

Отчёт по лабораторной работе №3

Настройка DHCP-сервера Kea и DDNS-интеграции с Bind

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Цели и задачи работы

Цель

Приобретение практических навыков установки и конфигурирования DHCP-сервера.

Выполнение работы

Установка Kea DHCP

- переход в режим суперпользователя (`sudo -i`)
- установка пакета `kea` через `dnf`
- зависимости установлены автоматически, ошибок не выявлено

```
--> Total                                         86 kB/s | 5.3 MB   01:02
Total
Running transaction check
Transaction check succeeded.
Running transaction test
Transaction test succeeded.
Running transaction
Preparing      : 1/1
Installing    : mariadb-connector-c-config-3.4.4-1.el10.noarch 1/6
Installing    : mariadb-connector-c-3.4.4-1.el10.x86_64        2/6
Installing    : log4cplus-2.1.1-8.el10_0.x86_64            3/6
Installing    : libpq-16.8-2.el10_0.x86_64                4/6
Installing    : kea-libs-3.0.1-2.el10_1.x86_64            5/6
Running scriptlet: kea-3.0.1-2.el10_1.x86_64          6/6
Installing    : kea-3.0.1-2.el10_1.x86_64                6/6
Running scriptlet: kea-3.0.1-2.el10_1.x86_64          6/6

Installed:
  kea-3.0.1-2.el10_1.x86_64      kea-libs-3.0.1-2.el10_1.x86_64      libpq-16.8-2.el10_0.x86_64
  log4cplus-2.1.1-8.el10.x86_64  mariadb-connector-c-3.4.4-1.el10.x86_64  mariadb-connector-c-config-3.4.4-1.el10.noarch

Complete!
[root@server.elsaiedadel.net server]#
```

Рис. 1: Установка DHCP-сервера Kea

Настройка DHCP: параметры DNS

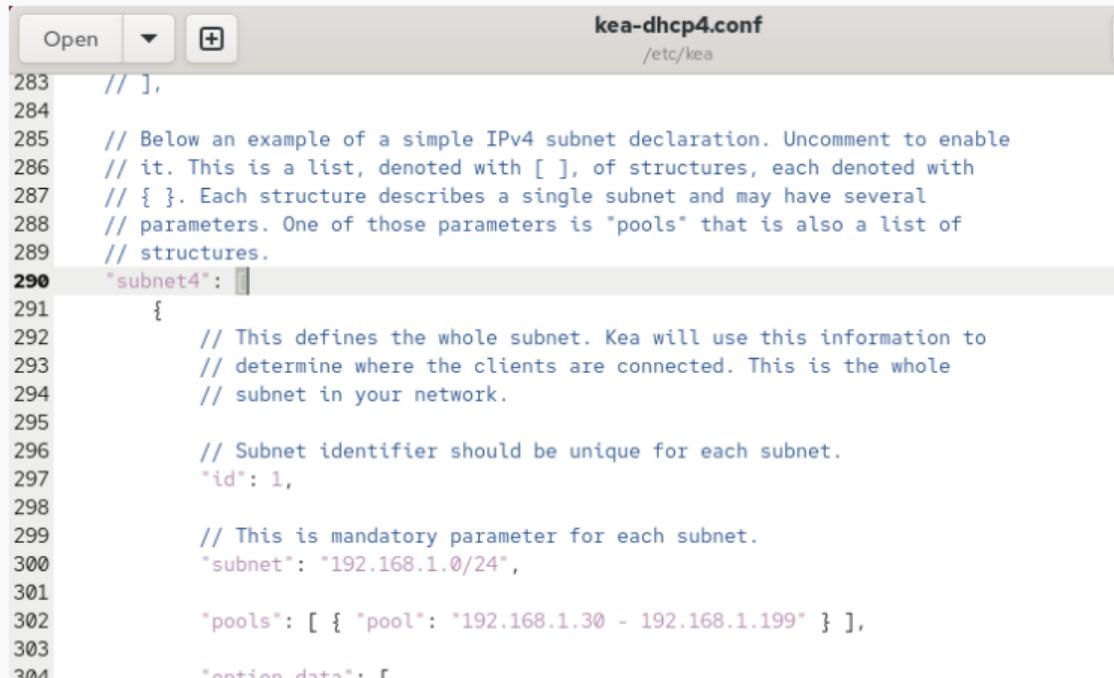
- DNS-сервер для клиентов: 192.168.1.1
- доменное имя: `elsaiedadel.net`
- домен поиска: `elsaiedadel.net`

The screenshot shows a code editor window with the file name 'kea-dhcp4.conf' located at '/etc/kea'. The file content is a JSON configuration for a Kea DHCP server. The configuration includes domain-name-servers, domain-name, and domain-search options. Line 152 highlights the 'data' field for the first domain-name-servers entry.

```
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": "elsaiedadel.net"
163    },
164
165    // Domain search is also a popular option. It tells the client to
```

Настройка DHCP: подсеть и пул адресов

- подсеть: 192.168.1.0/24
- пул: 192.168.1.30 - 192.168.1.199
- шлюз (routers): 192.168.1.1



The screenshot shows a code editor window with the file 'kea-dhcp4.conf' open. The file is located at '/etc/kea'. The code is written in JSON and defines a subnet configuration. The 'subnet4' section is highlighted with a red background.

```
// ],
// Below an example of a simple IPv4 subnet declaration. Uncomment to enable
// it. This is a list, denoted with [ ], of structures, each denoted with
// { }. Each structure describes a single subnet and may have several
// parameters. One of those parameters is "pools" that is also a list of
// structures.
"subnet4": [
    {
        // This defines the whole subnet. Kea will use this information to
        // determine where the clients are connected. This is the whole
        // subnet in your network.

        // Subnet identifier should be unique for each subnet.
        "id": 1,

        // This is mandatory parameter for each subnet.
        "subnet": "192.168.1.0/24",
        "pools": [ { "pool": "192.168.1.30 - 192.168.1.199" } ],
        "option_data": [
            ...
        ]
    }
]
```

DNS: добавление записей DHCP-сервера

- прямая зона: dhcp A 192.168.1.1

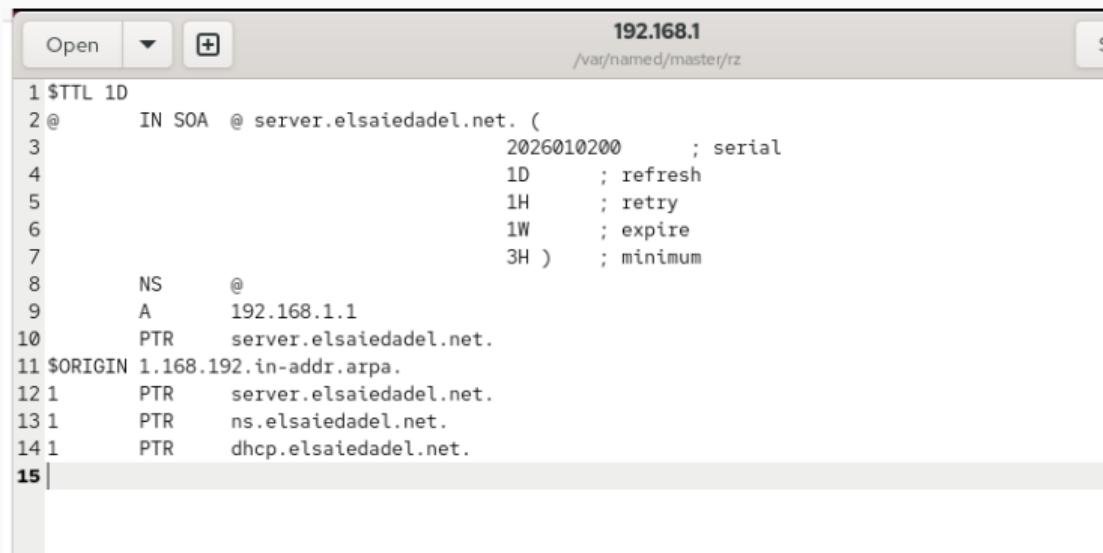
The screenshot shows a window titled 'elsaiedadel.net' with the path '/var/named/master/fz'. The window contains a text area with the following DNS zone configuration:

```
1 $TTL 1D
2 @      IN SOA  @ server.elsaiedadel.net. (
3                               2026010200      ; serial
4                               1D            ; refresh
5                               1H            ; retry
6                               1W            ; expire
7                               3H )          ; minimum
8       NS      @
9       A      192.168.1.1
10 $ORIGIN elsaiedadel.net.
11 servar  A      192.168.1.1
12 ns      A      192.168.1.1
13 dhcp   A      192.168.1.1
14
```

Рис. 4: Настройка прямой DNS-зоны

DNS: добавление записей DHCP-сервера

- обратная зона: 1 PTR dhcp.elsaiedadel.net.



The screenshot shows a window titled "192.168.1 /var/named/master/rz" with a toolbar containing "Open", a dropdown, and a "+" button. The main area displays a zone file with the following content:

```
1 $TTL 1D
2 @      IN SOA  @ server.elsaiedadel.net. (
3                               2026010200      ; serial
4                               1D            ; refresh
5                               1H            ; retry
6                               1W            ; expire
7                               3H )          ; minimum
8     NS      @
9     A       192.168.1.1
10    PTR     server.elsaiedadel.net.
11 $ORIGIN 1.168.192.in-addr.arpa.
12 1    PTR     server.elsaiedadel.net.
13 1    PTR     ns.elsaiedadel.net.
14 1    PTR     dhcp.elsaiedadel.net.
15 |
```

Рис. 5: Настройка обратной DNS-зоны

Проверка разрешения имени DHCP

- перезапуск Bind: `systemctl restart named`
- проверка: `ping dhcp.elsaiedadel.net`
- имя разрешается, потеря пакетов нет

```
[root@server.elsaiedadel.net server]# ping dhcp.elsaiedadel.net
PING dhcp.elsaiedadel.net (192.168.1.1) 56(84) bytes of data.
64 bytes from server.elsaiedadel.net (192.168.1.1): icmp_seq=1 ttl=64 time=0.021 ms
64 bytes from server.elsaiedadel.net (192.168.1.1): icmp_seq=2 ttl=64 time=0.032 ms
64 bytes from server.elsaiedadel.net (192.168.1.1): icmp_seq=3 ttl=64 time=0.079 ms
64 bytes from server.elsaiedadel.net (192.168.1.1): icmp_seq=4 ttl=64 time=0.033 ms
64 bytes from server.elsaiedadel.net (192.168.1.1): icmp_seq=5 ttl=64 time=0.030 ms
^C
--- dhcp.elsaiedadel.net ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4003ms
rtt min/avg/max/mdev = 0.021/0.039/0.079/0.020 ms
[root@server.elsaiedadel.net server]#
```

Рис. 6: Проверка разрешения имени DHCP-сервера

Firewall и SELinux, запуск DHCP

```
[root@server.elsaiedadel.net server]#  
[root@server.elsaiedadel.net server]# firewall-cmd --add-service=dhcp  
success  
[root@server.elsaiedadel.net server]# firewall-cmd --add-service=dhcp --permanent  
success  
[root@server.elsaiedadel.net server]# restorecon -vR /etc  
[root@server.elsaiedadel.net server]# restorecon -vR /var/named  
[root@server.elsaiedadel.net server]# restorecon -vR /var/lib/kea  
[root@server.elsaiedadel.net server]# systemctl start kea-dhcp4.service  
[root@server.elsaiedadel.net server]# █
```

Рис. 7: Запуск DHCP-сервера Kea

Provisioning маршрутизации на client

- шлюз по умолчанию назначается через eth1
- для eth0 отключается default-route (IPv4/IPv6)
- переподнимаются соединения NetworkManager

```
1  #!/bin/bash
2
3  echo "Provisioning script $0"
4
5  nmcli connection modify "eth1" ipv4.gateway "192.168.1.1"
6  nmcli connection up "eth1"
7
8  nmcli connection modify eth0 ipv4.never-default true
9  nmcli connection modify eth0 ipv6.never-default true
10
11 nmcli connection down eth0
12 nmcli connection up eth0
13
14 # systemctl restart NetworkManager
15
```

Получение адреса и ifconfig на client

- eth1: получен адрес 192.168.1.30/24, broadcast 192.168.1.255
- eth0: активен, но не является дефолтным маршрутом
- lo: локальная петля 127.0.0.1

```
elsaiedadel@client:~  
+  
  
ether 08:00:27:fb:07:db txqueuelen 1000 (Ethernet)  
RX packets 1293 bytes 158300 (154.5 KiB)  
RX errors 0 dropped 0 overruns 0 frame 0  
TX packets 1071 bytes 189644 (185.1 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::b99:10a2:5468:ed64 prefixlen 64 scopeid 0x20<link>  
      ether 08:00:27:da:7d:fb txqueuelen 1000 (Ethernet)  
      RX packets 267 bytes 35737 (34.8 KiB)  
      RX errors 0 dropped 0 overruns 0 frame 0  
      TX packets 426 bytes 38707 (37.7 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>
```

Файл аренд Kea: kea-leases4.csv

- `address` – выданный IP (192.168.1.30)
- `hwaddr` – MAC-адрес клиента
- `client_id` – идентификатор клиента (если используется)
- `valid_lifetime` – длительность аренды
- `expire` – время истечения аренды (epoch)
- `subnet_id` – ID подсети (в конфигурации `id: 1`)
- `state` – состояние записи аренды

```
[root@server.elsaiedadel.net server]# systemctl start kea-dhcp4.service
[root@server.elsaiedadel.net server]#
[root@server.elsaiedadel.net server]# cat /var/lib/kea/kea-leases4.csv
address,hwaddr,client_id,valid_lifetime,expire,subnet_id,fqdn_fwd,fqdn_rev,hostname,state,user_context,pool_id
192.168.1.30,08:00:27:da:7d:fb,01:08:00:27:da:7d:fb,3600,1767353009,1,0,0,client,,0
[root@server.elsaiedadel.net server]#
```

Рис. 10: Файл аренды DHCP kea-leases4.csv

TSIG-ключ для динамических обновлений

- сгенерирован ключ:
 - `tsig-keygen -a HMAC-SHA512 DHCP_UPDATER > /etc/named/keys/dhcp_updater.key`

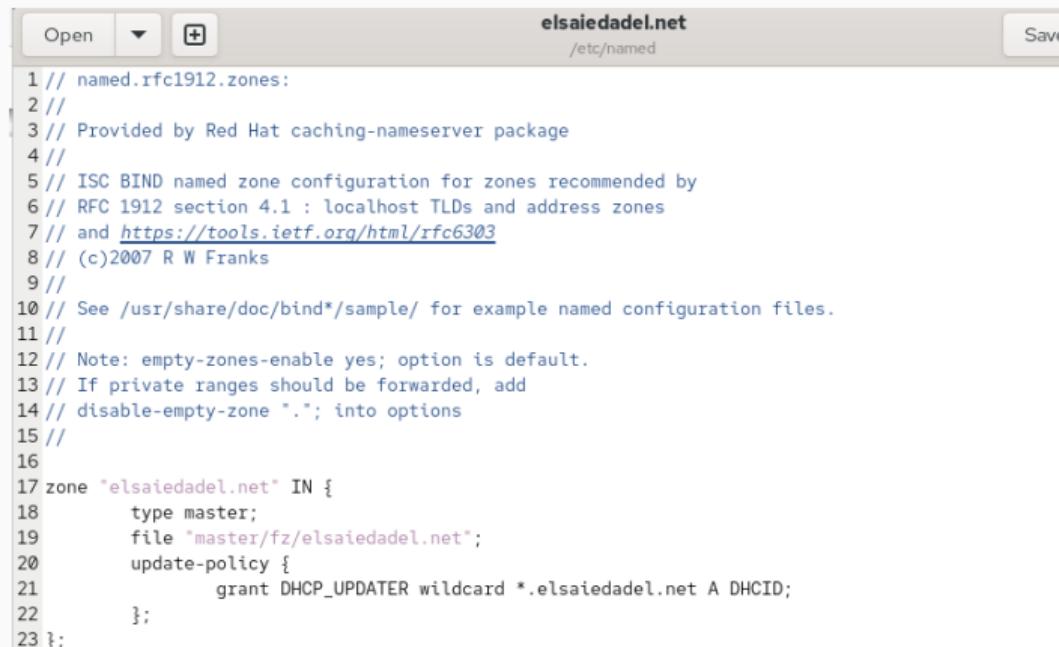
```
[root@server.elsaiedadel.net server]#  
[root@server.elsaiedadel.net server]# mkdir -p /etc/named/keys  
[root@server.elsaiedadel.net server]# tsig-keygen -a HMAC-SHA512 DHCP_UPDATER > /etc/named/keys/dhcp_updater.key  
[root@server.elsaiedadel.net server]# chown -R name:named /etc/named/keys/  
chown: invalid user: 'name:named'  
[root@server.elsaiedadel.net server]# chown -R named:named /etc/named/keys/  
[root@server.elsaiedadel.net server]# cat /etc/named/keys/dhcp_updater.key  
key "DHCP_UPDATER" {  
    algorithm hmac-sha512;  
    secret "tLMsCypkhKt45PEQzpDHPDntHnJttKxf0rtuFv9AFKv2Nua3voX9ZJMGr+J8CBu4UBmpsZpzDBcLnWrktYZelA==";  
};  
[root@server.elsaiedadel.net server]#
```

Рис. 11: Генерация TSIG-ключа DHCP_UPDATER

Bind: разрешение обновлений зон (update-policy)

В конфигурации зон включены правила:

- прямая зона `elsaiedadel.net`: разрешить A по ключу `DHCP_UPDATER`
- обратная зона `1.168.192.in-addr.arpa`: разрешить PTR по ключу `DHCP_UPDATER`

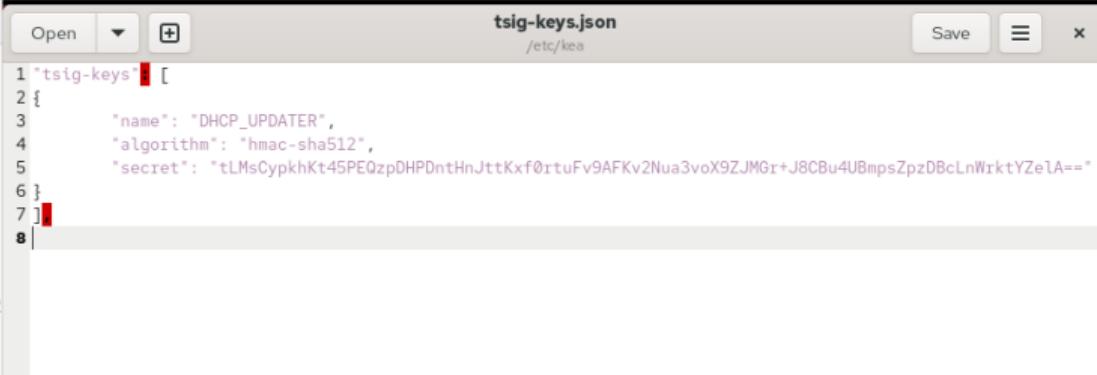


The screenshot shows a window titled 'elsaiedadel.net /etc/named' with a 'Save' button. The configuration file content is as follows:

```
1 // named.rfc1912.zones:
2 //
3 // Provided by Red Hat caching-nameserver package
4 //
5 // ISC BIND named zone configuration for zones recommended by
6 // RFC 1912 section 4.1 : localhost TLDs and address zones
7 // and https://tools.ietf.org/html/rfc6303
8 // (c)2007 R W Franks
9 //
10 // See /usr/share/doc/bind*/sample/ for example named configuration files.
11 //
12 // Note: empty-zones-enable yes; option is default.
13 // If private ranges should be forwarded, add
14 // disable-empty-zone "."; into options
15 //
16
17 zone "elsaiedadel.net" IN {
18     type master;
19     file "master/fz/elsaiedadel.net";
20     update-policy {
21         grant DHCP_UPDATER wildcard *.elsaiedadel.net A DHCID;
22     };
23 };
```

Kea: ключ в JSON и конфигурация DHCP-DDNS

- 1) Создан файл /etc/kea/tsig-keys.json (TSIG в формате JSON)
- 2) Настроен /etc/kea/kea-dhcp-ddns.conf:



The screenshot shows a code editor window titled "tsig-keys.json" located at "/etc/kea". The file contains the following JSON configuration for a TSIG key:

```
1 "tsig-keys": [  
2 {  
3     "name": "DHCP_UPDATER",  
4     "algorithm": "hmac-sha512",  
5     "secret": "tLMsCypkhKt45PEQzpDHPDntHnJttKxf0rtuFv9AFKv2Nua3voX9ZJMGr+J8CBu4UBmpsZpzDBcLnWrktYZelA=="  
6 }  
7 ]  
8 |
```

Рис. 13: TSIG-ключ в формате JSON для Kea

Kea: ключ в JSON и конфигурация DHCP-DDNS

The screenshot shows a terminal window with the configuration file 'kea-dhcp-ddns.conf' open. The file is located at '/etc/kea'. The configuration is as follows:

```
1
2 "DhcpDdns":
3 {
4     "ip-address": "127.0.0.1",
5     "port": 53001,
6     "control-socket": {
7         "socket-type": "unix",
8         "socket-name": "kea-ddns-ctrl-socket"
9     },
10    <?include "/etc/kea/tsig-keys.json"?>
11
12    "forward-ddns" : {
13        "ddns-domains" : [
14            {
15                "name": "elsaiedadel.net.",
16                "key-name": "DHCP_UPDATER",
17                "dns-servers": [
18                    { "ip-address": "192.168.1.1" }
19                ]
20            }
21        ]
22    },
23
24    "reverse-ddns" : {
25        "ddns-domains" : [
26            {
27                "name": "1.168.192.in-addr.arpa.",
28                "key-name": "DHCP_UPDATER",
29                "dns-servers": [
30                    { "ip-address": "192.168.1.1" }
31                ]
32            }
33        ]
34    },
35}
```

At the bottom of the terminal window, it says 'Saving file "/etc/kea/kea-dhcp-ddns.conf"'.

Bottom status bar: Plain Text ▾ Tab Width: 8 ▾ Ln 52 Col 2 INS

Запуск kea-dhcp-ddns и включение обновлений в DHCPv4

```
[root@server.elsaiedadel.net server]# 
[root@server.elsaiedadel.net server]# chown kea:kea /etc/kea/kea-dhcp-ddns.conf
[root@server.elsaiedadel.net server]# kea-dhcp-ddns -t /etc/kea/kea-dhcp-ddns.conf
2026-01-02 10:47:18.224 INFO [kea-dhcp-ddns.dctl/28706.140591095048064] DCTL_CONFIG_CHECK_COMPLETE server has completed configuration check: listening on 127.0.0.1, port 53001, using UDP, result: success(0), text=Configuration check successful
[root@server.elsaiedadel.net server]# systemctl enable --now kea-dhcp-ddns.service
Created symlink '/etc/systemd/system/multi-user.target.wants/kea-dhcp-ddns.service' → '/usr/lib/systemd/system/kea-dhcp-ddns.service'.
[root@server.elsaiedadel.net server]# systemctl status kea-dhcp-ddns.service
● kea-dhcp-ddns.service - Kea DHCP-DDNS Server
    Loaded: loaded (/usr/lib/systemd/system/kea-dhcp-ddns.service; enabled; preset: disabled)
      Active: active (running) since Fri 2026-01-02 10:47:39 UTC; 10s ago
        Invocation: 3a48cb14de254b0a84ddfd12ea2a33fa
          Docs: man:kea-dhcp-ddns(8)
        Main PID: 28920 (kea-dhcp-ddns)
          Tasks: 5 (limit: 10275)
        Memory: 2.2M (peak: 7.2M)
          CPU: 10ms
        CGroup: /system.slice/kea-dhcp-ddns.service
                └─28920 /usr/sbin/kea-dhcp-ddns -c /etc/kea/kea-dhcp-ddns.conf

Jan 02 10:47:39 server.elsaiedadel.net systemd[1]: Started kea-dhcp-ddns.service - Kea DHCP-DDNS Server.
Jan 02 10:47:39 server.elsaiedadel.net kea-dhcp-ddns[28920]: 2026-01-02 10:47:39.944 INFO [kea-dhcp-ddns.dctl/28920.139]
Jan 02 10:47:39 server.elsaiedadel.net kea-dhcp-ddns[28920]: INFO COMMAND_ACCEPTOR_START Starting to accept connections
Jan 02 10:47:39 server.elsaiedadel.net kea-dhcp-ddns[28920]: INFO DCTL_CONFIG_COMPLETE server has completed configuration
Jan 02 10:47:39 server.elsaiedadel.net kea-dhcp-ddns[28920]: INFO DHCP_DDNS_STARTED Kea DHCP-DDNS server version 3.0.1 >
[root@server.elsaiedadel.net server]#
```

Рис. 15: Состояние службы kea-dhcp-ddns

Запуск kea-dhcp-ddns и включение обновлений в DHCPv4

The screenshot shows a text editor window with the title 'kea-dhcp4.conf' and the path '/etc/kea'. The file content is a JSON configuration for a Kea DHCPv4 server. The configuration includes sections for DHCPv4, ddns, and control socket.

```
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
45     "dhcp-ddns": {
46         "enable-updates": true
47     },
48     "ddns-qualifying-suffix": "elsaiedadel.net",
49     "ddns-override-client-update": true,
50     // Kea supports control channel, which is a way to receive management
51     // commands while the server is running. This is a Unix domain socket that
52     // receives commands formatted in JSON, e.g. config-set (which sets new
53     // configuration), config-reload (which tells Kea to reload its
54     // configuration from file), statistic-get (to retrieve statistics) and many
55     // more. For detailed description, see Sections 8.8, 16 and 15.
56     "control-socket": {
57         "socket-type": "unix",
58         "socket-name": "kea4-ctrl-socket"
59     },
60 }
```

Запуск kea-dhcp-ddns и включение обновлений в DHCPv4

- перезапуск DHCP

```
[root@server.elsaiedadel.net server]# systemctl restart kea-dhcp4.service
[root@server.elsaiedadel.net server]# 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 Fri 2026-01-02 10:51:00 UTC; 9s ago
      Invocation: 707bc63fffab349e3b4158922879e5e1b
        Docs: man:kea-dhcp4(8)
       Main PID: 29450 (kea-dhcp4)
          Status: "Dispatching packets..."
         Tasks: 7 (limit: 10275)
        Memory: 2.5M (peak: 7.2M)
          CPU: 12ms
        CGroup: /system.slice/kea-dhcp4.service
                  └─29450 /usr/sbin/kea-dhcp4 -c /etc/kea/kea-dhcp4.conf

Jan 02 10:51:00 server.elsaiedadel.net systemd[1]: Starting kea-dhcp4.service - Kea DHCPv4 Server...
Jan 02 10:51:00 server.elsaiedadel.net kea-dhcp4[29450]: 2026-01-02 10:51:00.971 INFO  [kea-dhcp4.dhcp4/29450.1398240449]
Jan 02 10:51:00 server.elsaiedadel.net kea-dhcp4[29450]: 2026-01-02 10:51:00.972 INFO  [kea-dhcp4.commands/29450.1398240450]
Jan 02 10:51:00 server.elsaiedadel.net systemd[1]: Started kea-dhcp4.service - Kea DHCPv4 Server.
[root@server.elsaiedadel.net server]#
```

Рис. 17: Состояние службы kea-dhcp4

Проверка: запись клиента появилась в DNS (dig)

Ключевые признаки корректной работы:

- **status: NOERROR** — запись найдена
- **aa** — ответ авторитетный
- В ANSWER: A **192.168.1.30** — имя сопоставлено выданному адресу

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

; <>> DiG 9.18.33 <>> @192.168.1.1 client.elsaiedadel.net
; (1 server found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 62719
;; flags: qr aa rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 1232
; COOKIE: ed2d1a28ca528f5f010000006957a3714d85bd8399d1facd (good)
;; QUESTION SECTION:
;client.elsaiedadel.net.           IN      A

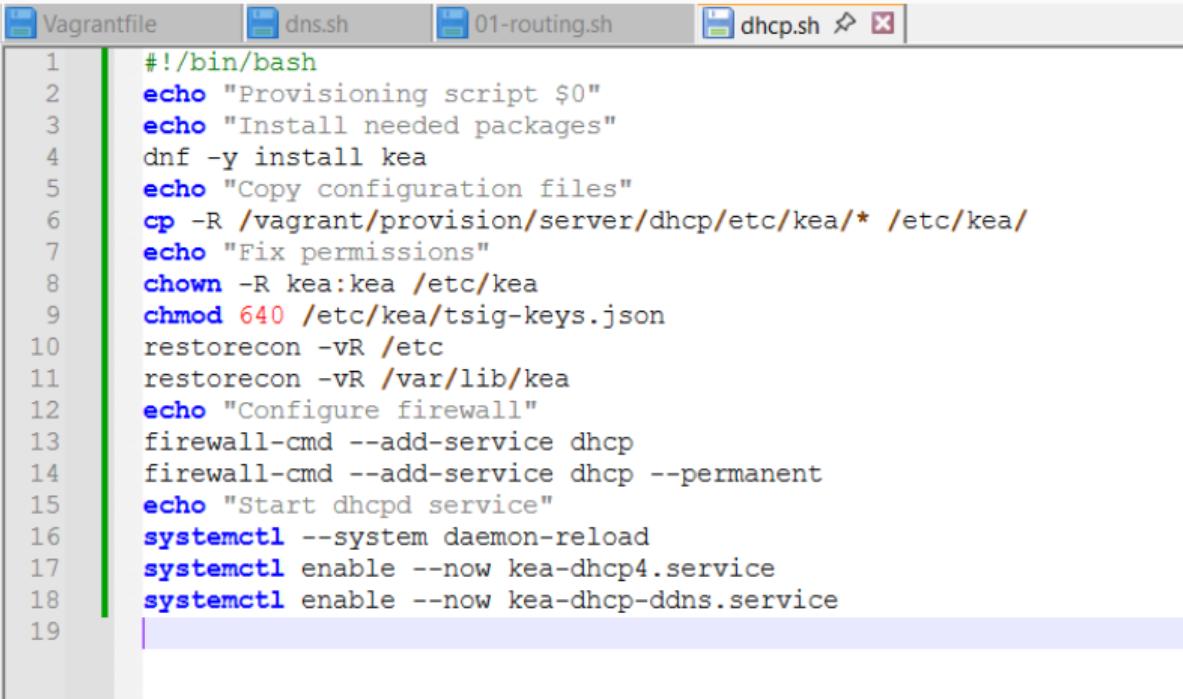
;; ANSWER SECTION:
```

Сохранение конфигураций и скрипт dhcp.sh

```
[root@server.elsaiedadel.net server]#  
[root@server.elsaiedadel.net server]# cd /vagrant/provision/server/  
[root@server.elsaiedadel.net server]# mkdir -p /vagrant/provision/server/dhcp/etc/kea  
[root@server.elsaiedadel.net server]# cp -R /etc/kea/* /vagrant/provision/server/dhcp/etc/kea/  
[root@server.elsaiedadel.net server]# cd /vagrant/provision/server/dns/  
[root@server.elsaiedadel.net dns]# cp -R /var/named/* /vagrant/provision/server/dns/var/named/  
cp: overwrite '/vagrant/provision/server/dns/var/named/master/fz/elsaiedadel.net'? y  
cp: overwrite '/vagrant/provision/server/dns/var/named/master/rz/192.168.1'? y  
[root@server.elsaiedadel.net dns]# cp -R /etc/named/* /vagrant/provision/server/dns/etc/named/  
cp: overwrite '/vagrant/provision/server/dns/etc/named/elsaiedadel.net'? y  
[root@server.elsaiedadel.net dns]# cd /vagrant/provision/server/  
[root@server.elsaiedadel.net server]# touch dhcp.sh  
[root@server.elsaiedadel.net server]# chmod +x dhcp.sh  
[root@server.elsaiedadel.net server]#
```

Рис. 19: Копирование конфигурации DNS и DHCP

Сохранение конфигураций и скрипт dhcp.sh



```
1 #!/bin/bash
2 echo "Provisioning script $0"
3 echo "Install needed packages"
4 dnf -y install kea
5 echo "Copy configuration files"
6 cp -R /vagrant/provision/server/dhcp/etc/kea/* /etc/kea/
7 echo "Fix permissions"
8 chown -R kea:kea /etc/kea
9 chmod 640 /etc/kea/tsig-keys.json
10 restorecon -vR /etc
11 restorecon -vR /var/lib/kea
12 echo "Configure firewall"
13 firewall-cmd --add-service dhcp
14 firewall-cmd --add-service dhcp --permanent
15 echo "Start dhcpcd service"
16 systemctl --system daemon-reload
17 systemctl enable --now kea-dhcp4.service
18 systemctl enable --now kea-dhcp-ddns.service
19 |
```

Рис. 20: Provisioning-скрипт dhcp.sh

Выводы

- Настроен Kea DHCPv4: выдача адресов и сетевых параметров
- Проанализирована работа DHCP на клиенте (маршрутизация, ifconfig, leases)
- Реализована интеграция DHCP и Bind через DDNS (TSIG + update-policy)
- Подтверждено автоматическое создание DNS-записи клиента (dig)
- Выполнена автоматизация действий через provisioning-скрипты Vagrant