

CS521-traceroute

lin liu

18:

traceroute from 134.79.197.200 (www.slac.stanford.edu) to 173.194.123.52 (lga15s47-in-f20.1e100.net) for 155.246.171.112

First:

```
Executing exec(traceroute -m 30 -q 3 173.194.123.52)
traceroute to 173.194.123.52 (173.194.123.52), 30 hops max, 40 byte packets
 1 134.79.197.131 (134.79.197.131) 0.694 ms 0.466 ms 0.540 ms
 2 rtr-core1-p2p-serv01-02.slac.stanford.edu (134.79.253.253) 0.471 ms 0.366 ms 0.398 ms
 3 rtr-fwcore2-trust-p2p-core2.slac.stanford.edu (134.79.254.146) 0.706 ms 0.694 ms 0.680
ms
 4 rtr-core2-p2p-fwcore2-untrust.slac.stanford.edu (134.79.254.149) 0.808 ms 0.588 ms
0.822 ms
 5 * * *
 6 sunncr5-ip-c-slac.slac.stanford.edu (192.68.191.233) 1.612 ms 1.460 ms 1.529 ms
 7 eqxsjrt1-ip-a-sunncr5.es.net (134.55.38.146) 1.648 ms 1.695 ms 1.665 ms
 8 eqixsj-google-gige.google.com (206.223.116.21) 1.778 ms 1.665 ms 1.671 ms
 9 216.239.49.168 (216.239.49.168) 17.421 ms 2.406 ms 216.239.49.170 (216.239.49.170)
2.226 ms
10 209.85.246.253 (209.85.246.253) 70.260 ms 69.851 ms 209.85.246.38 (209.85.246.38)
68.283 ms
11 216.239.46.240 (216.239.46.240) 47.749 ms 47.608 ms 47.423 ms
12 64.233.174.6 (64.233.174.6) 49.928 ms 216.239.46.55 (216.239.46.55) 47.773 ms 47.896
ms
13 64.233.174.89 (64.233.174.89) 49.664 ms 49.737 ms 49.659 ms
14 72.14.233.147 (72.14.233.147) 77.260 ms 69.498 ms 216.239.50.249 (216.239.50.249)
84.034 ms
15 209.85.246.5 (209.85.246.5) 68.860 ms 209.85.249.213 (209.85.249.213) 70.016 ms
69.868 ms
16 209.85.240.113 (209.85.240.113) 69.727 ms 69.666 ms 69.682 ms
17 lga15s47-in-f20.1e100.net (173.194.123.52) 69.346 ms 69.229 ms 69.246 ms
traceroute -m 30 -q 3 173.194.123.52 took 17secs. Total time=17secs.
```

second:

```
Executing exec(traceroute -m 30 -q 3 173.194.123.52)
traceroute to 173.194.123.52 (173.194.123.52), 30 hops max, 40 byte packets
 1 134.79.197.131 (134.79.197.131) 0.682 ms 0.469 ms 0.536 ms
 2 rtr-core1-p2p-serv01-02.slac.stanford.edu (134.79.253.253) 0.494 ms 0.338 ms 0.398 ms
 3 rtr-fwcore2-trust-p2p-core2.slac.stanford.edu (134.79.254.146) 0.682 ms 0.699 ms 0.678
ms
```

```

4  rtr-core2-p2p-fwcore2-untrust.slac.stanford.edu (134.79.254.149) 0.667 ms 0.546 ms
0.820 ms
5  * * *
6  sunnncr5-ip-c-slac.slac.stanford.edu (192.68.191.233) 2.176 ms 1.576 ms 7.576 ms
7  eqxsjrt1-ip-a-sunnncr5.es.net (134.55.38.146) 1.789 ms 1.812 ms 1.666 ms
8  eqixsj-google-gige.google.com (206.223.116.21) 1.813 ms 1.815 ms 2.650 ms
9  216.239.49.168 (216.239.49.168) 3.061 ms 216.239.49.170 (216.239.49.170) 2.274 ms
216.239.49.168 (216.239.49.168) 2.405 ms
10 209.85.246.253 (209.85.246.253) 70.147 ms 209.85.246.38 (209.85.246.38) 68.429 ms
209.85.246.253 (209.85.246.253) 69.934 ms
11 216.239.46.240 (216.239.46.240) 47.640 ms 47.726 ms 47.571 ms
12 64.233.174.6 (64.233.174.6) 49.779 ms 216.239.46.55 (216.239.46.55) 52.206 ms 47.727
ms
13 72.14.232.140 (72.14.232.140) 47.687 ms 64.233.174.89 (64.233.174.89) 49.579 ms
72.14.232.140 (72.14.232.140) 47.609 ms
14 216.239.50.249 (216.239.50.249) 67.738 ms 72.14.233.147 (72.14.233.147) 78.152 ms
216.239.50.249 (216.239.50.249) 68.040 ms
15 209.85.246.5 (209.85.246.5) 72.090 ms 209.85.249.213 (209.85.249.213) 70.082 ms
69.814 ms
16 209.85.240.113 (209.85.240.113) 69.738 ms 69.951 ms 70.803 ms
17 lga15s47-in-f20.1e100.net (173.194.123.52) 67.537 ms 67.692 ms 69.246 ms
traceroute -m 30 -q 3 173.194.123.52 took 16secs. Total time=17secs.

```

third:

```

Executing exec(traceroute -m 30 -q 3 173.194.123.52)
traceroute to 173.194.123.52 (173.194.123.52), 30 hops max, 40 byte packets
1 134.79.197.131 (134.79.197.131) 0.669 ms 0.473 ms 0.538 ms
2  rtr-core1-p2p-serv01-02.slac.stanford.edu (134.79.253.253) 0.434 ms 0.354 ms 0.398 ms
3  rtr-fwcore2-trust-p2p-core2.slac.stanford.edu (134.79.254.146) 0.744 ms 0.829 ms 0.680
ms
4  rtr-core2-p2p-fwcore2-untrust.slac.stanford.edu (134.79.254.149) 0.811 ms 0.624 ms 0.820
ms
5  * * *
6  sunnncr5-ip-c-slac.slac.stanford.edu (192.68.191.233) 1.739 ms 1.662 ms 1.523 ms
7  eqxsjrt1-ip-a-sunnncr5.es.net (134.55.38.146) 1.800 ms 1.675 ms 1.666 ms
8  eqixsj-google-gige.google.com (206.223.116.21) 1.738 ms 1.817 ms 1.813 ms
9  216.239.49.170 (216.239.49.170) 2.208 ms 2.204 ms 216.239.49.168 (216.239.49.168)
3.078 ms
10 209.85.246.253 (209.85.246.253) 69.843 ms 209.85.246.38 (209.85.246.38) 68.125 ms
209.85.246.253 (209.85.246.253) 69.893 ms
11 216.239.46.240 (216.239.46.240) 47.765 ms 47.641 ms 47.646 ms
12 216.239.46.55 (216.239.46.55) 53.252 ms 64.233.174.6 (64.233.174.6) 49.870 ms
216.239.46.55 (216.239.46.55) 58.510 ms
13 64.233.174.89 (64.233.174.89) 49.569 ms 49.752 ms 72.14.232.140 (72.14.232.140)
47.728 ms
14 72.14.233.147 (72.14.233.147) 69.448 ms 216.239.50.249 (216.239.50.249) 67.820 ms
72.14.233.147 (72.14.233.147) 70.303 ms

```

15 209.85.249.213 (209.85.249.213) 70.398 ms 209.85.246.5 (209.85.246.5) 68.731 ms
209.85.249.213 (209.85.249.213) 69.817 ms
16 209.85.240.113 (209.85.240.113) 70.089 ms 68.091 ms 68.260 ms
17 lga15s47-in-f20.1e100.net (173.194.123.52) 67.544 ms 67.838 ms 67.837 ms
traceroute -m 30 -q 3 173.194.123.52 took 17secs. Total time=17secs.

1:

average deviation:0.048,0.729,0.131

standard deviation:0.05162,0.7717,0.13836

2:

16 routers

no

3:

10 ISP networks

yes,the largest delays occur at the peering interface between adjacent ISP

form hongkong to 173.194.123.52

first:

1 172.18.88.1 (172.18.88.1) 51.021 ms 0.523 ms 0.398 ms
2 60.244.215.203.in-addr.arpa (203.215.244.60) 1.137 ms 1.125 ms 1.091 ms
3 202.153.99.201 (202.153.99.201) 0.776 ms 0.899 ms 0.782 ms
4 130.254.215.203.in-addr.arpa (203.215.254.130) 1.673 ms 2.195 ms 3.196 ms
5 google1-lacp-10G.hkix.net (202.40.161.10) 2.840 ms 2.733 ms 2.704 ms
6 66.249.95.80 (66.249.95.80) 7.111 ms 72.14.234.30 (72.14.234.30) 3.002 ms 2.970 ms
7 209.85.249.17 (209.85.249.17) 73.198 ms 209.85.248.135 (209.85.248.135) 48.299 ms
48.264 ms
8 209.85.143.1 (209.85.143.1) 140.670 ms 140.627 ms 209.85.143.3 (209.85.143.3)
140.151 ms
9 72.14.233.182 (72.14.233.182) 180.588 ms 182.538 ms 180.035 ms
10 216.239.46.216 (216.239.46.216) 213.465 ms 216.239.46.214 (216.239.46.214) 197.779
ms 197.694 ms
11 209.85.249.213 (209.85.249.213) 197.488 ms 196.513 ms 209.85.246.5 (209.85.246.5)
197.407 ms
12 209.85.240.113 (209.85.240.113) 197.506 ms 197.592 ms 197.869 ms
13 lga15s47-in-f20.1e100.net (173.194.123.52) 198.384 ms 196.389 ms 196.731 ms

second:

1 172.18.88.1 (172.18.88.1) 0.508 ms 0.446 ms 0.397 ms
2 60.244.215.203.in-addr.arpa (203.215.244.60) 1.117 ms 1.061 ms 1.042 ms
3 202.153.99.201 (202.153.99.201) 0.760 ms 0.755 ms 0.752 ms
4 130.254.215.203.in-addr.arpa (203.215.254.130) 1.427 ms 1.316 ms 2.985 ms
5 google1-lacp-10G.hkix.net (202.40.161.10) 2.735 ms 2.509 ms 2.650 ms

6 72.14.234.30 (72.14.234.30) 2.853 ms 66.249.95.80 (66.249.95.80) 3.330 ms 72.14.234.30 (72.14.234.30) 2.949 ms
 7 209.85.248.135 (209.85.248.135) 56.162 ms 48.187 ms 209.85.249.17 (209.85.249.17) 54.003 ms
 8 209.85.143.1 (209.85.143.1) 140.533 ms 140.506 ms 140.520 ms
 9 72.14.233.110 (72.14.233.110) 181.291 ms 72.14.233.182 (72.14.233.182) 181.258 ms 180.405 ms
 10 216.239.46.214 (216.239.46.214) 209.896 ms 216.765 ms 216.239.46.216 (216.239.46.216) 199.986 ms
 11 209.85.249.213 (209.85.249.213) 196.917 ms 197.078 ms 200.313 ms
 12 209.85.240.113 (209.85.240.113) 197.555 ms 198.486 ms 197.826 ms
 13 lga15s47-in-f20.1e100.net (173.194.123.52) 196.632 ms 197.829 ms 197.202 ms

third:

1 172.18.88.1 (172.18.88.1) 0.424 ms 0.445 ms 0.378 ms
 2 60.244.215.203.in-addr.arpa (203.215.244.60) 9.553 ms 1.100 ms 1.118 ms
 3 202.153.99.201 (202.153.99.201) 0.815 ms 0.758 ms 0.740 ms
 4 130.254.215.203.in-addr.arpa (203.215.254.130) 1.548 ms 1.214 ms 1.185 ms
 5 google1-lacp-10G.hkix.net (202.40.161.10) 2.672 ms 2.604 ms 2.620 ms
 6 66.249.95.80 (66.249.95.80) 3.230 ms 72.14.234.30 (72.14.234.30) 3.537 ms 66.249.95.80 (66.249.95.80) 3.251 ms
 7 209.85.249.17 (209.85.249.17) 53.797 ms 209.85.248.135 (209.85.248.135) 48.153 ms 49.312 ms
 8 209.85.143.3 (209.85.143.3) 148.200 ms 139.863 ms 209.85.143.1 (209.85.143.1) 141.078 ms
 9 72.14.233.110 (72.14.233.110) 180.652 ms 72.14.233.182 (72.14.233.182) 180.476 ms 72.14.233.110 (72.14.233.110) 187.888 ms
 10 216.239.46.214 (216.239.46.214) 198.166 ms 216.239.46.216 (216.239.46.216) 197.145 ms 216.239.46.214 (216.239.46.214) 197.517 ms
 11 209.85.249.213 (209.85.249.213) 201.748 ms 209.85.246.5 (209.85.246.5) 197.676 ms 196.931 ms
 12 209.85.240.113 (209.85.240.113) 197.296 ms 197.584 ms 197.686 ms
 13 lga15s47-in-f20.1e100.net (173.194.123.52) 197.030 ms 196.760 ms 197.243 ms

1:

average deviation:0.810,0.399,0.161

standard deviation:0.8711,0.48886,0.19764

2:

12routers

yes,it has changed

3:

10 ISP networks

yes,the largest delays occur at the peering interface between adjacent ISP

The transmit time is longer and the router path may chang.

19:

First:

Tracing route to lga15s47-in-f20.1e100.net [173.194.123.52]
over a maximum of 30 hops:

```
 1  <1 ms  <1 ms  <1 ms  172.24.131.1
 2  1 ms   <1 ms  <1 ms   . [46.19.176.193]
 3  1 ms   <1 ms  <1 ms   r2-v52-r7a-ix1.int.linkbynet.com [217.19.56.68]
 4  1 ms   1 ms   1 ms   google2.franceix.net [37.49.236.2]
 5  *      5 ms   1 ms   72.14.238.234
 6  1 ms   1 ms   1 ms   209.85.245.83
 7  73 ms  72 ms   73 ms   209.85.242.146
 8  73 ms  72 ms   73 ms   209.85.246.5
 9  73 ms  73 ms   72 ms   209.85.240.113
10  73 ms  73 ms   72 ms   lga15s47-in-f20.1e100.net [173.194.123.52]
```

Second:

```
 1      wblindix.sdv.fr          212.95.66.126          0.402 ms
 2      border-gateway2.sdv.fr    212.95.69.227          0.767 ms
 3      th2-10g-6-3.sdv.fr        212.95.64.54           6.799 ms
 4      google2.franceix.net      37.49.236.2            6.675 ms
 5      72.14.238.228             72.14.238.228          19.125 ms
 6      209.85.245.81             209.85.245.81          10.171 ms
 7      209.85.242.146            209.85.242.146          79.365 ms
 8      209.85.246.5              209.85.246.5           79.236 ms
 9      209.85.240.113            209.85.240.113          78.467 ms
10      lga15s47-in-f20.1e100.net 173.194.123.52          79.626 ms
```

**4 links are same
yes.**

germany:

traceroute to 173.194.123.52 (173.194.123.52), 30 hops max, 60 byte packets

```
 1  * * *
 2  xe-0-0-0-cr-pollux.cgn3.he-core.de (176.28.4.45) 0.204 ms 0.187 ms 0.187 ms
 3  xe-0-2-0-cr-antares.ams1.he-core.de (80.237.129.182) 4.468 ms 4.476 ms 4.482 ms
 4  core2.ams.net.google.com (80.249.209.100) 5.291 ms 5.245 ms 5.235 ms
 5  209.85.254.95 (209.85.254.95) 5.736 ms 5.698 ms 209.85.254.90 (209.85.254.90) 5.311
ms
 6  72.14.238.153 (72.14.238.153) 5.667 ms 5.612 ms 209.85.143.77 (209.85.143.77) 5.609
ms
```

7 72.14.236.136 (72.14.236.136) 18.151 ms 209.85.244.100 (209.85.244.100) 86.863 ms
 86.820 ms
 8 216.239.51.111 (216.239.51.111) 29.128 ms 28.326 ms 209.85.248.201 (209.85.248.201)
 28.413 ms
 9 209.85.247.143 (209.85.247.143) 86.566 ms 86.103 ms 209.85.242.146 (209.85.242.146)
 85.729 ms
 10 209.85.246.5 (209.85.246.5) 86.418 ms 85.820 ms 87.672 ms
 11 209.85.240.113 (209.85.240.113) 85.372 ms 86.047 ms 86.039 ms
 12 lga15s47-in-f20.1e100.net (173.194.123.52) 85.474 ms 84.994 ms 85.529 ms

france:

Tracing route to lga15s47-in-f20.1e100.net [173.194.123.52]
 over a maximum of 30 hops:

```

 1  <1 ms  <1 ms  <1 ms  172.24.131.1
 2  <1 ms  <1 ms  <1 ms  . [46.19.176.193]
 3  1 ms   <1 ms  <1 ms  r2-v52-r7a-ix1.int.linkbynet.com [217.19.56.68]
 4  1 ms   1 ms   1 ms   google2.franceix.net [37.49.236.2]
 5  1 ms   1 ms   1 ms   72.14.238.234
 6  1 ms   1 ms   1 ms   209.85.245.83
 7  82 ms  74 ms  73 ms  209.85.247.143
 8  73 ms  73 ms  73 ms  209.85.246.5
 9  73 ms  73 ms  73 ms  209.85.240.113
10  73 ms  73 ms  73 ms  lga15s47-in-f20.1e100.net [173.194.123.52]
  
```

3 links are same

yes,the transatlantic link is same

USA to shanghai

tracing path from www.net.princeton.edu to 202.120.2.119 ...

traceroute to 202.120.2.119 (202.120.2.119), 30 hops max, 40 byte packets

```

 1  core-87-router (128.112.128.2) 0.638 ms 0.411 ms 0.382 ms
 2  border-87-router (128.112.12.142) 0.465 ms 0.364 ms 0.462 ms
 3  local1.princeton.magpi.net (216.27.98.113) 10.564 ms 3.585 ms 10.303 ms
 4  216.27.100.18 (216.27.100.18) 13.411 ms 7.717 ms 11.183 ms
 5  et-5-0-0.104.rtr.atla.net.internet2.edu (198.71.45.6) 18.978 ms 28.538 ms 20.038 ms
 6  et-10-2-0.105.rtr.hous.net.internet2.edu (198.71.45.13) 44.139 ms 43.018 ms 43.167 ms
 7  et-5-0-0.111.rtr.losa.net.internet2.edu (198.71.45.21) 76.046 ms 83.330 ms 75.937 ms
 8  210.25.189.133 (210.25.189.133) 79.498 ms 85.291 ms 79.224 ms
 9  210.25.189.49 (210.25.189.49) 225.407 ms 222.743 ms 225.152 ms
10  210.25.189.17 (210.25.189.17) 231.941 ms 230.647 ms 224.645 ms
11  * * *
12  210.25.189.46 (210.25.189.46) 228.425 ms 223.988 ms 223.418 ms
13  101.4.116.133 (101.4.116.133) 223.304 ms 222.584 ms 224.910 ms
14  101.4.112.70 (101.4.112.70) 252.753 ms 251.678 ms 256.824 ms
  
```

```

15 101.4.116.118 (101.4.116.118) 258.030 ms 253.188 ms 255.905 ms
16 101.4.117.29 (101.4.117.29) 249.184 ms 249.085 ms 251.080 ms
17 101.4.115.173 (101.4.115.173) 253.178 ms 249.441 ms 252.296 ms
18 * * *
19 * * *
20 * * *
21 * * *
22 * * *
23 * * *
24 * * *
25 * * *
26 * * 202.120.2.119 (202.120.2.119) 252.665 ms
Done.

```

USA to wuhan

tracing path from www.net.princeton.edu to 202.114.113.3 ...

tracert to 202.114.113.3 (202.114.113.3), 30 hops max, 40 byte packets

```

 1 core-87-router (128.112.128.2) 1.343 ms 0.585 ms 0.495 ms
 2 border-87-router (128.112.12.142) 0.575 ms 1.461 ms 0.823 ms
 3 local1.princeton.magpi.net (216.27.98.113) 3.943 ms 3.678 ms 5.565 ms
 4 216.27.100.18 (216.27.100.18) 6.356 ms 7.292 ms 6.888 ms
 5 et-5-0-0.104.rtr.atla.net.internet2.edu (198.71.45.6) 21.855 ms 20.925 ms 20.418 ms
 6 et-10-2-0.105.rtr.hous.net.internet2.edu (198.71.45.13) 44.651 ms 44.000 ms 43.127 ms
 7 et-5-0-0.111.rtr.losa.net.internet2.edu (198.71.45.21) 75.503 ms 77.295 ms 78.053 ms
 8 210.25.189.133 (210.25.189.133) 79.607 ms 82.718 ms 78.475 ms
 9 210.25.189.49 (210.25.189.49) 223.190 ms 225.027 ms 227.409 ms
10 210.25.189.17 (210.25.189.17) 224.417 ms 227.076 ms 230.637 ms
11 * * *
12 210.25.189.46 (210.25.189.46) 225.138 ms 225.130 ms 228.088 ms
13 101.4.116.133 (101.4.116.133) 225.888 ms 224.022 ms 222.063 ms
14 101.4.112.2 (101.4.112.2) 246.255 ms 246.847 ms 248.202 ms
15 101.4.117.37 (101.4.117.37) 242.410 ms 241.758 ms 240.426 ms
16 101.4.112.49 (101.4.112.49) 242.042 ms 241.909 ms 101.4.113.161 (101.4.113.161)
243.410 ms
17 218.197.158.253 (218.197.158.253) 240.447 ms 242.181 ms 246.415 ms
18 * * *
19 * * *
20 * * *
21 * * *
22 * * *
23 * * *
24 * * *
25 * * *
26 * * *
27 * * *
28 * * *
29 * * *

```

30 * * *

Done.

12 links are common

No,they didn't diverge before reaching China.