RIPE NCC

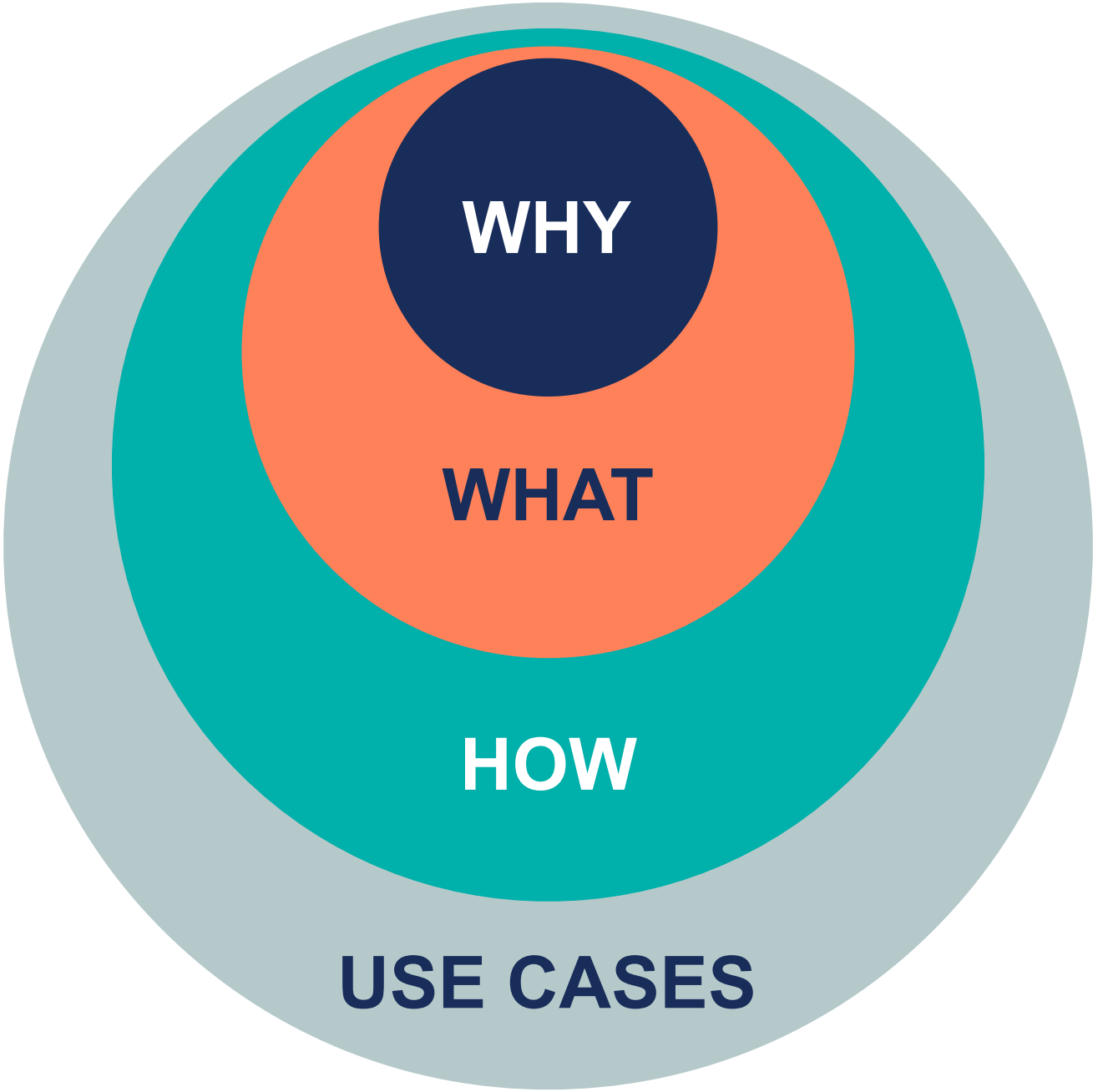
RIPE NETWORK COORDINATION CENTRE

RIPE Atlas

Measuring the Internet

Alvaro Vives | 20 March 2017 | TROOPERS17 - NGI

Overview



Why

What is it useful for?

Why RIPE Atlas? (1)

Internet

Growth

Critical

Multi-Stakeholder

Measurements

Monitor

Troubleshoot

Improve

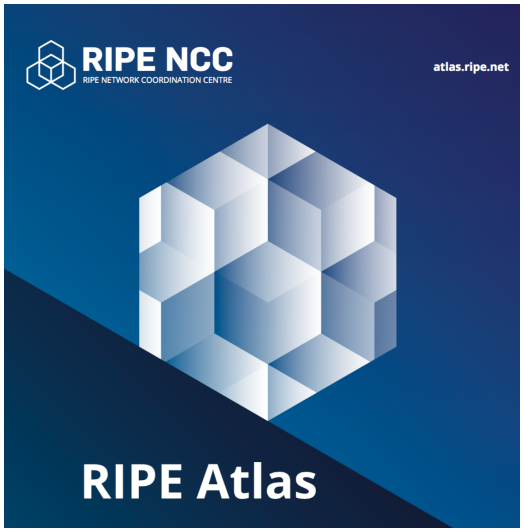
Security

Lack of Internet wide measurements

Why RIPE Atlas? (2)

Goals:

- Internet wide measurement system
  - Internet infrastructure, not all applications
- Real time & historical info
- Outbound and inbound measurements
- Collaborative effort
- Open and free
- IPv4 and IPv6 capable



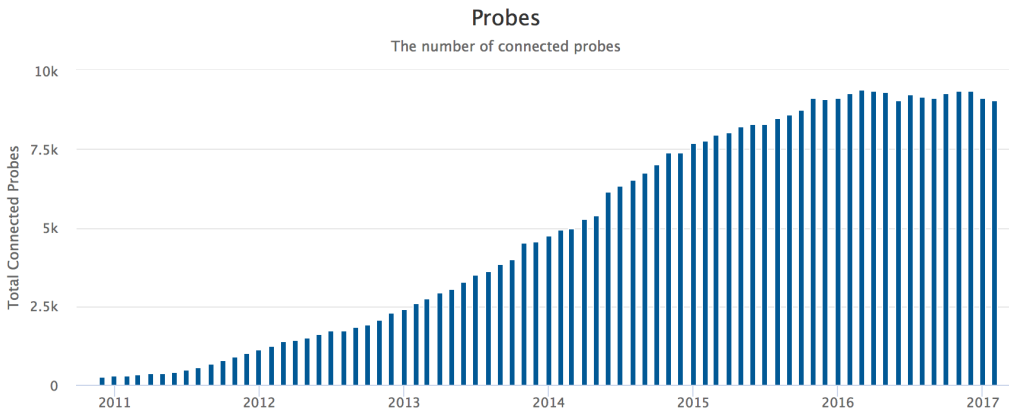
What

What is RIPE Atlas

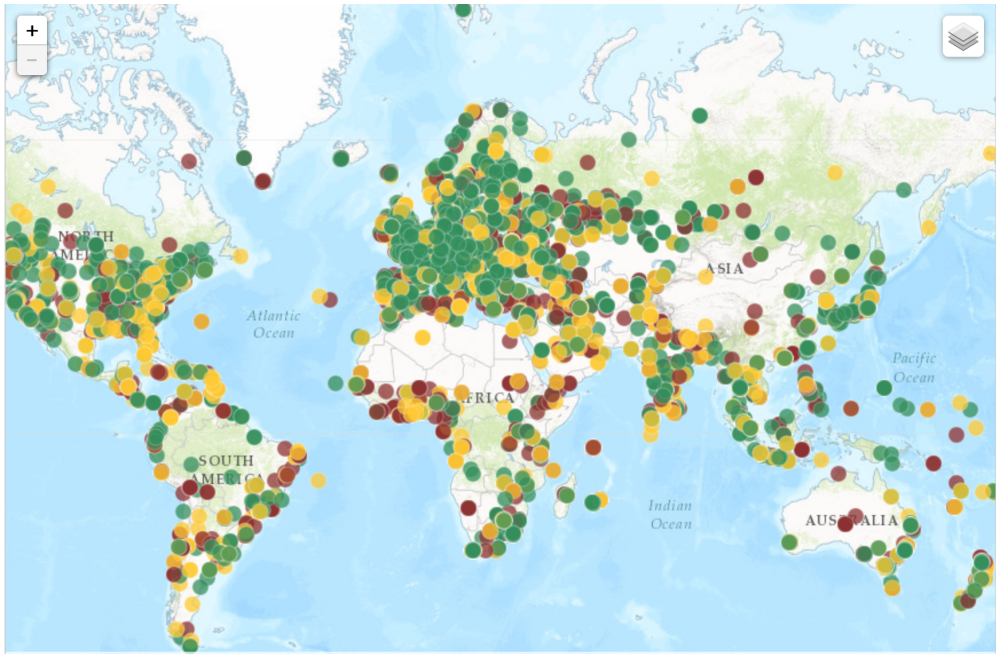
What is RIPE Atlas (1)

Composed by: **Probes**

- 9400+



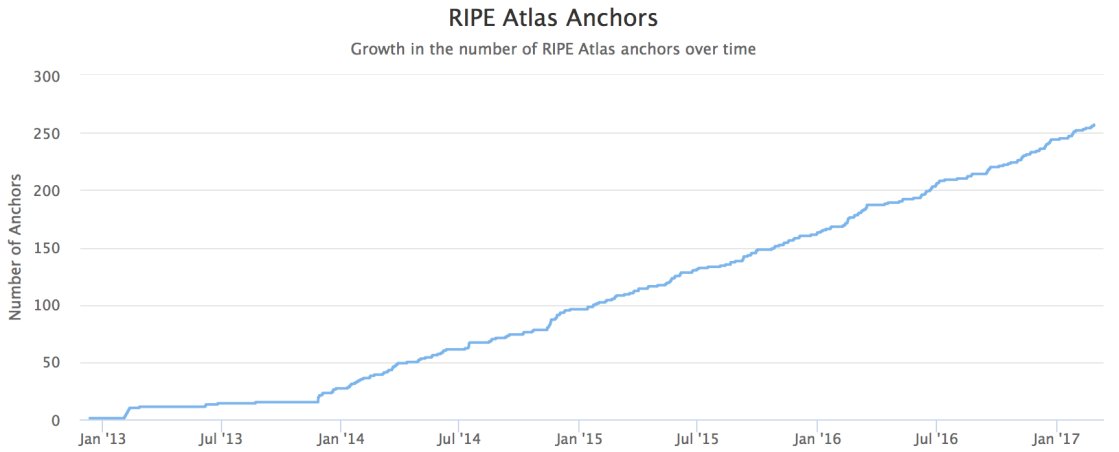
- Around the world



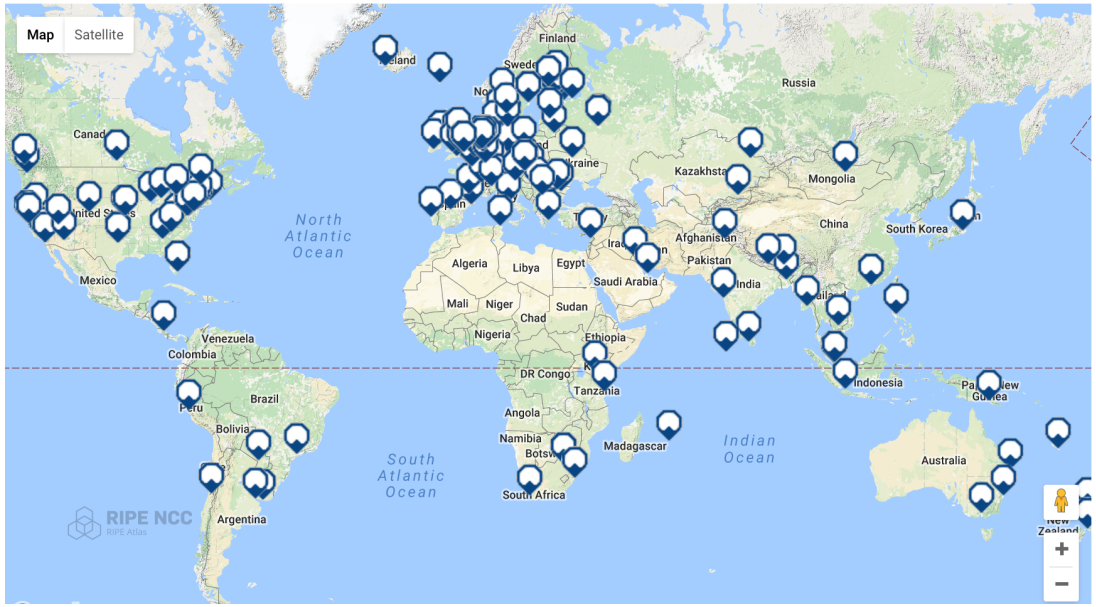
What is RIPE Atlas (2)

Composed by: **Anchors**

- 250+

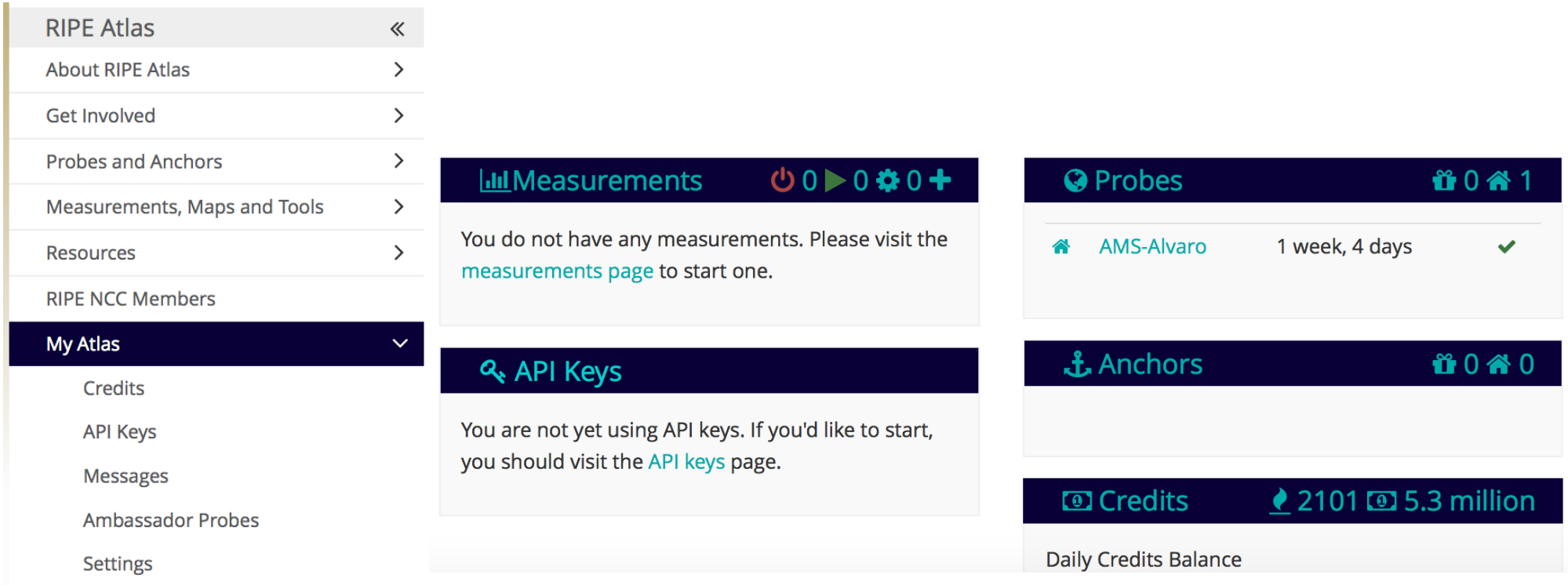


- Around the world



What is RIPE Atlas (3)

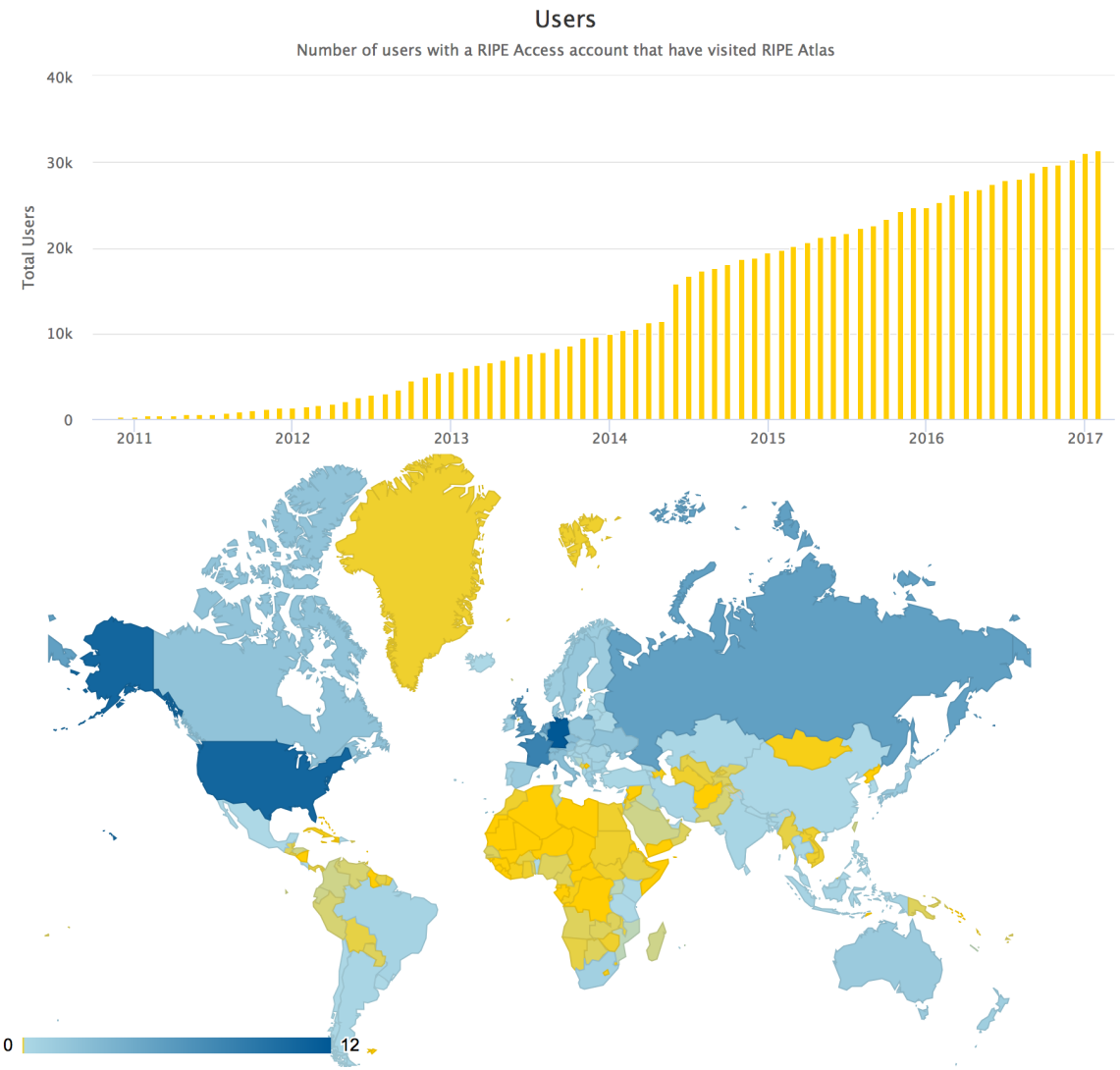
Composed by: **Web interface / API / CLI**



What is RIPE Atlas (4)

Composed by: **RIPE Atlas Community**

- Users
- Hosts
  - Probes
  - Anchors
- Sponsors
- Ambassadors



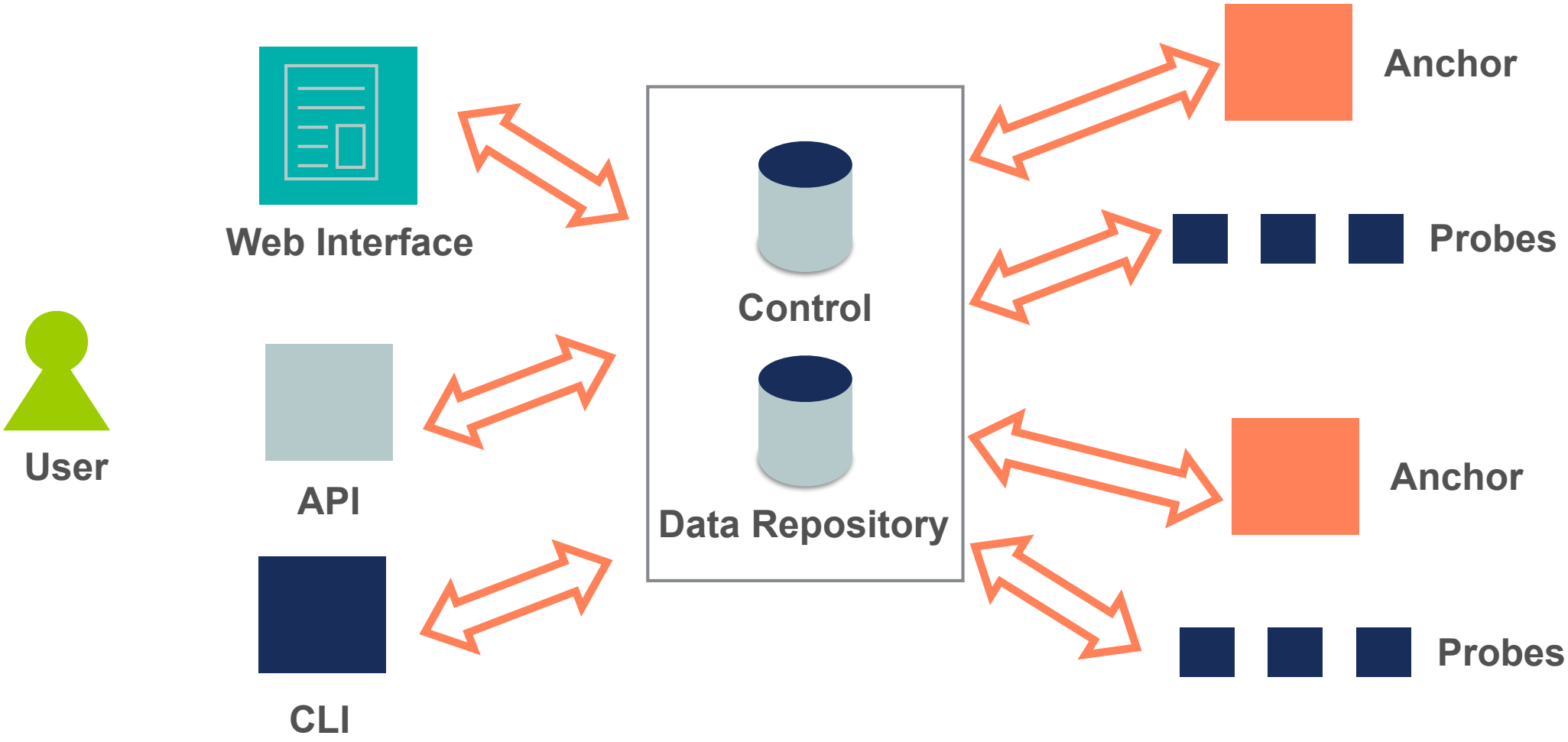
What is RIPE Atlas (5)

Composed by: **Measurements**

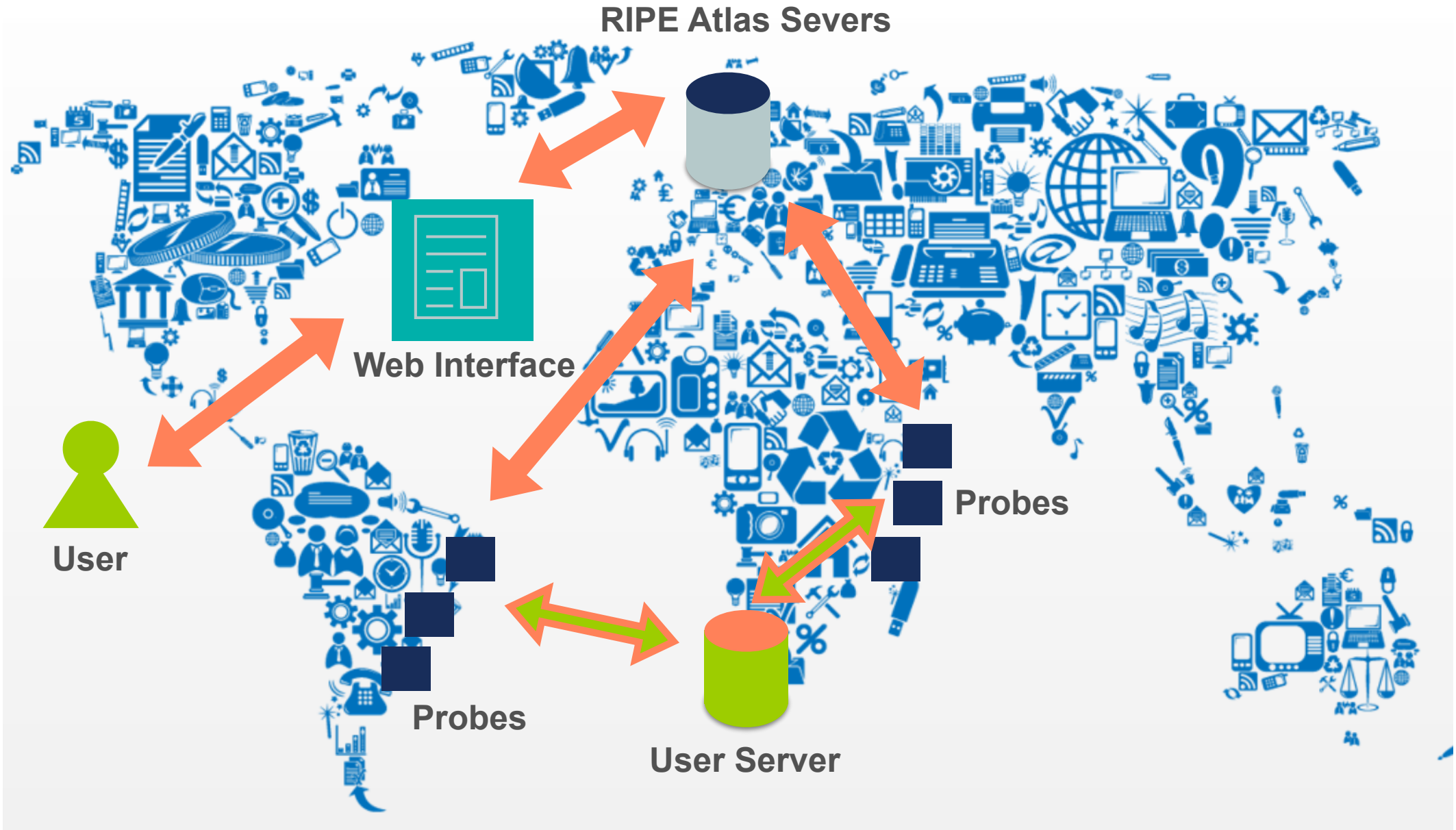
Measurements currently running

	Built-in	User-defined			
		Total UDM	Anchoring	DNSMON	Other
Ping	41	4363	505	0	3858
Traceroute	45	3303	507	817	1979
DNS	158	4869	0	3268	1601
SSL/TLS Certificate	4	225	0	0	225
NTP	0	44	0	0	44
HTTP	4	540	506	0	34

RIPE Atlas Overview (1)



RIPE Atlas Overview (2)



How

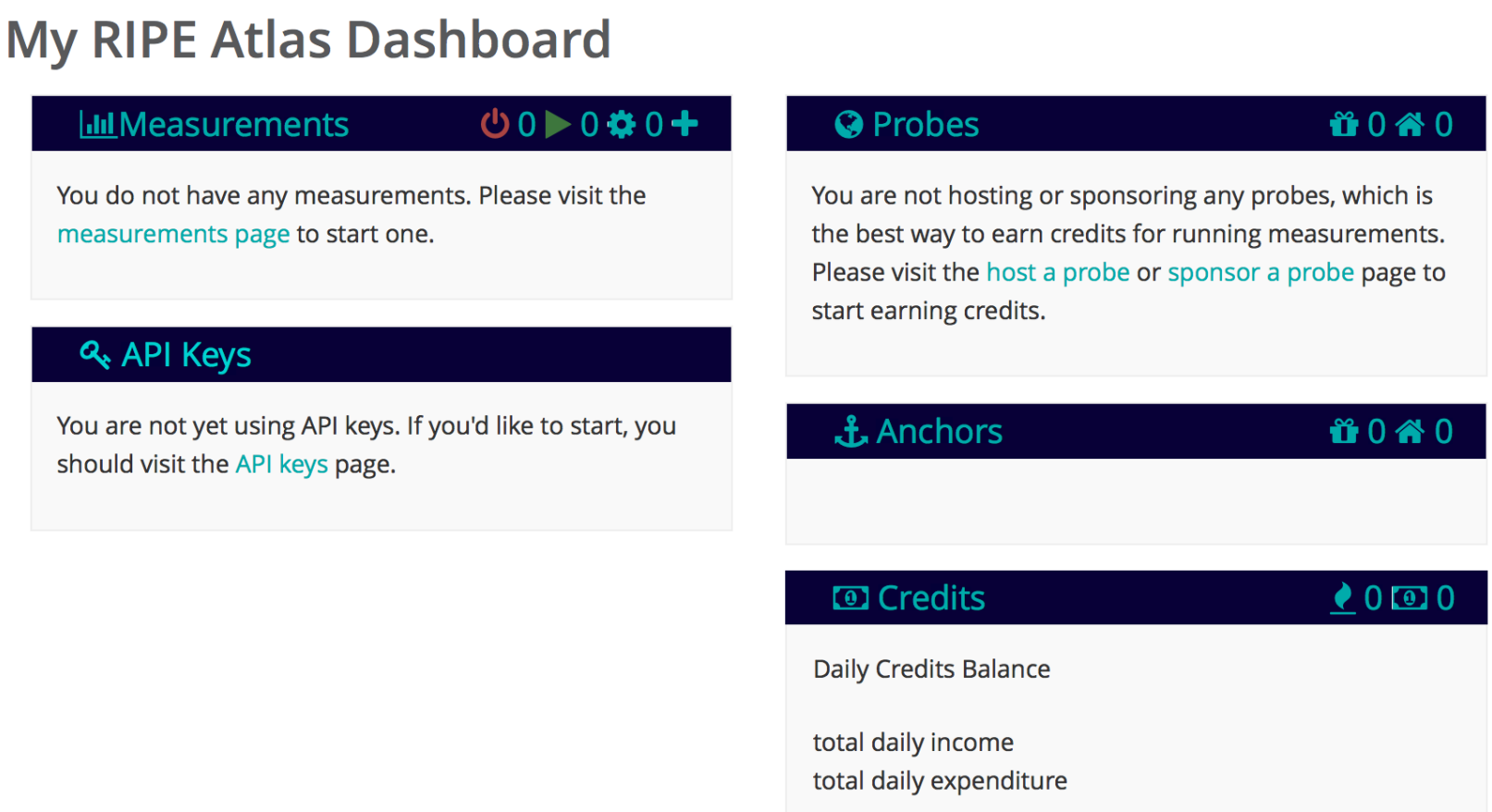
How can you use it?

How to use RIPE Atlas

- User friendly web interface, API or CLI
- System based on credits
- Create measurements (ping, trace route, etc.)
- Access (historical) data

How to Access RIPE Atlas

- RIPE NCC Access account (http://access.ripe.net)
- RIPE Atlas -> My Atlas (http://atlas.ripe.net)



Credits

- Every measurement has a cost in credits
- Why? Fairness and avoid overload
- How to earn credits?
  1. Hosting a probe / anchor
  2. Being an RIPE NCC member (LIR)
  3. Being RIPE Atlas sponsor
  4. Transfer
  5. Voucher…

RIPE Atlas measurements

- **Built-in** global measurements towards root nameservers
  - Visualised as Internet traffic maps
- **Built-in** regional measurements towards “anchors”
- **Users** can run customised measurements

Highlights

- Six types of measurements: ping, traceroute, DNS, SSL/TLS, NTP and HTTP (to anchors)
- APIs and CLI tools to start measurements and get results
- Streaming data for real-time results
- Status checks (Icinga & Nagios)
- New: “Time Travel”, LatencyMON, DomainMON

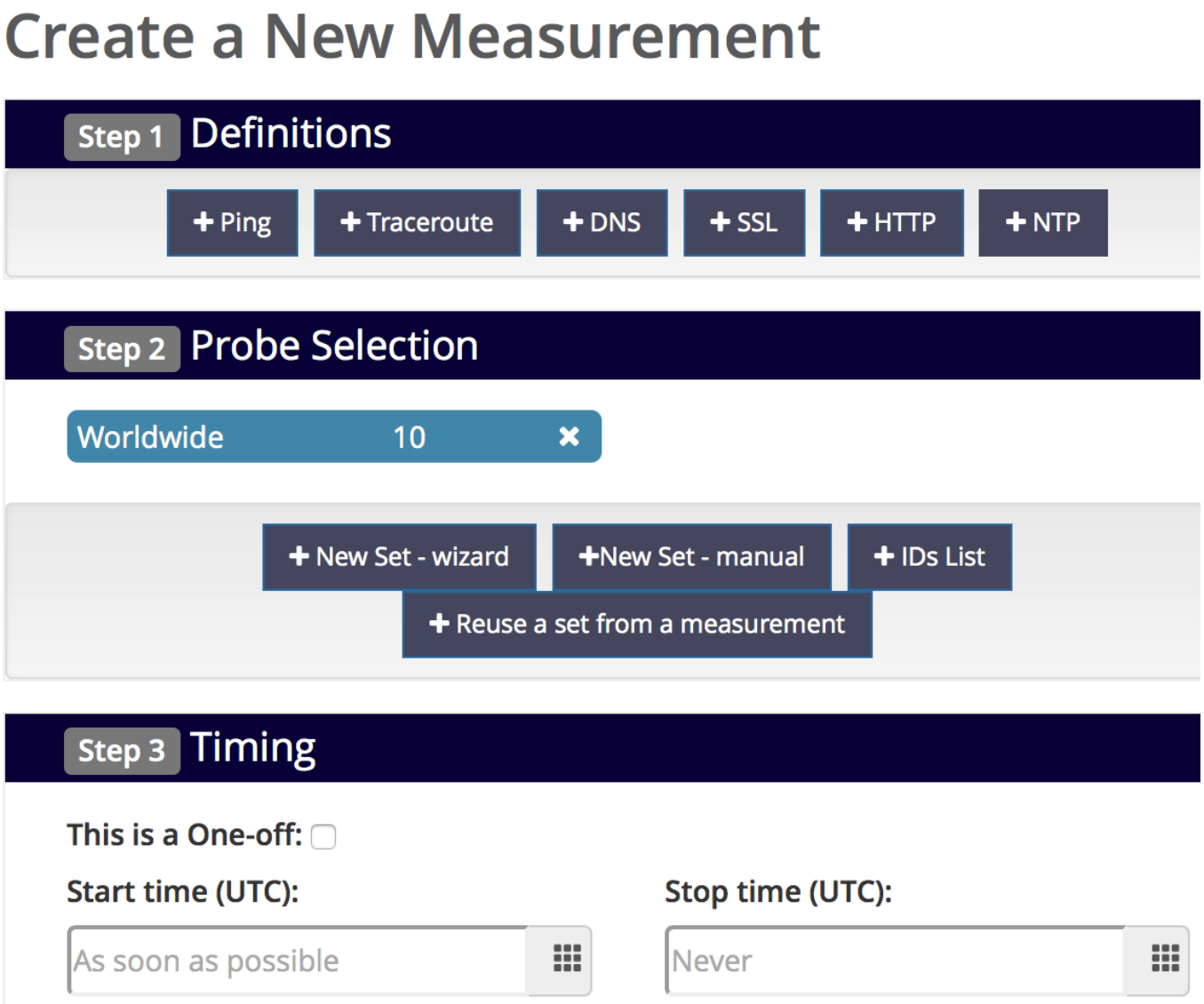
Security Aspects

- Probes:
  - Hardware trust material (regular server address, keys)
  - No open ports; initiate connection; NAT is okay
  - Don’t listen to local traffic
  - No passive measurements
  - Automatic FW updates
- Measurements triggered by “command servers”
  - Inverse ssh tunnels
- Source code published

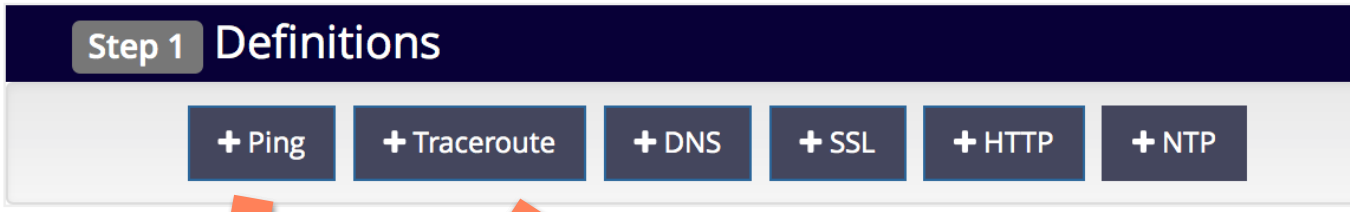
Ethical Considerations

- No passive measurements (no user traffic)
- Set of measurements is limited
- HTTP measurements only to Anchors
- All data is open and available to anyone
- Barrier to entry is low/cheap
- Open API’s
- Open source code on GitHub

Creating Measurements (1)



Creating Measurements (2)



Ping measurement

Target:

An IP address or hostname

Address Family*: IPv4

Packets: 3

Size: 48

Description: Ping measurement

Interval: 240

How often this should be done (seconds between samples). Note that this value is ignored for one-off measurements.

Resolve on Probe:

Force the probe to do DNS resolution

Advanced Options

Packet interval:

Time between packets (ms)

Spread:

Spread of uniformly distributed random probe start time phase

Skip DNS check:

Disables target DNS check on measurement creation

Traceroute measurement

Target*:

An IP address or hostname

Address Family*: IPv4

Timeout (ms): 4000

Description: Traceroute measurement

Protocol*: ICMP

Interval: 900

How often this should be done (seconds between samples). Note that this value is ignored for one-off measurements.

Resolve on Probe:

Force the probe to do DNS resolution

Advanced Options

Packets: 3

Size: 48

Size of the packet

First Hop: 1

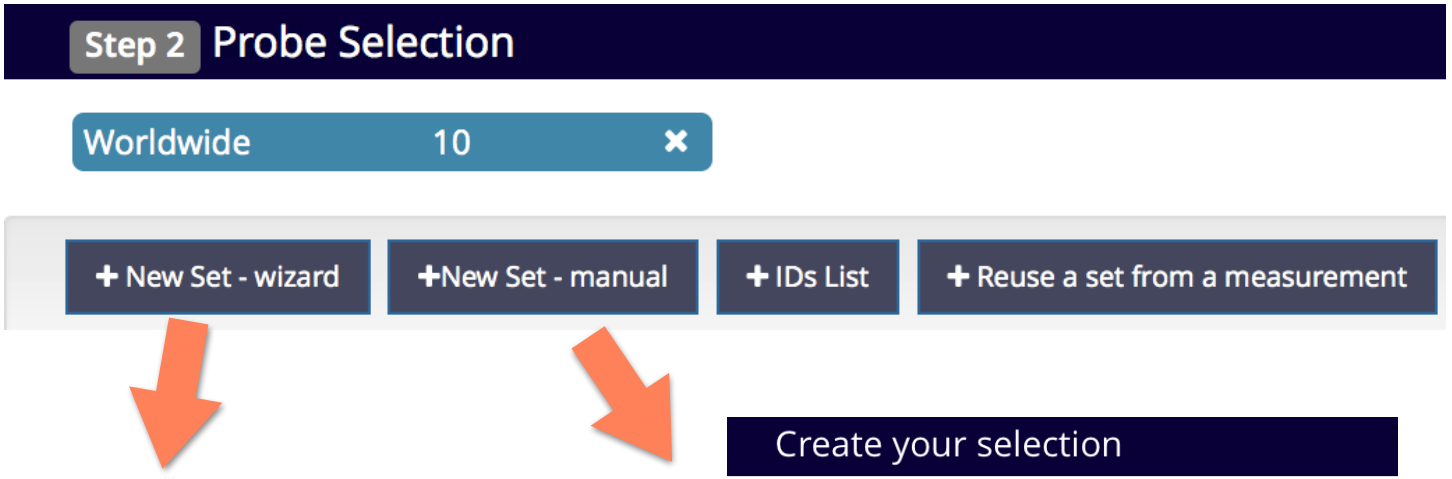
Paris: 16

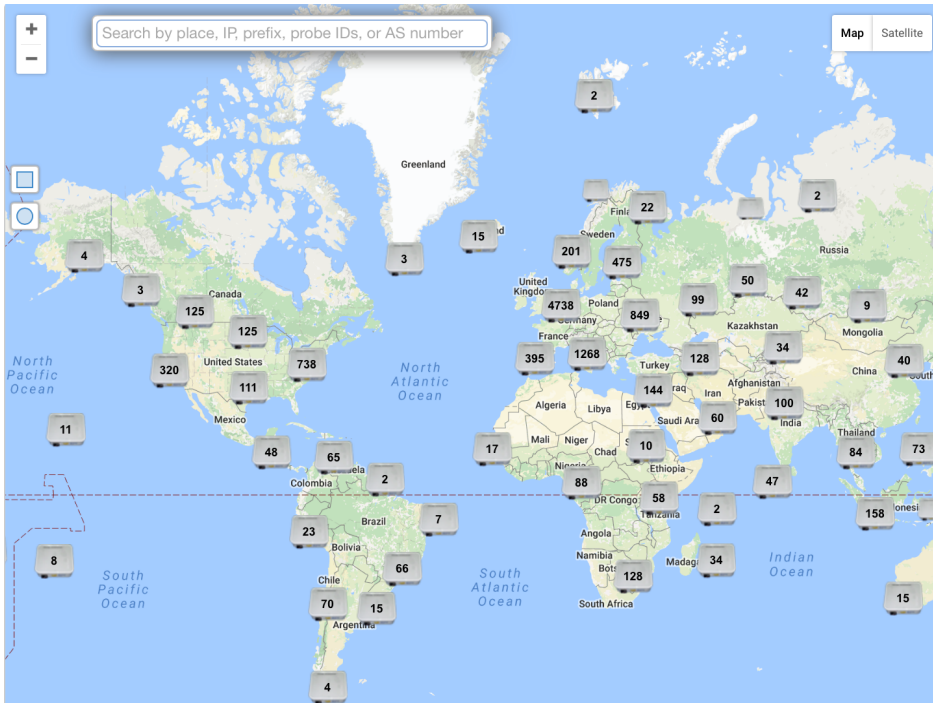
Number of different variations for paris traceroute. Set 0 for standard traceroute.

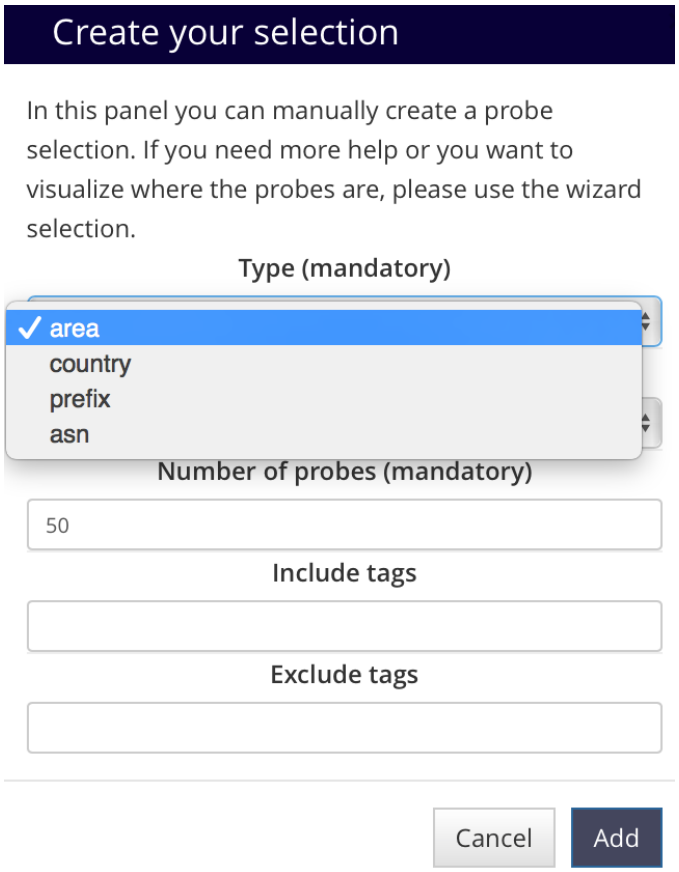
Destination Extension Header Size: 0

The size of the destination extension header to include in the IPv6 packet.

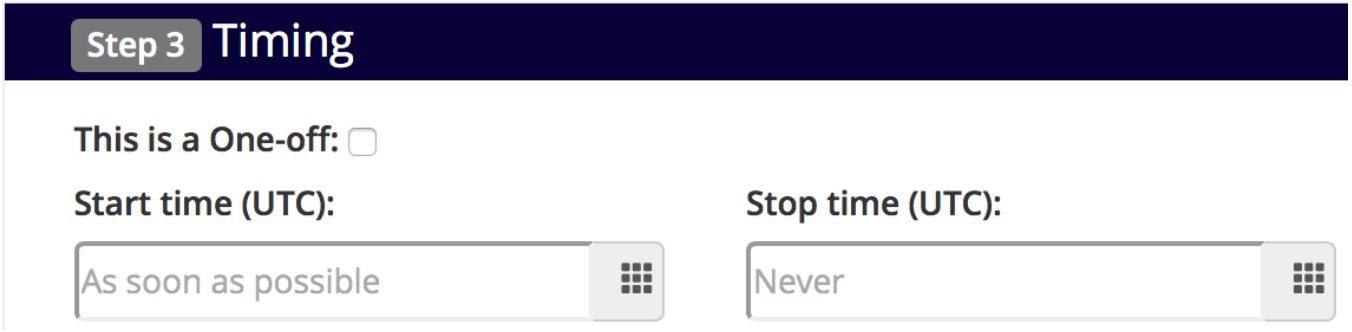
Creating Measurements (3)



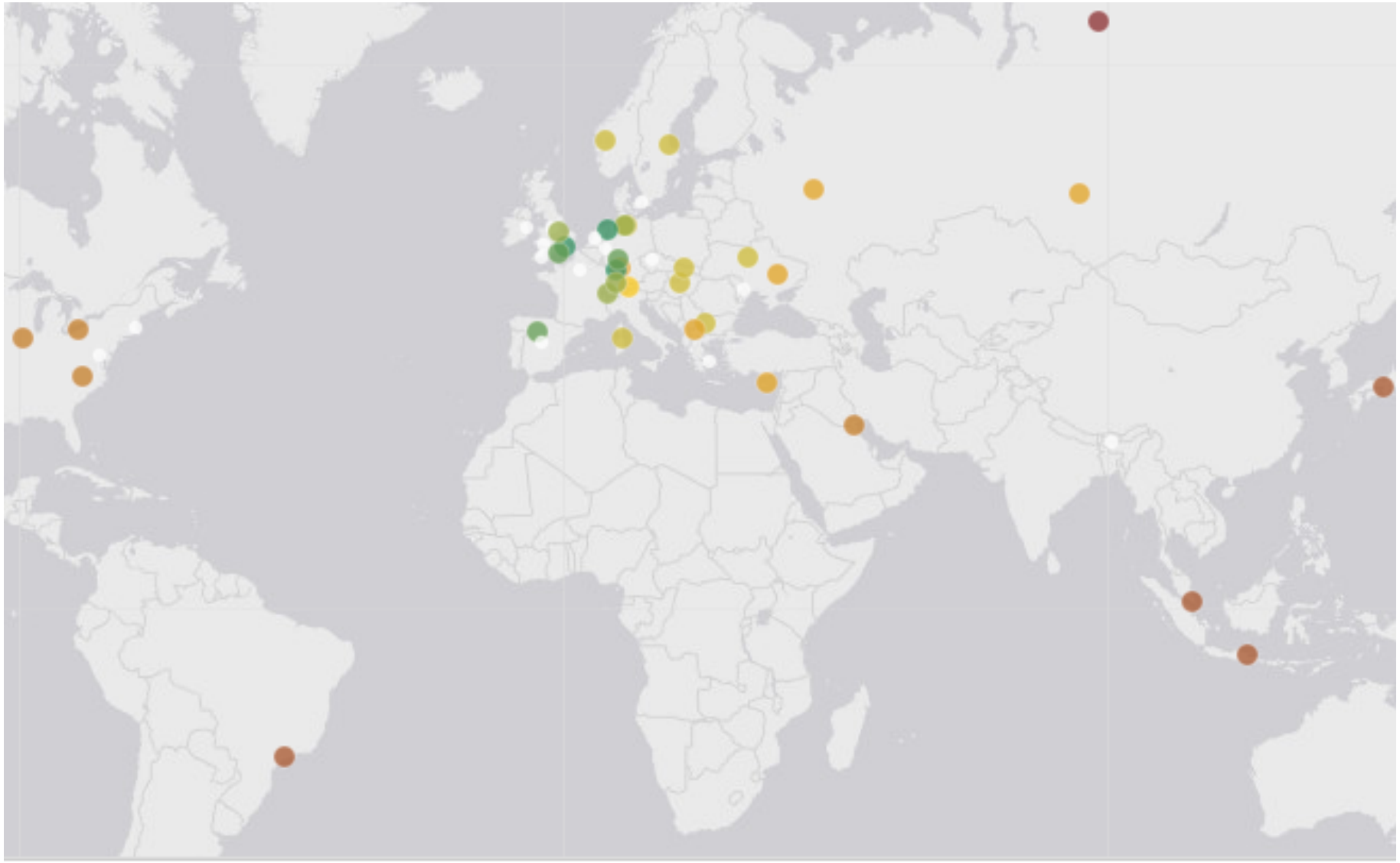




Creating Measurements (4)



Globe reachability check: traceroute

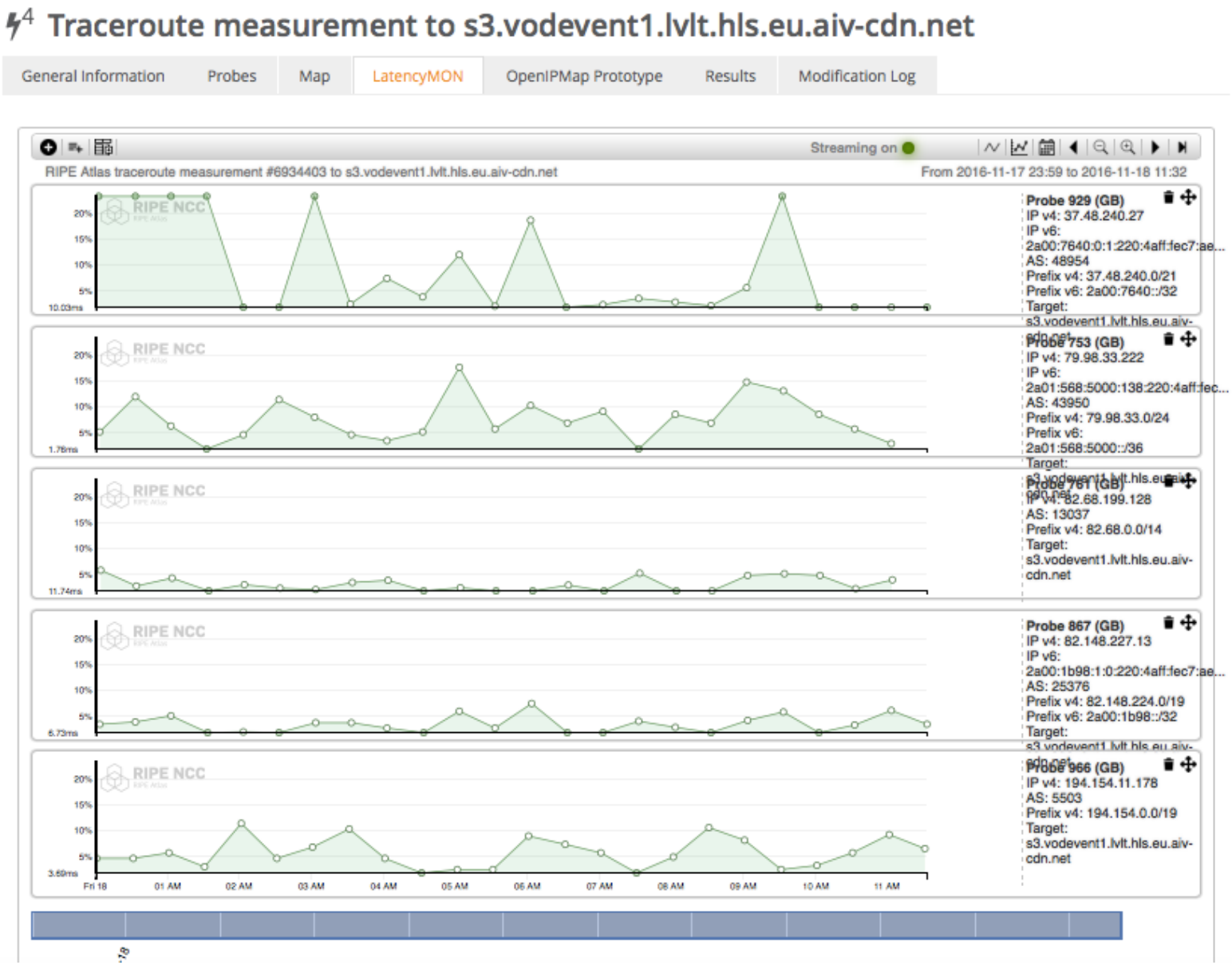


Traceroute view: list

General Information | Probes | Map | LatencyMON | OpenIPMap Prototype | Results | Modification

Probe	ASN (IPv4)	ASN (IPv6)	Time (UTC)	RTT	Hops
2713	60706	60706	2016-11-18 10:52	33.192	14
2941	25394		2016-11-18 10:51	50.783	20
3055	6412		2016-11-18 10:53	150.683	15
3222	6829		2016-11-18 10:49	36.686	24
4166	50581		2016-11-18 10:52	39.533	16
4554	6703		2016-11-18 10:51	82.704	19
4952	3244		2016-11-18 10:51	35.700	19
6078	202040	202040	2016-11-18 10:47	9.279	14
6091	5459	5459	2016-11-18 10:50	9.719	14
6112	197216	197216	2016-11-18 10:52	33.767	11
6139	18106	18106	2016-11-18 10:47	216.946	19
10166	5379		2016-11-18 10:49	60.850	19
10282	49009	49009	2016-11-18 10:47	32.699	11
10312	11426		2016-11-18 10:49	116.443	29

Traceroute view: LatencyMon



Use cases

Examples of RIPE Atlas use

Use cases (1)

Using RIPE Atlas to Validate International Routing Detours

Anant Shah — 30 Jan 2017

A Quick Look at the Attack on Dyn

Massimo Candela — 24 Oct 2016

Contributors: Emile Aben

Using RIPE Atlas to Monitor Game Service Connectivity

Annika Wickert — 14 Sep 2016

Using RIPE Atlas to Measure Cloud Connectivity

Jason Read — 06 Sep 2016

Using RIPE Atlas to Debug Network Connectivity Problems

Stéphane Bortzmeyer — 10 May 2016

RIPE Atlas IXP Country Jedi (1)

- Do paths between ASes stay in country?
- Any difference between IPv4 and IPv6?
- How many paths go via local IXP?
- Could adding peers improve reachability?

- Experimental tool
  - Feature requests welcome!
  - Depends on probe distribution in country

RIPE Atlas IXP Country Jedi (2)

- Methodology
  - **Trace route mesh** between RIPE Atlas probes
  - Identifying ASNs in country using RIPEstat
  - Identifying IXP and IXP LANs in PeeringDB

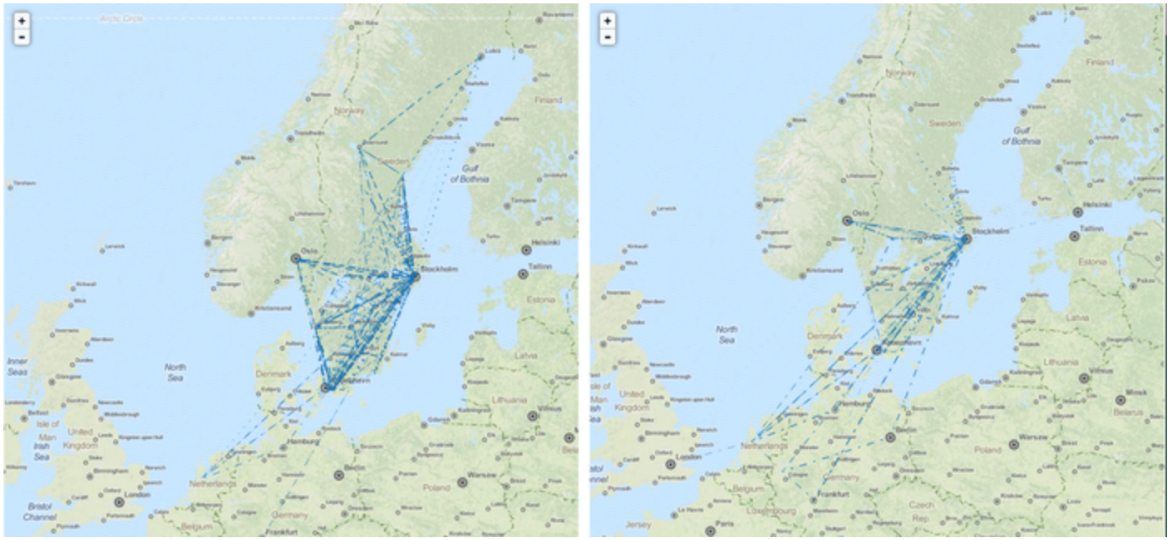
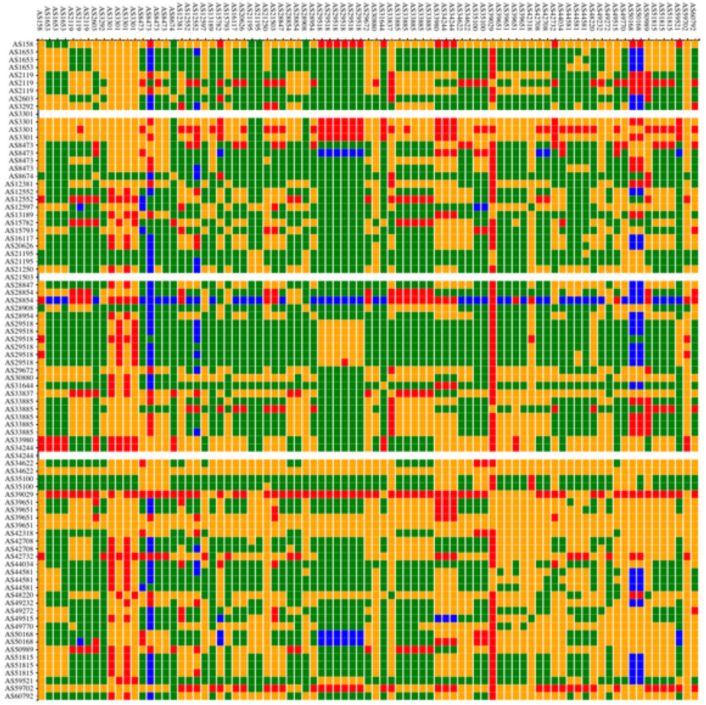


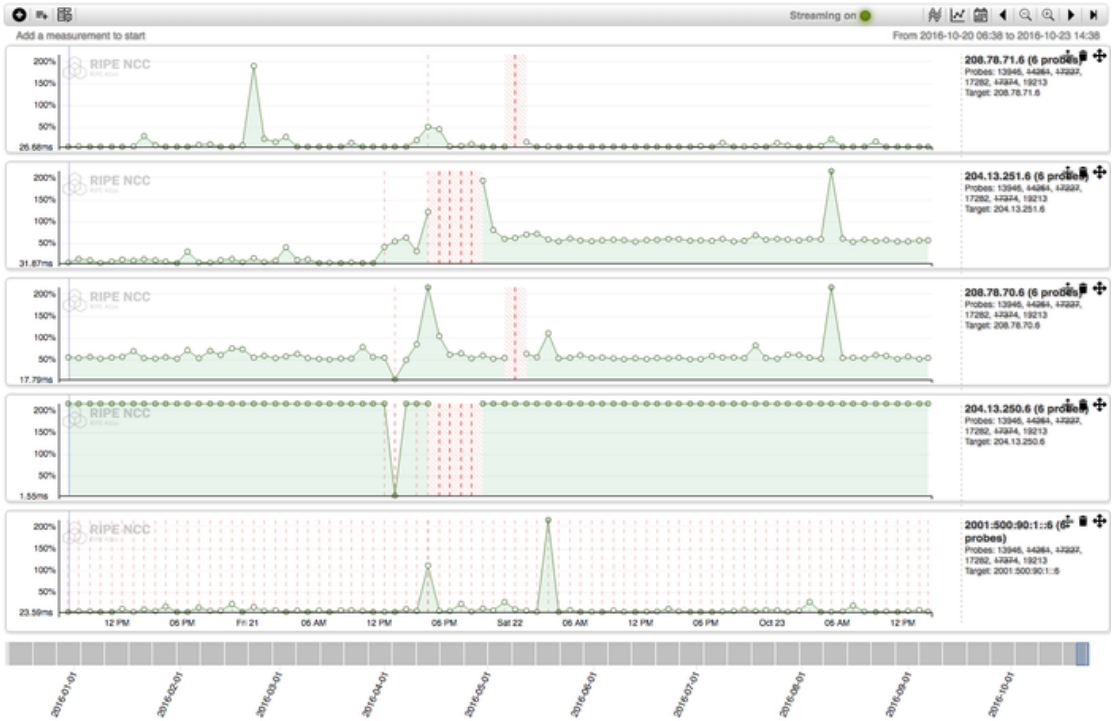
Figure 1: Visual representation of IPv4 paths (left) and IPv6 paths (right) between selected RIPE Atlas probes in Sweden



IXP IPs: YES, out-of-country IPs: NO
IXP IPs: NO, out-of-country IPs: NO
IXP IPs: YES, out-of-country IPs: YES
IXP IPs: NO, out-of-country IPs: YES

Use Cases (2)

- DDoS Attack on Dyn DNS Servers (Oct. 2016)
  - 10s millions devices - Mirai botnet
  - Legitimate requests

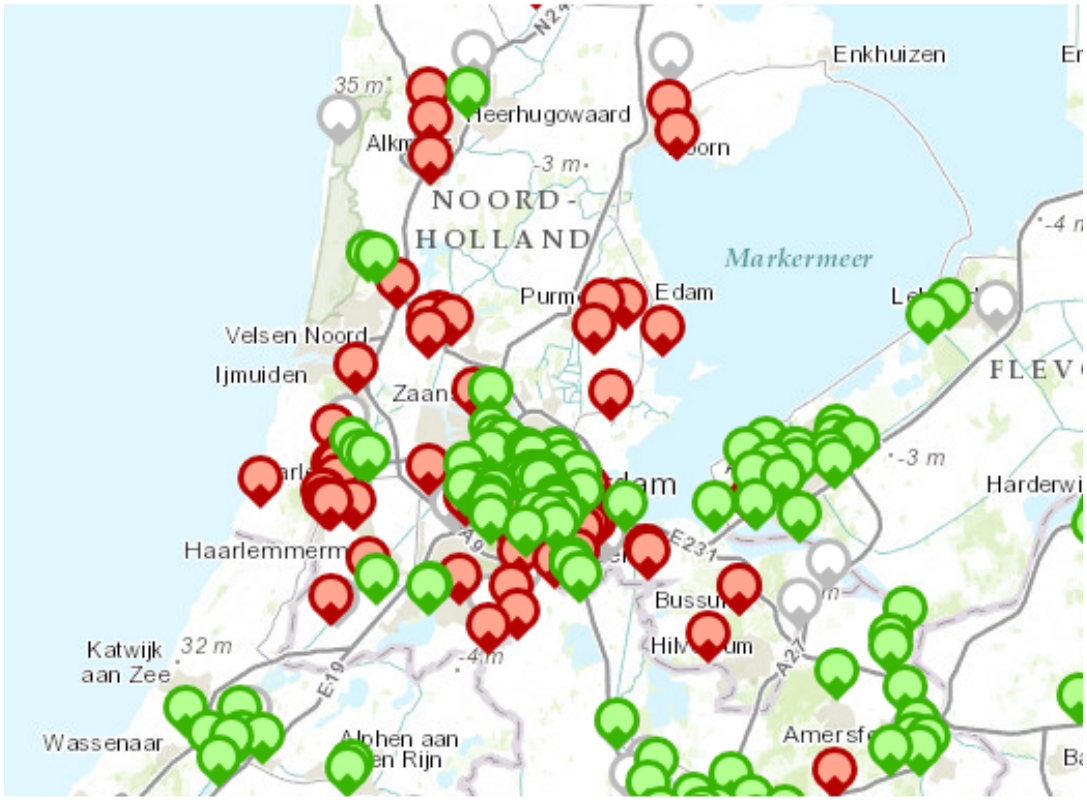


Use Cases (3)

- Monitor Game Service Connectivity (Sept. 2016)
- Requirements:
  - Check General Reachability, Latency, Historical data
  - Supported by an active and helpful community
  - Integrate with their existing logging system
- Track down an outage in one upstream
- Became sponsors

Use Cases (4)

- Amsterdam Power Outage (March 2015)
- When and were the outage was happening



Training

- Webinar
- Training Course

- All material available at RIPE web site

  https://www.ripe.net

RIPE Atlas Contact Info

- https://atlas.ripe.net
- http://roadmap.ripe.net/ripe-atlas/

- Users' mailing list: ripe-atlas@ripe.net
- Articles and updates: https://labs.ripe.net/atlas
- Questions and bugs: atlas@ripe.net
- Twitter: @RIPE_Atlas and #RIPEAtlas

Questions

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