

# Настройка DHCP-сервера Kea

## Лабораторная работа №3

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## Введение

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## Цель работы

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- Настроить DHCP-сервер Kea.
- Конфигурировать DNS Bind9.
- Реализовать автоматические DDNS-обновления.

## Конфигурирование DHCP

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- Обновлены `domain-name` и DNS-параметры.
- Настроена подсеть, шлюз и диапазон IP.
- Удалены примеры конфигураций.

```
142      // {
143      //   "name": "domain-name-servers",
144      //   "code": 6,
145      //   "csv-format": "true",
146      //   "space": "dhcp4",
147      //   "data": "192.0.2.1, 192.0.2.2"
148      // }
149      // but it's a lot of writing, so it's easier to do this instead:
150      {
151        "name": "domain-name-servers",
152        "data": "192.168.1.1"
153      },
154
155      // Typically people prefer to refer to options by their names, so they
156      // don't need to remember the code names. However, some people like
157      // to use numerical values. For example, option "domain-name" uses
158      // option code 15, so you can reference to it either by
159      // "name": "domain-name" or "code": 15.
160      {
161        "code": 15,
162        "data": "ngaforov.net"
163      },
164
165      // Domain search is also a popular option. It tells the client to
```

# Проверка и запуск

- Привязка DHCP к интерфейсу eth1.
- Успешная проверка конфигурации.
- Автоматический запуск сервиса.

```
[root@server.ngaforov.net ~]# firewall-cmd --add-service=dhcp
success
[root@server.ngaforov.net ~]# firewall-cmd --add-service=dhcp --permanent
success
[root@server.ngaforov.net ~]# restorecon -vR /etc
Relabeled /etc/NetworkManager/system-connections/eth1.nmconnection from unconfined_u:object_r:user_tmp_t:s0 to un
confined_u:object_r:NetworkManager_etc_rw_t:s0
[root@server.ngaforov.net ~]# restorecon -vR /var/named
[root@server.ngaforov.net ~]# restorecon -vR /var/lib/kea/
[root@server.ngaforov.net ~]# systemctl start kea-dhcp4.service
[root@server.ngaforov.net ~]#
[root@server.ngaforov.net ~]# systemctl status kea-dhcp4.service
● kea-dhcp4.service - Kea DHCPv4 Server
    Loaded: loaded (/usr/lib/systemd/system/kea-dhcp4.service; enabled; preset: disabled)
    Active: active (running) since Sat 2025-11-15 08:07:40 UTC; 6s ago
      Invocation: 3266268e73824dc8d9be21c54f7f246
        Docs: man:kea-dhcp4(8)
       Main PID: 14076 (kea-dhcp4)
          Tasks: 7 (limit: 10378)
         Memory: 3.2M (peak: 6.1M)
            CPU: 15ms
           CGroup: /system.slice/kea-dhcp4.service
                   └─14076 /usr/sbin/kea-dhcp4 -c /etc/kea/kea-dhcp4.conf

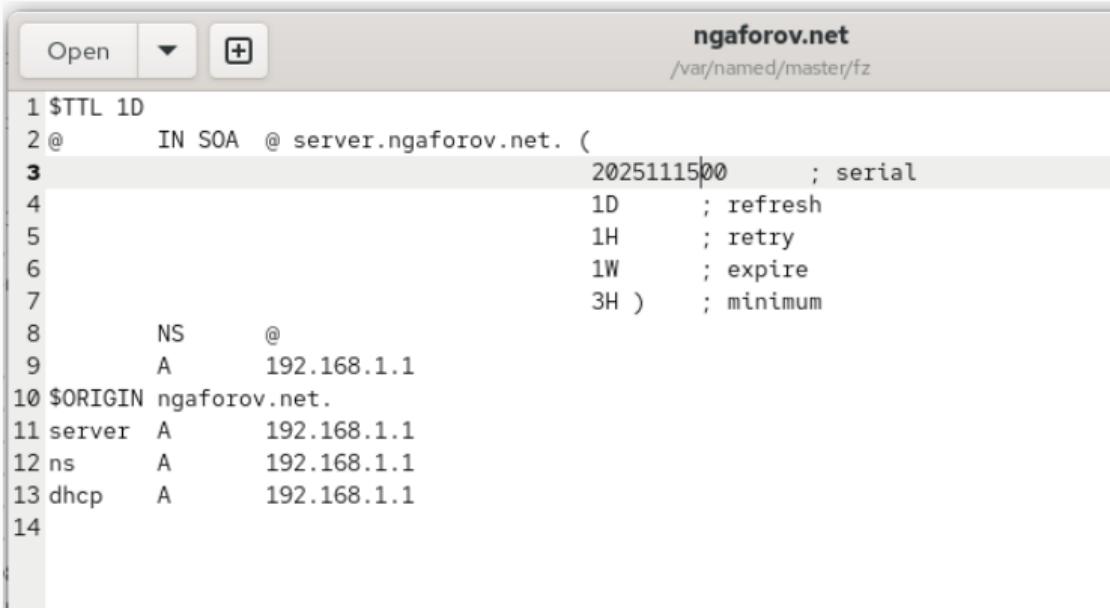
Nov 15 08:07:40 server.ngaforov.net systemd[1]: Started kea-dhcp4.service - Kea DHCPv4 Server.
Nov 15 08:07:40 server.ngaforov.net kea-dhcp4[14076]: 2025-11-15 08:07:40.523 INFO  [kea-dhcp4.dhcp4/14076.13969]
Nov 15 08:07:40 server.ngaforov.net kea-dhcp4[14076]: 2025-11-15 08:07:40.524 INFO  [kea-dhcp4.commands/14076.13969]
```

## Настройка DNS-зон

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## Внесённые изменения

- Добавлены A- и PTR-записи.
- Обновлены серийные номера зон.
- Перезапуск Bind9.



The screenshot shows a text editor window with the title "ngaforov.net" and the path "/var/named/master/fz". The file contains a DNS zone configuration:

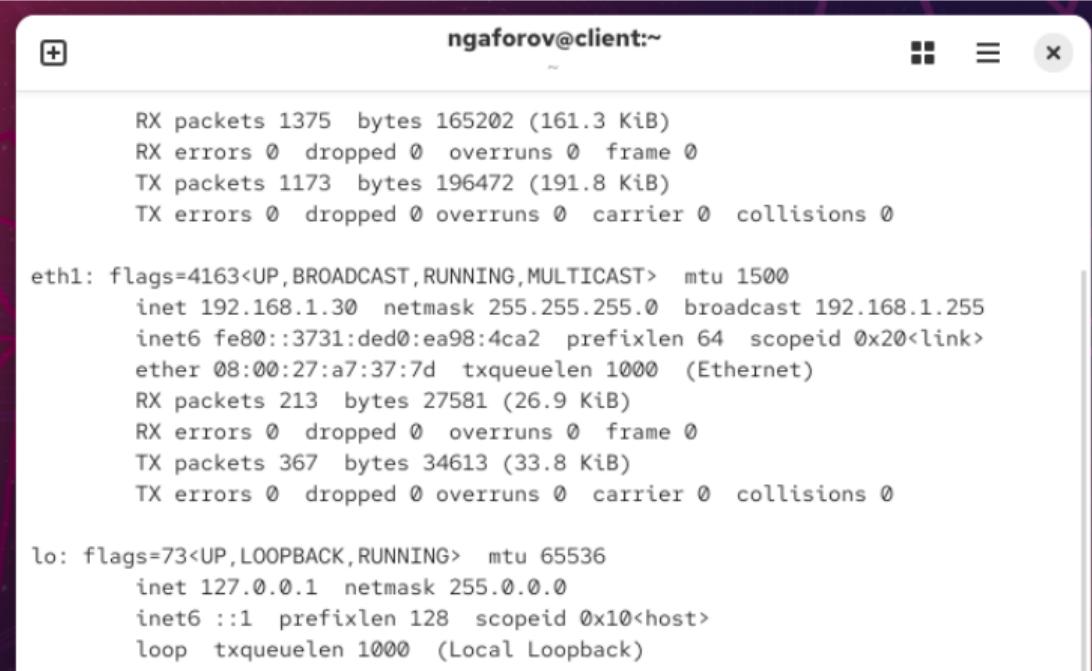
```
1 $TTL 1D
2 @      IN SOA  @ server.ngaforov.net. (
3                               2025111500      ; serial
4                               1D            ; refresh
5                               1H            ; retry
6                               1W            ; expire
7                               3H )          ; minimum
8       NS      @
9       A       192.168.1.1
10 $ORIGIN ngaforov.net.
11 server  A       192.168.1.1
12 ns      A       192.168.1.1
13 dhcp    A       192.168.1.1
14
```

## Анализ работы DHCP

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## Проверка клиента

- Клиент получил IP: 192.168.1.30.
- Lease записан в **kea-leases4.csv**.
- Соответствие MAC-адреса подтверждено.



The screenshot shows a terminal window titled "ngaforov@client:~". The window displays network statistics and interface details. The output includes:

```
RX packets 1375 bytes 165202 (161.3 KiB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 1173 bytes 196472 (191.8 KiB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

eth1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
inet 192.168.1.30 netmask 255.255.255.0 broadcast 192.168.1.255
inet6 fe80::3731:ded0:ea98:4ca2 prefixlen 64 scopeid 0x20<link>
ether 08:00:27:a7:37:7d txqueuelen 1000 (Ethernet)
RX packets 213 bytes 27581 (26.9 KiB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 367 bytes 34613 (33.8 KiB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
inet 127.0.0.1 netmask 255.0.0.0
inet6 ::1 prefixlen 128 scopeid 0x10<host>
loop txqueuelen 1000 (Local Loopback)
```

## Настройка DDNS

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- Создан ключ обновления зон.
- Подключён в Bind9.
- Задана политика `update-policy`.

```
[root@server.ngaforov.net ~]# mkdir -p /etc/named/keys
[root@server.ngaforov.net ~]# tsig-keygen -a HMAC-SHA512 DHCP_UPDATER > /etc/named/keys/dhcp_updater.key
[root@server.ngaforov.net ~]# chown -R named:named /etc/named/keys
[root@server.ngaforov.net ~]#
[root@server.ngaforov.net ~]# cat /etc/named/keys/dhcp_updater.key
key "DHCP_UPDATER" {
    algorithm hmac-sha512;
    secret "Oebs2cL4BskF3Q7iKFejZixe53C4nAFbNMtQceJdJah3VWg8iT0cV5HdCvYXfmAlvInlQZvxv4pjUXnWeP7iLg==";
};
[root@server.ngaforov.net ~]#
```

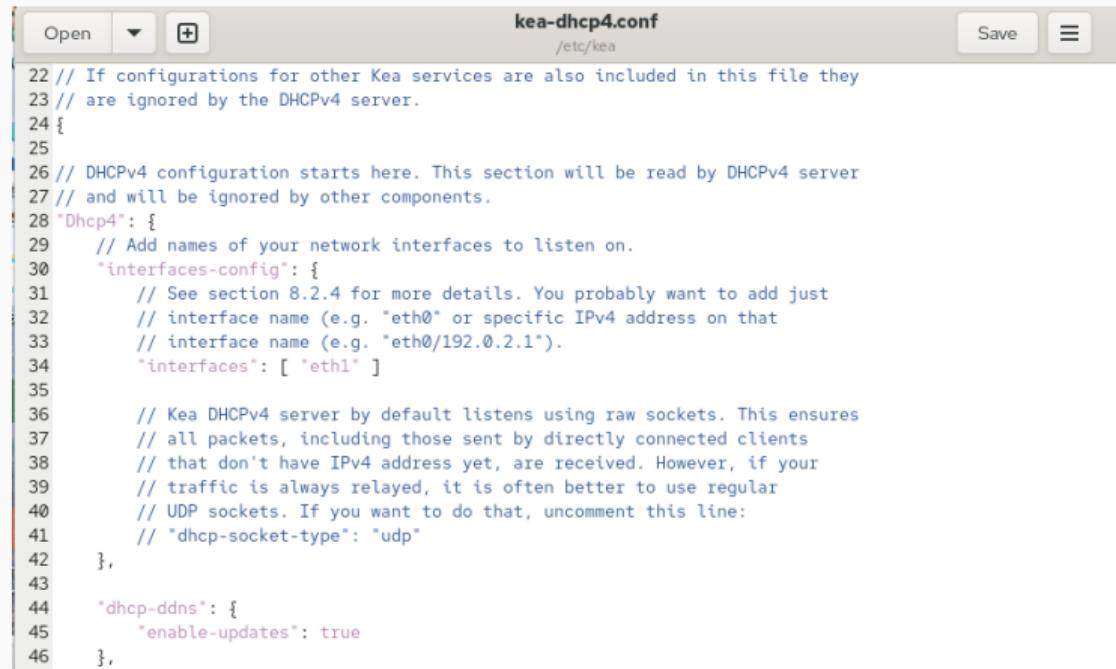
Рис. 5: TSIG-ключ

- Создан `tsig-keys.json`.
- Указаны параметры DDNS.
- Запущен сервис DDNS.

```
21
22     "ip-address": "127.0.0.1",
23     "port": 53001,
24     "control-socket": {
25         "socket-type": "unix",
26         "socket-name": "/run/kea/kea-ddns-ctrl-socket"
27     },
28     <?include "/etc/kea/tsig-keys.json"?>
29
30     "forward-ddns" : {
31         "ddns-domains": [
32             {
33                 "name": "ngaforov.net.",
34                 "key-name": "DHCP_UPDATER",
35                 "dns-servers": [
36                     { "ip-address": "192.168.1.1" }
37                 ]
38             }
39         ]
40     },
41
42     "reverse-ddns" : {
43         "ddns-domains": [
44             {
45                 "name": "192.168.1.1.ngaforov.net."
46             }
47         ]
48     }
49 }
```

## Активация DDNS в DHCP

- Включены обновления DNS.
- Указан суффикс `ngaforov.net`.
- Разрешено перезаписывать записи клиента.



The screenshot shows a code editor window with the file 'kea-dhcp4.conf' open. The file is located at '/etc/kea'. The code is a JSON configuration for a Kea DHCPv4 server. It includes sections for interface configuration and DHCPv4 specific settings, with comments explaining the purpose of each part. The configuration is designed to enable dynamic updates to a DNS server.

```
22 // If configurations for other Kea services are also included in this file they
23 // are ignored by the DHCPv4 server.
24 {
25
26 // DHCPv4 configuration starts here. This section will be read by DHCPv4 server
27 // and will be ignored by other components.
28 "Dhcp4": {
29     // Add names of your network interfaces to listen on.
30     "interfaces-config": {
31         // See section 8.2.4 for more details. You probably want to add just
32         // interface name (e.g. "eth0" or specific IPv4 address on that
33         // interface name (e.g. "eth0/192.0.2.1").
34         "interfaces": [ "eth1" ]
35
36         // Kea DHCPv4 server by default listens using raw sockets. This ensures
37         // all packets, including those sent by directly connected clients
38         // that don't have IPv4 address yet, are received. However, if your
39         // traffic is always relayed, it is often better to use regular
40         // UDP sockets. If you want to do that, uncomment this line:
41         // "dhcp-socket-type": "udp"
42     },
43
44     "dhcp-ddns": {
45         "enable-updates": true
46     }
47 }
```

## Проверка DDNS

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## Результат проверки

- В DNS появилась запись:
  - client.ngaforov.net
  - IP → 192.168.1.30
- Обновление прошло автоматически.

```
[ngaforov@client.ngaforov.net ~]$ dig @192.168.1.1 client.ngaforov.net

; <>> DiG 9.18.33 <>> @192.168.1.1 client.ngaforov.net
; (1 server found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 29518
;; flags: qr aa rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 1232
; COOKIE: c045ec5d1a48efd00100000069183babcf73ff3cef74eaf8e (good)
;; QUESTION SECTION:
;client.ngaforov.net.           IN      A

;; ANSWER SECTION:
client.ngaforov.net.    1200    IN      A      192.168.1.30
;; Query time: 0 msec
```

## Выводы

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- Настроены Kea DHCP и Bind9.
- Реализован DDNS на основе TSIG.
- Стенд полностью автоматизирован.