Лабораторная работа №7

Дисциплина: Администрирование сетевых подсистем

Ибрахим Мохсейн Алькамаль

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Содержание I

Раздел 1

1. Цель работы

1.1 Цель работы

- Получение навыков настройки межсетевого экрана в Linux
- Реализация переадресации портов
- Настройка Masquerading

Раздел 2

2. Выполнение лабораторной работы

2.1 Создание пользовательской службы firewalld

- Выполнен переход в режим суперпользователя
- Скопирован файл `ssh.xml` в `ssh-custom.xml`
- Файл размещён в `/etc/firewalld/services/`

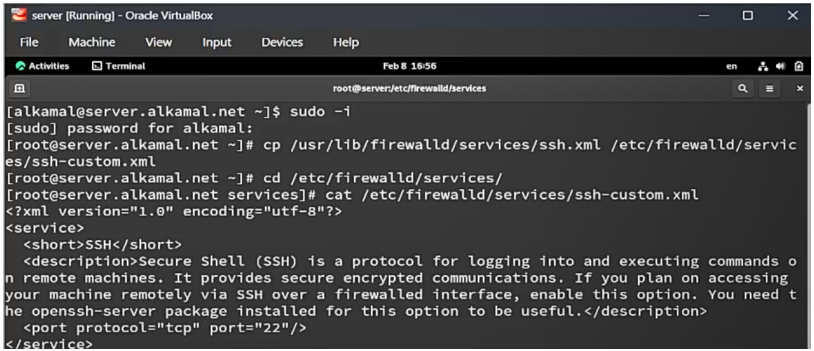


Рисунок 1: Копирование файла службы ssh.xml в ssh-custom.xml

- В файле изменён порт с 22 на 2022
- Обновлено описание службы
- Проверено содержимое файла

```
[root@server.alkamal.net services]# nano /etc/firewalld/services/ssh-custom.xml
[root@server.alkamal.net services]# cat /etc/firewalld/services/ssh-custom.xml
<?xml version="1.0" encoding="utf-8"?>
<service>
  <short>SSH</short>
  <description>Модифицированная служба SSH для доступа через порт TCP 2022 (лабораторная
работа №7)</description>
  <port protocol="tcp" port="2022"/>
</service>
```

Рисунок 2: Редактирование службы: изменение порта на 2022 и обновление описания

- Получен список служб `--get-services`
- Выполнена перезагрузка `firewall-cmd --reload`
- Служба `ssh-custom` добавлена в активные
- Добавлена в постоянную конфигурацию

```
[root@server.alkamal.net services]# firewall-cmd --get-services
RH-Satellite-6 RH-Satellite-6-capsule afp amanda-client amanda-k5-client amqp amqps apcup
sd audit ausweisapp2 bacula bacula-client bareos-director bareos-filedaemon bareos-storag
e bb bgp bitcoin bitcoin-rpc bitcoin-testnet bitcoin-testnet-rpc bittorrent-lsd ceph ceph
-exporter ceph-mon cfengine checkmk-agent cockpit collectd condor-collector cratedb ctdb
dds dds-multicast dds-unicast dhcp dhcpv6 dhcpv6-client distcc dns dns-over-tls docker-re
gistry 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 ht
tps ident imap imaps ipfs ipp ipp-client ipsec irc ircs iscsi-target isns jenkins kadmin
kdeconnect kerberos kibana klogin kpasswd kprop kshell kube-api kube-apiserver kube-contr
ol-plane kube-control-plane-secure kube-controller-manager kube-controller-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-clie
nt llmnr-tcp llmnr-udp managesieve matrix mdns memcache minidlna mongodb mosh mountd mqtt
 mqtt-tls ms-wbt mssql murmur mysql nbd nebula netbios-ns netdata-dashboard nfs nfs3 nmea
-0183 nrpe ntp nut opentelemetry openvpn ovirt-imageio ovirt-storageconsole ovirt-vmconso
le plex pmcd pmproxy pmwebapi pmwebapis pop3 pop3s postgresql privoxy prometheus promethe
us-node-exporter proxy-dhcp ps2link ps3netsrv ptp pulseaudio puppetmaster quassel radius
rdp redis redis-sentinel rootd rpc-bind rquotad rsh rsyncd rtsp salt-master samba samba-c
lient samba-dc sane sip sips slp smtp smtp-submission smtps snmp snmptls snmptls-trap snm
ptrap spideroak-lansync spotify-sync squid ssdp ssh steam-streaming svdrp svn syncthing s
yncthing-gui syncthing-relay synergy syslog syslog-tls telnet tentacle tftp tile38 tinc t
or-socks transmission-client upnp-client vdsm 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.alkamal.net services]# firewall-cmd --reload
success
```

```
success
[root@server.alkamal.net services]# firewall-cmd --get-services
RH-Satellite-6 RH-Satellite-6-capsule afp amanda-client amanda-k5-client amqp amqps apcup
sd audit ausweisapp2 bacula bacula-client bareos-director bareos-filedaemon bareos-storag
e bb bgp bitcoin bitcoin-rpc bitcoin-testnet bitcoin-testnet-rpc bittorrent-lsd ceph ceph
-exporter ceph-mon cfengine checkmk-agent cockpit collectd condor-collector cratedb ctdb
dds dds-multicast dds-unicast dhcp dhcpv6 dhcpv6-client distcc dns dns-over-tls docker-re
gistry 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 ht
tps ident imap imaps ipfs ipp ipp-client ipsec irc ircs iscsi-target isns jenkins kadmin
kdeconnect kerberos kibana klogin kpasswd kprop kshell kube-api kube-apiserver kube-contr
ol-plane kube-control-plane-secure kube-controller-manager kube-controller-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-clie
nt llmnr-tcp llmnr-udp managesieve matrix mdns memcache minidlna mongodb mosh mountd mqtt
 mqtt-tls ms-wbt mssql murmur mysql nbd nebula netbios-ns netdata-dashboard nfs nfs3 nmea
-0183 nrpe ntp nut opentelemetry openvpn ovirt-imageio ovirt-storageconsole ovirt-vmconso
le plex pmcd pmproxy pmwebapi pmwebapis pop3 pop3s postgresql privoxy prometheus promethe
us-node-exporter proxy-dhcp ps2link ps3netsrv ptp pulseaudio puppetmaster quassel radius
rdp redis redis-sentinel rootd rpc-bind rquotad rsh rsyncd rtsp salt-master samba samba-c
lient samba-dc sane sip sips slp smtp smtp-submission smtps snmp snmptls snmptls-trap snm
ptrap spideroak-lansync spotify-sync squid ssdp ssh ssh-custom steam-streaming svdrp svn
syncthing syncthing-gui syncthing-relay synergy syslog syslog-tls telnet tentacle tftp ti
le38 tinc tor-socks transmission-client upnp-client vdsm vnc-server warpinator wbem-http
wbem-https wireguard ws-discovery ws-discovery-client ws-discovery-tcp ws-discovery-udp w
sman wsmans xdmcp xmpp-bosh xmpp-client xmpp-local xmpp-server zabbix-agent zabbix-server
 zerotier
[root@server.alkamal.net services]# firewall-cmd --list-services
cockpit dhcp dhcpv6-client dns http https ssh
[root@server.alkamal.net services]# firewall-cmd --add-service=ssh-custom
success
[root@server.alkamal.net services]# firewall-cmd --list-services
cockpit dhcp dhcpv6-client dns http https ssh ssh-custom
[root@server.alkamal.net services]# firewall-cmd --add-service=ssh-custom --permanent
success
[root@server.alkamal.net services]# firewall-cmd --reload
success
```

2.2 Перенаправление портов

- Настроено правило перенаправления:
- 2022 → 22 (TCP)
- Правило добавлено в текущую конфигурацию

```
[root@server.alkamal.net services]# firewall-cmd --add-forward-port=port=2022:proto=tcp:t
oport=22
success
[root@server.alkamal.net services]#
```

Рисунок 5: Настройка перенаправления порта 2022 на 22 в firewalld

- С клиента выполнено подключение:
- `ssh -p 2022 alkamal@server.alkamal.net`
- Подтверждена успешная авторизация
- Проверена работа перенаправления

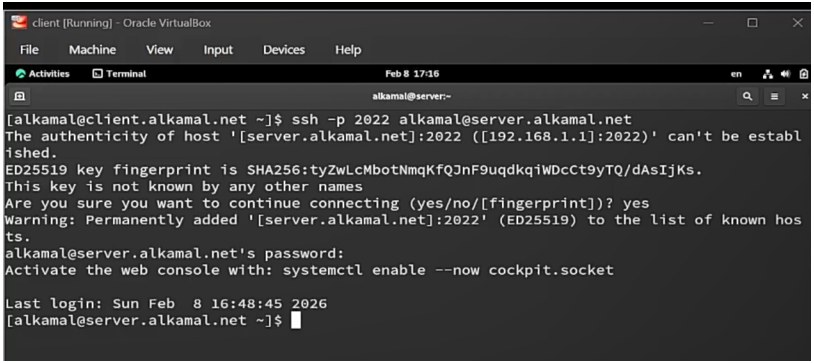


Рисунок 6: Подключение по SSH к серверу через порт 2022 с клиента

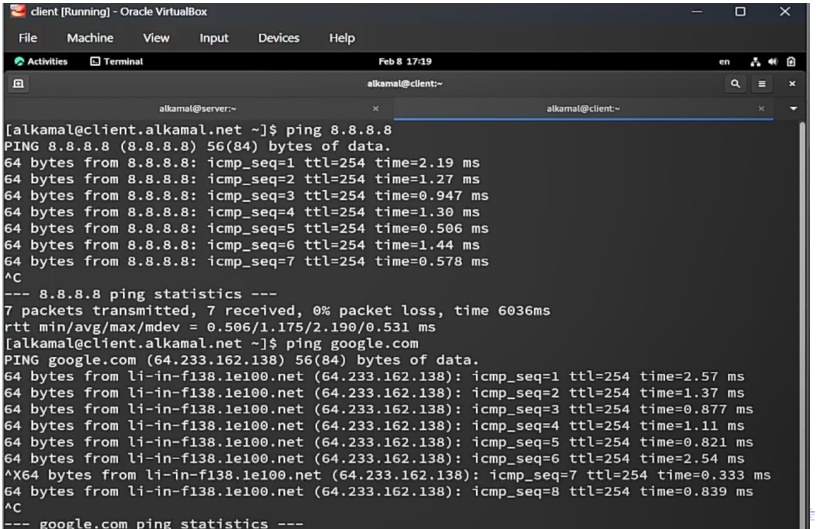
- Проверен параметр `net.ipv4.ip_forward`
- Значение — 0 (маршрутизация отключена)

```
[root@server.alkamal.net services]# sysctl -a | grep forward
net.ipv4.conf.all.bc_forwarding = 0
net.ipv4.conf.all.forwarding = 0
net.ipv4.conf.all.mc_forwarding = 0
net.ipv4.conf.default.bc_forwarding = 0
net.ipv4.conf.default.forwarding = 0
net.ipv4.conf.default.mc_forwarding = 0
net.ipv4.conf.eth0.bc_forwarding = 0
net.ipv4.conf.eth0.forwarding = 0
net.ipv4.conf.eth0.mc_forwarding = 0
net.ipv4.conf.eth1.bc_forwarding = 0
net.ipv4.conf.eth1.forwarding = 0
net.ipv4.conf.eth1.mc_forwarding = 0
net.ipv4.conf.lo.bc_forwarding = 0
net.ipv4.conf.lo.forwarding = 0
net.ipv4.conf.lo.mc_forwarding = 0
net.ipv4.ip_forward = 0
net.ipv4.ip_forward_update_priority = 1
net.ipv4.ip_forward_use_pmtu = 0
net.ipv6.conf.all.forwarding = 0
net.ipv6.conf.all.mc_forwarding = 0
net.ipv6.conf.default.forwarding = 0
net.ipv6.conf.default.mc_forwarding = 0
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
net.ipv6.conf.lo.forwarding = 0
net.ipv6.conf.lo.mc_forwarding = 0
[root@server.alkamal.net services]# echo "net.ipv4.ip_forward = 1" > /etc/sysctl.d/90-for
ward.conf
[root@server.alkamal.net services]# sysctl -p /etc/sysctl.d/90-forward.conf
net.ipv4.ip_forward = 1
```

- Создан файл `/etc/sysctl.d/90-forward.conf`
- Установлено `net.ipv4.ip_forward = 1`
- Применена конфигурация `sysctl -p`
- Включён masquerade в зоне `public`
- Выполнен `firewall-cmd --reload`

```
[root@server.alkamal.net services]# sysctl -a | grep forward
net.ipv4.conf.all.bc_forwarding = 0
net.ipv4.conf.all.forwarding = 0
net.ipv4.conf.all.mc_forwarding = 0
net.ipv4.conf.default.bc_forwarding = 0
net.ipv4.conf.default.forwarding = 0
net.ipv4.conf.default.mc_forwarding = 0
net.ipv4.conf.eth0.bc_forwarding = 0
net.ipv4.conf.eth0.forwarding = 0
net.ipv4.conf.eth0.mc_forwarding = 0
net.ipv4.conf.eth1.bc_forwarding = 0
net.ipv4.conf.eth1.forwarding = 0
net.ipv4.conf.eth1.mc_forwarding = 0
net.ipv4.conf.lo.bc_forwarding = 0
net.ipv4.conf.lo.forwarding = 0
net.ipv4.conf.lo.mc_forwarding = 0
net.ipv4.ip_forward = 0
net.ipv4.ip_forward_update_priority = 1
net.ipv4.ip_forward_use_pmtu = 0
net.ipv6.conf.all.forwarding = 0
net.ipv6.conf.all.mc_forwarding = 0
net.ipv6.conf.default.forwarding = 0
net.ipv6.conf.default.mc_forwarding = 0
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
```

- С клиента выполнены `ping 8.8.8.8` и `ping google.com`
- Потерь пакетов нет
- Подтверждён выход в Интернет через сервер



2.3 Внесение изменений в настройки внутреннего

- Созданы каталоги:
- `firewall/etc/firewalld/services`
- `firewall/etc/sysctl.d`
- Скопированы `ssh-custom.xml` и `90-forward.conf`

```
[root@server.alkamal.net services]# cd /vagrant/provision/server
[root@server.alkamal.net server]# mkdir -p /vagrant/provision/server/firewall/etc/firewal
ld/services
[root@server.alkamal.net server]# mkdir -p /vagrant/provision/server/firewall/etc/sysctl.
d
[root@server.alkamal.net server]# cp -r /etc/firewalld/services/ssh-custom.xml /vagrant/p
rovision/server/firewall/etc/firewalld/services/
[root@server.alkamal.net server]# cp -r /etc/sysctl.d/90-forward.conf /vagrant/provision/
server/firewall/etc/sysctl.d/
[root@server.alkamal.net server]# cd /vagrant/provision/server
[root@server.alkamal.net server]# touch firewall.sh
[root@server.alkamal.net server]# chmod +x firewall.sh
[root@server.alkamal.net server]# nano firewall.sh
```

Рисунок 10: Создание структуры каталогов и копирование конфигурационных файлов FirewallD

- Создан скрипт `firewall.sh`
- Реализовано:
- копирование конфигураций в `/etc`
- добавление службы `ssh-custom`
- перенаправление `2022` → `22`
- включение masquerade
- перезагрузка firewalld
- восстановление SELinux-контекстов

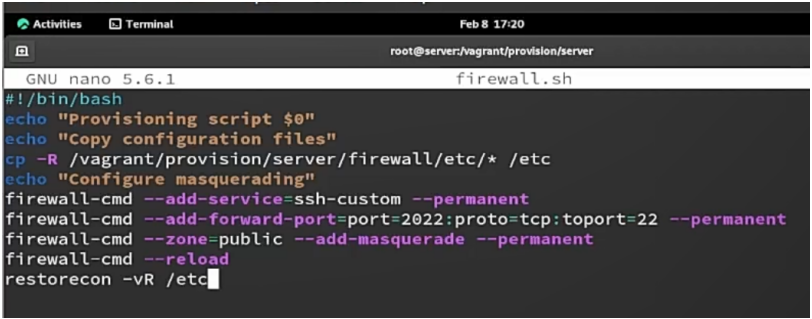


Рисунок 11: Содержимое provisioning-скрипта firewall.sh

- В `Vagrantfile` добавлен provision-блок
- Тип `shell`
- Путь `provision/server/firewall.sh`
- Указан `preserve_order: true`

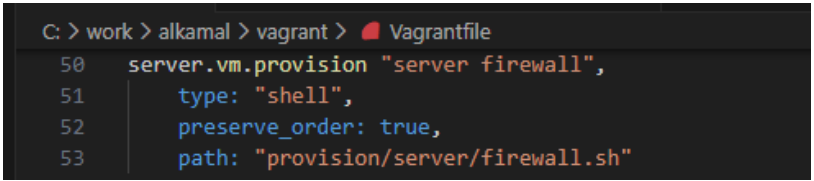


Рисунок 12: Добавление provisioning-скрипта firewall.sh в Vagrantfile

Раздел 3

3. Выводы

3.1 Выводы

- Создана пользовательская служба `ssh-custom` (порт 2022)
- Реализовано перенаправление `2022` → `22`
- Подтверждён SSH-доступ через нестандартный порт
- Включена маршрутизация IPv4 (`ip_forward = 1`)
- Настроен masquerading в зоне `public`
- Подтверждён выход клиента в Интернет через сервер
- Реализована автоматизация через `firewall.sh` и `Vagrantfile`