

Администрирование сетевых подсистем

Лабораторная работа №3

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Приобретение практических навыков по установке и конфигурированию DHCP-сервера.

Выполнение лабораторной работы

```
[root@server ~]# dnf -y install kea
Last metadata expiration check: 0:02:16 ago on Sun 16 Nov 2025 02:03:03 AM MSK.
Dependencies resolved.
=====
Package                Architecture      Version           Repository        Size
=====
Installing:
kea                    x86_64            2.6.4-1.el9      epel              1.3 M
Installing dependencies:
kea-libs               x86_64            2.6.4-1.el9      epel              3.0 M
log4plus               x86_64            2.0.5-15.el9     epel              337 K
mariadb-connector-c    x86_64            3.2.6-1.el9_0    appstream         195 K
mariadb-connector-c-config  noarch            3.2.6-1.el9_0    appstream         9.0 K
postgresql-private-libs x86_64            13.22-1.el9_6    appstream         137 K
=====
Transaction Summary
=====
Install 6 Packages

Total download size: 5.0 M
Installed size: 18 M
Downloading Packages:
(1/6): log4plus-2.0.5-15.el9.x86_64.rpm                164 kB/s | 337 kB  00:02
(2/6): mariadb-connector-c-3.2.6-1.el9_0.x86_64.rpm      1.0 MB/s | 195 kB  00:00
(3/6): postgresql-private-libs-13.22-1.el9_6.x86_64.rpm  750 kB/s | 137 kB  00:00
(4/6): mariadb-connector-c-config-3.2.6-1.el9_0.noarch.r  50 kB/s | 9.0 kB  00:00
(5/6): kea-2.6.4-1.el9.x86_64.rpm                      265 kB/s | 1.3 MB  00:04
(6/6): kea-libs-2.6.4-1.el9.x86_64.rpm                  376 kB/s | 3.0 MB  00:08
-----
Total                                     434 kB/s | 5.0 MB  00:11
Running transaction check
Transaction check succeeded.
Running transaction test
Transaction test succeeded.
Running transaction
Preparing :
Installing : mariadb-connector-c-config-3.2.6-1.el9_0.noarch 1/1
Installing : mariadb-connector-c-3.2.6-1.el9_0.x86_64      2/6
Installing : postgresql-private-libs-13.22-1.el9_6.x86_64   3/6
Installing : log4plus-2.0.5-15.el9.x86_64                  4/6
Installing : kea-libs-2.6.4-1.el9.x86_64                   5/6
Running scriptlet: kea-2.6.4-1.el9.x86_64                  6/6
Installing : kea-2.6.4-1.el9.x86_64                        6/6
Running scriptlet: kea-2.6.4-1.el9.x86_64                  6/6
Verifying : kea-2.6.4-1.el9.x86_64                         1/6
Verifying : kea-libs-2.6.4-1.el9.x86_64                   2/6
Verifying : log4plus-2.0.5-15.el9.x86_64                  3/6
Verifying : mariadb-connector-c-3.2.6-1.el9_0.x86_64       4/6
Verifying : postgresql-private-libs-13.22-1.el9_6.x86_64   5/6
Verifying : mariadb-connector-c-config-3.2.6-1.el9_0.noarch 6/6
Installed:
kea-2.6.4-1.el9.x86_64                                kea-libs-2.6.4-1.el9.x86_64
log4plus-2.0.5-15.el9.x86_64                          mariadb-connector-c-3.2.6-1.el9_0.x86_64
mariadb-connector-c-config-3.2.6-1.el9_0.noarch         postgresql-private-libs-13.22-1.el9_6.x86_64
```

Рис. 1: Установка dhcp

```
// ...
{
    "name": "domain-name-servers",
    "data": "192.168.1.1"
},

// Typically people prefer to refer to options by their names, so they
// don't need to remember the code names. However, some people like
// to use numerical values. For example, option "domain-name" uses
// option code 15, so you can reference to it either by
// "name": "domain-name" or "code": 15.
{
    "code": 15,
    "data": "user.net"
},

// Domain search is also a popular option. It tells the client to
// attempt to resolve names within those specified domains. For
// example, name "foo" would be attempted to be resolved as
// foo.mydomain.example.com and if it fails, then as foo.example.com
{
    "name": "domain-search",
    "data": "user.net"
},
}
```

Рис. 2: Замена шаблона domain-name

```
"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 define the actual part of your subnet that is governed
    // by Kea. Technically this is optional parameter, but it's
    // almost always needed for DHCP to do its job. If you omit it,
    // clients won't be able to get addresses, unless there are
    // host reservations defined for them.
    "pools": [ { "pool": "192.168.1.30 - 192.168.1.199" } ],

    // These are options that are subnet specific. In most cases,
    // you need to define at least routers option, as without this
    // option your clients will not be able to reach their default
    // gateway and will not have Internet connectivity.
    "option-data": [
        {
            // For each IPv4 subnet you most likely need to specify at
            // least one router.
            "name": "routers",
            "data": "192.168.1.1"
        }
    ],
},
]
```

Рис. 3: Создание собственной dhcp-сети

```
"interfaces-config": {  
  // See section 8.2.4 for more details. You probably want to add just  
  // interface name (e.g. "eth0" or specific IPv4 address on that  
  // interface name (e.g. "eth0/192.0.2.1").  
  "interfaces": [ "eth1"]  
}
```

Рис. 4: Привязка dhcpd к eth1

```
[root@server ~]# ping dhcp.user.net
PING dhcp.user.net (192.168.1.1) 56(84) bytes of data.
64 bytes from dhcp.user.net.1.168.192.in-addr.arpa (192.168.1.1): icmp_seq=1 ttl=64 time=0.099 ms
64 bytes from server.user.net (192.168.1.1): icmp_seq=2 ttl=64 time=0.290 ms
64 bytes from ns.user.net.1.168.192.in-addr.arpa (192.168.1.1): icmp_seq=3 ttl=64 time=0.051 ms
64 bytes from ns.user.net.1.168.192.in-addr.arpa (192.168.1.1): icmp_seq=4 ttl=64 time=0.048 ms
64 bytes from server.user.net (192.168.1.1): icmp_seq=5 ttl=64 time=0.059 ms
64 bytes from dhcp.user.net.1.168.192.in-addr.arpa (192.168.1.1): icmp_seq=6 ttl=64 time=0.064 ms
64 bytes from ns.user.net.1.168.192.in-addr.arpa (192.168.1.1): icmp_seq=7 ttl=64 time=0.085 ms
64 bytes from server.user.net (192.168.1.1): icmp_seq=8 ttl=64 time=0.066 ms
64 bytes from dhcp.user.net.1.168.192.in-addr.arpa (192.168.1.1): icmp_seq=9 ttl=64 time=0.062 ms
64 bytes from ns.user.net.1.168.192.in-addr.arpa (192.168.1.1): icmp_seq=10 ttl=64 time=0.050 ms
64 bytes from ns.user.net.1.168.192.in-addr.arpa (192.168.1.1): icmp_seq=11 ttl=64 time=0.061 ms
64 bytes from dhcp.user.net.1.168.192.in-addr.arpa (192.168.1.1): icmp_seq=12 ttl=64 time=0.062 ms
64 bytes from ns.user.net.1.168.192.in-addr.arpa (192.168.1.1): icmp_seq=13 ttl=64 time=0.061 ms
64 bytes from server.user.net (192.168.1.1): icmp_seq=14 ttl=64 time=0.064 ms
64 bytes from dhcp.user.net.1.168.192.in-addr.arpa (192.168.1.1): icmp_seq=15 ttl=64 time=0.068 ms
64 bytes from server.user.net (192.168.1.1): icmp_seq=16 ttl=64 time=0.063 ms
```

Рис. 5: Обращение к dhcp-серверу

```
[root@server ~]# tail -f /var/log/messages
Nov 16 00:28:57 server named[44692]: timed out resolving 'ns3.fastly.net/AAAA/IN': 192.168.1.1#53
Nov 16 00:28:57 server named[44692]: timed out resolving 'ns3.fastly.net/AAAA/IN': 192.168.1.1#53
Nov 16 00:28:57 server named[44692]: timed out resolving 'ns1.fastly.net/AAAA/IN': 192.168.1.1#53
Nov 16 00:28:57 server named[44692]: timed out resolving 'ns4.fastly.net/AAAA/IN': 192.168.1.1#53
Nov 16 00:28:57 server named[44692]: timed out resolving 'ns2.fastly.net/AAAA/IN': 192.168.1.1#53
Nov 16 00:28:57 server named[44692]: timed out resolving 'ns4.fastly.net/AAAA/IN': 192.168.1.1#53
Nov 16 00:28:57 server named[44692]: timed out resolving 'ns2.fastly.net/AAAA/IN': 192.168.1.1#53
Nov 16 00:28:57 server named[44692]: timed out resolving 'ns1.fastly.net/AAAA/IN': 192.168.1.1#53
Nov 16 00:35:12 server systemd[1]: Starting Hostname Service...
Nov 16 00:35:12 server systemd[1]: Started Hostname Service.
Nov 16 00:35:42 server systemd[1]: systemd-hostnamed.service: Deactivated successfully.
Nov 16 00:35:55 server systemd[1]: Started Kea DHCPv4 Server.
Nov 16 00:35:55 server kea-dhcp4[44781]: 2025-11-16 03:35:55.327 INFO [kea-dhcp4.dhcp4/44781.140249854556288] DHCP4_STARTING Kea DHCPv4 server version 2.6.4 (stable) starting
Nov 16 00:35:55 server kea-dhcp4[44781]: 2025-11-16 03:35:55.330 INFO [kea-dhcp4.commands/44781.140249854556288] COMMAND_RECEIVED Received command 'config-set'
```

Рис. 6: Проверка корректной работы dhcp-сервера

```
[root@server ~]# mkdir -p /etc/named/keys  
[root@server ~]# tsig-keygen -a HMAC-SHA512 DHCP_UPDATER > /etc/named/keys  
dhcp_updater.key  
[root@server ~]#
```

Рис. 7: Создание ключа

Выполнение лабораторной работы

```
GNU nano 5.6.1 /etc/named.conf Mo
recursion yes;

dnssec-enable no;
dnssec-validation no;

managed-keys-directory "/var/named/dynamic";
geoip-directory "/usr/share/GeoIP";

pid-file "/run/named/named.pid";
session-keyfile "/run/named/session.key";

/* https://fedoraproject.org/wiki/Changes/CryptoPolicy */
include "/etc/crypto-policies/back-ends/bind.config";
};

logging {
    channel default_debug {
        file "data/named.run";
        severity dynamic;
    };
};

zone "." IN {
    type hint;
    file "named.ca";
};

include "/etc/named.rfc1912.zones";
include "/etc/named.root.key";
include "/etc/named/user.net";
include "/etc/named/keys/dhcp_updater.key";
```

Рис. 8: Подключение ключа

```
GNU nano 5.6.1 /etc/kea/tsig-keys.json
"tsig-keys": [
  {
    "name": "DHCP_UPDATER",
    "algorithm": "hmac-sha512",
    "secret": "04ywtrL72FkmB+2luY+zyu5HlAXbUCVxqiIiUU+gu+9UUFvrlur50h>"
  }
],
```

Рис. 9: tsig-keys.json

```
// See section 2.1 for examples and details about the format
"DhcpDdns":
{
  "ip-address": "127.0.0.1",
  "port": 53001,
  "control-socket": {
    "socket-type": "unix",
    "socket-name": "/run/kea/kea-ddns-ctrl-socket"
  },
  <?include "/etc/kea/tsig-keys.json"?>

  "forward-ddns" : {
    "ddns-domains" : [
      {
        "name": "user.net.",
        "key-name": "DHCP_UPDATER",
        "dns-servers": [
          { "ip-address": "192.168.1.1" }
        ]
      }
    ]
  },

  "reverse-ddns" : {
    "ddns-domains" : [
      {
        "name": "1.168.192.in-addr.arpa",
        "key-name": "DHCP_UPDATER",
        "dns-servers": [

```

Рис. 10: Изменения в kea-dhcp-ddns.conf

```
},  
"dhcp-ddns": {  
    "enable-updates": true  
},  
"ddns-qualifying-suffix": "user.net",  
"ddns-override-client-update": true,  
  
// Kea supports control channel, which is a way to receive management  
// commands while the server is running. This is a Unix domain socket that  
// receives commands formatted in JSON, e.g. config-set (which sets new  
// configuration), config-reload (which tells Kea to reload its  
// configuration from file), statistic-get (to retrieve statistics) and many
```

Рис. 11: Изменения в kea-dhcp4.conf

```
[root@client ~]# dig @192.168.1.1 client.user.net

; <<>> DiG 9.16.23-RH <<>> @192.168.1.1 client.user.net
; (1 server found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NXDOMAIN, id: 44211
;; flags: qr aa rd ra; QUERY: 1, ANSWER: 0, AUTHORITY: 1, ADDITIONAL: 1

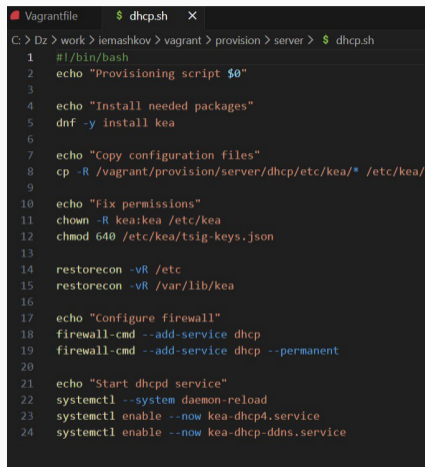
;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags;; udp: 1232
; COOKIE: 789512cfec0857ba010000006925b7833ec148d0b3e19146 (good)
;; QUESTION SECTION:
;client.user.net.                IN      A

;; AUTHORITY SECTION:
user.net.                10800    IN      SOA     user.net. server.user.net. 20251
11603 86400 3600 604800 10800

;; Query time: 1 msec
;; SERVER: 192.168.1.1#53(192.168.1.1)
;; WHEN: Tue Nov 25 17:04:51 MSK 2025
;; MSG SIZE rcvd: 115
```

Рис. 12: Обращение client.user.net

Выполнение лабораторной работы



```
Vagrantfile  dhcp.sh  X
C: > Dz > work > iemashkov > vagrant > provision > server > $ dhcp.sh
1  #!/bin/bash
2  echo "Provisioning script $0"
3
4  echo "Install needed packages"
5  dnf -y install kea
6
7  echo "Copy configuration files"
8  cp -R /vagrant/provision/server/dhcp/etc/kea/* /etc/kea/
9
10 echo "Fix permissions"
11 chown -R kea:kea /etc/kea
12 chmod 640 /etc/kea/tsig-keys.json
13
14 restorecon -vR /etc
15 restorecon -vR /var/lib/kea
16
17 echo "Configure firewall"
18 firewall-cmd --add-service dhcp
19 firewall-cmd --add-service dhcp --permanent
20
21 echo "Start dhcpd service"
22 systemctl --system daemon-reload
23 systemctl enable --now kea-dhcp4.service
24 systemctl enable --now kea-dhcp-ddns.service
```

Рис. 13: dhcp.sh

```
server.vm.provision "server dhcp",  
    type: "shell",  
    preserve_order: true,  
    path: "provision/server/dhcp.sh"
```

Рис. 14: Изменения в файле Vagrantfile

Во время выполнения лабораторной работы я приобрёл практические навыки по установке и конфигурированию DHCP-сервера.