

HW1: Network Connectivity Analysis

Course: Security and Networking
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Disclaimer

These results were obtained by running commands in the terminal and converted into Markdown format with AI assistance.
All analysis and explanations are my own.

Task 1: Basic Ping Analysis

Objective

Measure and analyze round-trip times (RTT) to websites at different geographic locations.

Websites Tested

- 1. Local/Regional: `www.austinkoske.com` (My personal website hosted in my dorm room through a CloudFlare tunnel)
- 2. National: `www.google.com`
- 3. International: `news.yahoo.co.jp`

Ping Results

Website	Command	Min (ms)	Max (ms)	Avg (ms)	Packet Loss
Local/Regional	<code>ping www.austinkoske.com</code>	5.901	9.264	7.037	0%

Website	Command	Min (ms)	Max (ms)	Avg (ms)	Packet Loss
National Site	ping www.google.com	4.434	5.429	4.986	0%
Intl Site	ping www.news.yahoo.co.jp	166.745	169.785	167.763	0%

Screenshots

- ```

koskea@AAD-PF50FYPV:~$ ping www.austinkoske.com -c 4
PING www.austinkoske.com (172.67.214.18) 56(84) bytes of data.
64 bytes from 172.67.214.18: icmp_seq=1 ttl=55 time=9.26 ms
64 bytes from 172.67.214.18: icmp_seq=2 ttl=55 time=6.97 ms
64 bytes from 172.67.214.18: icmp_seq=3 ttl=55 time=5.90 ms
64 bytes from 172.67.214.18: icmp_seq=4 ttl=55 time=6.02 ms

--- www.austinkoske.com ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3282ms
rtt min/avg/max/mdev = 5.901/7.037/9.264/1.350 ms

```
- ```

koskea@AAD-PF50FYPV:~$ ping www.google.com -c 4
PING www.google.com (142.251.32.4) 56(84) bytes of data.
64 bytes from ord38s33-in-f4.1e100.net (142.251.32.4): icmp_seq=1 ttl=115 time=4.33 ms
64 bytes from ord38s33-in-f4.1e100.net (142.251.32.4): icmp_seq=2 ttl=115 time=5.13 ms
64 bytes from ord38s33-in-f4.1e100.net (142.251.32.4): icmp_seq=3 ttl=115 time=5.06 ms
64 bytes from ord38s33-in-f4.1e100.net (142.251.32.4): icmp_seq=4 ttl=115 time=5.43 ms

--- www.google.com ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3336ms
rtt min/avg/max/mdev = 4.334/4.986/5.429/0.401 ms

```
- ```

koskea@AAD-PF50FYPV:~$ ping news.yahoo.co.jp -c 4
PING edge12.g.yimg.jp (124.83.185.124) 56(84) bytes of data.
64 bytes from 124.83.185.124: icmp_seq=1 ttl=45 time=167 ms
64 bytes from 124.83.185.124: icmp_seq=2 ttl=45 time=167 ms
64 bytes from 124.83.185.124: icmp_seq=3 ttl=45 time=167 ms
64 bytes from 124.83.185.124: icmp_seq=4 ttl=45 time=170 ms

--- edge12.g.yimg.jp ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3228ms
rtt min/avg/max/mdev = 166.745/167.763/169.785/1.194 ms

```

# Analysis

- Compare ping times (local vs national vs international).
- Explain differences (geographic distance, routing, ISP infrastructure).
- Note any packet loss or anomalies.

## Task 2: Tracert Route Analysis

### Objective

Trace and analyze network paths to the same three websites.

### Tracert Results

| Website             | Command                      | Hops | Final Time (ms) | Timeouts   | Major Providers                      |
|---------------------|------------------------------|------|-----------------|------------|--------------------------------------|
| Local/Regional Site | tracert www.austinkoske.com  | 9    | 5-6 ms          | 0          | WiscNet, Cloudflare                  |
| National Site       | tracert www.google.com       | 10   | 5-6 ms          | 0          | WiscNet, Equinix, Google             |
| International Site  | tracert www.news.yahoo.co.jp | 17   | ~170-207 ms     | 1 (Hop 16) | WiscNet, Internet2, IJJ, Yahoo Japan |

# Screenshots

- Tracing route to www.austinkoske.com [172.67.214.18]  
over a maximum of 30 hops:

|   |        |       |       |                                                        |
|---|--------|-------|-------|--------------------------------------------------------|
| 1 | 2 ms   | 3 ms  | 4 ms  | 10.100.0.1                                             |
| 2 | 3 ms   | 4 ms  | 5 ms  | 155.92.10.134                                          |
| 3 | 5 ms   | 6 ms  | 3 ms  | r-msoe-tengig0-0-2.wiscnet.net [216.56.74.129]         |
| 4 | 6 ms   | 15 ms | 12 ms | 140.189.100.57                                         |
| 5 | 6 ms   | 3 ms  | 2 ms  | r-milwaukee809-isp-ae1.ip4.wiscnet.net [140.189.8.157] |
| 6 | 6 ms   | 6 ms  | 5 ms  | r-equinix-isp-ae8.ip4.wiscnet.net [140.189.9.110]      |
| 7 | 132 ms | 15 ms | 18 ms | 141.101.73.28                                          |
| 8 | 7 ms   | 7 ms  | 6 ms  | 141.101.73.74                                          |
| 9 | 6 ms   | 5 ms  | 5 ms  | 172.67.214.18                                          |

Trace complete.

- PS C:\Users\koskea> **tracert** www.google.com

Tracing route to www.google.com [142.251.32.4]  
over a maximum of 30 hops:

|    |      |      |      |                                                        |
|----|------|------|------|--------------------------------------------------------|
| 1  | 2 ms | 2 ms | 2 ms | 10.100.0.1                                             |
| 2  | 5 ms | 6 ms | 4 ms | 155.92.10.134                                          |
| 3  | 3 ms | 4 ms | 2 ms | r-msoe-tengig0-0-2.wiscnet.net [216.56.74.129]         |
| 4  | 6 ms | 6 ms | 9 ms | 140.189.100.57                                         |
| 5  | 3 ms | 2 ms | 4 ms | r-milwaukee809-isp-ae1.ip4.wiscnet.net [140.189.8.157] |
| 6  | 5 ms | 5 ms | 5 ms | r-equinix-isp-ae8.ip4.wiscnet.net [140.189.9.110]      |
| 7  | 5 ms | 6 ms | 6 ms | 72.14.218.180                                          |
| 8  | 5 ms | 7 ms | 6 ms | 74.125.251.147                                         |
| 9  | 5 ms | 6 ms | 5 ms | 142.251.60.21                                          |
| 10 | 5 ms | 5 ms | 6 ms | ord38s33-in-f4.1e100.net [142.251.32.4]                |

Trace complete.

- PS C:\Users\koskea> **tracert** news.yahoo.co.jp

Tracing route to edge12.g.yimg.jp [124.83.184.124]  
over a maximum of 30 hops:

|    |        |        |        |                                                                         |
|----|--------|--------|--------|-------------------------------------------------------------------------|
| 1  | 3 ms   | 2 ms   | 3 ms   | 10.100.0.1                                                              |
| 2  | 3 ms   | 3 ms   | 3 ms   | 155.92.10.134                                                           |
| 3  | 4 ms   | 10 ms  | 6 ms   | r-msoe-tengig0-0-2.wiscnet.net [216.56.74.129]                          |
| 4  | 16 ms  | 11 ms  | 6 ms   | 140.189.100.57                                                          |
| 5  | 4 ms   | 3 ms   | 4 ms   | r-milwaukee809-isp-ae1.ip4.wiscnet.net [140.189.8.157]                  |
| 6  | 8 ms   | 6 ms   | 8 ms   | bundle-ether240.2098.core1.star.net.internet2.edu [64.57.21.93]         |
| 7  | 22 ms  | 25 ms  | 21 ms  | fourhundredge-0-0-0-4.4079.core1.eqch.net.internet2.edu [163.253.2.20]  |
| 8  | 22 ms  | 24 ms  | 23 ms  | fourhundredge-0-0-0-0.4079.core1.clev.net.internet2.edu [163.253.1.210] |
| 9  | 20 ms  | 22 ms  | 20 ms  | fourhundredge-0-0-0-3.4079.core1.ashb.net.internet2.edu [163.253.1.122] |
| 10 | 18 ms  | 18 ms  | 19 ms  | 163.253.1.131                                                           |
| 11 | 19 ms  | 19 ms  | 19 ms  | abn001bb00.iiij.net [206.126.236.23]                                    |
| 12 | 76 ms  | 77 ms  | 77 ms  | lax002bb01.IIJ.Net [58.138.81.241]                                      |
| 13 | 181 ms | 183 ms | 181 ms | osk004bb01.IIJ.Net [58.138.88.125]                                      |
| 14 | 182 ms | 182 ms | 182 ms | osk004ip56.IIJ.Net [58.138.106.190]                                     |
| 15 | 171 ms | 170 ms | 172 ms | 210.138.106.238                                                         |
| 16 | *      | *      | *      | Request timed out.                                                      |
| 17 | 172 ms | 207 ms | 176 ms | 124.83.184.124                                                          |

Trace complete.

# Analysis

- Which site required the most hops?
  - The international site, Yahoo
- Which had the fastest final hop time?
  - Google
- Any common routers across different traces?
  - MSOE/WiscNet appear in all traces
- Identify ISPs or exchange points (from hostnames).
  - WiscNet and Equinix appear in all traces; Cloudflare handles [austinkoske.com](https://austinkoske.com), Google's own backbone handles [google.com](https://google.com).
  - Yahoo Japan route uses Internet2 and IJ.
- Discuss routing patterns, international carriers for global site.
  - Local/regional ([austinkoske.com](https://austinkoske.com)) and national ([google.com](https://google.com)) stay under 10 hops with <10 ms latency.
  - International (Yahoo Japan) use Internet2 + IJ, ~170-200 ms latency, with one timed out hop.

# Conclusion

- Summarize differences between ping and tracer results.
  - Ping measures the amount of time it takes for an echo request packet to reach a domain and have it respond back.
  - Tracer reveals the route across routers that a connection takes to reach the host server.
- What I learned about latency and routing:
  - I learned how latency increases with geographic distance and the number of intermediate hops. Local and national sites had very low round-trip times (<10 ms), while the international site (Yahoo Japan) showed much higher latency (~170-200 ms).
- Unusual findings:
  - One timeout occurred on the Yahoo Japan route (hop 16), most likely due to a router not responding to the echo packet rather than actual packet loss.