LAB 7

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TASK 1:

10.9.0.5 ping 10.9.0.11:

```
root@efda7349cecf:/volumes# ping 10.9.0.11
PING 10.9.0.11 (10.9.0.11) 56(84) bytes of data.
64 bytes from 10.9.0.11: icmp_seq=1 ttl=64 time=0.157 ms
64 bytes from 10.9.0.11: icmp_seq=2 ttl=64 time=0.061 ms
64 bytes from 10.9.0.11: icmp_seq=3 ttl=64 time=0.079 ms
64 bytes from 10.9.0.11: icmp_seq=4 ttl=64 time=0.070 ms
^C
--- 10.9.0.11 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3075ms
rtt min/avg/max/mdev = 0.061/0.091/0.157/0.038 ms
```

Server-router ping 192.168.60.5:

```
root@f9644d809c33:/volumes# 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=64 time=0.080 ms
64 bytes from 192.168.60.5: icmp_seq=2 ttl=64 time=0.061 ms
64 bytes from 192.168.60.5: icmp_seq=3 ttl=64 time=0.068 ms
64 bytes from 192.168.60.5: icmp_seq=4 ttl=64 time=0.080 ms
^C
--- 192.168.60.5 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3072ms
rtt min/avg/max/mdev = 0.061/0.072/0.080/0.008 ms
```

10.9.0.5 ping 不到 192.168.60.5：

```
root@efda7349cecf:/volumes# ping 192.168.60.5
PING 192.168.60.5 (192.168.60.5) 56(84) bytes of data.
```

Server-router 监听 10.9.0.0/24 网段：

```
root@f9644d809c33:/volumes# tcpdump -i eth0 -n
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on eth0, link-type EN10MB (Ethernet), capture size 262144 bytes
16:13:08.592589 IP 10.9.0.5 > 10.9.0.11: ICMP echo request, id 230, seq 1, lengt
h 64
16:13:08.592630 IP 10.9.0.11 > 10.9.0.5: ICMP echo reply, id 230, seq 1, length
64
16:13:09.627025 IP 10.9.0.5 > 10.9.0.11: ICMP echo request, id 230, seq 2, lengt
h 64
16:13:09.627061 IP 10.9.0.11 > 10.9.0.5: ICMP echo reply, id 230, seq 2, length
64
16:13:10.651499 IP 10.9.0.5 > 10.9.0.11: ICMP echo request, id 230, seq 3, lengt
h 64
16:13:10.651539 IP 10.9.0.11 > 10.9.0.5: ICMP echo reply, id 230, seq 3, length
64
16:13:11.675332 IP 10.9.0.5 > 10.9.0.11: ICMP echo request, id 230, seq 4, lengt
```

Server-router 监听 192.168.60.0/24 网段

```
root@f9644d809c33:/volumes# tcpdump -i eth1 -n
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on eth1, link-type EN10MB (Ethernet), capture size 262144 bytes
16:16:03.673953 IP 192.168.60.5 > 192.168.60.11: ICMP echo request, id 48, seq 2
0, length 64
16:16:03.674030 IP 192.168.60.11 > 192.168.60.5: ICMP echo reply, id 48, seq 20,
 length 64
16:16:04.698303 IP 192.168.60.5 > 192.168.60.11: ICMP echo request, id 48, seq 2
1, length 64
16:16:04.698351 IP 192.168.60.11 > 192.168.60.5: ICMP echo reply, id 48, seq 21,
 length 64
16:16:05.721586 IP 192.168.60.5 > 192.168.60.11: ICMP echo request, id 48, seq 2
2, length 64
16:16:05.721625 IP 192.168.60.11 > 192.168.60.5: ICMP echo reply, id 48, seq 22,
 length 64
16:16:06.745271 IP 192.168.60.5 > 192.168.60.11: ICMP echo request, id 48, seq 2
3, length 64
```

TASK 2.A:

运行程序代码：

```
[07/26/21]seed@VM:~/.../Labsetup$ dockps
e440c0b9219f  host-192.168.60.6
1f3ea61355b2  host-192.168.60.5
efda7349cecf  client-10.9.0.5
f9644d809c33  server-router
[07/26/21]seed@VM:~/.../Labsetup$ docksh ef
root@efda7349cecf:/# cd volumes/
root@efda7349cecf:/volumes# chmod a+x tun.py
root@efda7349cecf:/volumes# python3 tun.py
Interface Name: tun0
```

查看 ipaddress，可以看到接口 tun0:

```
root@efda7349cecf:/# ip address
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group defaul
t qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
       valid_lft forever preferred_lft forever
3: tun0: <POINTOPOINT,MULTICAST,NOARP> mtu 1500 qdisc noop state DOWN group defa
ult qlen 500
    link/none
26: eth0@if27: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP
 group default
    link/ether 02:42:0a:09:00:05 brd ff:ff:ff:ff:ff:ff link-netnsid 0
    inet 10.9.0.5/24 brd 10.9.0.255 scope global eth0
       valid lft forever preferred lft forever
```

TASK 2.B:

修改 tun.py 代码如下：增加以下两行：

```
3 os.system("ip addr add 192.168.53.99/24 dev {}".format(ifname))
4 os.system("ip link set dev {} up".format(ifname))
```

运行之后，在 ipaddress 看到增加了 192.168.53.99：

```
root@efda7349cecf:/# ip address
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group defaul
t qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
       valid_lft forever preferred_lft forever
4: tun0: <POINTOPOINT,MULTICAST,NOARP,UP,LOWER_UP> mtu 1500 qdisc fq_codel state
 UNKNOWN group default qlen 500
    link/none
    inet 192.168.53.99/24 scope global tun0
       valid_lft forever preferred_lft forever
26: eth0@if27: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP
 group default
    link/ether 02:42:0a:09:00:05 brd ff:ff:ff:ff:ff:ff link-netnsid 0
    inet 10.9.0.5/24 brd 10.9.0.255 scope global eth0
       valid_lft forever preferred_lft forever
```

TASK 2.C:

修改代码如下：

```
while True:
    packet=os.read(tun,2048)
    if packet:
        ip=IP(packet)
        print(ip.summary())
    time.sleep(10)
```

Ping 192.168.53.1，但是 ping 不通:

```
root@efda7349cecf:/volumes# ping 192.168.53.1
PING 192.168.53.1 (192.168.53.1) 56(84) bytes of data.
^C
--- 192.168.53.1 ping statistics ---
97 packets transmitted, 0 received, 100% packet loss, time 98304ms
```

但是运行此处存在输出：

```
root@efda7349cecf:/volumes# python3 tun.py
Interface Name: tun0
IP / ICMP 192.168.53.99 > 192.168.53.1 echo-request 0 / Raw
IP / ICMP 192.168.53.99 > 192.168.53.1 echo-request 0 / Raw
IP / ICMP 192.168.53.99 > 192.168.53.1 echo-request 0 / Raw
```

Ping 192.168.60.1 不通且无输出:

```
root@efda7349cecf:/volumes# python3 tun.py
Interface Name: tun0
```

TASK 2.d:

再次修改代码如下：

```
while True:
   packet=os.read(tun,2048)
   if True:
        pkt=IP(packet)
        print(pkt.summary())

        if ICMP in pkt:
                newip = IP(src=pkt[IP].dst,dst=pkt[IP].src,ihl=pkt[IP].ihl)
                newip.ttl = 99
                newicmp = ICMP(type=0,id=pkt[ICMP].id,seq=pkt[ICMP].seq)
                if pkt.haslayer(Raw):
                        data = pkt[Raw].load
                        newpkt = newip/newicmp/data
                else:
                        newpkt = newip/newicmp
        os.write(tun,bytes(newpkt))
```

看到回复，并且 ping 通了：

```
root@efda7349cecf:/volumes# python3 tun2.py
Interface Name: tun0
IP / ICMP 192.168.53.99 > 192.168.53.1 echo-request 0 / Raw
IP / ICMP 192.168.53.99 > 192.168.53.1 echo-request 0 / Raw
IP / ICMP 192.168.53.99 > 192.168.53.1 echo-request 0 / Raw
IP / ICMP 192.168.53.99 > 192.168.53.1 echo-request 0 / Raw
IP / ICMP 192.168.53.99 > 192.168.53.1 echo-request 0 / Raw
^CTraceback (most recent call last):
  File "tun2.py", line 43, in <module>
    time.sleep(10)
KeyboardInterrupt

root@efda7349cecf:/volumes#
```

```
root@efda7349cecf:/volumes# ping 192.168.53.1
PING 192.168.53.1 (192.168.53.1) 56(84) bytes of data.
64 bytes from 192.168.53.1: icmp_seq=5 ttl=99 time=1.79 ms
64 bytes from 192.168.53.1: icmp_seq=6 ttl=99 time=9009 ms
64 bytes from 192.168.53.1: icmp_seq=7 ttl=99 time=18009 ms
64 bytes from 192.168.53.1: icmp_seq=8 ttl=99 time=26987 ms
64 bytes from 192.168.53.1: icmp_seq=9 ttl=99 time=35973 ms
^C
```

TASK 3:

具体代码如下：

Tun_server.py:

```
12
13 # Create the tun interface
14 tun = os.open("/dev/net/tun", os.O_RDWR)
15 ifr = struct.pack('16sH', b'tun%d', IFF_TUN | IFF_NO_PI)
16 ifname_bytes  = fcntl.ioctl(tun, TUNSETIFF, ifr)
17
18 # Get the interface name
19 ifname = ifname_bytes.decode('UTF-8')[:16].strip("\x00")
20 print("Interface Name: {}".format(ifname))
21
22 os.system("ip addr add 192.168.53.1/24 dev {}".format(ifname))
23 os.system("ip link set dev {} up".format(ifname))
24
25 IP_A = "0.0.0.0"
26 PORT = 9090
27 sock = socket.socket(socket.AF_INET, socket.SOCK_DGRAM)
28 sock.bind((IP_A, PORT))
29
30 while True:
31     data, (ip, port) = sock.recvfrom(2048)
32     pkt = IP(data)
33     #packet=os.read(tun,2048)
34     if(packet):
35         print("{}:{} --> {}:{}".format(ip, port, IP_A, PORT))
36         print(" Inside: {} --> {}".format(pkt.src, pkt.dst))
37         os.write(tun,data)
38     #time.sleep(10)
```

Tun_client.py:

```python
# Create the tun interface
tun = os.open("/dev/net/tun", os.O_RDWR)
ifr = struct.pack('16sH', b'tun%d', IFF_TUN | IFF_NO_PI)
ifname_bytes  = fcntl.ioctl(tun, TUNSETIFF, ifr)

# Get the interface name
ifname = ifname_bytes.decode('UTF-8')[:16].strip("\x00")
print("Interface Name: {}".format(ifname))

os.system("ip addr add 192.168.53.99/24 dev {}".format(ifname))
os.system("ip link set dev {} up".format(ifname))
os.system("ip route add 192.168.60.0/24 dev {} via 192.168.53.99".format(ifname))

sock = socket.socket(socket.AF_INET, socket.SOCK_DGRAM)
SERVER_IP="10.9.0.11"
SERVER_PORT=9090

while True:
    #Get a packet from the tun interface
    packet = os.read(tun,2048)
    if packet:
        ip = IP(packet)
        print(ip.summary())
        sock.sendto(packet,(SERVER_IP,SERVER_PORT))
    #time.sleep(10)
```

Ping 192.168.60.5：

```
root@efda7349cecf:/volumes# ping 192.168.60.5
PING 192.168.60.5 (192.168.60.5) 56(84) bytes of data.
```

客户端输出：

```
root@efda7349cecf:/volumes# python3 tun_client.py
Interface Name: tun0
IP / ICMP 192.168.53.99 > 192.168.60.5 echo-request 0 / Raw
IP / ICMP 192.168.53.99 > 192.168.60.5 echo-request 0 / Raw
IP / ICMP 192.168.53.99 > 192.168.60.5 echo-request 0 / Raw
IP / ICMP 192.168.53.99 > 192.168.60.5 echo-request 0 / Raw
IP / ICMP 192.168.53.99 > 192.168.60.5 echo-request 0 / Raw
IP / ICMP 192.168.53.99 > 192.168.60.5 echo-request 0 / Raw
IP / ICMP 192.168.53.99 > 192.168.60.5 echo-request 0 / Raw
IP / ICMP 192.168.53.99 > 192.168.60.5 echo-request 0 / Raw
IP / ICMP 192.168.53.99 > 192.168.60.5 echo-request 0 / Raw
IP / ICMP 192.168.53.99 > 192.168.60.5 echo-request 0 / Raw
IP / ICMP 192.168.53.99 > 192.168.60.5 echo-request 0 / Raw
IP / ICMP 192.168.53.99 > 192.168.60.5 echo-request 0 / Raw
```

服务器端输出：

```
root@f9644d809c33:/volumes# python3 tun_server.py
Interface Name: tun0
10.9.0.5:39559 --> 0.0.0.0:9090
 Inside: 192.168.53.99 --> 192.168.60.5
10.9.0.5:39559 --> 0.0.0.0:9090
 Inside: 192.168.53.99 --> 192.168.60.5
10.9.0.5:39559 --> 0.0.0.0:9090
 Inside: 192.168.53.99 --> 192.168.60.5
10.9.0.5:39559 --> 0.0.0.0:9090
 Inside: 192.168.53.99 --> 192.168.60.5
10.9.0.5:39559 --> 0.0.0.0:9090
 Inside: 192.168.53.99 --> 192.168.60.5
10.9.0.5:39559 --> 0.0.0.0:9090
 Inside: 192.168.53.99 --> 192.168.60.5
10.9.0.5:39559 --> 0.0.0.0:9090
 Inside: 192.168.53.99 --> 192.168.60.5
10.9.0.5:39559 --> 0.0.0.0:9090
 Inside: 192.168.53.99 --> 192.168.60.5
```

TASK 4:

server 修改代码如下：

```
os.system("ip addr add 192.168.53.1/24 dev {}".format(ifname))
os.system("ip link set dev {} up".format(ifname))

IP_A = "0.0.0.0"
PORT = 9090
sock = socket.socket(socket.AF_INET, socket.SOCK_DGRAM)
sock.bind((IP_A, PORT))

while True:
    data, (ip, port) = sock.recvfrom(2048)
    pkt = IP(data)
    #packet=os.read(tun,2048)
    if(packet):
        print("{}:{} --> {}:{}".format(ip, port, IP_A, PORT))
        print(" Inside: {} --> {}".format(pkt.src, pkt.dst))
        os.write(tun,data)
    #time.sleep(10)
```

在 host V 上 tcpdump 可以看到报文情况：

```
root@1f3ea61355b2:/# tcpdump
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on eth0, link-type EN10MB (Ethernet), capture size 262144 bytes
14:27:16.218129 IP 192.168.53.99 > 1f3ea61355b2: ICMP echo request, id 188, seq
24, length 64
14:27:16.218148 IP 1f3ea61355b2 > 192.168.53.99: ICMP echo reply, id 188, seq 24
, length 64
14:27:16.218818 IP 1f3ea61355b2.48075 > 8.8.8.8.domain: 60984+ PTR? 99.53.168.19
2.in-addr.arpa. (44)
14:27:17.242455 IP 192.168.53.99 > 1f3ea61355b2: ICMP echo request, id 188, seq
25, length 64
14:27:17.242467 IP 1f3ea61355b2 > 192.168.53.99: ICMP echo reply, id 188, seq 25
, length 64
14:27:18.265905 IP 192.168.53.99 > 1f3ea61355b2: ICMP echo request, id 188, seq
26, length 64
14:27:18.265919 IP 1f3ea61355b2 > 192.168.53.99: ICMP echo reply, id 188, seq 26
, length 64
14:27:19.291173 IP 192.168.53.99 > 1f3ea61355b2: ICMP echo request, id 188, seq
27, length 64
14:27:19.291187 IP 1f3ea61355b2 > 192.168.53.99: ICMP echo reply, id 188, seq 27
, length 64
```

TASK 5:

相关代码如下：

Tun_client:

```python
ifname = ifname_bytes.decode('UTF-8')[:16].strip("\x00")
print("Interface Name: {}".format(ifname))
#Create tun
os.system("ip addr add 192.168.53.99/24 dev {} ".format(ifname))
os.system("ip link set dev {} up".format(ifname))
os.system("ip route add 192.168.60.0/24 dev tun0 via 192.168.53.99".format(ifname))
#Create sock
IP_A = "0.0.0.0"
PORT = 9090
sock = socket.socket(socket.AF_INET, socket.SOCK_DGRAM)
sock.bind((IP_A, PORT))

while True:
    ready, _, _ = select.select([sock, tun], [], [])
    for fd in ready:
        if fd is sock:
            data, (ip, port) = sock.recvfrom(2048)
            pkt = IP(data)
            print("From socket <==: {} --> {}".format(pkt.src, pkt.dst))


            os.write(tun, bytes(pkt))
        if fd is tun:
            packet = os.read(tun, 2048)
            pkt = IP(packet)
            print("From tun ==>: {} --> {}".format(pkt.src, pkt.dst))
            sock.sendto(packet, ('10.9.0.11', 9090))
```

Tun_server:

```
# Get the interface name
ifname = ifname_bytes.decode('UTF-8')[:16].strip("\x00")
print("Interface Name: {}".format(ifname))
#Create tun
os.system("ip addr add 192.168.53.1/24 dev {}".format(ifname))
os.system("ip link set dev {} up".format(ifname))
#Create sock
IP_A = "0.0.0.0"
PORT = 9090
sock = socket.socket(socket.AF_INET, socket.SOCK_DGRAM)
sock.bind((IP_A, PORT))

while True:
    ready, _, _ = select.select([sock, tun], [], [])
    for fd in ready:
        if fd is sock:
            data, (ip, port) = sock.recvfrom(2048)
            print("{}:{}-->{}:{}".format('10.9.0.5',9090,IP_A,PORT))
            pkt = IP(data)
            print("From socket <==: {} --> {}".format(pkt.src, pkt.dst))

            os.write(tun, bytes(pkt))
        if fd is tun:
            packet = os.read(tun, 2048)
            pkt = IP(packet)
            print("From tun ==>: {} --> {}".format(pkt.src, pkt.dst))
            sock.sendto(packet, ('10.9.0.5', 9090))
```

Ping 通 192.168.60.5:

```
root@efda7349cecf:/volumes# 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=9 ttl=63 time=4.13 ms
64 bytes from 192.168.60.5: icmp_seq=10 ttl=63 time=1.86 ms
64 bytes from 192.168.60.5: icmp_seq=11 ttl=63 time=1.76 ms
64 bytes from 192.168.60.5: icmp_seq=12 ttl=63 time=2.73 ms
64 bytes from 192.168.60.5: icmp_seq=13 ttl=63 time=1.91 ms
64 bytes from 192.168.60.5: icmp_seq=14 ttl=63 time=1.84 ms
64 bytes from 192.168.60.5: icmp_seq=15 ttl=63 time=1.90 ms
64 bytes from 192.168.60.5: icmp_seq=16 ttl=63 time=1.55 ms
64 bytes from 192.168.60.5: icmp_seq=17 ttl=63 time=2.99 ms
64 bytes from 192.168.60.5: icmp_seq=18 ttl=63 time=1.88 ms
64 bytes from 192.168.60.5: icmp_seq=19 ttl=63 time=1.71 ms
64 bytes from 192.168.60.5: icmp_seq=20 ttl=63 time=2.11 ms
```

客户端输出：

```
root@efda7349cecf:/volumes# python3 tun_client_select.py
Interface Name: tun0
From tun ==>: 192.168.53.99 --> 192.168.60.5
From tun ==>: 192.168.53.99 --> 192.168.60.5
From tun ==>: 192.168.53.99 --> 192.168.60.5
From tun ==>: 192.168.53.99 --> 192.168.60.5
From socket <==: 192.168.60.5 --> 192.168.53.99
From tun ==>: 192.168.53.99 --> 192.168.60.5
From socket <==: 192.168.60.5 --> 192.168.53.99
From tun ==>: 192.168.53.99 --> 192.168.60.5
From socket <==: 192.168.60.5 --> 192.168.53.99
From tun ==>: 192.168.53.99 --> 192.168.60.5
From socket <==: 192.168.60.5 --> 192.168.53.99
From tun ==>: 192.168.53.99 --> 192.168.60.5
From socket <==: 192.168.60.5 --> 192.168.53.99
From tun ==>: 192.168.53.99 --> 192.168.60.5
From socket <==: 192.168.60.5 --> 192.168.53.99
From tun ==>: 192.168.53.99 --> 192.168.60.5
From socket <==: 192.168.60.5 --> 192.168.53.99
From tun ==>: 192.168.53.99 --> 192.168.60.5
From socket <==: 192.168.60.5 --> 192.168.53.99
```

服务器端输出：

```
root@f9644d809c33:/volumes# python3 tun_server_select.py
Interface Name: tun0
10.9.0.5:9090-->0.0.0.0:9090
From socket <==: 192.168.53.99 --> 192.168.60.5
From tun ==>: 192.168.60.5 --> 192.168.53.99
10.9.0.5:9090-->0.0.0.0:9090
From socket <==: 192.168.53.99 --> 192.168.60.5
From tun ==>: 192.168.60.5 --> 192.168.53.99
10.9.0.5:9090-->0.0.0.0:9090
From socket <==: 192.168.53.99 --> 192.168.60.5
From tun ==>: 192.168.60.5 --> 192.168.53.99
10.9.0.5:9090-->0.0.0.0:9090
From socket <==: 192.168.53.99 --> 192.168.60.5
From tun ==>: 192.168.60.5 --> 192.168.53.99
10.9.0.5:9090-->0.0.0.0:9090
From socket <==: 192.168.53.99 --> 192.168.60.5
From tun ==>: 192.168.60.5 --> 192.168.53.99
10.9.0.5:9090-->0.0.0.0:9090
From socket <==: 192.168.53.99 --> 192.168.60.5
From tun ==>: 192.168.60.5 --> 192.168.53.99
```

telnet 192.168.60.5 成功:

```
root@efda7349cecf:/volumes# telnet 192.168.60.5
Trying 192.168.60.5...
Connected to 192.168.60.5.
Escape character is '^]'.
Ubuntu 20.04.1 LTS
1f3ea61355b2 login:
```

客户端输出：

```
root@efda7349cecf:/volumes# python3 tun_client_select.py
Interface Name: tun0
From tun ==>: 192.168.53.99 --> 192.168.60.5
From socket <==: 192.168.60.5 --> 192.168.53.99
From tun ==>: 192.168.53.99 --> 192.168.60.5
From tun ==>: 192.168.53.99 --> 192.168.60.5
From socket <==: 192.168.60.5 --> 192.168.53.99
From socket <==: 192.168.60.5 --> 192.168.53.99
From tun ==>: 192.168.53.99 --> 192.168.60.5
From tun ==>: 192.168.53.99 --> 192.168.60.5
From socket <==: 192.168.60.5 --> 192.168.53.99
From socket <==: 192.168.60.5 --> 192.168.53.99
From tun ==>: 192.168.53.99 --> 192.168.60.5
From tun ==>: 192.168.53.99 --> 192.168.60.5
From socket <==: 192.168.60.5 --> 192.168.53.99
From socket <==: 192.168.60.5 --> 192.168.53.99
```

服务器端输出：

```
root@f9644d809c33:/volumes# python3 tun_server_select.py
Interface Name: tun0
10.9.0.5:9090-->0.0.0.0:9090
From socket <==: 192.168.53.99 --> 192.168.60.5
From tun ==>: 192.168.60.5 --> 192.168.53.99
10.9.0.5:9090-->0.0.0.0:9090
From socket <==: 192.168.53.99 --> 192.168.60.5
10.9.0.5:9090-->0.0.0.0:9090
From socket <==: 192.168.53.99 --> 192.168.60.5
From tun ==>: 192.168.60.5 --> 192.168.53.99
From tun ==>: 192.168.60.5 --> 192.168.53.99
10.9.0.5:9090-->0.0.0.0:9090
From socket <==: 192.168.53.99 --> 192.168.60.5
10.9.0.5:9090-->0.0.0.0:9090
From socket <==: 192.168.53.99 --> 192.168.60.5
From tun ==>: 192.168.60.5 --> 192.168.53.99
From tun ==>: 192.168.60.5 --> 192.168.53.99
```

Task 6:

断开 client 或者 server 程序之后，发现在 Telnet 登陆进去之处无法键入，Telnet 以及重新建立：

```
Connected to 192.168.60.5.
Escape character is '^]'.
Ubuntu 20.04.1 LTS
1f3ea61355b2 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

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.

The programs included with the Ubuntu system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
applicable law.

seed@1f3ea61355b2:~$
```