

CNS Lab – 7

Name: H M Mythreya

SRN: PES2UG20CS130

Task 1.A: Implementing a Simple Firewall

Inserting kernel module.

```
[ 273.227696] hello: module verification failed: signature and/or required key  
missing - tainting kernel  
[ 273.227886] Hello World!
```

Removing kernel module

```
[10/27/22] seed@VM:~/.../kernel_module$ lsmod | grep hello  
hello                16384  0  
[10/27/22] seed@VM:~/.../kernel_module$ sudo rmmod hello  
[ 329.059494] Bye-bye World!.
```

Task 1.B: Implement a Simple Firewall Using Netfilter

Before inserting the seedFilter module

```
[10/27/22]seed@VM:~/.../packet_filter$ dig @8.8.8.8 www.example.com

; <<>> DiG 9.16.1-Ubuntu <<>> @8.8.8.8 www.example.com
; (1 server found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 17632
;; flags: qr rd ra ad; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 512
;; QUESTION SECTION:
;www.example.com.                IN      A

;; ANSWER SECTION:
www.example.com.                20578   IN      A      93.184.216.34

;; Query time: 12 msec
;; SERVER: 8.8.8.8#53(8.8.8.8)
;; WHEN: Thu Oct 27 11:07:15 EDT 2022
;; MSG SIZE rcvd: 60
```

After inserting the seedFilter module

```
[10/27/22]seed@VM:~/.../packet_filter$ make
make -C /lib/modules/5.4.0-54-generic/build M=/home/seed/Desktop/CNS/Week7/Codes
/packet_filter modules
make[1]: Entering directory '/usr/src/linux-headers-5.4.0-54-generic'
CC [M] /home/seed/Desktop/CNS/Week7/Codes/packet_filter/seedFilter.o
Building modules, stage 2.
MODPOST 1 modules
CC [M] /home/seed/Desktop/CNS/Week7/Codes/packet_filter/seedFilter.mod.o
LD [M] /home/seed/Desktop/CNS/Week7/Codes/packet_filter/seedFilter.ko
make[1]: Leaving directory '/usr/src/linux-headers-5.4.0-54-generic'
[10/27/22]seed@VM:~/.../packet_filter$ sudo insmod seedFilter.ko
[10/27/22]seed@VM:~/.../packet_filter$ lsmod | grep seedFilter
seedFilter                16384  0
[10/27/22]seed@VM:~/.../packet_filter$ dig @8.8.8.8 www.example.com
```

```
; <<>> DiG 9.16.1-Ubuntu <<>> @8.8.8.8 www.example.com
; (1 server found)
;; global options: +cmd
;; connection timed out; no servers could be reached
```

```
[10/27/22]seed@VM:~/.../packet_filter$ [ 955.787903] Registering filters.
[ 980.580186] *** LOCAL_OUT
[ 980.580188] 127.0.0.1 --> 127.0.0.1 (UDP)
[ 980.580277] *** LOCAL_OUT
[ 980.580278] 10.0.2.4 --> 8.8.8.8 (UDP)
[ 980.580281] *** Dropping 8.8.8.8 (UDP), port 53
[ 985.579062] *** LOCAL_OUT
[ 985.579065] 10.0.2.4 --> 8.8.8.8 (UDP)
[ 985.579078] *** Dropping 8.8.8.8 (UDP), port 53
[ 990.595846] *** LOCAL_OUT
[ 990.595849] 10.0.2.4 --> 8.8.8.8 (UDP)
[ 990.595879] *** Dropping 8.8.8.8 (UDP), port 53
```

After inserting seedPrint module

```
[10/27/22]seed@VM:~/.../packet_filter$ dig @8.8.8.8 www.example.com

; <<>> DiG 9.16.1-Ubuntu <<>> @8.8.8.8 www.example.com
; (1 server found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 32052
;; flags: qr rd ra ad; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 512
;; QUESTION SECTION:
;www.example.com.                IN      A

;; ANSWER SECTION:
www.example.com.                21324   IN      A      93.184.216.34

;; Query time: 11 msec
;; SERVER: 8.8.8.8#53(8.8.8.8)
;; WHEN: Thu Oct 27 11:10:14 EDT 2022
;; MSG SIZE rcvd: 60

[10/27/22]seed@VM:~/.../packet_filter$
```

```
[10/27/22]seed@VM:~/.../packet_filter$ sudo dmesg -k -w
[ 1253.921876] Registering filters.
[ 1276.716894] *** LOCAL_OUT
[ 1276.716896] 127.0.0.1 --> 127.0.0.1 (UDP)
[ 1276.716905] *** POST_ROUTING
[ 1276.716905] 127.0.0.1 --> 127.0.0.1 (UDP)
[ 1276.716914] *** PRE_ROUTING
[ 1276.716914] 127.0.0.1 --> 127.0.0.1 (UDP)
[ 1276.716915] *** LOCAL_IN
[ 1276.716916] 127.0.0.1 --> 127.0.0.1 (UDP)
[ 1276.717039] *** LOCAL_OUT
[ 1276.717039] 10.0.2.4 --> 8.8.8.8 (UDP)
[ 1276.717042] *** POST_ROUTING
[ 1276.717042] 10.0.2.4 --> 8.8.8.8 (UDP)
[ 1276.727674] *** PRE_ROUTING
[ 1276.727725] 8.8.8.8 --> 10.0.2.4 (UDP)
[ 1276.727737] *** LOCAL_IN
[ 1276.727740] 8.8.8.8 --> 10.0.2.4 (UDP)
[ 1302.919409] *** LOCAL_OUT
[ 1302.919412] 10.0.2.4 --> 91.189.94.4 (UDP)
[ 1302.919425] *** POST_ROUTING
[ 1302.919425] 10.0.2.4 --> 91.189.94.4 (UDP)
[ 1303.100024] *** PRE_ROUTING
[ 1303.100055] 91.189.94.4 --> 10.0.2.4 (UDP)
```

Before inserting seedBlock module

```
root@56ddb1a4d999:/# ping 10.9.0.1
PING 10.9.0.1 (10.9.0.1) 56(84) bytes of data.
64 bytes from 10.9.0.1: icmp_seq=1 ttl=64 time=0.055 ms
64 bytes from 10.9.0.1: icmp_seq=2 ttl=64 time=0.056 ms
^C
--- 10.9.0.1 ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1017ms
rtt min/avg/max/mdev = 0.055/0.055/0.056/0.000 ms
root@56ddb1a4d999:/# telnet 10.9.0.1
Trying 10.9.0.1...
Connected to 10.9.0.1.
Escape character is '^]'.
Ubuntu 20.04.1 LTS
VM login: seed
Password:
Welcome to Ubuntu 20.04.1 LTS (GNU/Linux 5.4.0-54-generic x86_64)

* Documentation:  https://help.ubuntu.com
* Management:    https://landscape.canonical.com
* Support:       https://ubuntu.com/advantage

0 updates can be installed immediately.
0 of these updates are security updates.
```

After inserting seedBlock module

```
[ 1916.838972] *** Dropping 10.9.0.1 (ICMP)
[ 1917.067094] *** LOCAL_OUT
[ 1917.067096] 127.0.0.1 --> 127.0.0.53 (UDP)
[ 1917.067181] *** LOCAL_OUT
[ 1917.067183] 127.0.0.1 --> 127.0.0.53 (UDP)
[ 1917.067242] *** LOCAL_OUT
[ 1917.067244] 10.0.2.4 --> 192.168.1.1 (UDP)
[ 1917.077670] *** LOCAL_OUT
[ 1917.077672] 127.0.0.53 --> 127.0.0.1 (UDP)
[ 1917.077695] *** LOCAL_OUT
[ 1917.077696] 127.0.0.53 --> 127.0.0.1 (UDP)
[ 1917.862848] *** Dropping 10.9.0.1 (ICMP)
[ 1918.148979] *** LOCAL_OUT
[ 1918.148981] 10.9.0.1 --> 224.0.0.251 (UDP)
[ 1918.156797] *** LOCAL_OUT
[ 1918.156798] 192.168.60.1 --> 224.0.0.251 (UDP)
[ 1918.896651] *** Dropping 10.9.0.1 (ICMP)
[ 1919.916151] *** Dropping 10.9.0.1 (ICMP)
[ 1920.938345] *** Dropping 10.9.0.1 (ICMP)
[ 1921.959058] *** Dropping 10.9.0.1 (ICMP)
[ 1927.156841] *** Dropping 10.9.0.1 (TCP), port 23
[ 1928.166521] *** Dropping 10.9.0.1 (TCP), port 23
[ 1930.182543] *** Dropping 10.9.0.1 (TCP), port 23
```

```
|root@56ddb1a4d999:/# telnet 10.9.0.1
|Trying 10.9.0.1...
```

```
root@56ddb1a4d999:/# ping 10.9.0.1
PING 10.9.0.1 (10.9.0.1) 56(84) bytes of data.
```

Task 2: Experimenting with Stateless Firewall Rules

Task2.A: Protecting the router

Updating the iptables on seed-router

```
root@1592e240bfb6:/# iptables -t filter -L -n
Chain INPUT (policy ACCEPT)
target     prot opt source                destination

Chain FORWARD (policy ACCEPT)
target     prot opt source                destination

Chain OUTPUT (policy ACCEPT)
target     prot opt source                destination
root@1592e240bfb6:/# iptables -A INPUT -p icmp --icmp-type echo-request -j ACCEPT
root@1592e240bfb6:/# iptables -A OUTPUT -p icmp --icmp-type echo-request -j ACCEPT
root@1592e240bfb6:/# iptables -P OUTPUT DROP
root@1592e240bfb6:/# iptables -P INPUT DROP
root@1592e240bfb6:/# iptables -t filter -L -n
Chain INPUT (policy DROP)
target     prot opt source                destination
ACCEPT     icmp -- 0.0.0.0/0              0.0.0.0/0              icmp-type 8

Chain FORWARD (policy ACCEPT)
target     prot opt source                destination

Chain OUTPUT (policy DROP)
target     prot opt source                destination
ACCEPT     icmp -- 0.0.0.0/0              0.0.0.0/0              icmp-type 8
root@1592e240bfb6:/# █
```

Ping and Telnet not working

```
root@56ddb1a4d999:/# ping seed-router
PING seed-router (10.9.0.11) 56(84) bytes of data.
^C
--- seed-router ping statistics ---
4 packets transmitted, 0 received, 100% packet loss, time 3060ms

root@56ddb1a4d999:/# telnet seed-router
Trying 10.9.0.11...
^C
root@56ddb1a4d999:/#
```

Task 2.B: Protecting the Internal Network

Updating the iptables on seed-router

```
root@1592e240bfb6:/# iptables -A FORWARD -i eth0 -p icmp --icmp-type echo-request -j DROP
root@1592e240bfb6:/# iptables -A FORWARD -i eth1 -p icmp --icmp-type echo-request -j ACCEPT
root@1592e240bfb6:/# iptables -A FORWARD -i eth0 -p icmp --icmp-type echo-reply -j ACCEPT
root@1592e240bfb6:/# iptables -P FORWARD DROP
root@1592e240bfb6:/# iptables -L -n -v
Chain INPUT (policy ACCEPT 0 packets, 0 bytes)
 pkts bytes target    prot opt in     out     source                   destination

Chain FORWARD (policy DROP 0 packets, 0 bytes)
 pkts bytes target    prot opt in     out     source                   destination      icmptype
  0    0 DROP      icmp  --  eth0   *       0.0.0.0/0                0.0.0.0/0        icmp-type 8
  0    0 ACCEPT    icmp  --  eth1   *       0.0.0.0/0                0.0.0.0/0        icmp-type 8
  0    0 ACCEPT    icmp  --  eth0   *       0.0.0.0/0                0.0.0.0/0        icmp-type 0

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

Outside hosts cannot ping internal hosts (ex: 192.168.60.5)

```
root@56ddb1a4d999:/# ping 192.168.60.5
PING 192.168.60.5 (192.168.60.5) 56(84) bytes of data.
^C
--- 192.168.60.5 ping statistics ---
3 packets transmitted, 0 received, 100% packet loss, time 2027ms

root@56ddb1a4d999:/#
```

Outside hosts can ping the router

```
root@56ddb1a4d999:/# ping seed-router
PING seed-router (10.9.0.11) 56(84) bytes of data.
64 bytes from seed-router.net-10.9.0.0 (10.9.0.11): icmp_seq=1 ttl=64 time=0.049 ms
64 bytes from seed-router.net-10.9.0.0 (10.9.0.11): icmp_seq=2 ttl=64 time=0.057 ms
64 bytes from seed-router.net-10.9.0.0 (10.9.0.11): icmp_seq=3 ttl=64 time=0.058 ms
64 bytes from seed-router.net-10.9.0.0 (10.9.0.11): icmp_seq=4 ttl=64 time=0.072 ms
```

Internal hosts can ping outside Hosts, ping works but telnet doesn't

```
root@52b367ed4216:/# ping 10.9.0.5
PING 10.9.0.5 (10.9.0.5) 56(84) bytes of data.
64 bytes from 10.9.0.5: icmp_seq=1 ttl=63 time=0.081 ms
64 bytes from 10.9.0.5: icmp_seq=2 ttl=63 time=0.094 ms
^C
--- 10.9.0.5 ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1013ms
rtt min/avg/max/mdev = 0.081/0.087/0.094/0.006 ms
root@52b367ed4216:/# telnet 10.9.0.5
Trying 10.9.0.5...
^C
root@52b367ed4216:/#
```


Task 2.C: Protecting Internal Servers

Updating the iptables on seed-router

```
root@1592e240bfb6:/# iptables -A FORWARD -i eth0 -d 192.168.60.5 -ptcp --dport 23 -j ACCEPT
root@1592e240bfb6:/# iptables -A FORWARD -i eth1 -s 192.168.60.5 -p tcp --sport 23 -j ACCEPT
root@1592e240bfb6:/# iptables -P FORWARD DROP
root@1592e240bfb6:/# iptables -L -n -v
Chain INPUT (policy ACCEPT 0 packets, 0 bytes)
 pkts bytes target    prot opt in     out     source                   destination

Chain FORWARD (policy DROP 0 packets, 0 bytes)
 pkts bytes target    prot opt in     out     source                   destination
    0    0 ACCEPT    tcp  --  eth0   *       0.0.0.0/0                192.168.60.5            tcp dpt:23
    0    0 ACCEPT    tcp  --  eth1   *       192.168.60.5            0.0.0.0/0                tcp spt:23

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

Outside hosts can telnet to 192.168.60.5

```
root@56ddb1a4d999:/# telnet 192.168.60.5
Trying 192.168.60.5...
Connected to 192.168.60.5.
Escape character is '^]'.
Ubuntu 20.04.1 LTS
52b367ed4216 login: █
```

Outside hosts cannot access other internal servers

```
root@56ddb1a4d999:/# telnet 192.168.60.6
Trying 192.168.60.6...
^C
root@56ddb1a4d999:/# telnet 192.168.60.7
Trying 192.168.60.7...
+^C
root@56ddb1a4d999:/#
```

Internal hosts can access all other internal servers

```
root@896b985bfe01:/# telnet 192.168.60.5
Trying 192.168.60.5...
Connected to 192.168.60.5.
Escape character is '^]'.
Ubuntu 20.04.1 LTS
52b367ed4216 login: ^CConnection closed by foreign host.
root@896b985bfe01:/# telnet 192.168.60.7
Trying 192.168.60.7...
Connected to 192.168.60.7.
Escape character is '^]'.
Ubuntu 20.04.1 LTS
09f71354d4b9 login: ^CConnection closed by foreign host.
root@896b985bfe01:/#
```

Internal hosts cannot access external servers

```
root@896b985bfe01:/# telnet 10.9.0.5
Trying 10.9.0.5...
```


Task 3: Connection Tracking and Stateful Firewall

Task 3.A: Experiment with the Connection Tracking

Timer decreasing:

```
root@1592e240bfb6:/# conntrack -L
icmp      1 27 src=10.9.0.5 dst=192.168.60.5 type=8 code=0 id=62 src=192.168.60.5 dst=10.9.0.5 type=0 code=0 id=62 mark=0 use=1
conntrack v1.4.5 (conntrack-tools): 1 flow entries have been shown.
root@1592e240bfb6:/# conntrack -L
icmp      1 21 src=10.9.0.5 dst=192.168.60.5 type=8 code=0 id=62 src=192.168.60.5 dst=10.9.0.5 type=0 code=0 id=62 mark=0 use=1
conntrack v1.4.5 (conntrack-tools): 1 flow entries have been shown.
root@1592e240bfb6:/# conntrack -L
conntrack v1.4.5 (conntrack-tools): 0 flow entries have been shown.
root@1592e240bfb6:/#
```

UDP connection

```
root@1592e240bfb6:/# conntrack -L
udp       17 21 src=10.9.0.5 dst=192.168.60.5 sport=45496 dport=9090 [UNREPLIED] src=192.168.60.5 dst=10.9.0.5 sport=9090 dport=45496 mark=0 use=1
conntrack v1.4.5 (conntrack-tools): 1 flow entries have been shown.
root@1592e240bfb6:/# conntrack -L
udp       17 27 src=10.9.0.5 dst=192.168.60.5 sport=45496 dport=9090 [UNREPLIED] src=192.168.60.5 dst=10.9.0.5 sport=9090 dport=45496 mark=0 use=1
conntrack v1.4.5 (conntrack-tools): 1 flow entries have been shown.
root@1592e240bfb6:/# conntrack -L
udp       17 15 src=10.9.0.5 dst=192.168.60.5 sport=45496 dport=9090 [UNREPLIED] src=192.168.60.5 dst=10.9.0.5 sport=9090 dport=45496 mark=0 use=1
conntrack v1.4.5 (conntrack-tools): 1 flow entries have been shown.
root@1592e240bfb6:/# █
```

TCP connection

Very high timer duration when the connection is active

```
root@1592e240bfb6:/# conntrack -L
tcp       6 431995 ESTABLISHED src=10.9.0.5 dst=192.168.60.5 sport=51080 dport=9090 src=192.168.60.5 dst=10.9.0.5 sport=9090 dport=51080 [ASSURED] mark=0 use=1
conntrack v1.4.5 (conntrack-tools): 1 flow entries have been shown.
root@1592e240bfb6:/# conntrack -L
tcp       6 431990 ESTABLISHED src=10.9.0.5 dst=192.168.60.5 sport=51080 dport=9090 src=192.168.60.5 dst=10.9.0.5 sport=9090 dport=51080 [ASSURED] mark=0 use=1
conntrack v1.4.5 (conntrack-tools): 1 flow entries have been shown.
root@1592e240bfb6:/# conntrack -L
tcp       6 431989 ESTABLISHED src=10.9.0.5 dst=192.168.60.5 sport=51080 dport=9090 src=192.168.60.5 dst=10.9.0.5 sport=9090 dport=51080 [ASSURED] mark=0 use=1
conntrack v1.4.5 (conntrack-tools): 1 flow entries have been shown.
root@1592e240bfb6:/# █
```

Timer duration very low when connection closes

```
root@1592e240bfb6:/# conntrack -L
tcp       6 117 TIME WAIT src=10.9.0.5 dst=192.168.60.5 sport=51080 dport=9090 src=192.168.60.5 dst=10.9.0.5 sport=9090 dport=51080 [ASSURED] mark=0 use=1
conntrack v1.4.5 (conntrack-tools): 1 flow entries have been shown.
root@1592e240bfb6:/# conntrack -L
tcp       6 116 TIME WAIT src=10.9.0.5 dst=192.168.60.5 sport=51080 dport=9090 src=192.168.60.5 dst=10.9.0.5 sport=9090 dport=51080 [ASSURED] mark=0 use=1
conntrack v1.4.5 (conntrack-tools): 1 flow entries have been shown.
root@1592e240bfb6:/# conntrack -L
tcp       6 107 TIME WAIT src=10.9.0.5 dst=192.168.60.5 sport=51080 dport=9090 src=192.168.60.5 dst=10.9.0.5 sport=9090 dport=51080 [ASSURED] mark=0 use=1
conntrack v1.4.5 (conntrack-tools): 1 flow entries have been shown.
```

Task 3.B: Setting Up a Stateful Firewall

Setting up iptables

```
root@1592e240bfb6:/# iptables -L -n -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
 0      0 ACCEPT      tcp  --  eth0   *       0.0.0.0/0         192.168.60.5      tcp dpt:23 flags:0x17/0x02 ctstate NEW
 0      0 ACCEPT      tcp  --  eth1   *       0.0.0.0/0         0.0.0.0/0         tcp flags:0x17/0x02 ctstate NEW
 0      0 ACCEPT      tcp  --  *      *       0.0.0.0/0         0.0.0.0/0         ctstate RELATED,ESTABLISHED
 0      0 DROP        tcp  --  *      *       0.0.0.0/0         0.0.0.0/0

Chain OUTPUT (policy ACCEPT 0 packets, 0 bytes)
pkts bytes target      prot opt in     out     source            destination
root@1592e240bfb6:/#
```

Outside hosts can access telnet on 192.168.60.5 →

```
root@56ddb1a4d999:/# telnet 192.168.60.5
Trying 192.168.60.5...
Connected to 192.168.60.5.
```

Outside hosts cannot access other internal servers→

```
root@56ddb1a4d999:/# telnet 192.168.60.6
Trying 192.168.60.6...
```

Internal hosts can access all other internal servers

```
root@896b985bfe01:/# telnet 192.168.60.5
Trying 192.168.60.5...
Connected to 192.168.60.5.
Escape character is '^]'.
Ubuntu 20.04.1 LTS
52b367ed4216 login: ^CConnection closed by foreign host.
root@896b985bfe01:/# telnet 192.168.60.7
Trying 192.168.60.7...
Connected to 192.168.60.7.
Escape character is '^]'.
Ubuntu 20.04.1 LTS
09f71354d4b9 login: ^CConnection closed by foreign host.
```

Internal hosts can access external servers

```
root@896b985bfe01:/# telnet 10.9.0.5
Trying 10.9.0.5...
Connected to 10.9.0.5.
```

Task 4: Limiting Network Traffic

Setting up iptables

```
root@1592e240bfb6:/# iptables -A FORWARD -s 10.9.0.5 -m limit --limit 10/minute --limit-burst 5 -jACCEPT
root@1592e240bfb6:/# iptables -A FORWARD -s 10.9.0.5 -j DROP
root@1592e240bfb6:/# iptables -L -n -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
    0    0 ACCEPT      all  --  *       *       10.9.0.5          0.0.0.0/0          limit: avg 10/min burst 5
    0    0 DROP       all  --  *       *       10.9.0.5          0.0.0.0/0

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

With 2nd rule

```
root@56ddb1a4d999:/# ping 192.168.60.5
PING 192.168.60.5 (192.168.60.5) 56(84) bytes of data.
64 bytes from 192.168.60.5: icmp_seq=1 ttl=63 time=0.121 ms
64 bytes from 192.168.60.5: icmp_seq=2 ttl=63 time=0.073 ms
64 bytes from 192.168.60.5: icmp_seq=3 ttl=63 time=0.110 ms
64 bytes from 192.168.60.5: icmp_seq=5 ttl=63 time=0.077 ms
64 bytes from 192.168.60.5: icmp_seq=11 ttl=63 time=0.072 ms
64 bytes from 192.168.60.5: icmp_seq=16 ttl=63 time=0.080 ms
```

Without 2nd rule

```
root@1592e240bfb6:/# iptables -L -n -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
    0    0 ACCEPT      all  --  *       *       10.9.0.5          0.0.0.0/0          limit: avg 10/min burst 5

Chain OUTPUT (policy ACCEPT 0 packets, 0 bytes)
pkts bytes target      prot opt in      out     source            destination
root@1592e240bfb6:/# █
```

```
root@56ddb1a4d999:/# ping 192.168.60.5
PING 192.168.60.5 (192.168.60.5) 56(84) bytes of data.
64 bytes from 192.168.60.5: icmp_seq=1 ttl=63 time=0.078 ms
64 bytes from 192.168.60.5: icmp_seq=2 ttl=63 time=0.071 ms
64 bytes from 192.168.60.5: icmp_seq=3 ttl=63 time=0.076 ms
64 bytes from 192.168.60.5: icmp_seq=4 ttl=63 time=0.088 ms
64 bytes from 192.168.60.5: icmp_seq=5 ttl=63 time=0.074 ms
64 bytes from 192.168.60.5: icmp_seq=6 ttl=63 time=0.077 ms
64 bytes from 192.168.60.5: icmp_seq=7 ttl=63 time=0.084 ms
64 bytes from 192.168.60.5: icmp_seq=8 ttl=63 time=0.068 ms
--
```

Task 5: Load Balancing

Using the nth mode

from 10.9.0.5

```
root@56ddb1a4d999:/# nc -u 10.9.0.11 8080
Mythreya
Hardur
PES2UG20CS130
```

host-1

```
root@52b367ed4216:/# nc -luk 8080
Mythreya
```

host-2

```
root@896b985bfe01:/# nc -luk 8080
Hardur
```

host-3

```
root@09f71354d4b9:/# nc -luk 8080
PES2UG20CS130
```

Using the random mode

from 10.9.0.5

```
root@56ddb1a4d999:/# nc -u 10.9.0.11 8080
Mythreya
Hardur
PES2UG20CS130
HI
CS130
```

host-1

```
root@52b367ed4216:/# nc -luk 8080
Mythreya
```

■

host-2

```
root@896b985bfe01:/# nc -luk 8080
Hardur
```

■

host-3

```
root@09f71354d4b9:/# nc -luk 8080
PES2UG20CS130
HI
CS130
```

■