

**РОССИЙСКИЙ УНИВЕРСИТЕТ ДРУЖБЫ НАРОДОВ**

**Факультет физико-математических и естественных наук**

**Кафедра прикладной информатики и теории вероятностей**

**ПРЕЗЕНТАЦИЯ**

**ЛАБОРАТОРНОЙ РАБОТЫ № 3**

*дисциплина: Администрирование сетевых подсистем*

**Настройка DHCP-сервера**

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Группа: НПИбд-02-20

**МОСКВА**

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## Установка DHCP-сервера

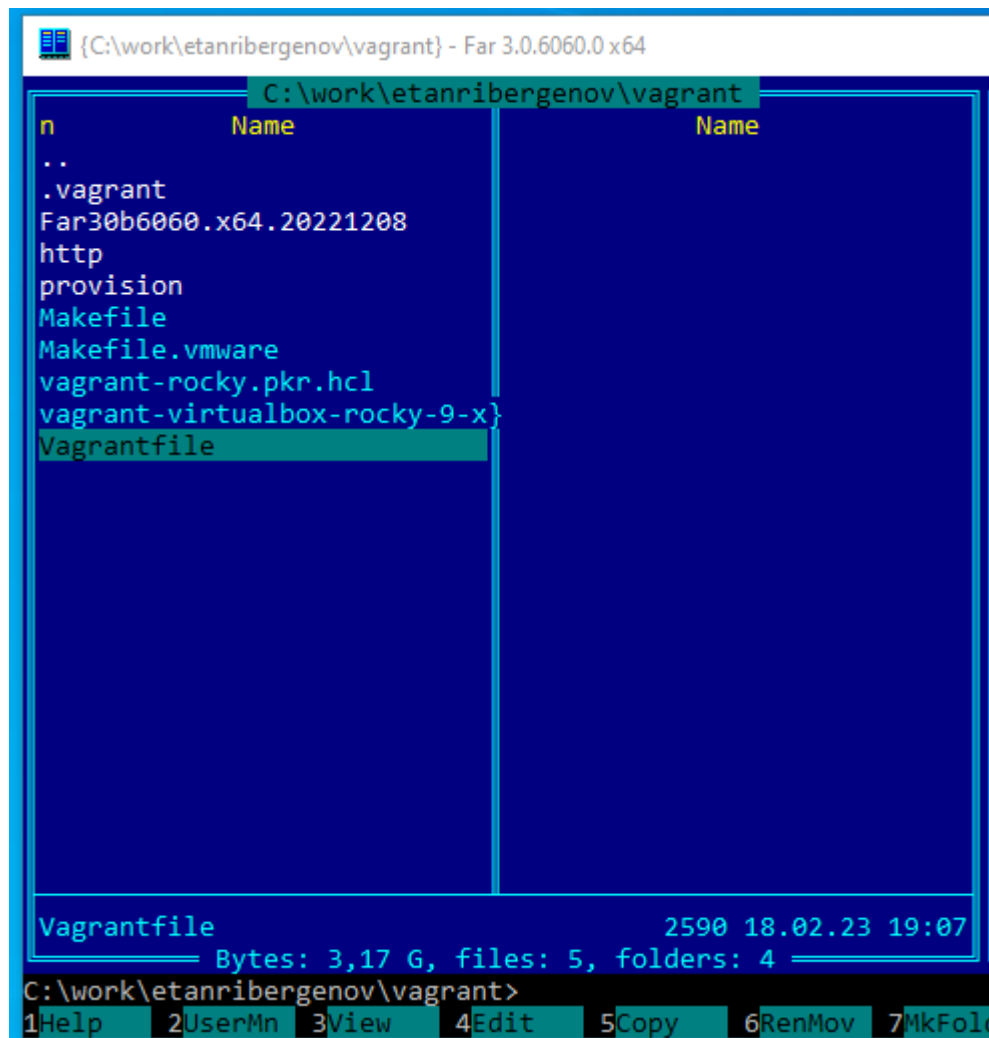


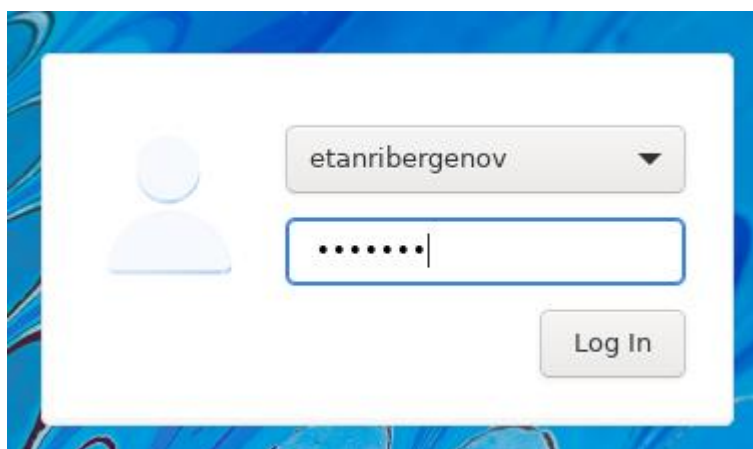
Рис. 1. Рабочий каталог с проектом

```

C:\work\etanribergenov\vagrant> vagrant up server
Bringing machine 'server' up with 'virtualbox' provider...
==> server: You assigned a static IP ending in ".1" to this machine.
==> server: This is very often used by the router and can cause the
==> server: network to not work properly. If the network doesn't work
==> server: properly, try changing this IP.
==> server: You assigned a static IP ending in ".1" to this machine.
==> server: This is very often used by the router and can cause the
==> server: network to not work properly. If the network doesn't work
==> server: properly, try changing this IP.
==> server: Clearing any previously set forwarded ports...
==> server: Clearing any previously set network interfaces...
==> server: Preparing network interfaces based on configuration...
    server: Adapter 1: nat
    server: Adapter 2: intnet
==> server: Forwarding ports...
    server: 22 (guest) => 2222 (host) (adapter 1)
==> server: Running 'pre-boot' VM customizations...
==> server: Booting VM...
==> server: Waiting for machine to boot. This may take a few minutes...
    server: SSH address: 127.0.0.1:2222
    server: SSH username: vagrant
    server: SSH auth method: password

```

*Рис. 2. Запуск VM server.*



*Рис. 3. Вход*

```

root@server:~
[etanribergenov@server.etanribergenov.net ~]$ sudo -i
[sudo] password for etanribergenov:
[root@server.etanribergenov.net ~]#

```

*Рис. 4. Переход в режим суперпользователя*

```
keyboard interrupt: terminated.  
[root@server.etanribergenov.net ~]# dnf -y install dhcp-server  
Last metadata expiration check: 0:00:28 ago on Mon 27 Mar 2023 10:47:19 AM UTC.  
Package dhcp-server-12:4.4.2-17.b1.el9.x86_64 is already installed.  
Dependencies resolved.  
Nothing to do.  
Complete!  
[root@server.etanribergenov.net ~]# █
```

*Рис. 5. Установка DHCP*

## Конфигурирование DHCP-сервера

- Работа с файлом примера конфигурации DHCP

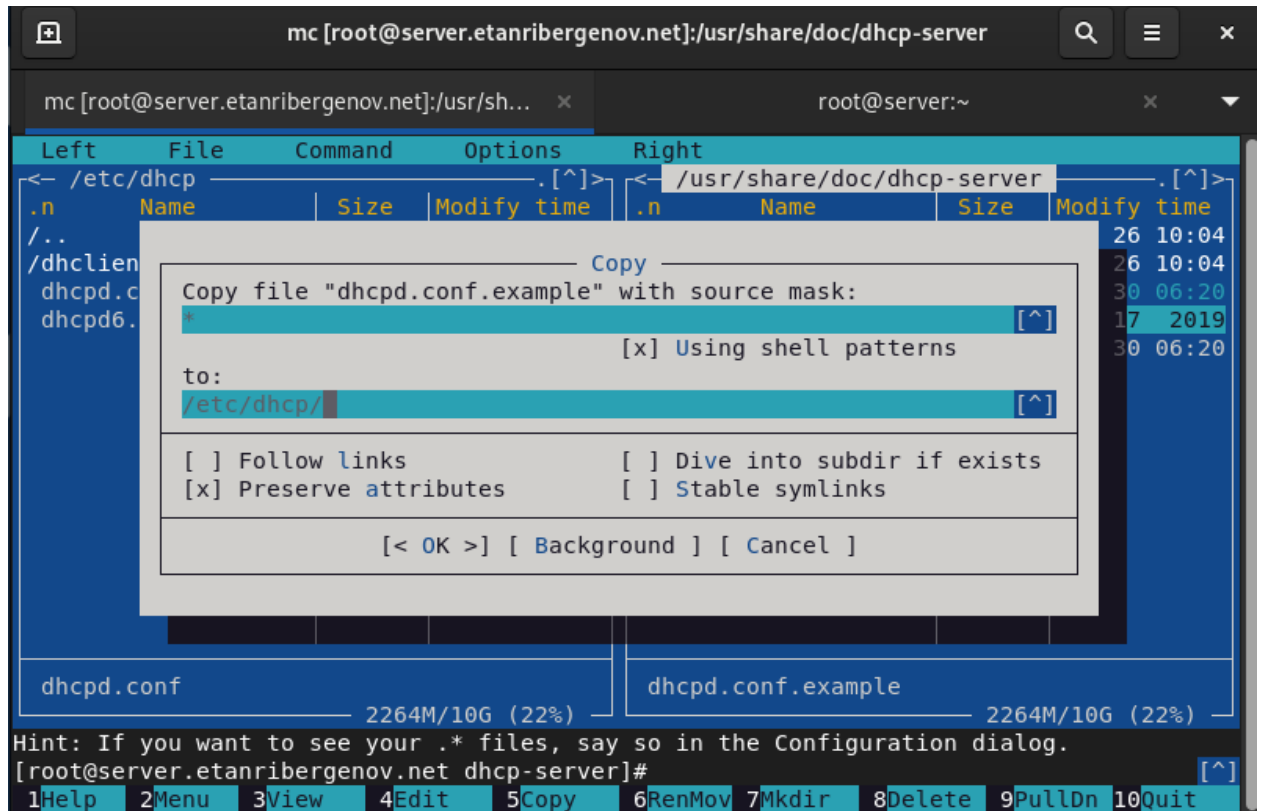


Рис. 6. Копирование файла примера конфигурации DHCP

```
[root@server.etanribergenov.net dhcp]# mv dhcpd.conf.example dhcpd.conf
mv: overwrite 'dhcpd.conf'? y
```

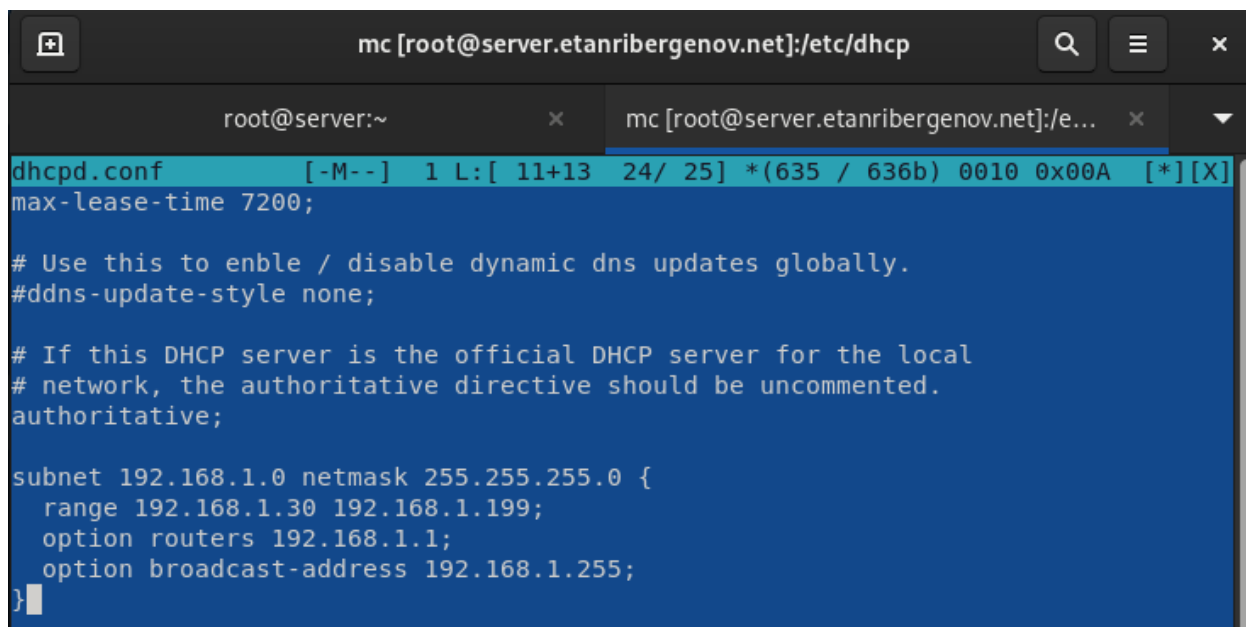
Рис. 7. Переименование файла примера конфигурации DHCP

```
# option definitions common to all supported networks...
option domain-name "etanribergenov.net";
option domain-name-servers ns.etanribergenov.net;
```

Рис. 8. Редактирование файла конфигурации dhcp (1): замена доменных имён server и nameserver

```
# network, the authoritative;  
authoritative;
```

*Рис. 9. Редактирование файла конфигурации dhcp (2): раскомментирование .*



```
mc [root@server.etanribergenov.net]:/etc/dhcp  
root@server:~ x mc [root@server.etanribergenov.net]:/e... x  
dhcpd.conf [-M--] 1 L: [ 11+13 24/ 25] *(635 / 636b) 0010 0x00A [*][X]  
max-lease-time 7200;  
  
# Use this to enable / disable dynamic dns updates globally.  
#ddns-update-style none;  
  
# If this DHCP server is the official DHCP server for the local  
# network, the authoritative directive should be uncommented.  
authoritative;  
  
subnet 192.168.1.0 netmask 255.255.255.0 {  
    range 192.168.1.30 192.168.1.199;  
    option routers 192.168.1.1;  
    option broadcast-address 192.168.1.255;  
}
```

*Рис. 10. Редактирование файла конфигурации dhcp (3): добавление подсети*

- Настройка привязки dhcpd к интерфейсу eth1 виртуальной машины server

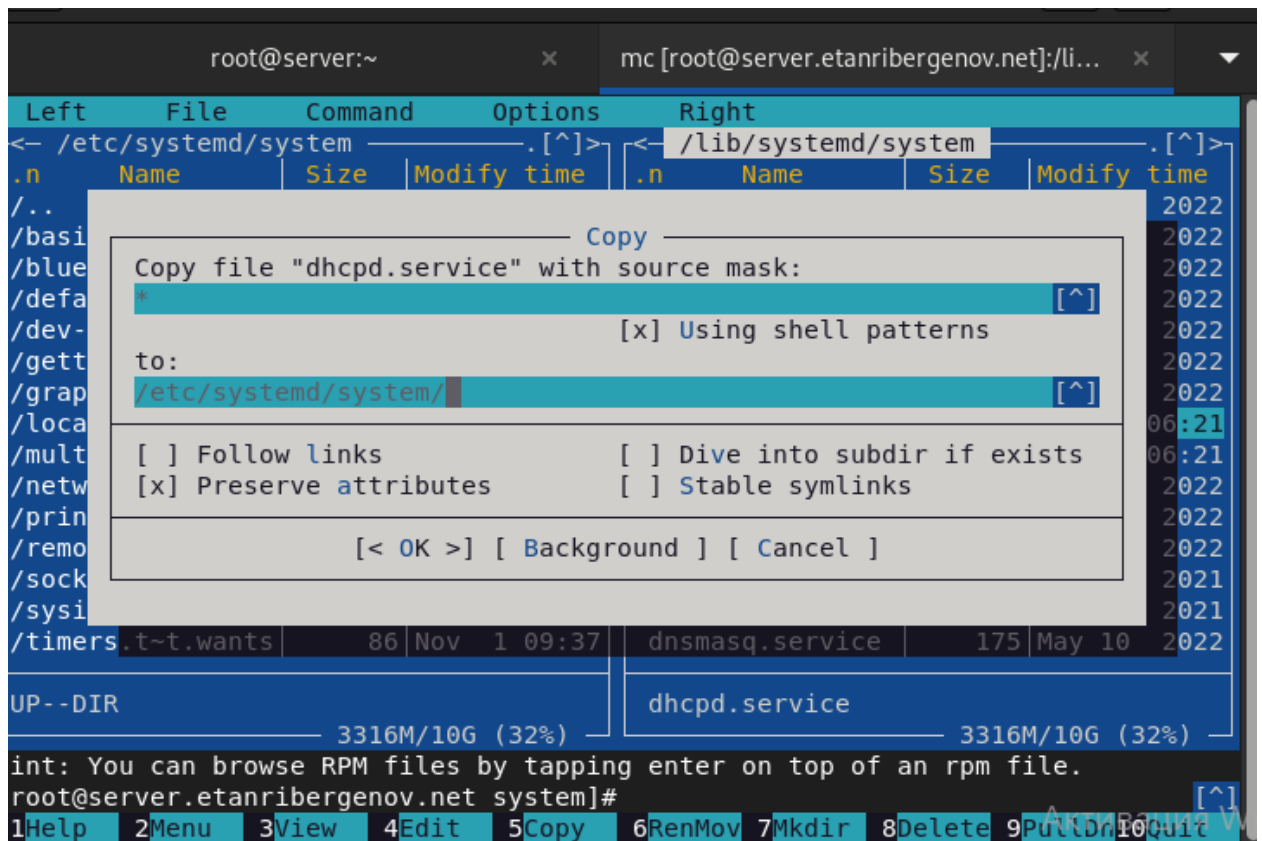


Рис. 11. Копирование файла dhcpd.service

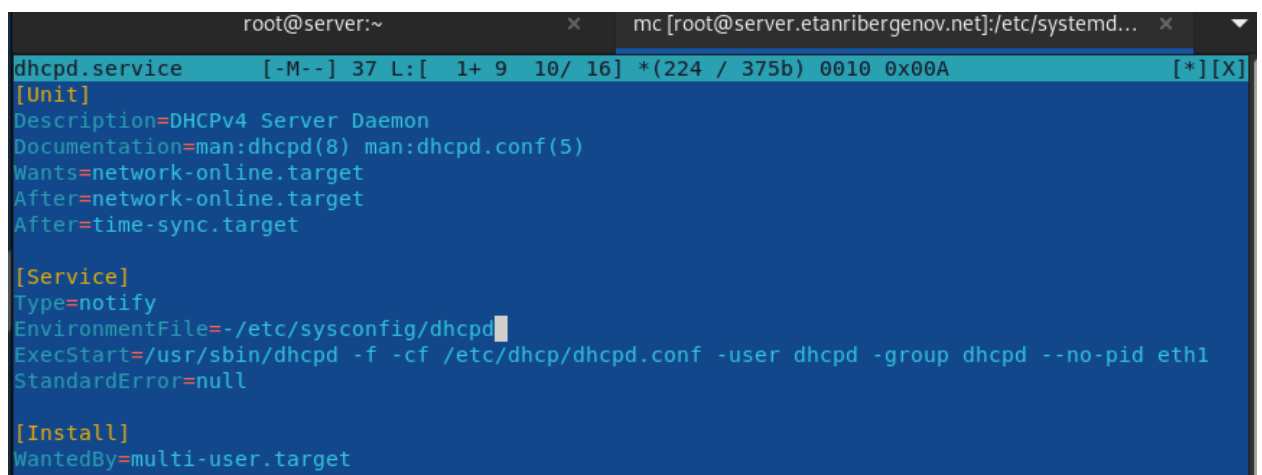


Рис. 12. Редактирование файла dhcpd.service

- Добавление записей для DHCP-сервера в файлы DNS-зон, его проверка и запуск

```
[root@server.etanribergenov.net ~]# systemctl --system daemon-reload
[root@server.etanribergenov.net ~]# systemctl enable dhcpd
Created symlink /etc/systemd/system/multi-user.target.wants/dhcpd.service → /etc/systemd/system/dhcpd.service.
[root@server.etanribergenov.net ~]#
```

*Рис. 13. Перезагрузка конфигурации dhcpd и включение DHCP-сервера в автозапуск*

```
etanribergenov.net  [-M--] 50 L:[ 1+ 2 3/ 13] *(63 / 249b) 0009 0x009
$TTL 1D
@<----->IN SOA<@ server.etanribergenov.net. (
<-----><-----><-----><-----><-----><----->2023032701<----->; serial
<-----><-----><-----><-----><-----><----->1D<----->; refresh
<-----><-----><-----><-----><-----><----->1H<----->; retry
<-----><-----><-----><-----><-----><----->1W<----->; expire
<-----><-----><-----><-----><-----><----->3H )<----->; minimum
<----->NS<----->@
<----->A<----->192.168.1.1
$ORIGIN etanribergenov.net.
server<----->A<----->192.168.1.1
ns<----->A<----->192.168.1.1
dhcp<----->A<----->192.168.1.1
```

*Рис. 14. Добавление записи для dhcp и смена серийного номера в файле прямой DNS-зоны*

```
root@server:~ x mc [root@server.etanribergenov.net]:/var/named/... x
192.168.1  [-M--] 50 L:[ 1+ 2 3/ 14] *(63 / 320b) 0009 0x009
$TTL 1D
@<----->IN SOA<@ server.etanribergenov.net. (
<-----><-----><-----><-----><-----><----->2023032701<----->; serial
<-----><-----><-----><-----><-----><----->1D<----->; refresh
<-----><-----><-----><-----><-----><----->1H<----->; retry
<-----><-----><-----><-----><-----><----->1W<----->; expire
<-----><-----><-----><-----><-----><----->3H )<----->; minimum
<----->NS<----->@
<----->A<----->192.168.1.1
<----->PTR<----->server.etanribergenov.net.
$ORIGIN 1.168.192.in-addr.arpa.
1<----->PTR<----->server.etanribergenov.net.
1<----->PTR<----->ns.etanribergenov.net.
1<----->PTR<----->dhcp.etanribergenov.net
```

*Рис. 15. Добавление записи для dhcp и смена серийного номера в файле обратной DNS-зоны*



```
[root@server.etanribergenov.net ~]#  
[root@server.etanribergenov.net ~]# systemctl restart named
```

*Рис. 16. Перезапуск named*

```
[root@server.etanribergenov.net ~]# ping dhcp.etanribergenov.net  
PING dhcp.etanribergenov.net (192.168.1.1) 56(84) bytes of data.  
64 bytes from dhcp.etanribergenov.net.1.168.192.in-addr.arpa (192.168.1.1): icmp_seq=1 ttl=64 t  
ime=0.064 ms  
64 bytes from ns.etanribergenov.net (192.168.1.1): icmp_seq=2 ttl=64 time=0.078 ms  
64 bytes from ns.etanribergenov.net (192.168.1.1): icmp_seq=3 ttl=64 time=0.058 ms  
^C  
--- dhcp.etanribergenov.net ping statistics ---  
3 packets transmitted, 3 received, 0% packet loss, time 2005ms  
rtt min/avg/max/mdev = 0.058/0.066/0.078/0.008 ms  
[root@server.etanribergenov.net ~]#
```

Актив

*Рис. 17. Попытка обращения к ДНС-серверу по имени – успешно*

```
root@server:~ x mc [root@server.etanribergenov.net]:/var/named/... x  
[root@server.etanribergenov.net ~]# firewall-cmd --list-services  
cockpit dhcpv6-client dns ssh  
[root@server.etanribergenov.net ~]# firewall-cmd --get-services  
RH-Satellite-6 RH-Satellite-6-capsule amanda-client amanda-k5-client amqp amqps apcupsd audit b  
acula bacula-client bb bgp bitcoin bitcoin-rpc bitcoin-testnet bitcoin-testnet-rpc bittorrent-l  
sd ceph ceph-mon cfengine cockpit collectd condor-collector ctdb dhcp dhcpv6 dhcpv6-client dist  
cc dns dns-over-tls docker-registry docker-swarm dropbox-lansync elasticsearch etcd-client etcd  
-server finger foreman foreman-proxy freeipa-4 freeipa-ldap freeipa-ldaps freeipa-replication f  
reeipa-trust ftp galera ganglia-client ganglia-master git grafana gre high-availability http ht  
tps imap imaps ipp ipp-client ipsec irc ircs iscsi-target isns jenkins kadmin kdeconnect kerber  
os kibana klogin kpasswd kprop kshell kube-api kube-apiserver kube-control-plane kube-controlle  
r-manager kube-scheduler kubelet-worker ldap ldaps libvirt libvirt-tls lightning-network llmnr  
managesieve matrix mdns memcache minidlna mongodb mosh mountd mqtt mqtt-tls ms-wbt mssql murmur  
mysql nbd netbios-ns nfs nfs3 nmea-0183 nrpe ntp nut openvpn ovirt-imageio ovirt-storageconsol  
e ovirt-vmconsole plex pmcd pmpoxy pmwebapi pmwebapis pop3 pop3s postgresql privoxy prometheus  
proxy-dhcp ptp pulseaudio puppetmaster quassel radius rdp redis redis-sentinel rpc-bind rquota  
d rsh rsyncd rtsp salt-master samba samba-client samba-dc sane sip sips slp smtp smtp-submissio  
n smtps snmp snmptrap spideroak-lansync spotify-sync squid ssdp ssh steam-streaming svdrp svn s  
yncthing syncthing-gui synergy syslog syslog-tls telnet tentacle tftp tile38 tinc tor-socks tra  
nsmmission-client upnp-client vdsm vnc-server wbem-http wbem-https wireguard wsman wsmans xdmcp  
xmpp-bosh xmpp-client xmpp-local xmpp-server zabbix-agent zabbix-server  
[root@server.etanribergenov.net ~]# firewall-cmd --get-services | grep dhcp  
RH-Satellite-6 RH-Satellite-6-capsule amanda-client amanda-k5-client amqp amqps apcupsd audit b  
acula bacula-client bb bgp bitcoin bitcoin-rpc bitcoin-testnet bitcoin-testnet-rpc bittorrent-l
```

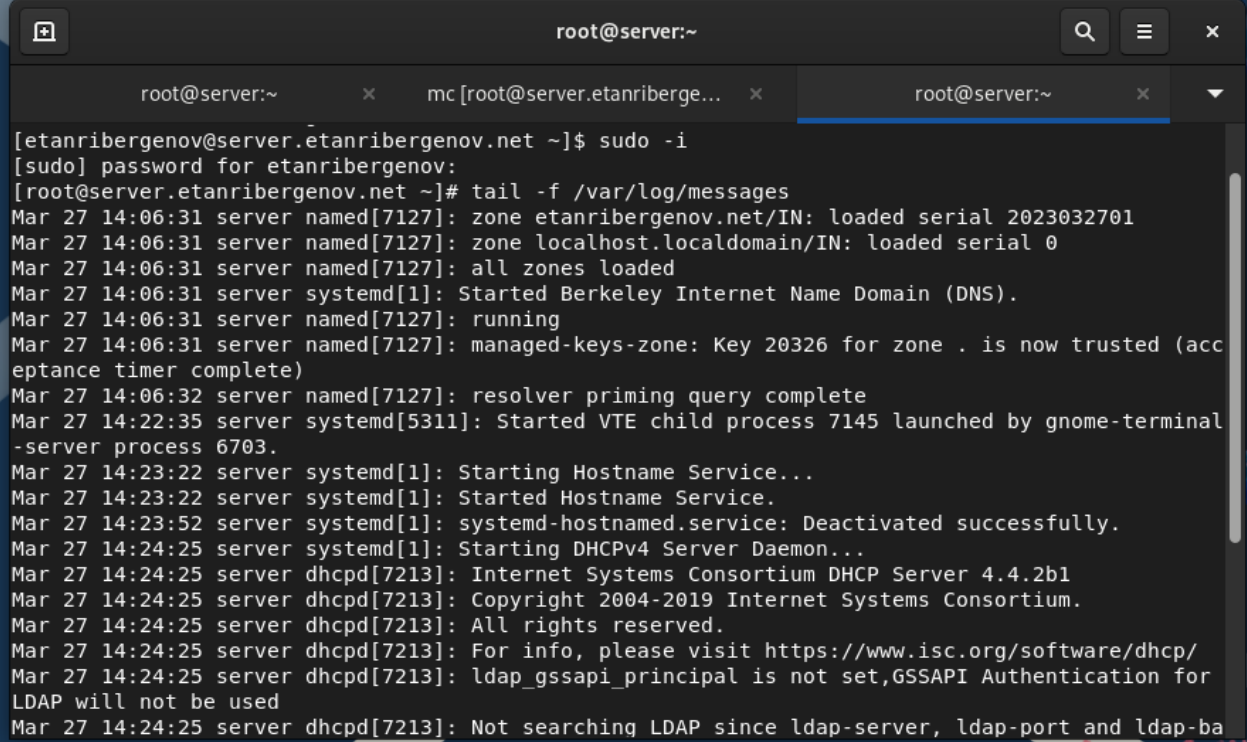
*Рис. 18. Просмотр разрешённых служб и доступных для разрешения firewall.*

```
[root@server.etanribergenov.net ~]# firewall-cmd --add-service=dhcp  
success  
[root@server.etanribergenov.net ~]# firewall-cmd --add-service=dhcp --permanent  
success  
[root@server.etanribergenov.net ~]#
```

*Рис. 19. Добавление службы dhcp в список разрешённых служб firewall.*

```
[root@server.etanribergenov.net ~]#
[root@server.etanribergenov.net ~]# restorecon -vR /etc
Relabeled /etc/systemd/system/dhcpd.service from unconfined_u:object_r:systemd_unit_file_t:s0 to unconfined_u:object_r:dhcpd_unit_file_t:s0
[root@server.etanribergenov.net ~]# restorecon -vR /var/named
[root@server.etanribergenov.net ~]# restorecon -vR /var/lib/dhcpd
[root@server.etanribergenov.net ~]#
```

*Рис. 20. Восстановление меток контекста безопасности в SELinux*



```
root@server:~
[etanribergenov@server.etanribergenov.net ~]$ sudo -i
[sudo] password for etanribergenov:
[root@server.etanribergenov.net ~]# tail -f /var/log/messages
Mar 27 14:06:31 server named[7127]: zone etanribergenov.net/IN: loaded serial 2023032701
Mar 27 14:06:31 server named[7127]: zone localhost.localdomain/IN: loaded serial 0
Mar 27 14:06:31 server named[7127]: all zones loaded
Mar 27 14:06:31 server systemd[1]: Started Berkeley Internet Name Domain (DNS).
Mar 27 14:06:31 server named[7127]: running
Mar 27 14:06:31 server named[7127]: managed-keys-zone: Key 20326 for zone . is now trusted (acceptance timer complete)
Mar 27 14:06:32 server named[7127]: resolver priming query complete
Mar 27 14:22:35 server systemd[5311]: Started VTE child process 7145 launched by gnome-terminal -server process 6703.
Mar 27 14:23:22 server systemd[1]: Starting Hostname Service...
Mar 27 14:23:22 server systemd[1]: Started Hostname Service.
Mar 27 14:23:52 server systemd[1]: systemd-hostnamed.service: Deactivated successfully.
Mar 27 14:24:25 server systemd[1]: Starting DHCPv4 Server Daemon...
Mar 27 14:24:25 server dhcpd[7213]: Internet Systems Consortium DHCP Server 4.4.2b1
Mar 27 14:24:25 server dhcpd[7213]: Copyright 2004-2019 Internet Systems Consortium.
Mar 27 14:24:25 server dhcpd[7213]: All rights reserved.
Mar 27 14:24:25 server dhcpd[7213]: For info, please visit https://www.isc.org/software/dhcp/
Mar 27 14:24:25 server dhcpd[7213]: ldap_gssapi_principal is not set,GSSAPI Authentication for LDAP will not be used
Mar 27 14:24:25 server dhcpd[7213]: Not searching LDAP since ldap-server, ldap-port and ldap-ba
```

*Рис. 21. Запуск мониторинга сис. процессов в реальном времени в доп. терминале*

```
[root@server.etanribergenov.net ~]#
[root@server.etanribergenov.net ~]# systemctl start dhcpd
[root@server.etanribergenov.net ~]#
```

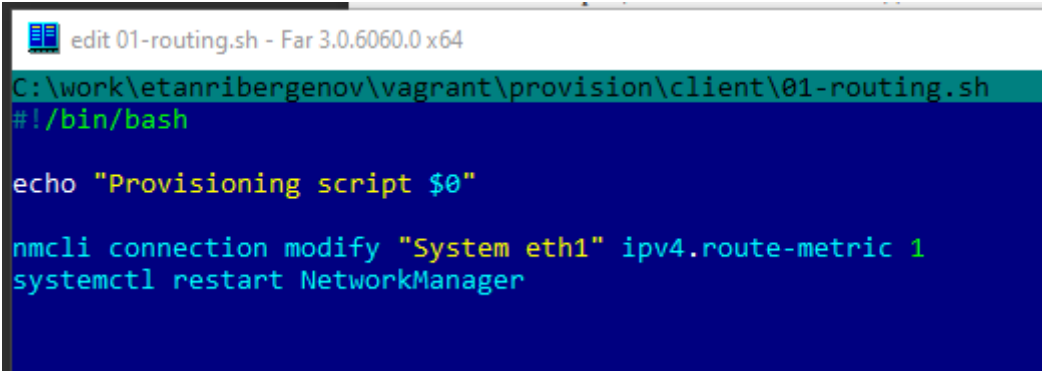
*Рис. 22. Запуск DHCP-сервера в основном рабочем терминале*

## Анализ работы DHCP-сервера

Конфигурация VM client и его запуск

```
[root@server.etanribergenov.net client]# touch 01-routing.sh  
[root@server.etanribergenov.net client]# chmod +x 01-routing.sh  
[root@server.etanribergenov.net client]#
```

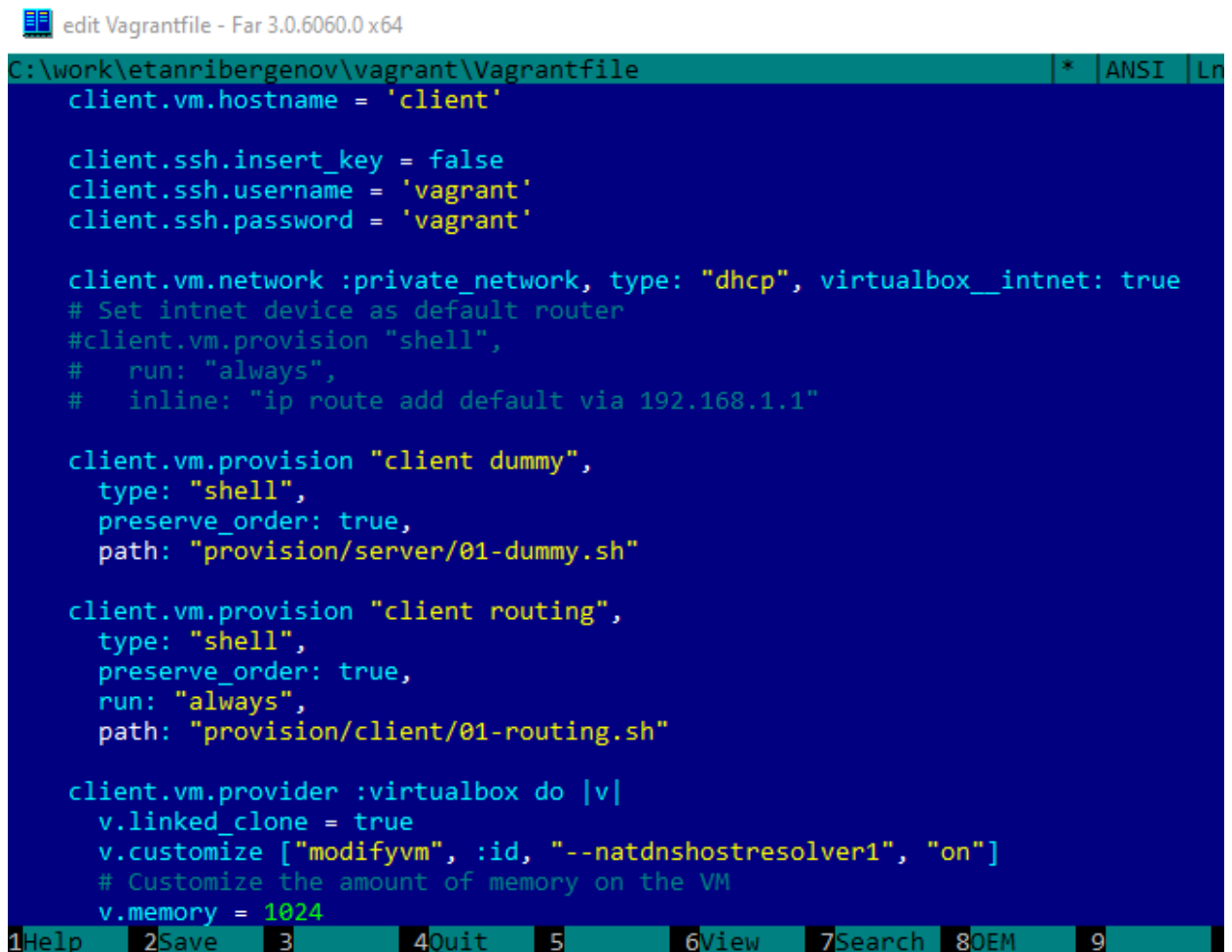
*Рис. 23. Создание файла-скрипта с правом на выполнение для client*



The screenshot shows a text editor window titled "edit 01-routing.sh - Far 3.0.6060.0 x64". The file path is "C:\work\etanribergenov\vagrant\provision\client\01-routing.sh". The script content is as follows:

```
#!/bin/bash  
  
echo "Provisioning script $0"  
  
nmcli connection modify "System eth1" ipv4.route-metric 1  
systemctl restart NetworkManager
```

*Рис. 24. Скрипт 01-routing.sh*



```
edit Vagrantfile - Far 3.0.6060.0 x64
C:\work\etanribergenov\vagrant\Vagrantfile
client.vm.hostname = 'client'

client.ssh.insert_key = false
client.ssh.username = 'vagrant'
client.ssh.password = 'vagrant'

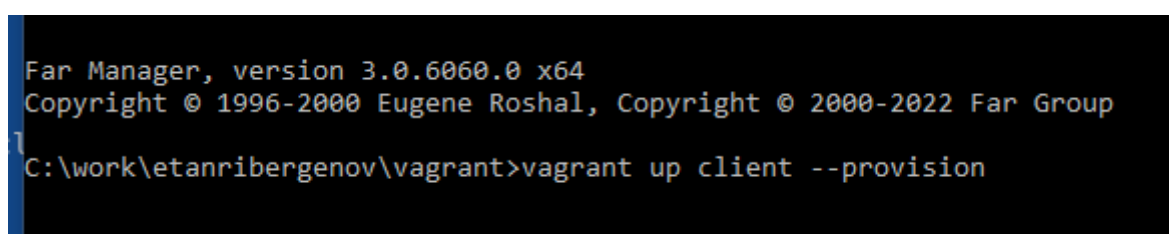
client.vm.network :private_network, type: "dhcp", virtualbox__intnet: true
# Set intnet device as default router
#client.vm.provision "shell",
#  run: "always",
#  inline: "ip route add default via 192.168.1.1"

client.vm.provision "client dummy",
  type: "shell",
  preserve_order: true,
  path: "provision/server/01-dummy.sh"

client.vm.provision "client routing",
  type: "shell",
  preserve_order: true,
  run: "always",
  path: "provision/client/01-routing.sh"

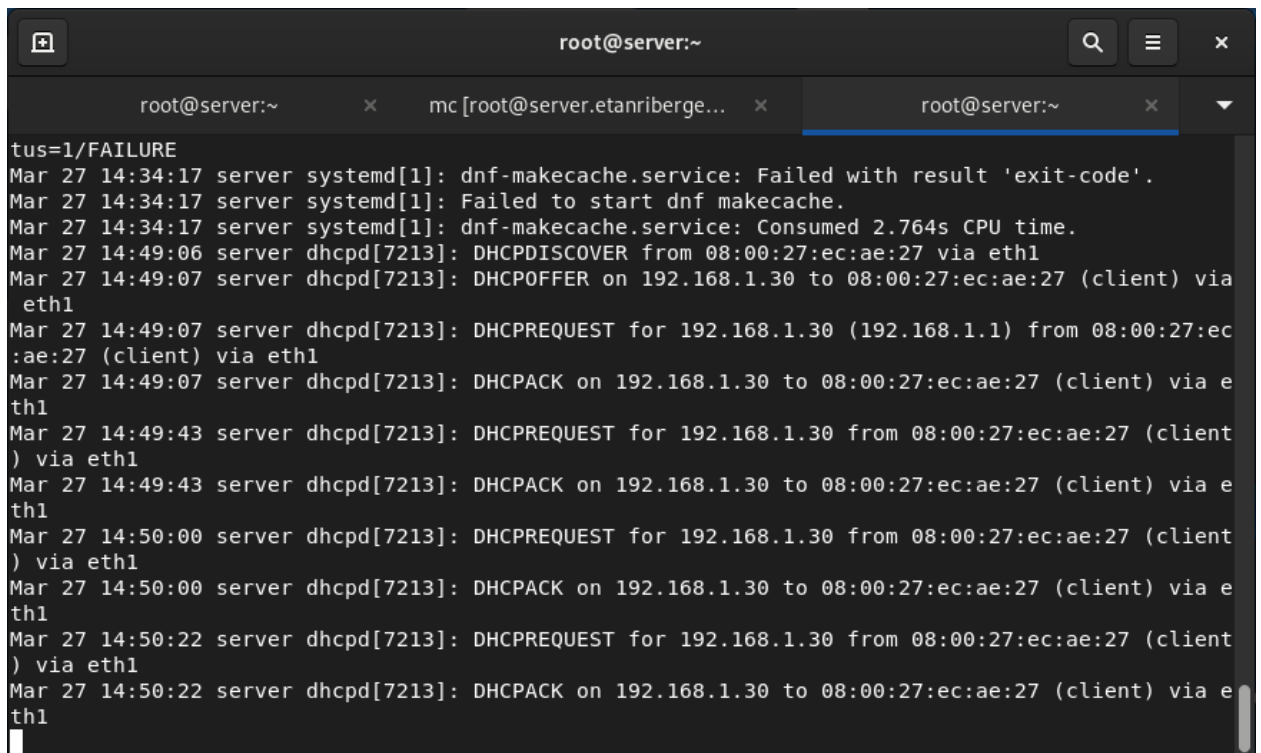
client.vm.provider :virtualbox do |v|
  v.linked_clone = true
  v.customize ["modifyvm", :id, "--natdnshostresolver1", "on"]
  # Customize the amount of memory on the VM
  v.memory = 1024
```

*Рис. 25. Подключение скрипта в конф. файле Vagrantfile*



```
Far Manager, version 3.0.6060.0 x64
Copyright © 1996-2000 Eugene Roshal, Copyright © 2000-2022 Far Group
C:\work\etanribergenov\vagrant>vagrant up client --provision
```

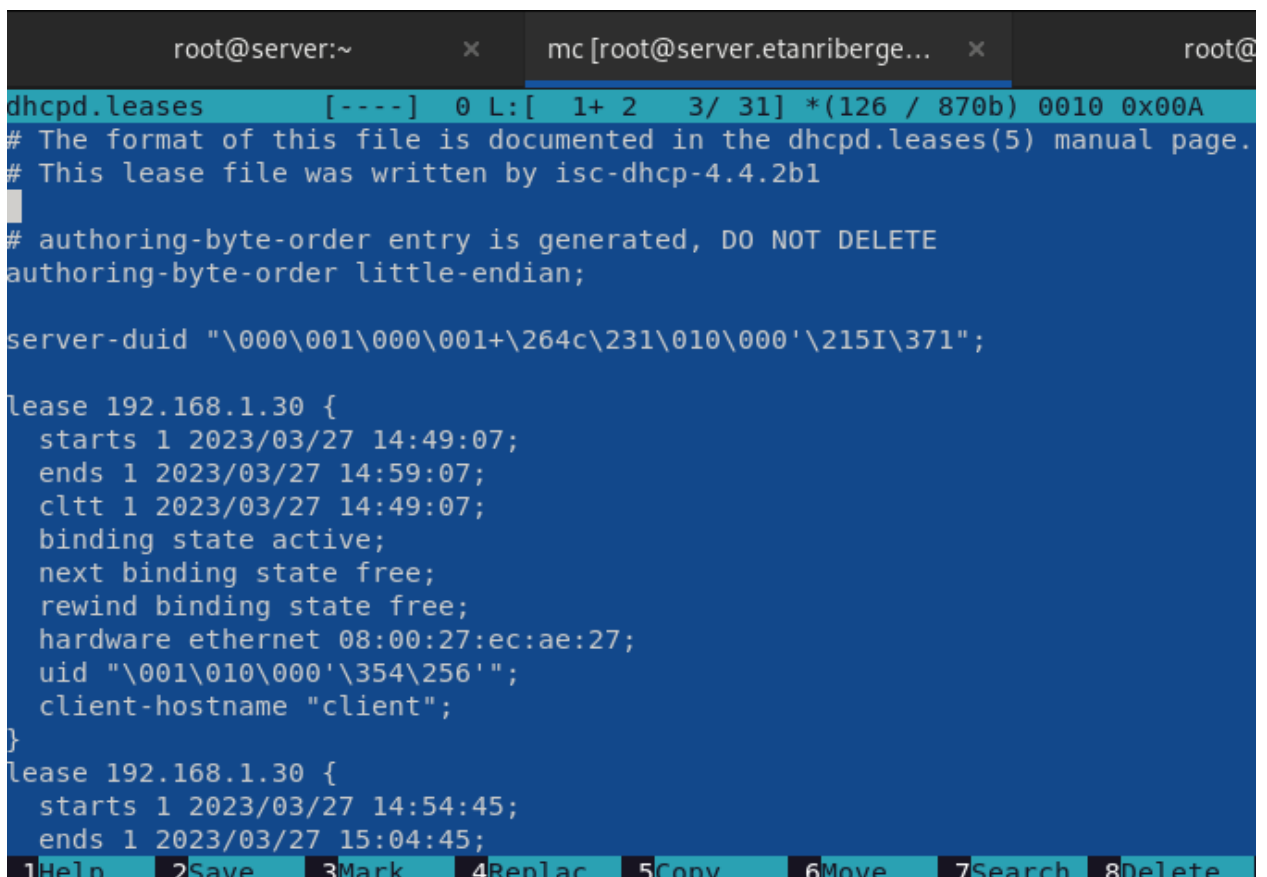
*Рис. 26. Запуск ВМ client*



A terminal window titled 'root@server:~' showing system logs. The logs indicate a failure of the dnf-makecache.service, followed by DHCP traffic from a client with MAC address 08:00:27:ec:ae:27. The client requests IP 192.168.1.30 and receives a DHCPACK response.

```
tus=1/FAILURE
Mar 27 14:34:17 server systemd[1]: dnf-makecache.service: Failed with result 'exit-code'.
Mar 27 14:34:17 server systemd[1]: Failed to start dnf makecache.
Mar 27 14:34:17 server systemd[1]: dnf-makecache.service: Consumed 2.764s CPU time.
Mar 27 14:49:06 server dhcpd[7213]: DHCPDISCOVER from 08:00:27:ec:ae:27 via eth1
Mar 27 14:49:07 server dhcpd[7213]: DHCPPOFFER on 192.168.1.30 to 08:00:27:ec:ae:27 (client) via eth1
Mar 27 14:49:07 server dhcpd[7213]: DHCPREQUEST for 192.168.1.30 (192.168.1.1) from 08:00:27:ec:ae:27 (client) via eth1
Mar 27 14:49:07 server dhcpd[7213]: DHCPACK on 192.168.1.30 to 08:00:27:ec:ae:27 (client) via eth1
Mar 27 14:49:43 server dhcpd[7213]: DHCPREQUEST for 192.168.1.30 from 08:00:27:ec:ae:27 (client) via eth1
Mar 27 14:49:43 server dhcpd[7213]: DHCPACK on 192.168.1.30 to 08:00:27:ec:ae:27 (client) via eth1
Mar 27 14:50:00 server dhcpd[7213]: DHCPREQUEST for 192.168.1.30 from 08:00:27:ec:ae:27 (client) via eth1
Mar 27 14:50:00 server dhcpd[7213]: DHCPACK on 192.168.1.30 to 08:00:27:ec:ae:27 (client) via eth1
Mar 27 14:50:22 server dhcpd[7213]: DHCPREQUEST for 192.168.1.30 from 08:00:27:ec:ae:27 (client) via eth1
Mar 27 14:50:22 server dhcpd[7213]: DHCPACK on 192.168.1.30 to 08:00:27:ec:ae:27 (client) via eth1
```

*Рис. 27. Записи о подключении к вирт. внутренней сети узла client и выдаче ему IP-адреса*



A terminal window showing the contents of the file /var/lib/dhcpd/dhcpd.leases. The file contains lease information for IP 192.168.1.30, including start and end times, binding state, hardware address, and client hostname.

```
dhcpd.leases  [---] 0 L:[ 1+ 2 3/ 31] *(126 / 870b) 0010 0x00A
# The format of this file is documented in the dhcpd.leases(5) manual page.
# This lease file was written by isc-dhcp-4.4.2b1

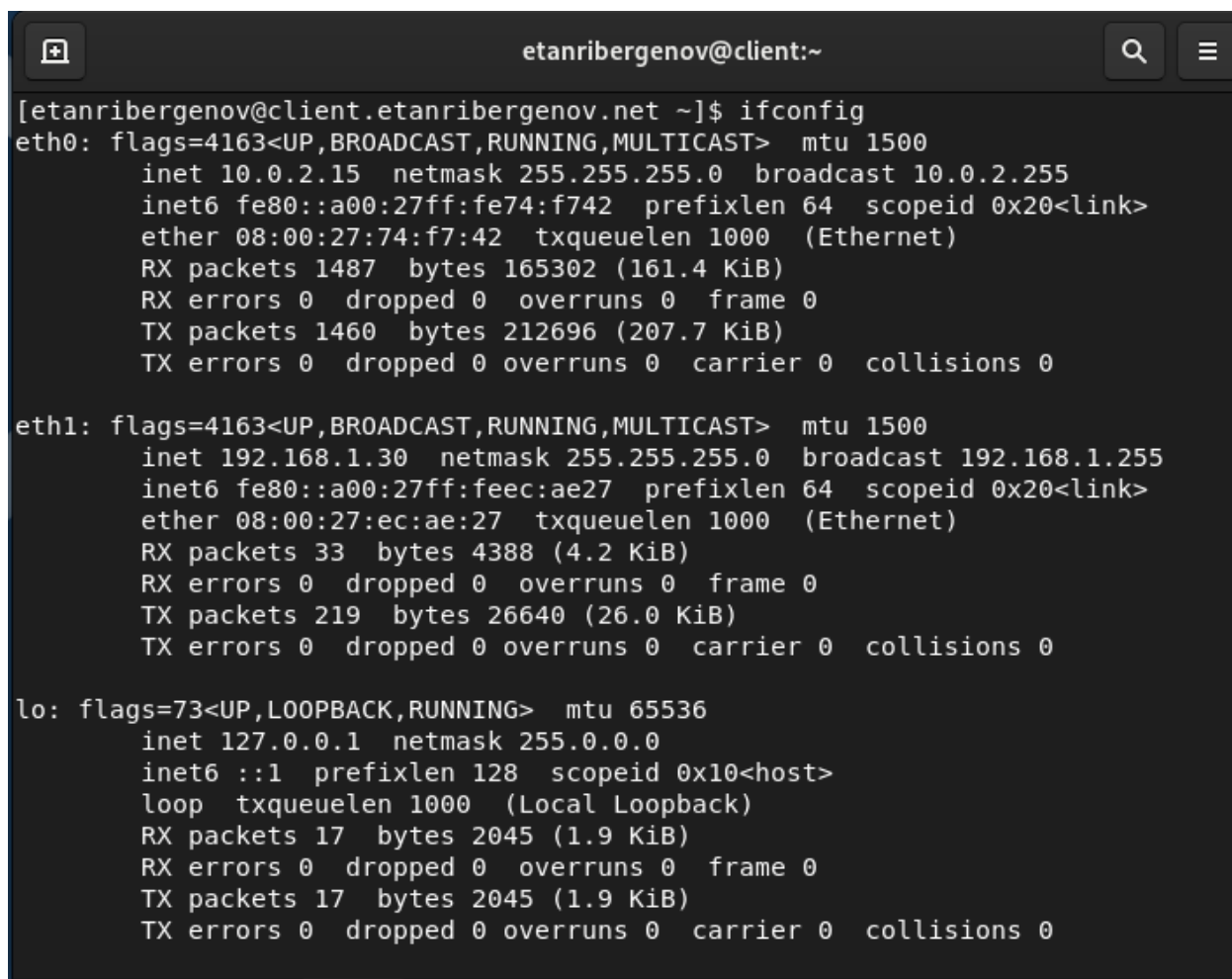
# authoring-byte-order entry is generated, DO NOT DELETE
authoring-byte-order little-endian;

server-uid "\000\001\000\001+\264c\231\010\000'\215I\371";

lease 192.168.1.30 {
    starts 1 2023/03/27 14:49:07;
    ends 1 2023/03/27 14:59:07;
    cltt 1 2023/03/27 14:49:07;
    binding state active;
    next binding state free;
    rewind binding state free;
    hardware ethernet 08:00:27:ec:ae:27;
    uid "\001\010\000'\354\256'";
    client-hostname "client";
}

lease 192.168.1.30 {
    starts 1 2023/03/27 14:54:45;
    ends 1 2023/03/27 15:04:45;
```

*Рис. 28. Сведения о подключении client в файле /var/lib/dhcpd/dhcpd.leases*

A terminal window with a dark background and light text. The title bar at the top shows a window icon, the username 'etanribergenov@client:~', a search icon, and a menu icon. The terminal content shows the output of the 'ifconfig' command. It lists three network interfaces: 'eth0' (Ethernet), 'eth1' (Ethernet), and 'lo' (Local Loopback). Each interface entry includes its flags, MTU, IP address, netmask, broadcast address, MAC address, and statistics for RX and TX packets, bytes, errors, and collisions. The 'lo' interface is a loopback device with IP 127.0.0.1.

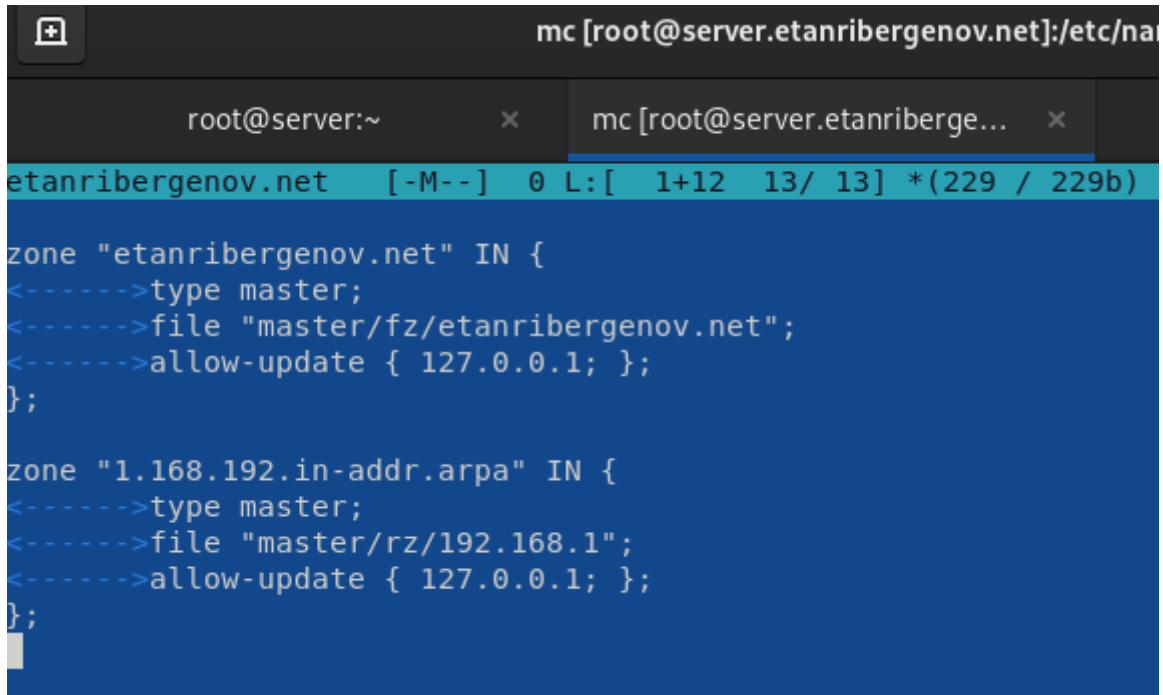
```
[etanribergenov@client.etanribergenov.net ~]$ ifconfig
eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.0.2.15 netmask 255.255.255.0 broadcast 10.0.2.255
    inet6 fe80::a00:27ff:fe74:f742 prefixlen 64 scopeid 0x20<link>
    ether 08:00:27:74:f7:42 txqueuelen 1000 (Ethernet)
    RX packets 1487 bytes 165302 (161.4 KiB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 1460 bytes 212696 (207.7 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::a00:27ff:feec:ae27 prefixlen 64 scopeid 0x20<link>
    ether 08:00:27:ec:ae:27 txqueuelen 1000 (Ethernet)
    RX packets 33 bytes 4388 (4.2 KiB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 219 bytes 26640 (26.0 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)
    RX packets 17 bytes 2045 (1.9 KiB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 17 bytes 2045 (1.9 KiB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

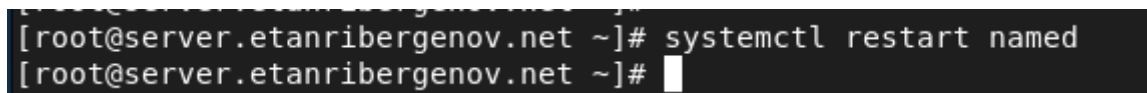
*Рис. 29. ifconfig: информация об имеющихся интерфейсах*

## Настройка обновления DNS-зоны



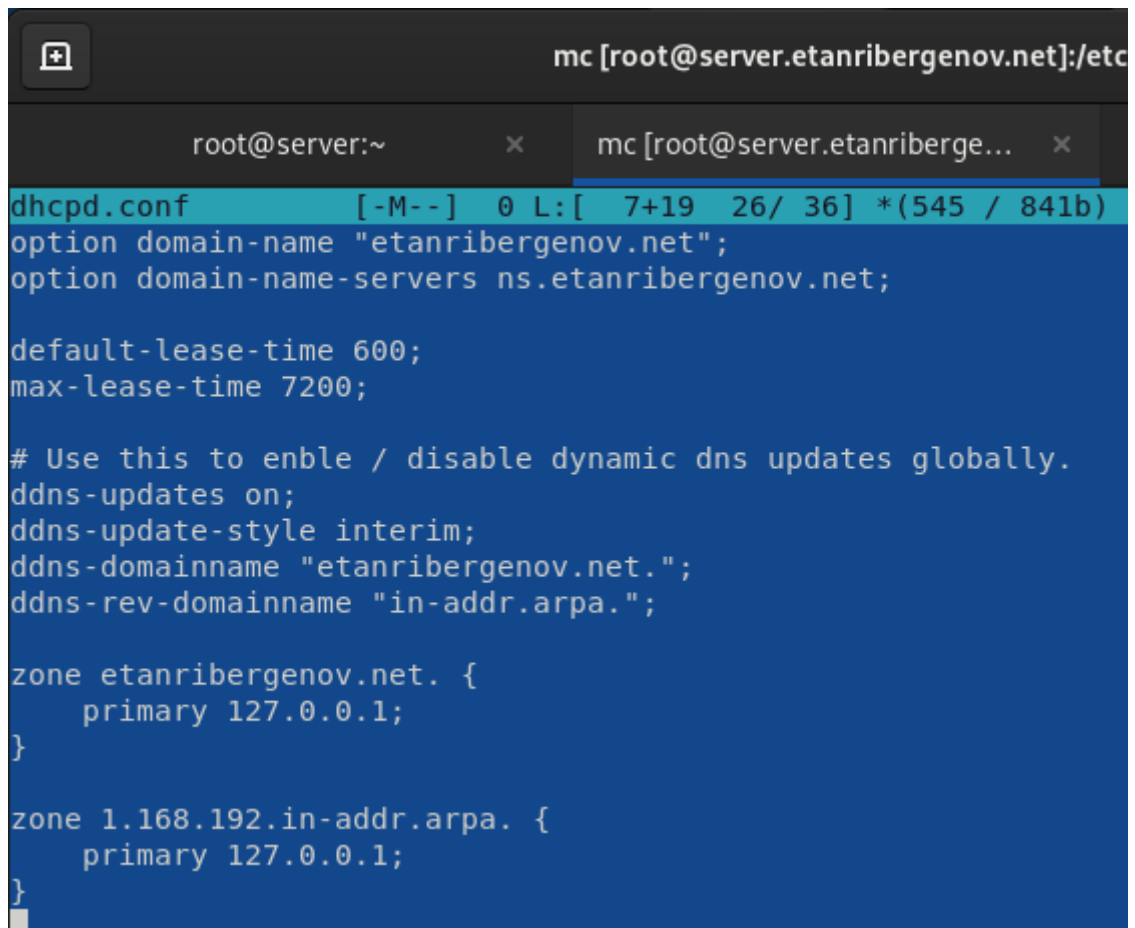
```
mc [root@server.etanribergenov.net]:/etc/na
root@server:~ x mc [root@server.etanriberge... x
etanribergenov.net [-M--] 0 L:[ 1+12 13/ 13] *(229 / 229b)
zone "etanribergenov.net" IN {
<----->type master;
<----->file "master/fz/etanribergenov.net";
<----->allow-update { 127.0.0.1; };
};
zone "1.168.192.in-addr.arpa" IN {
<----->type master;
<----->file "master/rz/192.168.1";
<----->allow-update { 127.0.0.1; };
};
```

Рис. 30. Редактирование файла /etc/named/etanribergenov.net



```
[root@server.etanribergenov.net ~]# systemctl restart named
[root@server.etanribergenov.net ~]#
```

Рис. 31. Перезапуск DNS-сервера



```
mc [root@server.etanribergenov.net]:/etc
root@server:~ x mc [root@server.etanriberge... x
dhcpd.conf [-M--] 0 L:[ 7+19 26/ 36] *(545 / 841b)
option domain-name "etanribergenov.net";
option domain-name-servers ns.etanribergenov.net;

default-lease-time 600;
max-lease-time 7200;

# Use this to enable / disable dynamic dns updates globally.
ddns-updates on;
ddns-update-style interim;
ddns-domainname "etanribergenov.net.";
ddns-rev-domainname "in-addr.arpa.";

zone etanribergenov.net. {
    primary 127.0.0.1;
}

zone 1.168.192.in-addr.arpa. {
    primary 127.0.0.1;
}
```

*Рис. 32. Редактирование конф. файла dhcpd.conf*

```
[root@server.etanribergenov.net ~]#
[root@server.etanribergenov.net ~]# systemctl restart dhcpd
[root@server.etanribergenov.net ~]#
```

*Рис. 33. Перезапуск DHCP-сервера*



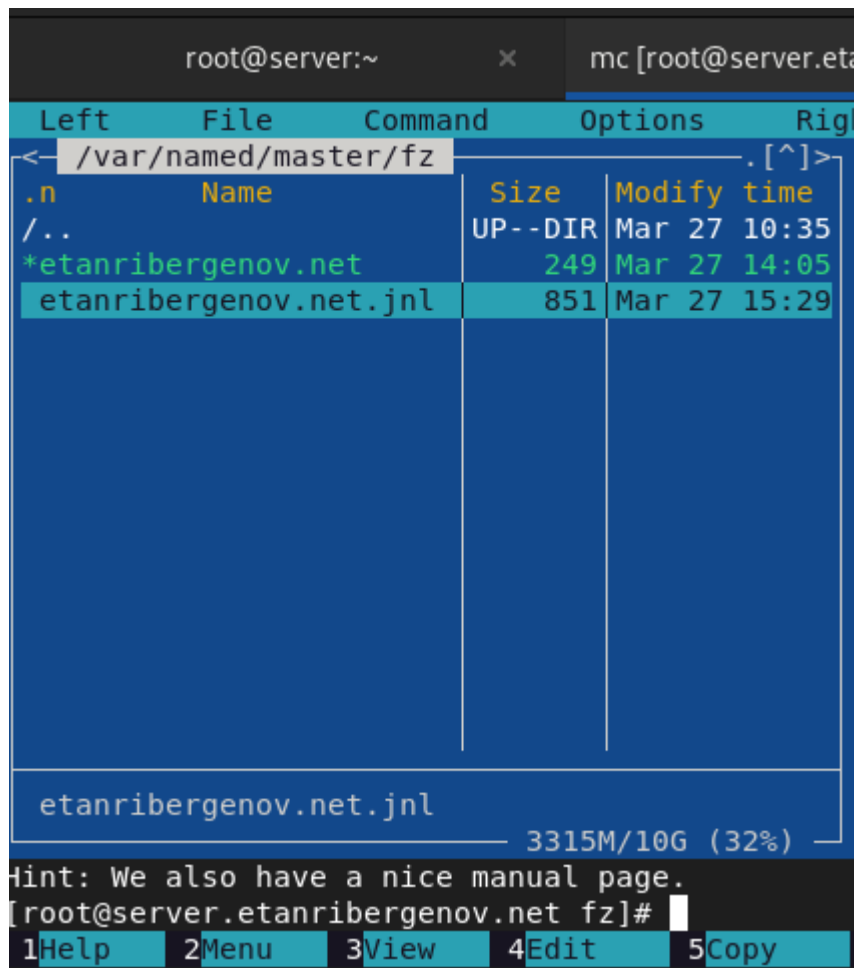
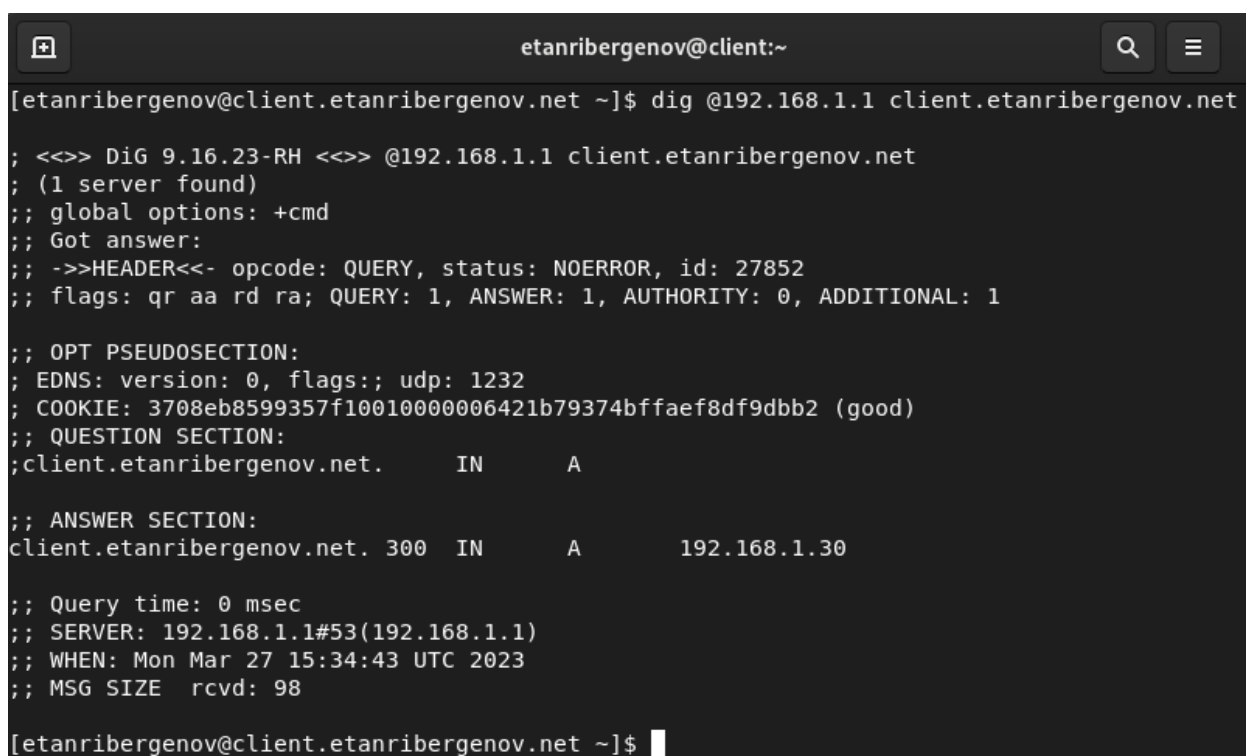


Рис. 34. В каталоге прямой DNS-зоны появился файл

## Анализ работы DHCP-сервера после настройки обновления DNS-зоны

- Использована утилита dig



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

; <<>> DiG 9.16.23-RH <<>> @192.168.1.1 client.etanribergenov.net
; (1 server found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 27852
;; flags: qr aa rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 1232
; COOKIE: 3708eb8599357f10010000006421b79374bffaef8df9dbb2 (good)
;; QUESTION SECTION:
;client.etanribergenov.net.      IN      A

;; ANSWER SECTION:
client.etanribergenov.net. 300 IN      A      192.168.1.30

;; Query time: 0 msec
;; SERVER: 192.168.1.1#53(192.168.1.1)
;; WHEN: Mon Mar 27 15:34:43 UTC 2023
;; MSG SIZE rcvd: 98

[etanribergenov@client.etanribergenov.net ~]$
```

*Рис. 35. Проверка наличия DNS-записи о клиенте в прямой DNS-зоне*

## Внесение изменений в настройки внутреннего окружения виртуальной машины

```
[root@server.etanribergenov.net ~]#  
[root@server.etanribergenov.net server]# mkdir -p dhcp/etc/dhcp  
[root@server.etanribergenov.net server]#  
[root@server.etanribergenov.net etc]# mkdir -p systemd/system  
[root@server.etanribergenov.net etc]#
```

Рис. 36. Создание каталога *dhcp* и подкаталогов в каталоге

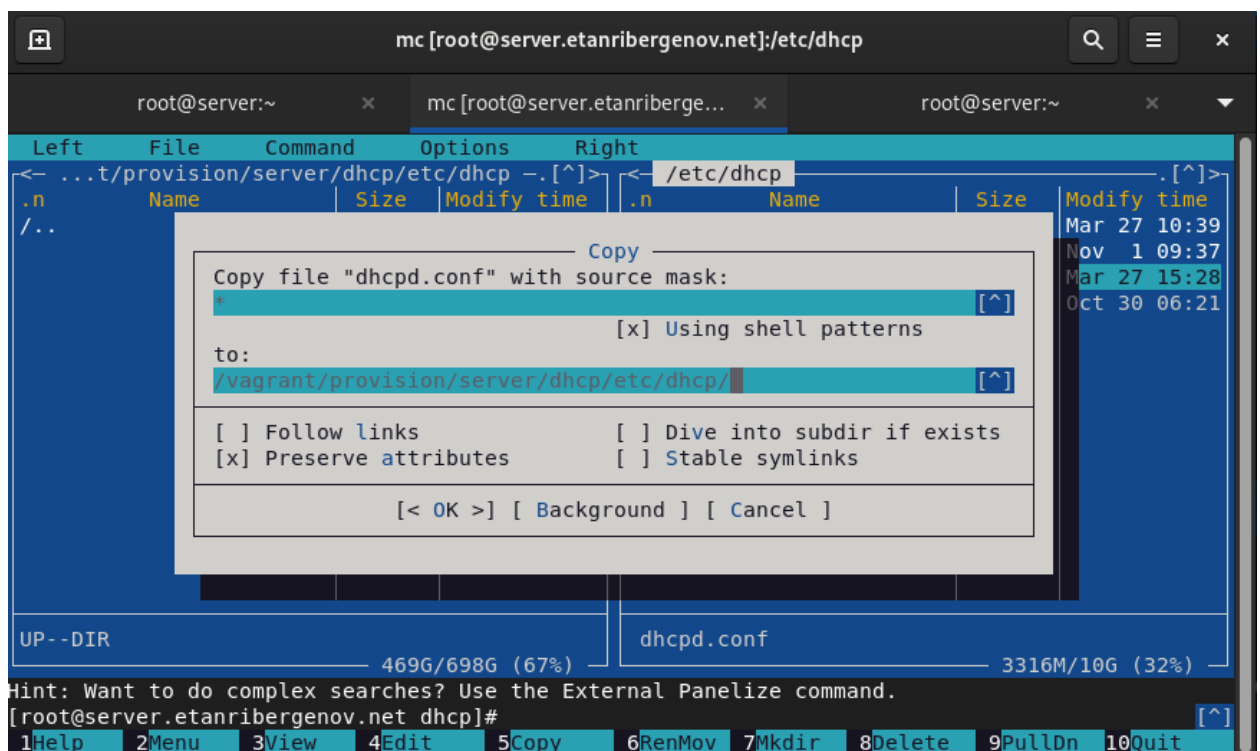


Рис. 37. Копирование конф. файла *dhcpd.conf*

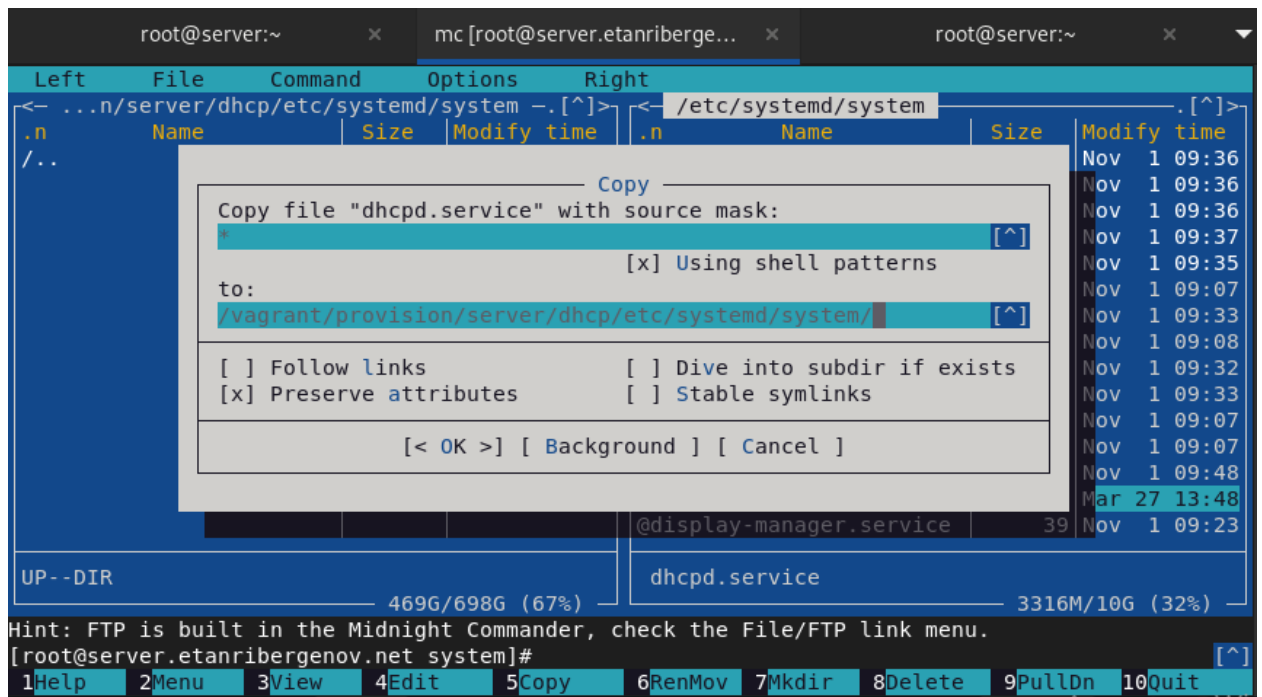


Рис. 38. Копирование конф. файла *dhcpd.service*

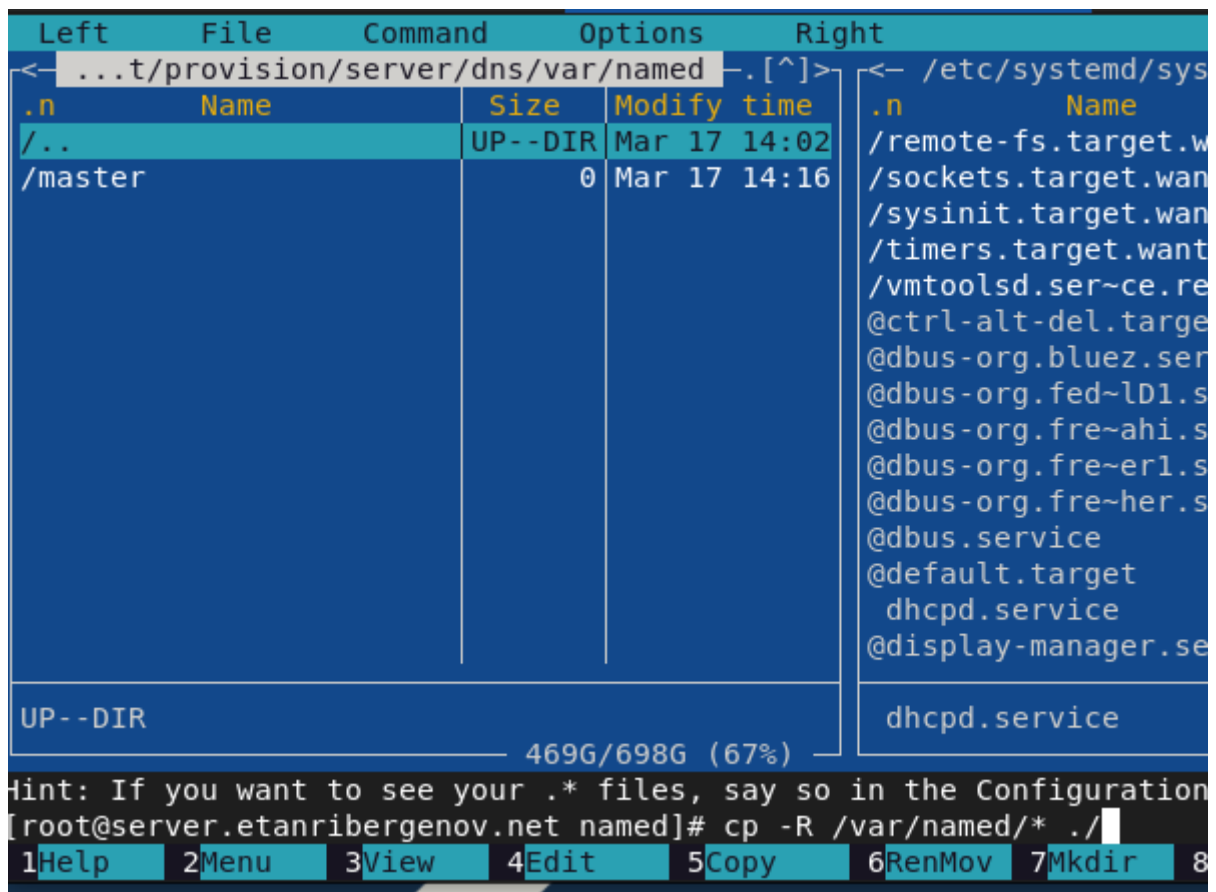
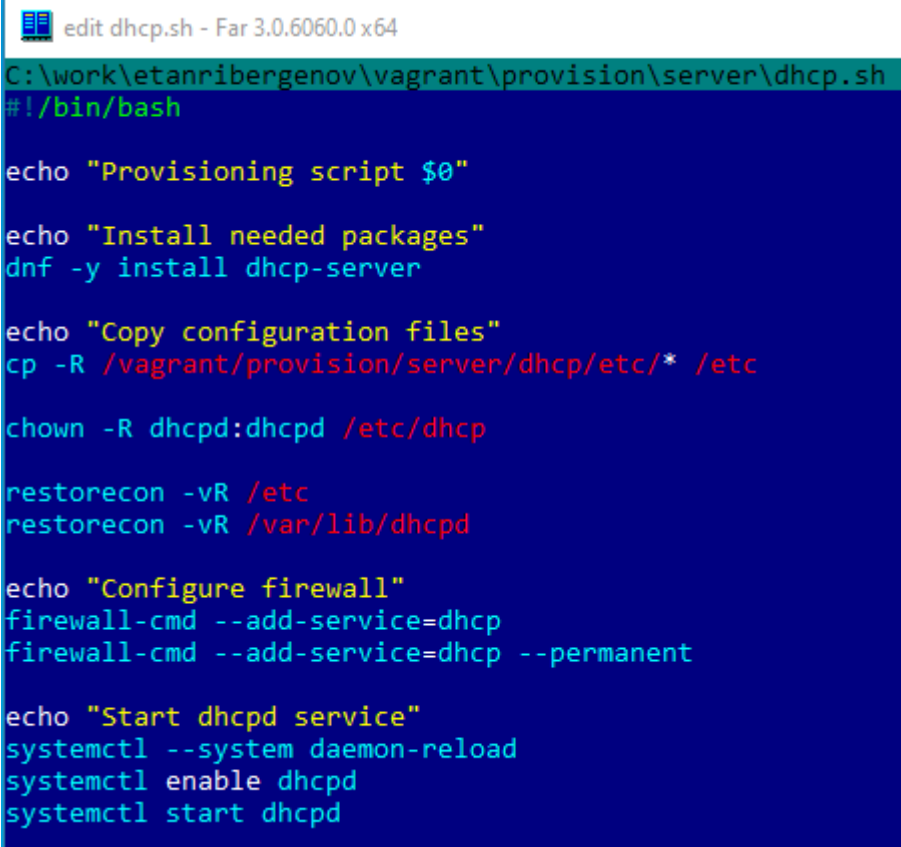


Рис. 39. Замена конф. файлов DNS-сервера

```
[root@server.etanribergenov.net named]#  
[root@server.etanribergenov.net server]# touch dhcp.sh  
[root@server.etanribergenov.net server]# chmod +x dhcp.sh  
[root@server.etanribergenov.net server]#
```

*Рис. 40. Создание исполняемого файла dhcp.sh*



The screenshot shows a terminal window titled "edit dhcp.sh - Far 3.0.6060.0 x64". The terminal displays the following script content:

```
C:\work\etanribergenov\vagrant\provision\server\dhcp.sh  
#!/bin/bash  
  
echo "Provisioning script $0"  
  
echo "Install needed packages"  
dnf -y install dhcp-server  
  
echo "Copy configuration files"  
cp -R /vagrant/provision/server/dhcp/etc/* /etc  
  
chown -R dhcpd:dhcpd /etc/dhcp  
  
restorecon -vR /etc  
restorecon -vR /var/lib/dhcpd  
  
echo "Configure firewall"  
firewall-cmd --add-service=dhcp  
firewall-cmd --add-service=dhcp --permanent  
  
echo "Start dhcpd service"  
systemctl --system daemon-reload  
systemctl enable dhcpd  
systemctl start dhcpd
```

*Рис. 41. Скрипт-файл dhcp.sh*

```
root@server:~ x mc [root@server.  
Vagrantfile [----] 0 L:[ 39+ 7 46/10  
server.vm.provision "server dns",  
  type: "shell",  
  preserve_order: true,  
  path: "provision/server/dns.sh"  
  
server.vm.provision "server dhcp",  
  type: "shell",  
  preserve_order: true,  
  path: "provision/server/dhcp.sh"
```

*Рис. 42. Запись для отработки скрипта во время загрузки ВМ server в конф. файле Vagrantfile*

```
Far Manager, version 3.0.6060.0 x64  
Copyright © 1996-2000 Eugene Roshal, Copyright © 2000-2022 Far Group  
  
C:\work\etanribergenov\vagrant>vagrant halt server  
==> server: Attempting graceful shutdown of VM...  
  
C:\work\etanribergenov\vagrant>vagrant halt client  
==> client: Attempting graceful shutdown of VM...  
  
C:\work\etanribergenov\vagrant>  
1Help 2UserMn 3View 4Edit 5Copy 6RenMov 7MkFold 8Delete
```

*Рис. 43. Выключение виртуальных машин*