

# Лабораторная работа №3

## Настройка DHCP-сервера

**Студент: Пакавира Арсениу Висенте Луиш**

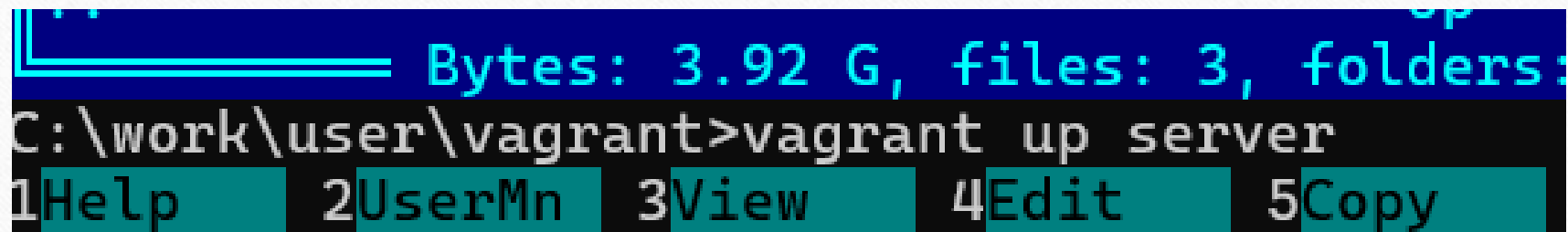
**Группа: НФИбд 02–23**

**дисциплина: Администрирование сетевых подсистем (Lab 3)**

# Цель работы

Приобретение практических навыков по установке и  
конфигурированию DHCP-сервера.

## Установка DHCP-сервера



The screenshot shows a terminal window with a dark background. The first line displays file statistics in cyan text: "Bytes: 3.92 G, files: 3, folders:". The second line shows a command prompt "C:\work\user\vagrant>" followed by the command "vagrant up server". The third line shows a menu with five options, each in a teal box: "1Help", "2UserMn", "3View", "4Edit", and "5Copy".

```
Bytes: 3.92 G, files: 3, folders:  
C:\work\user\vagrant>vagrant up server  
1Help 2UserMn 3View 4Edit 5Copy
```

Рис. 1.1. Открытие рабочего каталога с проектом и запуск виртуальной машины server.



# Установка DHCP-сервера

```
[user@server.user.net ~]$ sudo -i
[sudo] password for user:
[root@server.user.net ~]# dnf -y install bind bind-utils
Last metadata expiration check: 0:23:11 ago on Tue 06 Jan 2026 01:18:33 PM UTC.
Package bind-utils-32:9.16.23-18.el9_4.1.x86_64 is already installed.
Dependencies resolved.
=====
Package                        Architecture      Version           Repository        Size
=====
Installing:
bind                           x86_64            32:9.16.23-34.el9_7.1  appstream         488 k
Upgrading:
bind-libs                      x86_64            32:9.16.23-34.el9_7.1  appstream         1.2 M
bind-license                   noarch            32:9.16.23-34.el9_7.1  appstream         13 k
bind-utils                     x86_64            32:9.16.23-34.el9_7.1  appstream         199 k
openssl                       x86_64            1:3.5.1-4.el9_7       baseos            1.4 M
openssl-devel                 x86_64            1:3.5.1-4.el9_7       appstream         3.4 M
openssl-libs                  x86_64            1:3.5.1-4.el9_7       baseos            2.3 M
Installing dependencies:
bind-dnssec-doc                noarch            32:9.16.23-34.el9_7.1  appstream         45 k
openssl-fips-provider          x86_64            1:3.5.1-4.el9_7       baseos            812 k
python3-bind                   noarch            32:9.16.23-34.el9_7.1  appstream         61 k
python3-ply                    noarch            3.11-14.el9.0.1       baseos            103 k
Installing weak dependencies:
bind-dnssec-utils              x86_64            32:9.16.23-34.el9_7.1  appstream         113 k
=====
Transaction Summary
=====
Install  6 Packages
Upgrade  6 Packages
```

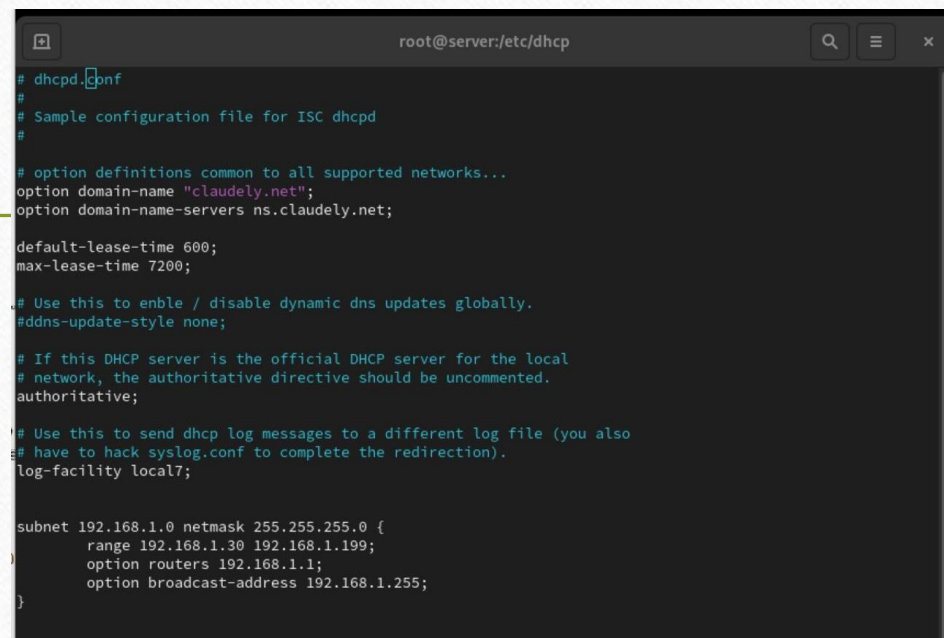
Рис. 1.2. Переход в режим суперпользователя и установка dhcp.

# Конфигурирование DHCP-сервера

```
root@server.claudely.net ~]#  
root@server.claudely.net ~]# cd /etc/dhcp  
root@server.claudely.net dhcp]# cp /usr/share/doc/dhcp*/dhcpd.conf.example /etc/dhcp  
root@server.claudely.net dhcp]# mv /etc/dhcp/dhcpd.conf.example /etc/dhcp/dhcpd.conf  
mv: overwrite '/etc/dhcp/dhcpd.conf'? yes  
root@server.claudely.net dhcp]#
```

**Рис. 2.1.** Копирование файла примера конфигурации DHCP и изменение его названия.

# Конфигурирование DHCP-сервера



```
root@server:/etc/dhcp
# dhcpd.conf
#
# Sample configuration file for ISC dhcpd
#
# option definitions common to all supported networks...
option domain-name "claudely.net";
option domain-name-servers ns.claudely.net;

default-lease-time 600;
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;

# Use this to send dhcp log messages to a different log file (you also
# have to hack syslog.conf to complete the redirection).
log-facility local7;

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. 2.2.** Открытие файла `/etc/dhcp/dhcpd.conf` на редактирование. Замена строки `option domain-name` и `option domain-name-servers`, снятие комментария со строки `authoritative`, создание собственной конфигурации dhcp-сети.



# Конфигурирование DHCP-сервера



The image shows a terminal window with a dark background and light-colored text. The window title is 'root@server:/etc/dhcp'. The content of the terminal is the configuration for the 'dhcpcd.service' file, which is displayed in a syntax-highlighted format. The configuration is divided into three sections: [Unit], [Service], and [Install]. The [Unit] section contains 'Description=DHCPv4 Server Daemon', 'Documentation=man:dhcpcd(8) man:dhcpcd.conf(5)', 'Wants=network-online.target', 'After=network-online.target', and 'After=time-sync.target'. The [Service] section contains 'Type=notify', 'EnvironmentFile=-/etc/sysconfig/dhcpd', 'ExecStart=/usr/sbin/dhcpd -f -cf /etc/dhcp/dhcpd.conf -user dhcpcd -group dhcpcd --no-pid eth1', and 'StandardError=null'. The [Install] section contains 'WantedBy=multi-user.target'. The terminal window has a search icon, a menu icon, and a close icon in the top right corner.

```
root@server:/etc/dhcp

[Unit]
Description=DHCPv4 Server Daemon
Documentation=man:dhcpcd(8) man:dhcpcd.conf(5)
Wants=network-online.target
After=network-online.target
After=time-sync.target

[Service]
Type=notify
EnvironmentFile=-/etc/sysconfig/dhcpd
ExecStart=/usr/sbin/dhcpd -f -cf /etc/dhcp/dhcpd.conf -user dhcpcd -group dhcpcd --no-pid eth1
StandardError=null

[Install]
WantedBy=multi-user.target
```

**Рис. 2.4.** Открытие файла `/etc/systemd/system/dhcpd.service` на редактирование и замена в нём строки.

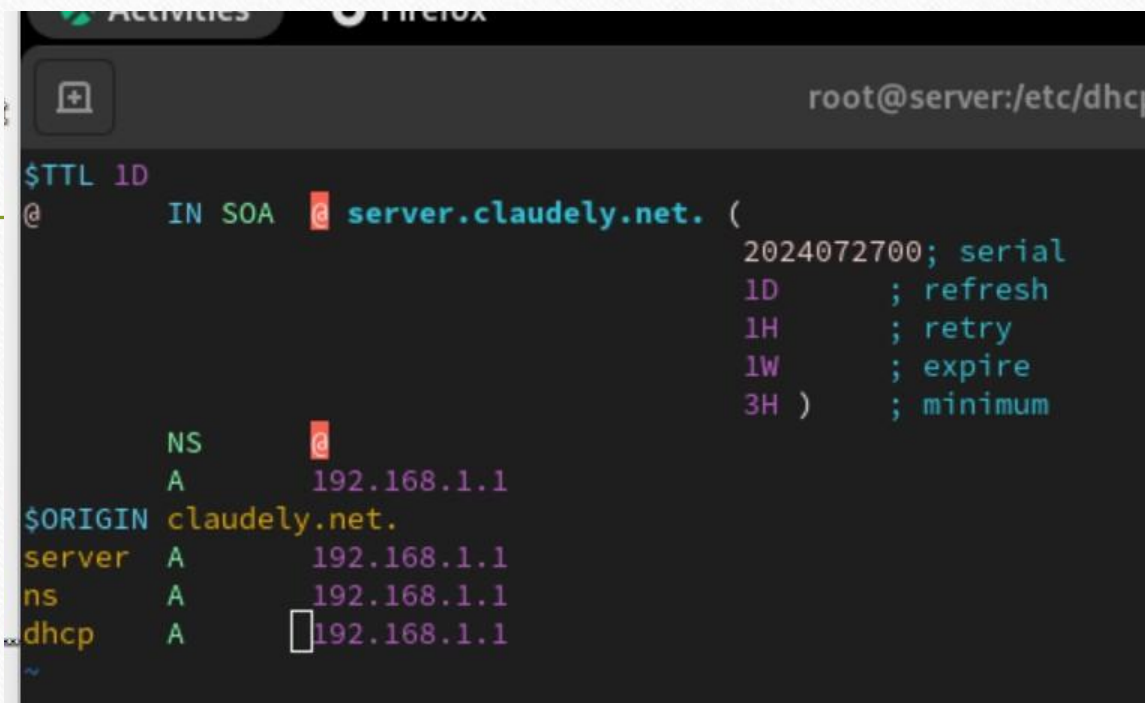
# Конфигурирование DHCP-сервера

```
[root@server.claudely.net dhcp]#  
[root@server.claudely.net dhcp]# cp /lib/systemd/system/dhcpd.service /etc/systemd/system/  
[root@server.claudely.net dhcp]#  
[root@server.claudely.net dhcp]# vim /etc/systemd/system/dhcpd.service  
[root@server.claudely.net dhcp]# vim /etc/systemd/system/dhcpd.service  
[root@server.claudely.net dhcp]# systemctl --system daemon-reload  
[root@server.claudely.net dhcp]# systemctl enable dhcpd  
Created symlink /etc/systemd/system/multi-user.target.wants/dhcpd.service → /etc/systemd/system/dhcpd.service.  
[root@server.claudely.net dhcp]#  
[root@server.claudely.net dhcp]#
```

**Рис. 2.5.** Перезагрузка конфигурации dhcpd и разрешение загрузки DHCP-сервера при запуске виртуальной машины server.



# Конфигурирование DHCP-сервера



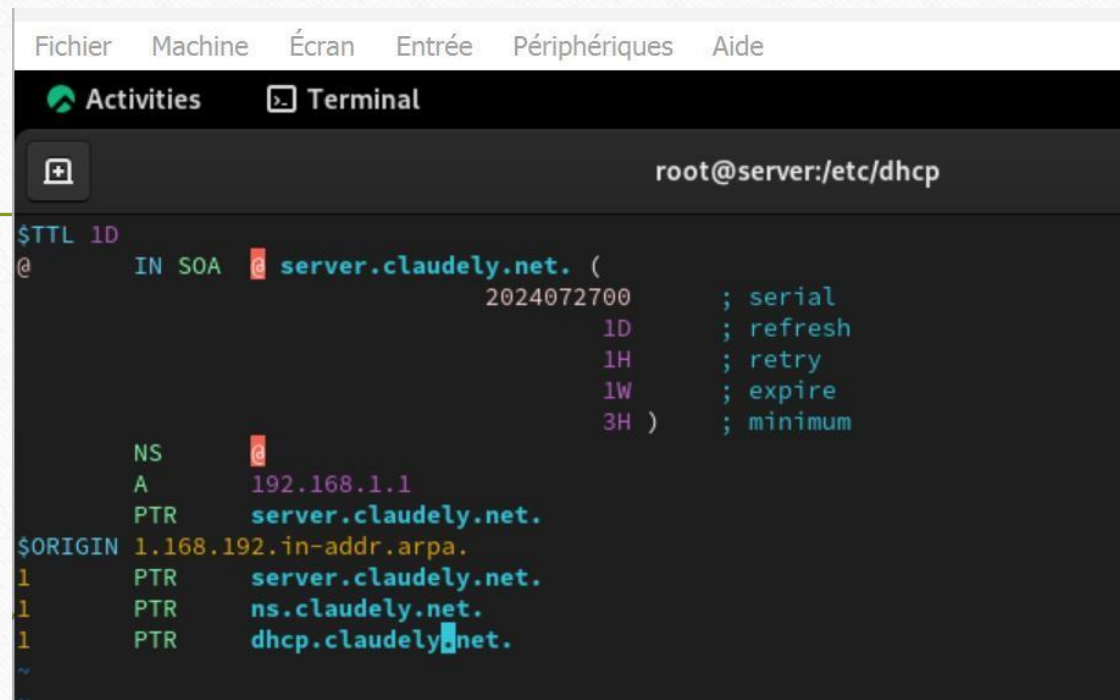
```
root@server:/etc/dhcp
$TTL 1D
@ IN SOA @ server.claudely.net. (
    2024072700; serial
    1D      ; refresh
    1H      ; retry
    1W      ; expire
    3H )    ; minimum

    NS      @
    A       192.168.1.1
$ORIGIN claudely.net.
server A    192.168.1.1
ns      A    192.168.1.1
dhcp    A    192.168.1.1
```

**Рис. 2.6.** Добавление записи для DHCP-сервера в конце файла прямой DNS-зоны  
/var/named/master/fz/claudey.net.



# Конфигурирование DHCP-сервера



```
Fichier  Machine  Écran  Entrée  Périphériques  Aide
Activities  Terminal
root@server:/etc/dhcp
$TTL 1D
@      IN SOA  server.claudely.net. (
                                2024072700      ; serial
                                1D              ; refresh
                                1H              ; retry
                                1W              ; expire
                                3H              ; minimum
      NS   server.claudely.net.
      A    192.168.1.1
      PTR   server.claudely.net.
$ORIGIN 1.168.192.in-addr.arpa.
1      PTR   server.claudely.net.
1      PTR   ns.claudely.net.
1      PTR   dhcp.claudely.net.
```

**Рис. 2.7.** Добавление записи для DHCP-сервера в конце файла обратной DNS-зоны /var/named/master/rz/192.168.1.

# Конфигурирование ДНСР-сервера

```
[root@server.claudely.net dhcp]#  
[root@server.claudely.net dhcp]# systemctl restart named  
[root@server.claudely.net dhcp]# ping dhcp.claudely.net  
PING dhcp.claudely.net (192.168.1.1) 56(84) bytes of data.  
64 bytes from ns.claudely.net (192.168.1.1): icmp_seq=1 ttl=64 time=0.567 ms  
64 bytes from ns.claudely.net (192.168.1.1): icmp_seq=2 ttl=64 time=0.082 ms  
64 bytes from server.claudely.net (192.168.1.1): icmp_seq=3 ttl=64 time=0.110 ms  
64 bytes from ns.claudely.net (192.168.1.1): icmp_seq=4 ttl=64 time=0.079 ms  
64 bytes from ns.claudely.net (192.168.1.1): icmp_seq=5 ttl=64 time=0.060 ms  
64 bytes from ns.claudely.net (192.168.1.1): icmp_seq=6 ttl=64 time=0.051 ms  
64 bytes from ns.claudely.net (192.168.1.1): icmp_seq=7 ttl=64 time=0.074 ms  
64 bytes from ns.claudely.net (192.168.1.1): icmp_seq=8 ttl=64 time=0.067 ms  
64 bytes from dhcp.claudely.net (192.168.1.1): icmp_seq=9 ttl=64 time=0.107 ms  
64 bytes from ns.claudely.net (192.168.1.1): icmp_seq=10 ttl=64 time=0.055 ms  
64 bytes from server.claudely.net (192.168.1.1): icmp_seq=11 ttl=64 time=0.082 ms  
64 bytes from server.claudely.net (192.168.1.1): icmp_seq=12 ttl=64 time=0.071 ms  
64 bytes from dhcp.claudely.net (192.168.1.1): icmp_seq=13 ttl=64 time=0.074 ms  
64 bytes from ns.claudely.net (192.168.1.1): icmp_seq=14 ttl=64 time=0.063 ms  
64 bytes from server.claudely.net (192.168.1.1): icmp_seq=15 ttl=64 time=0.064 ms  
64 bytes from ns.claudely.net (192.168.1.1): icmp_seq=16 ttl=64 time=0.067 ms
```

**Рис. 2.8.** Перезапуск named и выполнение проверки, что можно обратиться к ДНСР-серверу по имени.



# Конфигурирование ДНСР-сервера

```
[root@server.claudely.net dhcp]# firewall-cmd --list-services
cockpit dhcpv6-client dns ssh
[root@server.claudely.net dhcp]# firewall-cmd --get-services
RH-Satellite-6 RH-Satellite-6-capsule afp amanda-client amanda-k5-client amqp amqps apcupsd audit ausweis
app2 bacula bacula-client bareos-director bareos-filedaemon bareos-storage bb bgp bitcoin bitcoin-rpc bit
coin-testnet bitcoin-testnet-rpc bittorrent-lsd ceph ceph-exporter ceph-mon cfengine checkmk-agent cockpi
t collectd condor-collector cratedb ctdb dds dds-multicast dds-unicast dhcp dhcpv6 dhcpv6-client distcc d
ns 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 freeipa-trust ftp galera
ganglia-client ganglia-master git gpsd grafana gre high-availability http http3 https ident imap imaps ip
fs ipp ipp-client ipsec irc ircs iscsi-target isns jenkins kadmin kdeconnect kerberos kibana klogin kpass
wd kprop kshell kube-api kube-apiserver kube-control-plane kube-control-plane-secure kube-controller-mana
ger kube-controller-manager-secure kube-nodeport-services kube-scheduler kube-scheduler-secure kube-worke
r kubelet kubelet-readonly kubelet-worker ldap ldaps libvirt libvirt-tls lightning-network llmnr llmnr-cl
ient llmnr-tcp llmnr-udp managesieve matrix mdns memcache minidlna mongodb mosh moutnd mqtt mqtt-tls ms-w
bt mssql murmur mysql nbd nebula netbios-ns netdata-dashboard nfs nfs3 nmea-0183 nrpe ntp nut openvpn ovi
rt-imageio ovirt-storageconsole ovirt-vmconsole plex pmcd pmproxy pmwebapi pmwebapis pop3 pop3s postgresq
l privoxy prometheus prometheus-node-exporter proxy-dhcp ps2link ps3netsrv ptp pulseaudio puppetmaster qu
assel radius rdp redis redis-sentinel rpc-bind rquotad rsh rsyncd rtsp salt-master samba samba-client sam
ba-dc sane sip sips slp smtp smtp-submission smtps snmp snmptls snmptls-trap snmptrap spideroak-lansync s
potify-sync squid ssdp ssh steam-streaming svdrp svn syncthing syncthing-gui syncthing-relay synergy sysl
og syslog-tls telnet tentacle tftp tile38 tinc tor-socks transmission-client upnp-client vdsms vnc-server
warpinator wbem-http wbem-https wireguard ws-discovery ws-discovery-client ws-discovery-tcp ws-discovery-
udp wsman wsmans xdmcp xmpp-bosh xmpp-client xmpp-local xmpp-server zabbix-agent zabbix-server zerotier
[root@server.claudely.net dhcp]# firewall-cmd --add-service=dhcp
success
[root@server.claudely.net dhcp]# firewall-cmd --add-service=dhcp --permanent
success
[root@server.claudely.net dhcp]#
```

Рис. 2.9. Внесение изменений в настройки межсетевого экрана узла server, разрешив работу с ДНСР.

# Конфигурирование ДНСР-сервера

```
[root@server.claudely.net dhcp]#  
[root@server.claudely.net dhcp]# restorecon -vR /etc  
Relabeled /etc/systemd/system/dhcpd.service from unconfined_u:object_r:systemd_unit_file_t:s0 to unconfined_u:objec  
t_r:dhcpd_unit_file_t:s0  
[root@server.claudely.net dhcp]# restorecon -vR /var/named  
[root@server.claudely.net dhcp]# restorecon -vR /var/lib/dhcpd/  
[root@server.claudely.net dhcp]# tail -f /var/log/messages  
Sep 27 19:36:42 server named[13359]: network unreachable resolving 'safebrowsing.googleapis.com/AAAA/IN': 2001:4860  
:4802:36::a#53  
Sep 27 19:36:42 server named[13359]: network unreachable resolving 'safebrowsing.googleapis.com/A/IN': 2001:4860:48  
02:38::a#53  
Sep 27 19:36:42 server systemd-journald[453]: Data hash table of /run/log/journal/bb344eeb9a684c4bafa12b93fea4dac6/  
system.journal has a fill level at 75.0 (2629 of 3505 items, 2019328 file size, 768 bytes per hash table item), sug  
gesting rotation.  
Sep 27 19:36:42 server systemd-journald[453]: /run/log/journal/bb344eeb9a684c4bafa12b93fea4dac6/system.journal: Jou  
rnal header limits reached or header out-of-date, rotating.  
Sep 27 19:36:42 server named[13359]: network unreachable resolving 'safebrowsing.googleapis.com/AAAA/IN': 2001:4860  
:4802:38::a#53  
Sep 27 19:36:42 server named[13359]: network unreachable resolving 'safebrowsing.googleapis.com/A/IN': 2001:4860:48  
02:34::a#53  
Sep 27 19:36:42 server named[13359]: network unreachable resolving 'safebrowsing.googleapis.com/AAAA/IN': 2001:4860  
:4802:34::a#53  
Sep 27 19:36:42 server named[13359]: network unreachable resolving 'safebrowsing.googleapis.com/A/IN': 2001:4860:48  
02:32::a#53
```

Рис. 2.10. Восстановление контекста безопасности в SELinux.

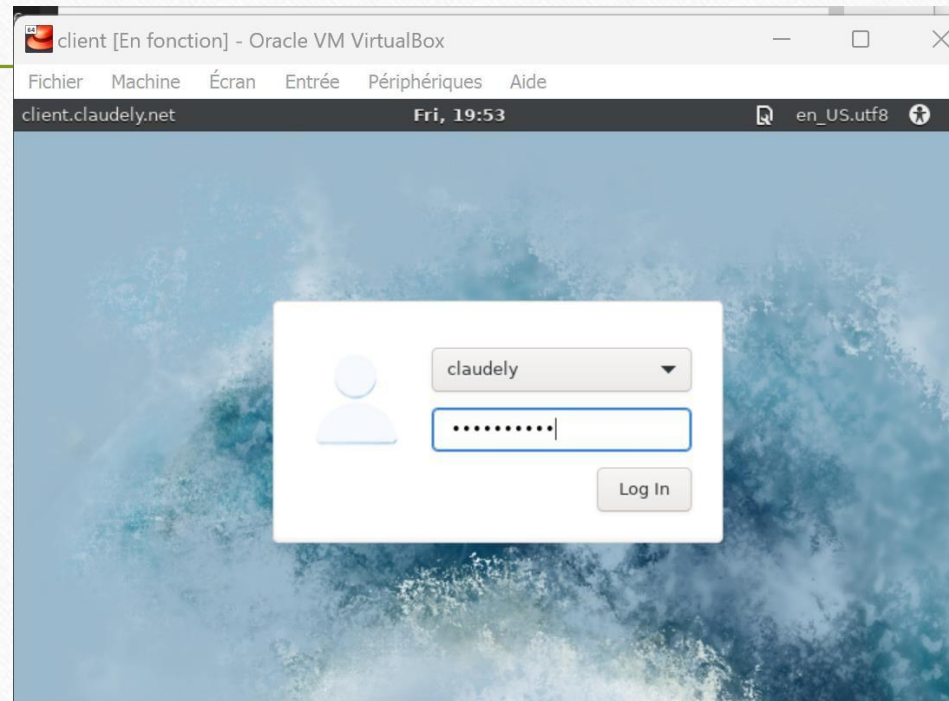


# Конфигурирование DHCP-сервера

```
[root@server.claudely.net dhcp]#  
[root@server.claudely.net dhcp]# systemctl start dhcpd  
[root@server.claudely.net dhcp]#  
[root@server.claudely.net dhcp]#
```

**Рис. 2.12.** Запуск в основном рабочем терминале DHCP-сервера.

# Анализ работы DHCP-сервера



**Рис. 3.1.** Фиксация внесённых изменений для внутренних настроек виртуальной машины client и её запуск.



# Анализ работы DHCP-сервера

```
[claudely@client.claudely.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:fea9:337c prefixlen 64 scopeid 0x20<link>
    ether 08:00:27:a9:33:7c txqueuelen 1000 (Ethernet)
    RX packets 1446 bytes 161844 (158.0 KiB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 1246 bytes 190563 (186.0 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:feea:d6fa prefixlen 64 scopeid 0x20<link>
    ether 08:00:27:ea:d6:fa txqueuelen 1000 (Ethernet)
    RX packets 85 bytes 12948 (12.6 KiB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 378 bytes 39350 (38.4 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

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

Рис. 3.3. Вывод на экран информации об имеющихся интерфейсах.

# Настройка обновления DNS-зоны

```
root@server:/etc/dhcp x claudely@server:~ — sudo -i tail -f /var/log/messages
# dhcpd.conf
#
# Sample configuration file for ISC dhcpd
#
# option definitions common to all supported networks...
option domain-name "claudely.net";
option domain-name-servers ns.claudely.net;

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

# Use this to enable / disable dynamic dns updates globally.
#ddns-update-style none;

ddns-updates on;
ddns-update-style interim;
ddns-domainname "claudely.net.";
ddns-rev-domainname "in-addr.arpa.";

zone claudely.net. {
    primary 127.0.0.1;
}

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

**Рис. 4.3.** Внесение изменений в конфигурационный файл `/etc/dhcp/dhcpd.conf`, добавив в него разрешение на динамическое обновление DNS-записей с локального узла прямой и обратной зон.

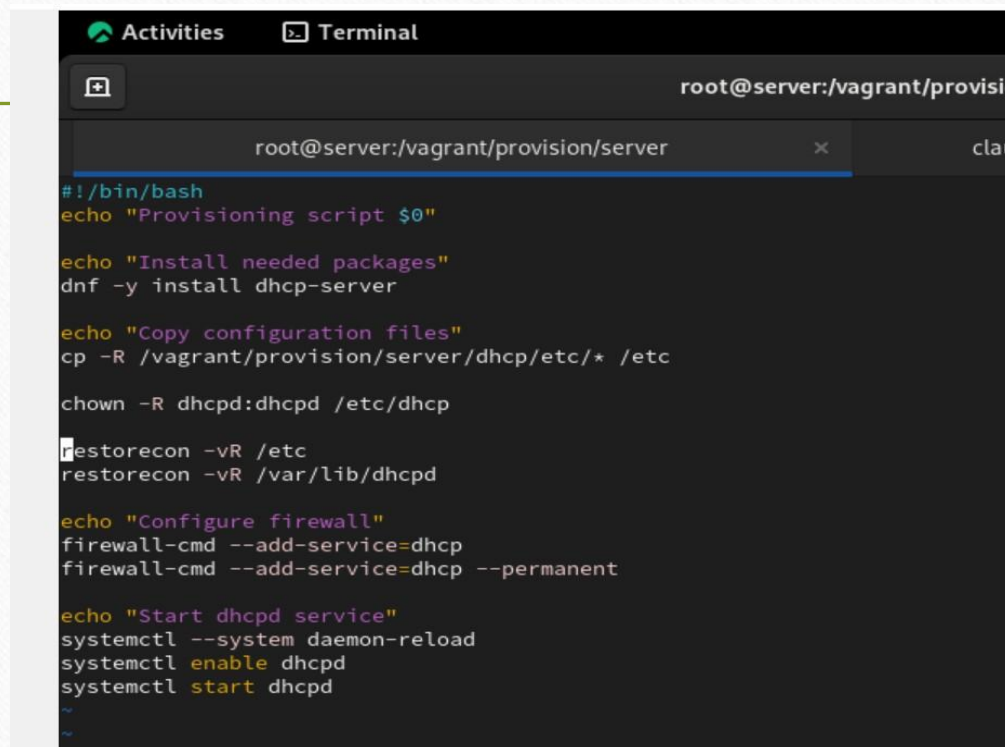


# Анализ работы DNS-сервера после настройки обновления DNS-зоны

```
[claudely@client.claudely.net ~]$  
[claudely@client.claudely.net ~]$ dig @192.168.1.1 client.claudely.net  
  
; <<>> DiG 9.16.23-RH <<>> @192.168.1.1 client.claudely.net  
; (1 server found)  
;; global options: +cmd  
;; Got answer:  
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 40938  
;; flags: qr aa rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 1  
  
;; OPT PSEUDOSECTION:  
; EDNS: version: 0, flags:; udp: 1232  
; COOKIE: dbce045803fe19800100000066f710d42aledale23b1386b (good)  
;; QUESTION SECTION:  
;client.claudely.net.                IN      A  
  
;; ANSWER SECTION:  
client.claudely.net.      300     IN      A      192.168.1.30  
  
;; Query time: 2 msec  
;; SERVER: 192.168.1.1#53(192.168.1.1)  
;; WHEN: Fri Sep 27 20:08:51 UTC 2024  
;; MSG SIZE rcvd: 92  
  
[claudely@client.claudely.net ~]$
```

**Рис. 5.** Проверка наличия DNS-записи о клиенте в прямой DNS-зоне.

# Внесение изменений в настройки внутреннего окружения виртуальной машины



```
Activities Terminal
root@server:/vagrant/provision/
root@server:/vagrant/provision/server
#!/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

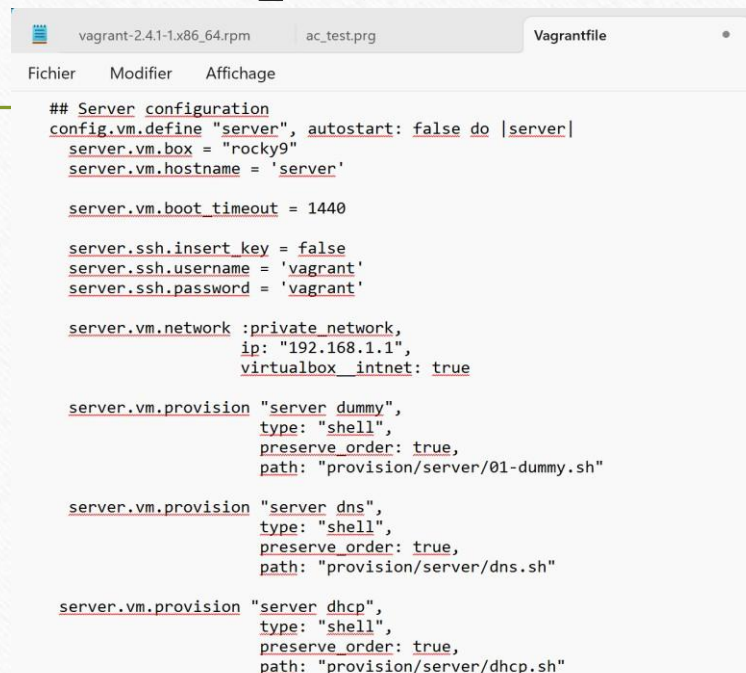
echo "Configure firewall"
firewall-cmd --add-service=dhcp
firewall-cmd --add-service=dhcp --permanent

echo "Start dhcpd service"
systemctl --system daemon-reload
systemctl enable dhcpd
systemctl start dhcpd
```

Рис. 6.2. Открытие файла на редактирование и помещение в него скрипта.



# Внесение изменений в настройки внутреннего окружения виртуальной машины



The image shows a code editor window with a tab labeled 'Vagrantfile'. The editor contains the following configuration for a virtual machine named 'server':

```
## Server configuration
config.vm.define "server", autostart: false do |server|
  server.vm.box = "rocky9"
  server.vm.hostname = 'server'

  server.vm.boot_timeout = 1440

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

  server.vm.network :private_network,
    ip: "192.168.1.1",
    virtualbox____intnet: true

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

  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. 6.3. Настройка отработки созданного скрипта во время загрузки виртуальной машины server.

# *Вывод*

В ходе выполнения лабораторной работы были приобретены практические навыки по установке и конфигурированию DHCP-сервера.



*Спасибо за внимание!*

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