Homework 1 Report

Questions

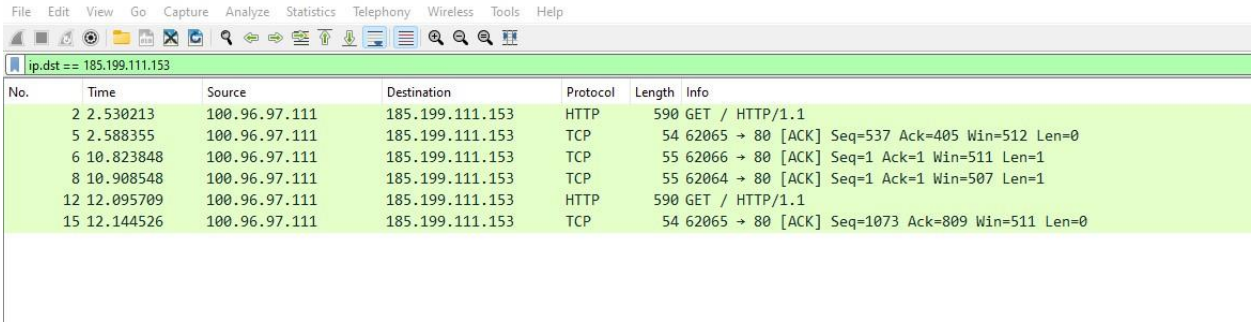
1. In this problem, I tried to ping four websites with www prefix and one without such prefix. The TTL and the minimum/maximum/average RTTs of the first four websites with www prefix are shown below, which are:
    a. www.ucsd.edu: $TTL = 227, RTT_{Min} = 33\ ms, RTT_{Max} = 34\ ms, RTT_{Ave} = 33\ ms$;
    b. www.google.com: $TTL = 114, RTT_{Min} = 3\ ms, RTT_{Max} = 4\ ms, RTT_{Ave} = 3\ ms$;
    c. www.youtube.com: $TTL = 55, RTT_{Min} = 3\ ms, RTT_{Max} = 4\ ms, RTT_{Ave} = 3\ ms$;
    d. www.facebook.com: $TTL = 54, RTT_{Min} = 3\ ms, RTT_{Max} = 4\ ms, RTT_{Ave} = 3\ ms$;
    e. http://mininet.org/: failed to ping, I think it is because the host of this website blocks the ICMP pings by default.

    So basically, the round-trip time (RTT) is to measure the time between initiating a network request from a starting point and receiving a response from the destination. In this question, my computer is the starting point of initiating a request and the website I ping to is the destination. So basically, the round-trip time is to measure the time between initiating a network request from a starting point and receiving a response from the destination. In this question, my computer is the starting point of initiating a request and the website I ping to is the destination.

    As for the time-to-live (TLL), it is the time that a packet should exist on the network before being discarded, which is the “lifetime” of a packet. Also, the TTL can be used to reach to a host or trace a route to the host.

```
Pinging cms-web-1573499122.us-west-2.elb.amazonaws.com [52.11.24.255] with 32 bytes of data:
Reply from 52.11.24.255: bytes=32 time=33ms TTL=227
Reply from 52.11.24.255: bytes=32 time=33ms TTL=227
Reply from 52.11.24.255: bytes=32 time=34ms TTL=227
Reply from 52.11.24.255: bytes=32 time=33ms TTL=227

Ping statistics for 52.11.24.255:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 33ms, Maximum = 34ms, Average = 33ms

C:\Users\10445>ping www.google.com

Pinging www.google.com [142.250.189.4] with 32 bytes of data:
Reply from 142.250.189.4: bytes=32 time=3ms TTL=114
Reply from 142.250.189.4: bytes=32 time=4ms TTL=114
Reply from 142.250.189.4: bytes=32 time=4ms TTL=114
Reply from 142.250.189.4: bytes=32 time=4ms TTL=114

Ping statistics for 142.250.189.4:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 3ms, Maximum = 4ms, Average = 3ms

C:\Users\10445>ping www.youtube.com

Pinging youtube-ui.l.google.com [142.250.176.14] with 32 bytes of data:
Reply from 142.250.176.14: bytes=32 time=3ms TTL=55
Reply from 142.250.176.14: bytes=32 time=4ms TTL=55
Reply from 142.250.176.14: bytes=32 time=4ms TTL=55
Reply from 142.250.176.14: bytes=32 time=4ms TTL=55

Ping statistics for 142.250.176.14:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 3ms, Maximum = 4ms, Average = 3ms

C:\Users\10445>ping www.facebook.com

Pinging star-mini.c10r.facebook.com [157.240.11.35] with 32 bytes of data:
Reply from 157.240.11.35: bytes=32 time=3ms TTL=54
Reply from 157.240.11.35: bytes=32 time=4ms TTL=54
Reply from 157.240.11.35: bytes=32 time=3ms TTL=54
Reply from 157.240.11.35: bytes=32 time=4ms TTL=54

Ping statistics for 157.240.11.35:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 3ms, Maximum = 4ms, Average = 3ms

C:\Users\10445>ping http://mininet.org/
Ping request could not find host http://mininet.org/. Please check the name and try again.
```

2. Since there is no valid submission for pcap file on gradescope, I include this screenshot for capturing packets of visiting the http:// mininet.org.



3. In this problem, when I tried to iperf to the http:// mininet.org, the connection was failed by timed out. I think it might be the same issue I met in problem 1 which caused by its host blocking such request by default. Therefore, I measured the bandwidth with a public iperf website located on France, which is shown below.

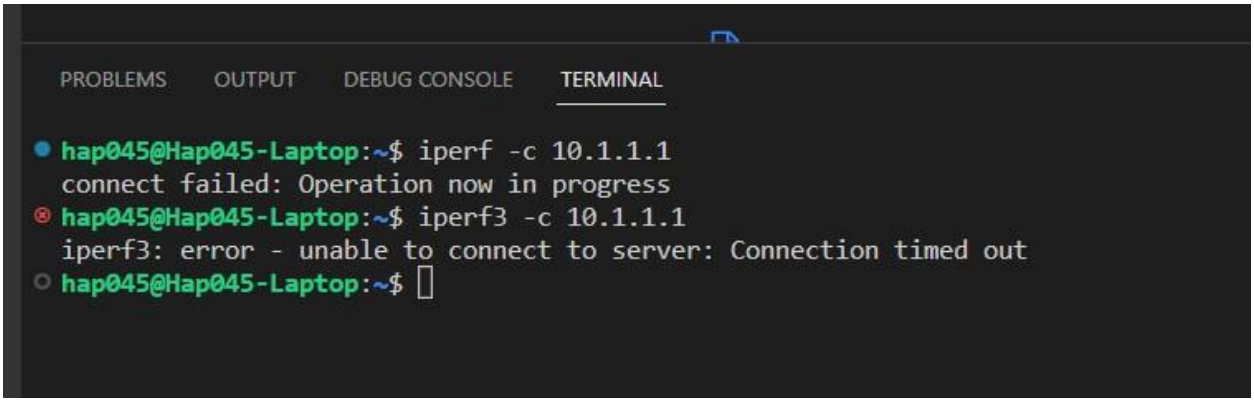
```
hap045@Hap045-Laptop:~$ iperf -c paris.testdebit.info
------------------------------------------------------------
Client connecting to paris.testdebit.info, TCP port 5001
TCP window size: 45.0 KByte (default)
------------------------------------------------------------
[  3] local 172.29.124.190 port 37452 connected with 89.84.1.194 port 5001
write failed: Connection reset by peer
[ ID] Interval       Transfer     Bandwidth
[  3]  0.0- 0.1 sec  70.1 KBytes  3.99 Mbits/sec
hap045@Hap045-Laptop:~$ iperf -c mininet.org
connect failed: Operation now in progress
hap045@Hap045-Laptop:~$ iperf3 -c mininet.org
iperf3: error - unable to connect to server: Connection timed out
```

Introduction

1.

```
hap045@Hap045-Laptop:~$ ping 8.8.8.8
PING 8.8.8.8 (8.8.8.8) 56(84) bytes of data.
64 bytes from 8.8.8.8: icmp_seq=1 ttl=115 time=10.3 ms
64 bytes from 8.8.8.8: icmp_seq=2 ttl=115 time=11.2 ms
64 bytes from 8.8.8.8: icmp_seq=3 ttl=115 time=10.3 ms
64 bytes from 8.8.8.8: icmp_seq=4 ttl=115 time=11.0 ms
64 bytes from 8.8.8.8: icmp_seq=5 ttl=115 time=11.0 ms
64 bytes from 8.8.8.8: icmp_seq=6 ttl=115 time=38.8 ms
^C
--- 8.8.8.8 ping statistics ---
6 packets transmitted, 6 received, 0% packet loss, time 5008ms
rtt min/avg/max/mdev = 10.301/15.438/38.791/10.449 ms
hap045@Hap045-Laptop:~$
```

2.



3.

3	0.144630	100.96.97.111	89.84.1.194	TCP	54	53948 → 443 [ACK] Seq=1 Ack=1 Win=131072 Len=0
4	0.144830	100.96.97.111	89.84.1.194	TLSv1.3	571	Client Hello
5	0.289306	89.84.1.194	100.96.97.111	TCP	54	443 → 53948 [ACK] Seq=1 Ack=518 Win=64512 Len=0
6	0.290092	89.84.1.194	100.96.97.111	TLSv1.3	292	Server Hello, Change Cipher Spec, Application Data, Application Data
7	0.290801	100.96.97.111	89.84.1.194	TLSv1.3	118	Change Cipher Spec, Application Data
8	0.291180	100.96.97.111	89.84.1.194	TLSv1.3	152	Application Data
9	0.291558	100.96.97.111	89.84.1.194	TLSv1.3	580	Application Data
10	0.434170	89.84.1.194	100.96.97.111	TCP	54	443 → 53948 [ACK] Seq=239 Ack=582 Win=64512 Len=0
11	0.435304	89.84.1.194	100.96.97.111	TCP	54	443 → 53948 [ACK] Seq=239 Ack=680 Win=64512 Len=0
12	0.435304	89.84.1.194	100.96.97.111	TLSv1.3	133	Application Data
13	0.435304	89.84.1.194	100.96.97.111	TLSv1.3	113	Application Data
14	0.435304	89.84.1.194	100.96.97.111	TCP	54	443 → 53948 [ACK] Seq=377 Ack=1206 Win=64512 Len=0
15	0.435352	100.96.97.111	89.84.1.194	TCP	54	53948 → 443 [ACK] Seq=1206 Ack=377 Win=130816 Len=0
16	0.435645	100.96.97.111	89.84.1.194	TLSv1.3	85	Application Data
17	0.445767	89.84.1.194	100.96.97.111	TLSv1.3	10054	Application Data, Application Data
18	0.445826	100.96.97.111	89.84.1.194	TCP	54	53948 → 443 [ACK] Seq=1237 Ack=10377 Win=131072 Len=0
19	0.454167	89.84.1.194	100.96.97.111	TLSv1.3	1304	Application Data
20	0.454231	100.96.97.111	89.84.1.194	TCP	54	53948 → 443 [ACK] Seq=1237 Ack=11627 Win=131072 Len=0
21	0.579997	89.84.1.194	100.96.97.111	TLSv1.3	1304	Application Data
22	0.579997	89.84.1.194	100.96.97.111	TLSv1.3	941	Application Data, Application Data
23	0.580042	100.96.97.111	89.84.1.194	TCP	54	53948 → 443 [ACK] Seq=1237 Ack=13764 Win=131072 Len=0
24	0.584068	89.84.1.194	100.96.97.111	TCP	54	443 → 53948 [ACK] Seq=13764 Ack=1237 Win=64512 Len=0
25	1.405886	52.206.78.77	100.96.97.111	TLSv1.2	85	Application Data
26	1.406109	100.96.97.111	52.206.78.77	TLSv1.2	89	Application Data
27	1.457056	100.96.97.111	52.206.78.77	TLSv1.2	93	Application Data
28	1.478357	52.206.78.77	100.96.97.111	TCP	54	443 → 65082 [ACK] Seq=32 Ack=36 Win=117 Len=0
29	1.529547	52.206.78.77	100.96.97.111	TCP	54	443 → 65082 [ACK] Seq=32 Ack=75 Win=117 Len=0

HW1

Thursday, October 6, 2022 3:08 PM

2.4 Propagation speed $= 2 \times 10^8$ m/s.

Distance $= 30000$ km $= 3 \times 10^7$ m.

capacity $C = 100$ Mbps.

(1) $d_{prop} = \frac{\text{Distance}}{\text{Prop. speed}} = \frac{3 \times 10^7}{2 \times 10^8} = 0.15$ s.

$C \times d_{prop} = (1 \times 10^8) \times 0.15 = 1.5 \times 10^7$ bits.

(2) the maximum number of bits on the link equals to the "bandwidth-delay product", i.e.,

$C \times d_{prop} = 1.5 \times 10^7$ bits.

(3) data size $= 3$ GB $= 3 \times 8 \times 10^9$ bits.

$d_{prop} = 0.15$ s.

$d_{trans} = \frac{3 \times 8 \times 10^9}{1 \times 10^8} = 240$ s.

$\therefore d_{total} = 240 + 0.15 = 240.15$ s.