CS168 | Fall 2016 Introduction to Internet: Architecture & Protocols

Project 3: Measurement

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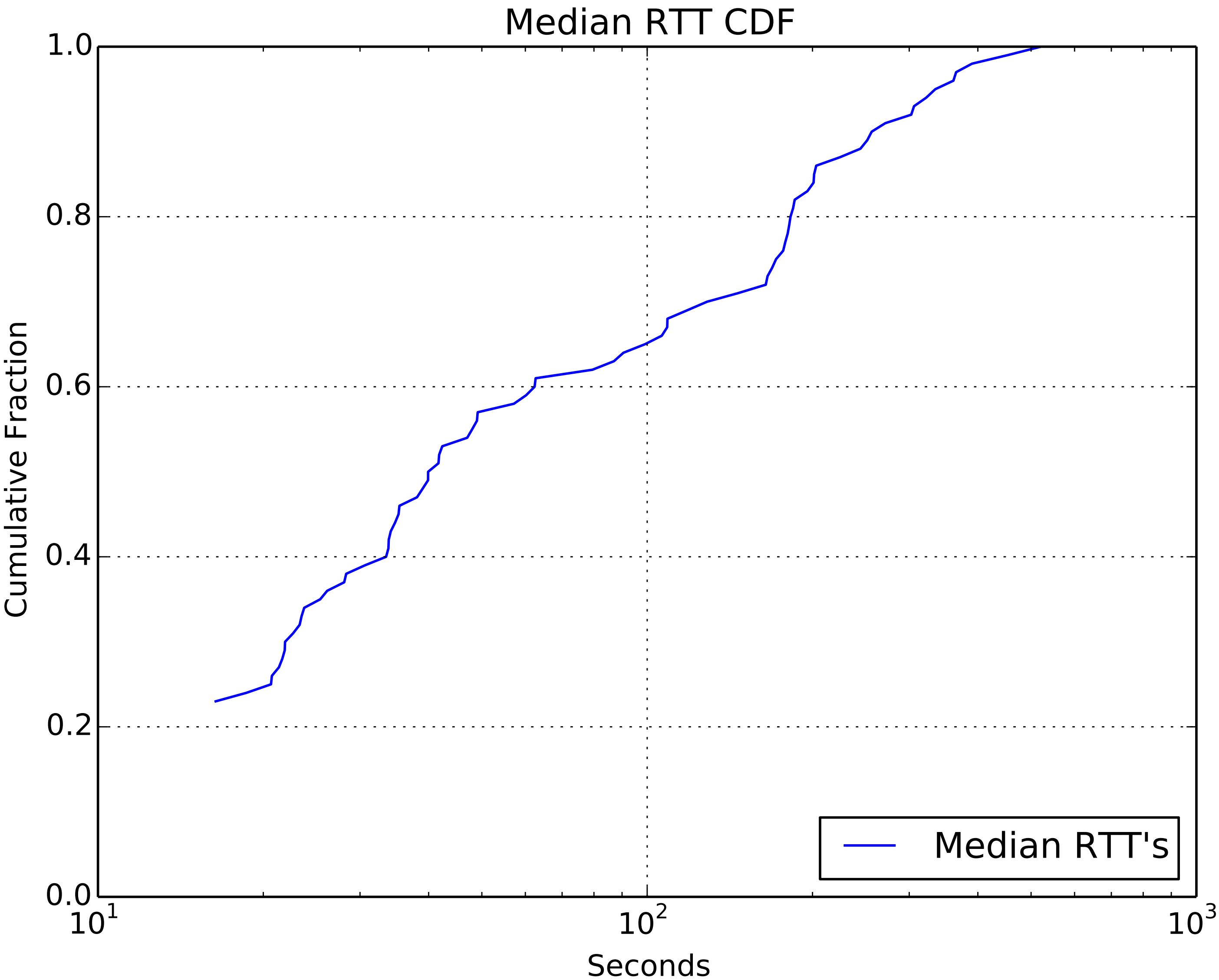
1 Round Trip Time

1. Experiment A:
   (a) 22% never respond to pings. 35% fail at least one ping.
   (b) CDF on next page.



Median RTT CDF
1.0
0.8
0.6
0.4
0.2
0.0
Cumulative Fraction
10^1
10^2
10^3
Seconds
Median RTT's

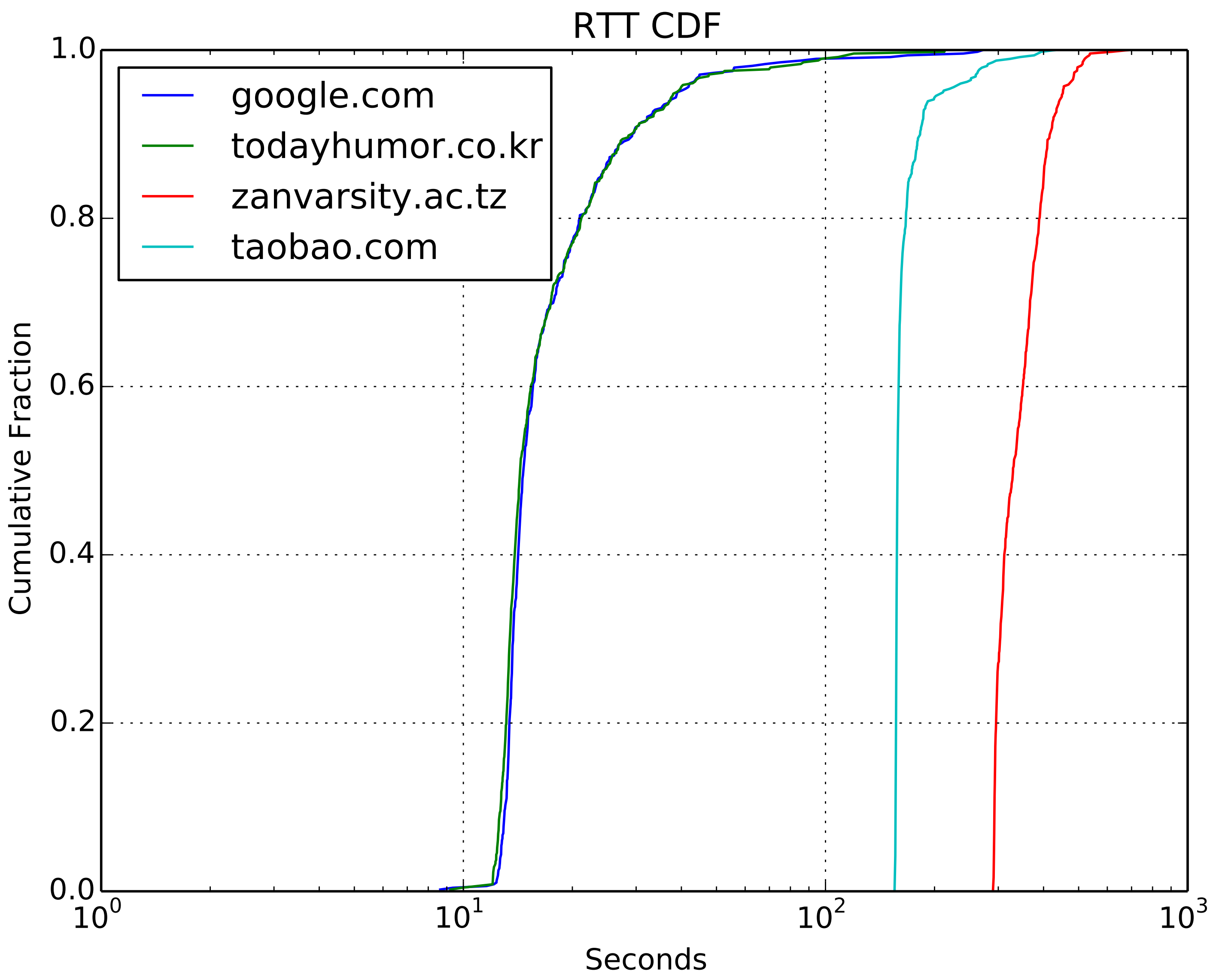
2. Experiment B:

   (a) For "google.com", median RTT: 95.495 ms, maximum RTT: 6.872 ms.
   It's loss rate is 0.0.
   For "todayhumor.co.kr", median RTT: 154.546 ms, maximum RTT: 11.985 ms.
   It's loss rate is 0.0.
   For "zanvarsity.ac.tz", median RTT: 680.526 ms, maximum RTT: 76.276 ms.
   It's loss rate is 2.0.
   For "taobao.com", median RTT: 668.561 ms, maximum RTT: 74.398 ms.
   It's loss rate is 0.8.

   (b) CDF on next page.

3. (a) The multiplier for google.com is $3.18537033 * 10^{-10} s^2/m$. The multipler for zanvarsity.ac.tz is $2.26999039 * 10^{-9} s^2/m$.

   (b) The reason why the ping time is not equal to the speed of light time is due to several factors, one example being distance that the packets have to travel back and forth, using cables and routers. Due to this, trying to ping a location that is farther away such as zanvaristy.ac.tz's servers compared to google.com's yields for a greater median RTT. This would mean that a website's "physical location" contributes to the amount of time it takes to ping the website.



RTT CDF
Cumulative Fraction
Seconds
google.com
todayhumor.co.kr
zanvarsity.ac.tz
taobao.com
1.0
0.8
0.6
0.4
0.2
0.0
10^0
10^1
10^2
10^3

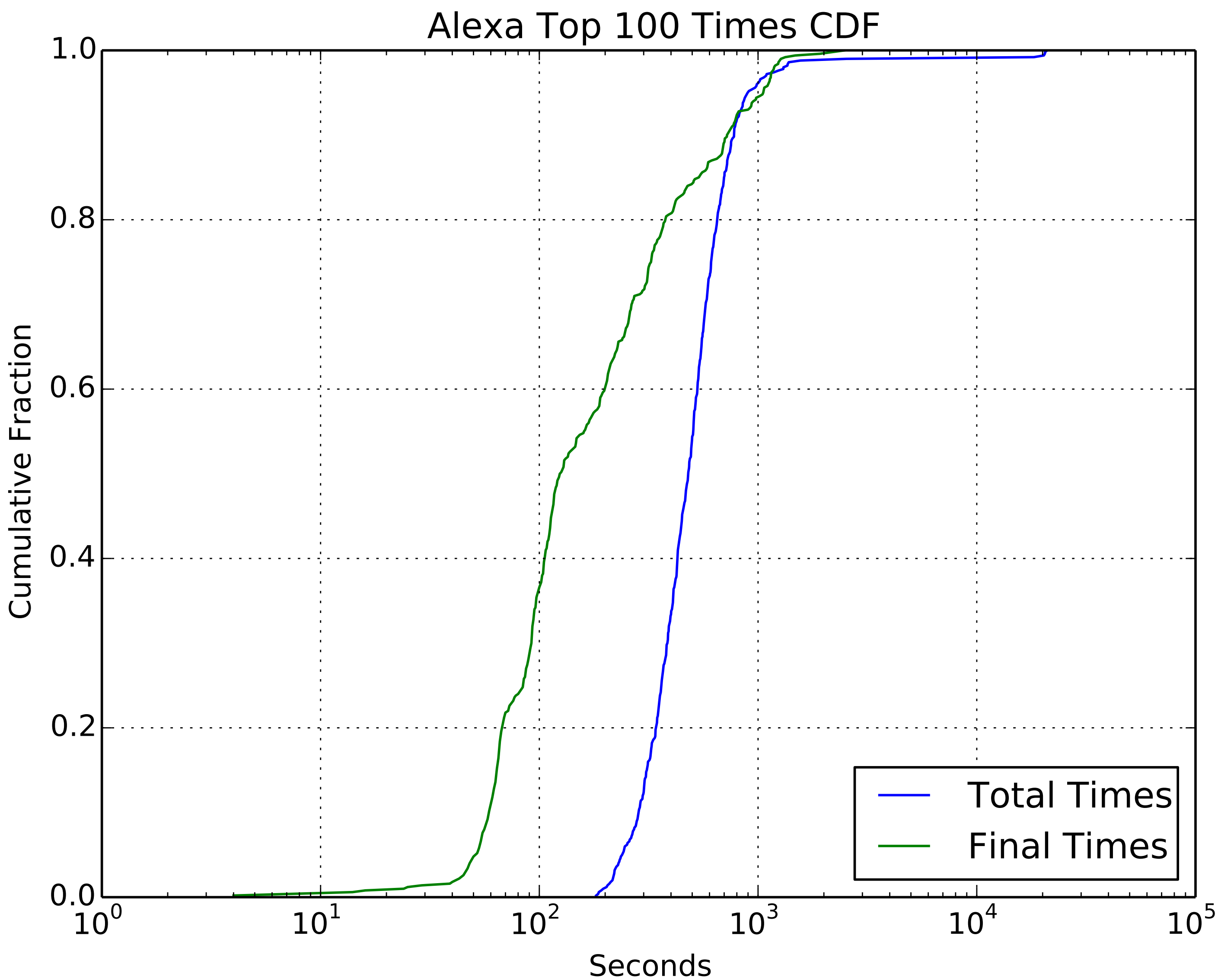
2 Routing

1. Experiment A
   (a) Which ASes are Berkeley directly connected to?
   AS2152
   (b) Which traceroute traverses the most number of ASes? How about the least number of ASes?
   Most : Zanvarsity.ac.tz, www.vutbr.cz
   Least: berkeley.edu
   (c) Which websites' routes are load-balanced?
   All are load-balanced
   (d) Are the observed routes stable over multiple runs? For each website, how many unique routes did you observe?
   "Google.com": 5
   "Facebook.com": 5
   "www.berkeley.edu": 1
   "Allspice.lcs.mit.edu": 4
   "Todayhumor.co.kr"âĂİ: 5
   "www.city.kobe.lg.jp": 5
   "www.vutbr.cz": 1
   "Zanvarsity.ac.tz": 5
   (e) Using one sentence, please explain one advantage of having stable routes.
   By utilizing stable routes it is easier to monitor link-failures for more reliable transportation.
2. Experiment B
   (a) How many hops do you observe in each route when you run traceroute from your computer? How many hops do you observe in the reverse direction?

   Number of hops from our computer to the public servers:
   18 hops to tpr-route-server.saix.net
   13 hops to route-server.ip-plus.net
   14 hops to route-views.oregon-ix.net
   13 hops to route-views.on.bb.telus.com
   Number of hops to our computer from the public servers:
   17 hops to tpr-route-server.saix.net
   23 hops to route-server.ip-plus.net
   9 hops to route-views.oregon-ix.net
   14 hops to route-views.on.bb.telus.com
   (b) Are these routes symmetric? How many are symmetric and how many are not?
   None of these routes are symmetric.
   (c) What might cause asymmetric routes? List one or two reasons?
   Traffic congestion is one potential cause of routing asymmetry.

3 Naming

1. The average root TTL: 22996220.
   The average TLD TTL: 12960000.
   The average other name server TTL: 31022125.
   The average terminating entry TTL: 269238.
2. CDF on the next page.



Alexa Top 100 Times CDF
Cumulative Fraction
Seconds
1.0
0.8
0.6
0.4
0.2
0.0
10^0
10^1
10^2
10^3
10^4
10^5
Total Times
Final Times

3. During the first trial, 6 answers changed. 11 names gave different answers at some point in the two trials.
4. When you run the trace with a different countries server, you find that when you count the differences, there are none for the different countries output, but when you compare that with one from the US, you get differences. When we ran this in count_different_dns_responses("dns_output_other_server.json", "dns_output_1.json"), we get [0, 36], when we used server = 192.203.138.11.
5. The Korean DNS server we queried probably has a different set of A records to use to refer us to an optimal IP address based on our location.
6. The DNS resolution times would be shorter because instead of following referrals starting from a root server to find the ip address of the hostname we queried, it would query a target name server and use the returned ip address.