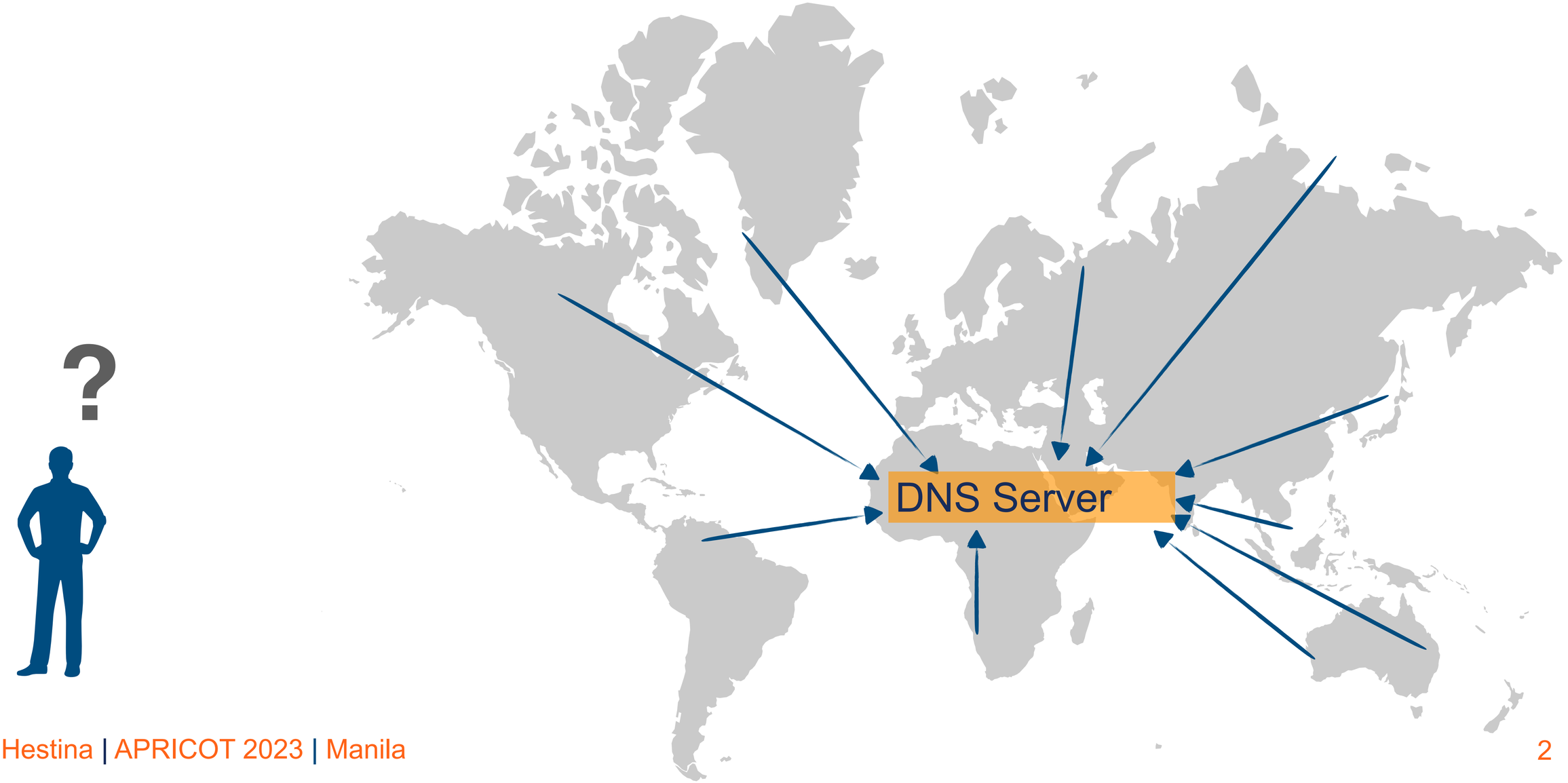
RIPE NCC
RIPE NETWORK COORDINATION CENTRE

Spotting latency issues with RIPE Atlas

Lia Hestina | APRICOT 2023 | Manila

Dennis has a problem…



Some problems

Where are the networks with **high** latency?

Need to know their **locations**

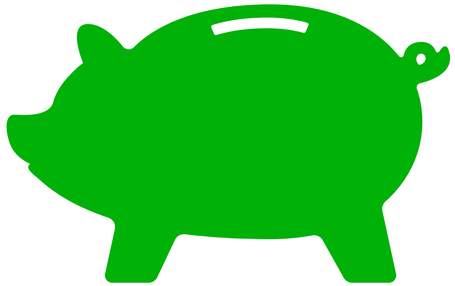
Which networks have **high latency**?

Need to know their **Service Provider**

Requirements

Trusted source

Within budget



Safe and secure

Show latency, location and route

RIPE Atlas

A Trustworthy Data Source

Introduction

- RIPE Atlas is a global active measurements platform, funded by RIPE NCC members
- Goal: view Internet reachability
- Probes hosted by volunteers
- Data publicly available

atlas.ripe.net

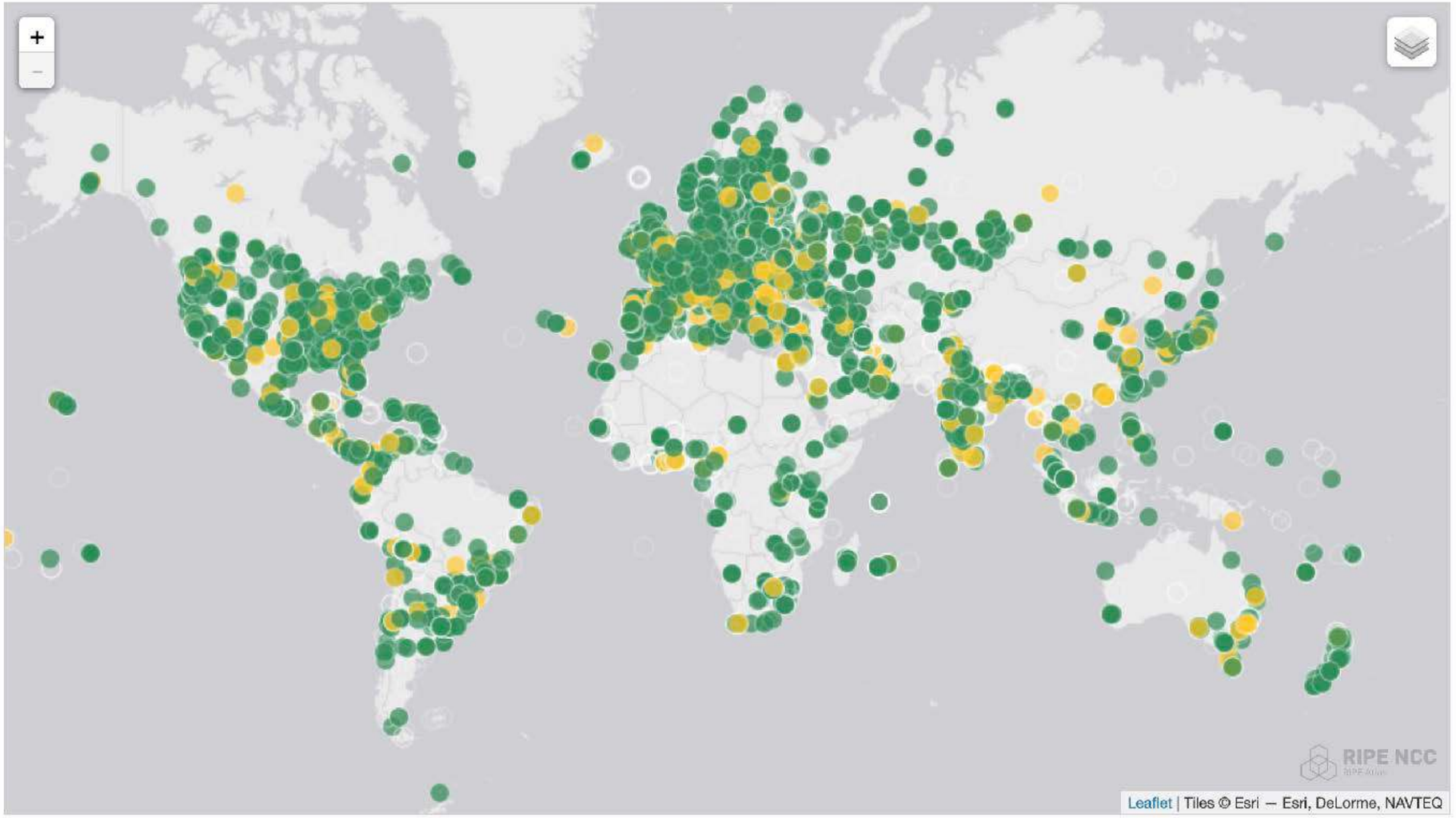
Global RIPE Atlas Network Coverage

Permalink

This map shows the locations of all RIPE Atlas probes, including those that are connected, disconnected and abandoned (meaning they have not been connected for a long period of time).

Filter by ASN, prefix, or country:

Just start typing



Connected: 12797 Disconnected: 1552 Abandoned: 19134

Probes and Anchors

12,000+
Connected probes

169
countries

13,000+
results per second

30,000+
measurements currently running

Plug & play Turris Mox
Runs active measurements
(background + on-demand)

More substantial hardware
Originator + target of measurements

Accessible via

- Web UI
- API
- CLI Tool

- Blaeu (community contribution)

https://labs.ripe.net/author/stephane_bortzmeyer/creating-ripe-atlas-one-off-measurements-with-blaeu/

Measurements
Internet Maps
Tools

Types of Measurements

Ping	NTP
Traceroute	SSL/TLS
DNS	HTTP*

Use Cases

Continuously
monitor network reachability
from outside (>12K probes)

Investigate and troubleshoot
network issues with quick, flexible
connectivity check

Test **IPv6** connectivity

Check the **responsiveness** and
proximity of DNS infrastructure,
such as root name servers

RIPE Atlas

Viewing
latency, locations and routes

MinRTT (prototype)

1. **Minimum latency** into each ASN & IXP from RIPE Atlas for a given day
2. Visualising **network deployments**
3. RIPE Atlas latency **world map** in Observable
4. Limitations and possible solutions
5. Credit to **Emile Aben** and **Agustin Formoso**

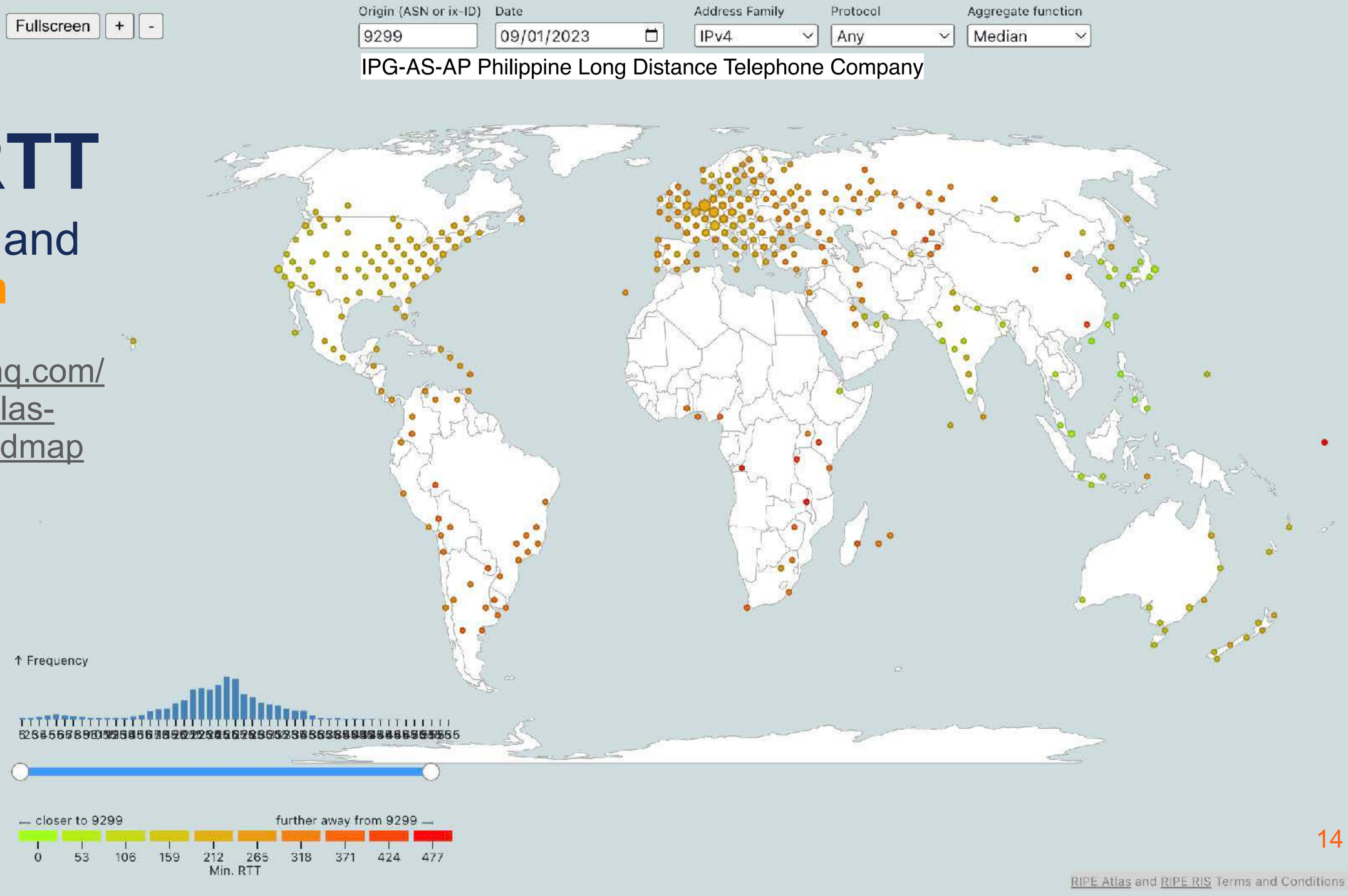
emile.aben@ripe.net - aformoso@ripe.net

https://labs.ripe.net/author/emileaben/latency-into-your-network-as-seen-from-ripe-atlas/

MinRTT

Latency and Location

https://observablehq.com/@ripencc/atlas-latency-worldmap

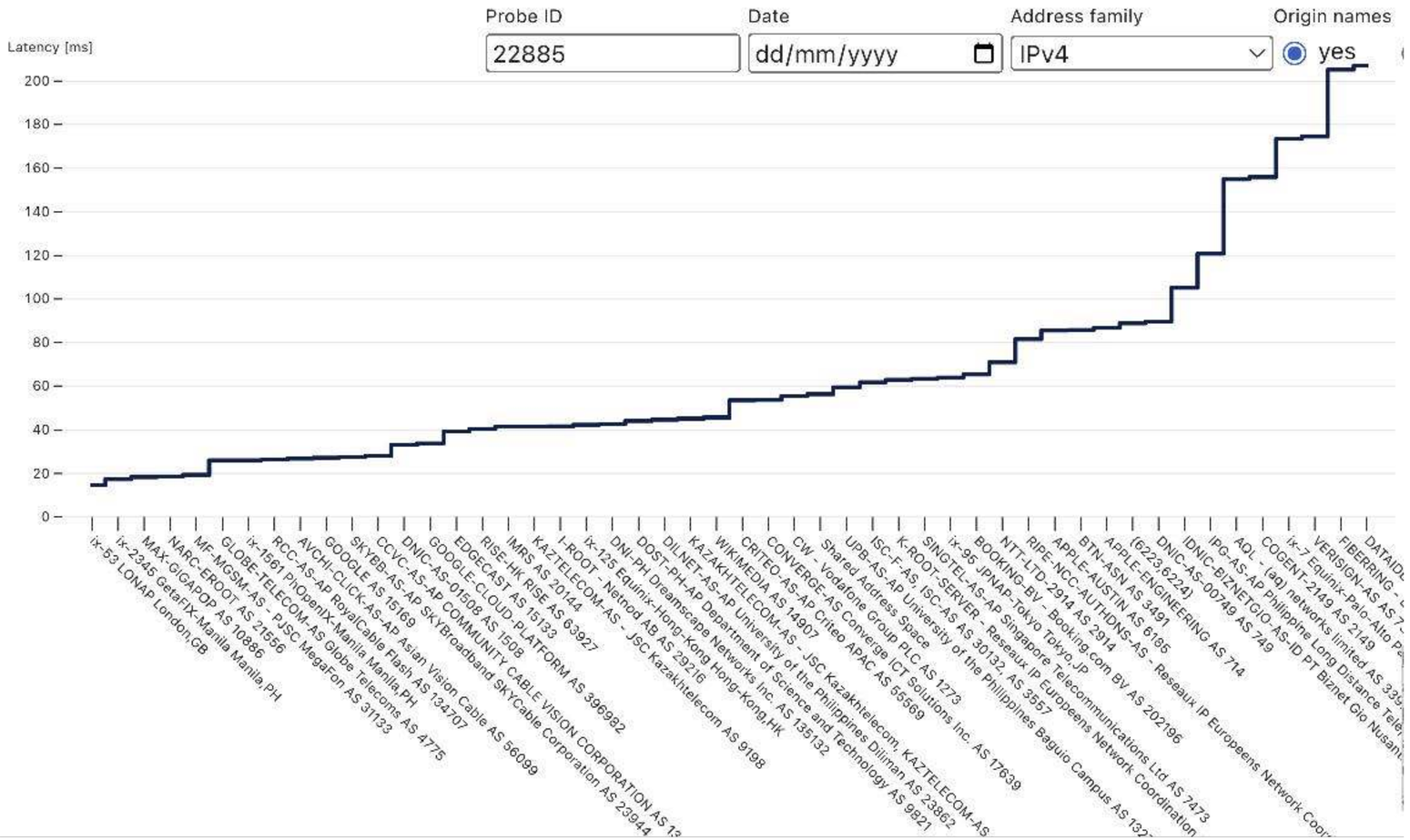


MinRTT

Your network **neighbourhood** as seen through RIPE Atlas

Try your probe here

https://observablehq.com/@ripencc/atlas-probe-neighbourhood?

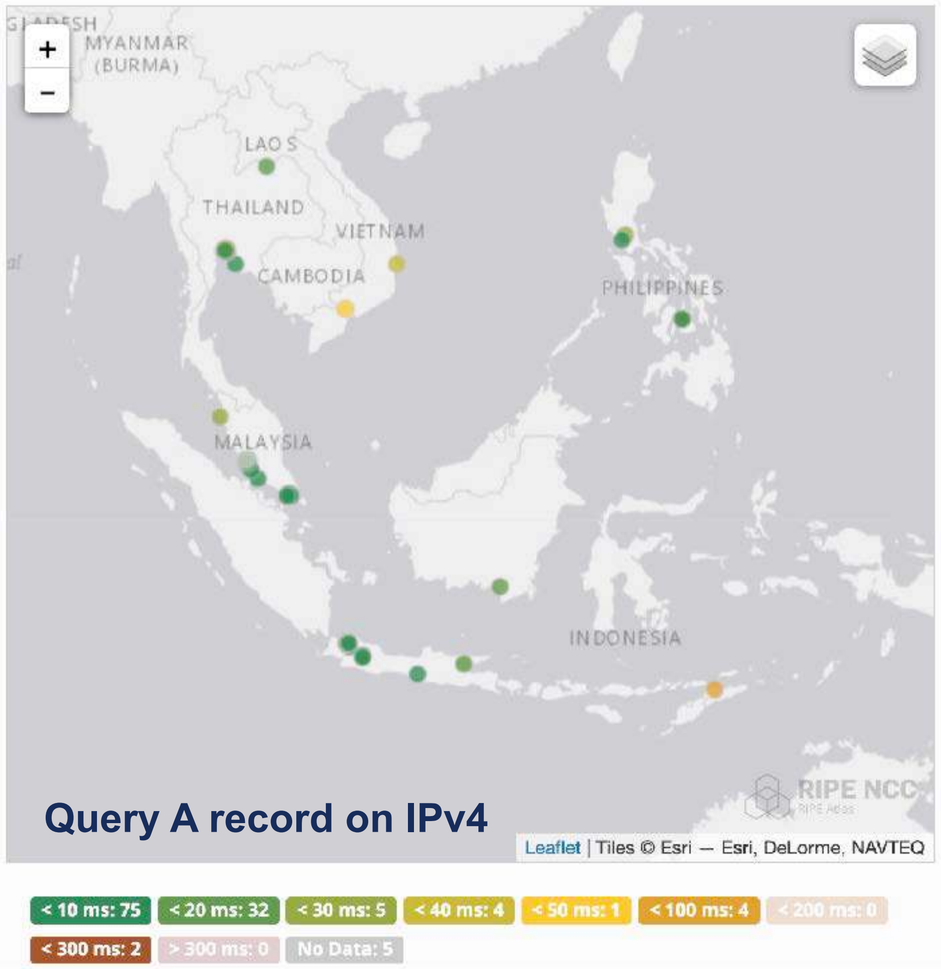


Limitations & Possible Solutions

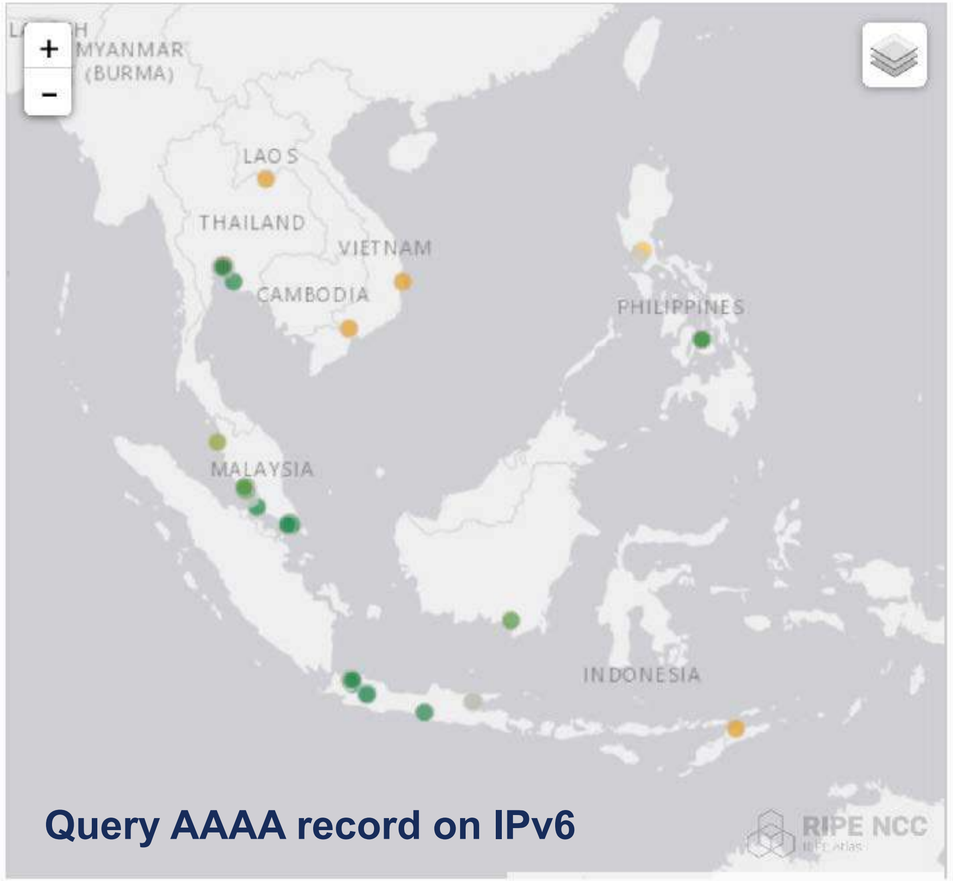
- No RIPE Atlas probe, no data shown: => RIPE Atlas deployment in that place that interest you for instance software probes.
- RIPE Atlas measurement bias: If RIPE Atlas doesn't measure into the network that you are interested in, the data we collect won't reflect the network very well. RIPE Atlas does a limited amount of so called 'topology measurements' where RIPE Atlas probes target the .1 or ::1 address of each prefix we see in BGP, which will likely give some visibility to the majority of networks. => schedule additional measurements that would capture routes of low latency into particular networks.
- ICMP blocking: If a network blocks the various packet types needed for data collection, this network won't show up.
- Data errors. If a probe has wrong geolocation information, or if the network setup around a probe causes data problems, this will cause our data aggregates to capture inaccurate information. For instance: We see some probes near routers that return ICMP messages with fake source addresses (for instance, the destination address of a traceroute).

DNS measurement

To authDNS ns1.idnic.net to resolve idnic.net



Query A record on IPv4



Query AAAA record on IPv6

DNS measurement

To authDNS ns1.idnic.net to resolve idnic.net

Query A record on IPv4

Settings & Status | Latest Results | Map | Downloads

Probe	ASN (IPv4)	ASN (IPv6)	Time (UTC)	Answer	Response Time
77	133481	133481	2023-02-10 07:24	NOERROR	229.909
4788	9785	9785	2023-02-10 07:24	NOERROR	230.789
6149	43996	43996	2023-02-10 07:24	NOERROR	2.3
6477	55002	55002	2023-02-10 07:24	NOERROR	1.404
6487	36236	36236	2023-02-10 07:24	NOERROR	1.429
6506	20473	20473	2023-02-10 07:24	NOERROR	1.432
6521	133802	133802	2023-02-10 07:24	NOERROR	3.906
6568	41095	41095	2023-02-10 07:24	NOERROR	1.388
6586	202196	202196	2023-02-10 07:24	NOERROR	33.753
6607	15133	15133	2023-02-10 07:24	NOERROR	1.275
6905	59238	59238	2023-02-10 07:24	NOERROR	28.504
6910	141371	141371	2023-02-10 07:24	NOERROR	1.192
6917	137409	137409	2023-02-10 07:24	NOERROR	1.909
6918	63949	63949	2023-02-10 07:24	NOERROR	1.546
6970	14061	14061	2023-02-10 07:24	NOERROR	2.023
6996	12008	12008	2023-02-10 07:24	NOERROR	1.025
7007	31713	3491	2023-02-10 07:24	NOERROR	8.333
7010	31713	3491	2023-02-10 07:24	NOERROR	2.026
7016	140443	140443	2023-02-10 07:24	NOERROR	0.913

Query AAAA record on IPv6

Settings & Status | Latest Results | Map | Downloads

Probe	ASN (IPv4)	ASN (IPv6)	Time (UTC)	Answer	Response Time
77	133481	133481	2023-02-10 07:24		✖ Error: Timeout: 5000
4788	9785	9785	2023-02-10 07:24	NOERROR	100.898
6149	43996	43996	2023-02-10 07:24	NOERROR	2.475
6477	55002	55002	2023-02-10 07:24	NOERROR	2.024
6487	36236	36236	2023-02-10 07:24	NOERROR	1.461
6506	20473	20473	2023-02-10 07:24	NOERROR	2.152
6521	133802	133802	2023-02-10 07:24		✖ Error: Timeout: 5000
6568	41095	41095	2023-02-10 07:24	NOERROR	1.444
6586	202196	202196	2023-02-10 07:24	NOERROR	2.351
6607	15133	15133	2023-02-10 07:24	NOERROR	1.458
6905	59238	59238	2023-02-10 07:24	NOERROR	224.224
6910	141371	141371	2023-02-10 07:24	NOERROR	2.462
6917	137409	137409	2023-02-10 07:24	NOERROR	1.104
6918	63949	63949	2023-02-10 07:24	NOERROR	1.25

DNS measurement

To authDNS ns1.idnic.net to resolve idnic.net

World view

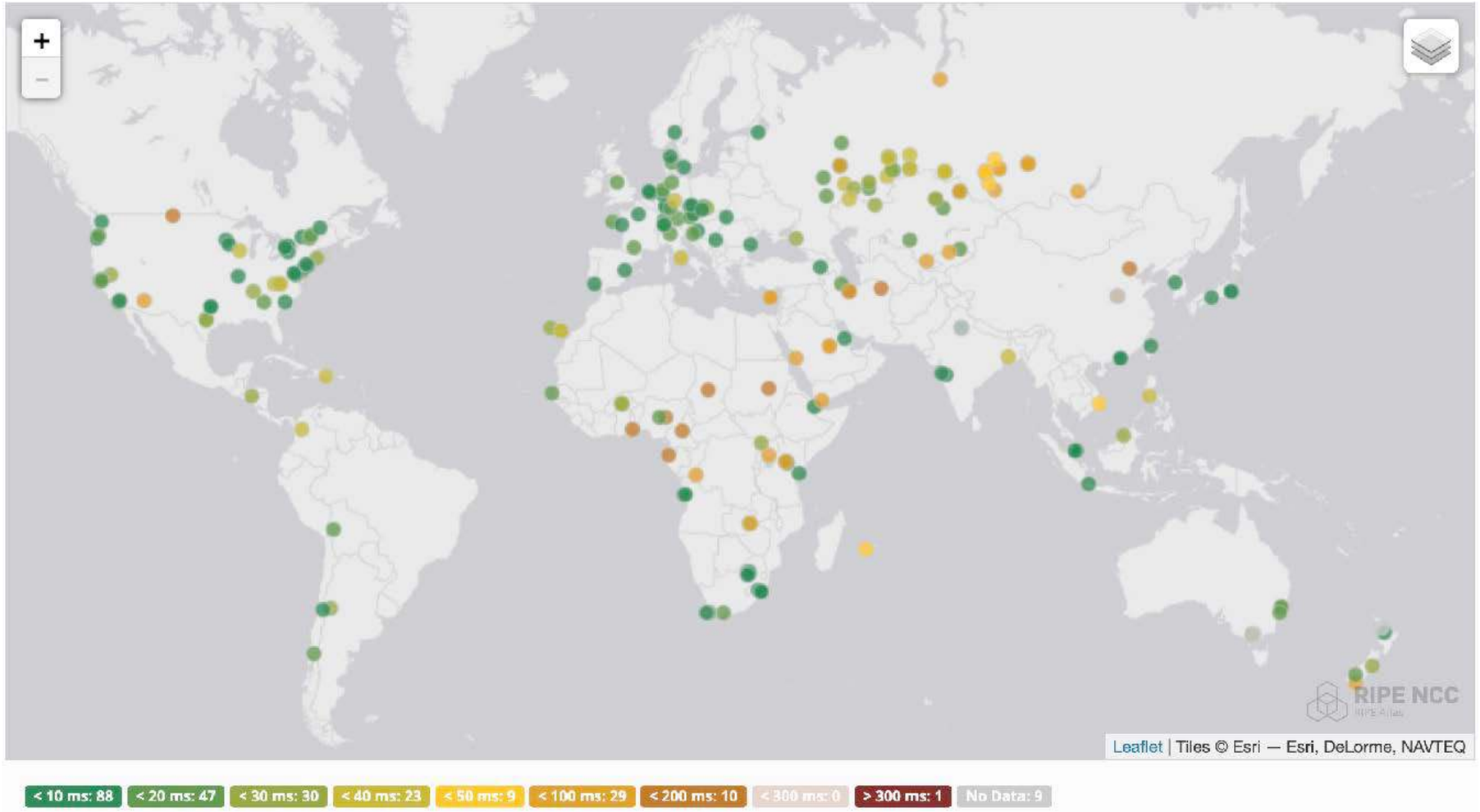
Settings & Status | Latest Results | Map | Downloads

Probe	ASN (IPv4)	ASN (IPv6)	Time (UTC)	Answer	Response Time
1000364	38182				No recent report available
1001397	16509				No recent report available
15763	156		2023-02-10 07:44		✖ Error: Timeout: 5000
29036	2907		2023-02-10 07:44		✖ Error: Timeout: 5000
62943	56030		2023-02-10 07:44		✖ Error: Timeout: 5000
1000726	17488		2023-02-10 07:44		✖ Error: Timeout: 5000
1004321	45090		2023-02-10 07:44		✖ Error: Timeout: 5000
1005145	38195		2023-02-10 07:44		✖ Error: Timeout: 5000
29332	3257		2023-02-10 07:44		✖ Error: Timeout: 5000
1002633	17117		2023-02-10 07:44	NOERROR	0.833
1003343	17117		2023-02-10 07:44	NOERROR	1.108
13888	15022	15022	2023-02-10 07:44	NOERROR	1.436
1004315	132203		2023-02-10 07:44	NOERROR	1.584
1000342	23661		2023-02-10 07:44	NOERROR	1.651
13536	36692		2023-02-10 07:44	NOERROR	1.659
1004294	132203		2023-02-10 07:44	NOERROR	1.922
20151	31713		2023-02-10 07:44	NOERROR	1.999
1002632	16509		2023-02-10 07:44	NOERROR	2.125
6983	12008	12008	2023-02-10 07:44	NOERROR	2.13

DNS measurement

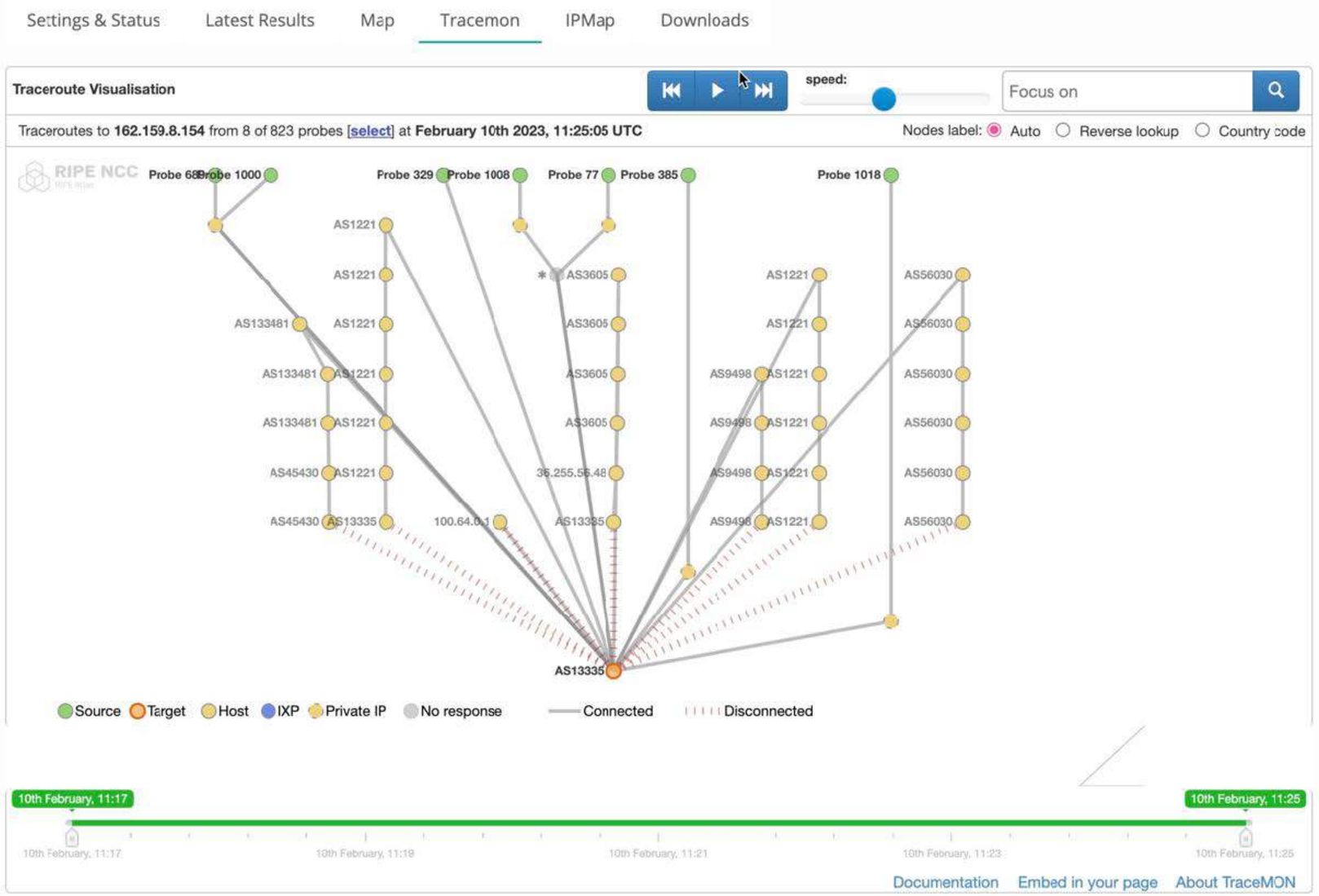
To authDNS ns1.idnic.net to resolve idnic.net

World view



TRACEROUTE

Shows **hops** and **routes**



Probes and Anchors

12,000+
probes

169
countries

13,000+
results per second

27,000+
measurements currently running

Plug & play Turris Mox
Runs active measurements (background + on-demand)

More substantial hardware
Originator + target of measurements

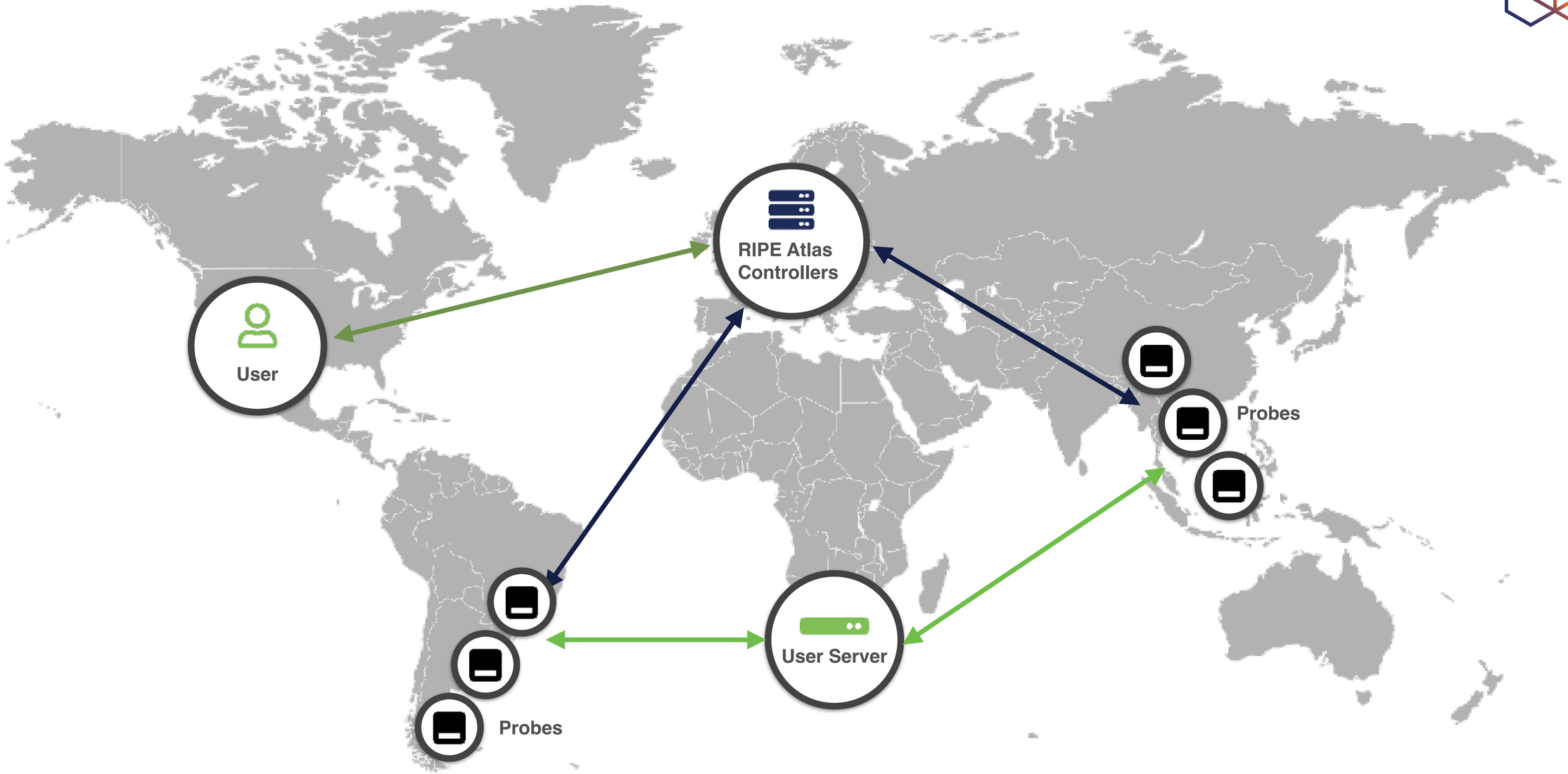
RIPE Atlas Anchors

- More robust probes mostly for data centres
- Either physical hardware or a virtual machine
- Generally more reliable and better connected than probes
- All the features of probes plus extra server features:
  - DNS server
  - HTTP(S) server
- Full mesh of ping and traceroute measurements is scheduled between all anchors

RIPE Atlas

Safe and Secure

RIPE Atlas Infrastructure



Security Review

Regular **external** security review

https://atlas.ripe.net/docs/security/

RIPE Atlas

No need to break the bank

Credits System

- Measurements cost credits
  - One ping result = 3 credits
  - One DNS resolution over UDP/TCP = 10 or 20 credits
  - One traceroute line = 30 credits
- Mostly to avoid overload
- Extra limits to prevent abuse
  - Maximum number of probes used
  - Maximum number of measurements per target
  - Maximum number of concurrent measurements

The RIPE Atlas community

RIPE Atlas users

Probe and anchor hosts

Ambassadors

Sponsors

- ✓Latency
- ✓Location
- ✓Trace route
- ✓Safe and Secure
- ✓Trusted source
- ✓Don’t break the bank

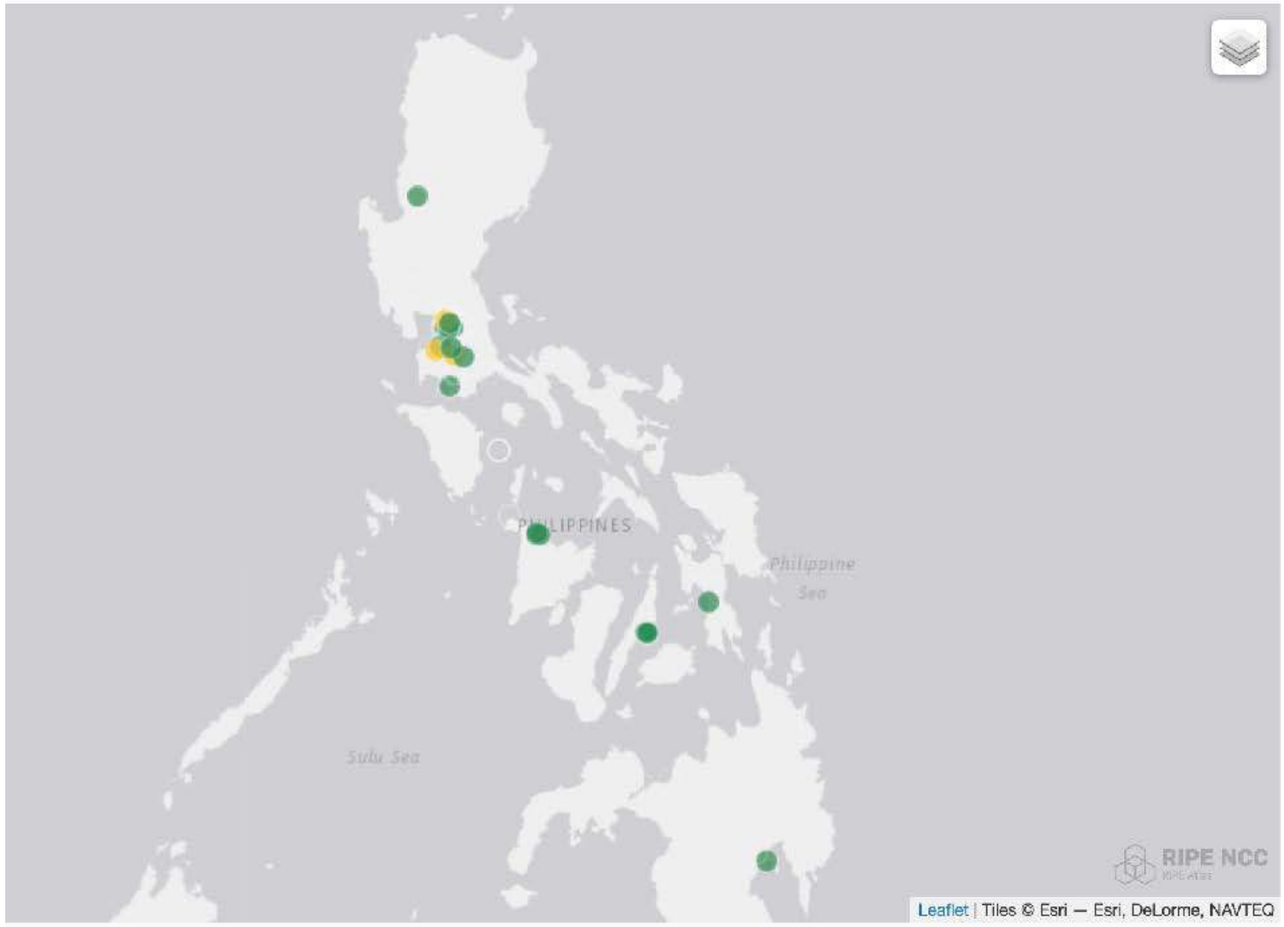
- ✓New issue found
- ✓Solution mapped
- ✓Policy adjusted

RIPE Atlas

A view into
Philippines - ASEAN

The Philippines

21 probes connected
2 anchors



https://atlas.ripe.net/results/maps/network-coverage/?filter=Philippines+

Most wanted ASNs in the Philippines

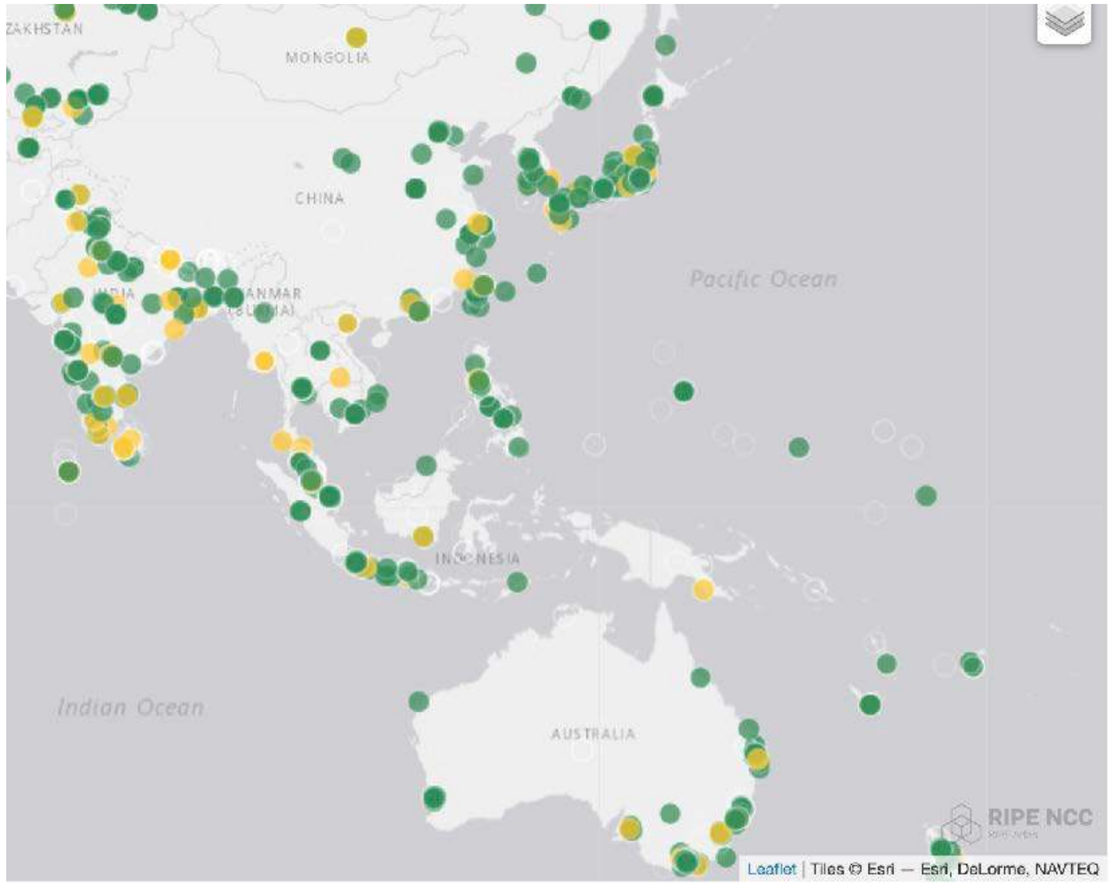
Search:

Network (ASN)	Network Name	Estimated User Population %	IPv4 Public Probes	IPv4 Private Probes	IPv4 Total Probes	IPv6 Public Probes	IPv6 Private Probes	IPv6 Total Probes	More
9299	IPG-AS-AP	34.94	3	0	3	0	0	0	View
17639	CONVERGE-AS	17.1	1	0	1	0	0	0	View
132199	GLOBE-MOBILE-5TH-GEN-AS	13.65	0	0	0	0	0	0	Apply for a probe
10139	SMARTBRO-PH-AP	11.17	0	0	0	0	0	0	Apply for a probe
4775	GLOBE-TELECOM-AS	10.1	2	0	2	0	0	0	View
139831	DTC-AS-AP	2.72	0	0	0	0	0	0	Apply for a probe

https://sg-pub.ripe.net/petros/population_coverage/country.html?name=PH

Probes in ASEAN

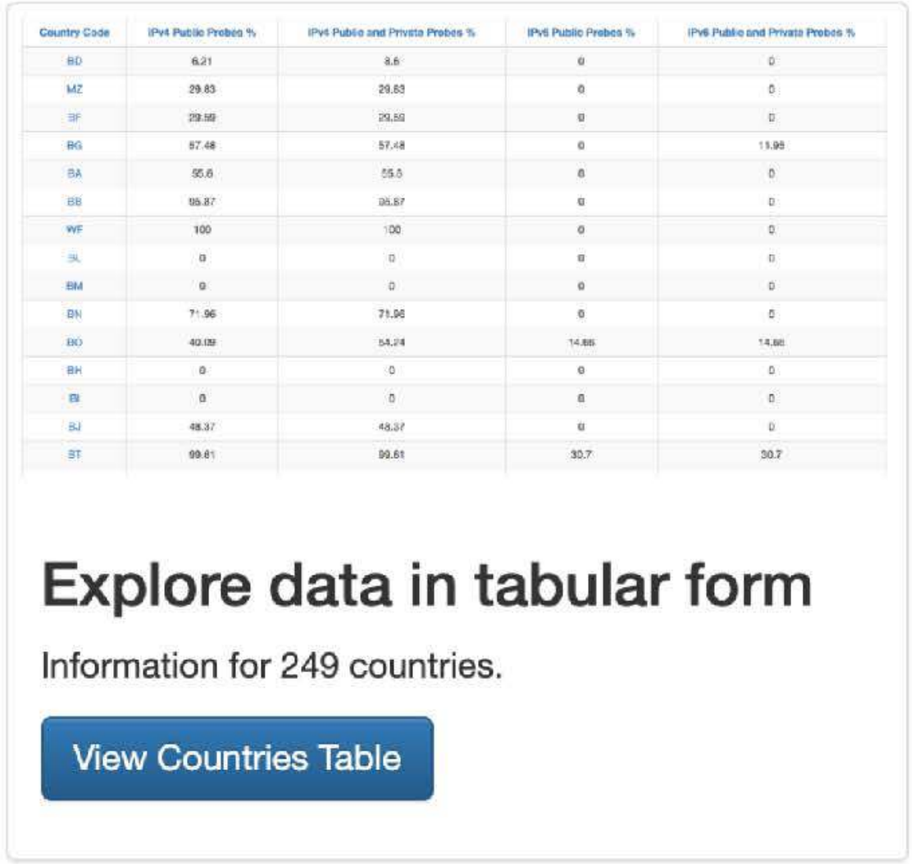
Economy	Active Probes
BD	6
ID	69
KH	1
LA	2
MM	1
MY	26
PH	21
SG	113
TH	20
TL	1
VN	9



Distribution in Asia Pacific

Check your economy here

RIPE Atlas Population Coverage



Country Code	IPv4 Public Probes %	IPv4 Public and Private Probes %	IPv6 Public Probes %	IPv6 Public and Private Probes %
BD	6.21	8.6	0	0
MZ	29.83	29.83	0	0
BF	29.59	29.59	0	0
BG	57.48	57.48	0	11.95
BA	55.6	55.6	0	0
BB	95.87	95.87	0	0
WF	100	100	0	0
BL	0	0	0	0
BM	0	0	0	0
BN	71.96	71.96	0	0
BO	40.09	54.24	14.86	14.86
BH	0	0	0	0
BI	0	0	0	0
BJ	48.37	48.37	0	0
BT	99.81	99.81	30.7	30.7

Explore data in tabular form

Information for 249 countries.

View Countries Table

Explore data on world map

Visualisation of data on a global map.

View IPv4 View IPv6

https://sg-pub.ripe.net/petros/population_coverage/index.html

Why run your own measurements

- Detect customer issues
  - Schedule measurements (pings or traceroutes) from up to 1,000 RIPE Atlas probes worldwide to check where the problem is
- Measuring packet loss on suspected *bad* link
- Testing anycast deployment
- Check the responsiveness and proximity of DNS infrastructure, such as root name servers
- Test IPv6 connectivity

Use Cases

A distributed view of the Internet
https://labs.ripe.net/author/alun_davies/ripe-atlas-a-distributed-view-of-the-internet/

The Kazakhstan outage as seen from RIPE Atlas
https://labs.ripe.net/author/emileaben/the-kazakhstan-outage-as-seen-from-ripe-atlas/

Detecting DNS root manipulation
https://labs.ripe.net/author/qasim-lone/detecting-dns-root-manipulation/

DNS vulnerability, configuration errors that can cause DDoS
https://labs.ripe.net/author/giovane_moura/dns-vulnerability-configuration-errors-that-can-cause-ddos/

Host a RIPE Atlas probe

- **Install** a probe in your network. We also have virtual software probes!
- **Reconnect** your probe
- **Bring** your network back onto the map
- **Measure** your network from over 12,000 external vantage points
- **Debug** and **share** your results

BONUS POINTS

- **Translate** the RIPE Atlas software installation in GitHub

Help us improve our coverage

Better coverage benefits **everyone**

Check if you can help with these **locations** or **networks**!

Questions

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