

Лабораторная работа 3

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Задача

1. Установите на виртуальной машине server DHCP-сервер (см. раздел 3.4.1).

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2. Настройте виртуальную машину server в качестве DHCP-сервера для виртуальной внутренней сети (см. раздел 3.4.2).

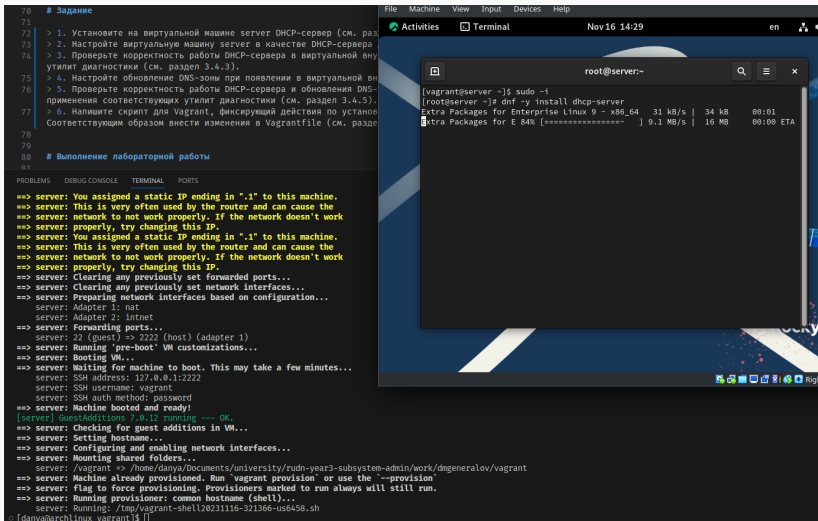
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3. Проверьте корректность работы DHCP-сервера в виртуальной внутренней сети путём запуска виртуальной машины client и применения соответствующих утилит диагностики (см. раздел 3.4.3).

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4. Настройте обновление DNS-зоны при появлении в виртуальной внутренней сети новых узлов (см. раздел 3.4.4).

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5. Проверьте корректность работы DHCP-сервера и обновления DNS-зоны в виртуальной внутренней сети путём запуска виртуальной машины client и применения соответствующих утилит диагностики (см. раздел 3.4.5).

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6. Напишите скрипт для Vagrant, фиксирующий действия по

Выполнение



```
70 # Задание
71
72 > 1. Установите на виртуальной машине server DHCP-сервер (см. раз
73 > 2. Настройте виртуальную машину server в качестве DHCP-сервера
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утилит диагностики (см. раздел 3.4.3).
75 > 4. Настройте обновление DNS-зоны при появлении в виртуальной ви
76 > 5. Проверьте корректность работы DHCP-сервера и обновления DNS-
применения соответствующих утилит диагностики (см. раздел 3.4.5).
77 > 6. Напишите скрипт для Vagrant, фиксирующий действия по установ
Соответствующим образом внести изменения в Vagrantfile (см. разде
78
79
80 # Выполнение лабораторной работы
81
PROBLEMS DEBUG CONSOLE TERMINAL PORTS
==> 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
==> server: Machine booted and ready!
[server] GuestAdditions 7.0.12 running --- OK...
==> server: Checking for guest additions in VM...
==> server: Setting hostname...
==> server: Configuring and enabling network interfaces...
==> server: Mounting shared folders...
server: /vagrant => /home/danya/Documents/university/ruon-year3-subsystem-admin/work/dmgeneralov/vagrant
==> server: Machine already provisioned. Run 'vagrant provision' or use the '--provision'
==> server: flag to force provisioning. Provisioners marked to run always will still run.
==> server: Running provisioner: common hostname (shell)...
server: Running: /tmp/vagrant-shell120231116-321366-us6458.sh
[danya@archlinux vagrant]$ ]]
```

```
File Machine View Input Devices Help
Activities Terminal Nov 16 14:29 en
root@server:~
[vagrant@server ~]$ sudo -i
[root@server ~]# dnf -y install dhcp-server
Extra Packages for Enterprise Linux 9 - x86_64 31 kB/s | 34 kB 00:01
Extra Packages for E 84% [===== ] 0.1 MB/s | 16 MB 00:00 ETA
```

Рис. 1: vagrant

```
GNU nano 5.6.1 /etc/dhcp/dhcpd.conf Modified
# dhcpd.conf
#
# Sample configuration file for ISC dhcpd
#
# option definitions common to all supported networks...
option domain-name "dmgeneralov.net";
option domain-name-servers ns1.dmgeneralov.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;
}
```

```
GNU nano 5.6.1 /etc/systemd/system/dhcpd.service Mod
[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 $DHCPDARGS
StandardError=null

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

Рис. 3: systemd

```
GNU nano 5.6.1 /var/named/master/fz/dmgeneralov.net
$TTL 1D
@      IN SOA  @ server.dmgeneralov.net. (
                                2023111600      ; serial
                                1D      ; refresh
                                1H      ; retry
                                1W      ; expire
                                3H )   ; minimum

      NS      @
      A      192.168.1.1
$ORIGIN dmgeneralov.net.

server A      192.168.1.1
ns     A      192.168.1.1
dhcp   A      192.168.1.1
```

Рис. 4: named

```
GNU nano 5.6.1 /var/named/master/rz/192.168.1
$TTL 1D
@ IN SOA @ server.dmgeneralov.net. (
                                2023111600 ; serial
                                1D      ; refresh
                                1H      ; retry
                                1W      ; expire
                                3H )    ; minimum

NS      @
A       192.168.1.1
PTR     server.dmgeneralov.net.

$ORIGIN 1.168.192.in-addr.arpa.
1 PTR   server.dmgeneralov.net.
1 PTR   ns.dmgeneralov.net.
1 PTR   dhcp.dmgeneralov.net.
```

Рис. 5: named

```
[root@server ~]# echo ^C
[root@server ~]# nano /var/named/master/fz/dmgeneralov.net
[root@server ~]# nano /var/named/master/rz/192.168.1
[root@server ~]# systemctl restart named
[root@server ~]# ping dhcp.dmgeneralov.net
PING dhcp.dmgeneralov.net (192.168.1.1) 56(84) bytes of data.
64 bytes from dhcp.dmgeneralov.net (192.168.1.1): icmp_seq=1 ttl=64 time=0.056 ms
64 bytes from dhcp.dmgeneralov.net (192.168.1.1): icmp_seq=2 ttl=64 time=0.045 ms
64 bytes from dhcp.dmgeneralov.net (192.168.1.1): icmp_seq=3 ttl=64 time=0.090 ms
64 bytes from ns.dmgeneralov.net (192.168.1.1): icmp_seq=4 ttl=64 time=0.046 ms
^C
--- dhcp.dmgeneralov.net ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3103ms
rtt min/avg/max/mdev = 0.045/0.059/0.090/0.018 ms
[root@server ~]#
```

Рис. 6: ping

```
[root@server ~]# systemctl start dhcpd
[root@server ~]# journalctl -f
Nov 16 14:46:16 server.user.net dhcpd[9774]: Copyright 2004-2019 Internet Systems Consortium.
Nov 16 14:46:16 server.user.net dhcpd[9774]: All rights reserved.
Nov 16 14:46:16 server.user.net dhcpd[9774]: For info, please visit https://www.isc.org/software/dhcp/
Nov 16 14:46:16 server.user.net dhcpd[9774]: Source compiled to use binary-leases
Nov 16 14:46:16 server.user.net dhcpd[9774]: Wrote 0 leases to leases file.
Nov 16 14:46:16 server.user.net dhcpd[9774]: Listening on LPF/eth1/08:00:27:25:4e:0e/192.168.1.0/24
Nov 16 14:46:16 server.user.net dhcpd[9774]: Sending on LPF/eth1/08:00:27:25:4e:0e/192.168.1.0/24
Nov 16 14:46:16 server.user.net dhcpd[9774]: Sending on Socket/fallback/fallback-net
Nov 16 14:46:16 server.user.net dhcpd[9774]: Server starting service.
Nov 16 14:46:16 server.user.net systemd[1]: Started DHCPv4 Server Daemon.
```

Рис. 7: dhcp


```
work > dmgeneralov > vagrant > provision > client > 01-routing.sh
1  #!/bin/bash
2
3  echo "Provisioning script $0"
4
5  nmcli connection modify "System eth1" ipv4.gateway "192.168.1.1"
6  nmcli connection up "System eth1"
7
8  nmcli connection modify eth0 ipv4.never-default true
9  nmcli connection modify eth0 ipv6.never-default true
10
11 nmcli connection down eth0
12 nmcli connection up eth0
13
14 # systemctl restart NetworkManager
15
```

Рис. 8: vagrant

```
work > dmgeneralov > vagrant > Vagrantfile
//                                     type: "nncp",
78                                     virtualbox__intnet: true
79
80     client.vm.provision "client dummy",
81                         type: "shell",
82                         preserve_order: true,
83                         path: "provision/client/01-dummy.sh"
84
85     client.vm.provision "client routing",
86                         type: "shell",
87                         preserve_order: true,
88                         run: "always",
89                         path: "provision/client/01-routing.sh"
90
91     client.vm.provider :virtualbox do |v|
92         v.linked_clone = true
```

Рис. 9: vagrant

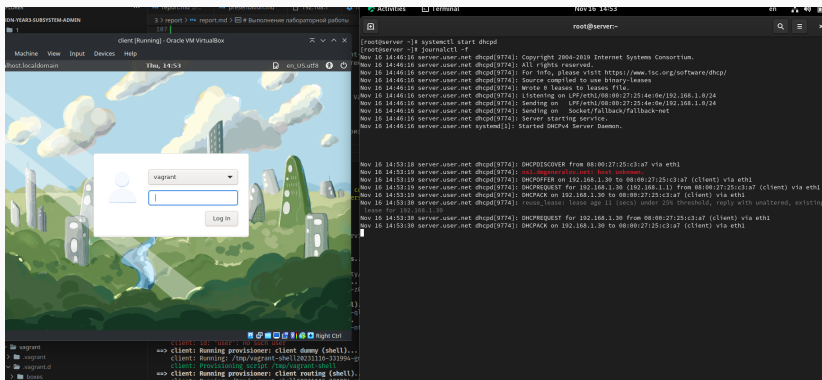
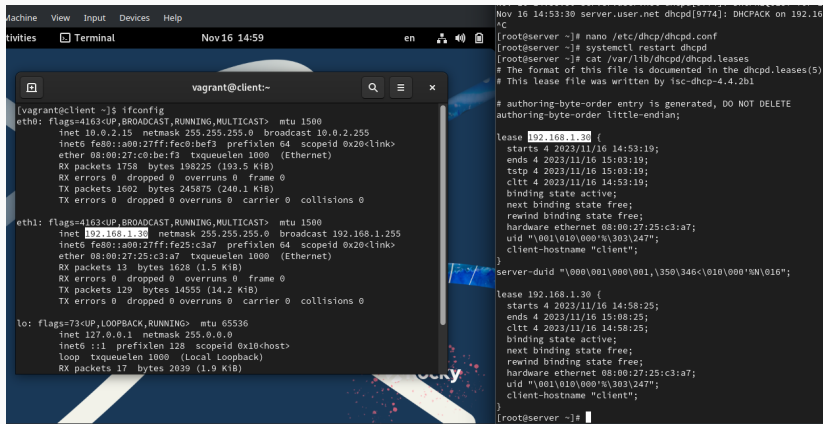


Рис. 10: dhcp



```

Machine View Input Devices Help
Activities Terminal Nov 16 14:59 en

vagrant@client:~
[vagrant@client ~]$ 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:fec0:bef3 prefixlen 64 scopeid 0x20<link>
    ether 08:00:27:c0:bef3 txqueuelen 1000 (Ethernet)
    RX packets 1758 bytes 198225 (193.5 KiB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 1602 bytes 245875 (240.1 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:fe25:c3a7 prefixlen 64 scopeid 0x20<link>
    ether 08:00:27:25:c3:a7 txqueuelen 1000 (Ethernet)
    RX packets 13 bytes 1628 (1.5 KiB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 129 bytes 14555 (14.2 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 2039 (1.9 KiB)

Nov 16 14:53:30 server.user.net dhcpd[9774]: DHCPACK on 192.16
^C
[root@server ~]# nano /etc/dhcp/dhcpd.conf
[root@server ~]# systemctl restart dhcpd
[root@server ~]# cat /var/lib/dhcpd/dhcpd.leases
# The format of this file is documented in the dhcpd.leases(5)
# 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;

lease 192.168.1.30 {
    starts 4 2023/11/16 14:53:19;
    ends 4 2023/11/16 15:03:19;
    tstp 4 2023/11/16 15:03:19;
    cltt 4 2023/11/16 14:53:19;
    binding state active;
    next binding state free;
    rewind binding state free;
    hardware ethernet 08:00:27:25:c3:a7;
    uid "\001\010\000'\N\303\247";
    client-hostname "client";
}
server-duid "\000\001\000\001,\350\346\010\000'\N\016";

lease 192.168.1.30 {
    starts 4 2023/11/16 14:58:25;
    ends 4 2023/11/16 15:08:25;
    cltt 4 2023/11/16 14:58:25;
    binding state active;
    next binding state free;
    rewind binding state free;
    hardware ethernet 08:00:27:25:c3:a7;
    uid "\001\010\000'\N\303\247";
    client-hostname "client";
}
[root@server ~]#

```

Рис. 11: dhcp

```
GNU nano 5.6.1 /etc/named/dmgeneralov.net
zone "dmgeneralov.net" IN {
    type master;
    file "master/fz/dmgeneralov.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. 12: named

```
GNU nano 5.6.1 /etc/dhcp/dhcpd.conf
# dhcpd.conf
#
# Sample configuration file for ISC dhcpd
#
# option definitions common to all supported networks...
option domain-name "dmgeneralov.net";
option domain-name-servers ns.dmgeneralov.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 "dmgeneralov.net.";
ddns-rev-domainname "in-addr.arpa.";

zone dmgeneralov.net. {
    primary 127.0.0.1;
}

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

# 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;
```

```

TX packets 129  bytes 14039 (14.2 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 2039 (2.0 KiB)
RX errors 0  dropped 0 overruns 0  frame 0
TX packets 17  bytes 2039 (2.0 KiB)
TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

[vagrant@client ~]$ sudo systemctl restart NetworkManager
[vagrant@client ~]$

Nov 16 15:06:04 server.user.net dhcpd[10125]: Database file: /var/lib/dhcpd/dhcpd.leases
Nov 16 15:06:04 server.user.net dhcpd[10125]: PID file: /var/run/dhcpd.pid
Nov 16 15:06:04 server.user.net dhcpd[10125]: Internet Systems Consortium DHCP Server 4.4.2b1
Nov 16 15:06:04 server.user.net dhcpd[10125]: Copyright 2004-2019 Internet Systems Consortium.
Nov 16 15:06:04 server.user.net dhcpd[10125]: All rights reserved.
Nov 16 15:06:04 server.user.net dhcpd[10125]: For info, please visit https://www.isc.org/software/dhcp/
Nov 16 15:06:04 server.user.net dhcpd[10125]: Source compiled to use binary-leases
Nov 16 15:06:04 server.user.net dhcpd[10125]: Wrote 1 leases to leases file.
Nov 16 15:06:04 server.user.net dhcpd[10125]: Listening on IPf/eth1/08:00:27:25:4e:0e/192.168.1.0/24
Nov 16 15:06:04 server.user.net dhcpd[10125]: Sending on  IPf/eth1/08:00:27:25:4e:0e/192.168.1.0/24
Nov 16 15:06:04 server.user.net dhcpd[10125]: Sending on  Socket/fallback/fallback-net
Nov 16 15:06:04 server.user.net dhcpd[10125]: Server starting service.
Nov 16 15:06:04 server.user.net systemd[1]: Started DHCPv4 Server Daemon.
Nov 16 15:07:23 server.user.net dhcpd[10125]: DHCPREQUEST for 192.168.1.30 from 08:00:27:25:c3:a7 (client) via eth1
Nov 16 15:07:23 server.user.net dhcpd[10125]: DHCPCACK on 192.168.1.30 to 08:00:27:25:c3:a7 (client) via eth1
Nov 16 15:07:23 server.user.net dhcpd[10125]: Added new forward map from client.dgeneratov.net. to 192.168.1.30
Nov 16 15:07:23 server.user.net dhcpd[10125]: Added reverse map from 30.1.168.192.in-addr.arpa. to client.dgeneratov.net.

```

Рис. 14: dhcp

```
agrant@client ~]$ dig @192.168.1.1 client.dmgeneralov.net

<<>> Dig 9.16.23-RH <<>> @192.168.1.1 client.dmgeneralov.net
(1 server found)
global options: +cmd
Got answer:
->>HEADER<<- opcode: QUERY, status: NOERROR, id: 28288
flags: qr aa rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 1

OPT PSEUDOSECTION:
EDNS: version: 0, flags:; udp: 1232
COOKIE: 01edcb33e562bc9d01000000655631a4db9c6d7b2222074a (good)
QUESTION SECTION:
client.dmgeneralov.net.          IN      A

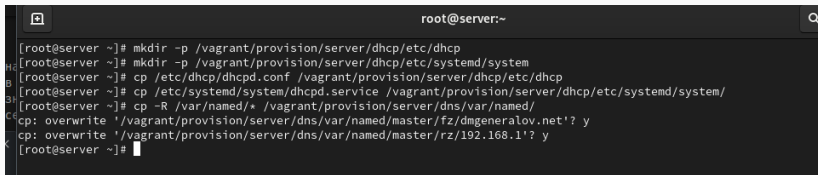
ANSWER SECTION:
client.dmgeneralov.net. 300      IN      A      192.168.1.30

Query time: 0 msec
SERVER: 192.168.1.1#53(192.168.1.1)
WHEN: Thu Nov 16 15:13:40 UTC 2023
MSG SIZE rcvd: 95

agrant@client ~]$
```


```
(root@server ~)# nano /etc/named
named/          named.conf          named.rfc1912.zones  named.root.key
(root@server ~)# nano /etc/named.conf
(root@server ~)# systemctl restart named
(root@server ~)# firewall-cmd --add-service dns --permanent
success
(root@server ~)# firewall-cmd --add-service dns
success
(root@server ~)# nano /etc/named.conf
(root@server ~)# systemctl restart named
(root@server ~)#
```

Рис. 15: dns



```
root@server:~  
[root@server ~]# mkdir -p /vagrant/provision/server/dhcp/etc/dhcp  
[root@server ~]# mkdir -p /vagrant/provision/server/dhcp/etc/systemd/system  
[root@server ~]# cp /etc/dhcp/dhcpd.conf /vagrant/provision/server/dhcp/etc/dhcp  
[root@server ~]# cp /etc/systemd/system/dhcpd.service /vagrant/provision/server/dhcp/etc/systemd/system/  
[root@server ~]# cp -R /var/named/* /vagrant/provision/server/dns/var/named/  
cp: overwrite '/vagrant/provision/server/dns/var/named/master/fz/dmgeneralov.net'? y  
cp: overwrite '/vagrant/provision/server/dns/var/named/master/rz/192.168.1'? y  
[root@server ~]#
```

Рис. 16: vagrant

```
work > dmgeneralov > vagrant > provision > server >  dhcp.sh
1  #!/bin/bash
2  echo "Provisioning script $0"
3  echo "Install needed packages"
4  dnf -y install dhcp-server
5  echo "Copy configuration files"
6  cp -R /vagrant/provision/server/dhcp/etc/* /etc
7  chown -R dhcpd:dhcpd /etc/dhcp
8  restorecon -vR /etc
9  restorecon -vR /var/lib/dhcpd
10 echo "Configure firewall"
11 firewall-cmd --add-service=dhcp
12 firewall-cmd --add-service=dhcp --permanent
13 echo "Start dhcpd service"
14 systemctl --system daemon-reload
15 systemctl enable dhcpd
16 systemctl start dhcpd
```

```
40     preserve_order: true,  
41     path: "provision/server/01-dummy.sh"  
42  
43     server.vm.provision "server dns",  
44         type: "shell",  
45         preserve_order: true,  
46         path: "provision/server/dns.sh"  
47  
48     server.vm.provision "server dhcp",  
49         type: "shell",  
50         preserve_order: true,  
51         path: "provision/server/dhcp.sh"  
52  
53  
54     server.vm.provider :virtualbox do |v|  
55         v.linked_clone = true  
56         # Customize the amount of memory on the VM  
57         v.memory = 1024
```

Рис. 18: vagrant

Я получил опыт настройки DHCP-сервера и подключения его к DNS-серверу для осуществления DDNS.