

Lab 4 - Cpre 489

By: Joseph Schmidt

Exercise 1:

Current Usage: 0 Node Hours, Prev Week: 0.68, Prev Month: 0.68 (30 day rank: 1540 of 1581 users)

▼ Your experiment is ready

Name: jschm333
State: ready
Profile: cpre489-lab4
Creator: jschm333
Project: ISUCPRE489
Created: Feb 24, 2024 2:25 PM
Started: Feb 24, 2024 2:25 PM
Expires: Feb 25, 2024 6:25 AM (in 16 hours)
[Login](#) [Portal Log](#) [Create Disk Image](#) [Copy](#) [Extend](#) [Terminate](#)

Topology View | List View | Manifest | Graphs

ID	Node	Type	Cluster	Status	Startup	Image	SSH command (if you provided your own key)	<input type="checkbox"/>	<input type="checkbox"/>
Client	chodevm246-1	pcvm	Clem	ready	Finished	n/a	ssh -p 26410 jschm333@clnode246.clemson.cloudlab.us	<input type="checkbox"/>	<input type="checkbox"/>
Server	chodevm246-2	pcvm	Clem	ready	Finished	n/a	ssh -p 26411 jschm333@clnode246.clemson.cloudlab.us	<input type="checkbox"/>	<input type="checkbox"/>
Node246	chode246	cb420	Clem	n/a	n/a	n/a	ssh jschm333@clnode246.clemson.cloudlab.us	<input type="checkbox"/>	<input type="checkbox"/>

Exercise 2:

```
jschm333@client: ~
File Edit View Search Terminal Help
0]:26410' (ECDSA) to the list of known hosts.
jschm333@clnode246.clemson.cloudlab.us: Permission denied (publickey).
bash-4.4$ ssh -p 26410 jschm333@clnode246.clemson.cloudlab.us -i id_cloudlab_rsa
Enter passphrase for key 'id_cloudlab_rsa':
Welcome to Ubuntu 22.04.2 LTS (GNU/Linux 5.15.0-86-generic x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/advantage

 * Introducing Expanded Security Maintenance for Applications.
   Receive updates to over 25,000 software packages with your
   Ubuntu Pro subscription. Free for personal use.

   https://ubuntu.com/pro

The programs included with the Ubuntu system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
applicable law.

jschm333@client:~$
```

```
jschm333@server: ~
File Edit View Search Terminal Help
0]:26411' (ECDSA) to the list of known hosts.
jschm333@clnode246.clemson.cloudlab.us: Permission denied (publickey).
bash-4.4$ ssh -p 26411 jschm333@clnode246.clemson.cloudlab.us -i id_cloudlab_rsa
Enter passphrase for key 'id_cloudlab_rsa':
Welcome to Ubuntu 22.04.2 LTS (GNU/Linux 5.15.0-86-generic x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/advantage

 * Introducing Expanded Security Maintenance for Applications.
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   https://ubuntu.com/pro

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the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
applicable law.

jschm333@server:~$
```

Exercise 3:

Client: 172.17.246.1

Server: 172.17.246.2

```
jschm333@client:~$ ifconfig
eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 172.17.246.1 netmask 255.240.0.0 broadcast 172.31.255.255
    inet6 fe80::47:39ff:fe54:a4db prefixlen 64 scopeid 0x20<link>
    ether 02:47:39:54:a4:db txqueuelen 1000 (Ethernet)
    RX packets 251295 bytes 44101305 (44.1 MB)
    RX errors 0 dropped 540 overruns 0 frame 0
    TX packets 2548 bytes 224715 (224.7 KB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

```
jschm333@server:~$ ifconfig
eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 172.17.246.2 netmask 255.240.0.0 broadcast 172.31.255.255
    inet6 fe80::e8:52ff:fed5:63f7 prefixlen 64 scopeid 0x20<link>
    ether 02:e8:52:d5:63:f7 txqueuelen 1000 (Ethernet)
    RX packets 249415 bytes 44091866 (44.0 MB)
    RX errors 0 dropped 535 overruns 0 frame 0
    TX packets 2402 bytes 208061 (208.0 KB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

Exercise 4:

2 Tcp connections:

```
jschm333@client: ~
File Edit View Search Terminal Help

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 286 bytes 35100 (35.1 KB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 286 bytes 35100 (35.1 KB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

jschm333@client:~$ iperf -c server -P 2
[ 1] local 10.10.1.1 port 54004 connected with 10.10.1.2 port 5001
[ 2] local 10.10.1.1 port 54008 connected with 10.10.1.2 port 5001
-----
Client connecting to server, TCP port 5001
TCP window size: 136 KByte (default)
-----
[ ID] Interval      Transfer    Bandwidth
[ 1] 0.0000-10.0546 sec 57.3 MBytes 47.8 Mbits/sec
[ 2] 0.0000-10.0544 sec 57.4 MBytes 47.9 Mbits/sec
[SUM] 0.0000-10.0155 sec 115 MBytes 96.0 Mbits/sec
[CT] final connect times (min/avg/max/stddev) = 0.474/0.506/0.538/0.045 ms (tot/err) = 2/0

jschm333@server:~$ iperf -s
Server listening on TCP port 5001
TCP window size: 128 KByte (default)
-----
[ 1] local 10.10.1.2 port 5001 connected with 10.10.1.1 port 54004
[ 2] local 10.10.1.2 port 5001 connected with 10.10.1.1 port 54008
[ ID] Interval      Transfer    Bandwidth
[ 2] 0.0000-10.0510 sec 57.4 MBytes 47.9 Mbits/sec
[ 1] 0.0000-10.0459 sec 57.3 MBytes 47.8 Mbits/sec
[SUM] 0.0000-10.0442 sec 115 MBytes 95.7 Mbits/sec
```

4 Tcp connections:

```
jschm333@client:~$ iperf -c server -P 4
[ 1] local 10.10.1.1 port 45164 connected with 10.10.1.2 port 5001
[ 3] local 10.10.1.1 port 45172 connected with 10.10.1.2 port 5001
[ 4] local 10.10.1.1 port 45186 connected with 10.10.1.2 port 5001
[ 2] local 10.10.1.1 port 45170 connected with 10.10.1.2 port 5001
-----
Client connecting to server, TCP port 5001
TCP window size: 196 KByte (default)
-----
[ ID] Interval      Transfer    Bandwidth
[ 2] 0.0000-10.2954 sec 42.5 MBytes 34.6 Mbits/sec
[ 3] 0.0000-10.3278 sec 28.5 MBytes 23.1 Mbits/sec
[ 1] 0.0000-10.3279 sec 42.8 MBytes 34.7 Mbits/sec
[ 4] 0.0000-10.3445 sec 4.13 MBytes 3.35 Mbits/sec
[SUM] 0.0000-10.1827 sec 118 MBytes 97.1 Mbits/sec
[CT] final connect times (min/avg/max/stddev) = 0.343/0.425/0.497/0.065 ms (tot/err) = 4/0

jschm333@server:~$ iperf -s
Server listening on TCP port 5001
TCP window size: 128 KByte (default)
-----
[ 1] local 10.10.1.2 port 5001 connected with 10.10.1.1 port 54004
[ 2] local 10.10.1.2 port 5001 connected with 10.10.1.1 port 54008
[ ID] Interval      Transfer    Bandwidth
[ 2] 0.0000-10.0510 sec 57.4 MBytes 47.9 Mbits/sec
[ 1] 0.0000-10.0459 sec 57.3 MBytes 47.8 Mbits/sec
[SUM] 0.0000-10.0442 sec 115 MBytes 95.7 Mbits/sec
[ 3] local 10.10.1.2 port 5001 connected with 10.10.1.1 port 45164
[ 4] local 10.10.1.2 port 5001 connected with 10.10.1.1 port 45170
[ 5] local 10.10.1.2 port 5001 connected with 10.10.1.1 port 45172
[ 6] local 10.10.1.2 port 5001 connected with 10.10.1.1 port 45186
[ ID] Interval      Transfer    Bandwidth
[ 4] 0.0000-10.2907 sec 42.5 MBytes 34.6 Mbits/sec
[ 5] 0.0000-10.3215 sec 28.5 MBytes 23.2 Mbits/sec
[ 3] 0.0000-10.3264 sec 42.8 MBytes 34.7 Mbits/sec
[ 6] 0.0000-10.3326 sec 4.13 MBytes 3.35 Mbits/sec
[SUM] 0.0000-10.3377 sec 118 MBytes 95.7 Mbits/sec
```

10 Tcp connections:

```
jschm333@client:~$ iperf -c server -P 10
[10] local 10.10.1.1 port 36112 connected with 10.10.1.2 port 5001
[ 4] local 10.10.1.1 port 36064 connected with 10.10.1.2 port 5001
[ 6] local 10.10.1.1 port 36078 connected with 10.10.1.2 port 5001
-----
Client connecting to server, TCP port 5001
TCP window size: 85.0 KByte (default)
-----
[ 1] local 10.10.1.1 port 36052 connected with 10.10.1.2 port 5001
[ 8] local 10.10.1.1 port 36090 connected with 10.10.1.2 port 5001
[ ID] Interval      Transfer    Bandwidth
[ 2] 0.0000-10.2525 sec 17.8 MBytes 14.5 Mbits/sec
[ 6] 0.0000-10.2689 sec 23.1 MBytes 18.9 Mbits/sec
[ 8] 0.0000-10.3013 sec 17.4 MBytes 14.1 Mbits/sec
[ 5] 0.0000-10.3340 sec 21.0 MBytes 17.0 Mbits/sec
[ 3] 0.0000-10.3664 sec 12.6 MBytes 10.2 Mbits/sec
[10] 0.0000-10.3819 sec 4.00 MBytes 3.23 Mbits/sec
[ 1] 0.0000-10.3988 sec 10.4 MBytes 8.37 Mbits/sec
[ 7] 0.0000-10.4153 sec 4.13 MBytes 3.32 Mbits/sec
[ 4] 0.0000-10.4158 sec 4.13 MBytes 3.32 Mbits/sec
[ 9] 0.0000-10.4154 sec 4.13 MBytes 3.32 Mbits/sec
[SUM] 0.0000-10.2896 sec 119 MBytes 96.7 Mbits/sec
[CT] final connect times (min/avg/max/stddev) = 0.311/0.578/0.781/0.150 ms (tot/err) = 10/0

jschm333@server:~$ iperf -s
Server listening on TCP port 5001
TCP window size: 128 KByte (default)
-----
[ 7] local 10.10.1.2 port 5001 connected with 10.10.1.1 port 36052
[ 8] local 10.10.1.2 port 5001 connected with 10.10.1.1 port 36058
[10] local 10.10.1.2 port 5001 connected with 10.10.1.1 port 36072
[12] local 10.10.1.2 port 5001 connected with 10.10.1.1 port 36078
[14] local 10.10.1.2 port 5001 connected with 10.10.1.1 port 36090
[15] local 10.10.1.2 port 5001 connected with 10.10.1.1 port 36104
[16] local 10.10.1.2 port 5001 connected with 10.10.1.1 port 36112
[ 9] local 10.10.1.2 port 5001 connected with 10.10.1.1 port 36064
[13] local 10.10.1.2 port 5001 connected with 10.10.1.1 port 36086
[11] local 10.10.1.2 port 5001 connected with 10.10.1.1 port 36076
[ ID] Interval      Transfer    Bandwidth
[ 8] 0.0000-10.2407 sec 17.8 MBytes 14.5 Mbits/sec
[12] 0.0000-10.2490 sec 23.1 MBytes 18.9 Mbits/sec
[14] 0.0000-10.2846 sec 17.4 MBytes 14.2 Mbits/sec
[11] 0.0000-10.3227 sec 21.0 MBytes 17.1 Mbits/sec
[10] 0.0000-10.3563 sec 12.6 MBytes 10.2 Mbits/sec
[16] 0.0000-10.3708 sec 4.00 MBytes 3.24 Mbits/sec
[ 7] 0.0000-10.3806 sec 10.4 MBytes 8.38 Mbits/sec
[ 9] 0.0000-10.3978 sec 4.13 MBytes 3.33 Mbits/sec
[13] 0.0000-10.3936 sec 4.13 MBytes 3.33 Mbits/sec
[15] 0.0000-10.3941 sec 4.13 MBytes 3.33 Mbits/sec
[SUM] 0.0000-10.4050 sec 119 MBytes 95.6 Mbits/sec
```

30 Tcp connections:

```

19] 0.0000-10.3227 sec 3.88 MBytes 3.15 Mbits/sec
24] 0.0000-10.3232 sec 3.13 MBytes 2.54 Mbits/sec
25] 0.0000-10.3217 sec 2.75 MBytes 2.24 Mbits/sec
8] 0.0000-10.3237 sec 3.25 MBytes 2.64 Mbits/sec
23] 0.0000-10.4028 sec 2.38 MBytes 1.92 Mbits/sec
12] 0.0000-10.4198 sec 4.13 MBytes 3.32 Mbits/sec
1] 0.0000-10.4369 sec 5.00 MBytes 4.02 Mbits/sec
6] 0.0000-10.4688 sec 5.00 MBytes 4.01 Mbits/sec
29] 0.0000-10.4829 sec 2.38 MBytes 1.90 Mbits/sec
20] 0.0000-10.4994 sec 3.50 MBytes 2.80 Mbits/sec
7] 0.0000-10.5174 sec 3.38 MBytes 2.69 Mbits/sec
10] 0.0000-10.5173 sec 5.13 MBytes 4.09 Mbits/sec
18] 0.0000-10.5164 sec 5.00 MBytes 3.99 Mbits/sec
5] 0.0000-10.5338 sec 4.88 MBytes 3.88 Mbits/sec
2] 0.0000-10.5662 sec 5.50 MBytes 4.37 Mbits/sec
9] 0.0000-10.5820 sec 6.00 MBytes 4.76 Mbits/sec
27] 0.0000-10.5966 sec 3.00 MBytes 2.37 Mbits/sec
3] 0.0000-10.6007 sec 5.13 MBytes 4.06 Mbits/sec
4] 0.0000-10.6014 sec 6.38 MBytes 5.04 Mbits/sec
28] 0.0000-11.6945 sec 3.00 MBytes 2.15 Mbits/sec
SUM] 0.0000-11.6757 sec 121 MBytes 86.9 Mbits/sec
[CT] final connect times (min/avg/max/stddev) = 0.076/0.711/1.668/0.443 ms (tot/err) = 30/0

[ 42] 0.0000-7.0556 sec 3.50 MBytes 4.16 Mbits/sec
[ 32] 0.0000-10.0698 sec 4.50 MBytes 3.75 Mbits/sec
[ 35] 0.0000-10.0735 sec 3.88 MBytes 3.23 Mbits/sec
[ 24] 0.0000-10.3007 sec 3.25 MBytes 2.65 Mbits/sec
[ 41] 0.0000-7.0877 sec 2.75 MBytes 3.25 Mbits/sec
[ 40] 0.0000-7.0970 sec 3.13 MBytes 3.69 Mbits/sec
[ 39] 0.0000-7.1707 sec 2.38 MBytes 2.78 Mbits/sec
[ 28] 0.0000-10.3941 sec 4.13 MBytes 3.33 Mbits/sec
[ 17] 0.0000-10.4073 sec 5.00 MBytes 4.03 Mbits/sec
[ 22] 0.0000-10.4608 sec 5.00 MBytes 4.01 Mbits/sec
[ 45] 0.0000-7.2530 sec 2.38 MBytes 2.75 Mbits/sec
[ 36] 0.0000-10.2606 sec 3.50 MBytes 2.86 Mbits/sec
[ 34] 0.0000-10.2746 sec 5.00 MBytes 4.08 Mbits/sec
[ 23] 0.0000-10.5030 sec 3.38 MBytes 2.70 Mbits/sec
[ 26] 0.0000-10.4992 sec 5.13 MBytes 4.09 Mbits/sec
[ 21] 0.0000-10.5255 sec 4.88 MBytes 3.89 Mbits/sec
[ 18] 0.0000-10.5522 sec 5.50 MBytes 4.37 Mbits/sec
[ 25] 0.0000-10.5422 sec 6.00 MBytes 4.77 Mbits/sec
[ 43] 0.0000-7.3607 sec 3.00 MBytes 3.42 Mbits/sec
[ 20] 0.0000-10.5804 sec 6.38 MBytes 5.05 Mbits/sec
[ 19] 0.0000-10.5878 sec 5.13 MBytes 4.06 Mbits/sec
[ 44] 0.0000-8.4602 sec 3.00 MBytes 2.97 Mbits/sec
SUM] 0.0000-11.6855 sec 121 MBytes 86.9 Mbits/sec

```

100 Tcp connections:

```

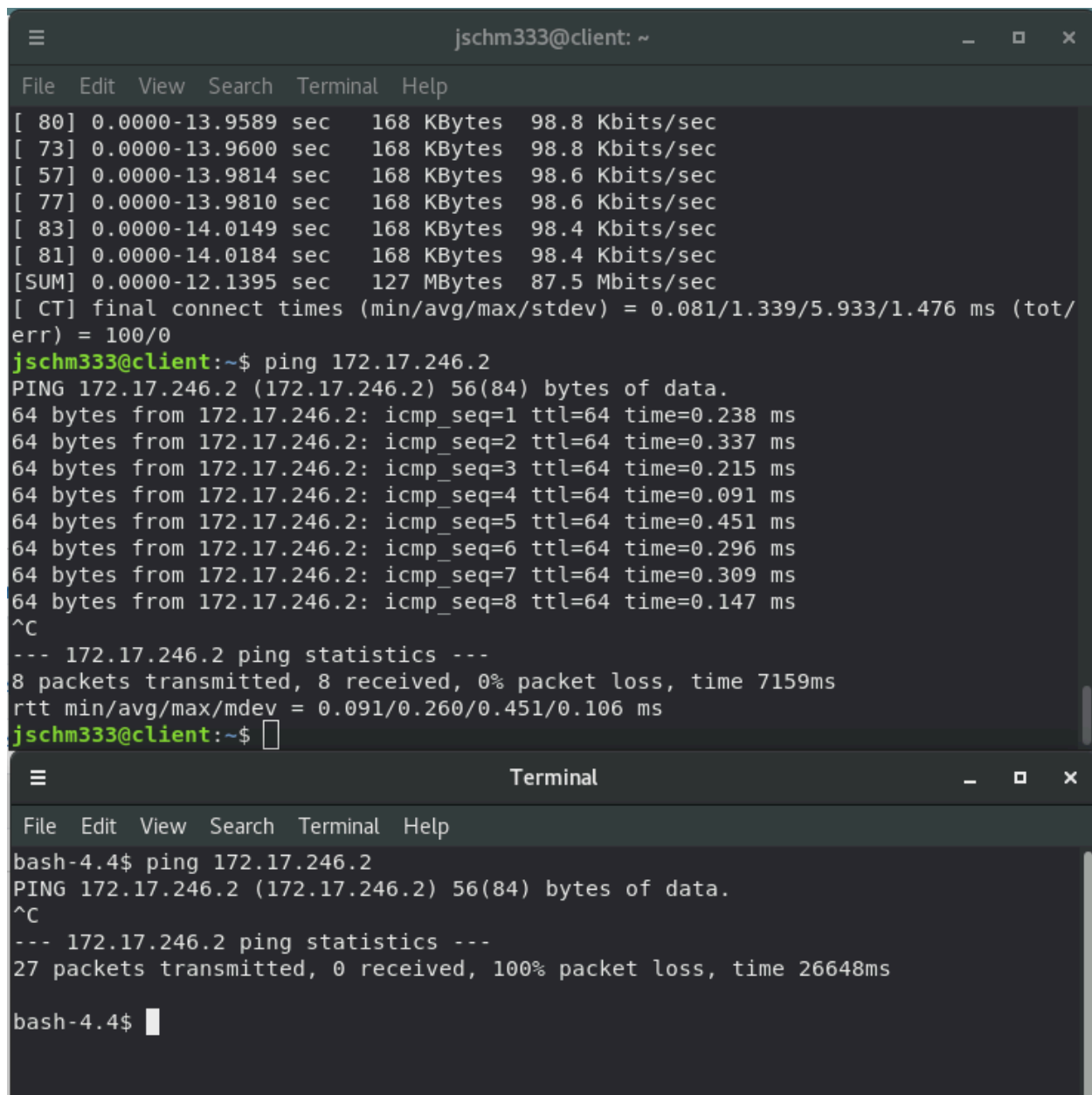
32] 0.0000-13.7651 sec 168 KBytes 100 Kbits/sec
22] 0.0000-13.7496 sec 106 KBytes 63.2 Kbits/sec
43] 0.0000-13.7660 sec 106 KBytes 63.1 Kbits/sec
55] 0.0000-13.7806 sec 168 KBytes 100 Kbits/sec
23] 0.0000-13.7839 sec 106 KBytes 63.1 Kbits/sec
88] 0.0000-13.8416 sec 106 KBytes 62.8 Kbits/sec
93] 0.0000-13.8415 sec 106 KBytes 62.8 Kbits/sec
92] 0.0000-13.8582 sec 106 KBytes 62.7 Kbits/sec
96] 0.0000-13.8746 sec 106 KBytes 62.7 Kbits/sec
40] 0.0000-13.9295 sec 168 KBytes 99.0 Kbits/sec
59] 0.0000-13.9289 sec 168 KBytes 99.0 Kbits/sec
68] 0.0000-13.9256 sec 106 KBytes 62.4 Kbits/sec
64] 0.0000-13.9288 sec 106 KBytes 62.4 Kbits/sec
75] 0.0000-13.9601 sec 168 KBytes 98.8 Kbits/sec
80] 0.0000-13.9589 sec 168 KBytes 98.8 Kbits/sec
73] 0.0000-13.9600 sec 168 KBytes 98.8 Kbits/sec
57] 0.0000-13.9814 sec 168 KBytes 98.6 Kbits/sec
77] 0.0000-13.9810 sec 168 KBytes 98.6 Kbits/sec
83] 0.0000-14.0149 sec 168 KBytes 98.4 Kbits/sec
81] 0.0000-14.0184 sec 168 KBytes 98.4 Kbits/sec
SUM] 0.0000-12.1395 sec 127 MBytes 87.5 Mbits/sec
[CT] final connect times (min/avg/max/stddev) = 0.081/1.339/5.933/1.476 ms (tot/err) = 100/0

[133] 0.0000-0.5381 sec 106 KBytes 1.62 Mbits/sec
[ 66] 0.0000-13.5146 sec 106 KBytes 64.3 Kbits/sec
[ 83] 0.0000-0.5948 sec 106 KBytes 1.46 Mbits/sec
[ 96] 0.0000-0.6021 sec 168 KBytes 2.29 Mbits/sec
[ 79] 0.0000-13.5094 sec 106 KBytes 64.3 Kbits/sec
[101] 0.0000-0.6020 sec 168 KBytes 2.29 Mbits/sec
[ 69] 0.0000-13.5395 sec 106 KBytes 64.2 Kbits/sec
[134] 0.0000-0.6256 sec 106 KBytes 1.39 Mbits/sec
[138] 0.0000-0.6214 sec 106 KBytes 1.40 Mbits/sec
[137] 0.0000-0.6239 sec 106 KBytes 1.39 Mbits/sec
[141] 0.0000-0.6215 sec 106 KBytes 1.40 Mbits/sec
[114] 0.0000-0.7281 sec 106 KBytes 1.19 Mbits/sec
[ 84] 0.0000-0.7517 sec 168 KBytes 1.83 Mbits/sec
[105] 0.0000-0.7501 sec 168 KBytes 1.84 Mbits/sec
[109] 0.0000-0.7585 sec 106 KBytes 1.15 Mbits/sec
[126] 0.0000-0.7582 sec 168 KBytes 1.82 Mbits/sec
[119] 0.0000-0.7625 sec 168 KBytes 1.81 Mbits/sec
[121] 0.0000-0.7580 sec 168 KBytes 1.82 Mbits/sec
[103] 0.0000-0.7983 sec 168 KBytes 1.73 Mbits/sec
[123] 0.0000-0.7690 sec 168 KBytes 1.79 Mbits/sec
[129] 0.0000-0.7989 sec 168 KBytes 1.73 Mbits/sec
[127] 0.0000-0.8071 sec 168 KBytes 1.71 Mbits/sec
SUM] 0.0000-14.0058 sec 127 MBytes 75.8 Mbits/sec

```

The total Mbits/sec or the sum stays the same throughout. Their individual connection speed goes down though. It basically divides the sum among the amount of the TCP connections but there are some outliers that get more than the others for example in the 100 one you can see some are down to 62 Kbits/sec but there are a couple that are at 100 Kbits/sec. So it divides it among the connections but not perfectly.

Exercise 5:



The image displays two terminal windows. The top window, titled 'jschm333@client: ~', shows a series of network statistics and a successful ping test to 172.17.246.2. The bottom window, titled 'Terminal', shows a failed ping test to the same IP address from a local bash shell.

```
jschm333@client: ~  
File Edit View Search Terminal Help  
[ 80] 0.0000-13.9589 sec 168 KBytes 98.8 Kbits/sec  
[ 73] 0.0000-13.9600 sec 168 KBytes 98.8 Kbits/sec  
[ 57] 0.0000-13.9814 sec 168 KBytes 98.6 Kbits/sec  
[ 77] 0.0000-13.9810 sec 168 KBytes 98.6 Kbits/sec  
[ 83] 0.0000-14.0149 sec 168 KBytes 98.4 Kbits/sec  
[ 81] 0.0000-14.0184 sec 168 KBytes 98.4 Kbits/sec  
[SUM] 0.0000-12.1395 sec 127 MBytes 87.5 Mbits/sec  
[ CT] final connect times (min/avg/max/stddev) = 0.081/1.339/5.933/1.476 ms (tot/  
err) = 100/0  
jschm333@client:~$ ping 172.17.246.2  
PING 172.17.246.2 (172.17.246.2) 56(84) bytes of data.  
64 bytes from 172.17.246.2: icmp_seq=1 ttl=64 time=0.238 ms  
64 bytes from 172.17.246.2: icmp_seq=2 ttl=64 time=0.337 ms  
64 bytes from 172.17.246.2: icmp_seq=3 ttl=64 time=0.215 ms  
64 bytes from 172.17.246.2: icmp_seq=4 ttl=64 time=0.091 ms  
64 bytes from 172.17.246.2: icmp_seq=5 ttl=64 time=0.451 ms  
64 bytes from 172.17.246.2: icmp_seq=6 ttl=64 time=0.296 ms  
64 bytes from 172.17.246.2: icmp_seq=7 ttl=64 time=0.309 ms  
64 bytes from 172.17.246.2: icmp_seq=8 ttl=64 time=0.147 ms  
^C  
--- 172.17.246.2 ping statistics ---  
8 packets transmitted, 8 received, 0% packet loss, time 7159ms  
rtt min/avg/max/mdev = 0.091/0.260/0.451/0.106 ms  
jschm333@client:~$
```

```
Terminal  
File Edit View Search Terminal Help  
bash-4.4$ ping 172.17.246.2  
PING 172.17.246.2 (172.17.246.2) 56(84) bytes of data.  
^C  
--- 172.17.246.2 ping statistics ---  
27 packets transmitted, 0 received, 100% packet loss, time 26648ms  
bash-4.4$
```

- i. The client can access the server. You can see from the upper terminal, that 8 packets were transmitted and that 8 were received. That means the client and the server are in connection.
- ii. The lower terminal shows my local pc trying to ping the server. As you can see 27 packets were transmitted but 0 were received. This means that things over the internet cannot access the server.

```
Terminal
File Edit View Search Terminal Help

virbr0: flags=4099<UP,BROADCAST,MULTICAST> mtu 1500
    inet 192.168.122.1 netmask 255.255.255.0 broadcast 192.168.122.255
    ether 52:54:00:58:b8:ae txqueuelen 1000 (Ethernet)
    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

bash-4.4$ ^C
bash-4.4$ ping 172.17.118.2
PING 172.17.118.2 (172.17.118.2) 56(84) bytes of data.
^C
^C
--- 172.17.118.2 ping statistics ---
26 packets transmitted, 0 received, 100% packet loss, time 25611ms

bash-4.4$ ping 172.17.118.2
PING 172.17.118.2 (172.17.118.2) 56(84) bytes of data.
^C
--- 172.17.118.2 ping statistics ---
5 packets transmitted, 0 received, 100% packet loss, time 4123ms

bash-4.4$
```


```
jschm333@server: ~
File Edit View Search Terminal Help

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 798 bytes 103224 (103.2 KB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 798 bytes 103224 (103.2 KB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

jschm333@server:~$ sudo tcpdump host 192.168.254.23
tcpdump: verbose output suppressed, use -v[v]... for full protocol decode
listening on eth0, link-type EN10MB (Ethernet), snapshot length 262144 bytes
^C
0 packets captured
0 packets received by filter
0 packets dropped by kernel
jschm333@server:~$ sudo tcpdump host 192.168.254.23
tcpdump: verbose output suppressed, use -v[v]... for full protocol decode
listening on eth0, link-type EN10MB (Ethernet), snapshot length 262144 bytes
^C
0 packets captured
0 packets received by filter
0 packets dropped by kernel
jschm333@server:~$
```

This shows the server running tcpdump with the ip of my computer pinging it. It got 0 packets from my computer and my computer received 0 back.

Experiment 6:

ExperimentsStorageNews!

Current Usage: 0 Node Hours, Prev Week: 1.42, Prev Month: 1.42 (30 day rank: 1542 of 1582 users)

ExperimentsProfilesProject ProfilesDatasetsReservationsMembershipUsageAccount

You do not have any active experiments. Click [here](#) to create one.

Experiment 6 in my Projects

Showing I terminated the server.

Conclusion:

In this lab we learned about Cloudlab and how to interact with it. We set up an experiment with a client and a server. We then used ssh to connect to both the server and the client. Using this we were able to establish TCP connections between them. We also were able to call shell commands on them from using ssh. We called ifconfig in order to get the ips of both the client and the server. Using this ip we were able to try to ping the server. We did this with both the client and another computer that was on the internet. The client was able to establish a connection with the server and receive back packets. The computer over the internet was unable to and received no packets back. Another interesting thing we saw was that when we had multiple TCP connections the sum stayed relatively the same no matter the amount of TCP connections. The result though was that the individual connections suffered and they didn't have as big of a transfer rate. Another thing we did was secure ssh where we had to have a certain key to connect to our server and our client. Along with this key we had a passphrase that we had to insert to connect. If you didn't have this key or passphrase you were unable to ssh into the server or the client. Overall, this lab gave us a good intro to cloud lab and to internal networks and working with client server models.