

Part 1

4.

7	18.001107404	0e:21:0d:f8:91:b2	08:18:04:01:01:44	ARP	42	18.0.0.2 is at 0e:21:0d:f8:91:b2
8	18.001122883	10.0.0.1	10.0.0.2	ICMP	98	Echo (ping) request id=0x798b, seq=1/256, ttl=64 (reply in 9)
9	18.001881427	10.0.0.2	10.0.0.1	ICMP	98	Echo (ping) reply id=0x798b, seq=1/256, ttl=64 (request in 8)
10	19.002044550	10.0.0.1	10.0.0.2	ICMP	98	Echo (ping) request id=0x798b, seq=2/512, ttl=64 (reply in 11)
11	19.002082731	10.0.0.2	10.0.0.1	ICMP	98	Echo (ping) reply id=0x798b, seq=2/512, ttl=64 (request in 10)
12	20.028051233	10.0.0.1	10.0.0.2	ICMP	98	Echo (ping) request id=0x798b, seq=3/768, ttl=64 (reply in 13)
13	20.028093966	10.0.0.2	10.0.0.1	ICMP	98	Echo (ping) reply id=0x798b, seq=3/768, ttl=64 (request in 12)
14	21.056049414	10.0.0.1	10.0.0.2	ICMP	98	Echo (ping) request id=0x798b, seq=4/1024, ttl=64 (reply in 15)
15	21.056092914	10.0.0.2	10.0.0.1	ICMP	98	Echo (ping) reply id=0x798b, seq=4/1024, ttl=64 (request in 14)
16	22.076098234	10.0.0.1	10.0.0.2	ICMP	98	Echo (ping) request id=0x798b, seq=5/1280, ttl=64 (reply in 17)
17	22.076139480	10.0.0.2	10.0.0.1	ICMP	98	Echo (ping) reply id=0x798b, seq=5/1280, ttl=64 (request in 16)
18	23.040021056	5e:21:65:7e:9f:82	5a:1a:b4:5f:0f:44	ARP	42	Who has 10.0.0.1? Tell 10.0.0.2
19	23.040038115	5a:1a:b4:5f:0f:44	5e:21:65:7e:9f:82	ARP	42	10.0.0.1 is at 5a:1a:b4:5f:0f:44
20	23.100064725	10.0.0.1	10.0.0.2	ICMP	98	Echo (ping) request id=0x798b, seq=6/1536, ttl=64 (reply in 21)
21	23.100105408	10.0.0.2	10.0.0.1	ICMP	98	Echo (ping) reply id=0x798b, seq=6/1536, ttl=64 (request in 20)
22	24.124109534	10.0.0.1	10.0.0.2	ICMP	98	Echo (ping) request id=0x798b, seq=7/1792, ttl=64 (reply in 23)
23	24.124149126	10.0.0.2	10.0.0.1	ICMP	98	Echo (ping) reply id=0x798b, seq=7/1792, ttl=64 (request in 22)
24	25.148080761	10.0.0.1	10.0.0.2	ICMP	98	Echo (ping) request id=0x798b, seq=8/2048, ttl=64 (reply in 25)
25	25.148139565	10.0.0.2	10.0.0.1	ICMP	98	Echo (ping) reply id=0x798b, seq=8/2048, ttl=64 (request in 24)
26	26.172045387	10.0.0.1	10.0.0.2	ICMP	98	Echo (ping) request id=0x798b, seq=9/2304, ttl=64 (reply in 27)
27	26.172085839	10.0.0.2	10.0.0.1	ICMP	98	Echo (ping) reply id=0x798b, seq=9/2304, ttl=64 (request in 26)
28	27.196002005	10.0.0.1	10.0.0.2	ICMP	98	Echo (ping) request id=0x798b, seq=10/2560, ttl=64 (reply in 29)
29	27.196020854	10.0.0.2	10.0.0.1	ICMP	98	Echo (ping) reply id=0x798b, seq=10/2560, ttl=64 (request in 28)

Part 2 - tshark

1. to capture and save packet:

sudo tshark -w packet01 -f '(src host 8.8.8.8 or dst host 8.8.8.8) and icmp'

2. to view packet:

sudo tshark -r packet01

```
maxhsu@Max-Hsu-Lab: ~/Desktop/Desktop/Homework/G3-1/Advanced_Computer_Network/HW2$ sudo tshark -r packet01
Running as user "root" and group "root". This could be dangerous.
 0 0.000000000 192.168.0.210 → 8.8.8.8 ICMP 98 Echo (ping) request id=0x27e6, seq=1/256, ttl=64
 2 0.006631197 8.8.8.8 → 192.168.0.210 ICMP 98 Echo (ping) reply id=0x27e6, seq=1/256, ttl=118 (request in 1)
 3 1.001174655 192.168.0.210 → 8.8.8.8 ICMP 98 Echo (ping) request id=0x27e6, seq=2/512, ttl=64
 4 1.007708041 8.8.8.8 → 192.168.0.210 ICMP 98 Echo (ping) reply id=0x27e6, seq=2/512, ttl=118 (request in 3)
 5 2.002608909 192.168.0.210 → 8.8.8.8 ICMP 98 Echo (ping) request id=0x27e6, seq=3/768, ttl=64
 6 2.009082472 8.8.8.8 → 192.168.0.210 ICMP 98 Echo (ping) reply id=0x27e6, seq=3/768, ttl=118 (request in 5)
 7 3.004236078 192.168.0.210 → 8.8.8.8 ICMP 98 Echo (ping) request id=0x27e6, seq=4/1024, ttl=64
 8 3.010744021 8.8.8.8 → 192.168.0.210 ICMP 98 Echo (ping) reply id=0x27e6, seq=4/1024, ttl=118 (request in 7)
 9 4.005503241 192.168.0.210 → 8.8.8.8 ICMP 98 Echo (ping) request id=0x27e6, seq=5/1280, ttl=64
10 4.012017845 8.8.8.8 → 192.168.0.210 ICMP 98 Echo (ping) reply id=0x27e6, seq=5/1280, ttl=118 (request in 9)
11 5.006650029 192.168.0.210 → 8.8.8.8 ICMP 98 Echo (ping) request id=0x27e6, seq=6/1536, ttl=64
12 5.013132530 8.8.8.8 → 192.168.0.210 ICMP 98 Echo (ping) reply id=0x27e6, seq=6/1536, ttl=118 (request in 11)
13 6.008239765 192.168.0.210 → 8.8.8.8 ICMP 98 Echo (ping) request id=0x27e6, seq=7/1792, ttl=64
14 6.014760642 8.8.8.8 → 192.168.0.210 ICMP 98 Echo (ping) reply id=0x27e6, seq=7/1792, ttl=118 (request in 13)
15 7.009706053 192.168.0.210 → 8.8.8.8 ICMP 98 Echo (ping) request id=0x27e6, seq=8/2048, ttl=64
16 7.016307591 8.8.8.8 → 192.168.0.210 ICMP 98 Echo (ping) reply id=0x27e6, seq=8/2048, ttl=118 (request in 15)
17 8.010557023 192.168.0.210 → 8.8.8.8 ICMP 98 Echo (ping) request id=0x27e6, seq=9/2304, ttl=64
18 8.017007025 8.8.8.8 → 192.168.0.210 ICMP 98 Echo (ping) reply id=0x27e6, seq=9/2304, ttl=118 (request in 17)
19 9.012127722 192.168.0.210 → 8.8.8.8 ICMP 98 Echo (ping) request id=0x27e6, seq=10/2560, ttl=64
20 9.018605535 8.8.8.8 → 192.168.0.210 ICMP 98 Echo (ping) reply id=0x27e6, seq=10/2560, ttl=118 (request in 19)
21 10.013838595 192.168.0.210 → 8.8.8.8 ICMP 98 Echo (ping) request id=0x27e6, seq=11/2816, ttl=64
22 10.020393046 8.8.8.8 → 192.168.0.210 ICMP 98 Echo (ping) reply id=0x27e6, seq=11/2816, ttl=118 (request in 21)
23 11.014665548 192.168.0.210 → 8.8.8.8 ICMP 98 Echo (ping) request id=0x27e6, seq=12/3072, ttl=64
24 11.021229949 8.8.8.8 → 192.168.0.210 ICMP 98 Echo (ping) reply id=0x27e6, seq=12/3072, ttl=118 (request in 23)
25 12.016308354 192.168.0.210 → 8.8.8.8 ICMP 98 Echo (ping) request id=0x27e6, seq=13/3328, ttl=64
26 12.022854718 8.8.8.8 → 192.168.0.210 ICMP 98 Echo (ping) reply id=0x27e6, seq=13/3328, ttl=118 (request in 25)
27 13.017528405 192.168.0.210 → 8.8.8.8 ICMP 98 Echo (ping) request id=0x27e6, seq=14/3584, ttl=64
root@Max-Hsu-Lab: /home/maxhsu/Desktop/Desktop/Homework/G3-1/Advanced_Computer_Network/HW2# 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=118 time=6.64 ms
64 bytes from 8.8.8.8: icmp_seq=2 ttl=118 time=6.55 ms
64 bytes from 8.8.8.8: icmp_seq=3 ttl=118 time=6.50 ms
64 bytes from 8.8.8.8: icmp_seq=4 ttl=118 time=6.53 ms
64 bytes from 8.8.8.8: icmp_seq=5 ttl=118 time=6.53 ms
64 bytes from 8.8.8.8: icmp_seq=6 ttl=118 time=6.50 ms
64 bytes from 8.8.8.8: icmp_seq=7 ttl=118 time=6.55 ms
64 bytes from 8.8.8.8: icmp_seq=8 ttl=118 time=6.56 ms
64 bytes from 8.8.8.8: icmp_seq=9 ttl=118 time=6.46 ms
64 bytes from 8.8.8.8: icmp_seq=10 ttl=118 time=6.51 ms
64 bytes from 8.8.8.8: icmp_seq=11 ttl=118 time=6.56 ms
64 bytes from 8.8.8.8: icmp_seq=12 ttl=118 time=6.57 ms
64 bytes from 8.8.8.8: icmp_seq=13 ttl=118 time=6.56 ms
64 bytes from 8.8.8.8: icmp_seq=14 ttl=118 time=6.55 ms
^C
--- 8.8.8.8 ping statistics ---
14 packets transmitted, 14 received, 0% packet loss, time 13017ms
rtt min/avg/max/mdev = 6.462/6.546/6.648/0.109 ms
root@Max-Hsu-Lab: /home/maxhsu/Desktop/Desktop/Homework/G3-1/Advanced_Computer_Network/HW2# ping 208.67.220.220
PING 208.67.220.220 (208.67.220.220) 56(84) bytes of data:
64 bytes from 208.67.220.220: icmp_seq=1 ttl=56 time=36.3 ms
64 bytes from 208.67.220.220: icmp_seq=2 ttl=56 time=36.1 ms
64 bytes from 208.67.220.220: icmp_seq=3 ttl=56 time=37.7 ms
64 bytes from 208.67.220.220: icmp_seq=4 ttl=56 time=43.8 ms
64 bytes from 208.67.220.220: icmp_seq=5 ttl=56 time=36.1 ms
64 bytes from 208.67.220.220: icmp_seq=6 ttl=56 time=36.1 ms
64 bytes from 208.67.220.220: icmp_seq=7 ttl=56 time=36.0 ms
64 bytes from 208.67.220.220: icmp_seq=8 ttl=56 time=36.1 ms
^C
--- 208.67.220.220 ping statistics ---
```

Part 2 – tcpstat

1. to capture : `sudo tcpstat -f 'icmp' -s 20 -R 1`

```
root@Max-Hsu-Lab:/home/maxhsu/Desktop/Desktop/Homework/G3-1/Advanced_Computer_Network/HW2# 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=118 time=6.56 ms
64 bytes from 8.8.8.8: icmp_seq=2 ttl=118 time=6.43 ms
64 bytes from 8.8.8.8: icmp_seq=3 ttl=118 time=6.59 ms
64 bytes from 8.8.8.8: icmp_seq=4 ttl=118 time=6.54 ms
64 bytes from 8.8.8.8: icmp_seq=5 ttl=118 time=6.64 ms
64 bytes from 8.8.8.8: icmp_seq=6 ttl=118 time=6.57 ms
64 bytes from 8.8.8.8: icmp_seq=7 ttl=118 time=6.48 ms
64 bytes from 8.8.8.8: icmp_seq=8 ttl=118 time=6.52 ms
64 bytes from 8.8.8.8: icmp_seq=9 ttl=118 time=6.45 ms
64 bytes from 8.8.8.8: icmp_seq=10 ttl=118 time=6.61 ms
64 bytes from 8.8.8.8: icmp_seq=11 ttl=118 time=6.58 ms
64 bytes from 8.8.8.8: icmp_seq=12 ttl=118 time=6.56 ms
64 bytes from 8.8.8.8: icmp_seq=13 ttl=118 time=6.51 ms
64 bytes from 8.8.8.8: icmp_seq=14 ttl=118 time=6.50 ms
64 bytes from 8.8.8.8: icmp_seq=15 ttl=118 time=6.59 ms
64 bytes from 8.8.8.8: icmp_seq=16 ttl=118 time=6.47 ms
64 bytes from 8.8.8.8: icmp_seq=17 ttl=118 time=6.41 ms
64 bytes from 8.8.8.8: icmp_seq=18 ttl=118 time=6.46 ms
64 bytes from 8.8.8.8: icmp_seq=19 ttl=118 time=6.57 ms
64 bytes from 8.8.8.8: icmp_seq=20 ttl=118 time=6.60 ms
64 bytes from 8.8.8.8: icmp_seq=21 ttl=118 time=6.63 ms
64 bytes from 8.8.8.8: icmp_seq=22 ttl=118 time=6.50 ms
```

```
maxhsu@Max-Hsu-Lab:~/Desktop/Desktop/Homework/G3-1/Advanced_Computer_Network/HW2$ sudo tcpstat -f 'icmp' -s 20 -R 1
Listening on enp5s0
Time:1601290005 n=10      avg=84.00      stddev=0.00      bps=1344.00
Time:1601290010 n=10      avg=84.00      stddev=0.00      bps=1344.00
Time:1601290015 n=10      avg=84.00      stddev=0.00      bps=1344.00
^CTime:1601290020      n=10      avg=84.00      stddev=0.00      bps=1344.00
```

Question 4-1 : iperf 的用途：檢查網路頻寬，確認電信商有沒有騙人

Question 4-4 : TCP 及 UDP 產生結果差異：TCP 有 group ack 及 sliding window 在幫忙控管，所以可以一次傳多 packets，讓 bandwidth 上升

Part 2 - netperf

1.TCP

server : netserver -p 15000

client : netperf -t TCP_STREAM -H 10.0.0.2 -l 10 -p 15000

```
Processing triggers for systemd (237-3ubuntu10.42) ...
Processing triggers for man-db (2.8.3-2ubuntu0.1) ...
Processing triggers for ureadahead (0.100.0-21) ...
maxhsu@Max-Hsu-Lab:~/Desktop/Desktop/Homework/G3-1/Advanced_Computer_Network/HW2$ sudo mn
*** Creating network
*** Adding controller
*** Adding hosts:

"Node: h2"
root@Max-Hsu-Lab:/media/WinData/Users/Max-Hsu-Lab/Desktop/Homework/G3-1/Advanced_Computer_Network/HW2# netserver -p 15000
Starting netserver with host '10.0.0.0/24' port '15000' and family AF_INET
root@Max-Hsu-Lab:/media/WinData/Users/Max-Hsu-Lab/Desktop/Homework/G3-1/Advanced_Computer_Network/HW2# ifconfig
c-eth0: flags=4353<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.0.0.2 netmask 255.0.0.0 broadcast 10.255.255.255
    inet6 fe80::f81d:c0ff:fe56:2b8e prefixlen 64 scopeid 0x20(link)
    ether fa:1d:c0:ff:56:2b:8e txqueuelen 1000 (Ethernet)
    RX packets 42 bytes 7213 (7.2 KB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 11 bytes 866 (866.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
    inet 127.0.0.1 netmask 255.0.0.0
    inet6 ::1 prefixlen 128 scopeid 0x10(host)
    loop txqueuelen 1000 (Local Loopback)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

root@Max-Hsu-Lab:/media/WinData/Users/Max-Hsu-Lab/Desktop/Homework/G3-1/Advanced_Computer_Network/HW2# []

bytes
"Node: h1"
specifying one value without a comma will set both parms to that
value, specifying a value with a leading comma will set just the second
parm, a value with a trailing comma will set just the first. To set
each parm to unique values, specify both and separate them with a
comma.

* For these options taking two parms, specifying one value with no comma
will only set the first parms and will leave the second at the default
value. To set the second value it must be preceded with a comma or be a
comma-separated pair. This is to retain previous netperf behaviour.
root@Max-Hsu-Lab:/media/WinData/Users/Max-Hsu-Lab/Desktop/Homework/G3-1/Advanced_Computer_Network/HW2# netp
netperf -t TCP_STREAM -H 10.0.0.2 -l 10 -p 15000
establish control: are you sure there is a netserver listening on localhost at port 12885?
establish control: could not establish the control connection from 0.0.0.0 port 0 address family AF_INET
root@Max-Hsu-Lab:/media/WinData/Users/Max-Hsu-Lab/Desktop/Homework/G3-1/Advanced_Computer_Network/HW2# netperf -t TCP_STREAM -H 10.0.0.2 -l 10 -p 15000
HIGRATED TCP STREAM TEST from 0.0.0.0 (0.0.0.0) port 0 AF_INET to 10.0.0.2 () port 0 AF_INET : demo
Recv Send Send
Size Size Size Time Throughput
bytes bytes bytes secs. 10^6bits/sec
87380 87380 87380 10.00 42783.11
root@Max-Hsu-Lab:/media/WinData/Users/Max-Hsu-Lab/Desktop/Homework/G3-1/Advanced_Computer_Network/HW2# netperf -t TCP_STREAM -H 10.0.0.2 -l 10 -p 15000
HIGRATED TCP STREAM TEST from 0.0.0.0 (0.0.0.0) port 0 AF_INET to 10.0.0.2 () port 0 AF_INET : demo
Recv Send Send
Size Size Size Time Throughput
bytes bytes bytes secs. 10^6bits/sec
87380 87380 87380 10.00 33799.94
root@Max-Hsu-Lab:/media/WinData/Users/Max-Hsu-Lab/Desktop/Homework/G3-1/Advanced_Computer_Network/HW2# netperf -t UDP_STREAM -H 10.0.0.2 -l 10 -p 15000
HIGRATED UDP STREAM TEST from 0.0.0.0 (0.0.0.0) port 0 AF_INET to 10.0.0.2 () port 0 AF_INET : demo
Size Size Size Time Throughput
bytes bytes bytes secs. 10^6bits/sec
21292 6507 10.00 181864 0 5630.53
21292 10.00 181832 9528.85
```

2.UDP

server : netserver -p 15000

client : netperf -t UDP_STREAM -H 10.0.0.2 -l 10 -p 15000

```
Setting up netperf (2.0.0-2.1) ...
Processing triggers for systemd (237-3ubuntu10.42) ...
Processing triggers for man-db (2.8.3-2ubuntu0.1) ...
Processing triggers for ureadahead (0.100.0-21) ...
maxhsu@Max-Hsu-Lab:~/Desktop/Desktop/Homework/G3-1/Advanced_Computer_Network/HW2$ sudo mn
*** Creating network
*** Adding controller
*** Adding hosts:

"Node: h2"
root@Max-Hsu-Lab:/media/WinData/Users/Max-Hsu-Lab/Desktop/Homework/G3-1/Advanced_Computer_Network/HW2# netserver -p 15000
Starting netserver with host '10.0.0.0/24' port '15000' and family AF_INET
root@Max-Hsu-Lab:/media/WinData/Users/Max-Hsu-Lab/Desktop/Homework/G3-1/Advanced_Computer_Network/HW2# ifconfig
c-eth0: flags=4353<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.0.0.2 netmask 255.0.0.0 broadcast 10.255.255.255
    inet6 fe80::f81d:c0ff:fe56:2b8e prefixlen 64 scopeid 0x20(link)
    ether fa:1d:c0:ff:56:2b:8e txqueuelen 1000 (Ethernet)
    RX packets 42 bytes 7213 (7.2 KB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 11 bytes 866 (866.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
    inet 127.0.0.1 netmask 255.0.0.0
    inet6 ::1 prefixlen 128 scopeid 0x10(host)
    loop txqueuelen 1000 (Local Loopback)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

root@Max-Hsu-Lab:/media/WinData/Users/Max-Hsu-Lab/Desktop/Homework/G3-1/Advanced_Computer_Network/HW2# []

bytes
"Node: h1"
-0 send.recv Set the remote send/recv buffer offset
-n ncpu Set the number of processors for (PI) util
-H Establish no control connection, do send side only
-p port,[port] Specify netserver port number and/or local port
-o 011 Don't display test headers
-t Allow confidence to be hit on result only
-s seconds Wait seconds between test setup and test start
-S Set SQUEALING on the data connection
-t testname Specify test to perform
-T [cpu,rspu Request netperf/netserver to be bound to local/remote cpu
-v verbosity Specify the verbosity level
-l send.recv Set the number of send/recv buffers
-l level Set the verbosity level (default 1, min 0)
-y local,remote Display the netperf version and exit
-y local,remote Set the socket priority
-y local,remote Set the IP TOS, Use hexadecimal.
-Z passphrase Set and pass to netserver a passphrase

For these options taking two parms, at least one must be specified:
specifying one value without a comma will set both parms to that
value, specifying a value with a leading comma will set just the second
parm, a value with a trailing comma will set just the first. To set
each parm to unique values, specify both and separate them with a
comma.

* For these options taking two parms, specifying one value with no comma
will only set the first parms and will leave the second at the default
value. To set the second value it must be preceded with a comma or be a
comma-separated pair. This is to retain previous netperf behaviour.
root@Max-Hsu-Lab:/media/WinData/Users/Max-Hsu-Lab/Desktop/Homework/G3-1/Advanced_Computer_Network/HW2# netp
netperf -t UDP_STREAM -H 10.0.0.2 -l 10 -p 15000
establish control: are you sure there is a netserver listening on localhost at port 12885?
establish control: could not establish the control connection from 0.0.0.0 port 0 address family AF_INET
root@Max-Hsu-Lab:/media/WinData/Users/Max-Hsu-Lab/Desktop/Homework/G3-1/Advanced_Computer_Network/HW2# netperf -t TCP_STREAM -H 10.0.0.2 -l 10 -p 15000
HIGRATED TCP STREAM TEST from 0.0.0.0 (0.0.0.0) port 0 AF_INET to 10.0.0.2 () port 0 AF_INET : demo
Recv Send Send
Size Size Size Time Throughput
bytes bytes bytes secs. 10^6bits/sec
87380 87380 87380 10.00 42783.11
root@Max-Hsu-Lab:/media/WinData/Users/Max-Hsu-Lab/Desktop/Homework/G3-1/Advanced_Computer_Network/HW2# []
```