



RIPE NCC Webinar: Introduction for the DNS Measurements Hackathon

Vesna Manojlovic, Chris Amin

7 April 2017



Overview

- Introduction to RIPE NCC's data
- Introduction to other data sources
- Existing projects that need input

- Goals for this webinar
 - Learn about RIPE NCC's data & available FLOSS tools
 - Get a glimpse of potential projects / challenges
 - Get your questions answered



Goals for the hackathon

- bring together operators, researchers, designers, coders
- combine creative skills
- .. & get feedback for RIPE NCC
- contribute useful tools for DNS operators
- make new connections
- have fun!



memes.com



Hackathon Info & Contact

- <https://atlas.ripe.net/hackathon/dns-measurements/>
- List: dns-measurements-hackathon@ripe.net
- Pad: <https://pad.riseup.net/p/dns-measurements-hackathon>
 - an unofficial IRC channel: #ripeatlas @ Freenode
 - optional Facebook group



RIPE Atlas Introduction

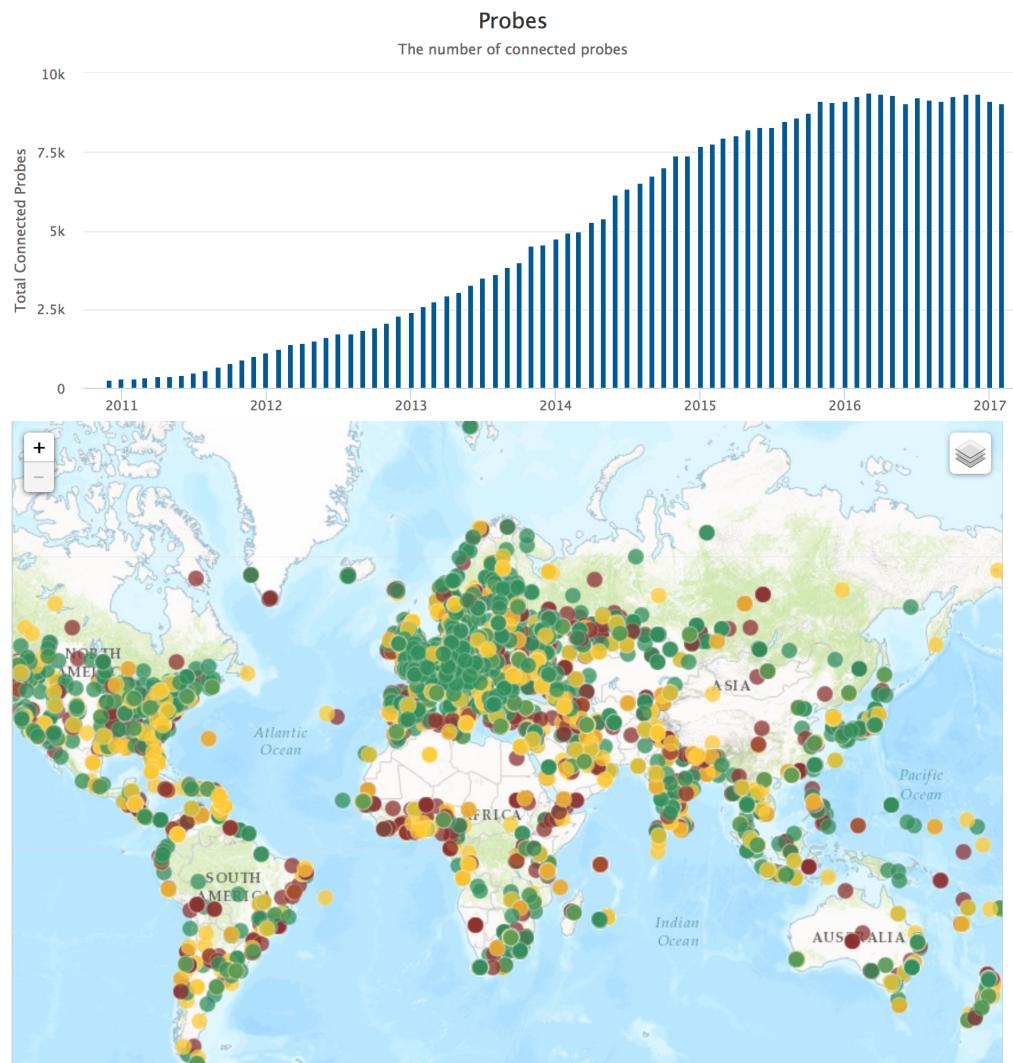


What is RIPE Atlas (1)

Composed by: Probes



- 9500+
- Around the world



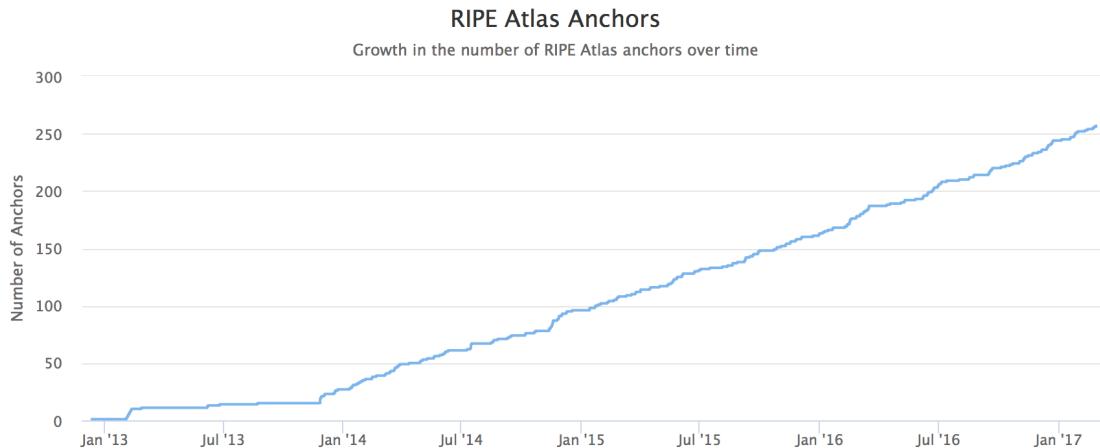
What is RIPE Atlas (2)



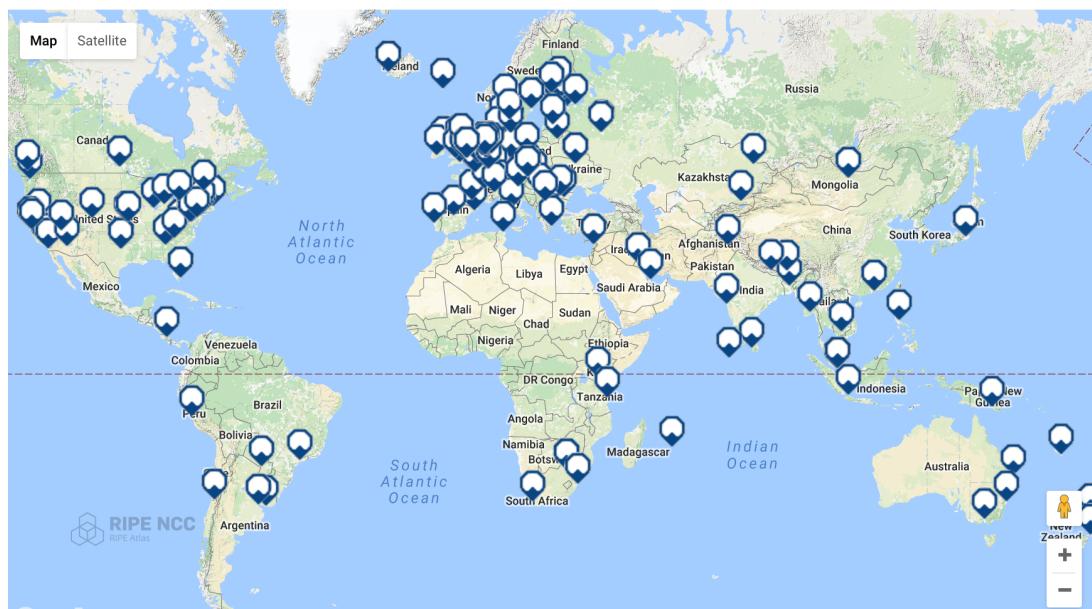
Composed by: Anchors



- 250+



- # • Around the world





What is RIPE Atlas (3)

Composed by: Web interface / API / CLI

The screenshot shows the RIPE Atlas web interface. On the left is a sidebar with a navigation menu:

- RIPE Atlas (selected)
- About RIPE Atlas
- Get Involved
- Probes and Anchors
- Measurements, Maps and Tools
- Resources
- RIPE NCC Members

Below the sidebar is a dropdown menu for "My Atlas":

- Credits
- API Keys
- Messages
- Ambassador Probes
- Settings

The main content area has several sections:

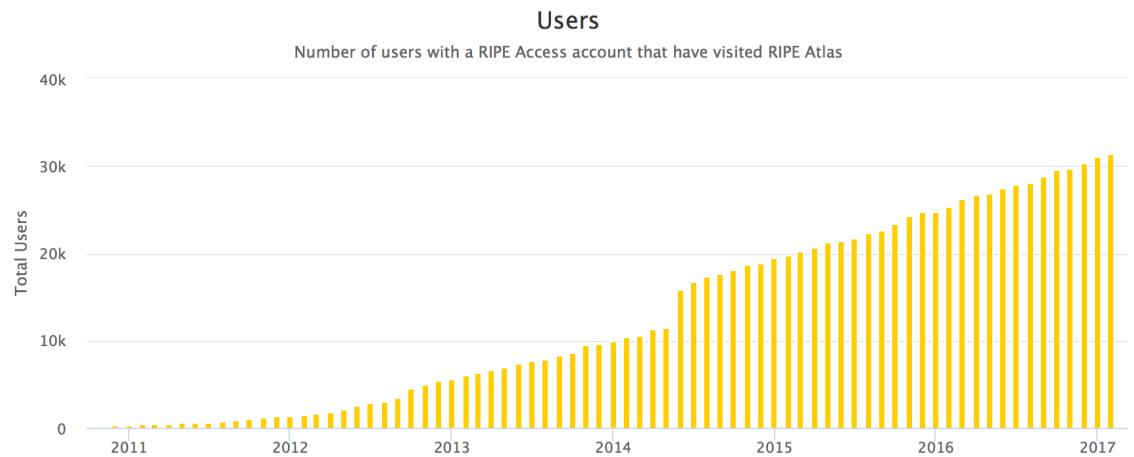
- Measurements**: Shows 0 measurements. Text: "You do not have any measurements. Please visit the [measurements page](#) to start one."
- Probes**: Shows 1 probe named "AMS-Alvaro" active for "1 week, 4 days".
- Anchors**: Shows 0 anchors.
- Credits**: Shows 2101 daily credits and 5.3 million total credits.



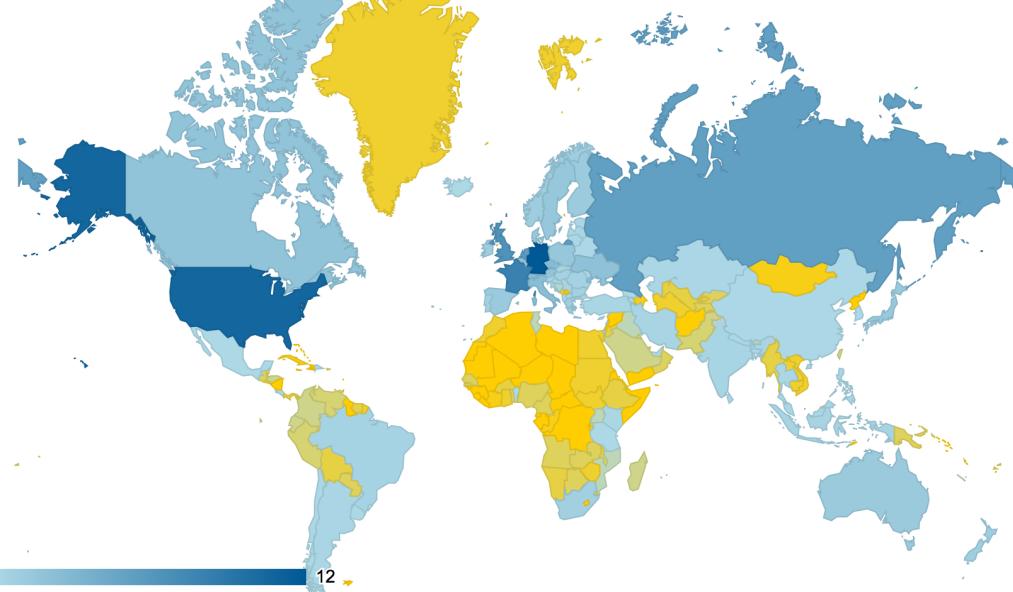
What is RIPE Atlas (4)

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



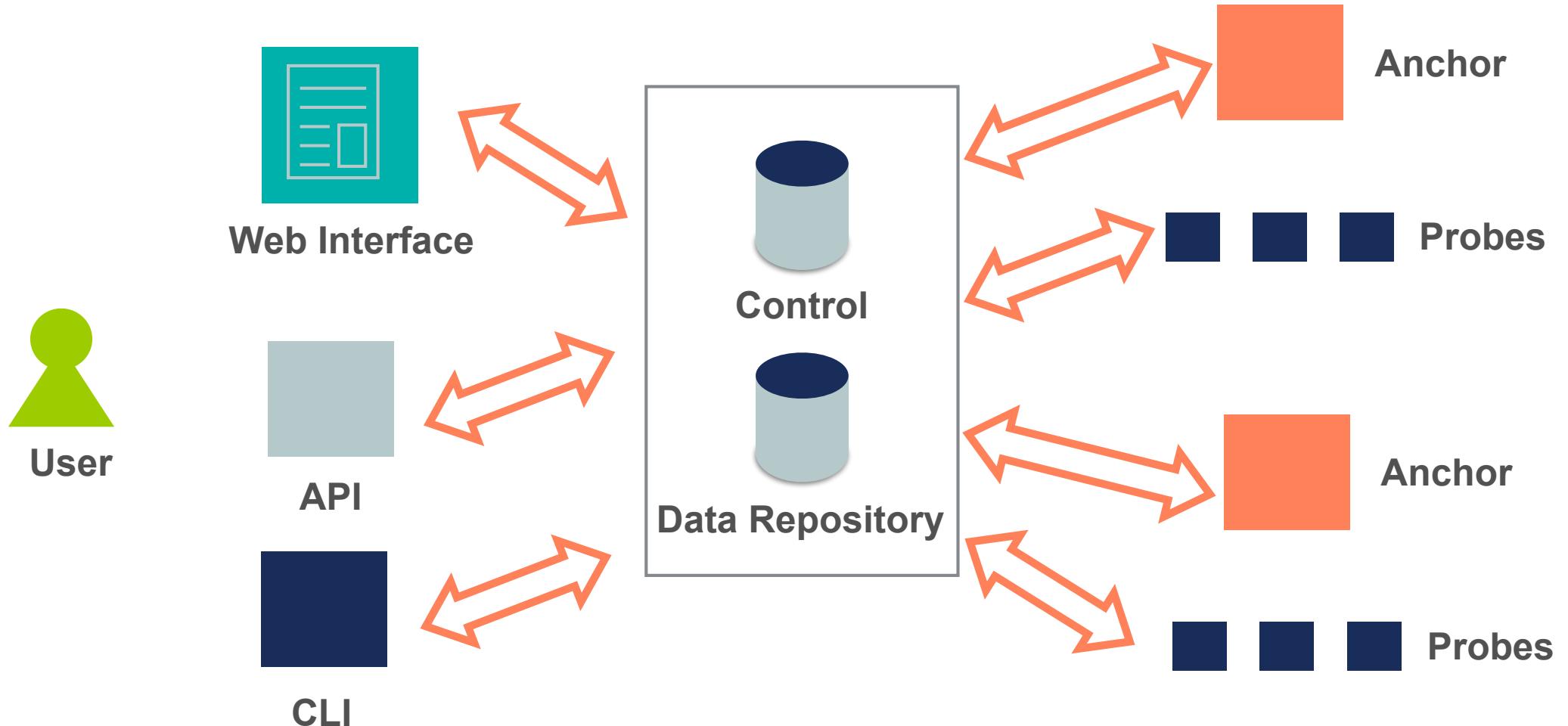
What is RIPE Atlas (6)

- Interesting numbers:

- IPv4 ASNs covered: 3268 (5.786%)
- IPv6 ASNs covered: 1222 (9.471%)
- Number of countries covered: 178 (90.816%)

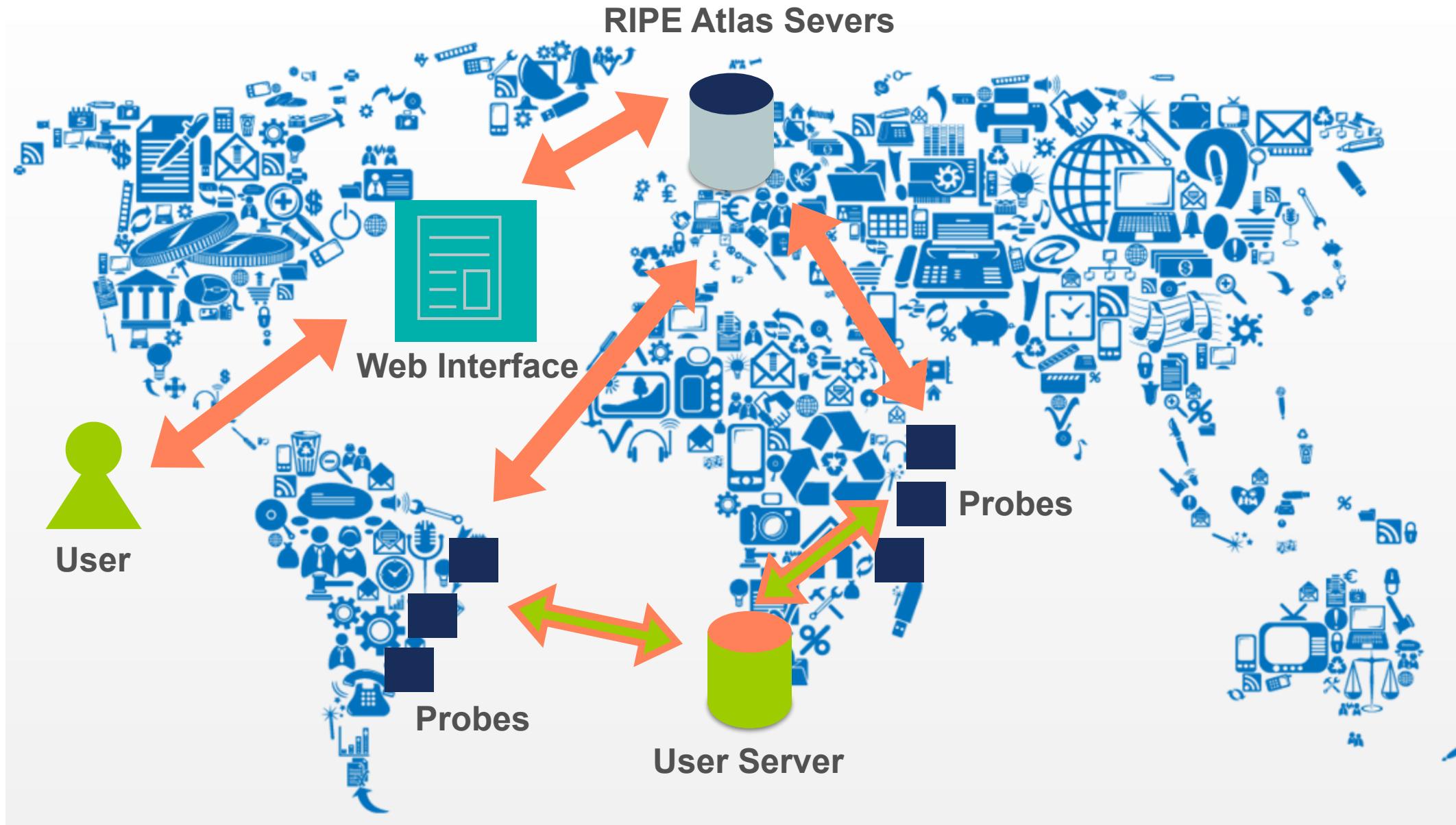


RIPE Atlas Overview (1)





RIPE Atlas Overview (2)





RIPE Atlas measurements



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.

 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.

 API Keys  0  0

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

 Anchors  0  0

 Credits  0  0

Daily Credits Balance

total daily income
total daily expenditure



RIPE Atlas Results

- Ongoing global measurements towards root name servers
 - Visualised as Internet traffic maps
- Ongoing regional measurements towards “anchors”
- Users can run customised measurements
 - Ping, traceroute, DNS, SSL/TLS, NTP and (limited) HTTP
- All data open and publicly available



Credit System

- Running your own measurements cost credits
 - Ping = 10 credits, traceroute = 20, etc.
- Why? Fairness and to avoid overload
- Limits: daily spending and measurement results
- Hosting a RIPE Atlas probe earns credits
- Earn extra credits:
 - RIPE NCC members
 - Host an anchor
 - Sponsor probes



Hackathon Vouchers

- If you have a RIPE NCC Access Account
- “My Atlas” -> Credits -> Redeem Voucher
 - name: DNS-Measurements-Hackathon
 - first 50 people will get 10.000.000 free credits ;-)



DNS-related RIPE Atlas Measurements



User measurements visualisations

- List of probes: sortable by RTT

4 DNS measurement to 195.253.65.6 (c.flexireg)

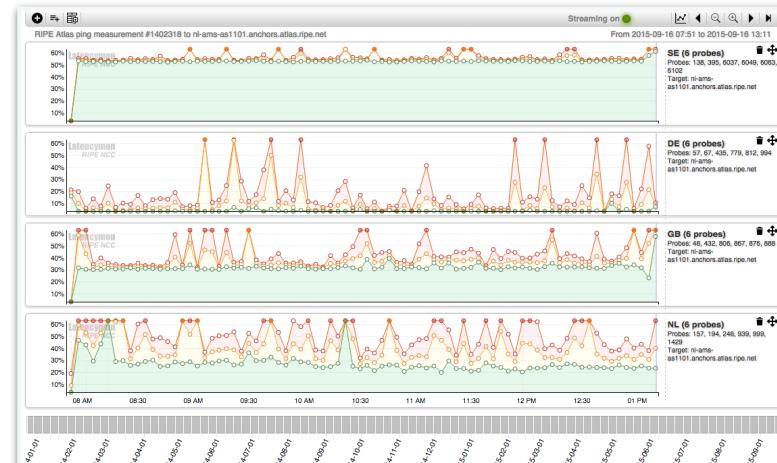
General Information		Probes		Map	LatencyMON	DNSMON	Results	Modification Log	Time Travel
Probe	ASN (IPv4)	ASN (IPv6)	Time (UTC)		Answer	Response Time			
2458	49272	49272	2017-04-05 09:27	NOERROR	42.68				
15171	8473	8473	2017-04-05 09:26	NOERROR	30.317				
21733	44746	44746	2017-04-05 09:27	NOERROR	44.629				
24854	62094	62094	2017-04-05 09:25	NOERROR	29.595				



< 10 ms: 0 < 20 ms: 0 < 30 ms: 1 < 40 ms: 1 < 50 ms: 2 < 100 ms: 0 < 200 ms: 0 < 300 ms: 0 > 300 ms: 0

- Map: colour-coded by RTT
- LatencyMON: compare multiple latency trends

- <https://atlas.ripe.net/measurements/7954428/>





Results structure (ping)

```
[ {"af":6,"avg": 61.32,  
 "dst_addr":"2a00:1450:4004:802::1014","dst_name":"www.google.com",  
 "loss":0,  
 "src_addr":"2001:8a0:7f00:b201:220:4aff:fec5:5b5b",  
 "fwd":4660,"lts":411,  
 "max":62.148,"min":60.372,  
 "msm_id":1004005,"msm_name":"Ping",  
 "prb_id":722,"proto":"ICMP","rcvd":10,  
 "result":[{"rtt":62.148},{"rtt":61.437},{"rtt":61.444},{"rtt":61.448},{"rtt":61.794},  
 {"rtt":61.533}, {"rtt":60.372}, {"rtt":60.373}, {"rtt":61.384}, {"rtt":61.267}],  
 "sent":10,"size":64,  
 "src_addr":"2001:8a0:7f00:b201:220:4aff:fec5:5b5b",  
 "step":240,"timestamp":1410220847,"ttl":54,"type":"ping"},
```

Reference (msm ID)

Source (probe public IP address)

Destination (IP & name)

Packet loss: difference between sent & received!



Maps based on DNS Measurements

- DNS Root Instances
 - <https://atlas.ripe.net/results/maps/root-instances/>
- Comparative DNS Root RTT
 - <https://atlas.ripe.net/results/maps/comparative-dns-root-rtt/>
- Root Server Performance
 - <https://atlas.ripe.net/results/maps/root-server-performance/>



DNSMON: dnsmon.ripe.net

- From anchors to ccTLDs



- https://labs.ripe.net/Members/fatemah_mafi/an-updated-dns-monitoring-service



DomainMon

- Like “DNSMON”, but
 - from probes
 - to second-level domains
- https://labs.ripe.net/Members/suzanne_taylor_muzzin/ripe-atlas-domainmon-is-here

Monitor a new domain: ripe.net.

Servers 12

- pri.authdns.ripe.net. 193.0.9.5 2001:67ce0::5
- sec1.apnic.net. 202.12.29.59 2001:dc0:2001:a:4608::59
- tinnie.arin.net. 199.212.0.53 2001:500:13::c764:35
- sns-pb.isc.org. 192.5.4.1 2001:500:2e::1
- ns3.nic.fr. 192.134.0.49 2001:660:3006:1:1:1
- sec3.apnic.net. 202.12.28.140 2001:dc0:1:0:4777::140

Probes 10

10 probes from Worldwide +



Measurements 1

Type	Interval (seconds)	Include?
UDP SOA	3600	<input checked="" type="checkbox"/>
TCP SOA	3600	<input type="checkbox"/>
ICMP Traceroute	3600	<input type="checkbox"/>

Back Monitor



Additional DNS measurements

- Measuring random domains
 - <https://atlas.ripe.net/measurements/30001/>
- Measuring popular domains
 - <https://atlas.ripe.net/measurements/30002/>
- https://labs.ripe.net/Members/chris_amin/new-ripe-atlas-root-zone-dns-measurements



Accessing RIPE Atlas data (API, streaming, CLI)



RIPE Atlas REST APIs

- List of scheduled measurements
 - <https://atlas.ripe.net/api/v2/measurements/>
 - <https://atlas.ripe.net/api/v2/measurements/{TYPE}/>
- Information about a specific measurement
 - <https://atlas.ripe.net/api/v2/measurements/{ID}/>
- Results of a specific measurement
 - <https://atlas.ripe.net/api/v2/measurements/{ID}/results>



RIPE Atlas REST APIs

- List of probes
 - <https://atlas.ripe.net/api/v2/probes/>
- Information about a specific probe
 - <https://atlas.ripe.net/api/v2/probes/{ID}>
- List of anchors
 - <https://atlas.ripe.net/api/v2/anchors/>
- Information about a specific anchor
 - <https://atlas.ripe.net/api/v2/anchors/{ID}>



RIPE Atlas REST APIs

- List of measurements targeted to an anchor
 - <https://atlas.ripe.net/api/v2/anchor-measurements/>
- Info about a specific anchor measurement
 - <https://atlas.ripe.net/api/v2/anchor-measurements/{ID}>

Reference: <https://atlas.ripe.net/docs/api/v2/reference/>

Manual: <https://atlas.ripe.net/docs/api/v2/manual/>



Using API to schedule a measurement

- Using command-line & scripting:
 - <https://atlas.ripe.net/docs/measurement-creation-api/>
 - <https://atlas.ripe.net/keys/>
- You will need API keys
 - To create measurements without logging in
 - To securely share your measurement data



RIPE Atlas streaming

- RIPE Atlas streaming is an architecture that allows users to receive the measurement results as soon as they are sent by the probes
 - in real time
 - Publish/subscribe through web sockets
- There are three types of data:
 - Measurement results
 - Probe connection status events
 - Measurements metadata



RIPE Atlas streaming

- Visualising network outages
 - <http://sg-pub.ripe.net/demo-area/atlas-stream/conn/>
- Real-time server and performance monitoring
- *Filtering and reusing measurement results*
- Documentation:
 - <https://atlas.ripe.net/docs/result-streaming/>



Streaming: Example of results

Screenshot of a browser developer tools Console tab showing a stream of log messages from a streaming application.

The messages are all of type "I received" and show objects with properties: af, prb_id, result, ttl, and avg. The "result" property is an array of three elements.

```
XHR finished loading: GET "http://atlas-stream.ripe.net/stream/socket.io/?EIO=2&transport=polling&t=1431095373684-0".
XHR finished loading: GET "http://atlas-stream.ripe.net/stream/socket.io/?EIO=2&transport=polling&t=1431095373739-1&sid=eB0kM7zfWFT2c-ScAAaH".
I received > Object {af: 4, prb_id: 16669, result: Array[3], ttl: 42, avg: 326.841...}
I received > Object {af: 4, prb_id: 16669, result: Array[3], ttl: 42, avg: 325.793333333...}
I received > Object {af: 4, prb_id: 16669, result: Array[3], ttl: 42, avg: 326.048...}
I received > Object {af: 4, prb_id: 16669, result: Array[3], ttl: 42, avg: 327.325333333...}
I received > Object {af: 4, prb_id: 15965, result: Array[3], ttl: 45, avg: 47.631333333...}
I received > Object {af: 4, prb_id: 15965, result: Array[3], ttl: 45, avg: 47.6996666667...}
I received > Object {af: 4, prb_id: 15965, result: Array[3], ttl: 45, avg: 47.4816666667...}
I received > Object {af: 4, prb_id: 19566, result: Array[3], ttl: 40, avg: 47.054...}
I received > Object {af: 4, prb_id: 19566, result: Array[3], ttl: 40, avg: 47.8626666667...}
I received > Object {af: 4, prb_id: 19566, result: Array[3], ttl: 40, avg: 47.5946666667...}
I received > Object {af: 4, prb_id: 19566, result: Array[3], ttl: 40, avg: 47.500333333...}
I received > Object {af: 4, prb_id: 18311, result: Array[3], ttl: 49, avg: 32.577...}
I received > Object {af: 4, prb_id: 18311, result: Array[3], ttl: 49, avg: 34.084333333...}
I received > Object {af: 4, prb_id: 18311, result: Array[3], ttl: 49, avg: 32.751333333...}
I received > Object {af: 4, prb_id: 16010, result: Array[3], ttl: 46, avg: 182.446333333...}
I received > Object {af: 4, prb_id: 16010, result: Array[3], ttl: 46, avg: 193.995333333...}
I received > Object {af: 4, prb_id: 16010, result: Array[3], ttl: 46, avg: 182.291333333...}
I received > Object {af: 4, prb_id: 16010, result: Array[3], ttl: 46, avg: 191.610333333...}
I received > Object {af: 4, prb_id: 14918, result: Array[3], ttl: 49, avg: 34.817...}
I received > Object {af: 4, prb_id: 14918, result: Array[3], ttl: 49, avg: 35.009333333...}
I received > Object {af: 4, prb_id: 14918, result: Array[3], ttl: 49, avg: 35.084333333...}
I received > Object {af: 4, prb_id: 20668, result: Array[3], ttl: 45, avg: 38.8846666667...}
I received > Object {af: 4, prb_id: 20668, result: Array[3], ttl: 45, avg: 38.8626666667...}
I received > Object {af: 4, prb_id: 20668, result: Array[3], ttl: 45, avg: 38.8806666667...}
I received > Object {af: 4, prb_id: 6093, result: Array[3], ttl: 49, avg: 128.727333333...}
I received > Object {af: 4, prb_id: 6093, result: Array[3], ttl: 49, avg: 128.737333333...}
I received > Object {af: 4, prb_id: 6093, result: Array[3], ttl: 49, avg: 128.888333333...}
```



RIPE Atlas Sagan

- A translation layer for RIPE Atlas measurement results
 - <https://github.com/RIPE-NCC/ripe.atlas.sagan>
 - pip install ripe.atlas.sagan
- Transforms JSON results in Python objects
- The output is firmware version transparent
- Pre-computes useful attributes (e.g. Does a traceroute reach the target host?)



RIPE Atlas Cousteau

- A python wrapper around RIPE Atlas API
 - <https://github.com/RIPE-NCC/ripe-atlas-cousteau>
 - pip install ripe.atlas.cousteau
- Fetches results from API and streaming, and probe and measurement information
- You can manage measurements:
 - Create a measurement
 - Stop a measurement
 - Change probes involved



RIPE Atlas CLI

- Network troubleshooting for command line pros
- Familiar output (ping, dig, traceroute)
- Linux/OSX
 - <http://ripe-atlas-tools.readthedocs.org/en/latest/installation.html#requirements-and-installation>
- Windows [experimental]
 - <https://github.com/chrisamin/ripe-atlas-tools-win32>



RIPE Atlas CLI

- Open source
 - RIPE NCC led community contribution
- Documentation
 - <https://ripe-atlas-tools.readthedocs.org/>
- Source:
 - <https://github.com/RIPE-NCC/ripe-atlas-tools/>
- How to contribute:
 - <https://github.com/RIPE-NCC/ripe-atlas-tools/blob/master/CONTRIBUTING.rst>



RIPEstat



A few words about RIPEstat

The screenshot shows the RIPEstat interface for AS3333. At the top left is the RIPEstat logo and a search bar with a 'Search' button. A speech bubble labeled 'Search box' points to the search bar. On the left, a sidebar titled 'At a Glance' lists categories: Routing (9/10), DNS (1), Anti Abuse (1), Database (5), Geographic (2), and Activity (2). A speech bubble labeled 'Thematic tabs' points to this sidebar. The main area contains four data panels:

- AS Overview (AS3333)**: Shows RIPE-NCC-AS - Reseaux IP Europeens Network Coordination Centre (RIPE NCC). It displays results from 2013-08-30 00:00:00 UTC to 2013-08-30 08:00:00 UTC. Buttons include source data, embed code, permalink, and info.
- Geoloc (AS3333)**: A map showing the geographic location of AS3333 in Europe, specifically in Germany and Belgium. It includes a legend for Map and Satellite views, and buttons for source data, embed code, permalink, and info.
- Registry Browser (AS3333)**: Displays information for AS3333, last updated on 2012-04-17 at 10:12:15 UTC. It includes fields for aut-num, as-name, descr, org, admin-c, admin-c, tech-c, mnt-by, and mnt-by. Buttons include source data, embed code, permalink, and info.
- Routing Status (AS3333)**: Shows AS3333 is visible by 97% of 107 IPv4 and 99% of 102 IPv6 RIS full peers. It lists first ever seen (Jan 2001), originated prefixes (IPv4: 6, IPv6: 1), observed BGP neighbours (160), and address space announced (IPv4: 4608 IPs, IPv6: equiv. to 1/48s). Buttons include source data, embed code, permalink, and info.

A speech bubble labeled 'Widgets' points to the bottom right corner of the 'Routing Status' panel.

- Data sources: <https://stat.ripe.net/data-sources>



RIPEstat APIs

- Complete list: https://stat.ripe.net/docs/data_api
- Routing Data History
 - https://stat.ripe.net/docs/data_api#BGPState
 - https://stat.ripe.net/docs/data_api#BGPUpdates
 - https://stat.ripe.net/docs/data_api#BGPlay
- Looking Glass
 - https://stat.ripe.net/docs/data_api#LookingGlass



RIPEstat APIs

- Resource Info
 - https://stat.ripe.net/docs/data_api#PrefixOverview
 - https://stat.ripe.net/docs/data_api#RIR
- DNS
 - https://stat.ripe.net/docs/data_api#ReverseDnsIP
- Bandwidth
 - https://stat.ripe.net/docs/data_api#SpeedcheckerBandwidthMeasurements



Possible Projects



Possible projects

- DNS root server observatory
- RIPE Atlas DNS measurement result streaming to dedicated (key-value, metric) storage backends
- “Status Checks” for DNS
 - a) https://labs.ripe.net/Members/suzanne_taylor_muzzin/introducing-ripe-atlas-status-checks
 - b) <https://github.com/pierky/ripe-atlas-monitor>
- Improve DNSMON code:
 - <https://github.com/RIPE-NCC/dnsmon/>



Jon's Project Ideas

- IPv4 vs IPv6 performance analysis
 - insight into how IPv6 Fragmentation plays into end user performance.
- Forced TCP
 - does it work better in some geos than others
 - tcp anycast availability comparison
- Geotargeting for Optimal Performance:
Anycast vs. Real IP



Other people's ideas

- bert hubert from PowerDNS
 - perhaps <https://ds9a.nl/hypernsec3/> is inspirational.
- roland van rijswijk from surfnet.nl
 - <https://www.openintel.nl/>
- Stephane's DNS consistency checks
 - <https://gist.github.com/bortzmeyer/922a3f24ed42ba751a6072af>
- Vesna / Mozilla
 - <https://internethealthreport.org/v01/>
 - <https://internethealthreport.org/v01/stories/inside-an-internet-sh>



Projects from previous hackathons

- All code on GitHub:
 - <https://github.com/RIPE-Atlas-Community/ripe-atlas-community-contrib/blob/master/README.md>
- labs.ripe.net/hackathons
 - DataViz: <https://labs.ripe.net/Members/becha/ripe-atlas-hackathon-results>
 - Tools for operators <https://labs.ripe.net/Members/becha/ripe-atlas-tools-hackathon-results>
 - Interfaces <https://labs.ripe.net/Members/becha/ripe-atlas-interface-hackathon-results>
 - IXP-tools <https://labs.ripe.net/Members/becha/ixp-tools-hackathon-results>



Learn more

- Basic RIPE Atlas course:
 - <http://www.ripe.net/lir-services/training/courses/tailor-made-workshops/#tools>
- RIPE Atlas webinar <https://www.ripe.net/support/training/learn-online/webinars/advanced-ripe-atlas-usage-webinar>
- Previous hackathon-webinar recording:
 - <http://meet95212513.adobeconnect.com/p60anmx5jl0/>
- Basic RIPE Atlas video: <https://www.youtube.com/watch?v=Z3SW2vO8qW0>
- Use cases: labs.ripe.net/atlas