

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	ping www.austinkoske.com	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, IIJ, 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  fourhundredrudge-0-0-0-4.4079.core1.eqch.net.internet2.edu [163.253.2.20]
8    22 ms     24 ms     23 ms  fourhundredrudge-0-0-0-0.4079.core1.clev.net.internet2.edu [163.253.1.210]
9    20 ms     22 ms     20 ms  fourhundredrudge-0-0-0-3.4079.core1.ashb.net.internet2.edu [163.253.1.122]
10     8 ms     18 ms     19 ms  163.253.1.131
11     9 ms     19 ms     19 ms  abn001bb00.ijij.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](#), Google's own backbone handles [google.com](#).
  - Yahoo Japan route uses Internet2 and IIJ.
- Discuss routing patterns, international carriers for global site.
  - Local/regional ([austinkoske.com](#)) and national ([google.com](#)) stay under 10 hops with <10 ms latency.
  - International (Yahoo Japan) use Internet2 + IIJ, ~170-200 ms latency, with one timed out hop.

# Conclusion

- Summarize differences between ping and tracert results.
  - Ping measures the amount of time it takes for an echo request packet to reach a domain and have it respond back.
  - Tracert 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.