



**RIPE
NCC**

RIPE Atlas - Measuring Domestic Internet

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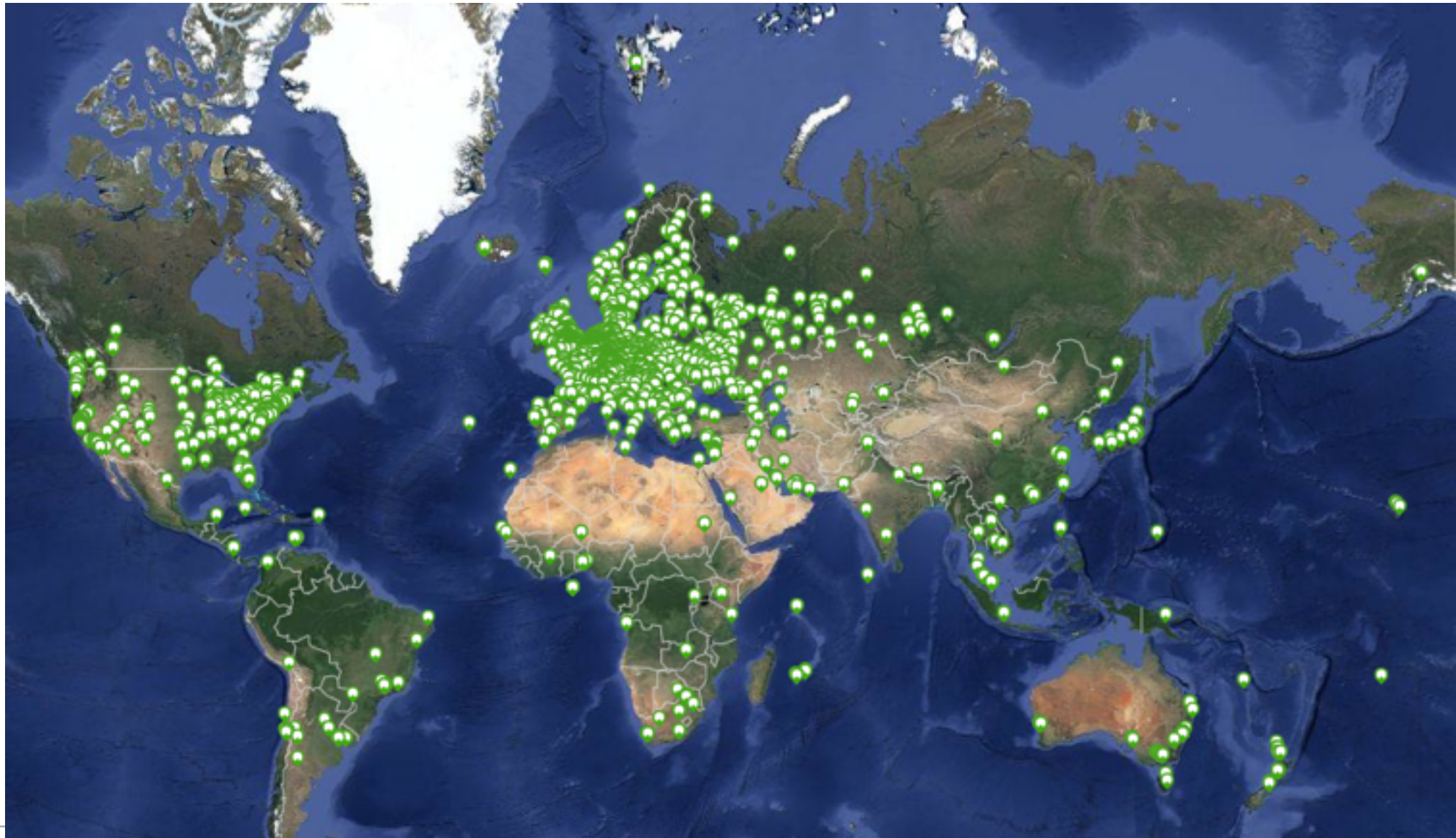
- "That which is measured improves. That which is measured and reported improves exponentially."
-- Karl Pearson
- Do we want the Internet to improve?

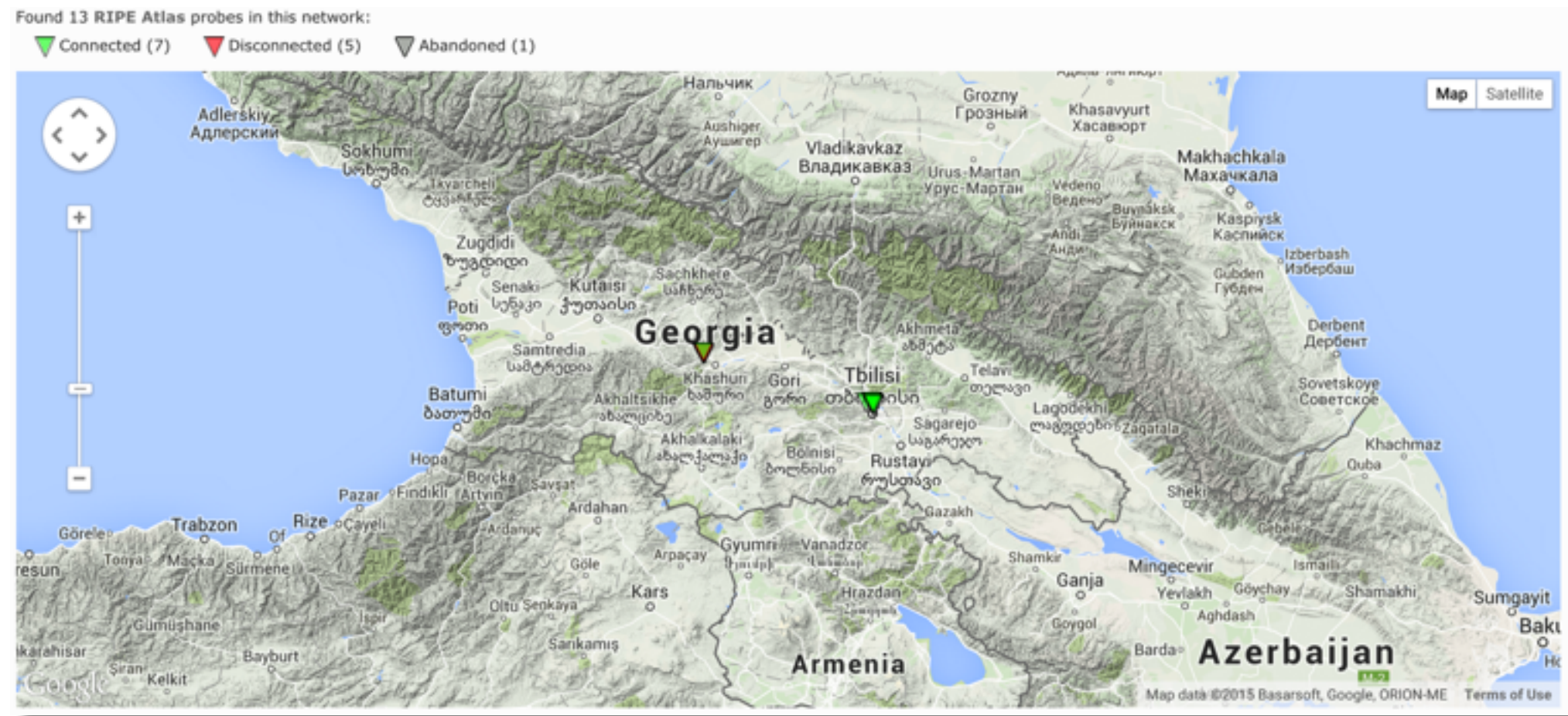


<https://atlas.ripe.net>

A measurement network of ~8200 devices

For the community, **by** the community





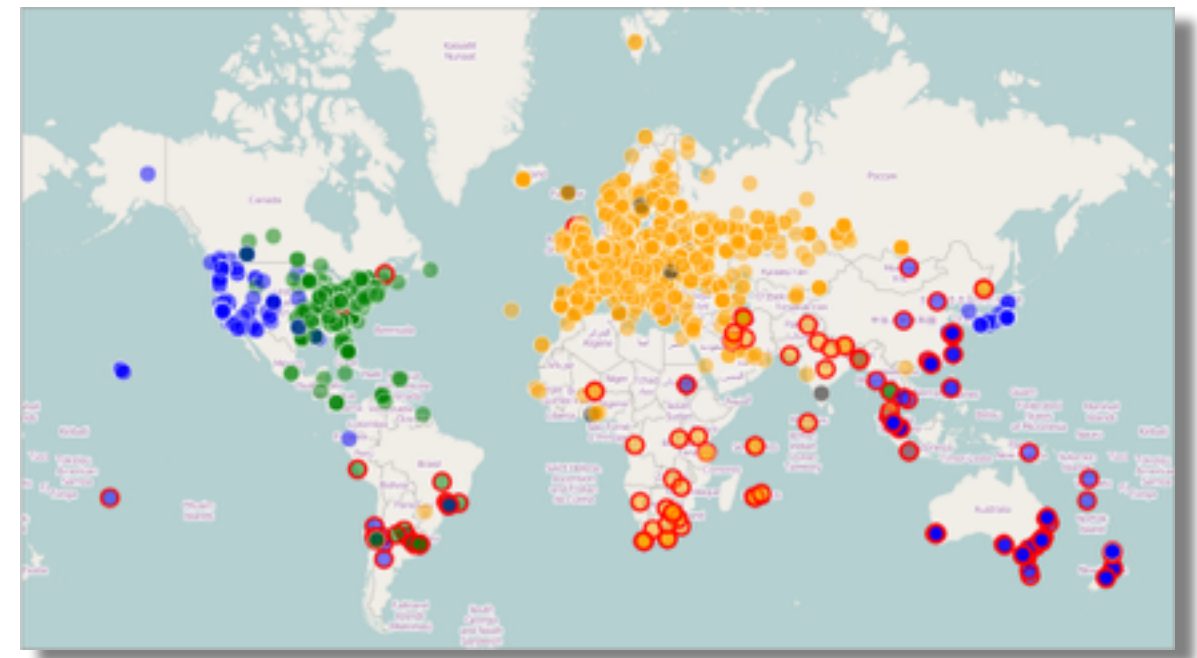
- Cities covered: Tbilisi
 - Desired: Kutaisi, Batumi, Poti, ...
- Networks covered: AS16010, 20545, 49254
 - Desired: All 54 ASNs in Georgia

- Install-and-forget, USB powered
- Hosted and sponsored by organisations and end users
- ISPs, individuals...
- **Free of charge** if you host individual probes



- Probes have hardwired trust material (registration server addresses / keys)
- No open ports on probes, they only initiate connections
- Measurements are scheduled by centralised “command servers” via reverse ssh tunnels over TCP/443
- Probes don’t listen to local traffic, there are no passive measurements running
 - There’s no snooping around
- Source code for probe software published

- Ping, traceroute, SSLcert, NTP and DNS queries
- “built-in” measurements
 - From all the probes, towards root name servers and RIPE Atlas infrastructure
- User-defined measurements
 - Measurements initiated by RIPE Atlas users
- Results: Neutral, Open
 - <https://atlas.ripe.net/results>
 - Data used by many networks

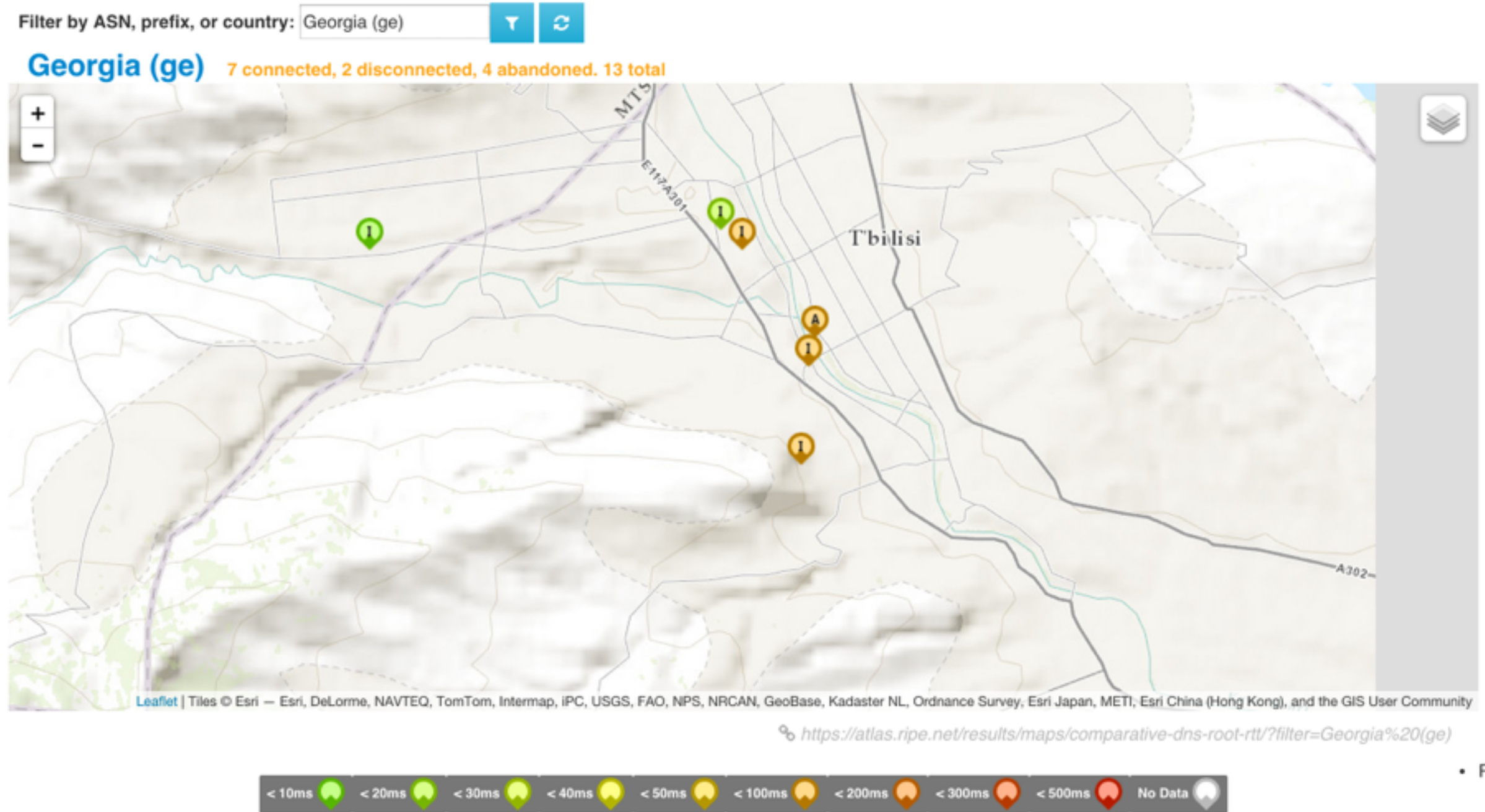


<https://labs.ripe.net/Members/emileaben/how-ripe-atlas-helped-wikipedia-users>

- Earning RIPE Atlas credits
 - Hosting a RIPE Atlas probe
- Spending RIPE Atlas credits
 - Create user-defined measurements
 - Major benefit: look at your network from the outside!
- Credit system exists to ensure fair use of the system

Example: Fastest DNS Root-server

| 9





Measuring Countries with RIPE Atlas

Methodology



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- Useful troubleshooting tool for operators
 - <http://cluepon.net/ras/traceroute.pdf>
- Traceroutes contain clues on the forward path packets traverse
 - Latency
 - Location information in hostnames

- Example:

...

6 (AS32934) be3.bb02.fra2.tfbnw.net [220.703, 220.788, 220.917] | Frankfurt am Main, Hesse, DE |

7 (AS32934) ae12.bb01.ams2.tfbnw.net [61.745, 61.753, 61.782] | Amsterdam, North Holland, NL |

8 (AS32934) ae3.bb02.bos2.tfbnw.net [140.577, 140.622, 147.216] | Boston, Massachusetts, US |

9 (AS32934) be10.bb01.ewr2.tfbnw.net [221.391, 221.688, 221.792] | Newark, New Jersey, US |

10 (AS32934) be44.bb02.iad3.tfbnw.net [221.621, 221.739, 221.895] | Washington, Washington, D.C., US |

...

- Geolocating Internet infrastructure IPs by crowdsourcing
- “OpenStreetMap for IPs in traceroute”
- Prototype with 30k+ infrastructure IPs mapped:
 - <https://marmot.ripe.net/openipmap/>



- Based on traceroute measurements using RIPE Atlas probes
- (Identify IXPs & IXP LANs using PeeringDB)
- Construct mesh: from all (*) country probes to each other
 - Max. 2 probes per ASN; only “public” probes
- Hops geolocated using “OpenIPMap” database
- Source: <https://github.com/emileaben/ixp-country-jedi>
- <https://labs.ripe.net/Members/emileaben/measuring-ixps-with-ripe-atlas>



Measuring Countries

Probe to probe traceroute
results

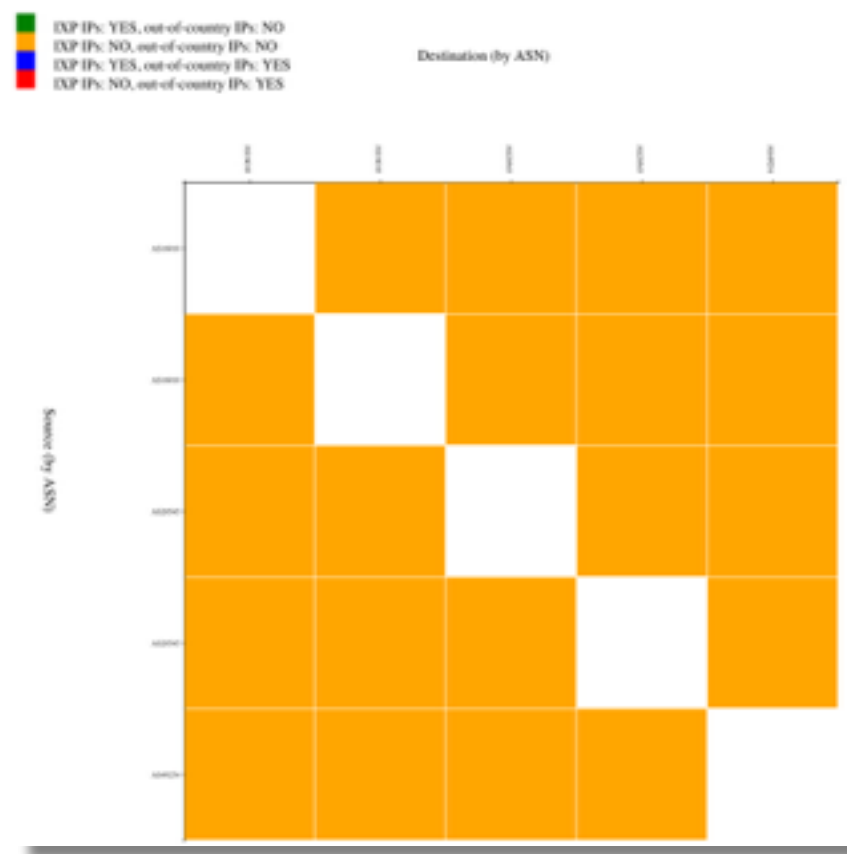


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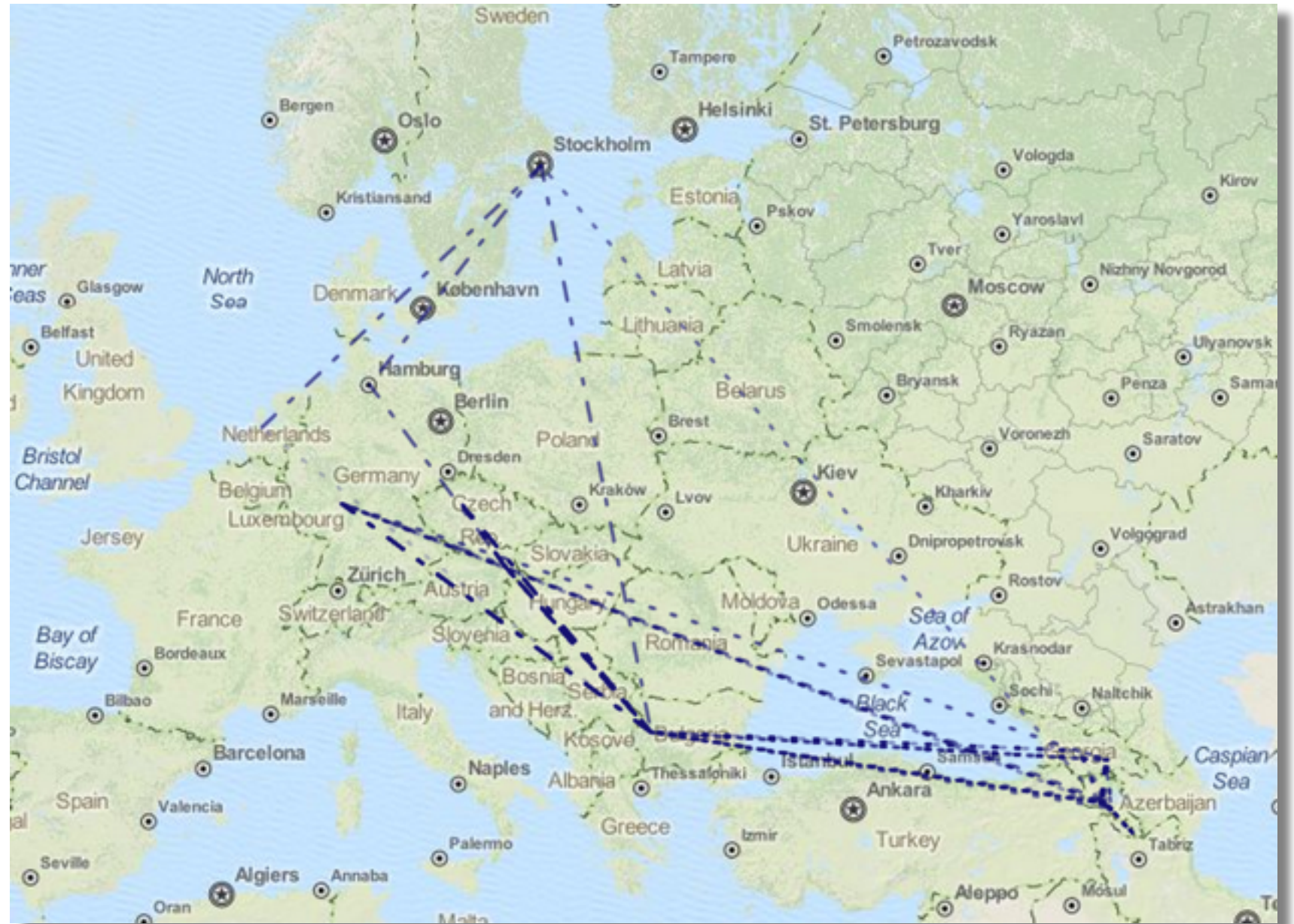
- Green: Local via IXP
- Orange: Local, but not via IXP
- Other: Go out of country
- IXPs help keeping traffic local



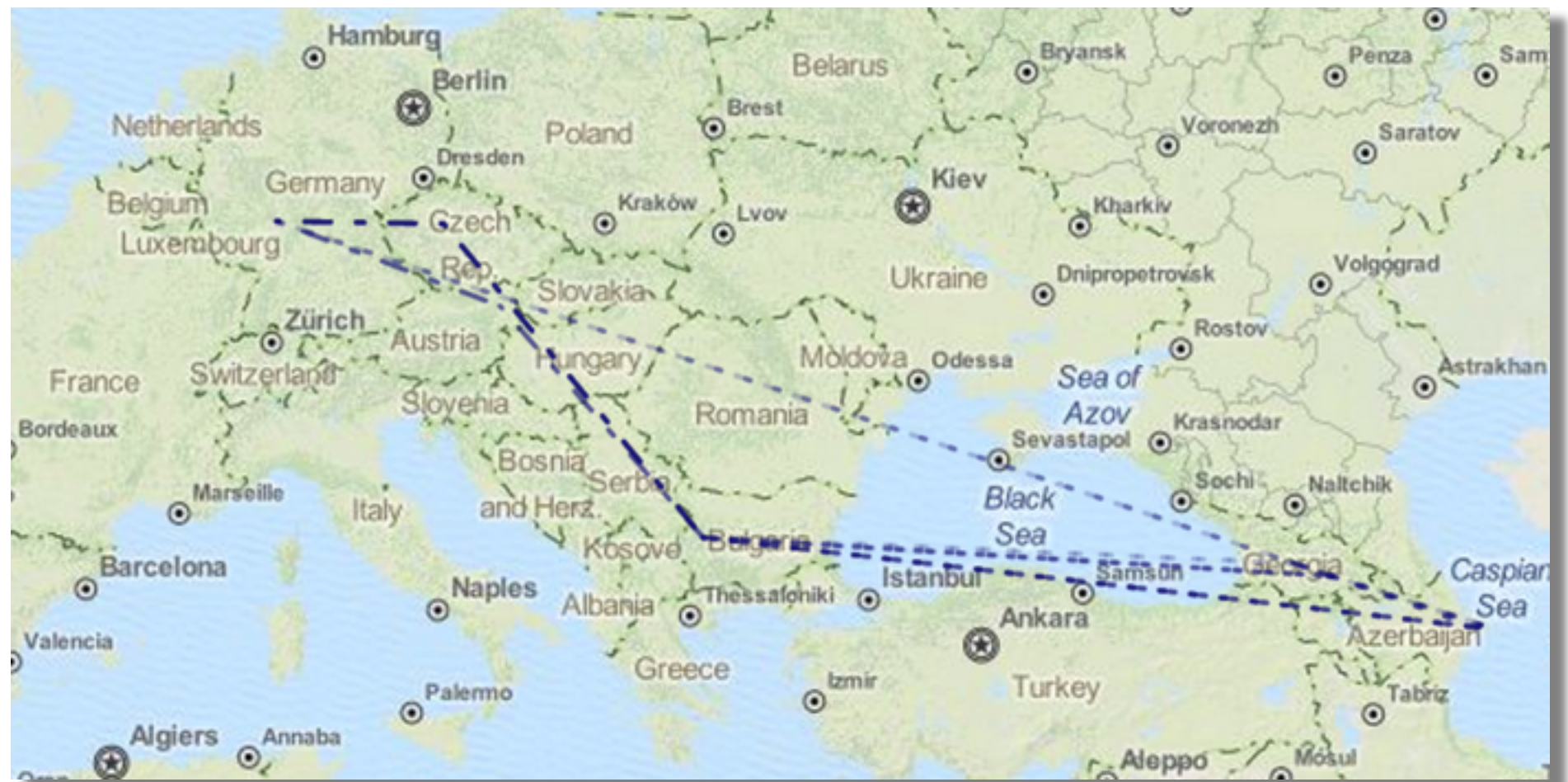
- No out-of-country paths detected!
- Latency: < 5ms
- but only 5 probes in 3 ASNs
 - Maybe not a representative sample?



- Out of Region:
- 38.8% of paths
- BG : 36.3%
- AT : 17.5%
- DE : 14.4%
- CZ : 8.8%
- SE : 1.9%
- NL : 0.6%
- (*) Excludes probes in same country



- Out of region paths: 50%
 - BG : 50%
 - DE : 13.3%
 - CZ : 10%
 - AT : 3.3%





Local Content

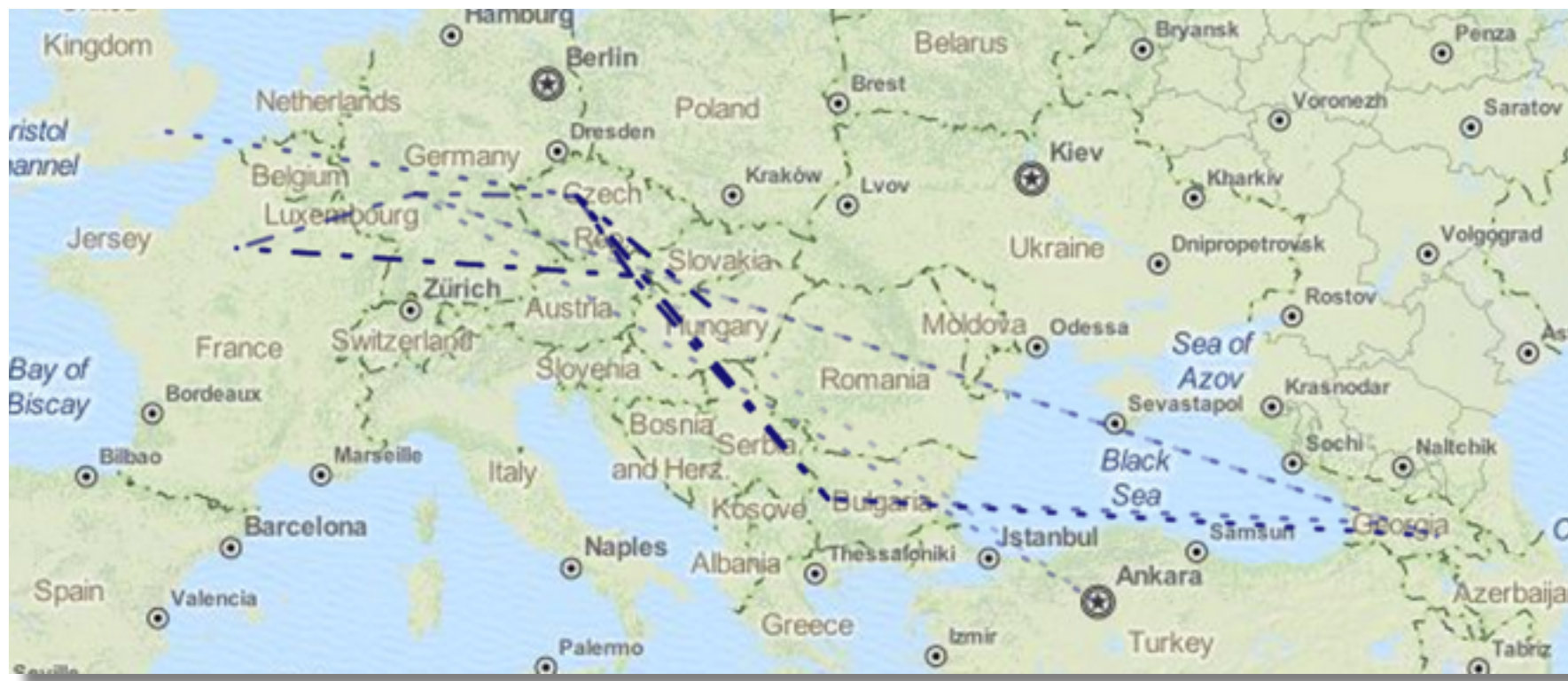
Probe to local content
traceroute results



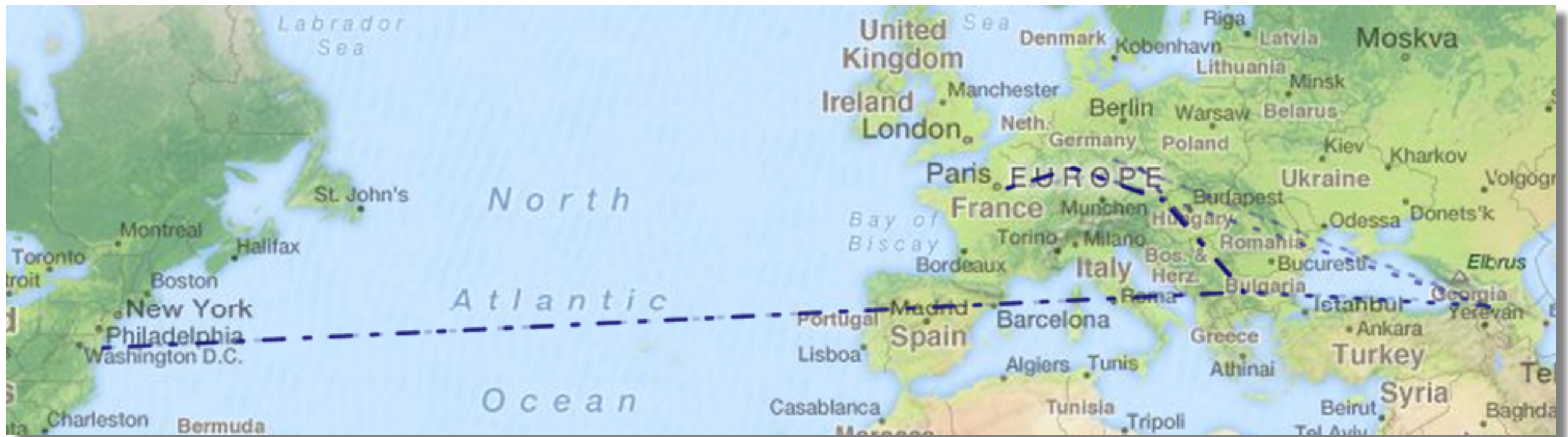
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- What is local content?
 - Content hosted in Georgia?
 - Content aimed at users in Georgia?
- Examples:
 - Georgian bank websites
 - top.ge-sites
- Prototype measurements

- Sources: RIPE Atlas probes in Georgia
- Destinations: Websites of 21 commercial banks licensed by the National Bank of Georgia
 - For 4 banking websites paths don't stay local
 - Rest: < 5ms latency



- Sources: RIPE Atlas Probes
- Destinations: Set of 49 Georgian websites
 - For 3 sites paths don't stay local
 - translate.ge : US , gees.in : FR , lider-bet.com : GE (!)



- www.lider-bet.com
- Low latency (top) stays in Georgia
- High latency (bottom) goes out of country

msm:2013502 prb:19967 ts:2015-05-16T18:54:25.000Z

remove

hop	IP	ASN	hostname	location	RTTs
1	192.168.0.1	(RFC1918)	(none)		1.3 1.2 1.1
2	188.92.212.129	49254	(none)		2.1 1.9 1.9
3	188.92.208.74	49254	(none)		1.7 2.0 2.1
5	94.43.132.38	35805	94-43-132-38.dsl.utg.ge	Tbilisi, T'bilisi, GE	2.4 2.5 2.5
6	185.68.8.50	201651	(none)		2.0 2.0 2.4
7	185.68.9.10	201651	(none)		3.1 3.1 2.4

msm:2013502 prb:20461 ts:2015-05-16T18:54:27.000Z

remove

hop	IP	ASN	hostname	location	RTTs
1	217.147.227.1	20545	(none)		1.3 1.1 1.2
2	217.147.237.30	20545	(none)		3.8 5.1 3.1
3	217.147.237.105	20545	(none)		3.8 2.3 2.2
4	217.147.237.174	20545	(none)		3.4 2.2 2.3
5	80.241.177.245	20771	host-80-241-177-245.customer.co.ge		3.8 5.0 3.5
6	80.239.192.241	1299	sfia-b2-link.telia.net	Sofia, Sofia-Capital, BG	60.1 60.1 60.2
7	62.115.135.28	1299	win-bb2-link.telia.net	Vienna, Vienna, AT	53.7 53.4 53.5
8	80.91.246.28	1299	ffm-bb2-link.telia.net	Frankfurt am Main, Hes	56.5 56.4 56.6
9	213.155.133.235	1299	ffm-b11-link.telia.net	Frankfurt am Main, Hes	57.2 57.3 56.5
10	62.115.12.226	1299	silknet-ic-300532-ffm-b11.c.telia.net	Frankfurt am Main, Hes	57.2 57.7 57.5
11	178.134.240.45	35805	(none)		127.6 125.4 125.9
12	178.134.240.170	35805	(none)		147.0 119.9 119.8
13	94.43.132.186	35805	94-43-132-186.dsl.utg.ge	Tbilisi, T'bilisi, GE	64.1 64.1 64.0
14	185.68.8.50	201651	(none)		64.5 64.1 64.3
15	185.68.9.10	201651	(none)		64.7 64.9

- Examples of path that that not always stay local
 - Would an IXP help?
- You are the local experts: Please tell us how/what to measure
 - Or do it yourself!
- More probes needed in Georgia for more accurate measurements
 - <https://atlas.ripe.net/get-involved/>

