config.boot'...
Done
[edit]
trseidaliev@trseidaliev-gw-01#
[edit]
trseidaliev@trseidaliev-gw-01# set service router-advert interface eth1 prefix 2
000::/64
[edit]
trseidaliev@trseidaliev-gw-01# set service router-advert interface eth1 other-co
nfig-flag
[edit]
trseidaliev@trseidaliev-gw-01# set service dhcpv6-server shared-network-name trs
eidaliev-stateless
[edit]
trseidaliev@trseidaliev-gw-01# set service dhcpv6-server shared-network-name trs
eidaliev-stateless subnet 2000::0/64
[edit]
trseidaliev@trseidaliev-gw-01# set service dhcpv6-server shared-network-name trs
eidaliev-stateless common-options name-server 2000::1
[edit]
trseidaliev@trseidaliev-gw-01# set service dhcpv6-server shared-network-name trs
eidaliev-stateless common-options domain-search trseidaliev.net
```

Параметры выдаются:

- DNS: 2000::1
- Domain-search: trseidaliev.net

A screenshot of a PuTTY terminal window titled 'trseidaliev-gw-01 - PuTTY'. The terminal displays a network configuration script for a DHCPv6 server. The script includes a 'stop' command for IP 10.0.0.253, followed by a 'dhcpv6-server' block. Inside this block, there is a 'shared-network-name' section for 'trseidaliev-stateless' which defines 'common-options' (domain-search: trseidaliev.net, name-server: 2000::1) and a 'subnet' for 2000::0/64. Below this is a 'router-advert' block for the 'eth1' interface, setting 'other-config-flag' and 'prefix' to 2000::/64.

```
stop 10.0.0.253
}
}
}
}
dhcpv6-server {
    shared-network-name trseidaliev-stateless {
        common-options {
            domain-search trseidaliev.net
            name-server 2000::1
        }
        subnet 2000::0/64 {
        }
    }
}
router-advert {
    interface eth1 {
        other-config-flag
        prefix 2000::/64 {
        }
    }
}
```

Клиент PC2 (SLAAC)

Адрес: SLAAC (2000::/64)

Маршруты добавлены автоматически

```
(kali@kali)-[~]
$ ifconfig eth0
eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 2000::ffe3:631:d25d:28c0 prefixlen 64 scopeid 0x0<global>
    inet6 fe80::a3d5:64fd:43a:4cee prefixlen 64 scopeid 0x20<link>
    ether 0c:9c:dd:5f:00:00 txqueuelen 1000 (Ethernet)
    RX packets 5 bytes 576 (576.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 21 bytes 3168 (3.0 KiB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

(kali@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	1	0	eth0
fe80::/64	::	U	100	1	0	eth0
::/0	fe80::eee:caff:fecf:1	UG	100	1	0	eth0
::1/128	::	Un	0	4	0	lo
2000::ffe3:631:d25d:28c0/128	::	Un	0	2	0	eth0
fe80::a3d5:64fd:43a:4cee/128	::	Un	0	3	0	eth0
ff00::/8	::	U	256	3	0	eth0
::/0	::	!n	-1	1	0	lo

```

(kali@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=4.49 ms
64 bytes from 2000::1: icmp_seq=2 ttl=64 time=2.45 ms

--- 2000::1 ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1002ms
```

DHCPv6 Stateless: получение DNS

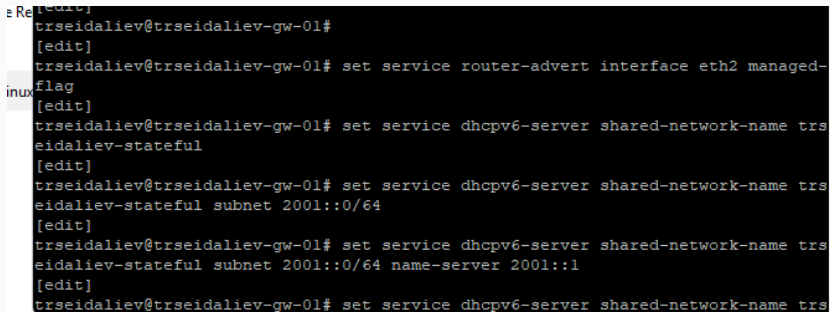
```
(kali㉿kali)-[~]  
$ sudo dhclient -6 -S -v eth0  
Internet Systems Consortium DHCP Client 4.4.1  
Copyright 2004-2018 Internet Systems Consortium.  
All rights reserved.  
For info, please visit https://www.isc.org/software/dhcp/  
  
Listening on Socket/eth0  
Sending on Socket/eth0  
Created duid "\000\003\000\001\014\234\335_\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::eee:caff:fecf:1.  
PRC: Done.  
  
(kali㉿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=1.53 ms  
64 bytes from 2000::1: icmp_seq=2 ttl=64 time=2.82 ms  
  
--- 2000::1 ping statistics ---  
2 packets transmitted, 2 received, 0% packet loss, time 1002ms  
rtt min/avg/max/mdev = 1.531/2.174/2.818/0.643 ms  
  
(kali㉿kali)-[~]  
$ cat /etc/resolv.conf  
search trseidaliev.net.  
nameserver 2000::1  
  
(kali㉿kali)-[~]  
$
```


Анализ DHCPv6 Stateless

No.	Time	Source	Destination	Protocol	Length	Info
37	89.400741	fe80::eee:caff:fecf...	fe80::a3d5:64fd:43a...	ICMPv6	78	Neighbor Advertisement fe80::eee:caff:fecf:1 (rtr, sol)
38	94.518922	fe80::eee:caff:fecf...	fe80::a3d5:64fd:43a...	ICMPv6	86	Neighbor Solicitation for fe80::a3d5:64fd:43a:4cee from 0c:ee:ca:cf:00:01
39	94.520758	fe80::a3d5:64fd:43a...	fe80::eee:caff:fecf...	ICMPv6	78	Neighbor Advertisement fe80::a3d5:64fd:43a:4cee (sol)
40	120.056019	fe80::a3d5:64fd:43a...	ff02::1:2	DHCPv6	98	Information-request XID: 0x6ec460 CID: 000300010c9cdd5f0000
41	120.059508	fe80::eee:caff:fecf...	fe80::a3d5:64fd:43a...	DHCPv6	139	Reply XID: 0x6ec460 CID: 000300010c9cdd5f0000
42	125.423299	fe80::eee:caff:fecf...	fe80::a3d5:64fd:43a...	ICMPv6	86	Neighbor Solicitation for fe80::a3d5:64fd:43a:4cee from 0c:ee:ca:cf:00:01
43	125.425528	fe80::a3d5:64fd:43a...	fe80::eee:caff:fecf...	ICMPv6	78	Neighbor Advertisement fe80::a3d5:64fd:43a:4cee (sol)
44	126.551152	2000::ffe3:631:d25d...	2000::1	ICMPv6	118	Echo (ping) request id=0x1fd7, seq=1, hop limit=64 (reply in 45)
45	126.551880	2000::1	2000::ffe3:631:d25d...	ICMPv6	118	Echo (ping) reply id=0x1fd7, seq=1, hop limit=64 (request in 44)
46	127.322252	0.0.0.0	255.255.255.255	DHCP	324	DHCP Discover - Transaction ID 0xa6b50f25
47	127.557229	2000::ffe3:631:d25d...	2000::1	ICMPv6	118	Echo (ping) request id=0x1fd7, seq=2, hop limit=64 (reply in 48)
48	127.558543	2000::1	2000::ffe3:631:d25d...	ICMPv6	118	Echo (ping) reply id=0x1fd7, seq=2, hop limit=64 (request in 47)
49	131.590810	fe80::eee:caff:fecf...	2000::ffe3:631:d25d...	ICMPv6	86	Neighbor Solicitation for 2000::ffe3:631:d25d:28c0 from 0c:ee:ca:cf:00:01
50	131.592512	2000::ffe3:631:d25d...	fe80::eee:caff:fecf...	ICMPv6	78	Neighbor Advertisement 2000::ffe3:631:d25d:28c0 (sol)
▶ Frame 41: 139 bytes on wire (1112 bits), 139 bytes captured (1112 bits) on interface -, id 0 ▶ Ethernet II, Src: 0c:ee:ca:cf:00:01 (0c:ee:ca:cf:00:01), Dst: 0c:9c:dd:5f:00:00 (0c:9c:dd:5f:00:00) ▶ Internet Protocol Version 6, Src: fe80::eee:caff:fecf:1, Dst: fe80::a3d5:64fd:43a:4cee ▶ User Datagram Protocol, Src Port: 547, Dst Port: 546 ▼ DHCPv6						
Message type: Reply (7) Transaction ID: 0x6ec460						
▼ Client Identifier						
Option: Client Identifier (1) Length: 10 DUID: 000300010c9cdd5f0000 DUID Type: link-layer address (3) Hardware type: Ethernet (1) Link-layer address: 0c:9c:dd:5f:00:00 Link-layer address (Ethernet): 0c:9c:dd:5f:00:00 (0c:9c:dd:5f:00:00)						
▼ Server Identifier						
Option: Server Identifier (2) Length: 14 DUID: 0001000130bc3cd90ceecacf0001 DUID Type: link-layer address plus time (1) Hardware type: Ethernet (1) DUID Time: Nov 28, 2025 13:58:33.000000000 RTZ 2 (зима) Link-layer address: 0c:ee:ca:cf:00:01 Link-layer address (Ethernet): 0c:ee:ca:cf:00:01 (0c:ee:ca:cf:00:01)						
▼ DNS recursive name server						
Option: DNS recursive name server (23) Length: 16 1 DNS server address: 2000::1						
▼ Domain Search List						
Option: Domain Search List (24) Length: 17 ▼ Domain name suffix search list List entry: tseidalliev.net						

Включение режима Stateful

- RA: managed-flag
- Диапазон адресов: 2001::100 – 2001::199
- DNS: 2001::1
- Domain-search: trseidaliev.net



```
[edit]
trseidaliev@trseidaliev-gw-01#
[edit]
trseidaliev@trseidaliev-gw-01# set service router-advert interface eth2 managed-
flag
[edit]
trseidaliev@trseidaliev-gw-01# set service dhcpv6-server shared-network-name trs
eidaliev-stateful
[edit]
trseidaliev@trseidaliev-gw-01# set service dhcpv6-server shared-network-name trs
eidaliev-stateful subnet 2001::0/64
[edit]
trseidaliev@trseidaliev-gw-01# set service dhcpv6-server shared-network-name trs
eidaliev-stateful subnet 2001::0/64 name-server 2001::1
[edit]
trseidaliev@trseidaliev-gw-01# set service dhcpv6-server shared-network-name trs
```

Рис. 14: Stateful настройки

PC3 — до получения адреса

```
(kali㉿kali)-[~]
$ ifconfig eth0
eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 2001::199 prefixlen 128 scopeid 0<global>
    inet6 fe80::a572:e73f:51ff:904a prefixlen 64 scopeid 0<20<link>
    ether 0c:17:39:a2:00:00 txqueuelen 1000 (Ethernet)
    RX packets 5 bytes 632 (632.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 25 bytes 3824 (3.7 KiB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

```
(kali㉿kali)-[~]
$ route -n -A inet6
Kernel IPv6 routing table
```

Destination	Next Hop	Flag	Met	Ref	Use	If
::1/128	::	U	256	2	0	lo
2001::199/128	::	U	100	1	0	eth0
fe80::/64	::	U	100	1	0	eth0
::/0	fe80::eee:caff:fecf:2	UG	100	1	0	eth0
::1/128	::	Un	0	4	0	lo
2001::199/128	::	Un	0	2	0	eth0
fe80::a572:e73f:51ff:904a/128	::	Un	0	3	0	eth0
ff00::/8	::	U	256	3	0	eth0
::/0	::	!n	-1	1	0	lo

```
(kali㉿kali)-[~]
$ cat /etc/resolv.conf
# Generated by NetworkManager
search trseidaliev.net
nameserver 2001::1
```

```
(kali㉿kali)-[~]
$
```

PC3 — получение адреса DHCPv6 Stateful

```
(kali@kali)-[~]  
$ sudo 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\0010\274@\004\014\0279\242\000\000".  
PRC: Soliciting for leases (INIT).  
XMT: Forming Solicit, 0 ms elapsed.  
XMT: X-- IA_NA 39:a2:00:00  
XMT: | X-- Request renew in +3600  
XMT: | X-- Request rebind in +5400  
XMT: Solicit on eth0, interval 1030ms.  
RCV: Advertise message on eth0 from fe80::eee:caff:febf:2.  
RCV: X-- IA_NA 39:a2:00:00  
RCV: | X-- starts 1764328325  
RCV: | X-- t1 - renew +0  
RCV: | X-- t2 - rebind +0  
RCV: | X-- [Options]  
RCV: | | X-- IAADDR 2001::198  
RCV: | | | X-- Preferred lifetime 27000.  
RCV: | | | X-- Max lifetime 43200.  
RCV: X-- Server ID: 00:01:00:01:30:bc:3c:d9:0c:ee:ca:cf:00:01  
RCV: Advertisement recorded.  
PRC: Selecting best advertised lease.  
PRC: Considering best lease.  
PRC: X-- Initial candidate 00:01:00:01:30:bc:3c:d9:0c:ee:ca:cf:00:01 (s: 10105, p: 0).  
XMT: Forming Request, 0 ms elapsed.  
XMT: X-- IA_NA 39:a2:00:00  
XMT: | X-- Requested renew +3600  
XMT: | X-- Requested rebind +5400  
XMT: | X-- IAADDR 2001::198  
XMT: | | X-- Preferred lifetime +7200  
XMT: | | X-- Max lifetime +7500  
XMT: V IA_NA appended.
```

PC3 — после получения адреса

Полная конфигурация:

- IPv6: 2001::198 или 2001::199
- DNS: 2001::1
- Пинг до 2001::1 успешен

```
└─$ ifconfig eth0
eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 2001::199 prefixlen 128 scopeid 0<global>
    inet6 fe80::a572:e73f:51ff:904a prefixlen 64 scopeid 0<link>
    inet6 2001::198 prefixlen 128 scopeid 0<global>
    ether 0c:17:39:a2:00:00 txqueuelen 1000 (Ethernet)
    RX packets 9 bytes 1170 (1.1 KiB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 33 bytes 4940 (4.8 KiB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

└─(kali@kali)~[~]
└─$ route -n -A inet6
Kernel IPv6 routing table

```

Destination	Next Hop	Flag	Met	Ref	Use	If
::1/128	::	U	256	2	0	lo
2001::198/128	::	U	256	1	0	eth0
2001::199/128	::	U	100	2	0	eth0
fe80::/64	::	U	100	1	0	eth0
::/0	fe80::eee:caff:fecf:2	UG	100	1	0	eth0
::1/128	::	Un	0	4	0	lo
2001::198/128	::	Un	0	2	0	eth0
2001::199/128	::	Un	0	3	0	eth0
fe80::a572:e73f:51ff:904a/128	::	Un	0	3	0	eth0
ff00::/8	::	U	256	3	0	eth0
::/0	::	!n	-1	1	0	lo

```
trseidaliev@trseidaliev-gw-01# run show dhcpv6 server leases
IPv6 address      State      Last communication  Lease expiration    Remaining
Type              Pool                               IAID_DUID
-----
-----
2001::198         active    2025/11/28 11:12:06  2025/11/28 13:17:06  2:03:49
non-temporary    trseidaliev-stateful  00:00:a2:39:00:01:00:01:30:bc:40:04:0c:17:
39:a2:00:00
2001::199         active    2025/11/28 11:09:58  2025/11/28 23:09:58  11:56:41
non-temporary    trseidaliev-stateful  35:67:50:2b:00:04:60:7a:53:d0:9a:66:2b:b0:
14:8c:4d:83:41:5a:14:7d
[edit]
trseidaliev@trseidaliev-gw-01#
```

Рис. 18: Stateful leases

Пакеты Solicit, Advertise, Request, Reply

29	32.784559	0.0.0.0	255.255.255.255	DHCP	324	DHCP Discover - Transaction ID 0x19f56df0
30	65.067775	0.0.0.0	255.255.255.255	DHCP	324	DHCP Discover - Transaction ID 0xcde84ac8
31	129.969913	0.0.0.0	255.255.255.255	DHCP	324	DHCP Discover - Transaction ID 0x38a42908
32	131.182556	fe80::a572:e73f:51ff::1:2	ff02::1:2	DHCPv6	118	Solicit XID: 0x1f0eae CID: 0001000130bc40040c1739a20000
33	131.187483	fe80::eee:caff:fecc::	fe80::a572:e73f:51ff::	DHCPv6	187	Advertise XID: 0x1f0eae IAA: 2001::198 CID: 0001000130bc40040c1739a20000
34	132.216188	fe80::a572:e73f:51ff::	ff02::1:2	DHCPv6	164	Request XID: 0x76686c CID: 0001000130bc40040c1739a20000 IAA: 2001::198
35	132.218347	fe80::eee:caff:fecc::	fe80::a572:e73f:51ff::	DHCPv6	187	Reply XID: 0x76686c IAA: 2001::198 CID: 0001000130bc40040c1739a20000
36	132.239929	fe80::a572:e73f:51ff::	ff02::1:6	ICMPv6	130	Multicast Listener Report Message v2
37	132.436836	::	ff02::1:ff00:198	ICMPv6	86	Neighbor Solicitation for 2001::198
38	132.925377	fe80::a572:e73f:51ff::	ff02::1:6	ICMPv6	130	Multicast Listener Report Message v2
39	136.648712	fe80::eee:caff:fecc::	fe80::a572:e73f:51ff::	ICMPv6	86	Neighbor Solicitation for fe80::a572:e73f:51ff:904a from 0c:ee:ca:cf:00:02
40	136.650647	fe80::a572:e73f:51ff::	fe80::eee:caff:fecc::	ICMPv6	78	Neighbor Advertisement fe80::a572:e73f:51ff:904a (sol)

Frame 34: 164 bytes on wire (1312 bits), 164 bytes captured (1312 bits) on interface -, id 0
Ethernet II, Src: 0c:17:39:a2:00:00 (0c:17:39:a2:00:00), Dst: IPv6mcast_01:00:02 (33:33:00:01:00:02)
Internet Protocol Version 6, Src: fe80::a572:e73f:51ff:904a, Dst: ff02::1:2
User Datagram Protocol, Src Port: 546, Dst Port: 547

DHCPv6

Message type: Request (3)
Transaction ID: 0x76686c

Client Identifier

Option: Client Identifier (1)
Length: 14
DUID: 0001000130bc40040c1739a20000
DUID Type: link-layer address plus time (1)
Hardware type: Ethernet (1)
DUID Time: Nov 28, 2025 14:12:04.000000000 RTZ 2 (зима)
Link-layer address: 0c:17:39:a2:00:00
Link-layer address (Ethernet): 0c:17:39:a2:00:00 (0c:17:39:a2:00:00)

Server Identifier

Option: Server Identifier (2)
Length: 14
DUID: 0001000130bc3cd90ceecacf0001
DUID Type: link-layer address plus time (1)
Hardware type: Ethernet (1)
DUID Time: Nov 28, 2025 13:58:33.000000000 RTZ 2 (зима)
Link-layer address: 0c:ee:ca:cf:00:01
Link-layer address (Ethernet): 0c:ee:ca:cf:00:01 (0c:ee:ca:cf:00:01)

Option Request

Option: Option Request (6)
Length: 8
Requested Option code: DNS recursive name server (23)
Requested Option code: Domain Search List (24)
Requested Option code: Client Fully Qualified Domain Name (39)
Requested Option code: Simple Network Time Protocol Server (31)

Elapsed time

Option: Elapsed time (8)
Length: 2
Elapsed time: 0ms

Identity Association for Non-temporary Address

Option: Identity Association for Non-temporary Address (3)
Length: 40
IAID: 39a20000
T1: 3600
T2: 5400
IA Address

Итоги

- Настроен DHCP для IPv4
- Настроены SLAAC, DHCPv6 Stateless и Stateful
- Выполнена полная проверка маршрутизации и связности
- Проанализирован сетевой трафик всех DHCP-механизмов
- Подтверждена корректная работа всех служб распределения адресов