

CS-374/672 Computer Networks: Fall 2010

Assignment 1

Many reports indicate that Google is turning into one of the largest ASes of the world [1]. Google has bought loads of dark fibre to connect many tier-2 ISPs directly into its AS for faster access to Google data centers around the world. We want to study the extent of this peering, and contrast it with non-peering scenarios for smaller websites. We will use the famous traceroute tool, launched towards different Google servers from various open traceroute servers on the web.

1. A list of several working traceroute servers is given at the end of this document
2. We will consider the following Google servers:
 - a. India: 209.85.231.104
 - b. Canada: 173.194.32.104
 - c. US: 209.85.225.103
 - d. China: 72.14.204.99
3. Divide yourself into groups, each group pick some dozen traceroute servers randomly, and do a traceroute to these four Google servers
4. Consult <http://whois.domaintools.com> to figure out when traffic gets into the Google AS
5. Study the following:
 - a. Frequency distribution of the number of hops from the traceroute server into the Google AS, contrasted with the number of hops traversed inside the Google AS
 - b. Distribution of the latency outside and inside the Google AS
 - c. How many countries did you find that have local ISPs directly peered with Google? For countries which do not, what seem to be the typical paths to route traffic to Google servers?
 - d. Any other interesting things you noticed
6. Write a short report on your findings. Also report your numerical results in a CSV with the following columns in the same order:
 - a. IP of traceroute server
 - b. target IP
 - c. hops outside Google
 - d. hops inside Google
 - e. latency outside Google
 - f. latency inside Google
 - g. country of traceroute server
 - h. target country
 - i. ingress country/city into Google AS

Bonus \$

7. Contrast the above experiments with traceroutes to smaller websites
 - a. Canada: 129.97.128.40 (www.uwaterloo.ca)
 - b. India: 220.227.156.20 (www.iitd.ernet.in)
8. Bonus: Collate the numerical results submitted by different groups and come up with a more comprehensive study

Additional

You can also try installing gtrace, which gives a visualization on the world map of how your data is being routed: <http://www.caida.org/tools/visualization/gtrace/>

References

[1] ATLAS Internet Observatory 2009 Annual Report,

http://www.nanog.org/meetings/nanog47/presentations/Monday/Labovitz_ObserveReport_N47_Mon.pdf

Open Traceroute servers

<http://adl-a-ext1.aarnet.net.au/cgi-bin/traceroute.pl?choice=yes>

<http://bne-a-ext1.aarnet.net.au/cgi-bin/traceroute.pl?choice=yes>

<http://cbr-a-ext1.aarnet.net.au/cgi-bin/traceroute.pl?choice=yes>

<http://mel-a-ext1.aarnet.net.au/cgi-bin/traceroute.pl?choice=yes>

<http://per-a-ext1.aarnet.net.au/cgi-bin/traceroute.pl?choice=yes>

<http://syd-a-ext1.aarnet.net.au/cgi-bin/traceroute.pl?choice=yes>

Ramallah, West Bank, Palestine. <http://pinger.alquds.edu/cgi-bin/traceroute.pl?choice=yes>

Florida International University, Miami, <http://davinci.ampath.net/cgi-bin/traceroute.pl?choice=yes>

Ottawa, Canada. <http://traceroute.physics.carleton.ca/cgi-bin/traceroute.pl?choice=yes>

<http://pinger.cdacmumbai.in/cgi-bin/traceroute.pl?choice=yes>

<http://netops.cdac.in/cgi-bin/traceroute.pl?choice=yes>

Geneva, Switzerland. <http://pinger.cern.ch/cgi-bin/traceroute.pl?choice=yes>

Warrington, England. <http://icfamondl.ac.uk/cgi-bin/traceroute.pl?choice=yes>

Chicago. <http://pinger.fnal.gov/cgi-pub/traceroute.pl?choice=yes>

Atlanta <http://www.rnoc.gatech.edu/cgi-bin/traceroute.pl?choice=yes>

Italy. <http://pinger.ictp.it/cgi-bin/traceroute.pl?choice=yes>

Beijing, China. <http://v-www.ihep.ac.cn/cgi-bin/traceroute.pl?choice=yes>

Israel <http://noc.ilan.net.il/LG/>

High Energy Research Lab near Tokyo, Japan. <http://yumj2.kek.jp/cgi-bin/traceroute.pl?choice=yes>

Sri Lanka. <http://namunu.learn.ac.lk/cgi-bin/traceroute.pl?choice=yes>

Mountain View, California <http://www.nren.nasa.gov/traceroute2.pl>

Islamabad, Pakistan. <http://pinger-ncp.ncp.edu.pk/cgi-bin/traceroute.pl?choice=yes>

Dallas, Texas, US. <http://network-tools.com/default.asp?prog=trace>

<http://monitor.niit.edu.pk/cgi-bin/traceroute.pl?choice=yes>

<http://maggie1.niit.edu.pk/cgi-bin/traceroute.pl?choice=yes>

<http://maggie2.niit.edu.pk/cgi-bin/traceroute.pl?choice=yes>

Oak Ridge, TN <http://www.csm.ornl.gov/~dunigan/cgi-bin/traceroute.cgi?choice=yes>

Ottawa, Canada. <http://www.ottix.net/cgi-bin/traceroute.pl?choice=yes>

Islamabad, Pakistan <http://pinger.pern.edu.pk/cgi-bin/traceroute.pl?choice=yes>

<http://icfamon.rl.ac.uk/cgi-bin/traceroute.pl?choice=yes>

Prague, Czech Republic. <http://www.pstruh.cz/util/trace.asp>

San Diego, CA <http://www.sdsc.edu/~hutton/cgi-bin/tracert.cgi>

<http://www-wanmon.slac.stanford.edu/cgi-bin/nph-traceroute.pl?choice=yes>

<http://pinger.stanford.edu/cgi-bin/traceroute.pl?choice=yes>

Cape Town, South Africa <http://brunsvigia.tenet.ac.za/cgi-bin/traceroute.pl?choice=yes>

Germany. <http://www.tracert-traceroute.de/>

Vancouver, Canada <http://andrew.triumf.ca/cgi-bin/traceroute.pl?choice=yes>

Sao Paulo, Brazil. <http://ping.unesp.br/cgi-bin/traceroute.pl?choice=yes>

University of Maryland <http://www.physics.umd.edu/cgi-script/hep/traceroute.sh?choice=yes>

Cochabamba, Bolivia. <http://www.umss.edu.bo/cgi-bin/traceroute.pl?choice=yes>

Burkina Faso. <http://www.univ-ouaga.bf/cgi-bin/traceroute.pl?choice=yes>

Mumbai, India <http://sfsmds2.vsnl.net/cgi-bin/traceroute.pl?choice=yes>

Argentina <http://www.telvvg.coop/cgi-bin/trace.cgi?estoydeacuerdo=si>