

Лабораторная работа №3

Настройка DHCP-сервера

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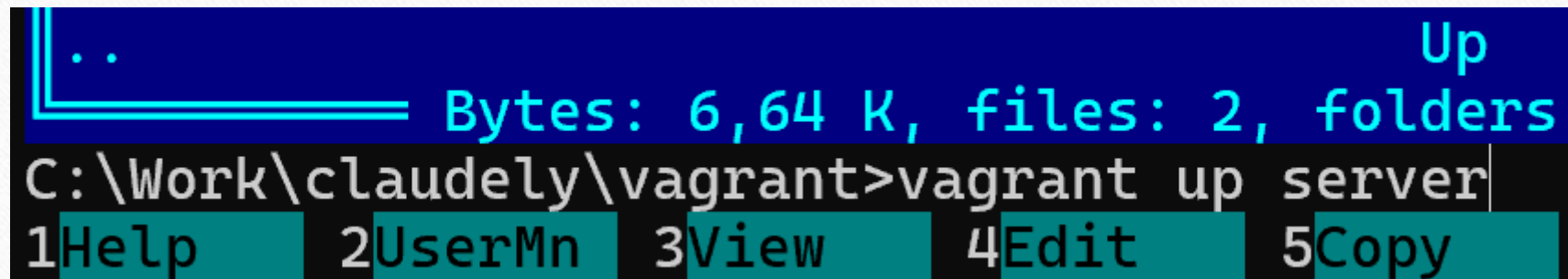
Группа: НПИбд 02–22

дисциплина: Администрирование сетевых подсистем (Lab 3)

Цель работы

Приобретение практических навыков по установке и конфигурированию DHCP-сервера.

Установка DHCP-сервера



The screenshot shows a Windows command prompt window. The first line shows the current directory as '..'. The second line shows the directory contents: 'Bytes: 6,64 K, files: 2, folders' and a 'Up' arrow. The third line shows the command 'C:\Work\claudely\vagrant>vagrant up server' being entered. The fourth line shows a list of options: '1Help', '2UserMn', '3View', '4Edit', and '5Copy'.

```
.. Up
Bytes: 6,64 K, files: 2, folders
C:\Work\claudely\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

```
root@server:~  
[claudely@server.claudely.net ~]$ sudo -i  
[sudo] password for claudely:  
[root@server.claudely.net ~]# dnf -y install dhcp-server  
Last metadata expiration check: 0:44:31 ago on Fri 27 Sep 2024 05:17:53 PM UTC.  
Dependencies resolved.  
=====
```

Package	Architecture	Version	Repository	Size
Installing:				
dhcp-server	x86_64	12:4.4.2-19.b1.el9	baseos	1.2 M
Installing dependencies:				
dhcp-common	noarch	12:4.4.2-19.b1.el9	baseos	128 k

```
=====
```

Transaction Summary

=====

Install 2 Packages

Total download size: 1.3 M
Installed size: 4.2 M

Downloading Packages:

(1/2): dhcp-common-4.4.2-19.b1.el9.noarch.rpm	55 kB/s 128 kB	00:02
(2/2): dhcp-server-4.4.2-19.b1.el9.x86_64.rpm	345 kB/s 1.2 MB	00:03

Total	119 kB/s 1.3 MB	00:11
-------	-------------------	-------

Running transaction check
Transaction check succeeded.
Running transaction test
Transaction test succeeded.
Running transaction

Preparing	:	1/1
Installing	: dhcp-common-12:4.4.2-19.b1.el9.noarch	1/2
Running scriptlet:	dhcp-server-12:4.4.2-19.b1.el9.x86_64	2/2
Installing	: dhcp-server-12:4.4.2-19.b1.el9.x86_64	2/2
Running scriptlet:	dhcp-server-12:4.4.2-19.b1.el9.x86_64	2/2
Verifying	: dhcp-server-12:4.4.2-19.b1.el9.x86_64	1/2
Verifying	: dhcp-common-12:4.4.2-19.b1.el9.noarch	2/2

Installed:
dhcp-common-12:4.4.2-19.b1.el9.noarch dhcp-server-12:4.4.2-19.b1.el9.x86_64

Complete!
[root@server.claudely.net ~]#

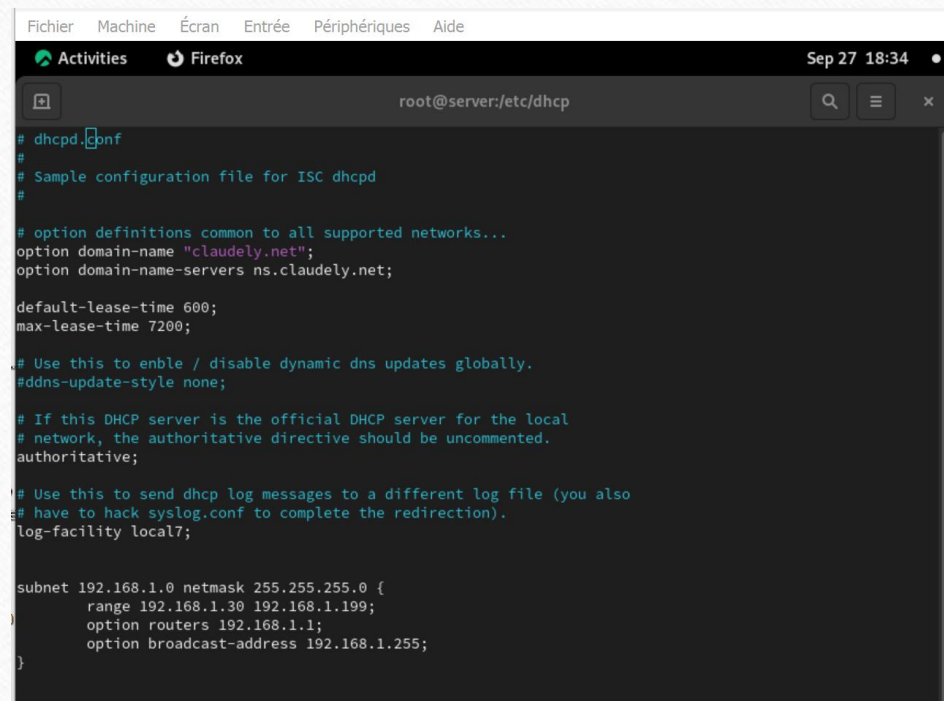
Рис. 1.2. Переход в режим суперпользователя и установка dhcp.

Конфигурирование DHCP-сервера

```
complete  
[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



```
Fichier Machine Écran Entrée Périphériques Aide
Activities Firefox Sep 27 18:34
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;

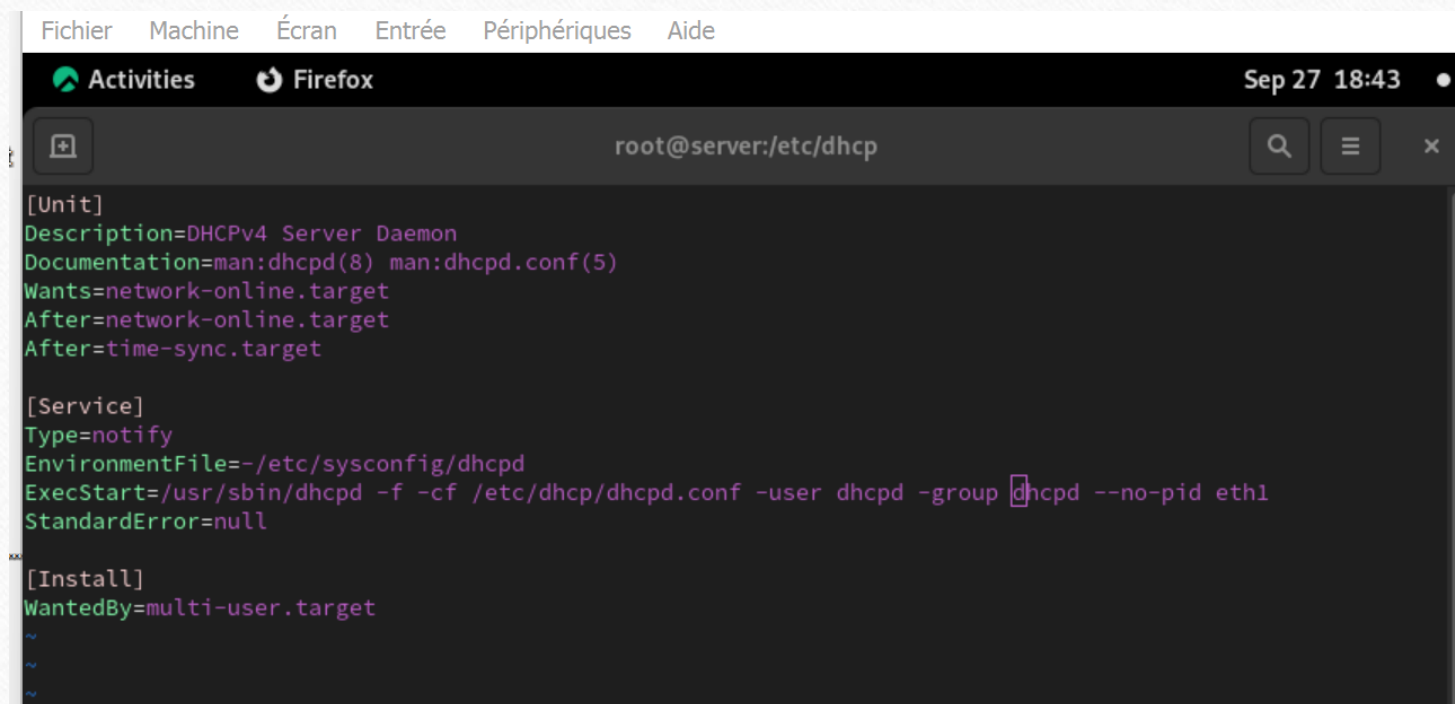
# If this DHCP server is the official DHCP server for the local
# network, the authoritative directive should be uncommented.
authoritative;

# 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 screenshot shows a Linux desktop environment with a terminal window open. The terminal title bar indicates the user is root at a server, editing the file /etc/dhcp. The terminal content displays the configuration for the dhcpd.service file, which is a systemd unit. The configuration is divided into three sections: [Unit], [Service], and [Install]. The [Unit] section includes a description, documentation, and dependencies. The [Service] section specifies the service type, environment file, and the command to start the DHCP daemon. The [Install] section specifies the target for which the service should be enabled. The terminal window has a dark background and a light-colored text color.

```
Fichier  Machine  Écran  Entrée  Périphériques  Aide
Activities  Firefox  Sep 27 18:43
root@server:/etc/dhcp

[Unit]
Description=DHCPv4 Server Daemon
Documentation=man:dhcpd(8) man:dhcpd.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 dhcpd -group dhcpd --no-pid eth1
StandardError=null

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

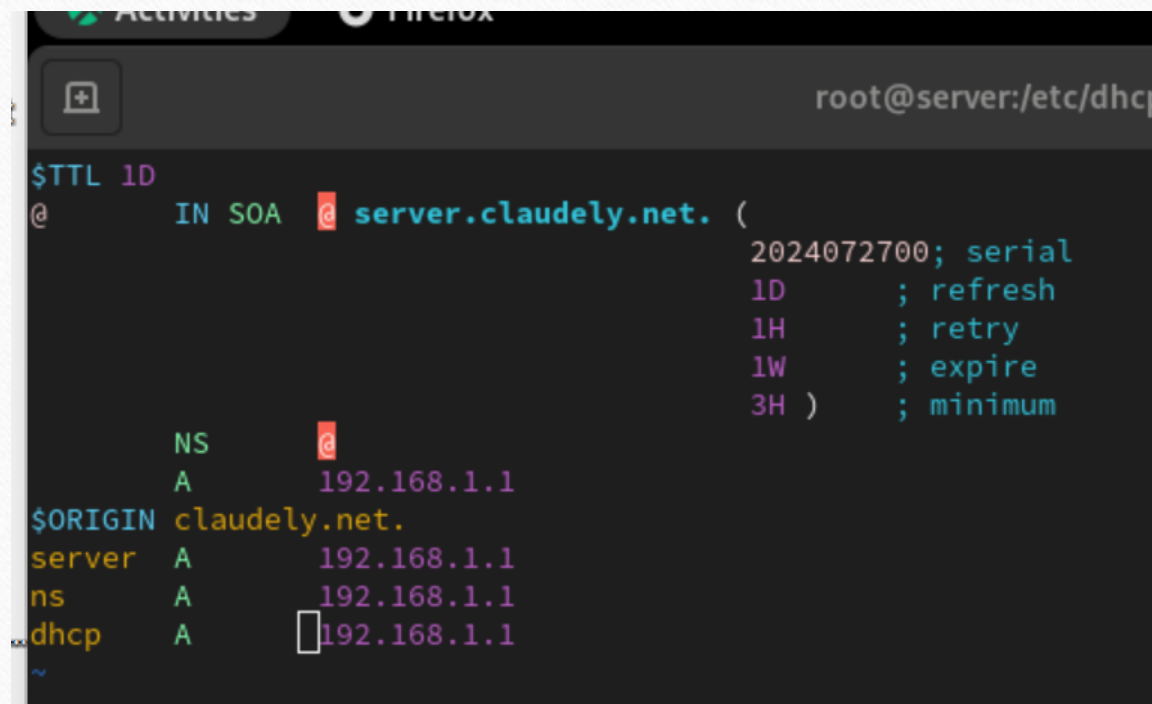
Рис. 2.4. Открытие файла `/etc/systemd/system/dhcpd.service` на редактирование и замена в нём строки.

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

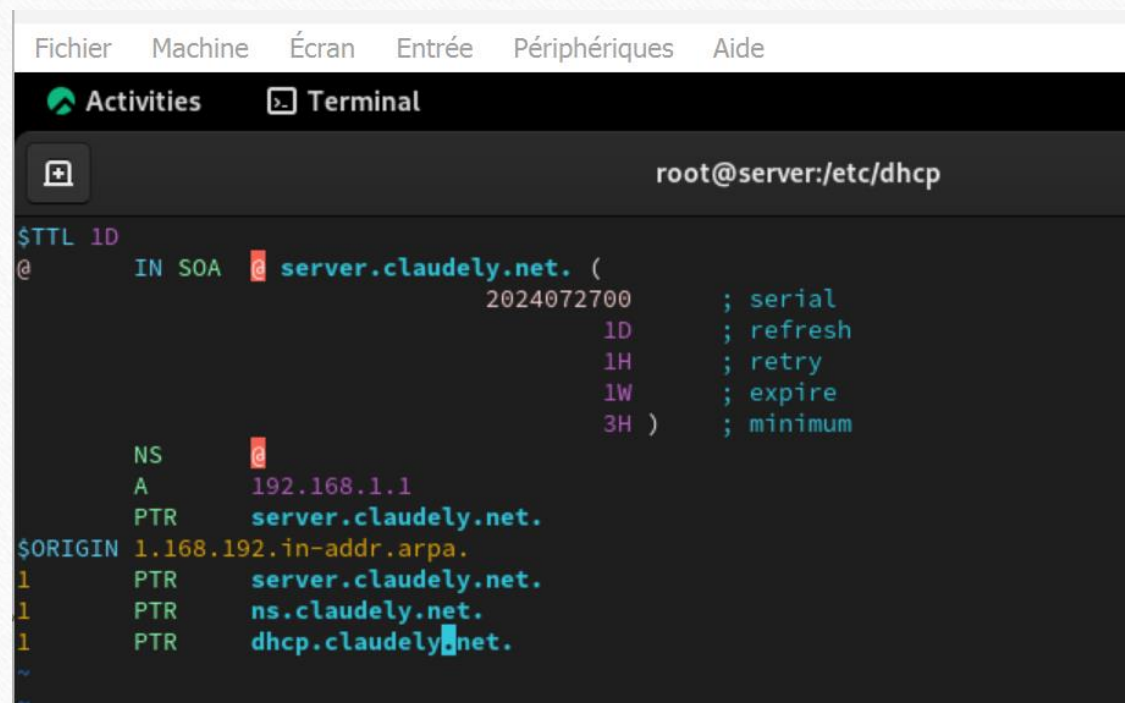


```
root@server:/etc/dhcp
$TTL 1D
@ IN SOA @ server.claudely.net. (
                                2024072700; serial
                                1D      ; refresh
                                1H      ; retry
                                1W      ; expire
                                3H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



The screenshot shows a terminal window with a menu bar at the top containing 'Fichier', 'Machine', 'Écran', 'Entrée', 'Périphériques', and 'Aide'. Below the menu bar are two tabs: 'Activities' and 'Terminal'. The terminal title bar shows 'root@server:/etc/dhcp'. The terminal content displays the following text:

```
$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 DNS-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 DNS-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 mountd 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 pmpoxy 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 vdsd 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/  
systemd-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/systemd-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

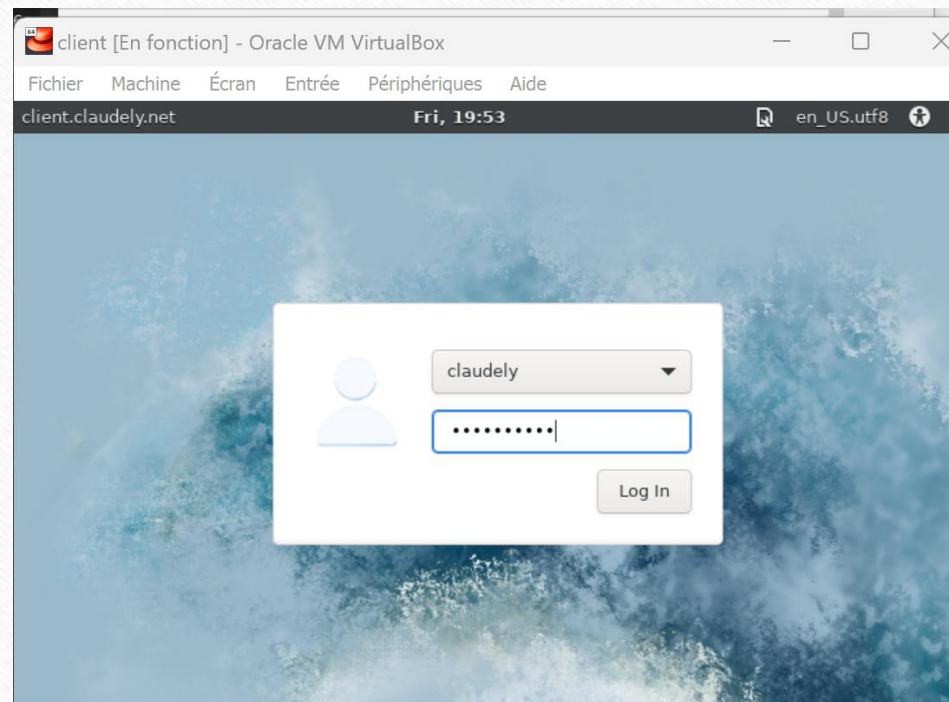
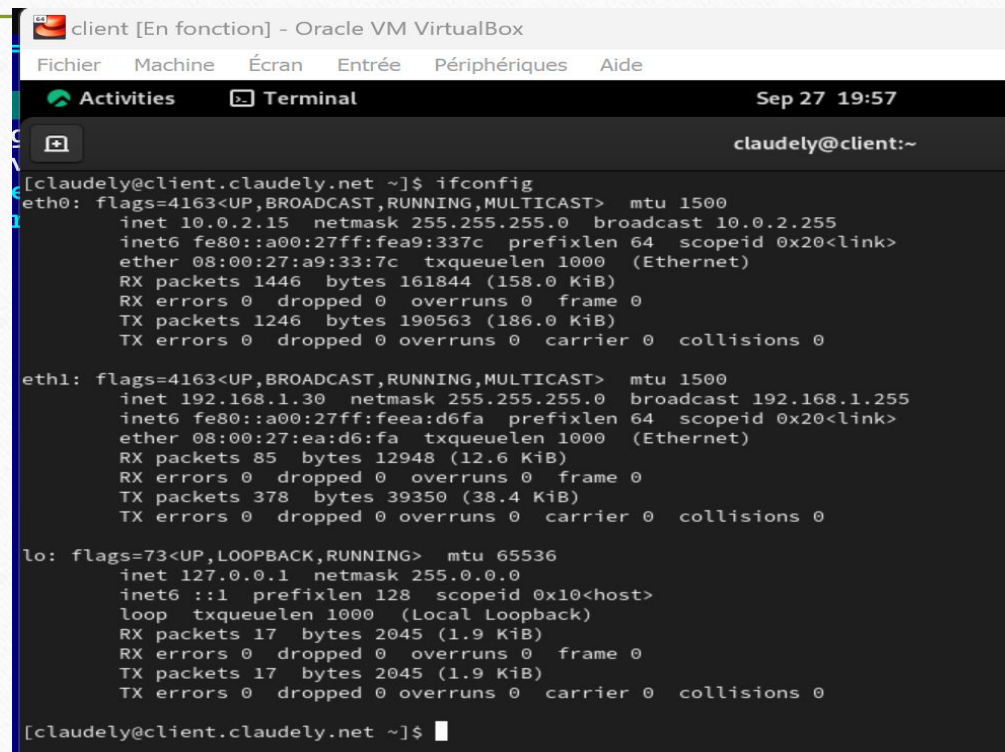


Рис. 3.1. Фиксация внесённых изменений для внутренних настроек виртуальной машины client и её запуск.

Анализ работы DHCP-сервера



```
client [En fonction] - Oracle VM VirtualBox
Fichier  Machine  Écran  Entrée  Périphériques  Aide

Activities  Terminal  Sep 27 19:57

claudely@client:~

[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

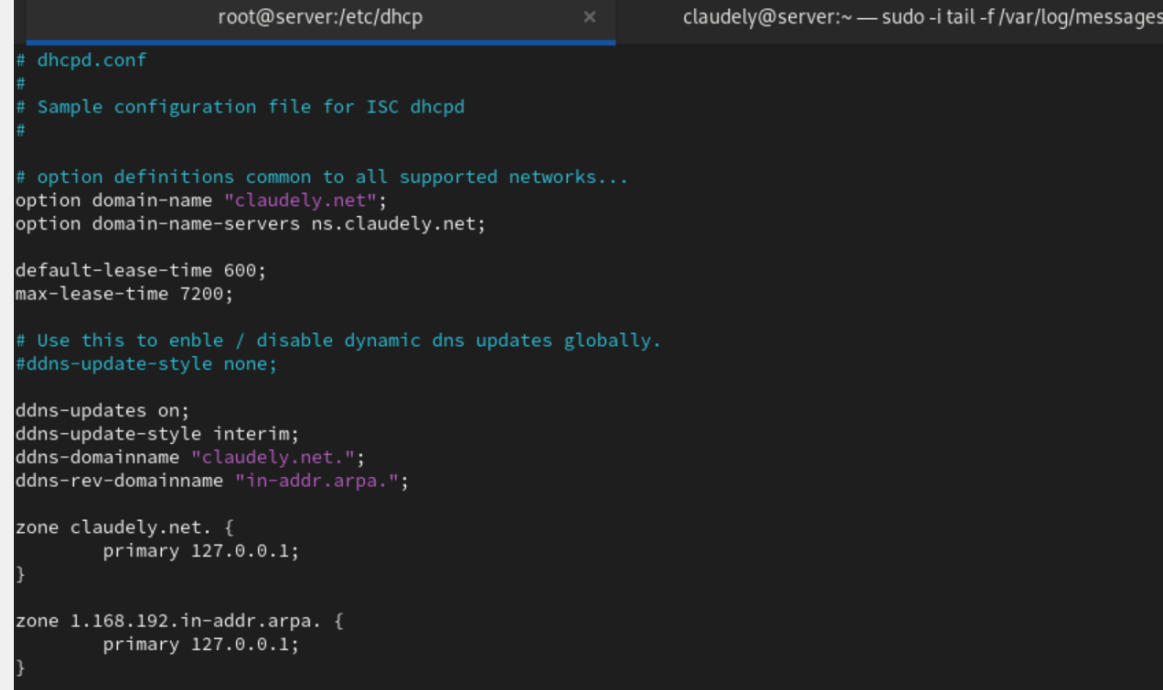
eth1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
    inet 192.168.1.30  netmask 255.255.255.0  broadcast 192.168.1.255
    inet6 fe80::a00:27ff:feea:d6fa  prefixlen 64  scopeid 0x20<link>
    ether 08:00:27:ea:d6:fa  txqueuelen 1000  (Ethernet)
    RX packets 85  bytes 12948 (12.6 KiB)
    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;
}
```

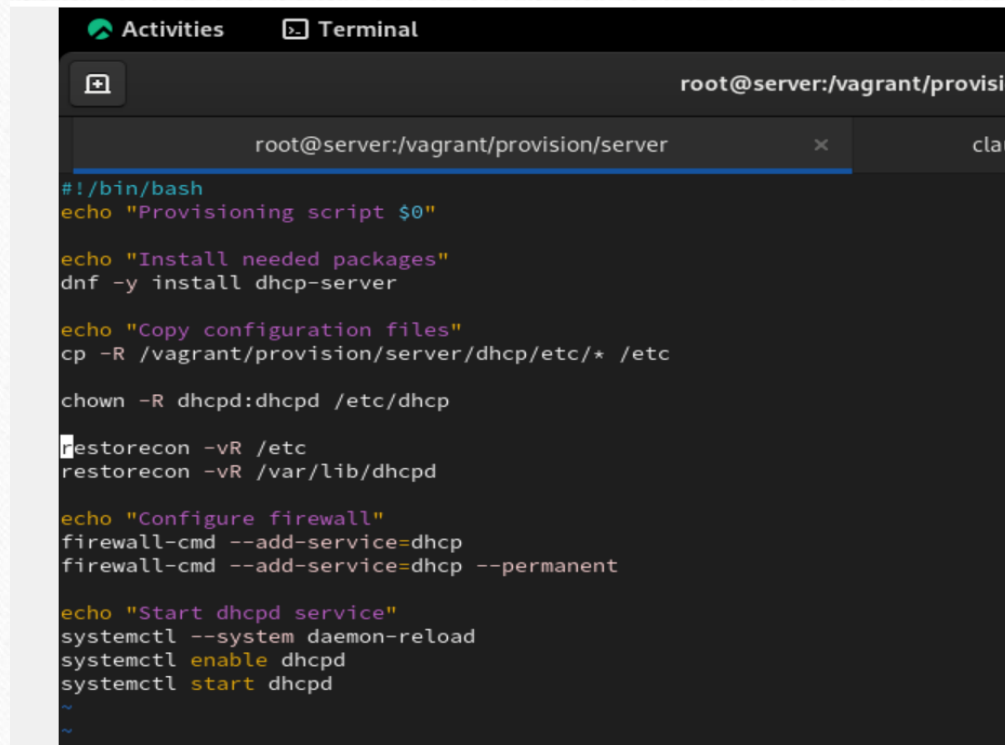
Рис. 4.3. Внесение изменений в конфигурационный файл `/etc/dhcp/dhcpd.conf`, добавив в него разрешение на динамическое обновление DNS-записей с локального узла прямой и обратной зон.

Анализ работы ДНСР-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

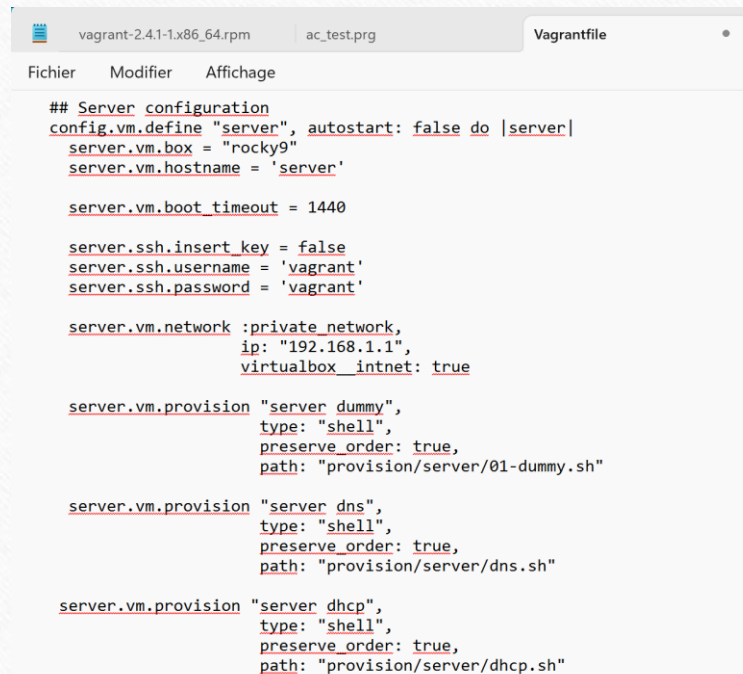
restorecon -vR /etc
restorecon -vR /var/lib/dhcpd

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 screenshot of a text editor window displaying a Vagrantfile. The window has three tabs: 'vagrant-2.4.1-1.x86_64.rpm', 'ac_test.prg', and 'Vagrantfile'. The 'Vagrantfile' tab is active. The editor has a menu bar with 'Fichier', 'Modifier', and 'Affichage'. The code is a Ruby configuration for a Vagrant virtual machine named 'server'. It defines the VM's box as 'rocky9', sets the hostname to 'server', and configures a private network with IP '192.168.1.1'. It also sets up three provisioners: 'dummy', 'dns', and 'dhcp', each with a specific shell script path.

```
## 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!