UC: Segurança em Redes

TP5a Report – Práticas com Firewalls (IPTables)

Students (N° / Name):

- **72362 – Miguel Costa**
- **74413 – Gonçalo Pereira**
- **74014 – Nuno Vieira**
- **75280 – José Silva**
- **76234 – Matias Araújo**

Material

1. Máquinas Virtuais VirtualBox CentOS 6.8 e Khali/XubunCore

Ambas configuradas com dois Network Adapters, um NAT e uma Internal Network.

NAT para ter acesso à internet.

Internal Network para a máquina Guest Khali/Core e a máquina Server CentOS poderem comunicar por endereços IP definidos manualmente(172.16.1.1 - Kalhi/Core, 172.16.1.2 - CentOS), usando os seguintes comandos:

- ip addr add 172.16.1.x dev <interface>
- ifconfig <interface> 172.16.1.x netmask 255.255.255.0

Tarefa 1

1. Resultado do comando netstat -l, resultados semelhantes para todos os membros do grupo.

```
Active Internet connections (only servers)
Proto Recv-Q Send-Q Local Address               Foreign Address             State
tcp        0      0 *:sunrpc                    *:*                         LISTEN
tcp        0      0 *:40018                     *:*                         LISTEN
tcp        0      0 *:ftp                       *:*                         LISTEN
tcp        0      0 *:ssh                       *:*                         LISTEN
tcp        0      0 localhost:ipp               *:*                         LISTEN
tcp        0      0 localhost:smtp              *:*                         LISTEN
tcp        0      0 *:36130                     *:*                         LISTEN
tcp        0      0 *:sunrpc                    *:*                         LISTEN
tcp        0      0 *:http                      *:*                         LISTEN
tcp        0      0 *:ssh                       *:*                         LISTEN
tcp        0      0 localhost:ipp               *:*                         LISTEN
tcp        0      0 localhost:smtp              *:*                         LISTEN
udp        0      0 *:sunrpc                    *:*
udp        0      0 *:42225                     *:*
udp        0      0 *:ipp                       *:*
udp        0      0 *:tenfold                   *:*
udp        0      0 *:bootpc                    *:*
udp        0      0 localhost:719               *:*
udp        0      0 *:sunrpc                    *:*
udp        0      0 *:tenfold                   *:*
udp        0      0 *:36688                     *:*
```

2. A firewall por predefinição encontrava-se ligada.
3.
    a. Obteve-se os mesmos resultados para todos os membros

```
[jpvs@jpvs ~]$ sudo iptables -L -v
Chain INPUT (policy ACCEPT 0 packets, 0 bytes)
 pkts bytes target     prot opt in     out     source               destination
    0     0 ACCEPT     all  --  any    any     anywhere             anywhere            state RELATED,ESTABLISHED
    0     0 ACCEPT     icmp --  any    any     anywhere             anywhere
    0     0 ACCEPT     all  --  lo     any     anywhere             anywhere
    0     0 ACCEPT     tcp  --  any    any     anywhere             anywhere            state NEW tcp dpt:ssh
    0     0 REJECT     all  --  any    any     anywhere             anywhere            reject-with icmp-host-prohibited

Chain FORWARD (policy ACCEPT 0 packets, 0 bytes)
 pkts bytes target     prot opt in     out     source               destination
    0     0 REJECT     all  --  any    any     anywhere             anywhere            reject-with icmp-host-prohibited

Chain OUTPUT (policy ACCEPT 0 packets, 0 bytes)
 pkts bytes target     prot opt in     out     source               destination
```

    b. Podemos observar que a firewall aceita qualquer pedido de ssh.

    Em termos de nível de segurança, a firewall rejeita pacotes que não pertençam a uma sessão criada (sequência de pacotes enviados-recebidos).

4. Conteúdo do ficheiro iptables.dump

```
# Generated by iptables-save v1.4.7 on Fri Dec 22 22:25:22 2017
*filter
:INPUT ACCEPT [0:0]
:FORWARD ACCEPT [0:0]
:OUTPUT ACCEPT [1034:107423]
-A INPUT -m state --state RELATED,ESTABLISHED -j ACCEPT
-A INPUT -p icmp -j ACCEPT
-A INPUT -i lo -j ACCEPT
-A INPUT -p tcp -m state --state NEW -m tcp --dport 22 -j ACCEPT
-A INPUT -j REJECT --reject-with icmp-host-prohibited
-A FORWARD -j REJECT --reject-with icmp-host-prohibited
COMMIT
# Completed on Fri Dec 22 22:25:22 2017
~
```

5. As iptables ficaram com o seguinte conteúdo após ter-se desligado a firewall, ou seja, deixam passar e aceitar tudo o que é tráfego na rede pelo que não é seguro.

```
[jpvs@jpvs ~]$ sudo iptables -L -v
Chain INPUT (policy ACCEPT 0 packets, 0 bytes)
 pkts bytes target     prot opt in     out     source               destination

Chain FORWARD (policy ACCEPT 0 packets, 0 bytes)
 pkts bytes target     prot opt in     out     source               destination

Chain OUTPUT (policy ACCEPT 0 packets, 0 bytes)
 pkts bytes target     prot opt in     out     source               destination
```

Tarefa 2

1. O comando de ping para o server teve o seguinte resultado

```
core@XubunCORE:~$ ping 188.82.220.124
PING 188.82.220.124 (188.82.220.124) 56(84) bytes of data.
64 bytes from 188.82.220.124: icmp_req=1 ttl=63 time=1.17 ms
64 bytes from 188.82.220.124: icmp_req=2 ttl=63 time=1.01 ms
64 bytes from 188.82.220.124: icmp_req=3 ttl=63 time=1.16 ms
64 bytes from 188.82.220.124: icmp_req=4 ttl=63 time=0.950 ms
64 bytes from 188.82.220.124: icmp_req=5 ttl=63 time=0.991 ms
64 bytes from 188.82.220.124: icmp_req=6 ttl=63 time=0.702 ms
^C
--- 188.82.220.124 ping statistics ---
6 packets transmitted, 6 received, 0% packet loss, time 5007ms
```

2. O comando nmap dá-nos os serviços ativos no server e conforme a figura seguinte temos o serviço de ssh ativo na porta 22

```
core@XubunCORE:~$ sudo nmap -sS 172.16.1.2

Starting Nmap 5.21 ( http://nmap.org ) at 2017-12-22 23:35 WET
Nmap scan report for 172.16.1.2
Host is up (0.00020s latency).
Not shown: 999 filtered ports
PORT   STATE SERVICE
22/tcp open  ssh
MAC Address: 08:00:27:90:7C:D6 (Cadmus Computer Systems)

Nmap done: 1 IP address (1 host up) scanned in 5.13 seconds
```

3. Após o comando w3m http://172.16.1.2 obtivemos o seguinte. Tal resultado é explicado pelo motivo de não termos autorizado na firewall o protocolo de http como input no server.

```
core@XubunCORE:~$ w3m http://172.16.1.2
w3m: Can't load http://172.16.1.2.
```

4. A resposta do servidor foi a seguinte e pelo mesmo motivo que na anterior alínea, não demos autorização na firewall do servidor ao protocolo ftp. Pelo que não conseguimos aceder ao servidor.

```
core@XubunCORE:~$ ftp 172.16.1.2
ftp: connect: No route to host
```

5. Não conseguimos aceder ao servidor.

```
core@XubunCORE:~$ ssh 172.16.1.2
The authenticity of host '172.16.1.2 (172.16.1.2)' can't be established.
RSA key fingerprint is fa:00:cb:53:e5:bb:9b:b0:e6:c6:2a:35:bc:b6:49:37.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added '172.16.1.2' (RSA) to the list of known hosts.
core@172.16.1.2's password:
Permission denied, please try again.
core@172.16.1.2's password:
Permission denied, please try again.
core@172.16.1.2's password:
Permission denied (publickey,gssapi-keyex,gssapi-with-mic,password).
```

Tarefa 3

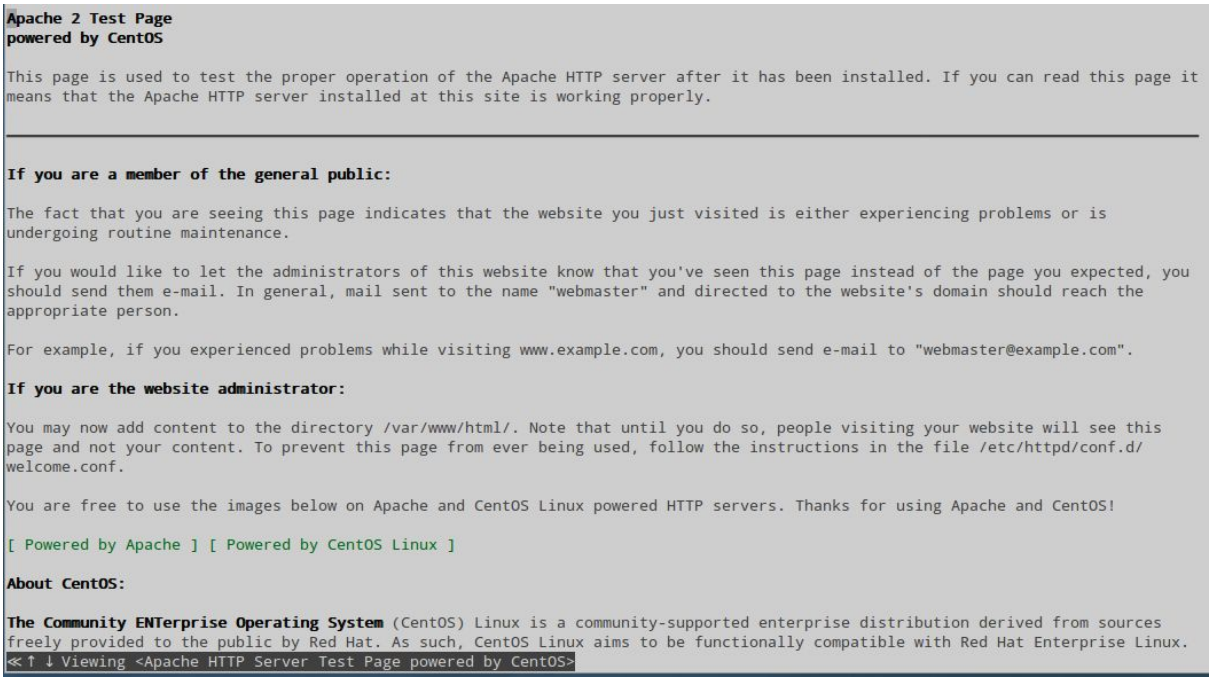
2. Após a alteração das regras da firewall obtivemos a seguinte iptable. Podemos observar que agora podemos aceitar tráfego http e ftp vindos de fora e rejeitamos pedidos de echo, ou seja, pedidos de ping.

```
[jpvs@jpvs ~]$ sudo iptables -L -v
Chain INPUT (policy ACCEPT 0 packets, 0 bytes)
 pkts bytes target     prot opt in     out     source               destination
    0     0 ACCEPT     all  --  any    any     anywhere             anywhere            state RELATED,ESTABLISHED
    0     0 REJECT     icmp --  any    any     anywhere             anywhere            icmp echo-request reject-with icmp-ho
st-prohibited
    0     0 ACCEPT     icmp --  any    any     anywhere             anywhere
    0     0 ACCEPT     all  --  lo     any     anywhere             anywhere
    0     0 ACCEPT     tcp  --  any    any     anywhere             anywhere            state NEW tcp dpt:ssh
    0     0 ACCEPT     tcp  --  any    any     anywhere             anywhere            state NEW tcp dpt:http
    0     0 ACCEPT     tcp  --  any    any     anywhere             anywhere            state NEW tcp dpt:ftp
    0     0 REJECT     all  --  any    any     anywhere             anywhere            reject-with icmp-host-prohibited

Chain FORWARD (policy ACCEPT 0 packets, 0 bytes)
 pkts bytes target     prot opt in     out     source               destination
    0     0 REJECT     all  --  any    any     anywhere             anywhere            reject-with icmp-host-prohibited

Chain OUTPUT (policy ACCEPT 0 packets, 0 bytes)
 pkts bytes target     prot opt in     out     source               destination
```

3. Uma vez que os pedidos de ping são rejeitados podemos dizer que o resultado obtido foi dentro do esperado.

```
core@XubunCORE:~$ ping 172.16.1.2
PING 172.16.1.2 (172.16.1.2) 56(84) bytes of data.
From 172.16.1.2 icmp_seq=1 Destination Host Prohibited
From 172.16.1.2 icmp_seq=2 Destination Host Prohibited
From 172.16.1.2 icmp_seq=3 Destination Host Prohibited
From 172.16.1.2 icmp_seq=4 Destination Host Prohibited
From 172.16.1.2 icmp_seq=5 Destination Host Prohibited
^C
--- 172.16.1.2 ping statistics ---
5 packets transmitted, 0 received, +5 errors, 100% packet loss, time 3997ms
```

4. Como visto na tarefa 2 com o comando w3m não conseguimos observar nenhuma página, pelo que agora obtivemos a seguinte página:



5. Com o user anonymous foi possível entrar em comunicação ftp

```
core@XubunCORE:~$ ftp 172.16.1.2
Connected to 172.16.1.2.
220 (vsFTPd 2.2.2)
Name (172.16.1.2:core): anonymous
331 Please specify the password.
Password:
230 Login successful.
Remote system type is UNIX.
Using binary mode to transfer files.
ftp> ls
200 PORT command successful. Consider using PASV.
150 Here comes the directory listing.
drwxr-xr-x    2 0        0            4096 Mar 22  2017 pub
226 Directory send OK.
```

6. Podemos observar que os serviços de ftp e http estão ativos. Uma vez com o ftp o nível de segurança diminuiu, pois qualquer IP consegue enviar pedidos FTP sem autenticação.

```
core@XubunCORE:~$ sudo nmap -sS 172.16.1.2

Starting Nmap 5.21 ( http://nmap.org ) at 2017-12-23 16:11 WET
Nmap scan report for 172.16.1.2
Host is up (0.00029s latency).
Not shown: 997 filtered ports
PORT   STATE SERVICE
21/tcp open  ftp
22/tcp open  ssh
80/tcp open  http
MAC Address: 08:00:27:90:7C:D6 (Cadmus Computer Systems)

Nmap done: 1 IP address (1 host up) scanned in 5.00 seconds
```

7. Podemos observar que o número de pacotes que chegaram ao servidor aumentou. Conforme os pedidos realizados ao longo desta tarefa podemos observar que filtrou 54 pedidos de ping e que para o ssh, http e ftp foram chegado pacotes devido às tarefas realizadas.

```
[jpvs@jpvs ~]$ sudo iptables -A INPUT -j LOG
[jpvs@jpvs ~]$ sudo iptables -L -v
Chain INPUT (policy ACCEPT 0 packets, 0 bytes)
 pkts bytes target     prot opt in     out     source               destination
   25  8200 LOG        all  --  any    any     anywhere             anywhere            LOG level warning
 3528 2560K ACCEPT     all  --  any    any     anywhere             anywhere            state RELATED,ESTABLISHED
   54  4536 REJECT     icmp --  any    any     anywhere             anywhere            icmp echo-request reject-with icmp-ho
st-prohibited
    0     0 ACCEPT     icmp --  any    any     anywhere             anywhere
    4   218 ACCEPT     all  --  lo     any     anywhere             anywhere
    1    44 ACCEPT     tcp  --  any    any     anywhere             anywhere            state NEW tcp dpt:ssh
    2   104 ACCEPT     tcp  --  any    any     anywhere             anywhere            state NEW tcp dpt:http
    6   344 ACCEPT     tcp  --  any    any     anywhere             anywhere            state NEW tcp dpt:ftp
 2482  235K REJECT     all  --  any    any     anywhere             anywhere            reject-with icmp-host-prohibited
    0     0 LOG        all  --  any    any     anywhere             anywhere            LOG level warning

Chain FORWARD (policy ACCEPT 0 packets, 0 bytes)
 pkts bytes target     prot opt in     out     source               destination
    0     0 REJECT     all  --  any    any     anywhere             anywhere            reject-with icmp-host-prohibited

Chain OUTPUT (policy ACCEPT 0 packets, 0 bytes)
 pkts bytes target     prot opt in     out     source               destination
```

Conclusão

Ativando a função de log do iptables para o input ficamos com a seguinte iptable. O comando utilizado foi iptables -A INPUT -j LOG, porque queremos que seja feito para todas regras de input.

```
[jpvs@jpvs ~]$ sudo iptables -A INPUT -j LOG
[jpvs@jpvs ~]$ sudo iptables -L -v
Chain INPUT (policy ACCEPT 0 packets, 0 bytes)
 pkts bytes target     prot opt in     out     source               destination
   25  8200 LOG        all  --  any    any     anywhere             anywhere            LOG level warning
 3528 2560K ACCEPT     all  --  any    any     anywhere             anywhere            state RELATED,ESTABLISHED
   54  4536 REJECT     icmp --  any    any     anywhere             anywhere            icmp echo-request reject-with icmp-ho
st-prohibited
    0     0 ACCEPT     icmp --  any    any     anywhere             anywhere
    4   218 ACCEPT     all  --  lo     any     anywhere             anywhere
    1    44 ACCEPT     tcp  --  any    any     anywhere             anywhere            state NEW tcp dpt:ssh
    2   104 ACCEPT     tcp  --  any    any     anywhere             anywhere            state NEW tcp dpt:http
    6   344 ACCEPT     tcp  --  any    any     anywhere             anywhere            state NEW tcp dpt:ftp
 2482  235K REJECT     all  --  any    any     anywhere             anywhere            reject-with icmp-host-prohibited
    0     0 LOG        all  --  any    any     anywhere             anywhere            LOG level warning

Chain FORWARD (policy ACCEPT 0 packets, 0 bytes)
 pkts bytes target     prot opt in     out     source               destination
    0     0 REJECT     all  --  any    any     anywhere             anywhere            reject-with icmp-host-prohibited

Chain OUTPUT (policy ACCEPT 0 packets, 0 bytes)
 pkts bytes target     prot opt in     out     source               destination
```