

# Администрирование сетевых подсистем

## Настройка DNS-сервера (Лабораторная работа №2)

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## Цели и задачи работы

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Приобретение практических навыков установки и конфигурирования DNS-сервера на базе BIND.

1. Установить и запустить службу **BIND** на сервере.
2. Настроить кэширующий DNS-сервер.
3. Настроить прямую и обратную зоны для собственного домена.
4. Проверить работу сервиса через утилиты **dig** и **host**.
5. Настроить автоматизацию конфигурации через Vagrant.

## Теоретическая часть

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- DNS переводит доменные имена в IP-адреса и обратно.
- Зоны:
  - Прямая (имя → IP)
  - Обратная (IP → имя)
- Типы записей:
  - SOA, NS, A, PTR, CNAME, MX.

## Процесс выполнения лабораторной работы

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# Установка DNS-сервера

```
root@server:~ - sudo -i

=====
Package                        Architecture      Version           Repository        Size
=====
Installing:
bind                           x86_64            32:9.18.33-3.el10 appstream          333 k
Installing weak dependencies:
bind-dnssec-utils              x86_64            32:9.18.33-3.el10 appstream          150 k

Transaction Summary
=====
Install 2 Packages

Total download size: 484 k
Installed size: 1.3 M
Downloading Packages:
(1/2): bind-dnssec-utils-9.18.33-3.el10.x86_64.rpm                3.6 MB/s | 150 kB    00:00
(2/2): bind-9.18.33-3.el10.x86_64.rpm                             7.1 MB/s | 333 kB    00:00
-----
Total                                                                1.7 MB/s | 484 kB    00:00

Running transaction check
Transaction check succeeded.
Running transaction test
Transaction test succeeded.
Running transaction
  Preparing      :                                                    1/1
  Installing     : bind-dnssec-utils-32:9.18.33-3.el10.x86_64        1/2
  Running scriptlet: bind-32:9.18.33-3.el10.x86_64                  2/2
  Installing     : bind-32:9.18.33-3.el10.x86_64                    2/2
  Running scriptlet: bind-32:9.18.33-3.el10.x86_64                  2/2

Installed:
  bind-32:9.18.33-3.el10.x86_64                                bind-dnssec-utils-32:9.18.33-3.el10.x86_64

Complete!
[root@server.smahmudov.net ~]#
```

Рис 1: Установка bind и bind-utils



## Проверка работы сервера

```
[root@server.smahmudov.net ~]# dig www.yandex.ru

; <<>> DiG 9.18.33 <<>> www.yandex.ru
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 14581
;; flags: qr rd ra; QUERY: 1, ANSWER: 3, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 1232
;; QUESTION SECTION:
;www.yandex.ru.                IN      A

;; ANSWER SECTION:
www.yandex.ru.                442     IN      A      77.88.44.55
www.yandex.ru.                442     IN      A      77.88.55.88
www.yandex.ru.                442     IN      A      5.255.255.77

;; Query time: 14 msec
;; SERVER: 10.0.2.3#53(10.0.2.3) (UDP)
;; WHEN: Sun Sep 07 13:37:10 UTC 2025
;; MSG SIZE rcvd: 90

[root@server.smahmudov.net ~]#
```

Рис. 2: Результат запроса dig к www.yandex.ru

```
[root@server.smahmudov.net ~]#  
[root@server.smahmudov.net ~]#  
[root@server.smahmudov.net ~]# cat /etc/resolv.conf  
# Generated by NetworkManager  
search smahmudov.net  
nameserver 10.0.2.3  
[root@server.smahmudov.net ~]#
```

Рис. 3: Файл resolv.conf с настройками

```
[root@server.smahmudov.net ~]#  
[root@server.smahmudov.net ~]# cat /var/named/named.localhost  
$TTL 1D  
@      IN SOA  @ rname.invalid. (  
                                0      ; serial  
                                1D     ; refresh  
                                1H     ; retry  
                                1W     ; expire  
                                3H )   ; minimum  
  
      NS      @  
      A      127.0.0.1  
      AAAA    ::1  
[root@server.smahmudov.net ~]# cat /var/named/named.loopback  
$TTL 1D  
@      IN SOA  @ rname.invalid. (  
                                0      ; serial  
                                1D     ; refresh  
                                1H     ; retry  
                                1W     ; expire  
                                3H )   ; minimum  
  
      NS      @  
      A      127.0.0.1  
      AAAA    ::1  
      PTR     localhost.  
[root@server.smahmudov.net ~]#
```

## Сравнение запросов

```
[root@server.smahmudov.net ~]# systemctl start named
[root@server.smahmudov.net ~]# systemctl enable named.service
Created symlink '/etc/systemd/system/multi-user.target.wants/named.service' → '/usr/lib/systemd/system/named.service'.
[root@server.smahmudov.net ~]# dig @127.0.0.1 www.yandex.ru
;; communications error to 127.0.0.1#53: timed out

; <<>> DiG 9.18.33 <<>> @127.0.0.1 www.yandex.ru
; (1 server found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 54459
;; flags: qr rd ra; QUERY: 1, ANSWER: 3, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 1232
; COOKIE: eb68e2ec95cc91480100000068bd8c04ba8489c9b22fbc3 (good)
;; QUESTION SECTION:
;www.yandex.ru.                IN      A

;; ANSWER SECTION:
www.yandex.ru.                600     IN      A      77.88.55.88
www.yandex.ru.                600     IN      A      5.255.255.77
www.yandex.ru.                600     IN      A      77.88.44.55

;; Query time: 4802 msec
;; SERVER: 127.0.0.1#53(127.0.0.1) (UDP)
;; WHEN: Sun Sep 07 13:43:32 UTC 2025
;; MSG SIZE rcvd: 118

[root@server.smahmudov.net ~]#
```

Рис. 5: Сравнение запросов через внешний и локальный сервер

# Настройка DNS через nmcli

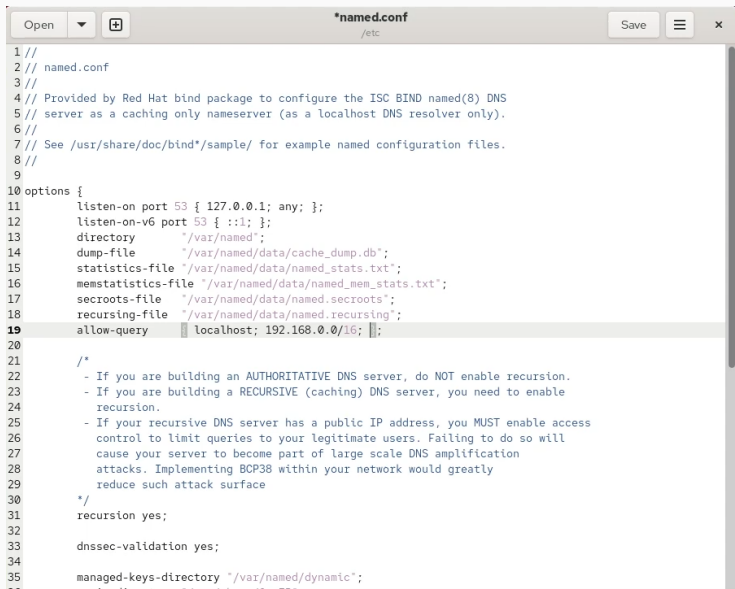
```
Editing existing '802-3-ethernet' connection: 'eth0'

Type 'help' or '?' for available commands.
Type 'print' to show all the connection properties.
Type 'describe [<setting>.<prop>]' for detailed property description.

You may edit the following settings: connection, 802-3-ethernet (ethernet), 802-1x, dcb, sriov, ethtool, match, ipv4, ipv6,
hostname, link, tc, proxy
nmcli> remove ipv4.dns
nmcli> set ipv4.dns.ignore-auto-dns yes
Error: invalid property: 'dns.ignore-auto-dns' not among [method, dns, dns-search, dns-options, dns-priority, addresses, gat
eway, routes, route-metric, route-table, routing-rules, replace-local-rule, dhcp-send-release, routed-dns, ignore-auto-route
s, ignore-auto-dns, dhcp-client-id, dhcp-iaid, dhcp-dscp, dhcp-timeout, dhcp-send-hostname-deprecated, dhcp-send-hostname, d
hcp-hostname, dhcp-fqdn, dhcp-hostname-flags, never-default, may-fail, required-timeout, dad-timeout, dhcp-vendor-class-iden
tifier, dhcp-ipv6-only-preferred, link-local, dhcp-reject-servers, auto-route-ext-gw, shared-dhcp-range, shared-dhcp-lease-t
ime]
nmcli> set ipv4.ignore-auto-dns yes
nmcli> set ipv4.dns 127.0.0.1
nmcli> save
Connection 'eth0' (e292e83a-7750-4087-b4e1-a998fc55c0ea) successfully updated.
nmcli> quit
[root@server.smahmudov.net ~]# nmcli connection show
NAME    UUID                                  TYPE      DEVICE
eth0    e292e83a-7750-4087-b4e1-a998fc55c0ea  ethernet  eth0
eth1    cfffd698-8bfa-4048-ab4c-38639fd85d17  ethernet  eth1
lo      5047a1e9-7103-4707-99d5-cffb6f83db43  loopback  lo
[root@server.smahmudov.net ~]#
```

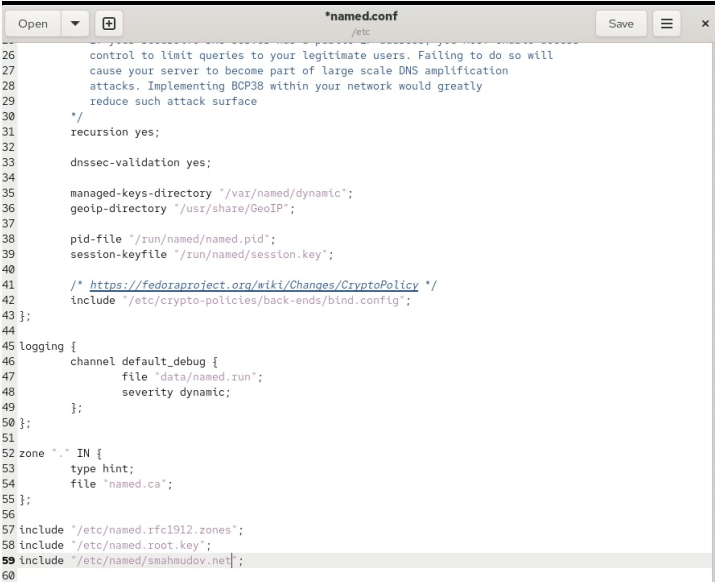
Рис. 6: Настройка DNS через nmcli

# Изменения в конфигурации named.conf



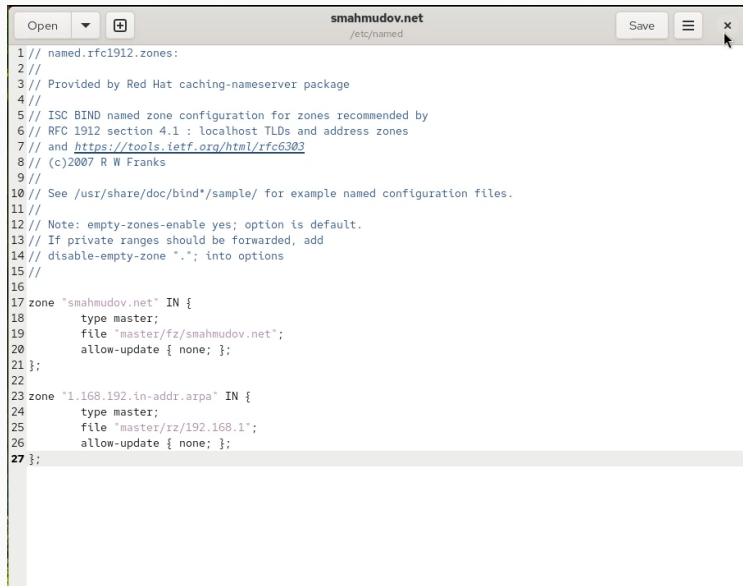
```
1 //
2 // named.conf
3 //
4 // Provided by Red Hat bind package to configure the ISC BIND named(8) DNS
5 // server as a caching only nameserver (as a localhost DNS resolver only).
6 //
7 // See /usr/share/doc/bind*/sample/ for example named configuration files.
8 //
9
10 options {
11     listen-on port 53 { 127.0.0.1; any; };
12     listen-on-v6 port 53 { ::1; };
13     directory "/var/named";
14     dump-file "/var/named/data/cache_dump.db";
15     statistics-file "/var/named/data/named_stats.txt";
16     memstatistics-file "/var/named/data/named_mem_stats.txt";
17     secroots-file "/var/named/data/named.secrets";
18     recursing-file "/var/named/data/named.recursing";
19     allow-query [ localhost; 192.168.0.0/16; ];
20
21     /*
22      * - If you are building an AUTHORITATIVE DNS server, do NOT enable recursion.
23      * - If you are building a RECURSIVE (caching) DNS server, you need to enable
24      * recursion.
25      * - If your recursive DNS server has a public IP address, you MUST enable access
26      * control to limit queries to your legitimate users. Failing to do so will
27      * cause your server to become part of large scale DNS amplification
28      * attacks. Implementing BCP38 within your network would greatly
29      * reduce such attack surface
30      */
31     recursion yes;
32
33     dnssec-validation yes;
34
35     managed-keys-directory "/var/named/dynamic";
36 }
```

# Изменения в конфигурации named.conf



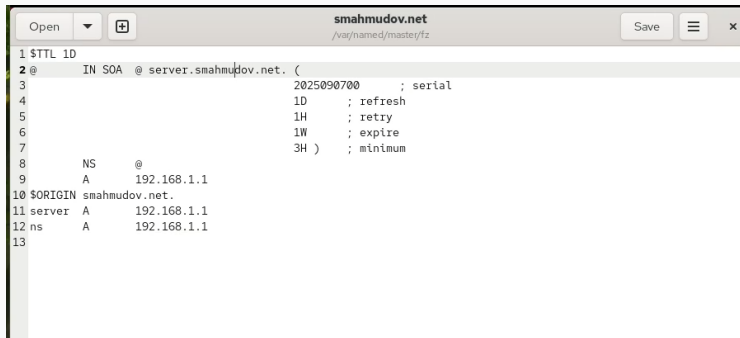
```
26     control to limit queries to your legitimate users. Failing to do so will
27     cause your server to become part of large scale DNS amplification
28     attacks. Implementing BCP38 within your network would greatly
29     reduce such attack surface
30 */
31 recursion yes;
32
33 dnssec-validation yes;
34
35 managed-keys-directory "/var/named/dynamic";
36 geoip-directory "/usr/share/GeoIP";
37
38 pid-file "/run/named/named.pid";
39 session-keyfile "/run/named/session.key";
40
41 /* https://fedoraproject.org/wiki/Changes/CryptoPolicy */
42 include "/etc/crypto-policies/back-ends/bind.config";
43 };
44
45 logging {
46     channel default_debug {
47         file "data/named.run";
48         severity dynamic;
49     };
50 };
51
52 zone "." IN {
53     type hint;
54     file "named.ca";
55 };
56
57 include "/etc/named.rfc1912.zones";
58 include "/etc/named.root.key";
59 include "/etc/named/smahmudov.net";
60
```

# Создание зоны smahmudov.net



```
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 "smahmudov.net" IN {
18     type master;
19     file "master/fz/smahmudov.net";
20     allow-update { none; };
21 };
22
23 zone "1.168.192.in-addr.arpa" IN {
24     type master;
25     file "master/rz/192.168.1";
26     allow-update { none; };
27 };
```





The image shows a text editor window titled "smahmudov.net" with a file path of "/var/named/master/fz". The editor contains a BIND zone file for the domain "smahmudov.net". The file is numbered 1 through 13 on the left margin. The content of the file is as follows:

```
1 $TTL 1D
2 @      IN SOA  @ server.smahmudov.net. (
3                               2025090700 ; serial
4                               1D      ; refresh
5                               1H      ; retry
6                               1W      ; expire
7                               3H )    ; minimum
8       NS      @
9       A        192.168.1.1
10 $ORIGIN smahmudov.net.
11 server A      192.168.1.1
12 ns     A      192.168.1.1
13
```

Рис. 10: Прямая зона smahmudov.net

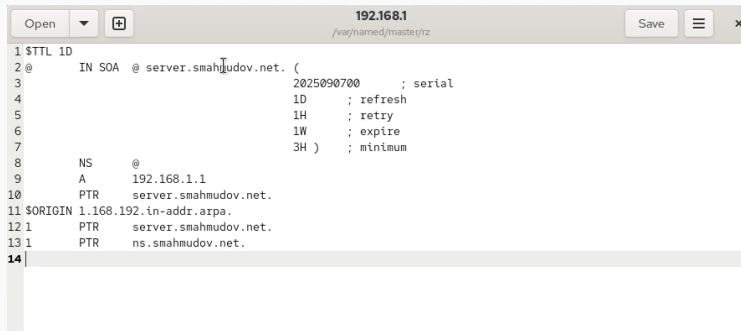


Рис. 11: Обратная зона для сети 192.168.1

## Проверка работы зоны через dig

```
[root@server.smahmudov.net rz]#
[root@server.smahmudov.net rz]# dig ns.smahmudov.net

; <<>> DiG 9.18.33 <<>> ns.smahmudov.net
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 19760
;; flags: qr aa rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 1232
; COOKIE: bf917b0ea560339b0100000068bd91f6a64076b708ed7f22 (good)
;; QUESTION SECTION:
;ns.smahmudov.net.                IN      A

;; ANSWER SECTION:
ns.smahmudov.net.                86400   IN      A      192.168.1.1

;; Query time: 1 msec
;; SERVER: 127.0.0.1#53(127.0.0.1) (UDP)
;; WHEN: Sun Sep 07 14:08:54 UTC 2025
;; MSG SIZE rcvd: 89

[root@server.smahmudov.net rz]#
[root@server.smahmudov.net rz]# host -l smahmudov.net
smahmudov.net name server smahmudov.net.
smahmudov.net has address 192.168.1.1
ns.smahmudov.net has address 192.168.1.1
server.smahmudov.net has address 192.168.1.1
[root@server.smahmudov.net rz]#
```

# Проверка работы зоны через host

```
[root@server.smahmudov.net fz]# host -a smahmudov.net
Trying "smahmudov.net"
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 31536
;; flags: qr aa rd ra; QUERY: 1, ANSWER: 3, AUTHORITY: 0, ADDITIONAL: 0

;; QUESTION SECTION:
;smahmudov.net.                IN      ANY

;; ANSWER SECTION:
smahmudov.net.                86400   IN      SOA      smahmudov.net. server.smahmudov.net. 2025090700 86400 3600 604800 10800
smahmudov.net.                86400   IN      NS       smahmudov.net.
smahmudov.net.                86400   IN      A        192.168.1.1

Received 104 bytes from 127.0.0.1#53 in 2 ms
[root@server.smahmudov.net fz]#
[root@server.smahmudov.net fz]# host -t A smahmudov.net
smahmudov.net has address 192.168.1.1
[root@server.smahmudov.net fz]# host -t PTR 192.168.1.1
1.1.168.192.in-addr.arpa domain name pointer ns.smahmudov.net.
1.1.168.192.in-addr.arpa domain name pointer server.smahmudov.net.
[root@server.smahmudov.net fz]#
```

Рис. 13: Проверка зоны с помощью host

## Выводы по проделанной работе

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В ходе лабораторной работы был установлен и настроен DNS-сервер на базе BIND. Реализованы прямая и обратная зоны, проведена проверка их работы с помощью утилит **dig** и **host**. Настроен кэширующий и первичный сервер. Создан скрипт автоматизации для Vagrant, что позволяет воспроизводить конфигурацию автоматически.