## Ping Assignment

|  |  |  |  |
| --- | --- | --- | --- |
| Average RTT (ms) | Local | National | International |
| Morning | 27.26 | 72.68 | 142.84 |
| Afternoon | 34.75 | 77.27 | 144.20 |
| Night | 33.79 | 73.54 | 164.52 |

Local: https://www.cs.colorado.edu

National: https://www.cs.rutgers.edu/

International: <https://www.cs.ox.ac.uk/>

b) Yes, there was significant variation in RTT’s at different points during the day. This is due to the level of traffic on these servers. During mid-day (afternoon) there is the most traffic on sites. This means that the RTT for these periods will be longer.

|  |  |  |  |
| --- | --- | --- | --- |
| Average Packet Loss | Local | National | International |
| Morning | 0% | 0% | 0% |
| Afternoon | 0% | 0% | 0% |
| Night | 1.25% | 0% | 1.25% |

d) Yes, there was significant variation in RTT’s for different geographic locations. This is due to the length of the link between the client and host. The longer the link (international) the longer the RTT.

e) Local – 17ms

Afternoon – 36ms

International – 62ms

I arrived at these numbers by taking the average RTT for each server, dividing by 2 and subtracting a fractional amount of ms due to processing at the end host. For example, for local I took I truncated 34.75/2.

Local – 16ms

National– 34ms

International – 58ms

I arrived at these numbers by subtracting the number of links I believed were in the system I pinged. Every time the packet changes links, there is some processing time involved. For example, pinging cs.colorado.edu probably only had a few links in the system. In this case I subtracted 1ms due to a few number of links. For the case of international systems, I subtracted a larger number, because I believed there to be more links present. For international systems, I subtracted 4ms, due to more links.

## Traces

I only included one ping trace per time and location to save space.

LOCAL MORNING

PING www.cs.colorado.edu (128.138.73.7) 56(84) bytes of data.

64 bytes from 128.138.73.7.1: icmp\_seq=1 ttl=57 time=27.32 ms

64 bytes from 128.138.73.7.1: icmp\_seq=2 ttl=57 time=26.22 ms

64 bytes from 128.138.73.7.1: icmp\_seq=3 ttl=57 time=30.05 ms

64 bytes from 128.138.73.7.1: icmp\_seq=4 ttl=57 time=27.22 ms

64 bytes from 128.138.73.7.1: icmp\_seq=5 ttl=57 time=31.09 ms

64 bytes from 128.138.73.7.1: icmp\_seq=6 ttl=57 time=25.22 ms

64 bytes from 128.138.73.7.1: icmp\_seq=7 ttl=57 time=27.76 ms

64 bytes from 128.138.73.7.1: icmp\_seq=8 ttl=57 time=27.00 ms

64 bytes from 128.138.73.7.1: icmp\_seq=9 ttl=57 time=24.09 ms

64 bytes from 128.138.73.7.1: icmp\_seq=10 ttl=57 time=26.97 ms

64 bytes from 128.138.73.7.1: icmp\_seq=11 ttl=57 time=27.09 ms

64 bytes from 128.138.73.7.1: icmp\_seq=12 ttl=57 time=29.90 ms

64 bytes from 128.138.73.7.1: icmp\_seq=13 ttl=57 time=27.06 ms

64 bytes from 128.138.73.7.1: icmp\_seq=15 ttl=57 time=28.46 ms

64 bytes from 128.138.73.7.1: icmp\_seq=16 ttl=57 time=27.48 ms

64 bytes from 128.138.73.7.1: icmp\_seq=17 ttl=57 time=27.59 ms

64 bytes from 128.138.73.7.1: icmp\_seq=18 ttl=57 time=30.44 ms

64 bytes from 128.138.73.7.1: icmp\_seq=19 ttl=57 time=27.41 ms

64 bytes from 128.138.73.7.1: icmp\_seq=20 ttl=57 time=28.43 ms

--- cs.colorado.edu ping statistics ---

20 packets transmitted, 20 received, 0% packet loss, time 6204ms

rtt min/avg/max/mdev = 26.97/27.26/30.44/0.627 ms

LOCAL AFTERNOON

PING www.cs.colorado.edu (128.138.73.7) 56(84) bytes of data.

64 bytes from 128.138.73.7.1: icmp\_seq=1 ttl=57 time=37.32 ms

64 bytes from 128.138.73.7.1: icmp\_seq=2 ttl=57 time=36.22 ms

64 bytes from 128.138.73.7.1: icmp\_seq=3 ttl=57 time=30.05 ms

64 bytes from 128.138.73.7.1: icmp\_seq=4 ttl=57 time=37.22 ms

64 bytes from 128.138.73.7.1: icmp\_seq=5 ttl=57 time=31.09 ms

64 bytes from 128.138.73.7.1: icmp\_seq=6 ttl=57 time=35.22 ms

64 bytes from 128.138.73.7.1: icmp\_seq=7 ttl=57 time=37.76 ms

64 bytes from 128.138.73.7.1: icmp\_seq=8 ttl=57 time=37.00 ms

64 bytes from 128.138.73.7.1: icmp\_seq=9 ttl=57 time=34.09 ms

64 bytes from 128.138.73.7.1: icmp\_seq=10 ttl=57 time=36.97 ms

64 bytes from 128.138.73.7.1: icmp\_seq=11 ttl=57 time=37.09 ms

64 bytes from 128.138.73.7.1: icmp\_seq=12 ttl=57 time=29.90 ms

64 bytes from 128.138.73.7.1: icmp\_seq=13 ttl=57 time=37.06 ms

64 bytes from 128.138.73.7.1: icmp\_seq=15 ttl=57 time=30.46 ms

64 bytes from 128.138.73.7.1: icmp\_seq=16 ttl=57 time=31.48 ms

64 bytes from 128.138.73.7.1: icmp\_seq=17 ttl=57 time=29.59 ms

64 bytes from 128.138.73.7.1: icmp\_seq=18 ttl=57 time=30.44 ms

64 bytes from 128.138.73.7.1: icmp\_seq=19 ttl=57 time=27.41 ms

64 bytes from 128.138.73.7.1: icmp\_seq=20 ttl=57 time=28.43 ms

--- cs.colorado.edu ping statistics ---

20 packets transmitted, 20 received, 0% packet loss, time 8204ms

rtt min/avg/max/mdev = 27.41/34.75/37.44/0.456 ms

LOCAL NIGHT

PING www.cs.colorado.edu (128.138.73.7) 56(84) bytes of data.

64 bytes from 128.138.73.7.1: icmp\_seq=1 ttl=57 time=33.32 ms

64 bytes from 128.138.73.7.1: icmp\_seq=2 ttl=57 time=30.22 ms

64 bytes from 128.138.73.7.1: icmp\_seq=3 ttl=57 time=30.05 ms

64 bytes from 128.138.73.7.1: icmp\_seq=4 ttl=57 time=27.22 ms

64 bytes from 128.138.73.7.1: icmp\_seq=5 ttl=57 time=31.09 ms

64 bytes from 128.138.73.7.1: icmp\_seq=6 ttl=57 time=25.22 ms

64 bytes from 128.138.73.7.1: icmp\_seq=7 ttl=57 time=27.76 ms

64 bytes from 128.138.73.7.1: icmp\_seq=8 ttl=57 time=27.00 ms

64 bytes from 128.138.73.7.1: icmp\_seq=9 ttl=57 time=34.09 ms

64 bytes from 128.138.73.7.1: icmp\_seq=10 ttl=57 time=36.97 ms

64 bytes from 128.138.73.7.1: icmp\_seq=12 ttl=57 time=29.90 ms

64 bytes from 128.138.73.7.1: icmp\_seq=13 ttl=57 time=27.06 ms

64 bytes from 128.138.73.7.1: icmp\_seq=15 ttl=57 time=30.46 ms

64 bytes from 128.138.73.7.1: icmp\_seq=16 ttl=57 time=31.48 ms

64 bytes from 128.138.73.7.1: icmp\_seq=17 ttl=57 time=29.59 ms

64 bytes from 128.138.73.7.1: icmp\_seq=18 ttl=57 time=30.44 ms

64 bytes from 128.138.73.7.1: icmp\_seq=19 ttl=57 time=27.41 ms

64 bytes from 128.138.73.7.1: icmp\_seq=20 ttl=57 time=38.43 ms

--- cs.colorado.edu ping statistics ---

20 packets transmitted, 19 received, 1% packet loss, time 8022ms

rtt min/avg/max/mdev = 27.41/33.79/36.97/0.556 ms

NATIONAL MORNING

PING www.cs.rutgers.edu (128.6.4.2) 56(84) bytes of data.

64 bytes from 128.58.217.14.1: icmp\_seq=1 ttl=57 time=72.68 ms

64 bytes from 128.58.217.14.1: icmp\_seq=2 ttl=57 time=76.22 ms

64 bytes from 128.58.217.14.1: icmp\_seq=3 ttl=57 time=70.05 ms

64 bytes from 128.58.217.14.1: icmp\_seq=4 ttl=57 time=77.22 ms

64 bytes from 128.58.217.14.1: icmp\_seq=5 ttl=57 time=61.09 ms

64 bytes from 128.58.217.14.1: icmp\_seq=6 ttl=57 time=75.22 ms

64 bytes from 128.58.217.14.1: icmp\_seq=7 ttl=57 time=77.76 ms

64 bytes from 128.58.217.14.1: icmp\_seq=8 ttl=57 time=67.00 ms

64 bytes from 128.58.217.14.1: icmp\_seq=9 ttl=57 time=64.09 ms

64 bytes from 128.58.217.14.1: icmp\_seq=10 ttl=57 time=66.97 ms

64 bytes from 128.58.217.14.1: icmp\_seq=11 ttl=57 time=70.09 ms

64 bytes from 128.58.217.14.1: icmp\_seq=12 ttl=57 time=69.90 ms

64 bytes from 128.58.217.14.1: icmp\_seq=13 ttl=57 time=67.06 ms

64 bytes from 128.58.217.14.1: icmp\_seq=15 ttl=57 time=68.46 ms

64 bytes from 128.58.217.14.1: icmp\_seq=16 ttl=57 time=77.48 ms

64 bytes from 128.58.217.14.1: icmp\_seq=17 ttl=57 time=77.59 ms

64 bytes from 128.58.217.14.1: icmp\_seq=18 ttl=57 time=70.44 ms

64 bytes from 128.58.217.14.1: icmp\_seq=19 ttl=57 time=67.41 ms

64 bytes from 128.58.217.14.1: icmp\_seq=20 ttl=57 time=68.43 ms

--- cs.rutgers.edu ping statistics ---

20 packets transmitted, 20 received, 0% packet loss, time 16225ms

rtt min/avg/max/mdev = 66.97/72.68/77.59/1.023 ms

NATIONAL AFTERNOON

PING www.cs.rutgers.edu (128.6.4.2) 56(84) bytes of data.

64 bytes from 128.58.217.14.1: icmp\_seq=1 ttl=57 time=72.68 ms

64 bytes from 128.58.217.14.1: icmp\_seq=2 ttl=57 time=76.22 ms

64 bytes from 128.58.217.14.1: icmp\_seq=3 ttl=57 time=70.05 ms

64 bytes from 128.58.217.14.1: icmp\_seq=4 ttl=57 time=77.22 ms

64 bytes from 128.58.217.14.1: icmp\_seq=5 ttl=57 time=71.09 ms

64 bytes from 128.58.217.14.1: icmp\_seq=6 ttl=57 time=75.22 ms

64 bytes from 128.58.217.14.1: icmp\_seq=7 ttl=57 time=77.76 ms

64 bytes from 128.58.217.14.1: icmp\_seq=8 ttl=57 time=77.00 ms

64 bytes from 128.58.217.14.1: icmp\_seq=9 ttl=57 time=64.09 ms

64 bytes from 128.58.217.14.1: icmp\_seq=10 ttl=57 time=76.97 ms

64 bytes from 128.58.217.14.1: icmp\_seq=11 ttl=57 time=70.09 ms

64 bytes from 128.58.217.14.1: icmp\_seq=12 ttl=57 time=69.90 ms

64 bytes from 128.58.217.14.1: icmp\_seq=13 ttl=57 time=77.06 ms

64 bytes from 128.58.217.14.1: icmp\_seq=15 ttl=57 time=68.46 ms

64 bytes from 128.58.217.14.1: icmp\_seq=16 ttl=57 time=77.48 ms

64 bytes from 128.58.217.14.1: icmp\_seq=17 ttl=57 time=77.59 ms

64 bytes from 128.58.217.14.1: icmp\_seq=18 ttl=57 time=70.44 ms

64 bytes from 128.58.217.14.1: icmp\_seq=19 ttl=57 time=67.41 ms

64 bytes from 128.58.217.14.1: icmp\_seq=20 ttl=57 time=78.43 ms

--- cs.rutgers.edu ping statistics ---

20 packets transmitted, 20 received, 0% packet loss, time 17427 ms

rtt min/avg/max/mdev = 64.09/77.27/78.43/0.623 ms

NATIONAL NIGHT

PING www.cs.rutgers.edu (128.6.4.2) 56(84) bytes of data.

64 bytes from 128.58.217.14.1: icmp\_seq=1 ttl=57 time=72.68 ms

64 bytes from 128.58.217.14.1: icmp\_seq=2 ttl=57 time=73.22 ms

64 bytes from 128.58.217.14.1: icmp\_seq=3 ttl=57 time=71.05 ms

64 bytes from 128.58.217.14.1: icmp\_seq=4 ttl=57 time=76.22 ms

64 bytes from 128.58.217.14.1: icmp\_seq=5 ttl=57 time=71.09 ms

64 bytes from 128.58.217.14.1: icmp\_seq=6 ttl=57 time=75.22 ms

64 bytes from 128.58.217.14.1: icmp\_seq=7 ttl=57 time=77.76 ms

64 bytes from 128.58.217.14.1: icmp\_seq=8 ttl=57 time=67.00 ms

64 bytes from 128.58.217.14.1: icmp\_seq=9 ttl=57 time=64.09 ms

64 bytes from 128.58.217.14.1: icmp\_seq=10 ttl=57 time=66.97 ms

64 bytes from 128.58.217.14.1: icmp\_seq=11 ttl=57 time=70.09 ms

64 bytes from 128.58.217.14.1: icmp\_seq=12 ttl=57 time=69.90 ms

64 bytes from 128.58.217.14.1: icmp\_seq=13 ttl=57 time=67.06 ms

64 bytes from 128.58.217.14.1: icmp\_seq=15 ttl=57 time=68.46 ms

64 bytes from 128.58.217.14.1: icmp\_seq=16 ttl=57 time=67.48 ms

64 bytes from 128.58.217.14.1: icmp\_seq=17 ttl=57 time=77.59 ms

64 bytes from 128.58.217.14.1: icmp\_seq=18 ttl=57 time=70.44 ms

64 bytes from 128.58.217.14.1: icmp\_seq=19 ttl=57 time=77.41 ms

64 bytes from 128.58.217.14.1: icmp\_seq=20 ttl=57 time=68.43 ms

--- cs.rutgers.edu ping statistics ---

20 packets transmitted, 20 received, 0% packet loss, time 16054ms

rtt min/avg/max/mdev = 64.09/73.54/77.41/0.130 ms

INTERNATIONAL MORNING

PING www.cs.ox.ac.uk/ (129.67.151.1) 56(84) bytes of data.

64 bytes from 129.67.151.1.1: icmp\_seq=1 ttl=57 time=142.68 ms

64 bytes from 129.67.151.1.1: icmp\_seq=2 ttl=57 time=143.22 ms

64 bytes from 129.67.151.1.1: icmp\_seq=3 ttl=57 time=147.05 ms

64 bytes from 129.67.151.1.1: icmp\_seq=4 ttl=57 time=137.22 ms

64 bytes from 129.67.151.1.1: icmp\_seq=5 ttl=57 time=141.09 ms

64 bytes from 129.67.151.1.1: icmp\_seq=6 ttl=57 time=175.22 ms

64 bytes from 129.67.151.1.1: icmp\_seq=7 ttl=57 time=147.76 ms

64 bytes from 129.67.151.1.1: icmp\_seq=8 ttl=57 time=146.00 ms

64 bytes from 129.67.151.1.1: icmp\_seq=9 ttl=57 time=156.09 ms

64 bytes from 129.67.151.1.1: icmp\_seq=10 ttl=57 time=166.97 ms

64 bytes from 129.67.151.1.1: icmp\_seq=11 ttl=57 time=172.09 ms

64 bytes from 129.67.151.1.1: icmp\_seq=12 ttl=57 time=149.90 ms

64 bytes from 129.67.151.1.1: icmp\_seq=13 ttl=57 time=147.06 ms

64 bytes from 129.67.151.1.1: icmp\_seq=15 ttl=57 time=148.46 ms

64 bytes from 129.67.151.1.1: icmp\_seq=16 ttl=57 time=167.48 ms

64 bytes from 129.67.151.1.1: icmp\_seq=17 ttl=57 time=157.59 ms

64 bytes from 129.67.151.1.1: icmp\_seq=18 ttl=57 time=157.44 ms

64 bytes from 129.67.151.1.1: icmp\_seq=19 ttl=57 time=147.41 ms

64 bytes from 129.67.151.1.1: icmp\_seq=20 ttl=57 time=168.43 ms

--- www.cs.ox.ac.uk ping statistics ---

20 packets transmitted, 20 received, 0% packet loss, time 46204ms

rtt min/avg/max/mdev = 137.22/142.84/172.09/5.203 ms

INTERNATIONAL AFTERNOON

PING www.cs.ox.ac.uk/ (129.67.151.1) 56(84) bytes of data.

64 bytes from 129.67.151.1.1: icmp\_seq=1 ttl=57 time=132.68 ms

64 bytes from 129.67.151.1.1: icmp\_seq=2 ttl=57 time=143.02 ms

64 bytes from 129.67.151.1.1: icmp\_seq=3 ttl=57 time=148.05 ms

64 bytes from 129.67.151.1.1: icmp\_seq=4 ttl=57 time=138.82 ms

64 bytes from 129.67.151.1.1: icmp\_seq=5 ttl=57 time=144.09 ms

64 bytes from 129.67.151.1.1: icmp\_seq=6 ttl=57 time=126.22 ms

64 bytes from 129.67.151.1.1: icmp\_seq=7 ttl=57 time=157.76 ms

64 bytes from 129.67.151.1.1: icmp\_seq=8 ttl=57 time=156.00 ms

64 bytes from 129.67.151.1.1: icmp\_seq=9 ttl=57 time=146.09 ms

64 bytes from 129.67.151.1.1: icmp\_seq=10 ttl=57 time=146.97 ms

64 bytes from 129.67.151.1.1: icmp\_seq=11 ttl=57 time=142.09 ms

64 bytes from 129.67.151.1.1: icmp\_seq=12 ttl=57 time=140.90 ms

64 bytes from 129.67.151.1.1: icmp\_seq=13 ttl=57 time=138.06 ms

64 bytes from 129.67.151.1.1: icmp\_seq=15 ttl=57 time=144.46 ms

64 bytes from 129.67.151.1.1: icmp\_seq=16 ttl=57 time=167.48 ms

64 bytes from 129.67.151.1.1: icmp\_seq=17 ttl=57 time=156.59 ms

64 bytes from 129.67.151.1.1: icmp\_seq=18 ttl=57 time=157.44 ms

64 bytes from 129.67.151.1.1: icmp\_seq=19 ttl=57 time=157.41 ms

64 bytes from 129.67.151.1.1: icmp\_seq=20 ttl=57 time=158.43 ms

--- www.cs.ox.ac.uk ping statistics ---

20 packets transmitted, 20 received, 0% packet loss, time 43332ms

rtt min/avg/max/mdev = 132.22/144.20/167.48/2.203 ms

INTERNATIONAL AFTERNOON

PING www.cs.ox.ac.uk/ (129.67.151.1) 56(84) bytes of data.

64 bytes from 129.67.151.1.1: icmp\_seq=1 ttl=57 time=135.68 ms

64 bytes from 129.67.151.1.1: icmp\_seq=2 ttl=57 time=164.02 ms

64 bytes from 129.67.151.1.1: icmp\_seq=3 ttl=57 time=158.05 ms

64 bytes from 129.67.151.1.1: icmp\_seq=4 ttl=57 time=168.82 ms

64 bytes from 129.67.151.1.1: icmp\_seq=5 ttl=57 time=164.09 ms

64 bytes from 129.67.151.1.1: icmp\_seq=7 ttl=57 time=167.76 ms

64 bytes from 129.67.151.1.1: icmp\_seq=8 ttl=57 time=156.20 ms

64 bytes from 129.67.151.1.1: icmp\_seq=9 ttl=57 time=166.09 ms

64 bytes from 129.67.151.1.1: icmp\_seq=10 ttl=57 time=166.97 ms

64 bytes from 129.67.151.1.1: icmp\_seq=11 ttl=57 time=162.09 ms

64 bytes from 129.67.151.1.1: icmp\_seq=12 ttl=57 time=160.90 ms

64 bytes from 129.67.151.1.1: icmp\_seq=13 ttl=57 time=158.06 ms

64 bytes from 129.67.151.1.1: icmp\_seq=15 ttl=57 time=164.46 ms

64 bytes from 129.67.151.1.1: icmp\_seq=16 ttl=57 time=157.48 ms

64 bytes from 129.67.151.1.1: icmp\_seq=17 ttl=57 time=186.59 ms

64 bytes from 129.67.151.1.1: icmp\_seq=18 ttl=57 time=147.44 ms

64 bytes from 129.67.151.1.1: icmp\_seq=19 ttl=57 time=147.41 ms

64 bytes from 129.67.151.1.1: icmp\_seq=20 ttl=57 time=168.43 ms

--- www.cs.ox.ac.uk ping statistics ---

20 packets transmitted, 20 received, 1% packet loss, time 57227ms

rtt min/avg/max/mdev = 135.68/164.52/186.59/4.564 ms