

Ex1:

Q1:

Name: [www.google.com](http://www.google.com)  
Address: 216.58.196.132

All outputs are IP address of Google, since Google have a lots of servers to support its operation. Different response from nslookup means it visit Google website in different server.

Q2:

Name: localhost  
Address: 127.0.0.1

Localhost is a hostname that means this computer. It is used to access the network services that are running on the host.

Ex2:

[www.cse.unsw.edu.au](http://www.cse.unsw.edu.au) : Reachable, good connectivity, same packets transmitted and received. Could access by both ping and browser.

[www.getfittest.com.au](http://www.getfittest.com.au) : Unreachable, unknown host. Server not find its IP address. Could not access by both ping and browser.

[www.mit.edu](http://www.mit.edu) : Reachable, good connectivity, same packets transmitted and received. Could access by both ping and browser.

[www.intel.com.au](http://www.intel.com.au) : Reachable, good connectivity, same packets transmitted and received. Could access by both ping and browser.

[www.tpg.com.au](http://www.tpg.com.au) : Reachable, good connectivity, same packets transmitted and received. Could access by both ping and browser.

[www.hola.hp](http://www.hola.hp) : Unreachable, unknown host. Server not find its IP address. Could not access by both ping and browser.

[www.amazon.com](http://www.amazon.com) : Reachable, good connectivity, same packets transmitted and received. Could access by both ping and browser.

[www.tsinghua.edu.cn](http://www.tsinghua.edu.cn) : Reachable, good connectivity, same packets transmitted and received. Could access by both ping and browser.

browser.

[www.kremlin.ru](http://www.kremlin.ru) : Unreachable, all packets that has been transmit are lost. **However this website could be open by browser.**

8.8.8.8 : Reachable, good connectivity, same packets transmitted and received. Could access by both ping and browser.

Ex3:

1. 21 routers between my workstation and [www.columbia.edu](http://www.columbia.edu). 5 routers along the path are part of the UNSW network. Between 113.197.15.149 and 113.197.15.99 do packet cross the Pacific Ocean. Below is output:

```
1 cserouter1-server.cse.unsw.EDU.AU (129.94.242.251) 0.082 ms 0.075 ms 0.061 ms
2 129.94.39.17 (129.94.39.17) 1.062 ms 1.076 ms 1.012 ms
3 ombudnex1-vl-3154.gw.unsw.edu.au (149.171.253.35) 2.306 ms 2.263 ms 2.261 ms
4 ombcr1-po-6.gw.unsw.edu.au (149.171.255.169) 1.293 ms 1.290 ms libcr1-po-5.gw.unsw.edu.au (149.171.255.165) 30.230 ms
5 unswbr1-te-2-13.gw.unsw.edu.au (149.171.255.105) 1.324 ms unswbr1-te-1-9.gw.unsw.edu.au (149.171.255.101) 1.340 ms
unswbr1-te-2-13.gw.unsw.edu.au (149.171.255.105) 1.365 ms
6 138.44.5.0 (138.44.5.0) 1.585 ms 1.429 ms 1.421 ms
7 et-1-3-0.pe1.sxt.bkvl.nsw.aarnet.net.au (113.197.15.149) 2.167 ms 2.221 ms 2.212 ms
8 et-0-0-0.pe1.a.hnl.aarnet.net.au (113.197.15.99) 95.392 ms 95.320 ms 95.322 ms
9 et-2-1-0.bdr1.a.sea.aarnet.net.au (113.197.15.201) 146.721 ms 146.689 ms 146.677 ms
10 abilene-1-lo-jmb-706.sttlwa.pacificwave.net (207.231.240.8) 146.723 ms 146.745 ms 146.789 ms
11 et-4-0-0.4079.rtsw.miss2.net.internet2.edu (162.252.70.0) 157.663 ms 157.519 ms 157.551 ms
12 et-4-0-0.4079.rtsw.minn.net.internet2.edu (162.252.70.58) 180.859 ms 180.739 ms 180.758 ms
13 et-1-1-5.4079.rtsw.eqch.net.internet2.edu (162.252.70.106) 188.597 ms 193.208 ms 193.276 ms
14 162.252.70.163 (162.252.70.163) 188.700 ms 188.913 ms 188.900 ms
15 ae-1.4079.rtsw.clev.net.internet2.edu (162.252.70.130) 197.324 ms 197.234 ms 197.187 ms
16 buf-9208-12-CLEV.nysernet.net (199.109.11.33) 201.488 ms 201.576 ms 201.446 ms
17 syr-9208-buf-9208.nysernet.net (199.109.7.193) 204.671 ms 204.699 ms 204.662 ms
```

```

18 nyc-9208-syr-9208.nysernet.net (199.109.7.162) 210.377 ms 211.557 ms 211.547 ms
19 columbia.nyc-9208.nysernet.net (199.109.4.14) 211.505 ms 211.461 ms 211.424 ms
20 nyser111-gw-1-x-nyser32-gw-1.net.columbia.edu (128.59.255.10) 211.527 ms 211.497 ms 211.499 ms
21 phi-core-1-x-nyser111-gw-1.net.columbia.edu (128.59.255.13) 211.557 ms 211.558 ms 211.536 ms
22 cc-conc-1-x-phi-core-1.net.columbia.edu (128.59.255.214) 211.541 ms 211.501 ms 211.044 ms
23 caho.columbia.edu (128.59.105.24) 210.913 ms 210.876 ms 211.140 ms

```

2. In the 8<sup>th</sup> router the path to these 3 destination diverge from my machine. The path to Japan goes to an IP address(202.158.194.177) while the others stay the same. This IP address is in Canberra belongs to an organization call “Australian Academic and Research Network”. Before the path to Japan goes to Canberra they were in the IP address(113.197.15.147) which belongs to Customer Connection Network in South Australia. There is no evidence to show the number of hops on each path proportional the physical distance since Australia to Japan should be the shortest, in fact the shortest path is to America.

[www.ucla.edu](http://www.ucla.edu) :::::

```

1 cserouter1-server.cse.unsw.EDU.AU (129.94.242.251) 0.080 ms 0.065 ms 0.055 ms
2 129.94.39.17 (129.94.39.17) 0.997 ms 1.073 ms 1.076 ms
3 libudnex1-vl-3154.gw.unsw.edu.au (149.171.253.34) 1.367 ms ombudnex1-vl-3154.gw.unsw.edu.au (149.171.253.35) 1.811 ms 1.484 ms
4 libcr1-po-5.gw.unsw.edu.au (149.171.255.165) 1.356 ms libcr1-po-6.gw.unsw.edu.au (149.171.255.201) 1.253 ms libcr1-po-5.gw.unsw.edu.au
(149.171.255.165) 1.322 ms
5 unswbr1-te-2-13.gw.unsw.edu.au (149.171.255.105) 36.532 ms unswbr1-te-1-9.gw.unsw.edu.au (149.171.255.101) 36.507 ms
unswbr1-te-2-13.gw.unsw.edu.au (149.171.255.105) 36.523 ms
6 138.44.5.0 (138.44.5.0) 1.419 ms 1.474 ms 1.355 ms
7 et-1-3-0.pe1.sxt.bkvl.nsw.aarnet.net.au (113.197.15.149) 2.189 ms 2.198 ms 2.216 ms
8 et-0-0-0.pe1.a.hnl.aarnet.net.au (113.197.15.99) 95.370 ms 95.270 ms 95.239 ms
9 et-2-1-0.bdr1.a.sea.aarnet.net.au (113.197.15.201) 146.747 ms 146.727 ms 146.696 ms
10 cenichpr-1-is-jmb-778.snvac.pacificwave.net (207.231.245.129) 163.271 ms 163.272 ms 163.261 ms
11 hpr-lax-hpr3--svl-hpr3-100ge.cenic.net (137.164.25.73) 171.263 ms 171.264 ms 171.208 ms
12 * * *
13 bd11f1.anderson--cr00f2.csb1.ucla.net (169.232.4.4) 171.575 ms bd11f1.anderson--cr001.anderson.ucla.net (169.232.4.6) 171.536 ms
bd11f1.anderson--cr00f2.csb1.ucla.net (169.232.4.4) 171.464 ms
14 cr00f1.anderson--dr00f2.csb1.ucla.net (169.232.4.55) 171.441 ms cr00f2.csb1--dr00f2.csb1.ucla.net (169.232.4.53) 171.549 ms 171.543 ms
15 * * *
16 * * *
17 * * *
18 * * *
19 * * *
20 * * *
21 * * *
22 * * *
23 * * *
24 * * *
25 * * *
26 * * *
27 * * *
28 * * *
29 * * *
30 * * *

```

[www.u-tokyo.ac.jp](http://www.u-tokyo.ac.jp) :::::

```

1 cserouter1-server.cse.unsw.EDU.AU (129.94.242.251) 0.090 ms 0.075 ms 0.064 ms
2 129.94.39.17 (129.94.39.17) 1.100 ms 1.067 ms 1.067 ms
3 libudnex1-vl-3154.gw.unsw.edu.au (149.171.253.34) 1.456 ms ombudnex1-vl-3154.gw.unsw.edu.au (149.171.253.35) 2.380 ms 2.373 ms
4 ombcr1-po-5.gw.unsw.edu.au (149.171.255.197) 1.219 ms libcr1-po-6.gw.unsw.edu.au (149.171.255.201) 1.215 ms ombcr1-po-5.gw.unsw.edu.au
(149.171.255.197) 1.199 ms
5 unswbr1-te-1-9.gw.unsw.edu.au (149.171.255.101) 1.254 ms unswbr1-te-2-13.gw.unsw.edu.au (149.171.255.105) 1.205 ms
unswbr1-te-1-9.gw.unsw.edu.au (149.171.255.101) 1.269 ms
6 138.44.5.0 (138.44.5.0) 1.401 ms 1.544 ms 1.497 ms
7 et-0-3-0.pe1.bkvl.nsw.aarnet.net.au (113.197.15.147) 4.018 ms 4.538 ms 4.509 ms
8 ge-4_0_0.bb1.a.pao.aarnet.net.au (202.158.194.177) 159.684 ms 159.664 ms 159.626 ms
9 paloalto0.iiij.net (198.32.176.24) 158.097 ms 158.106 ms 158.215 ms
10 osk004bb01.IIJ.Net (58.138.88.189) 264.745 ms osk004bb00.IIJ.Net (58.138.88.185) 288.744 ms osk004bb01.IIJ.Net (58.138.88.189) 264.702 ms
11 osk004ix51.IIJ.Net (58.138.106.126) 288.573 ms 288.457 ms osk004ix51.IIJ.Net (58.138.106.130) 264.284 ms
12 210.130.135.130 (210.130.135.130) 276.458 ms 276.439 ms 288.567 ms
13 124.83.228.58 (124.83.228.58) 276.683 ms 276.472 ms 276.504 ms
14 124.83.252.178 (124.83.252.178) 282.516 ms 270.504 ms 282.625 ms
15 158.205.134.26 (158.205.134.26) 294.449 ms 282.414 ms 282.403 ms
16 * * *
17 * * *
18 * * *
19 * * *
20 * * *
21 * * *
22 * * *
23 * * *
24 * * *
25 * * *
26 * * *
27 * * *
28 * * *
29 * * *
30 * * *

```

[www.lancaster.ac.uk](http://www.lancaster.ac.uk) :::::

```

1 cserouter1-server.cse.unsw.EDU.AU (129.94.242.251) 0.101 ms 0.089 ms 0.089 ms
2 129.94.39.17 (129.94.39.17) 1.014 ms 1.012 ms 1.000 ms
3 ombudnex1-vl-3154.gw.unsw.edu.au (149.171.253.35) 3.564 ms 3.559 ms 4.009 ms
4 ombcr1-po-5.gw.unsw.edu.au (149.171.255.197) 1.263 ms libcr1-po-6.gw.unsw.edu.au (149.171.255.201) 1.250 ms ombcr1-po-5.gw.unsw.edu.au

```

```

(149.171.255.197) 1.242 ms
5 unswbr1-te-2-13.gw.unsw.edu.au (149.171.255.105) 1.305 ms unswbr1-te-1-9.gw.unsw.edu.au (149.171.255.101) 1.238 ms 1.314 ms
6 138.44.5.0 (138.44.5.0) 8.836 ms 8.325 ms 8.306 ms
7 et-1-3-0.pe1.sxt.bkvl.nsw.aarnet.net.au (113.197.15.149) 2.156 ms 2.149 ms 2.211 ms
8 et-0-0-0.pe1.a.hnl.aarnet.net.au (113.197.15.99) 97.360 ms 97.356 ms 97.353 ms
9 et-2-1-0.bdr1.a.sea.aarnet.net.au (113.197.15.201) 146.733 ms 146.732 ms 146.732 ms
10 abilene-1-lo-jmb-706.sttlwa.pacificwave.net (207.231.240.8) 146.828 ms 146.855 ms 146.809 ms
11 et-4-0-0.4079.rtsw.miss2.net.internet2.edu (162.252.70.0) 157.592 ms 157.503 ms 157.629 ms
12 et-4-0-0.4079.rtsw.minn.net.internet2.edu (162.252.70.58) 180.907 ms 180.783 ms 180.599 ms
13 et-1-1-5.4079.rtsw.eqch.net.internet2.edu (162.252.70.106) 190.864 ms 188.734 ms 188.742 ms
14 162.252.70.163 (162.252.70.163) 188.654 ms 191.527 ms 191.489 ms
15 ae-1.4079.rtsw.clev.net.internet2.edu (162.252.70.130) 197.510 ms 197.512 ms 197.401 ms
16 et-2-0-0.4079.rtsw.ashb.net.internet2.edu (162.252.70.54) 207.828 ms 205.980 ms 205.065 ms
17 ae-2.4079.rtsw.wash.net.internet2.edu (162.252.70.136) 205.350 ms 205.340 ms 205.317 ms
18 internet2-gw.mx1.lon.uk.geant.net (62.40.124.44) 280.564 ms 280.572 ms 280.547 ms
19 janet-gw.mx1.lon.uk.geant.net (62.40.124.198) 280.577 ms 280.497 ms 280.521 ms
20 ae29.londpg-sbr2.ja.net (146.97.33.2) 280.942 ms 280.945 ms 280.923 ms
21 ae31.erdiss-sbr2.ja.net (146.97.33.22) 284.819 ms 284.814 ms 284.760 ms
22 ae29.manckh-sbr2.ja.net (146.97.33.42) 287.915 ms 286.664 ms 286.654 ms
23 ae24.lanclu-rbr1.ja.net (146.97.38.58) 288.873 ms 288.891 ms 288.854 ms
24 lancaster-university.ja.net (194.81.46.2) 303.969 ms 310.237 ms 310.227 ms
25 * * *
26 ismx-issrx.rtr.lancs.ac.uk (148.88.255.17) 290.779 ms 290.977 ms 290.966 ms
27 dc.iss.srv.rtrcloud.lancs.ac.uk (148.88.253.3) 293.136 ms 293.102 ms 293.098 ms
28 www.lancs.ac.uk (148.88.65.80) 290.777 ms IX 290.770 ms IX 290.727 ms IX

```

3. I have choose 202.150.221.169 (<http://www.speedtest.com.sg/tr.php>) and 203.50.77.53 (<https://www.telstra.net/cgi-bin/trace>) as my server. For the example of (<http://www.speedtest.com.sg/tr.php>) the path towards to my machine and its reverse are different. However the sample of (<https://www.telstra.net/cgi-bin/trace>) is almost the same. I think is because the first one needs to access international internet (the reverse path from Australia to Singapore goes to America as interchange) while the second one only needs to access domestic internet. In the second example both path are going through the same routers but the IP address of these common routers are not the same, the last part of IP address are different while the front parts are the same. The use of different IP address for a same server could increase security grade.

```

From http://www.speedtest.com.sg/tr.php to my machine(vlab 129.94.242.115)
traceroute to 129.94.242.115 (129.94.242.115), 30 hops max, 60 byte packets
1 ge2-8.r01.sin01.ne.com.sg (202.150.221.169) 0.180 ms 0.194 ms 0.198 ms
2 10.11.33.30 (10.11.33.30) 0.257 ms 0.263 ms 0.267 ms
3 10.11.33.74 (10.11.33.74) 0.729 ms 0.735 ms 0.737 ms
4 aarnet.sgix.sg (103.16.102.67) 225.606 ms 225.655 ms 225.668 ms
5 xe-3-0-3.pe1.brwy.nsw.aarnet.net.au (113.197.15.206) 232.853 ms 232.817 ms 232.837 ms
6 138.44.5.1 (138.44.5.1) 225.831 ms 225.986 ms 225.854 ms
7 libcr1-te-1-5.gw.unsw.edu.au (149.171.255.102) 226.044 ms 225.960 ms 226.069 ms
8 libudnex1-po-1.gw.unsw.edu.au (149.171.255.166) 224.582 ms 224.675 ms 224.682 ms
9 ufw1-ae-1-3154.gw.unsw.edu.au (149.171.253.36) 236.448 ms 236.479 ms 236.498 ms
10 129.94.39.23 (129.94.39.23) 224.852 ms 224.821 ms 224.774 ms
11 * * *
12 * * *
13 * * *
14 * * *
15 * * *
16 * * *
17 * * *
18 * * *
19 * * *
20 * * *
21 * * *
22 * * *
23 * * *
24 * * *
25 * * *
26 * * *
27 * * *
28 * * *
29 * * *
30 * * *

```

#### REVERSE

```

traceroute to 202.150.221.169 (202.150.221.169), 30 hops max, 60 byte packets
1 cserouter1-server.cse.unsw.EDU.AU (129.94.242.251) 0.128 ms 0.088 ms 0.070 ms
2 129.94.39.17 (129.94.39.17) 1.009 ms 1.002 ms 1.018 ms
3 ombudnex1-vl-3154.gw.unsw.edu.au (149.171.253.35) 1.535 ms libudnex1-vl-3154.gw.unsw.edu.au (149.171.253.34) 1.702 ms 1.704 ms
4 ombcr1-po-6.gw.unsw.edu.au (149.171.255.169) 5.550 ms libcr1-po-5.gw.unsw.edu.au (149.171.255.165) 1.303 ms ombcr1-po-5.gw.unsw.edu.au (149.171.255.197) 5.551 ms
5 unswbr1-te-2-13.gw.unsw.edu.au (149.171.255.105) 1.509 ms 1.529 ms unswbr1-te-1-9.gw.unsw.edu.au (149.171.255.101) 1.598 ms

```

```

6 138.44.5.0 (138.44.5.0) 1.619 ms 6.537 ms 6.524 ms
7 et-0-3-0.pe1.alxd.nsw.aarnet.net.au (113.197.15.153) 1.815 ms 1.843 ms 1.847 ms
8 xe-0-0-3.pe1.wnppa.akl.aarnet.net.au (113.197.15.67) 24.551 ms xe-0-2-1-204.pe1.wnppa.akl.aarnet.net.au (113.197.15.183) 24.512 ms
ms xe-0-0-3.pe1.wnppa.akl.aarnet.net.au (113.197.15.67) 24.285 ms
9 et-0-1-0.200.pe1.tkpa.akl.aarnet.net.au (113.197.15.69) 24.619 ms 24.613 ms 24.628 ms
10 xe-0-2-6.bdr1.a.lax.aarnet.net.au (202.158.194.173) 147.934 ms 147.969 ms 147.974 ms
11 singtel.as7473.any2ix.coresite.com (206.72.210.63) 148.020 ms 148.123 ms 148.106 ms
12 203.208.173.161 (203.208.173.161) 308.108 ms 203.208.158.29 (203.208.158.29) 329.315 ms 203.208.173.161 (203.208.173.161) 307.911 ms
13 ***
14 203.208.182.45 (203.208.182.45) 315.201 ms 321.711 ms 323.275 ms
15 ***
16 ***
17 ***
18 ***
19 ***
20 ***
21 ***
22 ***
23 ***
24 ***
25 ***
26 ***
27 ***
28 ***
29 ***
30 ***

```

From <https://www.telstra.net/cgi-bin/trace> to my machine(vlab 129.94.242.115)

```

1 gigabitethernet3-3.exi2.melbourne.telstra.net (203.50.77.53) 0.286 ms 0.222 ms 0.245 ms
2 bundle-ether3-100.win-core10.melbourne.telstra.net (203.50.80.129) 3.116 ms 1.611 ms 2.120 ms
3 bundle-ether12.ken-core10.sydney.telstra.net (203.50.11.122) 12.737 ms 12.481 ms 12.987 ms
4 bundle-ether1.ken-edge901.sydney.telstra.net (203.50.11.95) 13.113 ms 11.982 ms 11.863 ms
5 aarnet6.lnk.telstra.net (139.130.0.78) 11.614 ms 11.606 ms 11.613 ms
6 ge-6-0-0.bb1.a.syd.aarnet.net.au (202.158.202.17) 11.863 ms 11.731 ms 11.740 ms
7 ae9.pe2.brwy.nsw.aarnet.net.au (113.197.15.56) 12.113 ms 11.982 ms 12.113 ms
8 et-3-1-0.pe1.brwy.nsw.aarnet.net.au (113.197.15.146) 12.114 ms 12.106 ms 12.114 ms
9 138.44.5.1 (138.44.5.1) 12.362 ms 12.234 ms 12.363 ms
10 libcr1-te-1-5.gw.unsw.edu.au (149.171.255.102) 12.363 ms 12.356 ms 12.363 ms
11 libudnex1-po-1.gw.unsw.edu.au (149.171.255.166) 12.613 ms 12.607 ms 12.613 ms
12 ufw1-ae-1-3154.gw.unsw.edu.au (149.171.253.36) 13.112 ms 12.980 ms 13.002 ms
13 129.94.39.23 (129.94.39.23) 13.224 ms 13.107 ms 13.238 ms

```

#### REVERSE

traceroute to 203.50.77.53 (203.50.77.53), 30 hops max, 60 byte packets

```

1 cserouter1-server.cse.unsw.EDU.AU (129.94.242.251) 0.083 ms 0.066 ms 0.069 ms
2 129.94.39.17 (129.94.39.17) 1.045 ms 1.028 ms 0.988 ms
3 libudnex1-vl-3154.gw.unsw.edu.au (149.171.253.34) 1.695 ms 1.662 ms 1.654 ms
4 ombcr1-po-5.gw.unsw.edu.au (149.171.255.197) 1.194 ms ombcr1-po-6.gw.unsw.edu.au (149.171.255.169) 1.268 ms
libcr1-po-6.gw.unsw.edu.au (149.171.255.201) 1.260 ms
5 unswbr1-te-1-9.gw.unsw.edu.au (149.171.255.101) 1.254 ms 1.326 ms 1.330 ms
6 138.44.5.0 (138.44.5.0) 1.408 ms 1.475 ms 1.462 ms
7 et-0-3-0.pe1.alxd.nsw.aarnet.net.au (113.197.15.153) 1.518 ms 1.591 ms 1.595 ms
8 ae9.bb1.b.syd.aarnet.net.au (113.197.15.65) 1.909 ms 1.923 ms 1.977 ms
9 gigabitethernet1-1.pe1.b.syd.aarnet.net.au (202.158.202.18) 1.909 ms 2.087 ms 2.023 ms
10 gigabitethernet3-11.ken37.sydney.telstra.net (139.130.0.77) 2.645 ms 2.719 ms 2.577 ms
11 bundle-ether13.ken-core10.sydney.telstra.net (203.50.11.94) 4.844 ms 3.432 ms 3.666 ms
12 bundle-ether10.win-core10.melbourne.telstra.net (203.50.11.123) 14.447 ms 14.408 ms 14.409 ms
13 tengigabitethernet8-1.exi2.melbourne.telstra.net (203.50.80.154) 13.481 ms * *

```

Ex4:

1. Destination of [www.uq.edu.au](http://www.uq.edu.au) (Brisbane):
  - Physical distance: 760 km (By Google Maps)
  - Possible time for a packet to reach the location:  $T \approx 2.53$  ms
  - RTT(min): 16.697 ms
  - Ratio :  $16.697/2.53 \approx 6.60$
  - www.uq.edu.au ping statistics ---
  - 50 packets transmitted, 50 received, 0% packet loss, time 49072ms
  - rtt min/avg/max/mdev = 16.697/18.777/53.393/7.047 ms
- Destination of [www.nus.edu.sg](http://www.nus.edu.sg) (Singapore):
  - Physical distance: 6302 km
  - Possible time for a packet to reach the location:  $T \approx 21.007$  ms
  - RTT(min): 141.893 ms

Ratio:  $141.893/21.007 \approx 6.755$

--- www.nus.edu.sg ping statistics ---

50 packets transmitted, 50 received, 0% packet loss, time 49066ms

rtt min/avg/max/mdev = 141.893/142.863/161.955/2.903 ms

Destination of [www.tu-berlin.de](http://www.tu-berlin.de) (Berlin):

Physical distance: 16084 km

Possible time for a packet to reach the location:  $T \approx 53.613$  ms

RTT(min): 307.094 ms

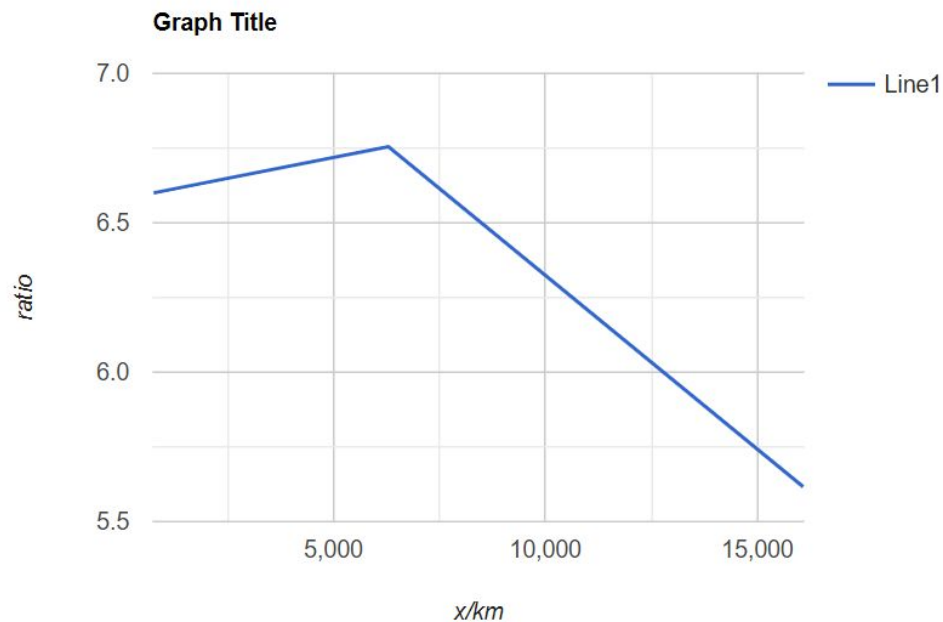
Ratio:  $307.094/53.613 \approx 5.616$

--- www.tu-berlin.de ping statistics ---

50 packets transmitted, 50 received, 0% packet loss, time 49070ms

rtt min/avg/max/mdev = 307.094/307.395/307.657/0.648 ms

Because RTT reflect to the round trip time which means it needs go to the destination and then go back to the origin that makes the ratio between RTT and possible time at least  $2 \cdot T$  time. Another reason is the network path from the origin to the destination is not a direct path however the physical distance we measure is a straight line from city to city. The network trip needs to go to many routers locate in different places and the connection of these places always not a straight line, hence it will also take at least  $2 \cdot T$  time to do the round trip.



2. The delay is dynamic, even it may go through the path of same routers, the router has different amount of packet needs to deal with in a different time. The amount of the packets influence the speed of the router and hence affects the time of delay.

3. Processing delay, transmission delay and queuing delay will affect by the packet size, since processing delay checks the bit error of the packet since the checking time will increase by the packet size, also the transmission is the time increased by the packet length, finally the increase of transmission time will affect the queuing time. However propagation delay affect by the length of physical link which do not affect by packet size.