



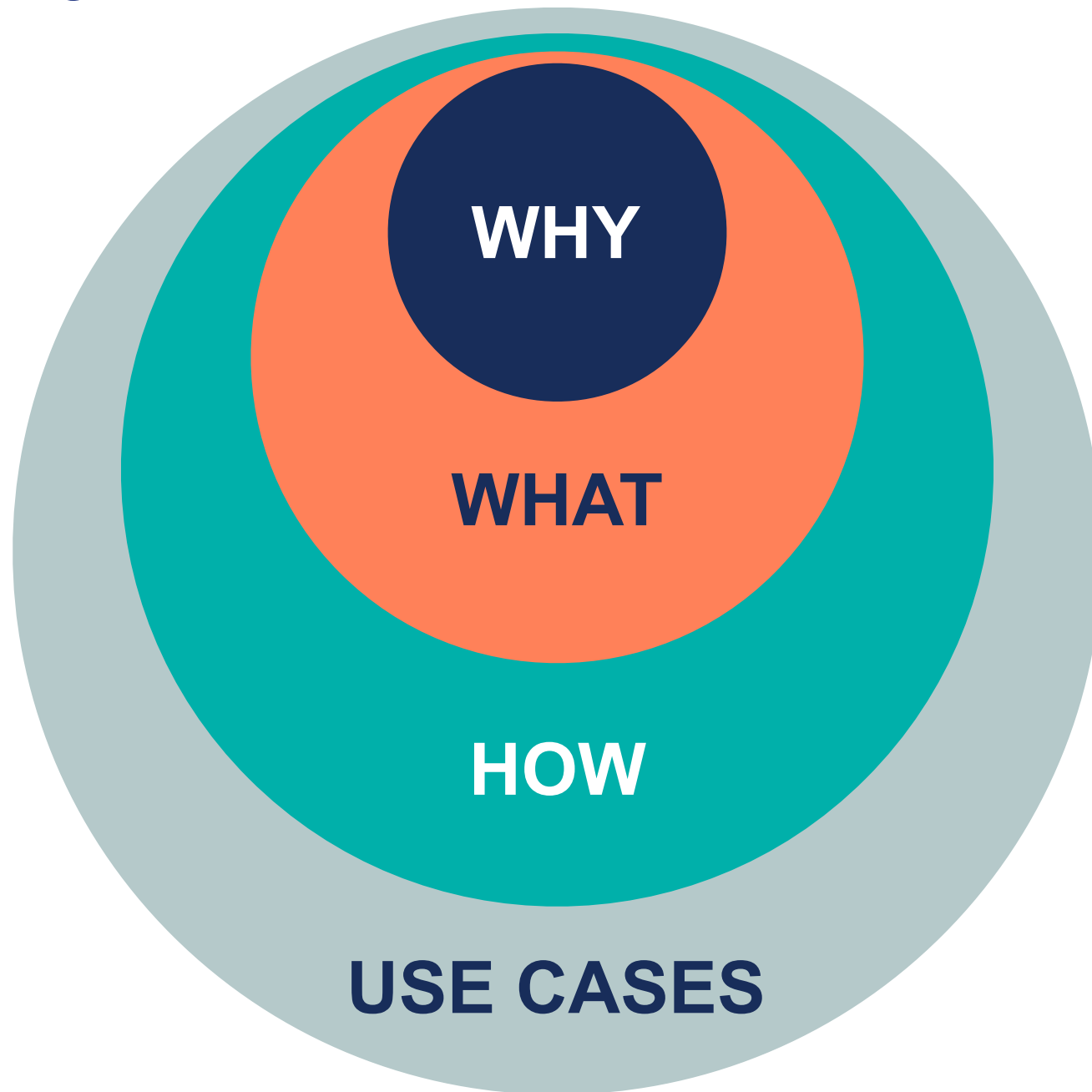
RIPE NCC
RIPE NETWORK COORDINATION CENTRE

RIPE Atlas

Measuring the Internet

Alvaro Vives | 20 March 2017 | TROOPERS17 - NGI

Overview



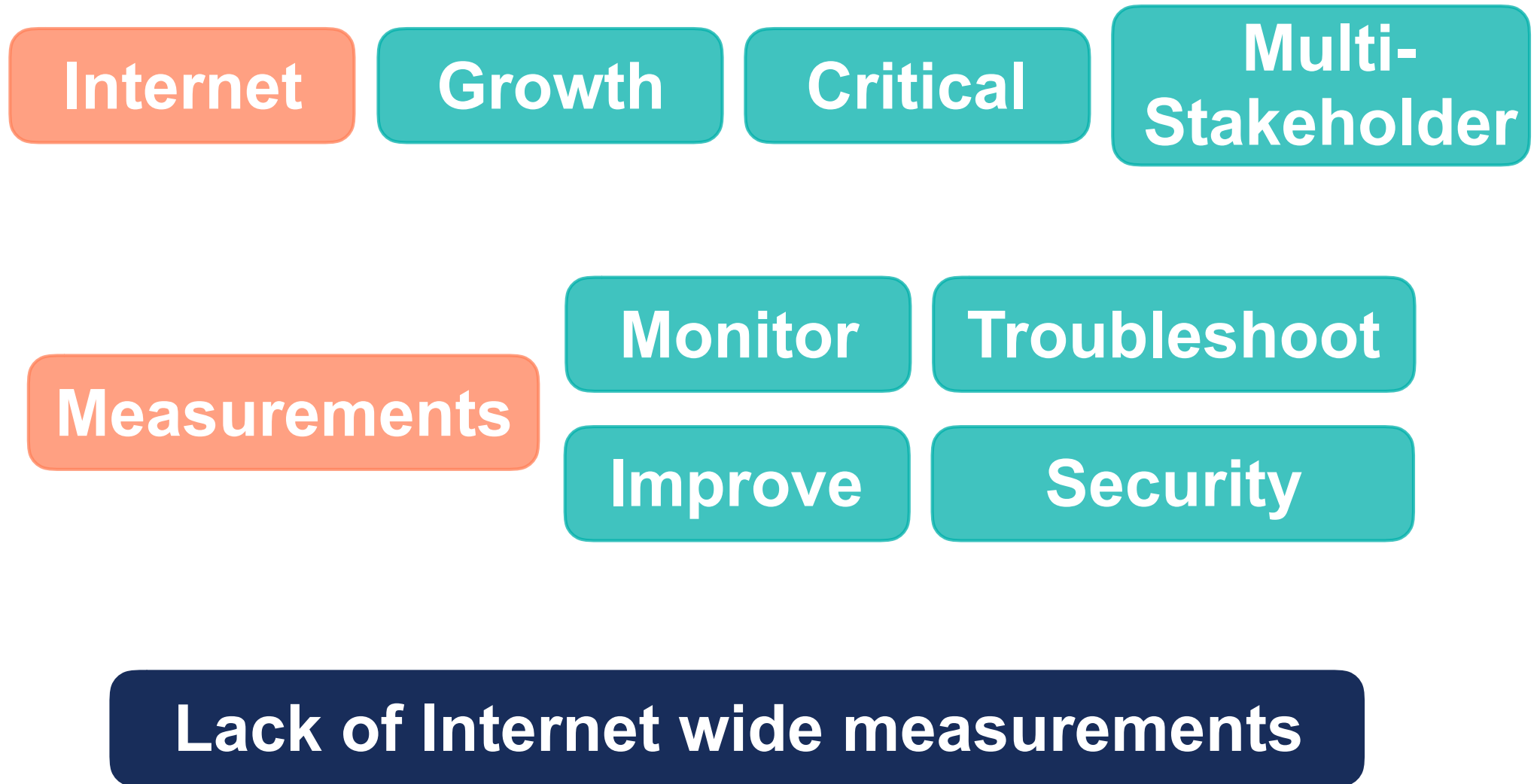


Why

What is it useful for?



Why RIPE Atlas? (1)





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



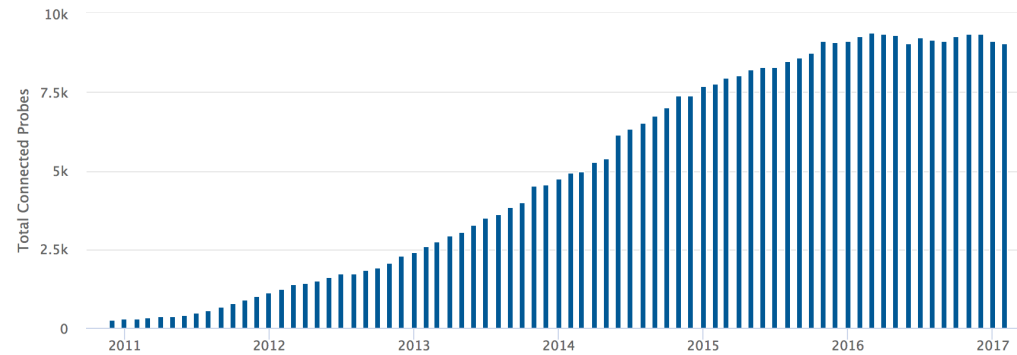
What is RIPE Atlas (1)

Composed by: **Probes**



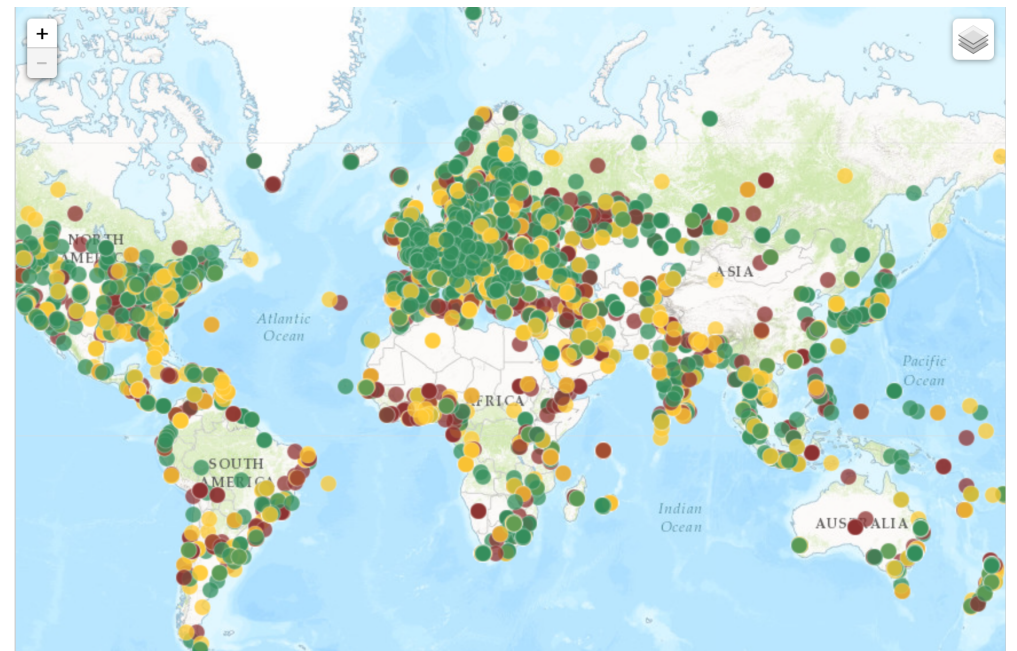
Probes

The number of connected probes



- 9400+

- Around the world





What is RIPE Atlas (2)

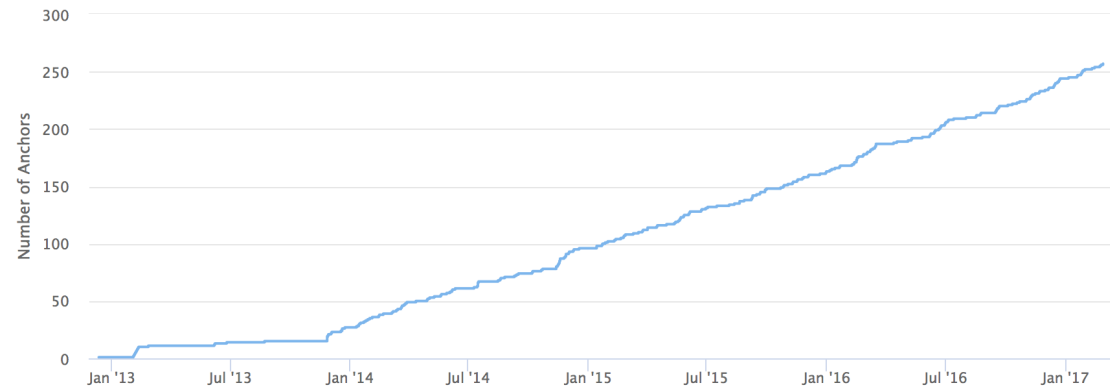
Composed by: **Anchors**



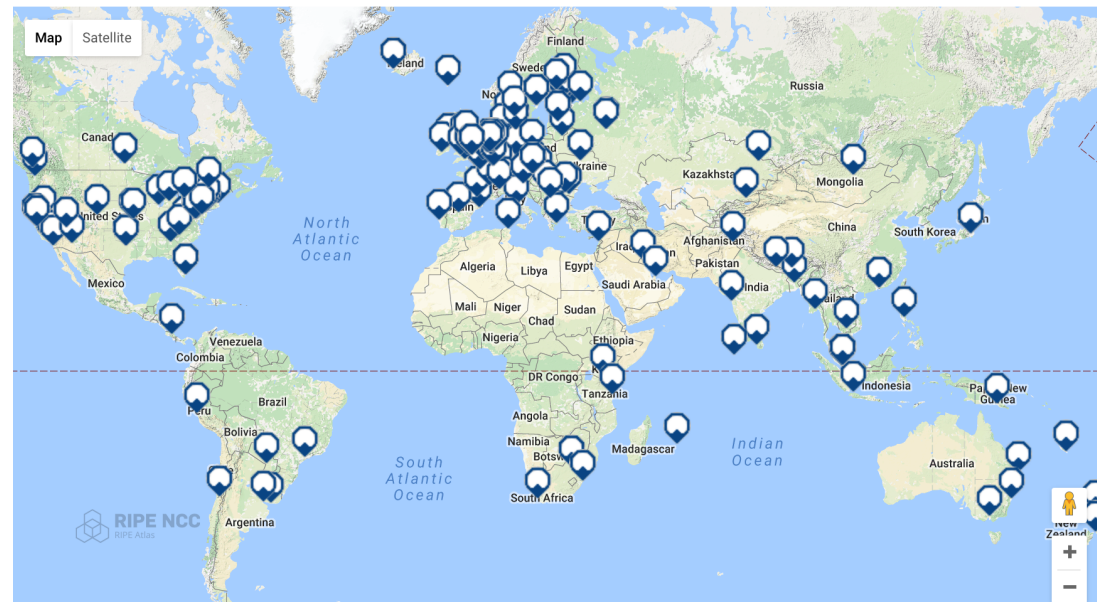
- 250+

RIPE Atlas Anchors

Growth in the number of RIPE Atlas anchors over time



- Around the world





What is RIPE Atlas (3)

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

The screenshot displays the RIPE Atlas web interface. On the left is a navigation menu with the following items: RIPE Atlas (selected), About RIPE Atlas, Get Involved, Probes and Anchors, Measurements, Maps and Tools, Resources, RIPE NCC Members, My Atlas (expanded), Credits, API Keys, Messages, Ambassador Probes, and Settings. The main content area features several widgets: 1. 'Measurements' widget: Shows 0 measurements with icons for power, play, settings, and add. Text: 'You do not have any measurements. Please visit the [measurements page](#) to start one.' 2. 'API Keys' widget: Shows 0 API keys. Text: 'You are not yet using API keys. If you'd like to start, you should visit the [API keys page](#).' 3. 'Probes' widget: Shows 0 probes with a home icon. List item: 'AMS-Alvaro' (home icon), '1 week, 4 days', and a green checkmark. 4. 'Anchors' widget: Shows 0 anchors with a home icon. 5. 'Credits' widget: Shows 2101 credits with a flame icon and 5.3 million credits with a coin icon. Below it is a 'Daily Credits Balance' section.



What is RIPE Atlas (4)

Composed by: **RIPE Atlas Community**

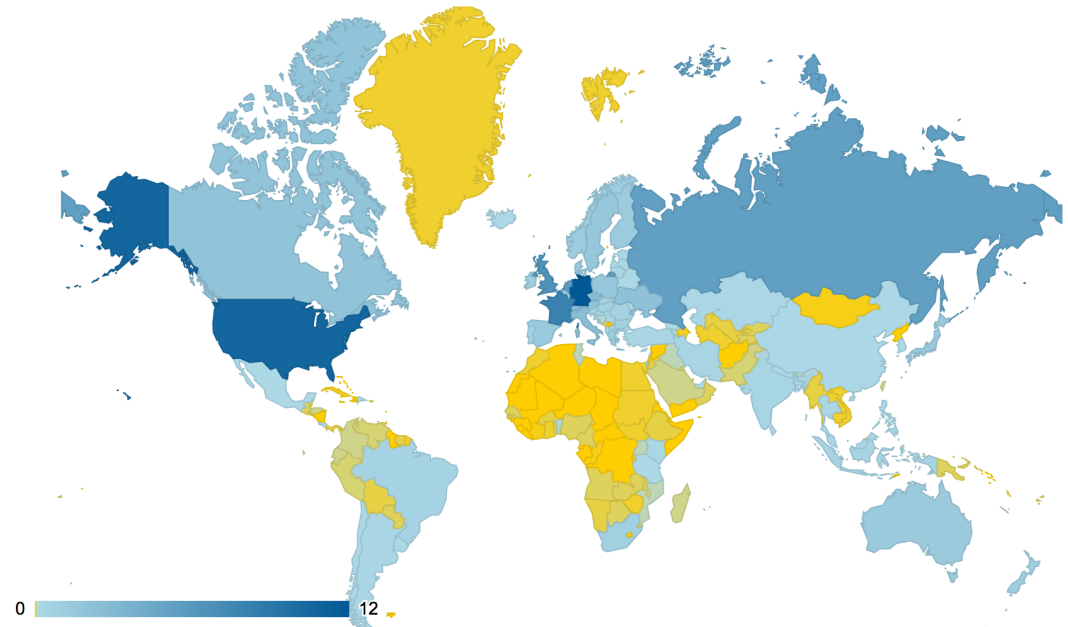
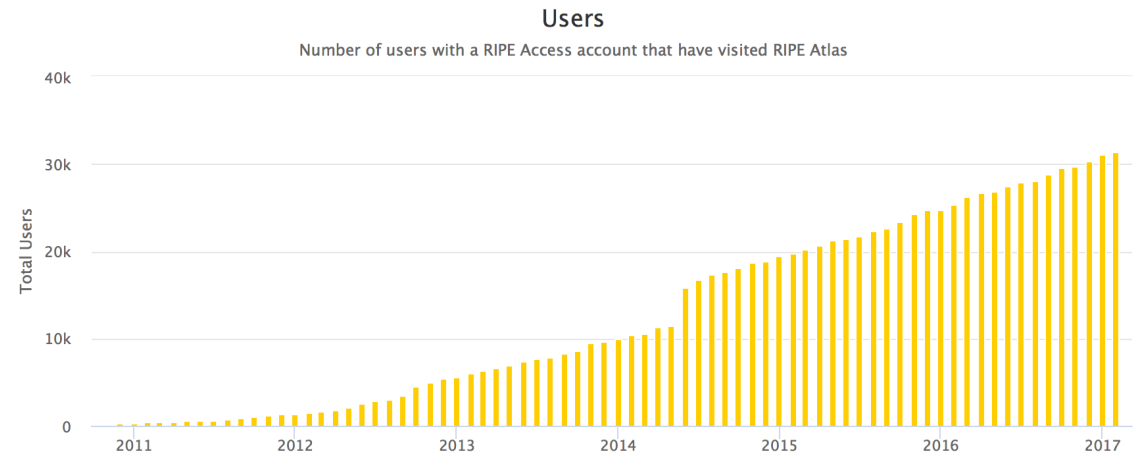
- **Users**

- **Hosts**

- Probes
- Anchors

- **Sponsors**

- **Ambassadors**





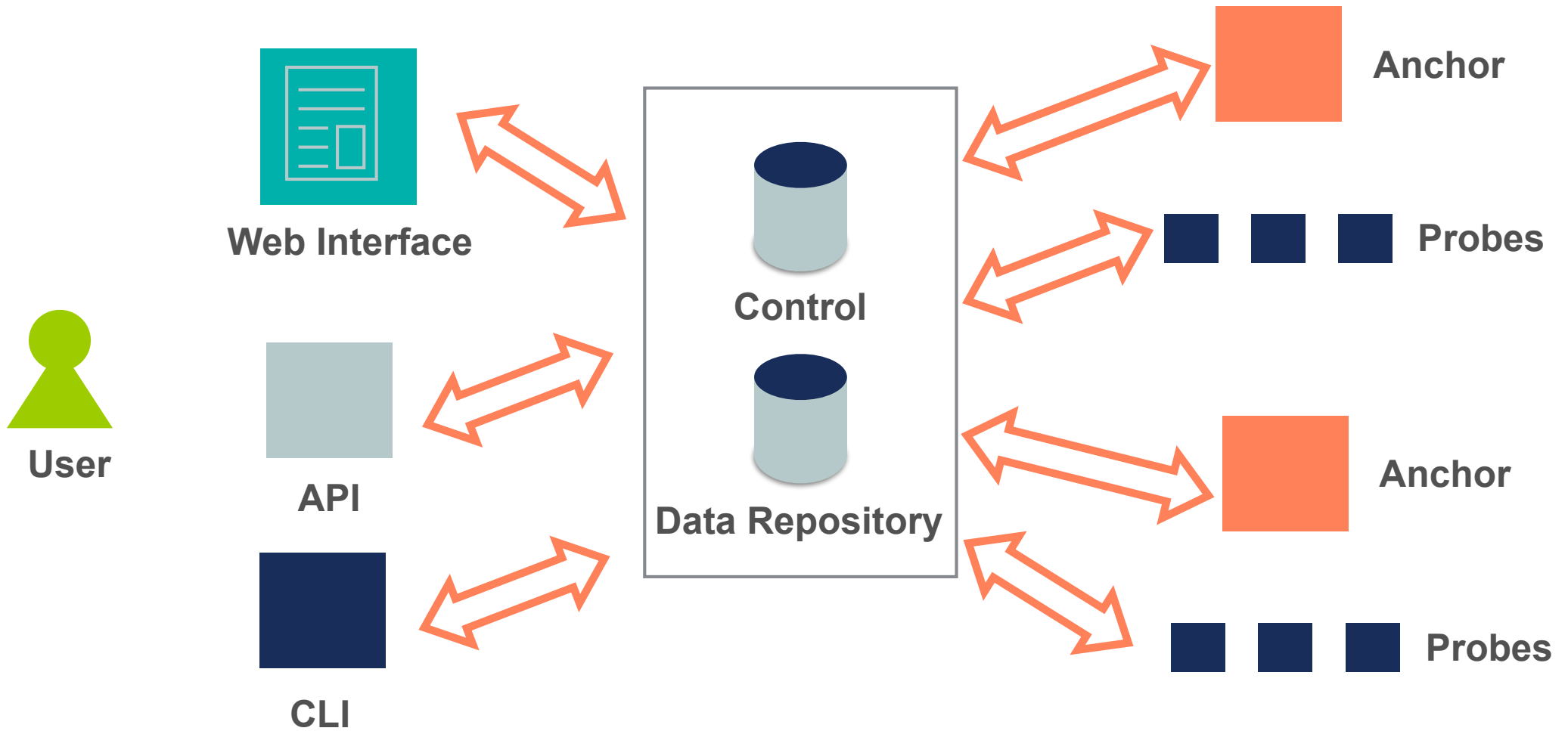
What is RIPE Atlas (5)

Composed by: **Measurements**

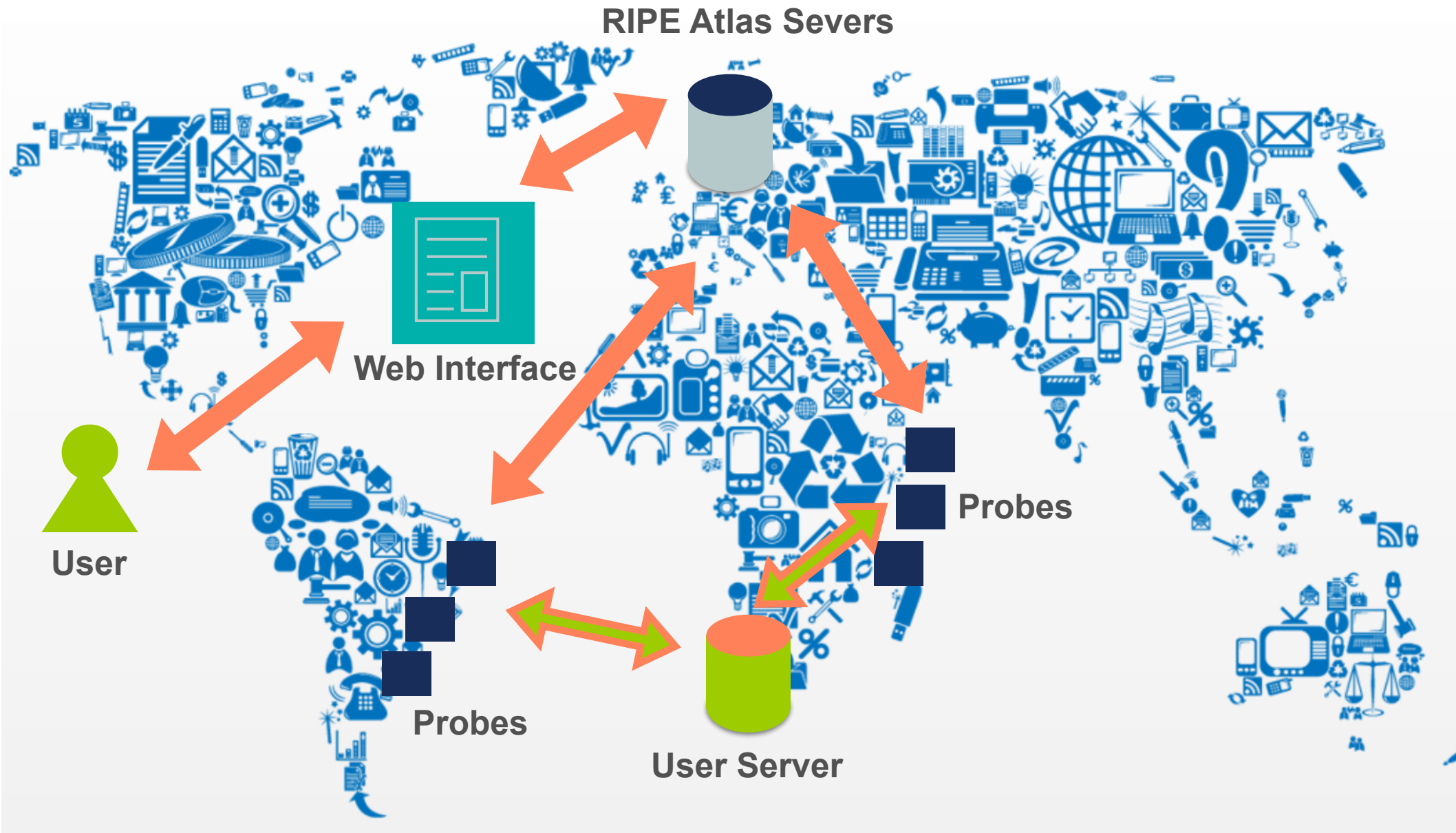
Measurements currently running

	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>)

My RIPE Atlas Dashboard

Measurements 0 0 0 +

You do not have any measurements. Please visit the [measurements page](#) to start one.

API Keys

You are not yet using API keys. If you'd like to start, you should visit the [API keys](#) page.

Probes 0 0

You are not hosting or sponsoring any probes, which is the best way to earn credits for running measurements. Please visit the [host a probe](#) or [sponsor a probe](#) page to start earning credits.

Anchors 0 0

Credits 0 0

Daily Credits Balance

total daily income
total daily expenditure



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)

Create a New Measurement

Step 1 Definitions

+ Ping

+ Traceroute

+ DNS

+ SSL

+ HTTP

+ NTP

Step 2 Probe Selection

Worldwide

10



+ New Set - wizard

+ New Set - manual

+ IDs List

+ Reuse a set from a measurement

Step 3 Timing

This is a One-off:

Start time (UTC):

As soon as possible



Stop time (UTC):

Never



Creating Measurements (2)



Step 1 Definitions

+ Ping

+ Traceroute

+ DNS

+ SSL

+ HTTP

+ NTP

▼ Ping measurement ✕

Target:

An IP address or hostname

Address Family*:
IPv4

Packets:
3

Size:
48

Advanced Options

Packet interval:

Time between packets (ms)

Skip DNS check:
Disables target DNS check on measurement creation

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

Spread:

Spread of uniformly distributed random probe start time phase

▼ Traceroute measurement ✕

Target*:

An IP address or hostname

Address Family*:
IPv4

Timeout (ms):
4000

Advanced Options

Packets:
3

Size:
48
Size of the packet

First Hop:
1

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

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)

Step 2 Probe Selection

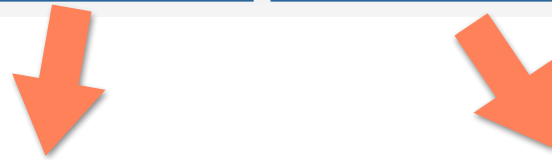
Worldwide 10 ✕

+ New Set - wizard

+ New Set - manual

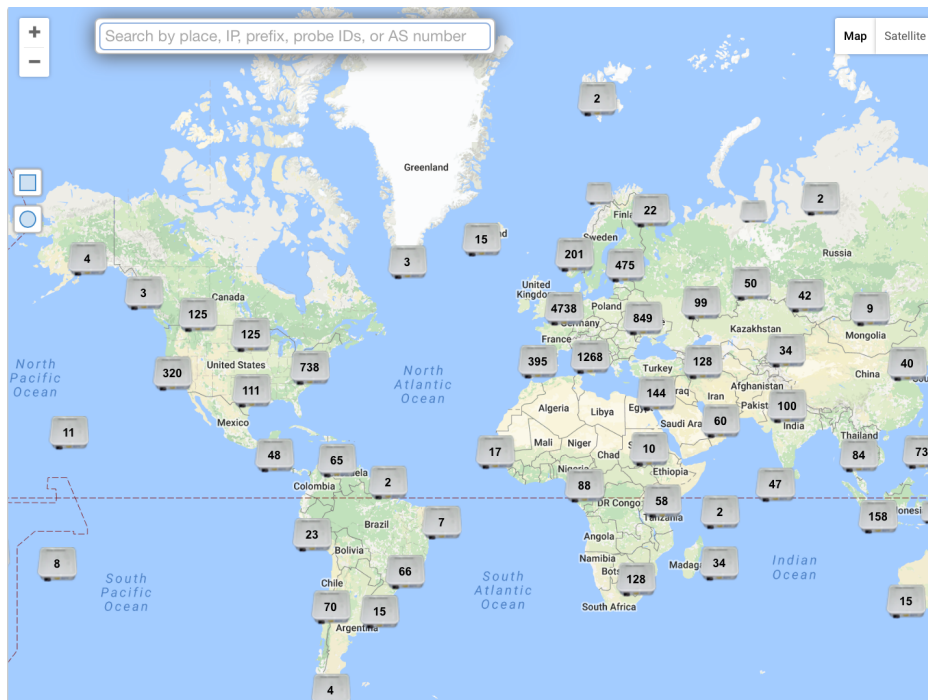
+ IDs List

+ Reuse a set from a measurement



Create your selection

In this panel you can manually create a probe selection. If you need more help or you want to visualize where the probes are, please use the wizard selection.



Type (mandatory)

- area
- country
- prefix
- asn

Number of probes (mandatory)

50

Include tags

Exclude tags

Cancel Add



Creating Measurements (4)

Step 3 Timing

This is a One-off:

Start time (UTC):

As soon as possible

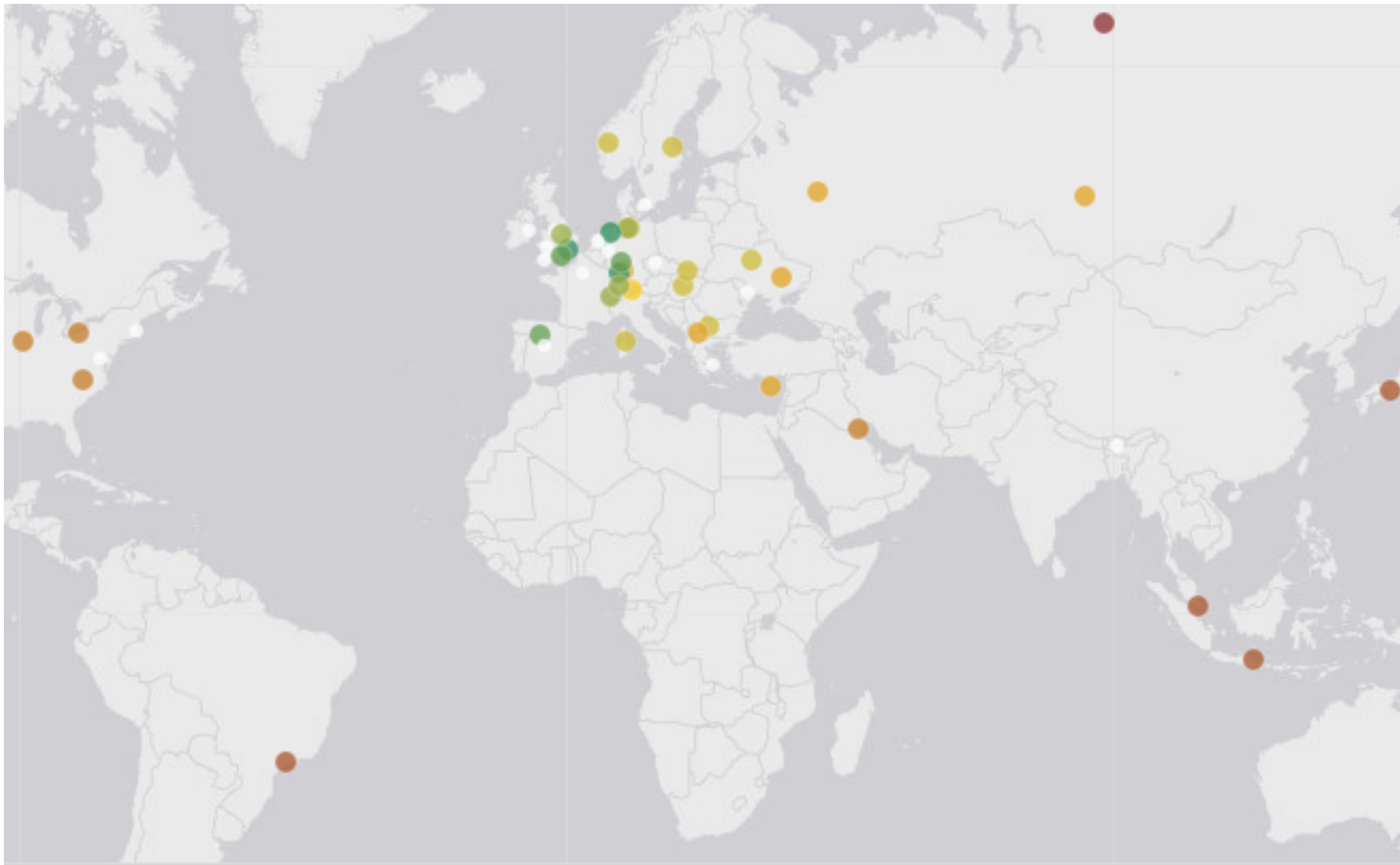


Stop time (UTC):

Never



Globe reachability check: traceroute





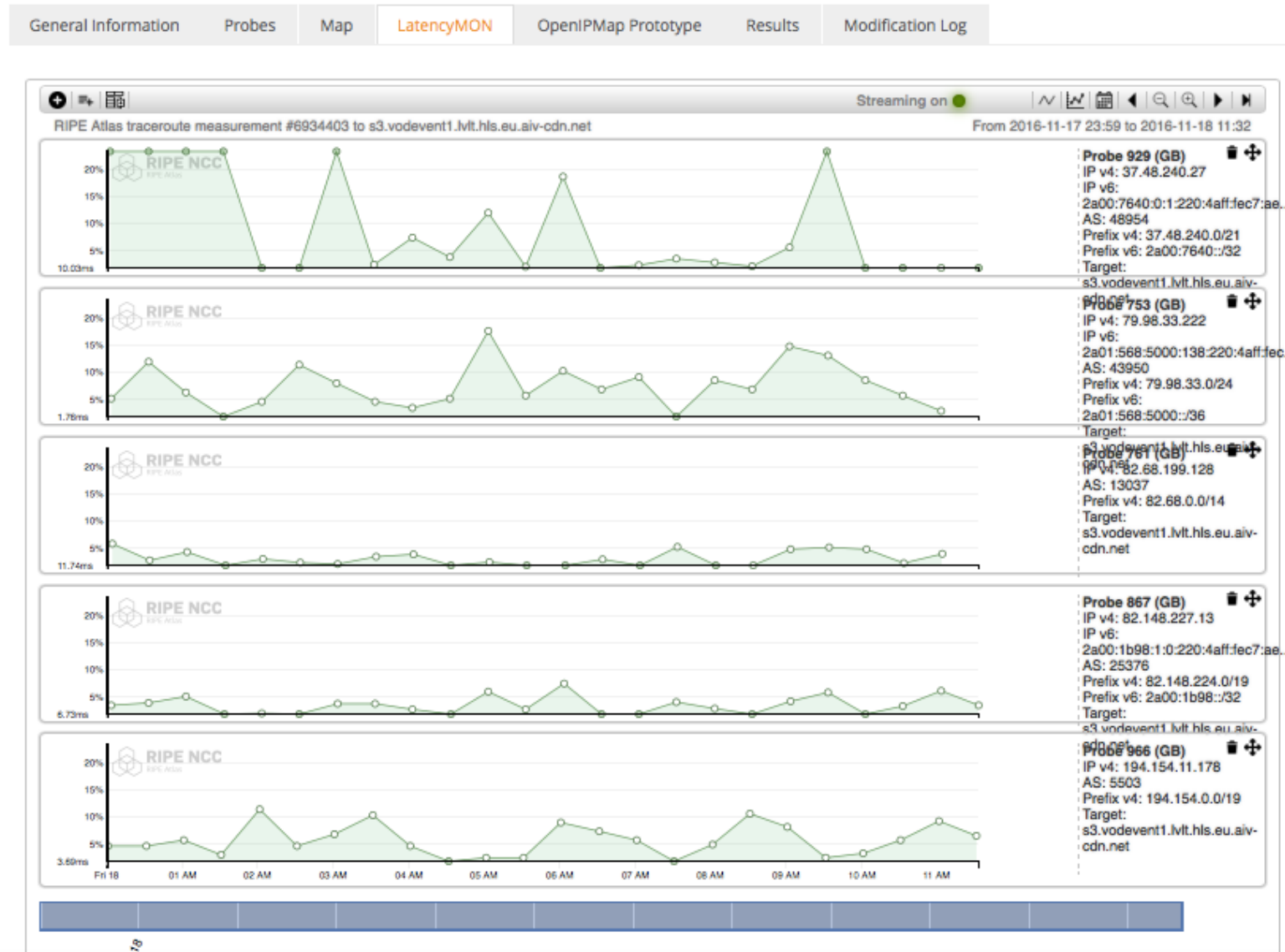
Traceroute view: list

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



⚡ Traceroute measurement to s3.vodevent1.lvl.hls.eu.aiv-cdn.net





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

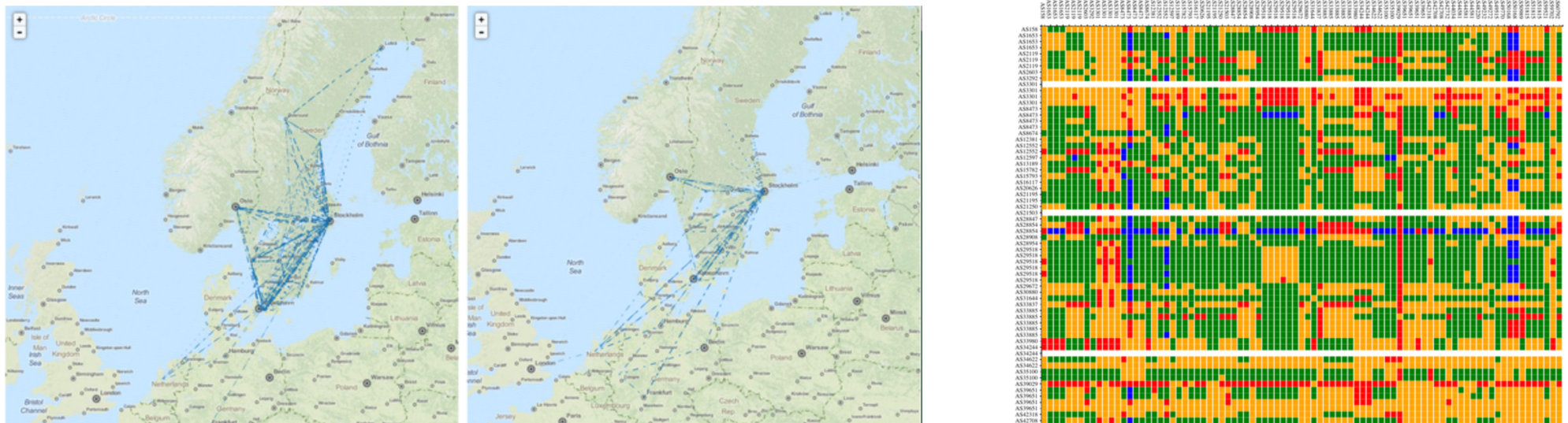


Figure 1: Visual representation of IPv4 paths (left) and IPv6 paths (right) between selected RIPE Atlas probes in Sweden

■ 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)

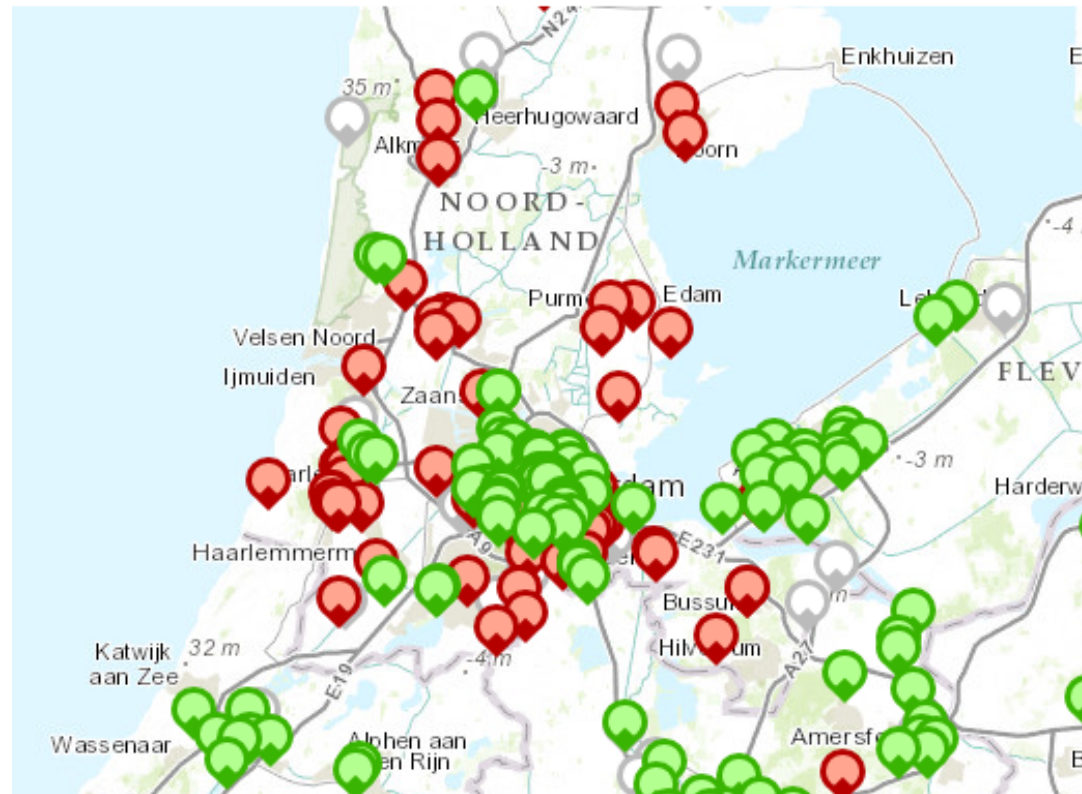
- Monitor Game Service Connectivity (Sept. 2016)
- Requirements:
 - Check General Reachability, Latency, Historical data
 - Supported by an active and helpful community
 - Integrate with their existing logging system
- Track down an outage in one upstream
- Became sponsors





Use Cases (4)

- Amsterdam Power Outage (March 2015)
- When and where 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



avives at ripe dot net