

EE359 Computer Networks Lab 1 Report

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Exercise 1 What protocol does "ping" and "traceroute" use?

Solution. ping and traceroute use ICMP(Internet Control Message Protocol). See Figure 1

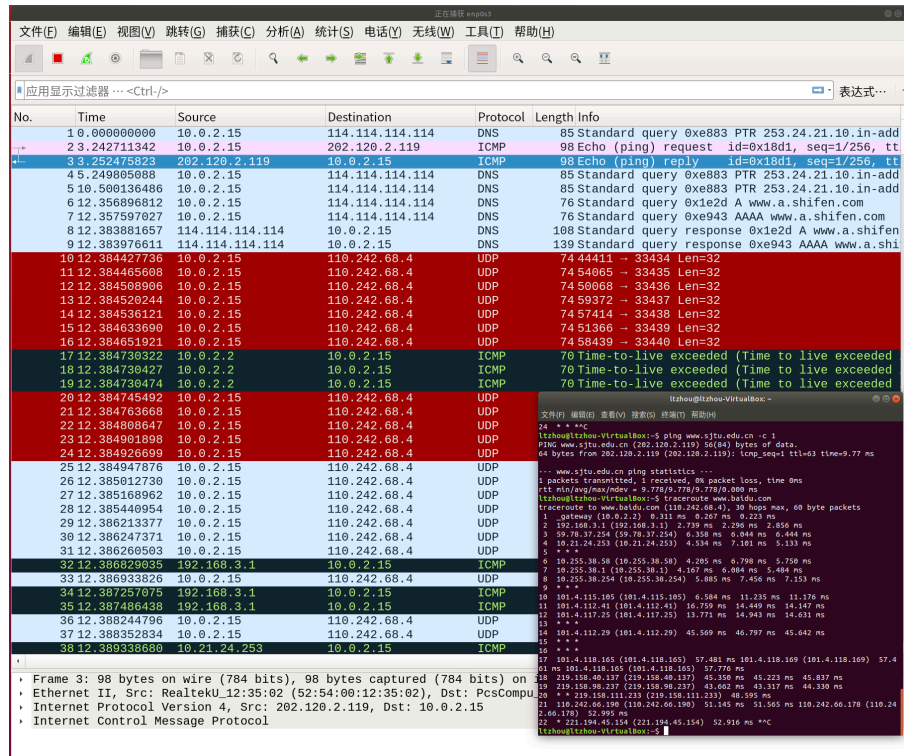


Figure 1: A ping and a traceroute command are executed in the terminal. The 2nd and 3rd record in Wireshark shows that ICMP is used in ping. The 17th - 19th record in Wireshark shows that ICMP is also used in traceroute.

Exercise 2 What is the IP address of www.sjtu.edu.cn?

Solution. From my experiment, IP address of www.sjtu.edu.cn is 202.120.2.119

```
ltzhou@ltzhou-VirtualBox: ~  
文件(F) 编辑(E) 查看(V) 搜索(S) 终端(T) 帮助(H)  
ltzhou@ltzhou-VirtualBox:~$ ping www.sjtu.edu.cn  
PING www.sjtu.edu.cn (202.120.2.119) 56(84) bytes of data.  
64 bytes from 202.120.2.119 (202.120.2.119): icmp_seq=1 ttl=63 time=4.29 ms  
64 bytes from 202.120.2.119 (202.120.2.119): icmp_seq=2 ttl=63 time=4.29 ms  
64 bytes from 202.120.2.119 (202.120.2.119): icmp_seq=3 ttl=63 time=10.0 ms  
64 bytes from 202.120.2.119 (202.120.2.119): icmp_seq=4 ttl=63 time=4.24 ms  
64 bytes from 202.120.2.119 (202.120.2.119): icmp_seq=5 ttl=63 time=13.4 ms  
^C  
--- www.sjtu.edu.cn ping statistics ---  
5 packets transmitted, 5 received, 0% packet loss, time 4007ms  
rtt min/avg/max/mdev = 4.246/7.267/13.464/3.819 ms  
ltzhou@ltzhou-VirtualBox:~$
```

Figure 2: The IP address is obtained by pinging the domain name of SJTU

Exercise 3 What is the average round trip time (RTT) from your VM to `www.sjtu.edu.cn` and `mit.edu`. Analyze the reason for the difference of their RTTs.

Solution. RTT for `www.sjtu.edu.cn` is 7.706 ms on average. RTT for `mit.edu` is 214.188 ms on average. More details can be found in Figure 3.

The reason why RTT for `mit` takes longer than that for `SJTU` is probably because in order to reach the host in MIT, the packet has to travel through more routers, thus increasing transmission delay, queuing delay, etc.

```
ltzhou@ltzhou-VirtualBox: ~  
文件(F) 编辑(E) 查看(V) 搜索(S) 终端(T) 帮助(H)  
ltzhou@ltzhou-VirtualBox:~$ ping www.sjtu.edu.cn -c 10  
PING www.sjtu.edu.cn (202.120.2.119) 56(84) bytes of data.  
64 bytes from 202.120.2.119 (202.120.2.119): icmp_seq=1 ttl=63 time=3.31 ms  
64 bytes from 202.120.2.119 (202.120.2.119): icmp_seq=2 ttl=63 time=10.5 ms  
64 bytes from 202.120.2.119 (202.120.2.119): icmp_seq=3 ttl=63 time=9.70 ms  
64 bytes from 202.120.2.119 (202.120.2.119): icmp_seq=4 ttl=63 time=9.67 ms  
64 bytes from 202.120.2.119 (202.120.2.119): icmp_seq=5 ttl=63 time=6.65 ms  
64 bytes from 202.120.2.119 (202.120.2.119): icmp_seq=6 ttl=63 time=9.59 ms  
64 bytes from 202.120.2.119 (202.120.2.119): icmp_seq=7 ttl=63 time=9.67 ms  
64 bytes from 202.120.2.119 (202.120.2.119): icmp_seq=8 ttl=63 time=3.71 ms  
64 bytes from 202.120.2.119 (202.120.2.119): icmp_seq=9 ttl=63 time=3.47 ms  
64 bytes from 202.120.2.119 (202.120.2.119): icmp_seq=10 ttl=63 time=10.7 ms  
--- www.sjtu.edu.cn ping statistics ---  
10 packets transmitted, 10 received, 0% packet loss, time 9018ms  
rtt min/avg/max/mdev = 3.319/7.706/10.712/2.942 ms  
ltzhou@ltzhou-VirtualBox:~$ ping mit.edu -c 10  
PING mit.edu (23.79.177.10) 56(84) bytes of data.  
64 bytes from 23.79.177.10 (23.79.177.10): icmp_seq=1 ttl=63 time=199 ms  
64 bytes from 23.79.177.10 (23.79.177.10): icmp_seq=2 ttl=63 time=221 ms  
64 bytes from 23.79.177.10 (23.79.177.10): icmp_seq=3 ttl=63 time=210 ms  
64 bytes from 23.79.177.10 (23.79.177.10): icmp_seq=4 ttl=63 time=202 ms  
64 bytes from 23.79.177.10 (23.79.177.10): icmp_seq=5 ttl=63 time=207 ms  
64 bytes from 23.79.177.10 (23.79.177.10): icmp_seq=6 ttl=63 time=209 ms  
64 bytes from 23.79.177.10 (23.79.177.10): icmp_seq=7 ttl=63 time=207 ms  
64 bytes from 23.79.177.10 (23.79.177.10): icmp_seq=8 ttl=63 time=211 ms  
64 bytes from 23.79.177.10 (23.79.177.10): icmp_seq=9 ttl=63 time=225 ms  
64 bytes from 23.79.177.10 (23.79.177.10): icmp_seq=10 ttl=63 time=246 ms  
--- mit.edu ping statistics ---  
10 packets transmitted, 10 received, 0% packet loss, time 18226ms  
rtt min/avg/max/mdev = 199.881/214.188/246.542/12.994 ms  
ltzhou@ltzhou-VirtualBox:~$
```

Figure 3: 10 packets are sent by the ping command for each site

□

Exercise 4 What is the TCP bandwidth between your two VMs?

Solution. The bandwidth between two VMs are about 4 Gbits/sec, shown in Figure 4

□

Exercise 5 Select a VM as your host machine, and another VM as your server machine, then use ssh on your host to connect to the server.

Solution. See Figure 5



Exercise 6 Use scp to copy a file from your host to the server.

Solution. See Figure 6, Figure 7.



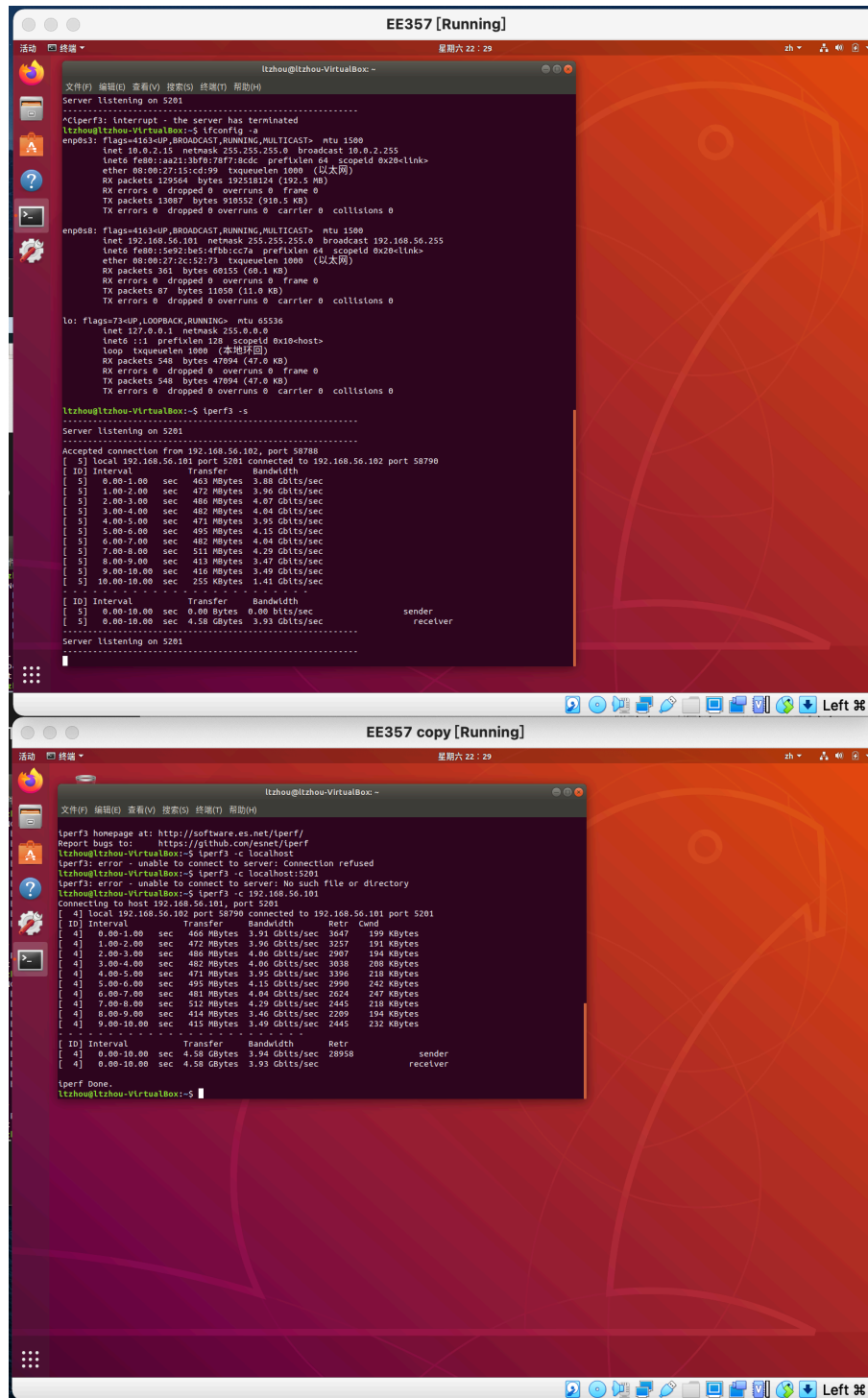


Figure 4: Use iperf to test TCP bandwidth between two VMs. The above VM is the server, and the below is host

```
ltzhou@ltzhou-VirtualBox: ~  
文件(F) 编辑(E) 查看(V) 搜索(S) 终端(T) 帮助(H)  
iperf Done.  
ltzhou@ltzhou-VirtualBox:~$ ssh ltzhou@192.168.56.101  
The authenticity of host '192.168.56.101 (192.168.56.101)' can't be established.  
ECDSA key fingerprint is SHA256:2v3YDN9m5k2zfHocFrX7MMr0udGoHLVnfa4hwvcrYI.  
Are you sure you want to continue connecting (yes/no)? yes  
Warning: Permanently added '192.168.56.101' (ECDSA) to the list of known hosts.  
ltzhou@192.168.56.101's password:  
Welcome to Ubuntu 18.04.5 LTS (GNU/Linux 5.4.0-66-generic x86_64)  
  
* Documentation:  https://help.ubuntu.com  
* Management:    https://landscape.canonical.com  
* Support:       https://ubuntu.com/advantage  
  
* Canonical Livepatch is available for installation.  
- Reduce system reboots and improve kernel security. Activate at:  
  https://ubuntu.com/livepatch  
  
1 个可升级软件包。  
0 of these updates are security updates.  
To see these additional updates run: apt list --upgradable  
  
Your Hardware Enablement Stack (HWE) is supported until April 2023.  
ltzhou@ltzhou-VirtualBox:~$
```

Figure 5: ssh screenshot

```
EE357 copy [Running]  
活动 终端 星期六 22 : 51 zh 40  
ltzhou@ltzhou-VirtualBox: ~  
文件(F) 编辑(E) 查看(V) 搜索(S) 终端(T) 帮助(H)  
* Management:  https://landscape.canonical.com  
* Support:     https://ubuntu.com/advantage  
  
* Canonical Livepatch is available for installation.  
- Reduce system reboots and improve kernel security. Activate at:  
  https://ubuntu.com/livepatch  
  
1 个可升级软件包。  
0 of these updates are security updates.  
To see these additional updates run: apt list --upgradable  
  
Your Hardware Enablement Stack (HWE) is supported until April 2023.  
ltzhou@ltzhou-VirtualBox:~$ exit  
注销  
Connection to 192.168.56.101 closed.  
ltzhou@ltzhou-VirtualBox:~$ vi a.txt  
ltzhou@ltzhou-VirtualBox:~$ scp a.txt ltzhou@192.168.56.101:/home/test/a.txt  
ltzhou@192.168.56.101's password:  
scp: /home/test/a.txt: No such file or directory  
ltzhou@ltzhou-VirtualBox:~$ scp a.txt ltzhou@192.168.56.101:/home/ltzhou/a.txt  
ltzhou@192.168.56.101's password:  
a.txt  
ltzhou@ltzhou-VirtualBox:~$
```

Figure 6: “a.txt” is created in the host machine, it is copied to the “/home/ltzhou” directory of the server machine

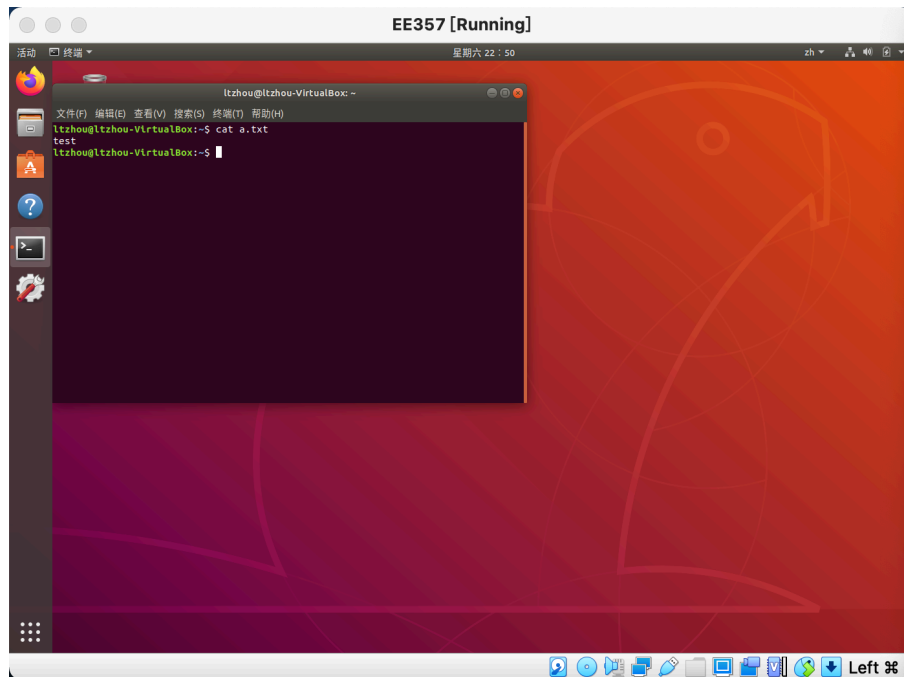


Figure 7: "a.txt" is transferred to the server machine