Лабораторная работа

Номер 7

Мошаров Д. М.

01 января 1970

Российский университет дружбы народов, Москва, Россия

Информация

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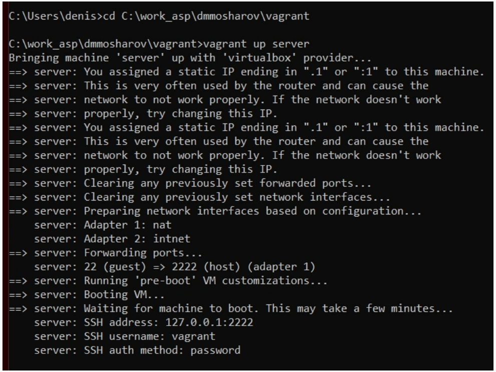
Цель работы

Получить навыки настройки межсетевого экрана в Linux в части переадресации портов и настройки Masquerading.

Запуск сервера

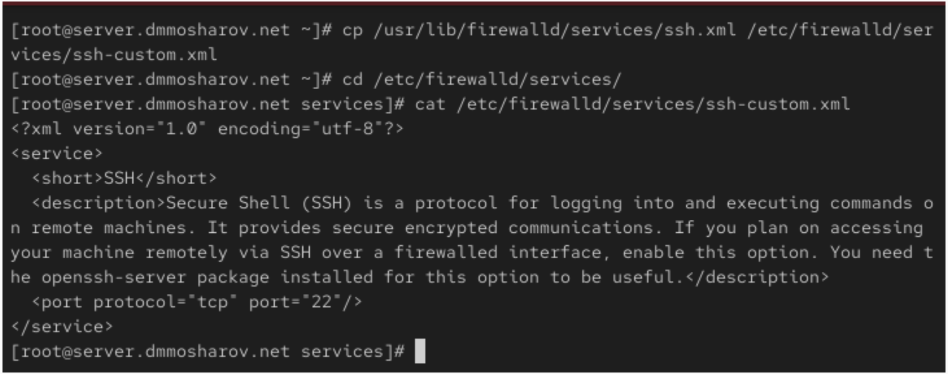


```
C:\Users\denis>cd C:\work_asp\dmmosharov\vagrant

C:\work_asp\dmmosharov\vagrant>vagrant up server
Bringing machine 'server' up with 'virtualbox' provider...
==> server: You assigned a static IP ending in ".1" or ":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" or ":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. 1: Запуск сервера

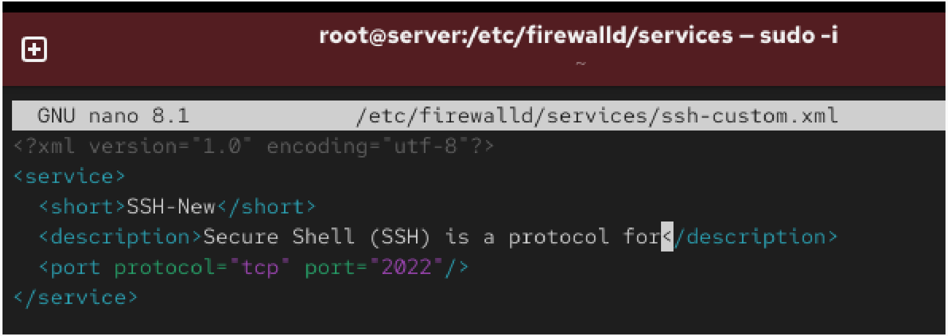
Копирование конфигурационного файла



```
[root@server.dmmosharov.net ~]# cp /usr/lib/firewalld/services/ssh.xml /etc/firewalld/ser
vices/ssh-custom.xml
[root@server.dmmosharov.net ~]# cd /etc/firewalld/services/
[root@server.dmmosharov.net services]# cat /etc/firewalld/services/ssh-custom.xml
<?xml version="1.0" encoding="utf-8"?>
<service>
  <short>SSH</short>
  <description>Secure Shell (SSH) is a protocol for logging into and executing commands o
n remote machines. It provides secure encrypted communications. If you plan on accessing
your machine remotely via SSH over a firewalled interface, enable this option. You need t
he openssh-server package installed for this option to be useful.</description>
  <port protocol="tcp" port="22"/>
</service>
[root@server.dmmosharov.net services]# 
```

Рис. 2: Копирование конфигурационного файла

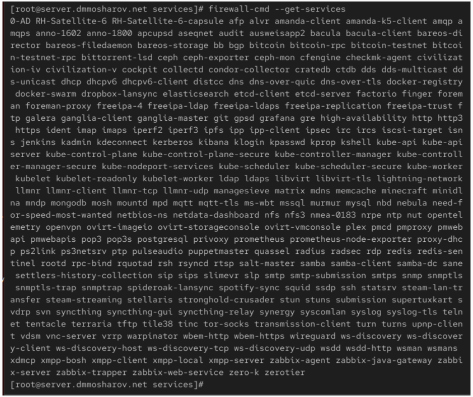
Редактирование файла /etc/firewalld/services/ssh-custom.xml



```
 GNU nano 8.1                   /etc/firewalld/services/ssh-custom.xml
<?xml version="1.0" encoding="utf-8"?>
<service>
  <short>SSH-New</short>
  <description>Secure Shell (SSH) is a protocol for</description>
  <port protocol="tcp" port="2022"/>
</service>
```

Рис. 3: Редактирование файла /etc/firewalld/services/ssh-custom.xml

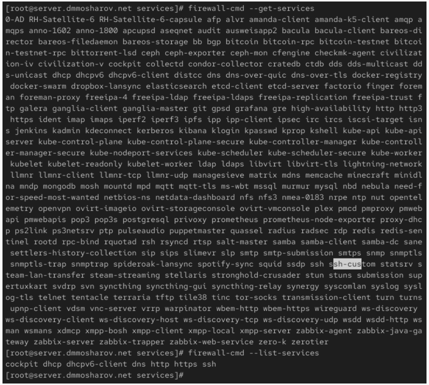
Список служб firewalld



```
[root@server.dmmosharov.net services]# firewall-cmd --get-services
0-AD RH-Satellite-6 RH-Satellite-6-capsule afp alvr amanda-client amanda-k5-client amqp a
mqps anno-1602 anno-1800 apcupsd aseqnet audit ausweisapp2 bacula bacula-client bareos-di
rector bareos-filedaemon bareos-storage bb bgp bitcoin bitcoin-rpc bitcoin-testnet bitcoi
n-testnet-rpc bittorrent-lsd ceph ceph-exporter ceph-mon cfengine checkmk-agent civilizat
ion-iv civilization-v cockpit collectd condor-collector cratedb ctdb dds dds-multicast dd
s-unicast dhcp dhcpv6 dhcpv6-client distcc dns dns-over-quic dns-over-tls docker-registry
 docker-swarm dropbox-lansync elasticsearch etcd-client etcd-server factorio finger forem
an foreman-proxy freeipa-4 freeipa-ldap freeipa-ldaps freeipa-replication freeipa-trust f
tp galera ganglia-client ganglia-master git gpsd grafana gre high-availability http http3
 https ident imap imaps iperf2 iperf3 ipfs ipp ipp-client ipsec irc ircs iscsi-target isn
s jenkins kadmin kdeconnect kerberos kibana klogin kpasswd kprop kshell kube-api kube-api
server kube-control-plane kube-control-plane-secure kube-controller-manager kube-controll
er-manager-secure kube-nodeport-services kube-scheduler kube-scheduler-secure kube-worker
 kubelet kubelet-readonly kubelet-worker ldap ldaps libvirt libvirt-tls lightning-network
 llmnr llmnr-client llmnr-tcp llmnr-udp managesieve matrix mdns memcache minecraft minidl
na mndp mongodb mosh mountd mpd mqtt mqtt-tls ms-wbt mssql murmur mysql nbd nebula need-f
or-speed-most-wanted netbios-ns netdata-dashboard nfs nfs3 nmea-0183 nrpe ntp nut opentel
emetry openvpn ovirt-imageio ovirt-storageconsole ovirt-vmconsole plex pmcd pmproxy pmweb
api pmwebapis pop3 pop3s postgresql privoxy prometheus prometheus-node-exporter proxy-dhc
p ps2link ps3netsrv ptp pulseaudio puppetmaster quassel radius radsec rdp redis redis-sen
tinel rootd rpc-bind rquotad rsh rsyncd rtsp salt-master samba samba-client samba-dc sane
 settlers-history-collection sip sips slimevr slp smtp smtp-submission smtps snmp snmptls
 snmptls-trap snmptrap spideroak-lansync spotify-sync squid ssdp ssh statsrv steam-lan-tr
ansfer steam-streaming stellaris stronghold-crusader stun stuns submission supertuxkart s
vdrp svn syncthing syncthing-gui syncthing-relay synergy syscomlan syslog syslog-tls teln
et tentacle terraria tftp tile38 tinc tor-socks transmission-client turn turns upnp-clien
t vdsm vnc-server vrrp warpinator wbem-http wbem-https wireguard ws-discovery ws-discover
y-client ws-discovery-host ws-discovery-tcp ws-discovery-udp wsdd wsdd-http wsman wsmans
xdmcp xmpp-bosh xmpp-client xmpp-local xmpp-server zabbix-agent zabbix-java-gateway zabbi
x-server zabbix-trapper zabbix-web-service zero-k zerotier
[root@server.dmmosharov.net services]#
```

Рис. 4: Список служб firewalld

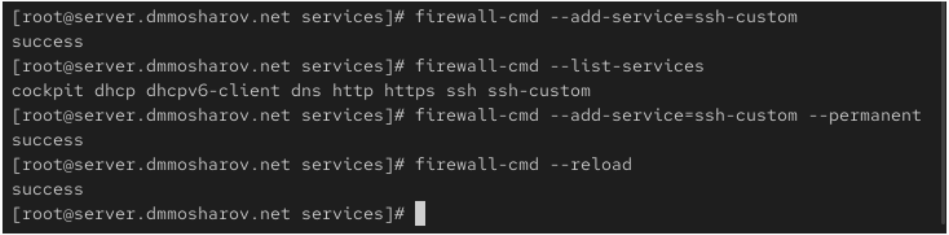
Списки служб



```
[root@server.dmmosharov.net services]# firewall-cmd --get-services
0-AD RH-Satellite-6 RH-Satellite-6-capsule afp alvr amanda-client amanda-k5-client amqp a
mqps anno-1602 anno-1800 apcupsd aseqnet audit ausweisapp2 bacula bacula-client bareos-di
rector bareos-filedaemon bareos-storage bb bgp bitcoin bitcoin-rpc bitcoin-testnet bitcoi
n-testnet-rpc bittorrent-lsd ceph ceph-exporter ceph-mon cfengine checkmk-agent civilizat
ion-iv civilization-v cockpit collectd condor-collector cratedb ctdb dds dds-multicast dd
s-unicast dhcp dhcpv6 dhcpv6-client distcc dns dns-over-quic dns-over-tls docker-registry
 docker-swarm dropbox-lansync elasticsearch etcd-client etcd-server factorio finger forem
an foreman-proxy freeipa-4 freeipa-ldap freeipa-ldaps freeipa-replication freeipa-trust f
tp galera ganglia-client ganglia-master git gpsd grafana gre high-availability http http3
 https ident imap imaps iperf2 iperf3 ipfs ipp ipp-client ipsec irc ircs iscsi-target isn
s jenkins kadmin kdeconnect kerberos kibana klogin kpasswd kprop kshell kube-api kube-api
server kube-control-plane kube-control-plane-secure kube-controller-manager kube-controll
er-manager-secure kube-nodeport-services kube-scheduler kube-scheduler-secure kube-worker
 kubelet kubelet-readonly kubelet-worker ldap ldaps libvirt libvirt-tls lightning-network
 llmnr llmnr-client llmnr-tcp llmnr-udp managesieve matrix mdns memcache minecraft minidl
na mndp mongodb mosh mountd mpd mqtt mqtt-tls ms-wbt mssql murmur mysql nbd nebula need-f
or-speed-most-wanted netbios-ns netdata-dashboard nfs nfs3 nmea-0183 nrpe ntp nut opentel
emetry openvpn ovirt-imageio ovirt-storageconsole ovirt-vmconsole plex pmcd pmproxy pmweb
api pmwebapis pop3 pop3s postgresql privoxy prometheus prometheus-node-exporter proxy-dhc
p ps2link ps3netsrv ptp pulseaudio puppetmaster quassel radius radsec rdp redis redis-sen
tinel rootd rpc-bind rquotad rsh rsyncd rtsp salt-master samba samba-client samba-dc sane
 settlers-history-collection sip sips slimevr slp smtp smtp-submission smtps snmp snmptls
 snmptls-trap snmptrap spideroak-lansync spotify-sync squid ssdp ssh ssh-custom statsrv s
team-lan-transfer steam-streaming stellaris stronghold-crusader stun stuns submission sup
ertuxkart svdrp svn syncthing syncthing-gui syncthing-relay synergy syscomlan syslog sysl
og-tls telnet tentacle terraria tftp tile38 tinc tor-socks transmission-client turn turns
 upnp-client vdsm vnc-server vrrp warpinator wbem-http wbem-https wireguard ws-discovery
ws-discovery-client ws-discovery-host ws-discovery-tcp ws-discovery-udp wsdd wsdd-http ws
man wsmans xdmcp xmpp-bosh xmpp-client xmpp-local xmpp-server zabbix-agent zabbix-java-ga
teway zabbix-server zabbix-trapper zabbix-web-service zero-k zerotier
[root@server.dmmosharov.net services]# firewall-cmd --list-services
cockpit dhcp dhcpv6-client dns http https ssh
[root@server.dmmosharov.net services]#
```

Рис. 5: Списки служб

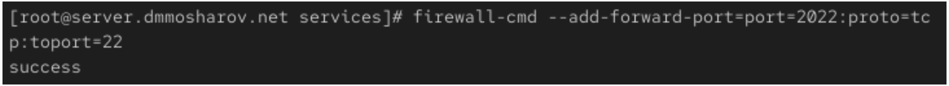
Добавление службы как активной



```
[root@server.dmmosharov.net services]# firewall-cmd --add-service=ssh-custom
success
[root@server.dmmosharov.net services]# firewall-cmd --list-services
cockpit dhcp dhcpv6-client dns http https ssh ssh-custom
[root@server.dmmosharov.net services]# firewall-cmd --add-service=ssh-custom --permanent
success
[root@server.dmmosharov.net services]# firewall-cmd --reload
success
[root@server.dmmosharov.net services]# 
```

Рис. 6: Добавление службы как активной

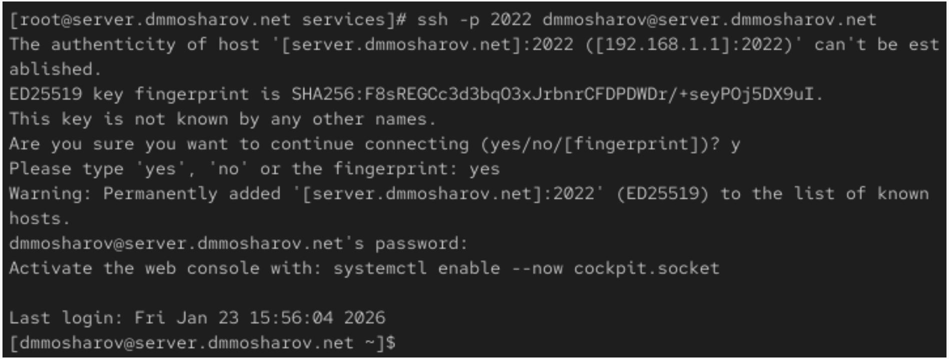
Форвардинг портов



```
[root@server.dmmosharov.net services]# firewall-cmd --add-forward-port=port=2022:proto=tc
p:toport=22
success
```

Рис. 7: Форвардинг портов

Подключение по ssh

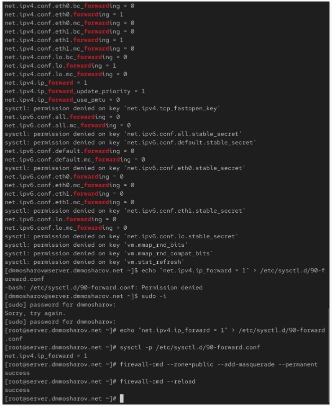


```
[root@server.dmmosharov.net services]# ssh -p 2022 dmmosharov@server.dmmosharov.net
The authenticity of host '[server.dmmosharov.net]:2022 ([192.168.1.1]:2022)' can't be est
ablished.
ED25519 key fingerprint is SHA256:F8sREGCc3d3bqO3xJrbnrCFDPDWDr/+seyPOj5DX9uI.
This key is not known by any other names.
Are you sure you want to continue connecting (yes/no/[fingerprint])? y
Please type 'yes', 'no' or the fingerprint: yes
Warning: Permanently added '[server.dmmosharov.net]:2022' (ED25519) to the list of known
hosts.
dmmosharov@server.dmmosharov.net's password:
Activate the web console with: systemctl enable --now cockpit.socket

Last login: Fri Jan 23 15:56:04 2026
[dmmosharov@server.dmmosharov.net ~]$
```

Рис. 8: Подключение по ssh

Включение перенаправления и маскарадинга



```
net.ipv4.conf.eth0.bc_forwarding = 0
net.ipv4.conf.eth0.forwarding = 1
net.ipv4.conf.eth0.mc_forwarding = 0
net.ipv4.conf.eth1.bc_forwarding = 0
net.ipv4.conf.eth1.forwarding = 1
net.ipv4.conf.eth1.mc_forwarding = 0
net.ipv4.conf.lo.bc_forwarding = 0
net.ipv4.conf.lo.forwarding = 1
net.ipv4.conf.lo.mc_forwarding = 0
net.ipv4.ip_forward = 1
net.ipv4.ip_forward_update_priority = 1
net.ipv4.ip_forward_use_pmtu = 0
sysctl: permission denied on key 'net.ipv4.tcp_fastopen_key'
net.ipv6.conf.all.forwarding = 0
net.ipv6.conf.all.mc_forwarding = 0
sysctl: permission denied on key 'net.ipv6.conf.all.stable_secret'
sysctl: permission denied on key 'net.ipv6.conf.default.stable_secret'
net.ipv6.conf.default.forwarding = 0
net.ipv6.conf.default.mc_forwarding = 0
sysctl: permission denied on key 'net.ipv6.conf.eth0.stable_secret'
net.ipv6.conf.eth0.forwarding = 0
net.ipv6.conf.eth0.mc_forwarding = 0
net.ipv6.conf.eth1.forwarding = 0
net.ipv6.conf.eth1.mc_forwarding = 0
sysctl: permission denied on key 'net.ipv6.conf.eth1.stable_secret'
net.ipv6.conf.lo.forwarding = 0
net.ipv6.conf.lo.mc_forwarding = 0
sysctl: permission denied on key 'net.ipv6.conf.lo.stable_secret'
sysctl: permission denied on key 'vm.mmap_rnd_bits'
sysctl: permission denied on key 'vm.mmap_rnd_compat_bits'
sysctl: permission denied on key 'vm.stat_refresh'
[dmmosharov@server.dmmosharov.net ~]$ echo "net.ipv4.ip_forward = 1" > /etc/sysctl.d/90-f
orward.conf
-bash: /etc/sysctl.d/90-forward.conf: Permission denied
[dmmosharov@server.dmmosharov.net ~]$ sudo -i
[sudo] password for dmmosharov:
Sorry, try again.
[sudo] password for dmmosharov:
[root@server.dmmosharov.net ~]# echo "net.ipv4.ip_forward = 1" > /etc/sysctl.d/90-forward
.conf
[root@server.dmmosharov.net ~]# sysctl -p /etc/sysctl.d/90-forward.conf
net.ipv4.ip_forward = 1
[root@server.dmmosharov.net ~]# firewall-cmd --zone=public --add-masquerade --permanent
success
[root@server.dmmosharov.net ~]# firewall-cmd --reload
success
[root@server.dmmosharov.net ~]# 
```

Рис. 9: Включение перенаправления и маскарадинга

Проверка доступа в интернет

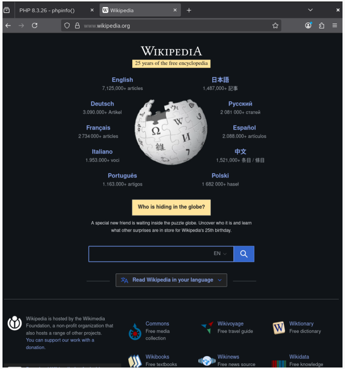


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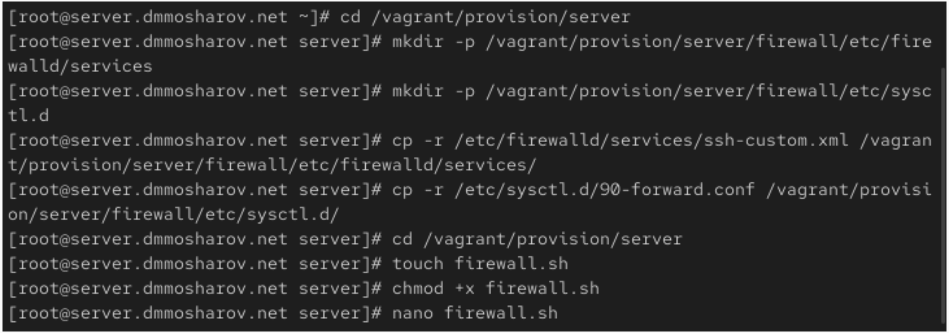
Рис. 10: Проверка доступа в интернет

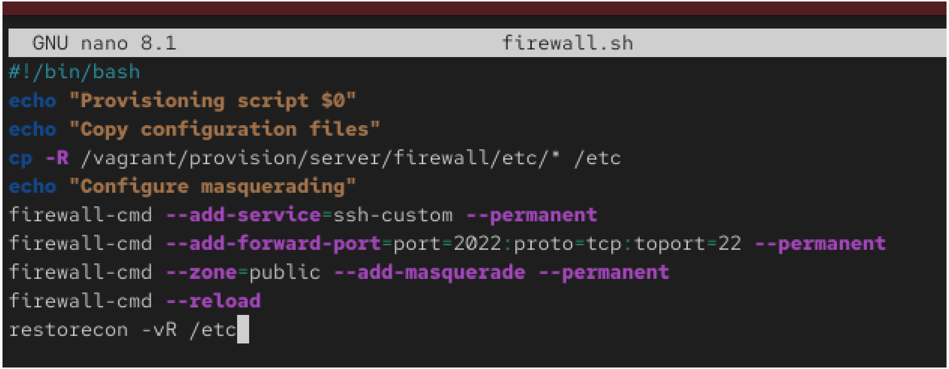
Сохранение конфигурации vagrant



```
[root@server.dmmosharov.net ~]# cd /vagrant/provision/server
[root@server.dmmosharov.net server]# mkdir -p /vagrant/provision/server/firewall/etc/fire
walld/services
[root@server.dmmosharov.net server]# mkdir -p /vagrant/provision/server/firewall/etc/sysc
tl.d
[root@server.dmmosharov.net server]# cp -r /etc/firewalld/services/ssh-custom.xml /vagran
t/provision/server/firewall/etc/firewalld/services/
[root@server.dmmosharov.net server]# cp -r /etc/sysctl.d/90-forward.conf /vagrant/provisi
on/server/firewall/etc/sysctl.d/
[root@server.dmmosharov.net server]# cd /vagrant/provision/server
[root@server.dmmosharov.net server]# touch firewall.sh
[root@server.dmmosharov.net server]# chmod +x firewall.sh
[root@server.dmmosharov.net server]# nano firewall.sh
```

Рис. 11: Сохранение конфигурации vagrant

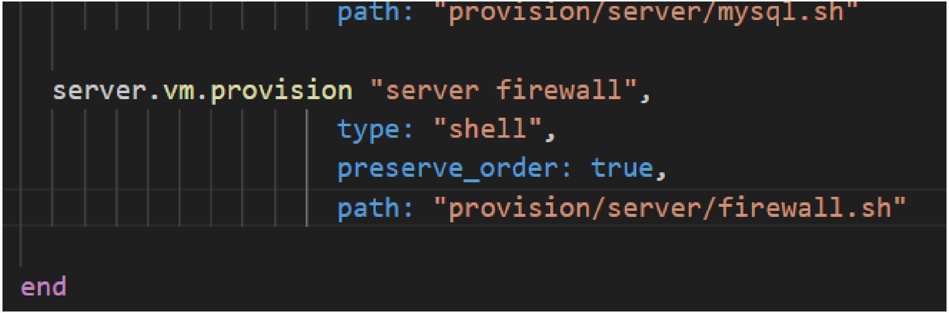
firewall.sh



```
  GNU nano 8.1                                       firewall.sh
#!/bin/bash
echo "Provisioning script $0"
echo "Copy configuration files"
cp -R /vagrant/provision/server/firewall/etc/* /etc
echo "Configure masquerading"
firewall-cmd --add-service=ssh-custom --permanent
firewall-cmd --add-forward-port=port=2022:proto=tcp:toport=22 --permanent
firewall-cmd --zone=public --add-masquerade --permanent
firewall-cmd --reload
restorecon -vR /etc
```

Рис. 12: firewall.sh

Vagrantfile



```
                    path: "provision/server/mysql.sh"

  server.vm.provision "server firewall",
                    type: "shell",
                    preserve_order: true,
                    path: "provision/server/firewall.sh"

end
```

Рис. 13: Vagrantfile

Выводы

В результате выполнения лабораторной работы были получены навыки работы с фаерволом и настройкой форвардинга и маскарадинга