Lab1: Set Up Environment and Test Basic SoftWares

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Summary

In this lab, I combined both what I learned in class and some experiments. I set up environment and test basic software. My results are as follows:

0) First, I set up the environment. I install VirtualBox and ISO file of Ubuntu 18.04. Then I create a host only network and add my VM to the host only network. Further, after installing Ubuntu OS, I open a terminal and install some necessary software. Last, I make a copy of my VM.
1) In TASK 1, I use “ping” to connect to www.baidu.com, and use wireshark to determine which protocol is used. As we can see, “ping” uses ICMP.

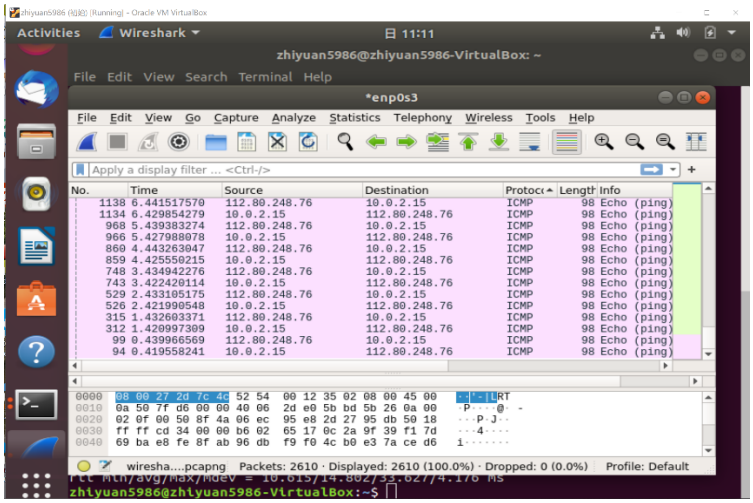

Fig.1 ping www.baidu.com

Then I use “traceroute” to connect www.baidu.com, and use wireshark to determine which protocol is used. As we can see, “traceroute” uses UDP.

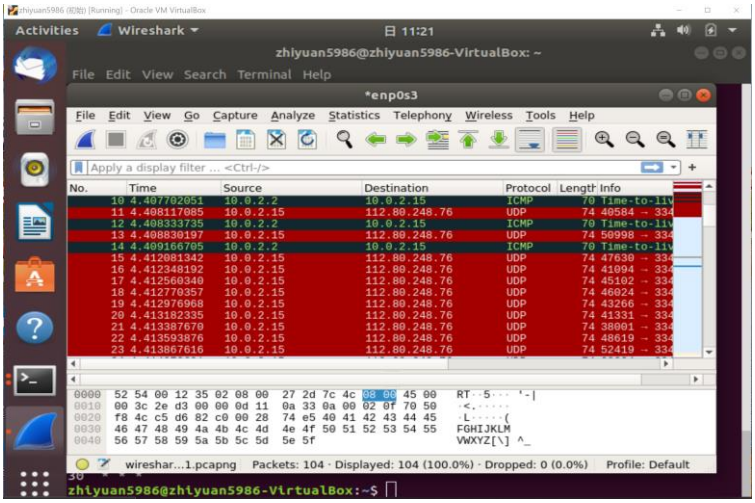

Fig.2 traceroute www.baidu.com

2) In TASK 2, in order to find the IP address of www.baidu.com, I use "ping" and observe the result shown in the terminal. As we can see, the IP address of www.baidu.com is 112.80.248.76.

```
zhiyuan5986@zhiyuan5986-VirtualBox:~$ ping www.baidu.com
PING www.a.shifen.com (112.80.248.76) 56(84) bytes of data.
64 bytes from 112.80.248.76 (112.80.248.76): icmp_seq=1 ttl=49 time=13.1 ms
64 bytes from 112.80.248.76 (112.80.248.76): icmp_seq=2 ttl=49 time=11.8 ms
64 bytes from 112.80.248.76 (112.80.248.76): icmp_seq=3 ttl=49 time=11.7 ms
64 bytes from 112.80.248.76 (112.80.248.76): icmp_seq=4 ttl=49 time=11.6 ms
64 bytes from 112.80.248.76 (112.80.248.76): icmp_seq=5 ttl=49 time=13.2 ms
64 bytes from 112.80.248.76 (112.80.248.76): icmp_seq=6 ttl=49 time=13.2 ms
64 bytes from 112.80.248.76 (112.80.248.76): icmp_seq=7 ttl=49 time=8.73 ms
64 bytes from 112.80.248.76 (112.80.248.76): icmp_seq=8 ttl=49 time=8.50 ms
64 bytes from 112.80.248.76 (112.80.248.76): icmp_seq=9 ttl=49 time=12.6 ms
64 bytes from 112.80.248.76 (112.80.248.76): icmp_seq=10 ttl=49 time=10.7 ms
64 bytes from 112.80.248.76 (112.80.248.76): icmp_seq=11 ttl=49 time=10.4 ms
64 bytes from 112.80.248.76 (112.80.248.76): icmp_seq=12 ttl=49 time=13.8 ms
64 bytes from 112.80.248.76 (112.80.248.76): icmp_seq=13 ttl=49 time=11.7 ms
64 bytes from 112.80.248.76 (112.80.248.76): icmp_seq=14 ttl=49 time=10.9 ms
64 bytes from 112.80.248.76 (112.80.248.76): icmp_seq=15 ttl=49 time=11.8 ms
64 bytes from 112.80.248.76 (112.80.248.76): icmp_seq=16 ttl=49 time=9.57 ms
64 bytes from 112.80.248.76 (112.80.248.76): icmp_seq=17 ttl=49 time=10.2 ms
64 bytes from 112.80.248.76 (112.80.248.76): icmp_seq=18 ttl=49 time=11.1 ms
64 bytes from 112.80.248.76 (112.80.248.76): icmp_seq=19 ttl=49 time=9.36 ms
64 bytes from 112.80.248.76 (112.80.248.76): icmp_seq=20 ttl=49 time=11.1 ms
```

Fig.3 find IP address of www.baidu.com

3) In TASK 3, in order to find the average round trip time (RTT) from my VM to www.baidu.com and mit.edu, I use "ping" and parameter "-c 5" to send 5 packets. As we can see, avg RTT of www.baidu.com is 13.940ms and avg RTT of mit.edu is 121.116ms. And the reason for the difference is that the server of www.baidu.com is more close to my VM so the trip to it is shorter, and the server of mit.edu is farther, switchs and links are more than those of www.baidu.com.

```
zhiyuan5986@zhiyuan5986-VirtualBox:~$ ping -c 5 www.baidu.com
PING www.a.shifen.com (112.80.248.76) 56(84) bytes of data.
64 bytes from 112.80.248.76 (112.80.248.76): icmp_seq=1 ttl=49 time=11.6 ms
64 bytes from 112.80.248.76 (112.80.248.76): icmp_seq=2 ttl=49 time=13.7 ms
64 bytes from 112.80.248.76 (112.80.248.76): icmp_seq=3 ttl=49 time=11.9 ms
64 bytes from 112.80.248.76 (112.80.248.76): icmp_seq=4 ttl=49 time=19.8 ms
64 bytes from 112.80.248.76 (112.80.248.76): icmp_seq=5 ttl=49 time=12.5 ms

--- www.a.shifen.com ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4005ms
rtt min/avg/max/mdev = 11.614/13.940/19.827/3.034 ms
```

Fig.4 avg RTT of www.baidu.com

```
zhiyuan5986@zhiyuan5986-VirtualBox:~$ ping -c 5 mit.edu
PING mit.edu (23.7.172.76) 56(84) bytes of data.
64 bytes from a23-7-172-76.deploy.static.akamaitechnologies.com (23.7.172.76):
icmp_seq=1 ttl=46 time=109 ms
64 bytes from a23-7-172-76.deploy.static.akamaitechnologies.com (23.7.172.76):
icmp_seq=2 ttl=46 time=110 ms
64 bytes from a23-7-172-76.deploy.static.akamaitechnologies.com (23.7.172.76):
icmp_seq=3 ttl=46 time=110 ms
64 bytes from a23-7-172-76.deploy.static.akamaitechnologies.com (23.7.172.76):
icmp_seq=4 ttl=46 time=112 ms
64 bytes from a23-7-172-76.deploy.static.akamaitechnologies.com (23.7.172.76):
icmp_seq=5 ttl=46 time=162 ms

--- mit.edu ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4499ms
rtt min/avg/max/mdev = 109.215/121.116/162.552/20.742 ms
```

Fig.5 avg RTT of mit.edu

4) In TASK 4, first, I use the command “iperf3 -s” to open listening in a machine (Host 1). Then in another machine (Host2), I use “iperf -c 192.168.56.102” to connect to Host1. As we can see, the TCP bandwidth between the two VMs is about 2.05Gbits/sec.

```
zhiyuan5986@zhiyuan5986-VirtualBox:~$ iperf3 -s
-----------------------------------------------------------
Server listening on 5201
-----------------------------------------------------------
Accepted connection from 192.168.56.101, port 39518
[  5] local 192.168.56.102 port 5201 connected to 192.168.56.101 port 39520
[ ID] Interval           Transfer     Bandwidth
[  5]   0.00-1.00   sec  74.9 MBytes   628 Mbits/sec
[  5]   1.00-2.00   sec   240 MBytes  2.01 Gbits/sec
[  5]   2.00-3.00   sec   251 MBytes  2.11 Gbits/sec
[  5]   3.00-4.00   sec   248 MBytes  2.08 Gbits/sec
[  5]   4.00-5.00   sec   252 MBytes  2.11 Gbits/sec
[  5]   5.00-6.00   sec   242 MBytes  2.03 Gbits/sec
[  5]   6.00-7.00   sec   248 MBytes  2.08 Gbits/sec
[  5]   7.00-8.00   sec   252 MBytes  2.11 Gbits/sec
[  5]   8.00-9.00   sec   241 MBytes  2.02 Gbits/sec
[  5]   9.00-10.00  sec   248 MBytes  2.08 Gbits/sec
[  5]  10.00-10.64  sec   146 MBytes  1.90 Gbits/sec
- - - - - - - - - - - - - - - - - - - - - - - - -
[ ID] Interval           Transfer     Bandwidth
[  5]   0.00-10.64  sec  0.00 Bytes  0.00 bits/sec                  sender
[  5]   0.00-10.64  sec  2.39 GBytes  1.92 Gbits/sec                  receiver
-----------------------------------------------------------
Server listening on 5201
-----------------------------------------------------------
```

Fig.6 Host 1

```
zhiyuan5986@zhiyuan5986-VirtualBox:~$ iperf3 -c 192.168.56.102
Connecting to host 192.168.56.102, port 5201
[  4] local 192.168.56.101 port 39520 connected to 192.168.56.102 port 5201




[ ID] Interval           Transfer     Bandwidth       Retr  Cwnd
[  4]   0.00-1.00   sec   237 MBytes  1.99 Gbits/sec  765    290 KBytes
[  4]   1.00-2.00   sec   246 MBytes  2.06 Gbits/sec  1016    284 KBytes
[  4]   2.00-3.00   sec   246 MBytes  2.07 Gbits/sec  1050    354 KBytes
[  4]   3.00-4.00   sec   258 MBytes  2.16 Gbits/sec  957    189 KBytes
[  4]   4.00-5.00   sec   240 MBytes  2.02 Gbits/sec  641    315 KBytes
[  4]   5.00-6.00   sec   246 MBytes  2.06 Gbits/sec  855    229 KBytes
[  4]   6.00-7.00   sec   256 MBytes  2.15 Gbits/sec  630    348 KBytes
[  4]   7.00-8.00   sec   241 MBytes  2.02 Gbits/sec  900    233 KBytes
[  4]   8.00-9.00   sec   244 MBytes  2.05 Gbits/sec  640    225 KBytes
[  4]   9.00-10.00  sec   231 MBytes  1.94 Gbits/sec  725    269 KBytes
- - - - - - - - - - - - - - - - - - - - - - - - -
[ ID] Interval           Transfer     Bandwidth       Retr
[  4]   0.00-10.00  sec  2.39 GBytes  2.05 Gbits/sec  8179             sender
[  4]   0.00-10.00  sec  2.39 GBytes  2.05 Gbits/sec                  receiver

iperf Done.
```

Fig.7 Host 2

5) In TASK 5, I use Host 1 as server machine and Host 2 as host machine. I use ssh in Host 2 to connect Host 1. As we can see, the connection is successful.

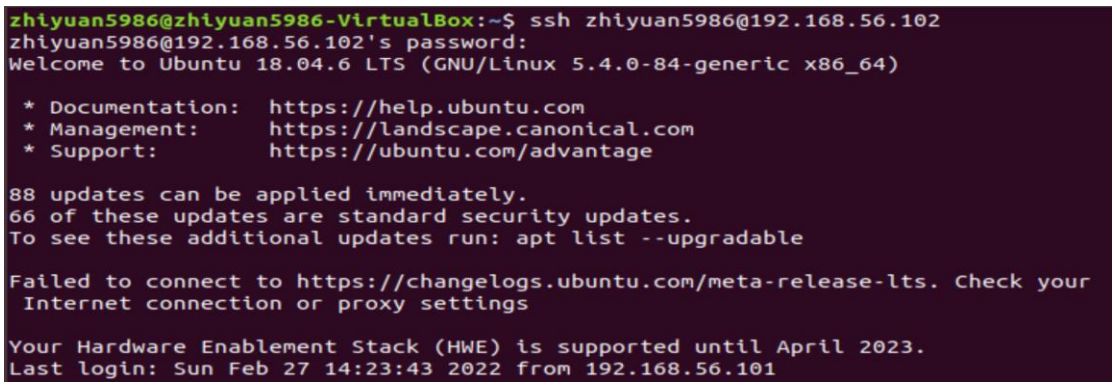

Fig.8 use ssh in Host 2 to connect Host 1

6) In TASK 6, I create a file named “lab1.txt” in Host 2 and use “scp” to copy it to Host 1. The result is as follows:

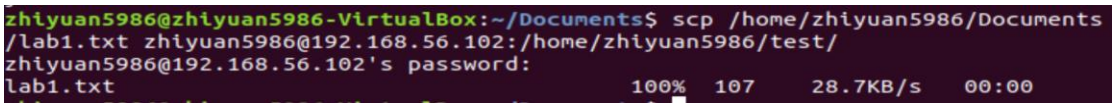

Fig.8 copy lab1.txt from Host 2 to Host 1

Conclusion

In this lab, I study the basic operation in computer network. As a programmer, I find some bugs and solve them by search in the Internet or with my experience. As a consequence, I make some progress and find it interesting.

Reference

[1] https://blog.csdn.net/lppl010_/article/details/80831380
[2] https://blog.csdn.net/weixin_41960890/article/details/105020897
[3] https://blog.csdn.net/weixin_30518397/article/details/96142861
[4] https://blog.csdn.net/qq_41253960/article/details/121308134
[5] https://blog.csdn.net/weixin_50301100/article/details/112914291
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[7] https://blog.csdn.net/wuhuimin521/article/details/80033378?ops_request_misc=%257B%2522request%255Fid%2522%253A%252216460512291678026198433 9%2522%252C%2522scm%2522%253A%252220140713.130102334..%2522%257D&request_id=164605122916780261984339&biz_id=0&utm_medium=distribute.pc_search_result.none-task-blog-2~all~sobaiduend~default-1-80033378.pc_search_result_positive&utm_term=host+only&spm=1018.2226.3001.4187