Data Driven Model for DNS Server Location

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The Challenge

- Locate DNS servers close to clients
  - Minimize latency
- How do we know if it is working?
  - Are we in the right physical locations?
  - Are clients using the nearest sites?
- How can we do better?
  - Are we on the right networks?

The Challenge

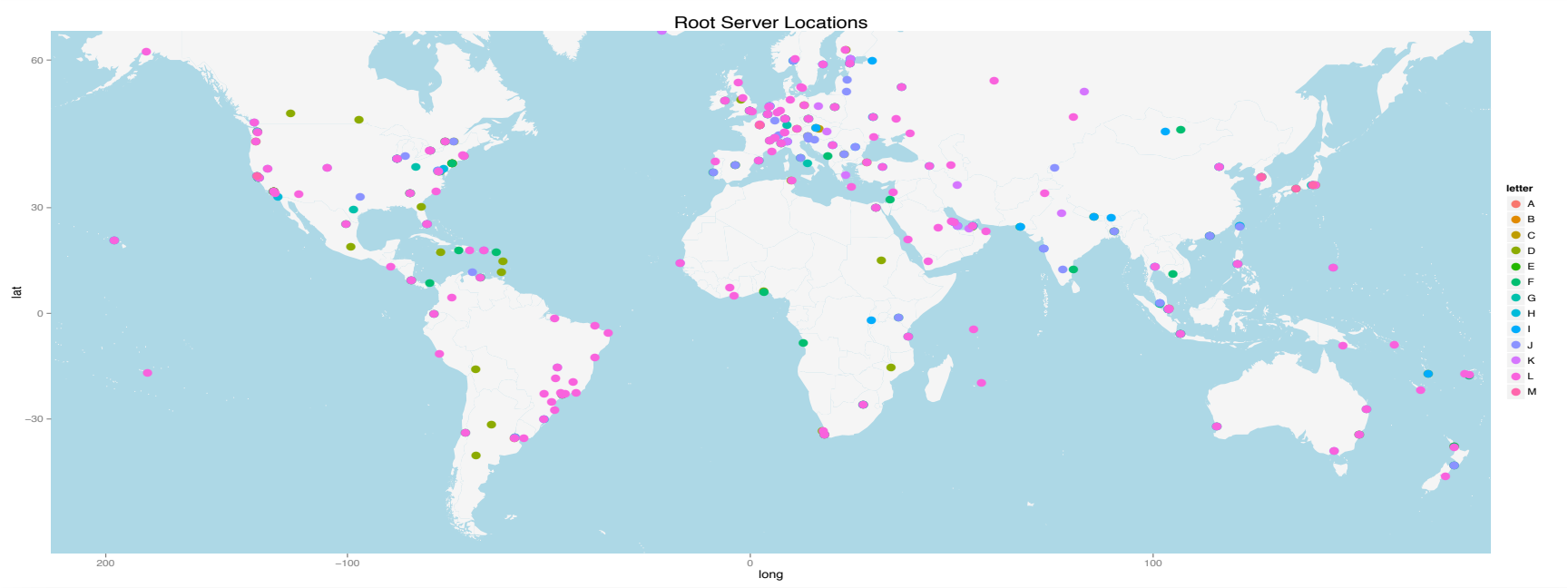
- Work in progress…
- Look at geolocation of query sources
  - Network topology is easier to fix than geography
- TCP Inter-packet gap analysis to measure RTT
  - Find outlying prefixes, ASNs, countries, peers
- DITL data via DNS-OARC
  - Geolocated to evaluate root server placement

Where do the Queries Come From?

	continent	total	ratio
1	North America	8836589313	32.24
2	Asia	8805223905	32.12
3	Europe	7881479926	28.75
4	South America	1174494649	4.28
5	Africa	463414875	1.69
6	Oceania	250328860	0.91

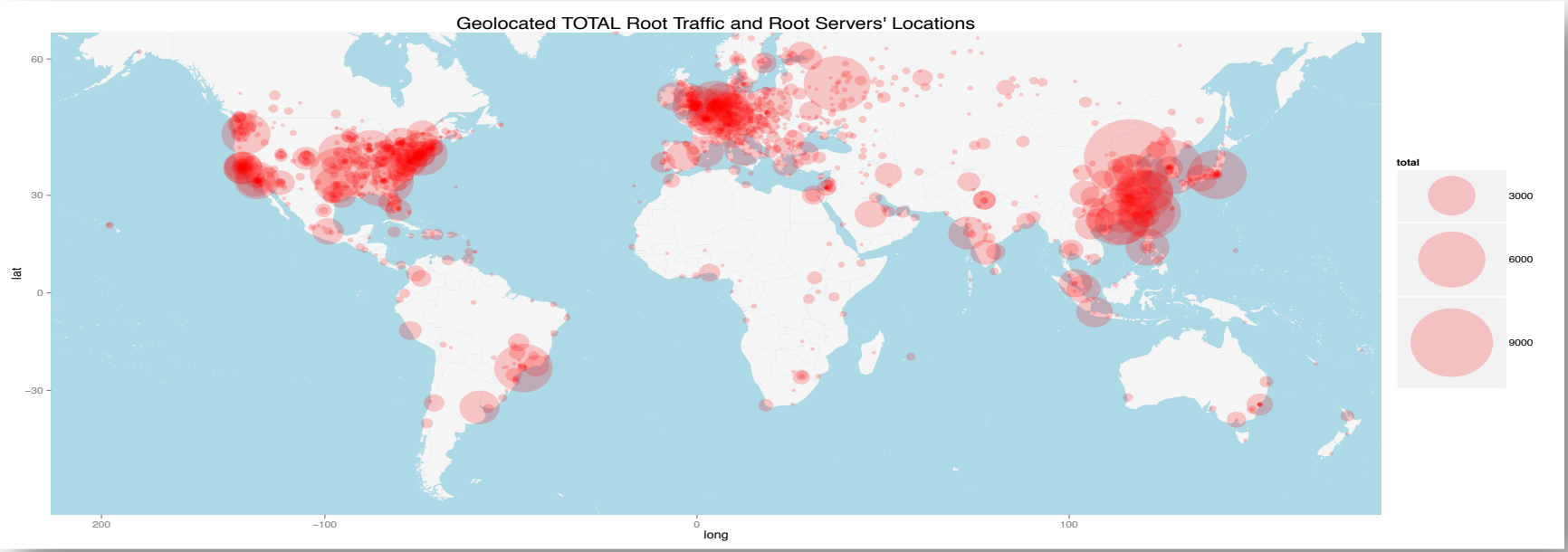
	country_name	total	ratio
1	United States	7918152762	28.89
2	China	3963576353	14.46
3	Germany	1231512619	4.49
4	Russian Federation	1084152447	3.96
5	Taiwan	968046976	3.53
6	United Kingdom	812067933	2.96
7	Brazil	712324885	2.60
8	Japan	690701087	2.52
9	Netherlands	680454479	2.48
10	Korea, Republic of	639416507	2.33
11	France	618902038	2.26
12	India	593805716	2.17
13	Canada	554327659	2.02
14	Italy	471115226	1.72
15	Spain	374643105	1.37
16	Hong Kong	330832589	1.21
17	Belgium	328006067	1.20
18	Poland	309177585	1.13
19	Philippines	275975993	1.01
20	Australia	211108466	0.77

Where the Servers are



Where the Root Traffic is Coming From

Each red “bubble” represents a geographic location that sends traffic to the Root
The size of the “bubble” represents the amount of traffic from that location



Root Traffic and Root servers' Locations

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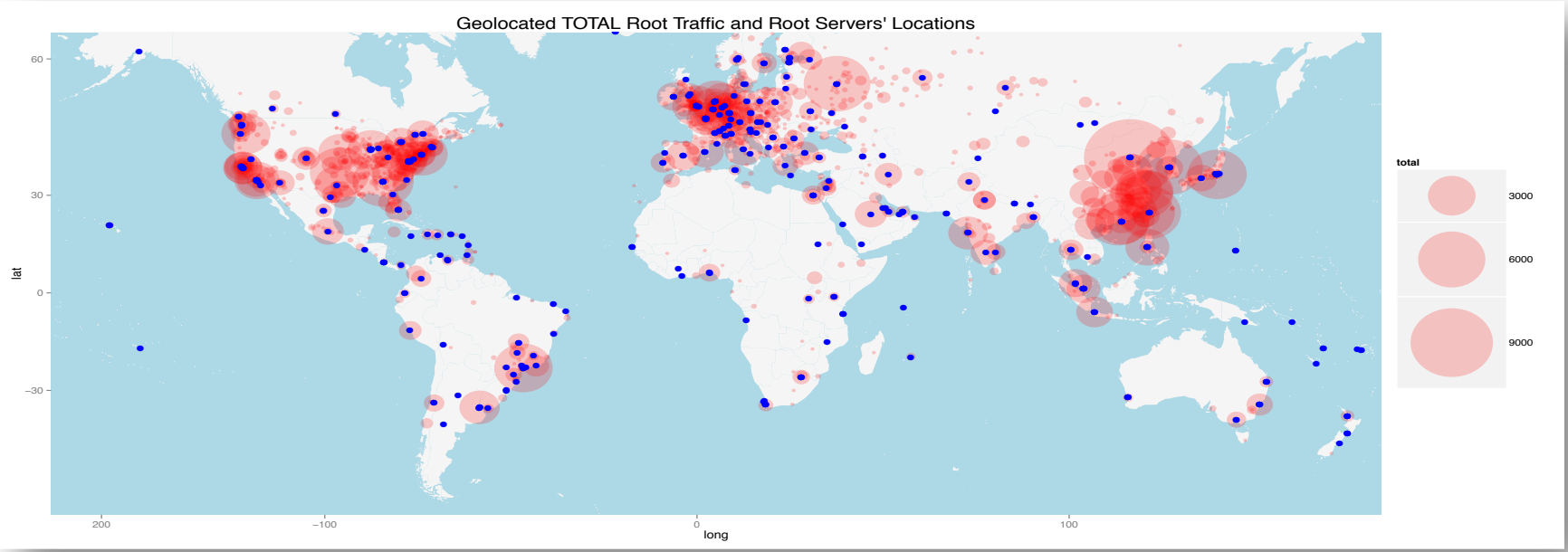
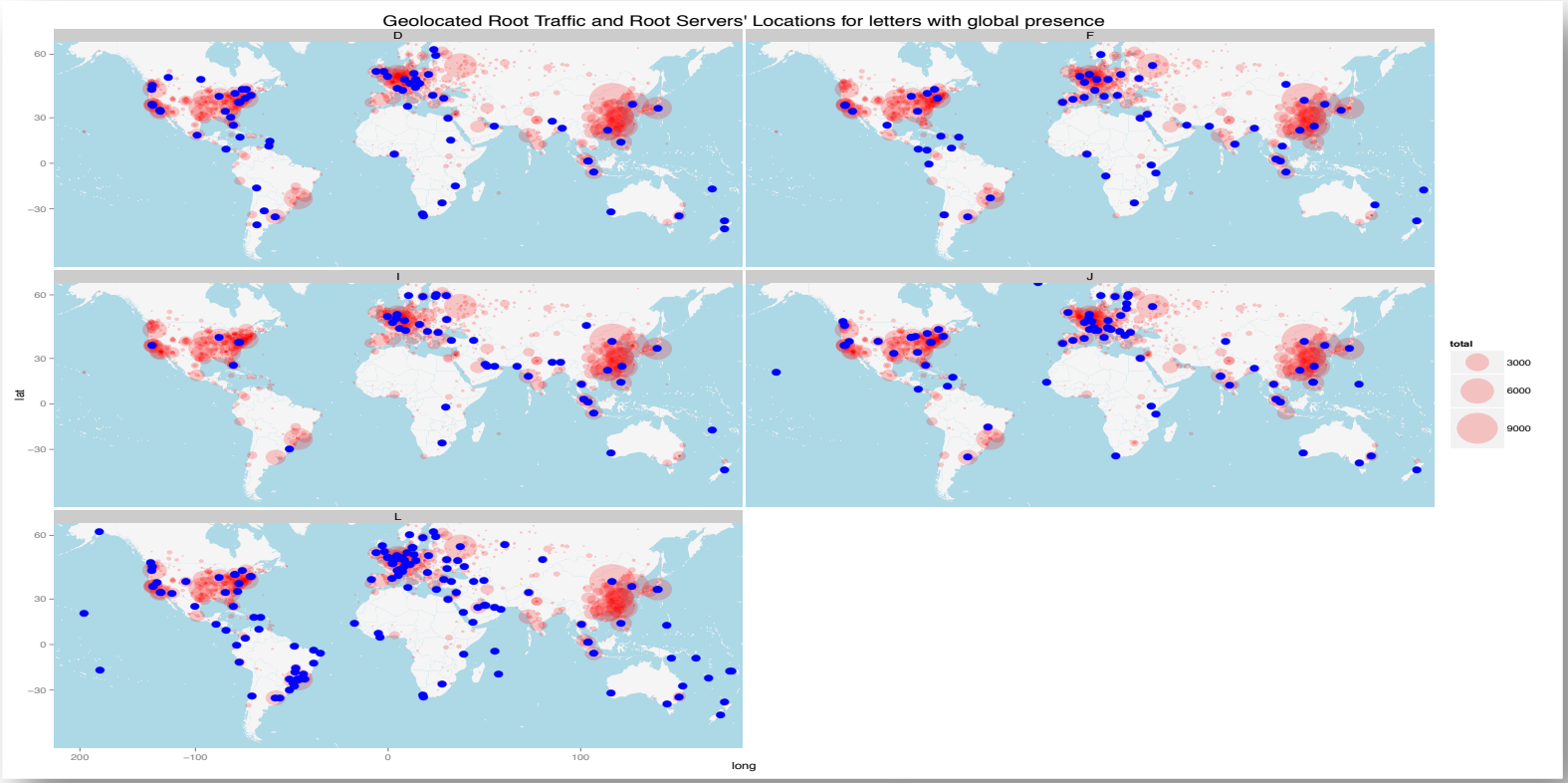
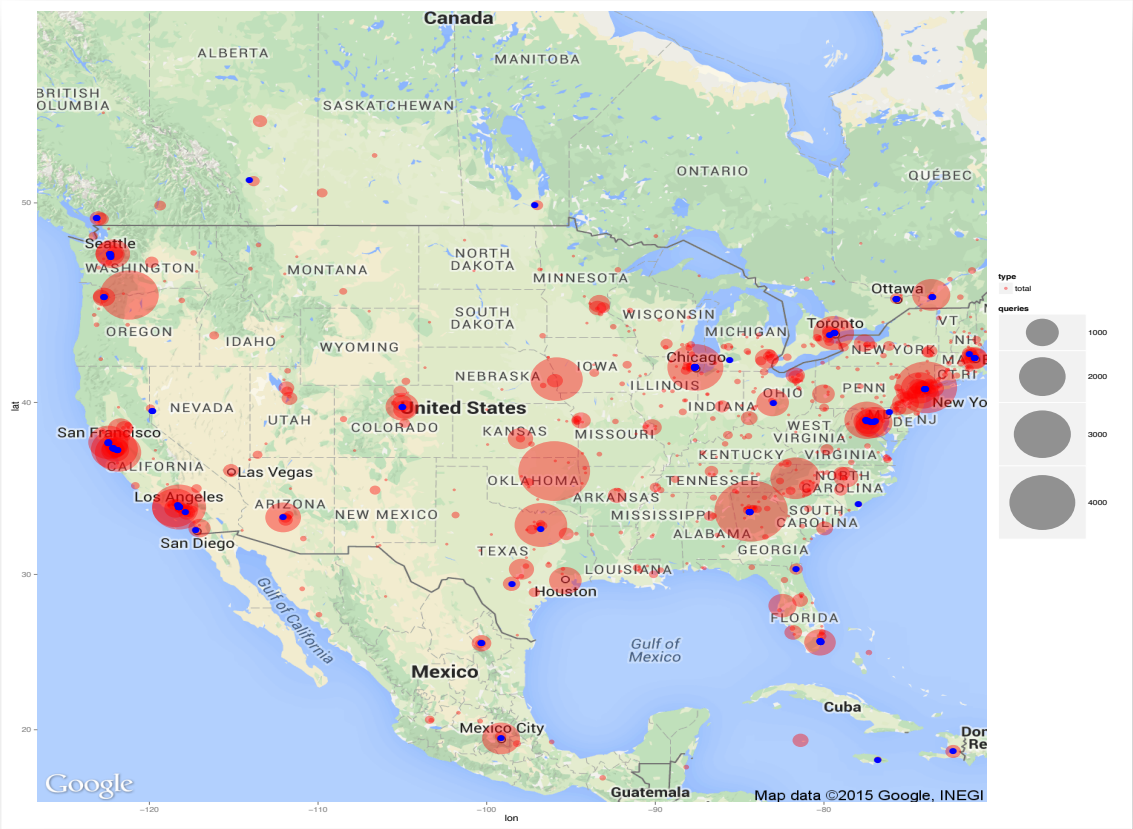


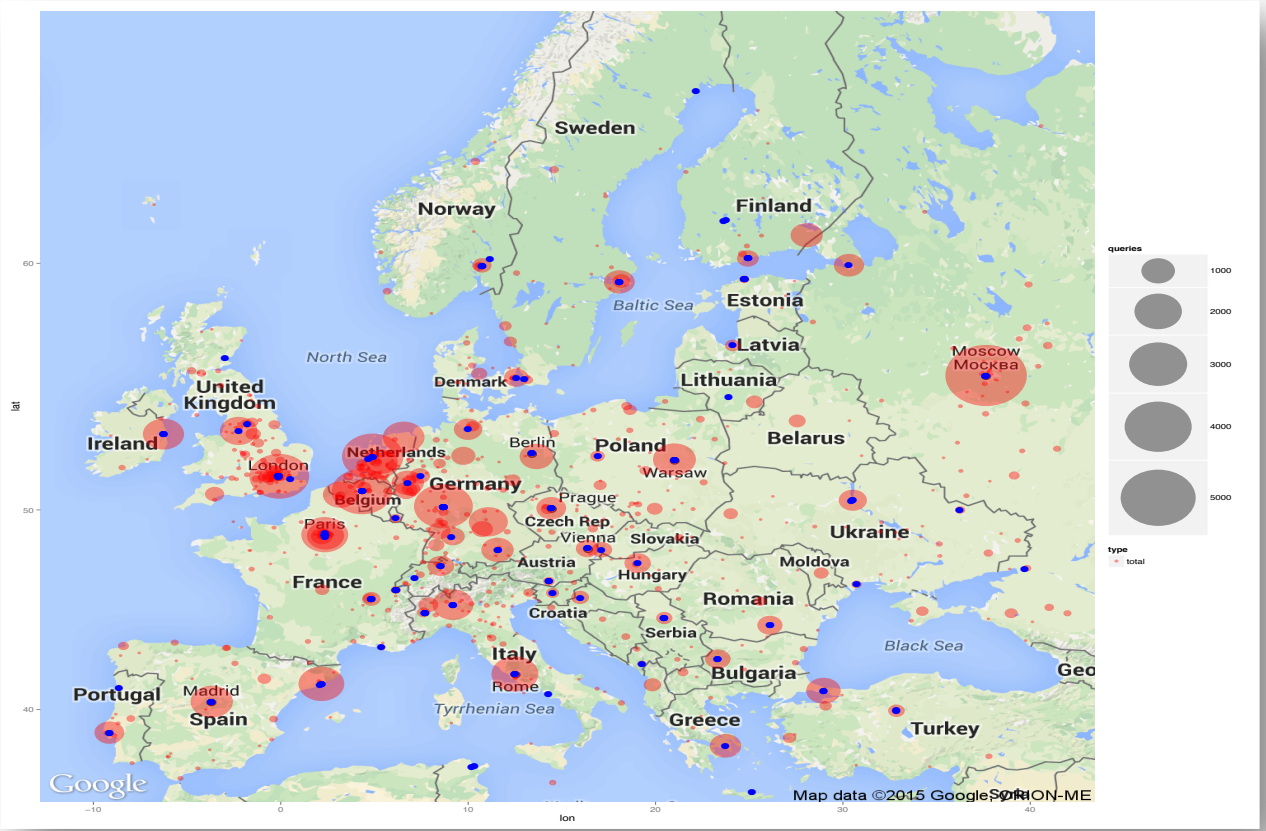
Root traffic and each **global presence** letter's servers



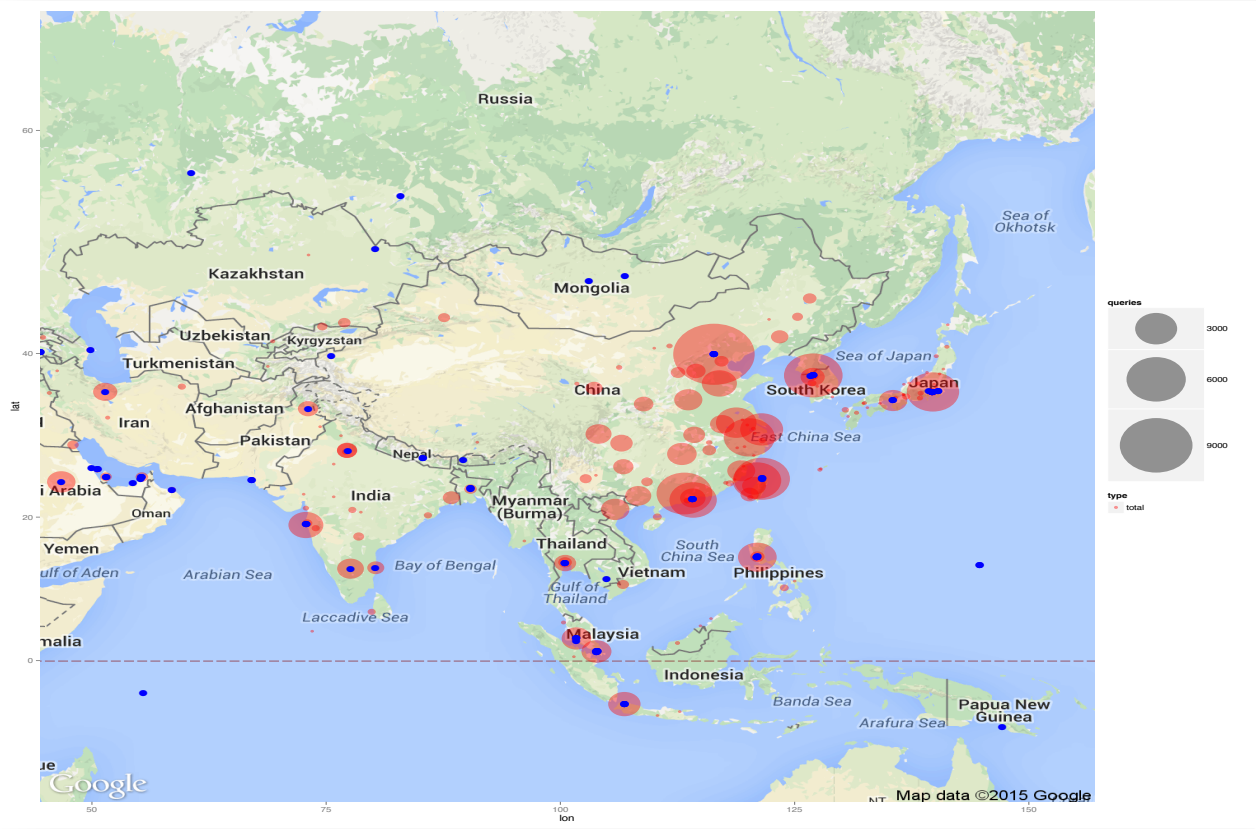
North America Root Traffic and Server Location



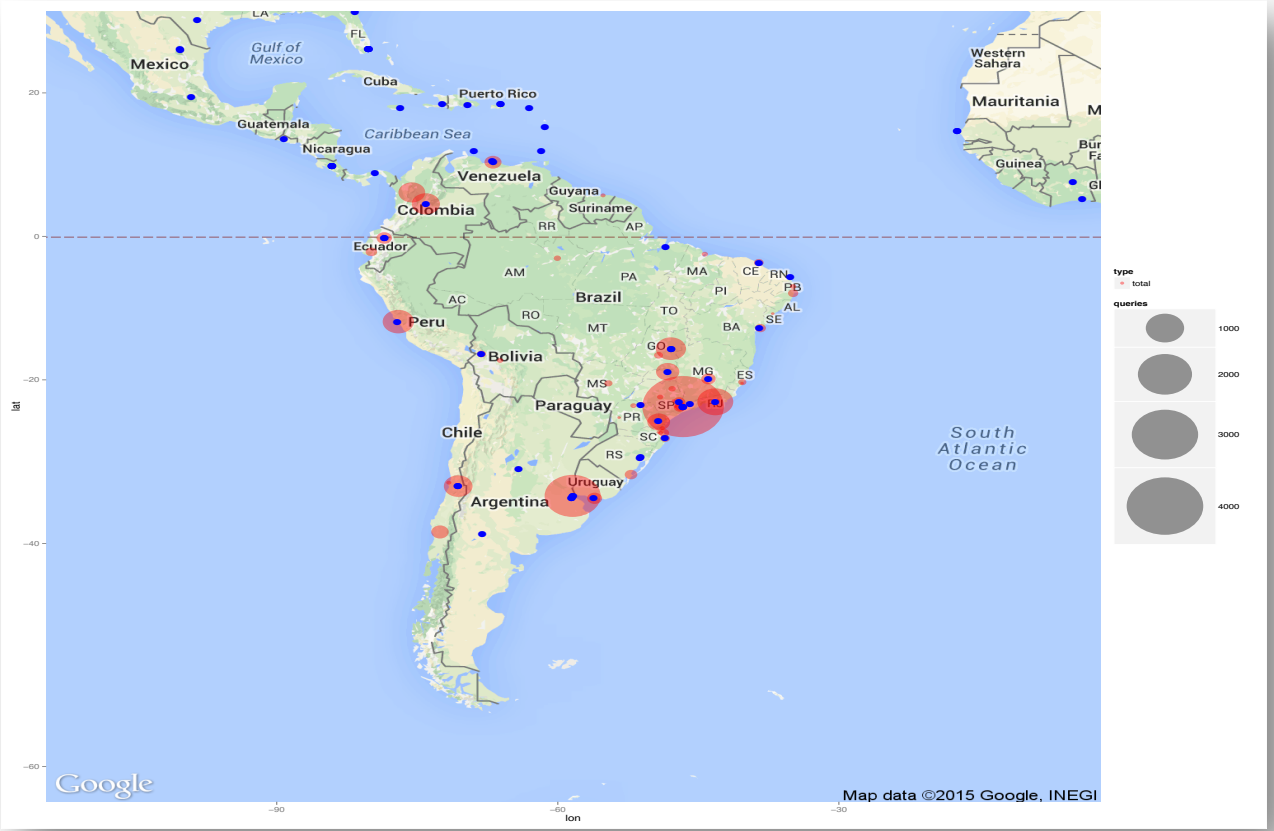
Europe Root Traffic and Server Location



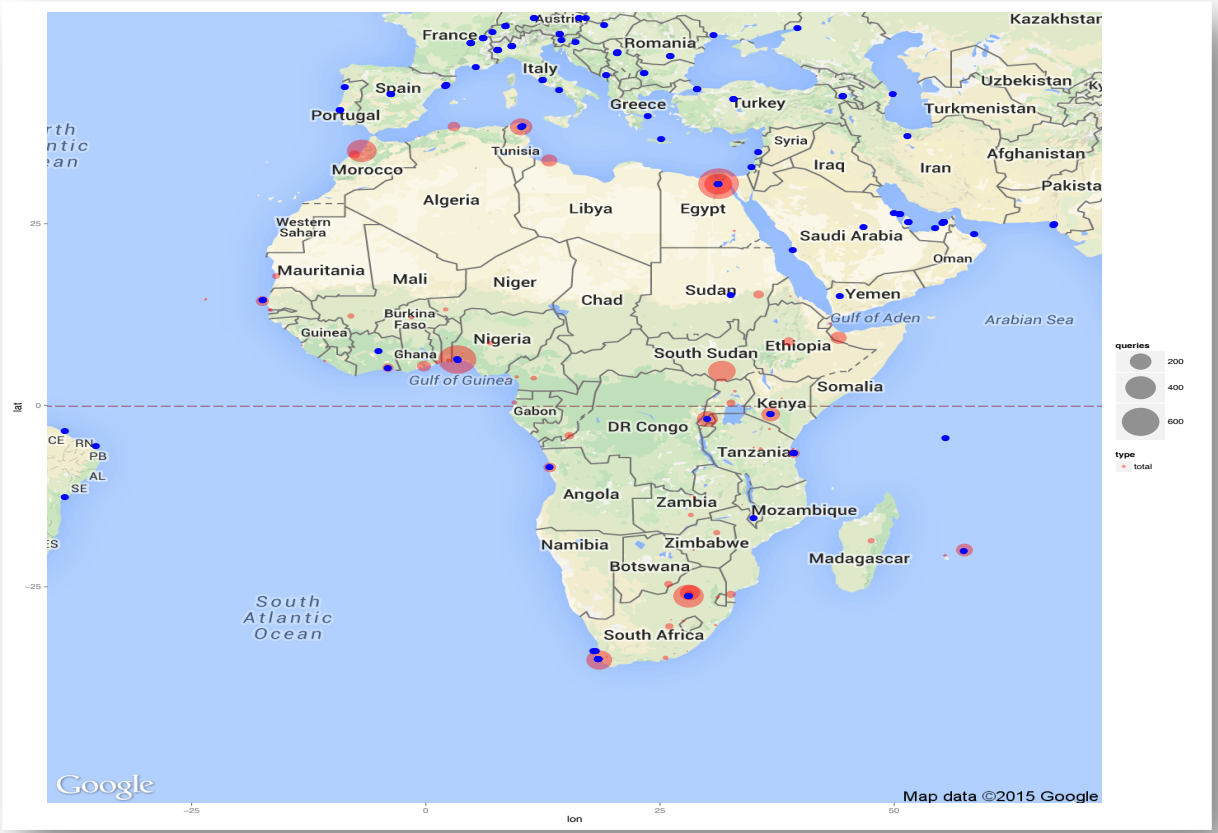
Asia Root Traffic and Server Location



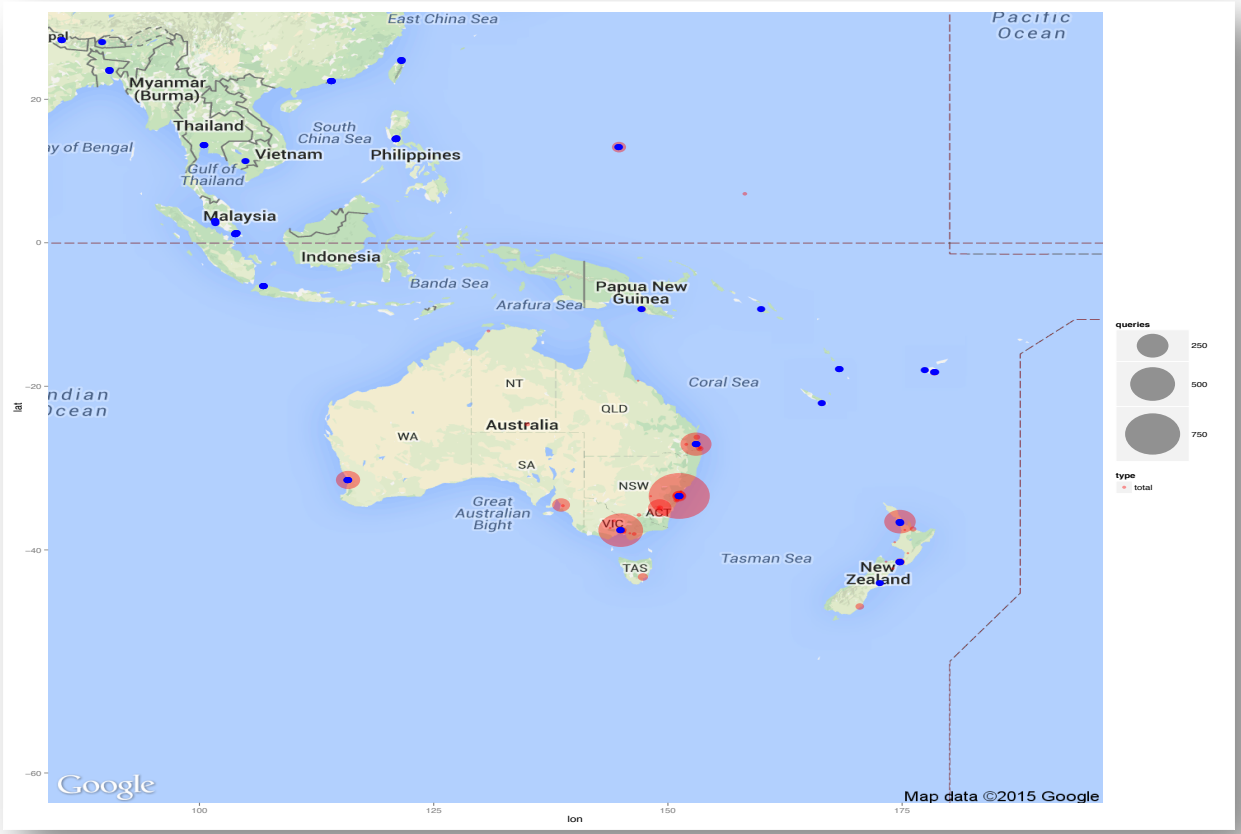
South America Root Traffic and Server Location



Africa Root Traffic and Server Location



Oceania Root Traffic and Server Location



How Far Does a Query Have to Travel?

- If every client sent its queries to the closest server …
  - That is a BIG IF!
- What would be the distance travelled?
- Actual distance travelled in fiber is hard to get
  - Geographic distance (in km) is a reasonable proxy
  - Represents best possible case

- Data can be useful in gauging server placement effectiveness

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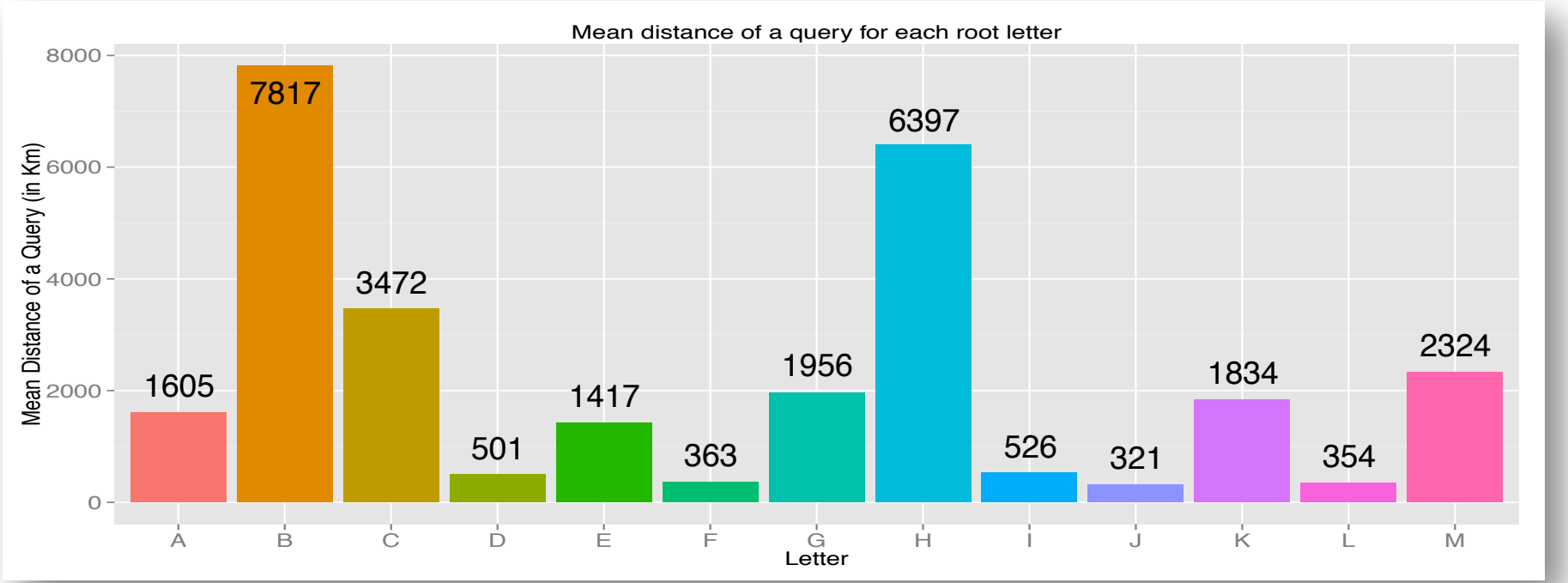
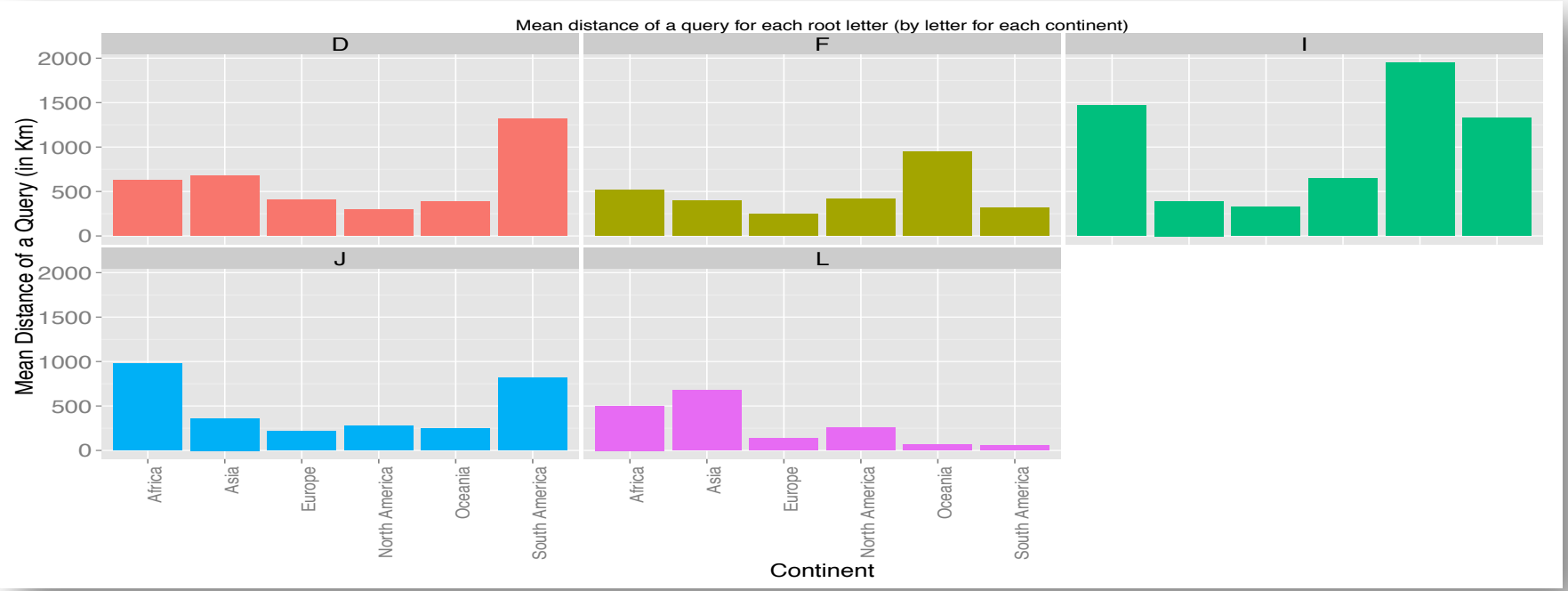
	Continent	Mean Distance in Km
1	Global	144
2	Africa	201
3	Asia	234
4	Europe	70
5	North America	134
6	Oceania	59
7	South America	37

Per letter


Mean distance of a query for each root letter
Mean Distance of a Query (in Km)
8000
6000
4000
2000
0
1605
7817
3472
501
1417
363
1956
6397
526
321
1834
354
2324
A
B
C
D
E
F
G
H
I
J
K
L
M
Letter

Letters with global presence broken down by continent



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