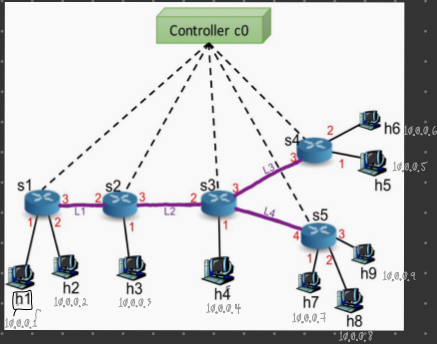


Part 1 Explanation:

Using iperf to measure the bandwidth and pings to measure the latency, data is sent between two hosts which utilize the target link I'm trying to evaluate. I evaluated one link at a time by running iperf/ping to two hosts which would have a path that only uses the target switch-to-switch link. Technically, the path also includes the two host-to-switch links, but the TA said we did not have to account for these in our part 1 evaluation.



L1 Bandwidth: 23.1 Mbits/sec

L1 Latency: 81.6 ms

L2 Bandwidth: 39.5 Mbits/sec

L2 Latency: 22.4 ms

L3 Bandwidth: 30.2 Mbits/sec

L3 Latency: 41.5 ms

L4 Bandwidth: 22.6 Mbits/sec

L4 Latency: 61.5 ms

Link	iperf & ping hosts	Screenshots	bW	Latency
L1	h1 to h3		23.1	81.6
L2	h3 to h4		39.5	22.4
L3	h4 to h5		30.2	41.5
L4	h4 to h7		22.6	61.5

L1

```
*** Starting CLI:
mininet> h3 iperf -s -p 4000 &
mininet> h1 iperf -c h3 -p 4000 -t 5

-----
Client connecting to 10.0.0.3, TCP port 4000
TCP window size: 85.3 KByte (default)
-----
[ 3] local 10.0.0.1 port 55112 connected with 10.0.0.3 port 4000
[ ID] Interval      Transfer    Bandwidth
[ 3]  0.0- 5.1 sec  14.0 MBytes  23.1 Mbits/sec
mininet> h1 ping h3
PING 10.0.0.3 (10.0.0.3) 56(84) bytes of data.
64 bytes from 10.0.0.3: icmp_seq=1 ttl=64 time=88.2 ms
64 bytes from 10.0.0.3: icmp_seq=2 ttl=64 time=82.1 ms
64 bytes from 10.0.0.3: icmp_seq=3 ttl=64 time=80.6 ms
64 bytes from 10.0.0.3: icmp_seq=4 ttl=64 time=81.0 ms
64 bytes from 10.0.0.3: icmp_seq=5 ttl=64 time=80.6 ms
64 bytes from 10.0.0.3: icmp_seq=6 ttl=64 time=80.5 ms
64 bytes from 10.0.0.3: icmp_seq=7 ttl=64 time=80.4 ms
64 bytes from 10.0.0.3: icmp_seq=8 ttl=64 time=80.8 ms
64 bytes from 10.0.0.3: icmp_seq=9 ttl=64 time=81.2 ms
64 bytes from 10.0.0.3: icmp_seq=10 ttl=64 time=81.3 ms
64 bytes from 10.0.0.3: icmp_seq=11 ttl=64 time=80.6 ms
^C
--- 10.0.0.3 ping statistics ---
11 packets transmitted, 11 received, 0% packet loss, time 10016ms
rtt min/avg/max/mdev = 80.4/81.578/88.220/2.151 ms
mininet>
```

L2

```
*** Starting CLI:
mininet> h3 iperf -s -p 4000 &
mininet> h4 iperf -c h3 -p 4000 -t 5

-----
Client connecting to 10.0.0.3, TCP port 4000
TCP window size: 85.3 KByte (default)
-----
[ 3] local 10.0.0.4 port 38352 connected with 10.0.0.3 port 4000
[ ID] Interval      Transfer    Bandwidth
[ 3]  0.0- 5.0 sec  23.8 MBytes  39.5 Mbits/sec
mininet> h3 ping h4
Server listening on TCP port 4000
TCP window size: 85.3 KByte (default)
-----
[ 4] local 10.0.0.3 port 4000 connected with 10.0.0.4 port 38352
[ ID] Interval      Transfer    Bandwidth
[ 4]  0.0- 6.0 sec  23.8 MBytes  33.3 Mbits/sec
PING 10.0.0.4 (10.0.0.4) 56(84) bytes of data.
64 bytes from 10.0.0.4: icmp_seq=1 ttl=64 time=39.7 ms
64 bytes from 10.0.0.4: icmp_seq=2 ttl=64 time=21.1 ms
64 bytes from 10.0.0.4: icmp_seq=3 ttl=64 time=20.7 ms
64 bytes from 10.0.0.4: icmp_seq=4 ttl=64 time=20.9 ms
64 bytes from 10.0.0.4: icmp_seq=5 ttl=64 time=20.7 ms
64 bytes from 10.0.0.4: icmp_seq=6 ttl=64 time=22.2 ms
64 bytes from 10.0.0.4: icmp_seq=7 ttl=64 time=20.9 ms
64 bytes from 10.0.0.4: icmp_seq=8 ttl=64 time=20.2 ms
64 bytes from 10.0.0.4: icmp_seq=9 ttl=64 time=21.8 ms
64 bytes from 10.0.0.4: icmp_seq=10 ttl=64 time=20.9 ms
64 bytes from 10.0.0.4: icmp_seq=11 ttl=64 time=20.4 ms
64 bytes from 10.0.0.4: icmp_seq=12 ttl=64 time=21.2 ms
64 bytes from 10.0.0.4: icmp_seq=13 ttl=64 time=20.7 ms
^C
--- 10.0.0.4 ping statistics ---
13 packets transmitted, 13 received, 0% packet loss, time 12021ms
rtt min/avg/max/mdev = 20.2/22.414/33.745/5.028 ms
mininet>
```

L3

```
*** Starting CLI:
mininet> h4 iperf -s -p 4000 &
mininet> h5 iperf -c h4 -p 4000 -t 5

-----
Client connecting to 10.0.0.4, TCP port 4000
TCP window size: 85.3 KByte (default)
-----
[ 3] local 10.0.0.5 port 59234 connected with 10.0.0.4 port 4000
[ ID] Interval      Transfer    Bandwidth
[ 3]  0.0- 5.0 sec  18.1 MBytes  30.2 Mbits/sec
mininet> h4 ping h5
Server listening on TCP port 4000
TCP window size: 85.3 KByte (default)
-----
[ 4] local 10.0.0.4 port 4000 connected with 10.0.0.5 port 59234
[ ID] Interval      Transfer    Bandwidth
[ 4]  0.0- 6.1 sec  18.1 MBytes  25.0 Mbits/sec
PING 10.0.0.5 (10.0.0.5) 56(84) bytes of data.
64 bytes from 10.0.0.5: icmp_seq=1 ttl=64 time=45.6 ms
64 bytes from 10.0.0.5: icmp_seq=2 ttl=64 time=41.2 ms
64 bytes from 10.0.0.5: icmp_seq=3 ttl=64 time=41.7 ms
64 bytes from 10.0.0.5: icmp_seq=4 ttl=64 time=41.4 ms
64 bytes from 10.0.0.5: icmp_seq=5 ttl=64 time=41.1 ms
64 bytes from 10.0.0.5: icmp_seq=6 ttl=64 time=40.3 ms
64 bytes from 10.0.0.5: icmp_seq=7 ttl=64 time=40.2 ms
64 bytes from 10.0.0.5: icmp_seq=8 ttl=64 time=40.1 ms
64 bytes from 10.0.0.5: icmp_seq=9 ttl=64 time=41.9 ms
64 bytes from 10.0.0.5: icmp_seq=10 ttl=64 time=41.0 ms
64 bytes from 10.0.0.5: icmp_seq=11 ttl=64 time=41.6 ms
64 bytes from 10.0.0.5: icmp_seq=12 ttl=64 time=42.3 ms
64 bytes from 10.0.0.5: icmp_seq=13 ttl=64 time=41.0 ms
^C
--- 10.0.0.5 ping statistics ---
13 packets transmitted, 13 received, 0% packet loss, time 12017ms
rtt min/avg/max/mdev = 40.128/41.496/45.565/1.330 ms
mininet>
```

L4

```
*** Starting CLI:
mininet> h4 iperf -s -p 4000 &
mininet> h7 iperf -c h4 -p 4000 -t 5

-----
Client connecting to 10.0.0.4, TCP port 4000
TCP window size: 85.3 KByte (default)
-----
[ 3] local 10.0.0.7 port 38338 connected with 10.0.0.4 port 4000
[ ID] Interval      Transfer    Bandwidth
[ 3]  0.0- 5.2 sec  14.0 MBytes  22.6 Mbits/sec
mininet> h4 ping h7
Server listening on TCP port 4000
TCP window size: 85.3 KByte (default)
-----
[ 4] local 10.0.0.4 port 4000 connected with 10.0.0.7 port 38338
[ ID] Interval      Transfer    Bandwidth
[ 4]  0.0- 6.5 sec  14.0 MBytes  18.0 Mbits/sec
PING 10.0.0.7 (10.0.0.7) 56(84) bytes of data.
64 bytes from 10.0.0.7: icmp_seq=1 ttl=64 time=63.2 ms
64 bytes from 10.0.0.7: icmp_seq=2 ttl=64 time=61.0 ms
64 bytes from 10.0.0.7: icmp_seq=3 ttl=64 time=62.6 ms
64 bytes from 10.0.0.7: icmp_seq=4 ttl=64 time=60.6 ms
64 bytes from 10.0.0.7: icmp_seq=5 ttl=64 time=62.6 ms
64 bytes from 10.0.0.7: icmp_seq=6 ttl=64 time=61.0 ms
64 bytes from 10.0.0.7: icmp_seq=7 ttl=64 time=60.6 ms
64 bytes from 10.0.0.7: icmp_seq=8 ttl=64 time=62.3 ms
64 bytes from 10.0.0.7: icmp_seq=9 ttl=64 time=61.1 ms
64 bytes from 10.0.0.7: icmp_seq=10 ttl=64 time=60.9 ms
64 bytes from 10.0.0.7: icmp_seq=11 ttl=64 time=61.4 ms
64 bytes from 10.0.0.7: icmp_seq=12 ttl=64 time=61.0 ms
^C
--- 10.0.0.7 ping statistics ---
12 packets transmitted, 12 received, 0% packet loss, time 11016ms
rtt min/avg/max/mdev = 60.3/61.526/63.187/0.863 ms
mininet>
```

Note: the TA said we didn't have to factor in the host-to-switch links involved in our iperf and ping tests for this part 1 of the project. But I thought it was worth mentioning that I understand the results in the output for our L links isn't as accurate because it includes the 2 host links involved in the host to host packets being sent.

*** Starting CLI:

mininet> h3 iperf -s -p 4000 &
mininet> h1 iperf -c h3 -p 4000 -t 5

Client connecting to 10.0.0.3, TCP port 4000
TCP window size: 85.3 KByte (default)

[3]	local 10.0.0.1	port 55112	connected with 10.0.0.3	port 4000
[ID]	Interval	Transfer	Bandwidth	
[3]	0.0- 5.1 sec	14.0 MBytes	23.1 Mbits/sec	

mininet> h1 ping h3

PING 10.0.0.3 (10.0.0.3) 56(84) bytes of data.
64 bytes from 10.0.0.3: icmp_seq=1 ttl=64 time=88.2 ms
64 bytes from 10.0.0.3: icmp_seq=2 ttl=64 time=82.1 ms
64 bytes from 10.0.0.3: icmp_seq=3 ttl=64 time=80.6 ms
64 bytes from 10.0.0.3: icmp_seq=4 ttl=64 time=81.0 ms
64 bytes from 10.0.0.3: icmp_seq=5 ttl=64 time=80.6 ms
64 bytes from 10.0.0.3: icmp_seq=6 ttl=64 time=80.5 ms
64 bytes from 10.0.0.3: icmp_seq=7 ttl=64 time=80.4 ms
64 bytes from 10.0.0.3: icmp_seq=8 ttl=64 time=80.8 ms
64 bytes from 10.0.0.3: icmp_seq=9 ttl=64 time=81.2 ms
64 bytes from 10.0.0.3: icmp_seq=10 ttl=64 time=81.3 ms
64 bytes from 10.0.0.3: icmp_seq=11 ttl=64 time=80.6 ms

^C
--- 10.0.0.3 ping statistics ---
11 packets transmitted, 11 received, 0% packet loss, time 10016ms
rtt min/avg/max/mdev = 80.381/81.578/88.220/2.151 ms
mininet>