

Network Topology

Computer Networks

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1 Network Topology Discovery

Websites & Network Diversity

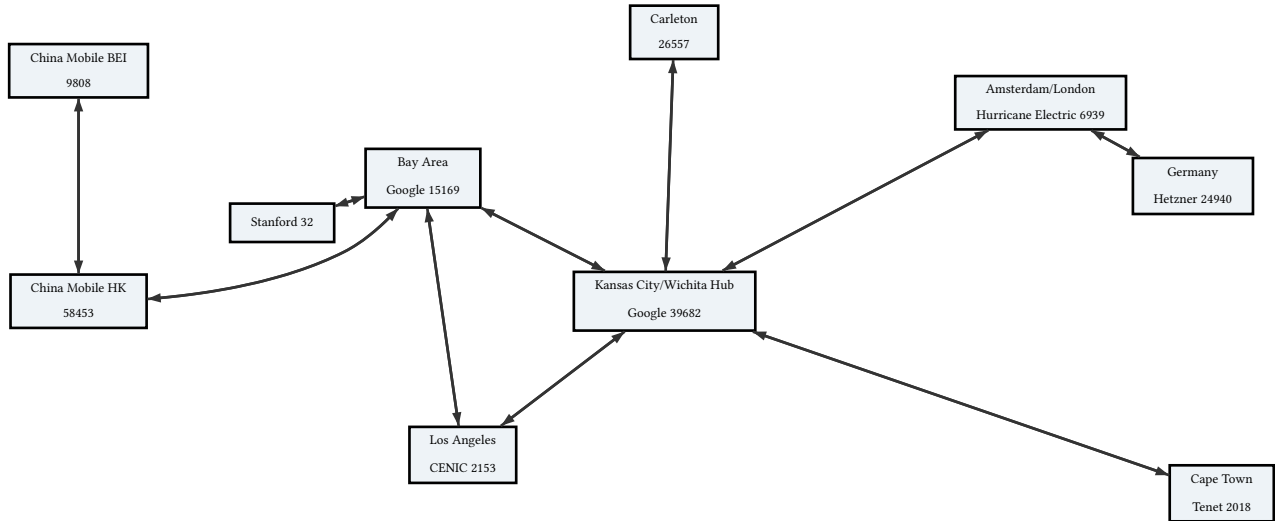


```
root@194-67-116-72:~# traceroute google.com
traceroute to google.com (172.217.16.110), 30 hops max, 60 byte packets
 1  node82-msk1.cloudvps.reg.ru (89.108.69.216)  0.150 ms  0.126 ms  0.115 ms
 2  kiae-r1.hosting.reg.ru (31.31.194.4)  0.466 ms  0.456 ms  0.446 ms
 3  * * *
 4  150-192-212-88.host.exempto.ru (88.212.192.150)  0.241 ms  0.230 ms  0.268 ms
 5  msk-m9-b1-ae30-vlan342.fiord.net (62.140.239.222)  1.079 ms  1.052 ms  1.039 ms
 6  * * *
 7  * * *
 8  72.14.222.198 (72.14.222.198)  1.478 ms  1.285 ms  1.356 ms
 9  108.170.250.113 (108.170.250.113)  1.435 ms  108.170.250.146 (108.170.250.146)  1.467 ms  108.170.250.130 (108.170.250.130)  2.035 ms
10  216.239.50.44 (216.239.50.44)  17.193 ms  216.239.50.132 (216.239.50.132)  15.801 ms  209.85.255.136 (209.85.255.136)  18.984 ms
11  142.250.227.25 (142.250.227.25)  34.555 ms  142.250.227.7 (142.250.227.7)  33.099 ms  142.250.227.131 (142.250.227.131)  35.104 ms
12  64.233.175.142 (64.233.175.142)  44.503 ms  66.249.94.20 (66.249.94.20)  46.843 ms  72.14.237.108 (72.14.237.108)  46.849 ms
13  74.125.242.241 (74.125.242.241)  45.134 ms  74.125.242.225 (74.125.242.225)  47.957 ms  49.450 ms
14  72.14.239.201 (72.14.239.201)  44.523 ms  45.201 ms  72.14.239.195 (72.14.239.195)  48.765 ms
15  prg02s12-in-f14.1e100.net (172.217.16.110)  46.698 ms  48.458 ms  46.712 ms
root@194-67-116-72:~#
```

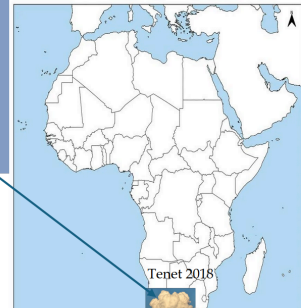
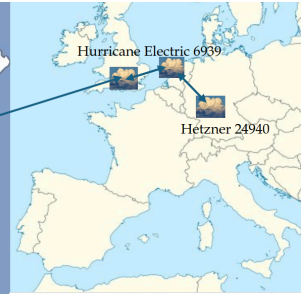
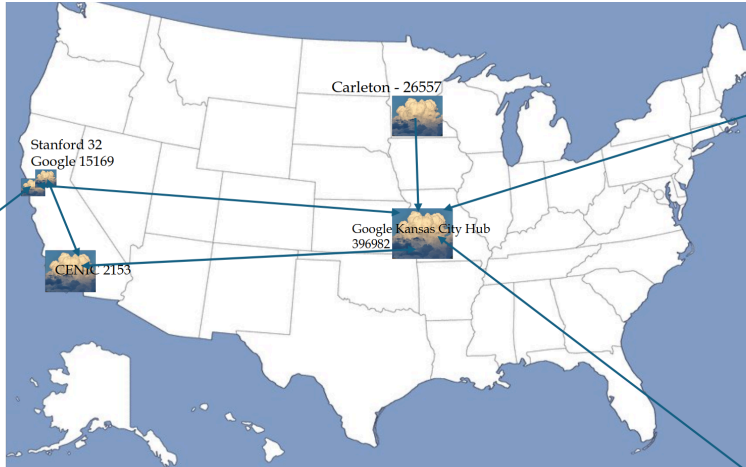
Figure 1: Traceroutes were from

- Small Websites: Corndog.io, regex101.com
- Universities: U Cape Town, Stanford
- Large Corporations: Deutsche Bank, baidu.com

Node Graph



Network Map



Times & Analysis



Category	Range (One-Way)	Notes
Domestic U.S. traffic	$\approx 40\text{--}100$ ms	corndog.io (40 ms), db.com (80 ms)
Transatlantic	≈ 300 ms	regex101.com (Germany) (≈ 300 ms)
Transpacific	≈ 620 ms	baidu.com (≈ 700 ms)
Africa	≈ 500 ms	transatlantic, Cape Town (≈ 440 ms)

2 Network Performance

Ping



Website	Mean (ms)	Median (ms)	Min (ms)	Max (ms)	Status
corndog.io	32.02	32.05	31.40	32.50	✓
regex101.com	112.80	113.00	112.00	114.00	✓
db.com	15.28	15.45	13.90	16.60	✓
uct.ac.za	N/A	N/A	N/A	N/A	✗
plato.stanford.edu	60.32	60.15	59.50	61.20	✓
baidu.com	237.90	238.00	233.00	245.00	✓

Conclusion



- The U.S. and Western Europe are best connected; China and South Africa show high latency and long routes.
- All traffic from Carleton passes through a Midwestern hub, likely Wichita or Kansas City.
- Stanford's route had many hops, large networks add routing complexity.
- China and South Africa paths show major delays from submarine optical fiber telecommunication distance.
- Smaller sites like corndog.io revealed unreliable or missing routes.
- Latency mostly follows distance.