



RIPE NCC
RIPE NETWORK COORDINATION CENTRE

RIPE NCC Measurement Data Workshop



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Schedule



09:00 - 10:30

First session

10:30 - 11:00

Break

11:00 - 12:30

Second session

Lunch

Exercises



<https://stat.ripe.net/widgets/workshops/enog11/exercises.pdf>

Solutions:

<https://stat.ripe.net/widgets/workshops/enog11/solutions.pdf>

Overview 1 - RIPEstat



RIPEstat

- ~~Introduction to RIPE and the RIPE NGG - not part of this workshop~~
- Introduction to RIPEstat
- More about widgets
- *List of widgets - optional*
 - *Exercise: Querying for a Resource*
- Useful routing widgets
 - *Exercise: BGPlay*
- Handling abuse
 - *Exercise: Handling Abuse*
- *Personalising RIPEstat - optional*
 - *Exercise: MyView*
- Comparing results
 - *Exercise: Comparing Results*
 - *Exercise: RIPEstat Use Cases*

Overview 2 - RIPE Atlas



RIPE Atlas

- Introduction to RIPE Atlas
- What you can get from RIPE Atlas as a visitor
- Exploring public probes
 - *Live Demo*
- Finding public measurements
 - *Exercise F: Analyse results*
- Creating a measurement
 - *Exercise G: Create a measurement*
- Network monitoring
 - *Exercise H: Setting up 'Status Checks'*
- *More RIPE Atlas features - optional*
- How to host a probe
- ~~Advanced topics - not part of this workshop~~
 - ~~Use cases and success stories~~
 - ~~RIPE Atlas anchors~~
 - ~~RIPE Atlas community~~



Introduction to R1PEstat

Section 2

What is RIPLEstat?



One interface for viewing all Internet number resource data

“One-stop shop”



What data? What sources?



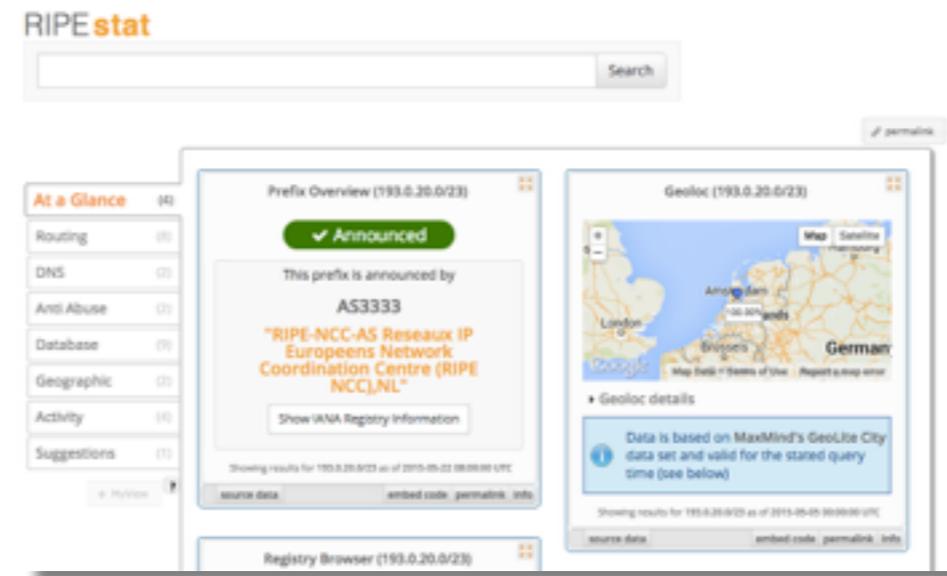
- RIPE Database
- Other RIR data
- BGP routing data (RIS)
- Active measurements (RIPE Atlas, DNSMON)
- Geolocation (third party)
- Blacklist data (third party)
- More...

RIPEstat APIs



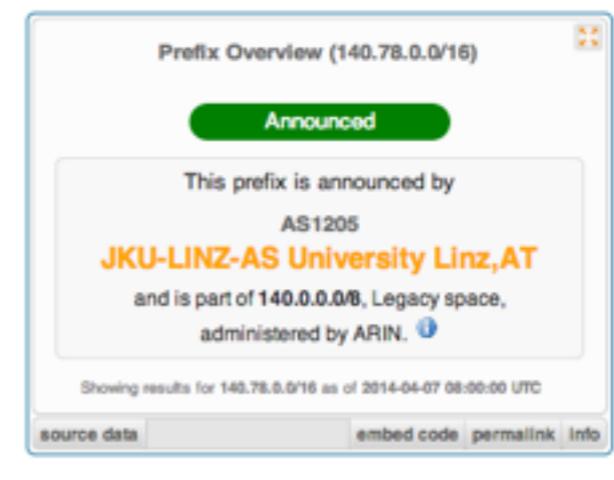
- <https://stat.ripe.net>

- RIPEstat widget API



- RIPEstat data API

- <https://stat.ripe.net/data/routing-status/data.json?resource=...>



Landing page



**RIPEstat shows
your own IP/ASN**

- RIPEstat Home <<
- About RIPEstat >
- Documentation >
- Use Cases >

Your IP address is:
193.0.20.230

System Statistics

249,893
Requests seen in the last full hour on
RIPEstat

On RIPE Labs

RIPE Atlas Hackathon Results
Apr 10, 2015

Search RIPEstat

Your network: **AS3333, 193.0.20.0/2** Search

e.g.: IPv4 prefix/range, IPv6, ASN

RIPEstat Data API
RESTful. Versatile.
And all about data.

Query Types



- IPv6 address/prefix
- IPv4 address/prefix
- ASN
- Hostname
- Country code

Results page



More tabs
with results

Widgets

Why use RIPEstat?



- For your own network:
 - Is someone else announcing my prefix?
 - How visible is my new IPv6 network?
 - Is my BGP routing consistent with the Routing Registry?
 - Are my DNS and reverse DNS consistent?
 - Location of my customers' prefixes
 - Was my prefix visible yesterday in Tokyo?

Why use RIPEstat?



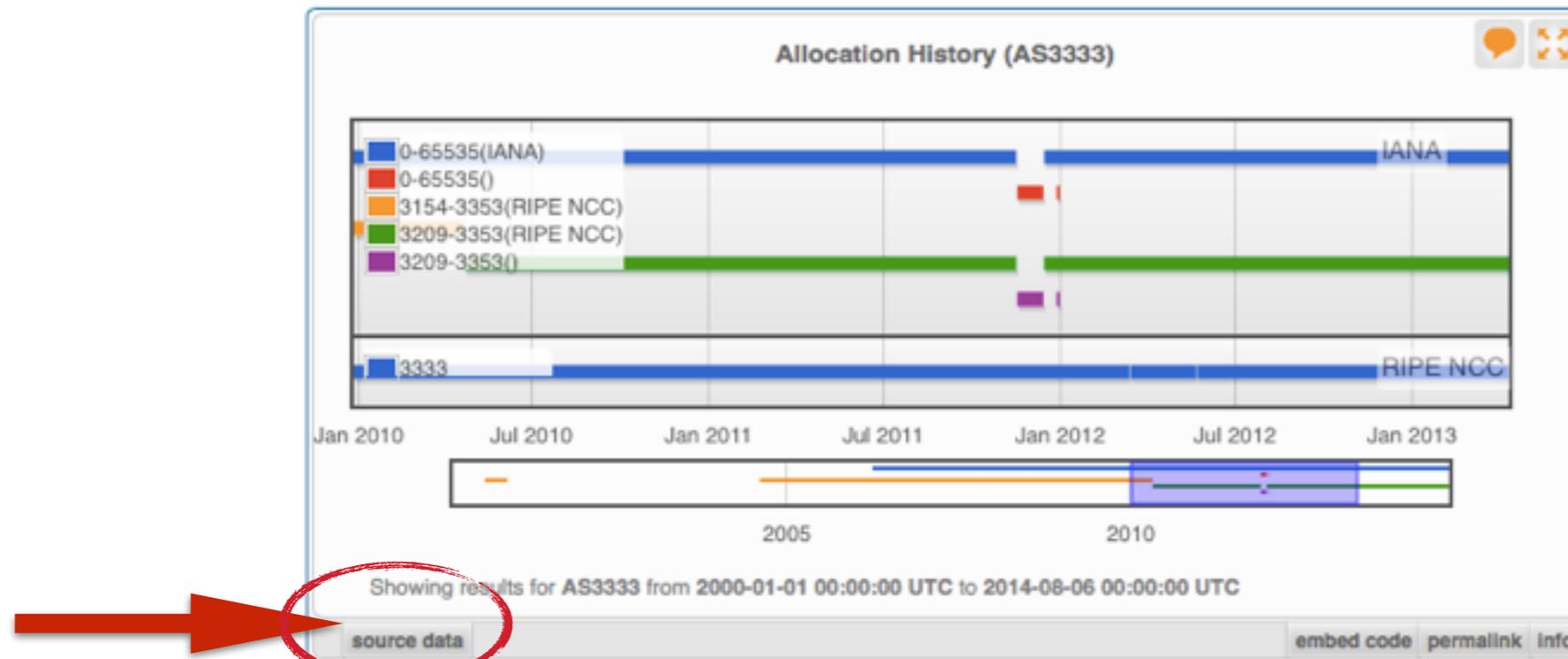
- For viewing other networks:
 - How many IPv6 prefixes are announced in my country?
 - IPv6 in my country compared to neighbours
 - Who has more peers, AS1 or AS2?
 - How does the upstream outage look?
 - Is the prefix/ASN that I want already announced?
 - Which ASN announces an IP?
 - Where can I report abuse from an IP?



More About Widgets

Section 3

Get the data behind the widget!



source data embed code permalink info

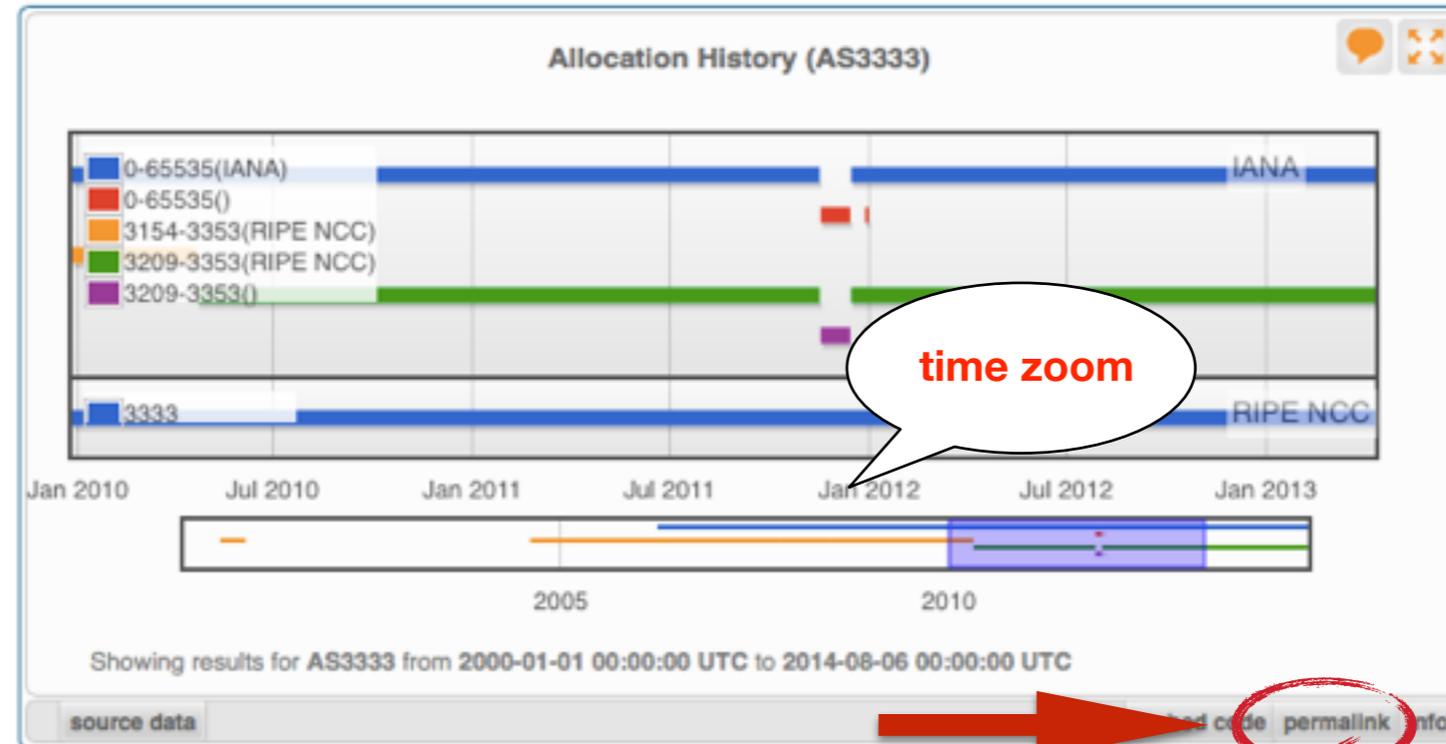
Get the data behind this widget with the Data API

<https://stat.ripe.net/data/allocation-history/data.json?resource=AS3333>

```
{
  "cached": true,
  "data": {
    "query_endtime": "2014-08-06T00:00:00",
    "query_starttime": "2000-01-01T00:00:00",
    "resource": "3333",
    "results": {
      "IANA": [
        {
          "resource": "0-65535",
          "status": "IANA",
          "timelines": [
            {
              "endtime": "2007-10-11T00:00:00",
              "starttime": "2007-10-11T00:00:00"
            },
            {
              "endtime": "2008-11-03T00:00:00",
              "starttime": "2007-10-27T00:00:00"
            }
          ]
        }
      ]
    }
  }
}
```

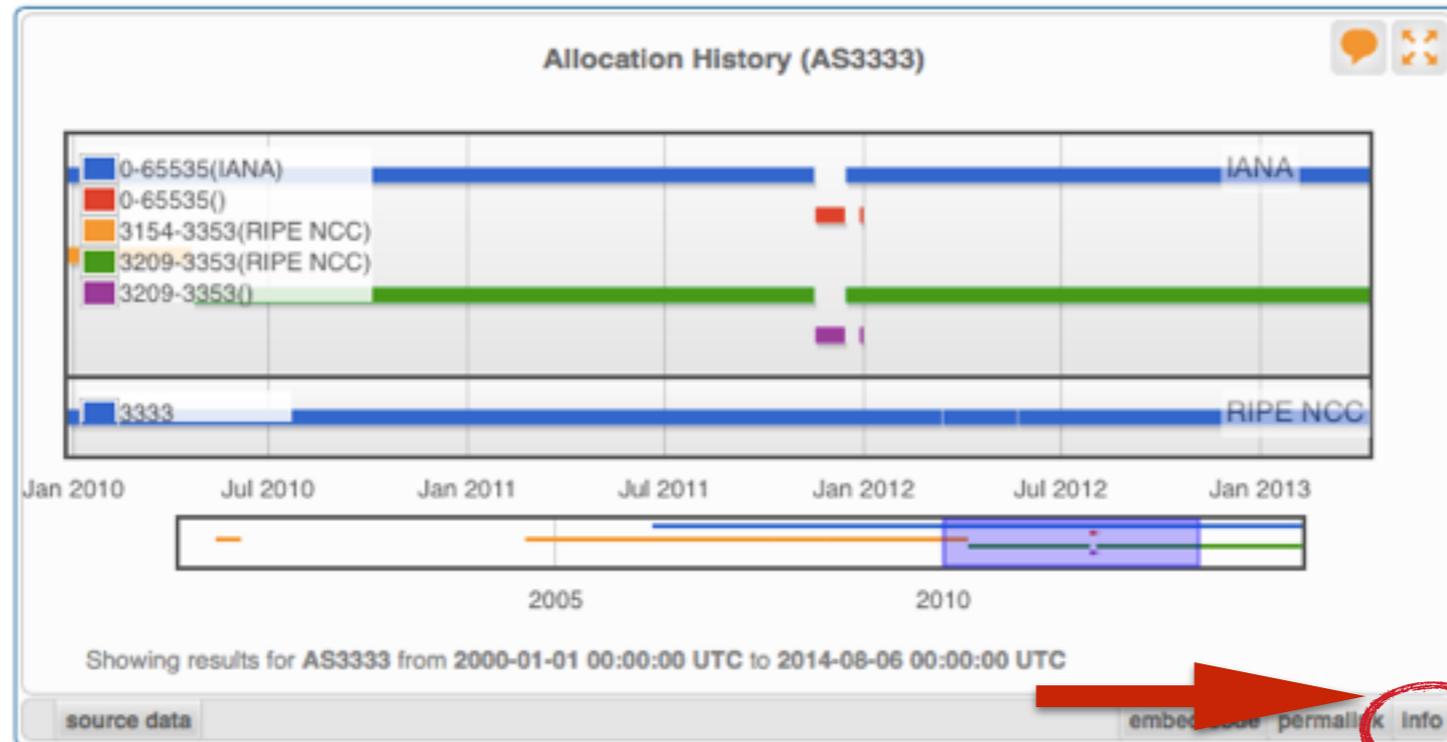


Shareable results URL



- Immutable shareable URL for each result!
- URL includes:
 - Zoom
 - History

Where's the data from?



source data embed code permalink info

Content Explanation

What does this widget show?
Allocation History displays information about allocations and direct assignments of prefixes or AS numbers.

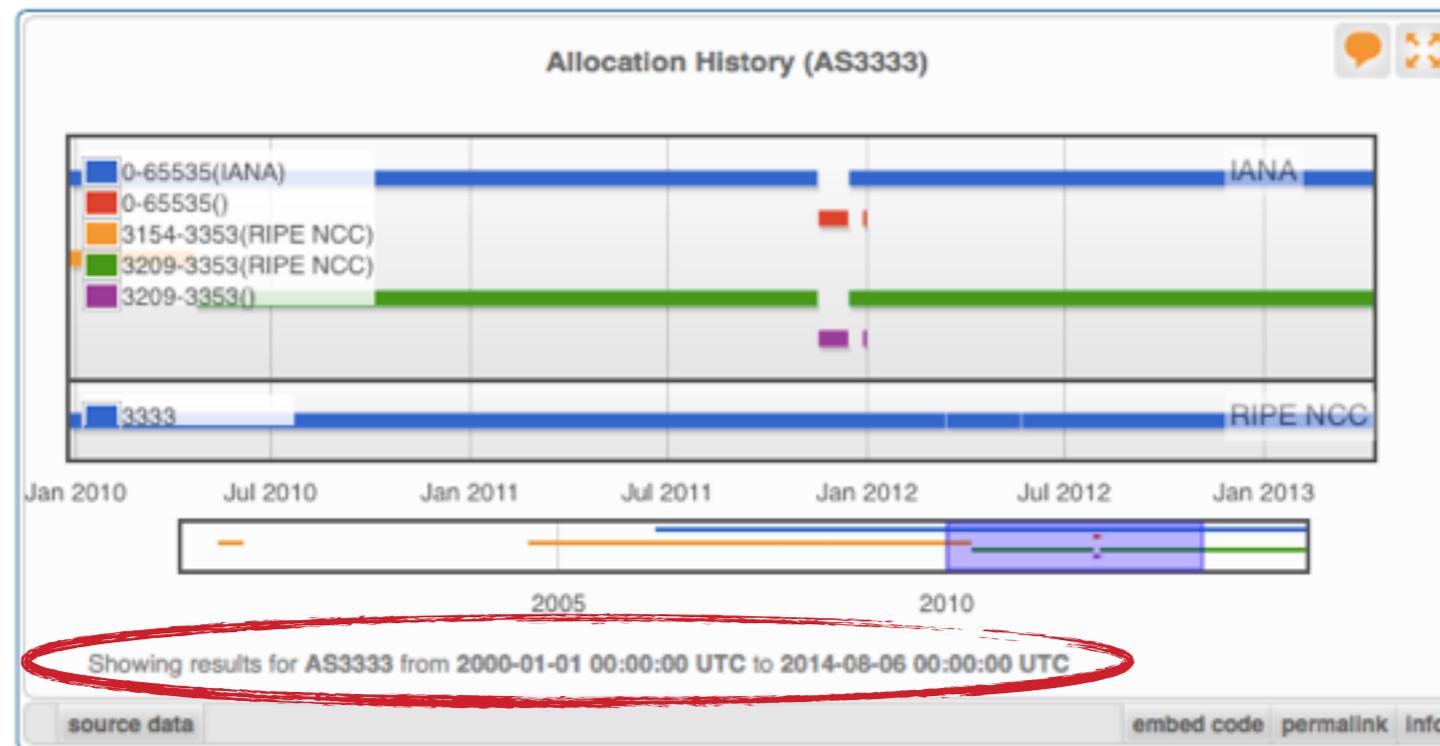
How can the visualisation be interpreted?
When the queried resource was a prefix, the graph will show how that prefix and related (more or less specific prefixes) were allocated over time. When the queried resource was an ASN, the graph will show the allocation of that ASN.
The legend will display all resources, including those which are not announced during the time range displayed. It is possible to change the displayed time period with the timeline selector underneath the graph.

The shaded area is displayed in the graph. This area can be adjusted by moving to the left or right end of the shaded area and then dragging it to the desired location. It is possible to change not only the start and end time, but also the length of the period which is shown.

What is the data source?
The RIR statistics files summarise the current state of allocations and assignments of Internet number resources. They are intended to provide a snapshot of the status of Internet number resources, without any transactional or historical details. Find details for each RIR here:

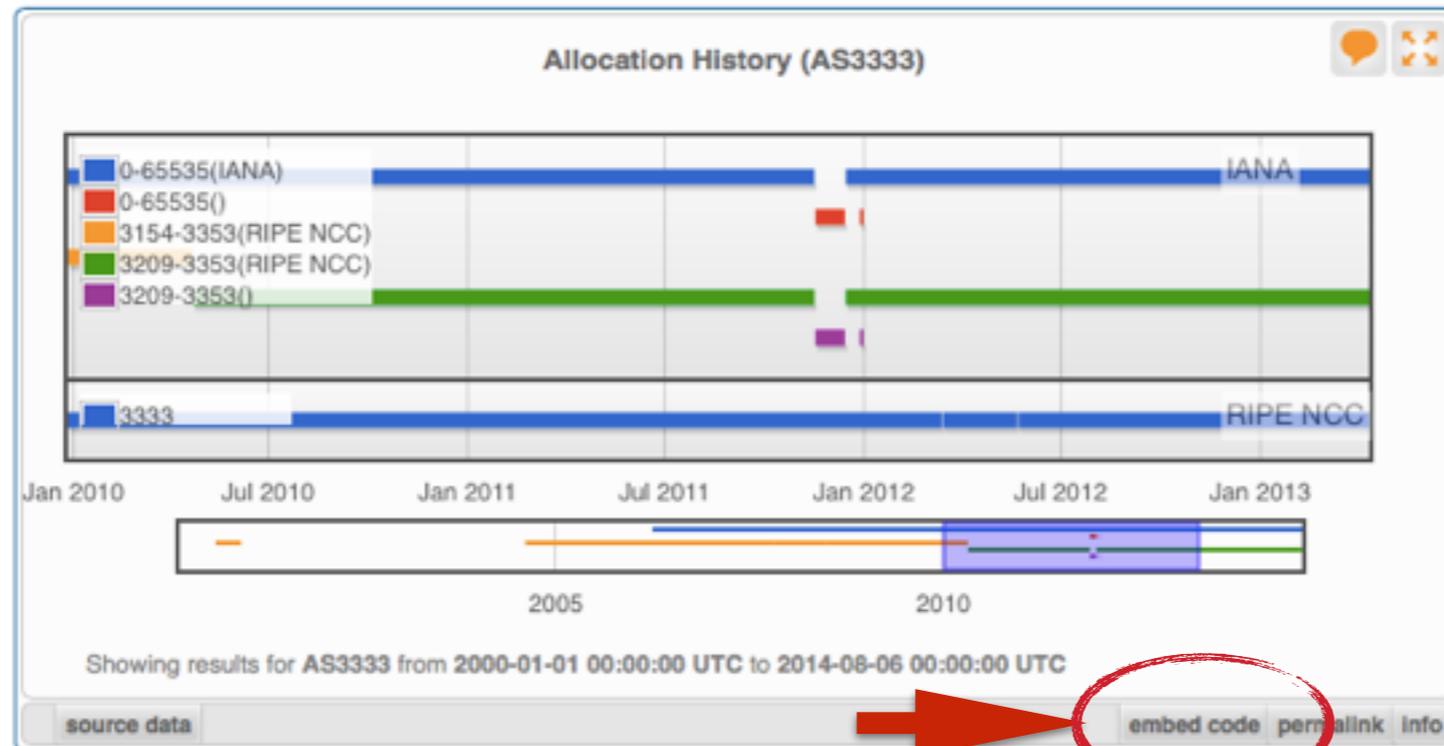
- AFRINIC
- APNIC
- ARIN
- LACNIC
- RIPE NCC

Freshness and timescale of the data



- Timestamp and time period of data
- Different widgets = different data update frequency
- Can be adjusted in most cases
 - Limits: different maximum granularities

Embed the widget!



source data embed code permalink info

Embed this widget on your page

```
<script src="https://stat.ripe.net/widgets/widget_api.js"></script>
<div class="statwdgtauto"><script>ripestat.init("allocation-history",
{"resource": "AS3333"}, null, {"size": "medium", "disable": ["controls"]})</script>
</div>
```

Copy and paste this code into an HTML webpage. Note: `widget_api.js` (the 1st line) only needs to be included once per page.

For more usage details please view the [RIPEstat Widget API documentation](#).

Embedding widgets on your site



- This ISP embedded widgets on its page

Prefix Count widget

AS Path Length widget

The screenshot shows the AS42093.net website with a navigation menu (Home, Network load, Peers, Peering policy, Maintenance, Looking glass) and several informational sections: Welcome, Network status, Network Details, and Prefixes. The Prefixes section includes a line graph showing the number of IPv4 and IPv6 prefixes from 2010 to 2013, and an AS Path Length radar chart showing average path lengths to various ISPs.

Prefixes
The table shows every prefix that originated from our AS in the last week.

number of Prefixes Addresses

Showing results for AS42093 from 2000-01-01 00:00:00 UTC to 2013-09-09 00:00:00 UTC

AS Path Length
The diagram shows the average length of all AS paths seen in the last week originating from our AS.

Showing results for AS42093 from 2013-09-09 08:00:00 UTC to 2013-09-09 16:00:00 UTC



List Of Widgets

Section 4

Widgets List



<https://stat.ripe.net/widget/list>

RIPEstat Widgets

This is a complete list of all of the widgets that RIPEstat offers. Each of these widgets can be accessed using the links below.

When you view a widget you can also get code for **embedding** it in your own pages. The full procedure for embedding and configuring widgets is described in the [Widget API Documentation](#).

Show entries

Search:

Title (show slug)	Example	Prefix	IP address	ASN	Hostname	Country code
Abuse Contact Finder		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Address Space Hierarchy		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Address Space Usage		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Allocation History		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Announced Prefixes		<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
AS Overview		<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
AS Path Length		<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
AS Routing Consistency		<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ASN Neighbours		<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ASN Neighbours History		<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
RIPE Atlas Probes		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
RIPE Atlas Measurement Targets		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>



Exercise A

Querying for a Resource

Refer to the exercise booklet



Visualising BGP Routing Information

Section 5

Querying

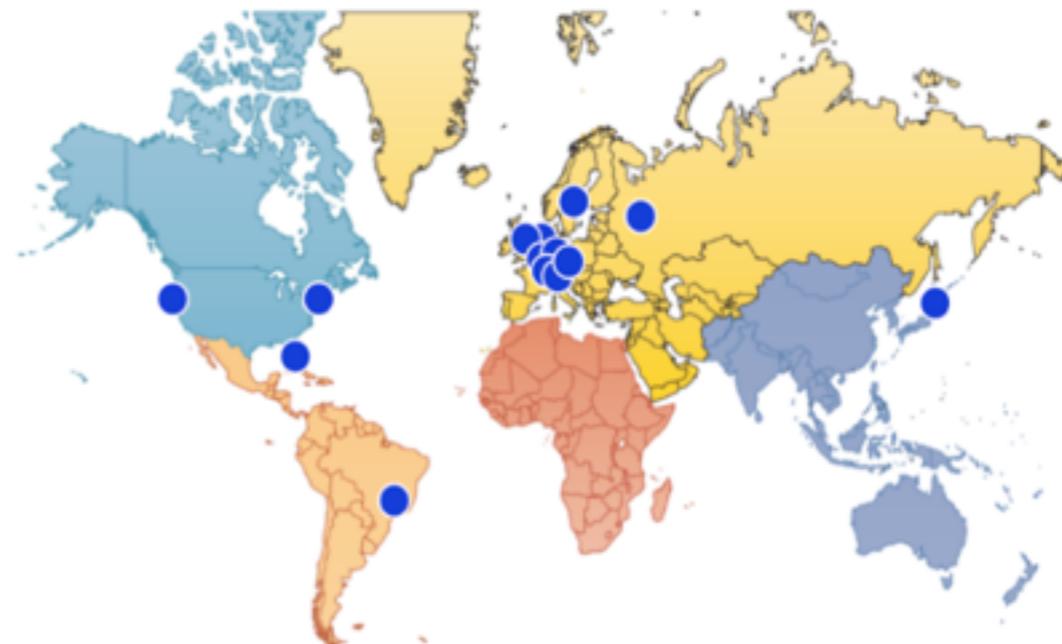


- IP or ASN queried?
 - You get different widgets!
- ASN often visualised based on the prefixes it announces

RIS - Routing Information Service



- RIPE NCC has been collecting BGP information since 1999
 - Raw data: ris.ripe.net
- RIS has 15 route collectors and 600+ peers
- RIPEstat visualises RIS data



At-a-glance view: Prefix queried



At a glance

- Route
- DNS
- Anti
- Database (9)
- Geographic (2)
- Activity (4)
- Suggestions (1)
- + MyView ?

Prefix Overview (140.78.0.0/16)

Announced?
By which AS?

Announced

This prefix is announced by **AS1205 JKU-LINZ-AS University Linz,AT** and is part of 140.0.0.0/8, Legacy space, administered by ARIN.

Showing results for 140.78.0.0/16 as of 2014-08-13 08:00:00 UTC

source data embed code permalink info

Registry Browser (140.78.0.0/16)

Last updated on 2014-05-27 at 12:53:54 UTC. Show more

inetnum:
140.78.0.0/16

netname	JKU-LAN
descr	Johannes Kepler University
country	AT
org	ORG-JKU1-RIPE
admin-c	ULAC1-RIPE
tech-c	ULNA1-RIPE
status	LEGACY
mnt-by	AS1205-MNT
mnt-by	ACONET-LIR-MNT

Showing results for 140.78.0.0/16 as of 2014-08-13 13:26:45 UTC

RIPE NCC members can access historical information by signing in with their LIR's RIPE NCC Access account.

source data embed code permalink info

Geoloc (140.78.0.0/16)

100.00%

Data is based on MaxMind's GeoLite City data set and valid for the stated query time (see below)

Showing results for 140.78.0.0/16 as of 2014-08-01 00:00:00 UTC

source data embed code permalink info

Routing Status (140.78.0.0/16)

Announced?
By which AS?
What % visible?
Since when?

At 2014-08-13 08:00:00 UTC, 140.78.0.0/16 was 100% visible (by 97 of 97 RIS full peers).

First ever seen before Jan 2004 (= beginning of available data).
Originated by: AS1205 (valid route object in RIPE)
No less-specific covering prefixes.

Advanced Settings

Compare to 1 week earlier | Exclude low visibility routes

Showing results for 140.78.0.0/16 as of 2014-08-13 08:00:00 UTC

Results exclude routes with very low visibility (less than 3 RIS peers seeing).

source data embed code permalink info

At-a-glance view: ASN queried



Announced?

AS Overview (AS1205)
Announced
Holder of this ASN:
JKU-LINZ-AS University Linz,AT
Showing results for AS1205 as of 2014-08-13 08:00:00 UTC
source data embed code permalink info

Registry Browser (AS1205)
Last updated on 2014-05-27 at 11:47:51 UTC.
aut-num: AS1205
as-name JKU-LINZ-AS
org ORG-JKU1-RIPE
descr University Linz
admin-c ULAC1-RIPE
tech-c ULNA1-RIPE
mnt-by AS1205-MNT
mnt-by ACONET-LIR-MNT
Showing results for AS1205 as of 2014-08-13 13:49:15 UTC
RIPE NCC members can access historical information by signing in with their LIR's RIPE NCC Access account.
source data embed code permalink info

Geoloc (AS1205)
Map Satellite
Map Data Terms of Use Report a map error
Geoloc details
Data is based on MaxMind's GeoLite City data set and valid for the stated query time (see below)
Showing results for AS1205 as of 2014-08-01 00:00:00 UTC
source data embed code permalink info

Routing Status (AS1205)
At 2014-08-13 08:00:00 UTC, AS1205 was visible to 100% of 97 IPv4 and 2% of 95 IPv6 RIS full peers.
First ever seen as origin announcing 193.186.172.0/22, on 2004-01-03 00:00:00 UTC.
Originated IPv4 prefixes: 3
Originated IPv6 prefixes: 0
Observed BGP neighbours: 2
Address space announced (IPv4): 67584 IPs
Address space announced (IPv6): equiv. to 0 /48s
Advanced Settings
Change to 1 week earlier | Exclude low visibility routes
Showing results for AS1205 as of 2014-08-13 08:00:00 UTC
Results exclude routes with very low visibility (less than 3 RIS peers seeing).
Given query time (2014-08-13 08:00:00 UTC) has been changed because it is earlier than the time there is data available for!
source data embed code permalink info

The rest is the same as for a prefix

BGPlay



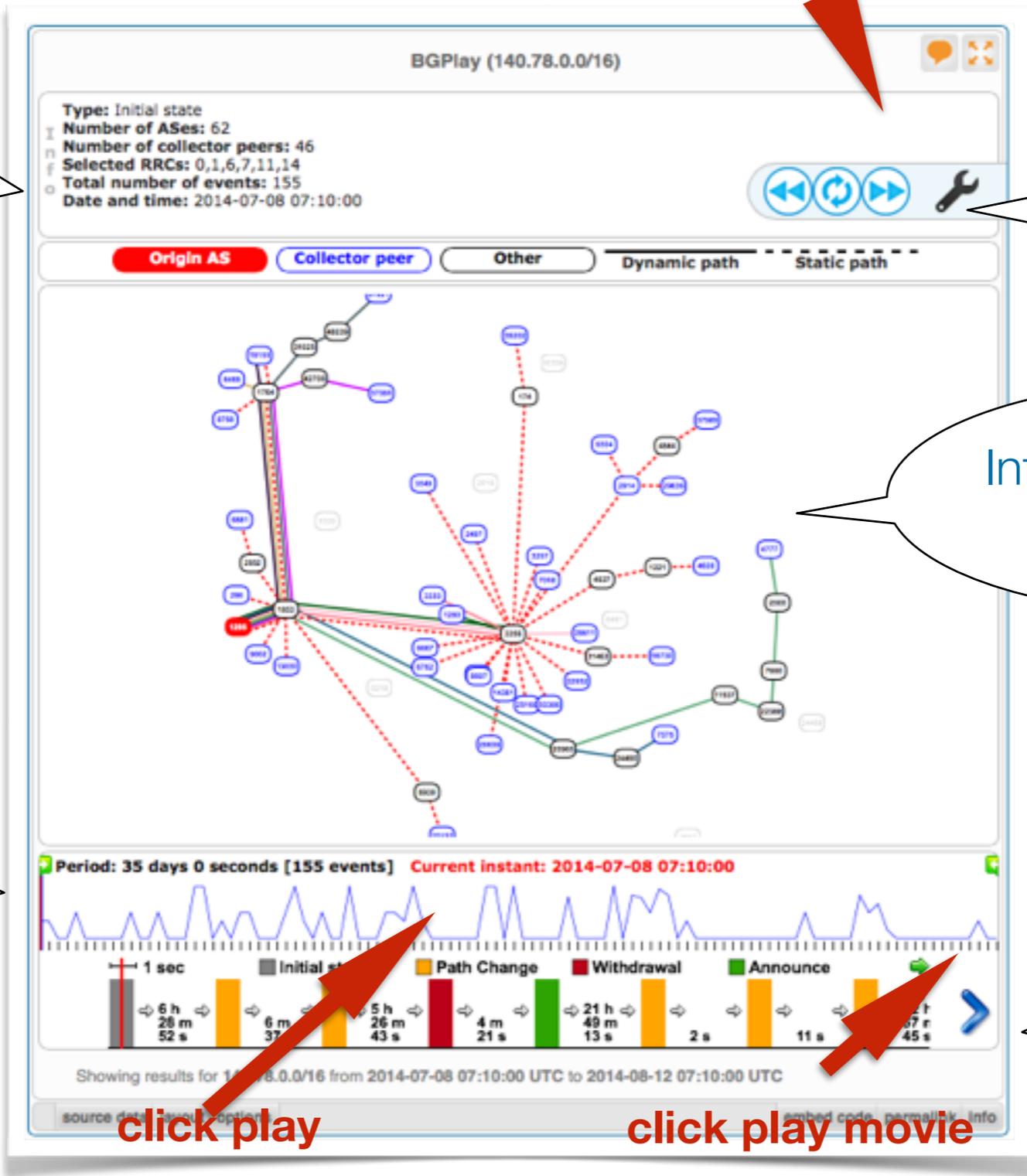
- See how your network is routed
 - Announcements
 - Withdrawals
 - Path changes
- BGPlay shows routing history
 - Animated graphic
 - Highly interactive

<https://stat.ripe.net/widget/bgplay>

BGPlay



BGP event, ASN or ASN path details



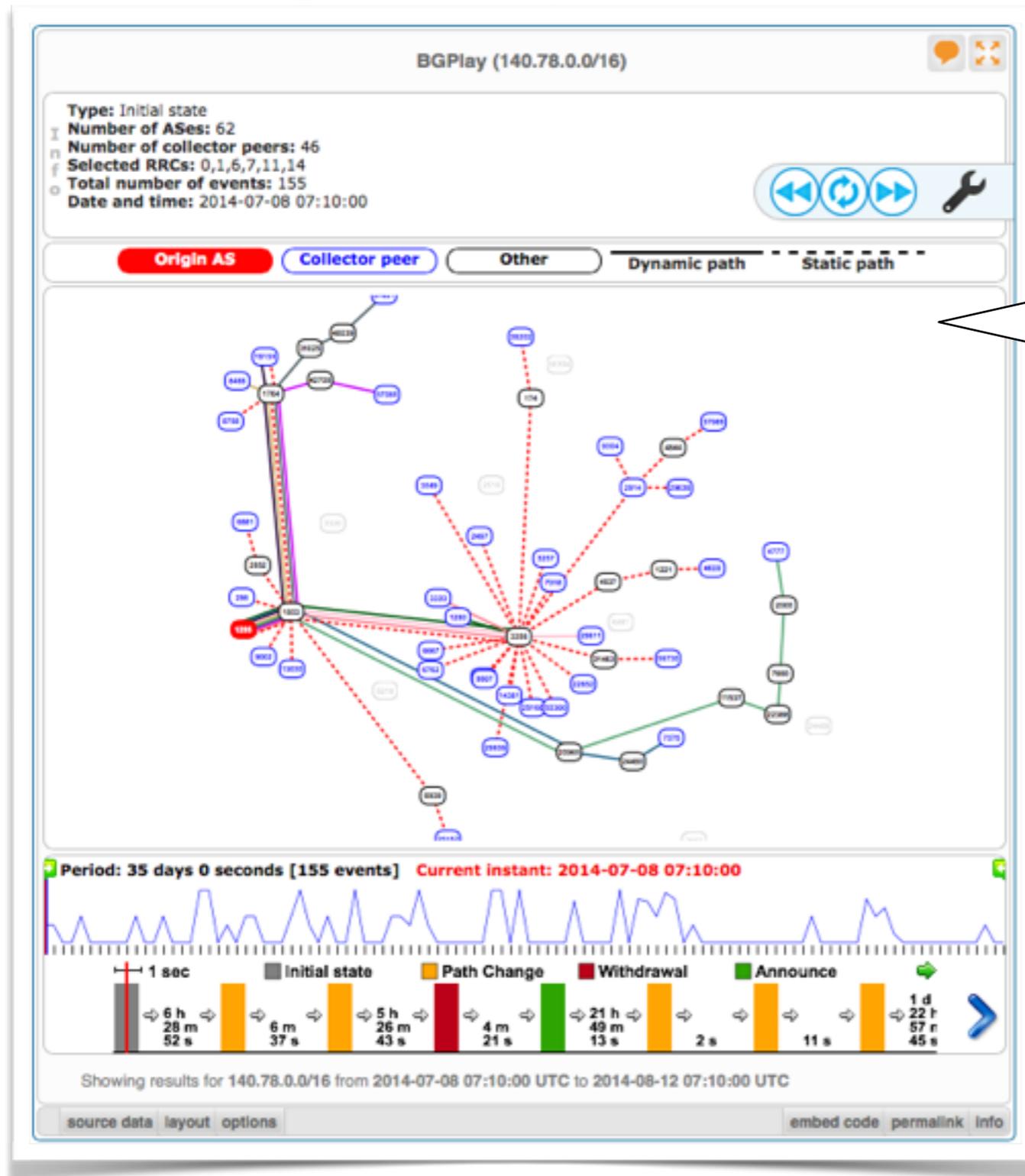
Control panel:
• Covered time period
• RRC selection

Interactive animated graph

Control timeline

Detailed timeline with events

BGPlay



Examples: (2013/8/28-30)

- Prefix with announcements & withdrawals:
84.205.64.0/24
- Check IPv6 connectivity:
2001:67c:2e8::/48
- Multi-homed prefix:
199.7.80.0/24
- BGP hijacking
2008-02-28: 208.65.153.0/24
Youtube traffic by Pakistan Telecom
AS17557
- Blackholing:
193.33.96.64

Prefixes visible for this ASN



Announced Prefixes (AS1205)

Show 10 entries Search:

Prefix	First Seen ?	Last Seen ?
193.186.176.0/22	2014-07-30 08:00:00 UTC	2014-08-13 08:00:00 UTC
193.186.172.0/22	2014-07-30 08:00:00 UTC	2014-08-13 08:00:00 UTC
140.78.0.0/16	2014-07-30 08:00:00 UTC	2014-08-13 08:00:00 UTC

Showing 1 to 3 of 3 entries

[Click here to load the entire history, starting from 2004-01-01 00:00 UTC!](#)

[Advanced Settings](#)

Exclude low visibility prefixes

Showing results for AS1205 from 2014-07-30 08:00:00 UTC to 2014-08-13 08:00:00 UTC

i Results exclude routes with very low visibility (less than 3 RIS peers seeing).

source data embed code permalink info

IPv4 vs IPv6?
Sort by prefix
or
Search "." vs "::"



Time period
shown in widget
Default:
last two weeks

Announced Prefixes: useful for ASN



Announced Prefixes (AS1205)

Show entries Search:

Prefix	First Seen ?	Last Seen ?
193.186.176.0/22	2004-01-22 16:00:00 UTC	2014-08-13 08:00:00 UTC
193.186.172.0/22	2004-01-01 00:00:00 UTC	2014-08-13 08:00:00 UTC
193.171.8.0/24	2008-12-09 08:00:00 UTC	2008-12-11 16:00:00 UTC
193.171.32.0/20	2008-12-09 08:00:00 UTC	2008-12-11 16:00:00 UTC
193.171.200.0/21	2008-12-09 08:00:00 UTC	2008-12-11 16:00:00 UTC
193.170.32.0/21	2008-12-09 08:00:00 UTC	2008-12-11 16:00:00 UTC
140.78.0.0/16	2004-01-01 00:00:00 UTC	2014-08-13 08:00:00 UTC

Showing 1 to 7 of 7 entries

Advanced Settings

Exclude low visibility prefixes

Showing results for AS1205 from 2004-01-01 00:00:00 UTC to 2014-08-13 08:00:00 UTC

i Results exclude routes with very low visibility (less than 3 RIS peers seeing).

source data embed code permalink info

History of prefixes announced by ASN





Exercise B

BGPlay

Refer to the exercise booklet



Reporting Abuse

Section 6

Reporting Abuse



DON'T PANIC!

What to do if your network is attacked?



- Spam or unauthorised access?
 - Find IP in message headers or logs
- Want to contact their admin?
 - Find the correct email for reporting abuse
- RIPE Database
 - Contact details for every ASN and IP address
 - In Europe, the Middle East and parts of Central Asia

<https://labs.ripe.net/Members/cteusche/finding-anti-abuse-contact-information-with-ripestat>

Reporting Abuse



- Take action with the Abuse Contact Finder

<https://stat.ripe.net/abuse>

RIPEstat Abuse Contact Finder

The RIPEstat Abuse Contact Finder may be able to help you find the email address that should be used to report network abuse originating from a particular IP address.

- You can learn more about network abuse in general and what you can do to stop it on the RIPE NCC's [Abuse Information page](#).
- You can learn more about how the RIPEstat Abuse Contact Finder works and how to report abuse in this [tutorial on RIPE Labs](#).

In -depth information about abuse

RIPEstat Abuse Contact Finder BETA

Enter an IP address

Enter IP address

source data embed code permalink info

For regular RIPEstat users: this widget, of course, can also be found on the regular result page in the "Anti Abuse" tab.

Reporting Abuse



Abuse Contact Finder (2001:67c:2e8::/48) **BETA**

Email-Contact
abuse@ripe.net

Contact-Quality-Rating
★★★★★ (5/5)
This contact can be used to report abuse.

Show Complete Details
 Info for Resource Holders

Showing results for 2001:67c:2e8::/48 as of 2013-08-30 14:39:00 UTC

BETA Beta status: Please note that even highly rated contacts can be incorrect

source data embed code permalink info

Rating of the contact

Email contact to report abuse

Reporting Abuse



Abuse Contact Finder (2001:67c:2e8::/48) **BETA**

Email-Contact

abuse@ripe.net

Contact-Quality-Rating

★★★★★ (5/5)

This contact can be used to report abuse.

Show Complete Details
 Info for Resource Holders

Showing results for 2001:67c:2e8::/48 as of 2013-08-30 14:39:00 UTC

BETA Beta status: Please note that even highly rated contacts can be incorrect

source data embed code permalink info

Details about the resource and abuse contact:

Show Complete Details

Details

- Results for

193.0.18.0-193.0.21.255 [Ⓢ]
abuse@ripe.net from abuse-contact role

- Special Network Resource Information

This resource has been identified to be related to this information:
RIPE NCC PI Allocation

Hold by:
n.a. [Ⓢ]

- RIR Information

RIR	RIPE NCC	RIPE's Whois
		https://apps.db.ripe.net/search/query.html



Exercise C

Handling abuse

Refer to the exercise booklet



Personalising RPEstat

Section 6

Create a RIPE NCC Access Account



<https://access.ripe.net>

The screenshot shows the RIPE NCC Access account login page. At the top left is the RIPE NCC logo and the text "RIPE NCC RIPE NETWORK COORDINATION CENTRE". To the right is a search bar with "RIPE Database (Whois)" and "Website" tabs, and a search input field with a magnifying glass icon. Below the search bar is a navigation menu with items: "Manage IPs and ASNs >", "Analyse >", "Participate >", "Get Support >", "Publications >" (highlighted), and "About Us >". The main content area has a breadcrumb "You are here: Home > Access" and a heading "Sign in using your RIPE NCC Access account". Below the heading is a text block: "If you don't have a RIPE NCC Access account, click here to create one." To the right is a login form with "Email" and "Password" labels, input fields for "Your email address" and "Your password", a "Sign in" button, and a link "Forgot your password?". A yellow box contains the text "New: Two-step verification. Learn more...". At the bottom is a dark blue footer with social media icons (Facebook, Twitter, LinkedIn, YouTube, RSS) and a list of links: "Home | Sitemap | Contact us | Service Announcements | Privacy Statement | Cookies | Copyright Statement".

Why personalise RIPEstat?



- If you have recurring lookup tasks that involve different widgets spread over multiple tabs
- Building a “history” of your lookups

Log into RIPE NCC Access Account



MyView



- Create custom views
 - Click the “MyView” button
 - Drag and drop the widgets you want on the MyView tab
- Created under “ASN” or “IP”

MyView



The screenshot shows the MyView interface. On the left is a sidebar with a list of widget categories: At a Glance (4), Routing (11), DNS (1), Anti Abuse (1), Database (5), Geographic (2), Activity (2), and Suggestions (1). Below these is a '+ MyView ?' button, which is circled in red. Underneath is a 'MyView-Test1' widget with a gear icon and '(2)' next to it. A red callout box points to this widget with the text 'Newly created MyView'. The main view area contains a message: 'This view is empty :(Add content by dragging a widget onto the tab of this view.' Below this is a preview of a widget titled 'Resource Overview' with a tooltip that says 'Resource Overview'. The widget content shows 'RIPE-NCC-AS - Reseaux IP Europeens Network Coordination Centre (RIPE NCC)' and 'Showing results from 2013-04-23 00:00:00 UTC'. Below the preview is a 'Registry Browser (AS3333)' section with details for 'aut-num: AS3333', including 'as-name: RIPE-NCC-AS', 'descr: Reseaux IP Europeens Network Coordination Centre', 'org: ORG-RIEN1-RIPE', and 'admin-c: JDR-RIPE'. At the bottom of the main view area, there is a link: 'For more information on custom views, please go to [custom views](#).'

MyViews are only visible to you. The option to share your views will be available soon!

Customise MyView



Re-order widgets
as you like

The screenshot shows the MyView interface. On the left is a sidebar with a list of widget categories and their counts: At a Glance (4), Routing (11), DNS (1), Anti Abuse (1), Database (5), Geographic (2), Activity (2), and Suggestions (1). Below these is a '+ MyView ?' button and a list of existing views: 'MyView-Test1' (2) and 'Monitor-2' (2). The 'Monitor-2' view is highlighted with a red dashed box. The main content area displays two widgets. The top widget is 'AS Overview (AS1205)', which shows an 'Announced' status, the holder 'JKU-LINZ-AS University Linz,AT', and information about the 16-bit ASN block. The bottom widget is 'Routing Status (AS1205)', which shows a yellow alert box stating that AS1205 was visible to 100% of 97 IPv4 and 2% of 95 IPv6 RIS full peers at 2014-08-14 08:00:00 UTC. Below this, it lists statistics: 'First ever seen as origin announcing 193.186.172.0/22, on 2004-01-03 00:00:00 UTC', 'Originated IPv4 prefixes: 3', 'Originated IPv6 prefixes: 0', 'Observed BGP neighbours: 2', 'Address space announced (IPv4): 67584 IPs', and 'Address space announced (IPv6): equiv. to 0 /48s'. There is also an 'Advanced Settings' link and a blue information box at the bottom stating 'Results exclude routes with very low visibility (less than 3 RIS peers seeing)'.

- Rename
- Re-order
- Control visibility
- Remove

Visibility of MyView



- MyView is only accessible after you have queried an ASN or IP
- A MyView created after an ASN query is only **visible** for other ASN queries
- A MyView created after IP query is only **visible** for other IP queries
- This can be changed via settings

Controlling Visibility



Monitor-2 was created after an ASN query

Monitor-2's Settings

Resource Properties

Simplified Advanced

For what resource type should this view be visible:
(Change by clicking on property)

ASN IP

Hostname Country

view will be shown for resource type (e.g. 'ASN')

view will **not** be shown for resource type (e.g. 'ASN')

Ok

Monitor-2

First ever seen as origin announcing 193.0.0.0/21, on 2004-01-03 00:00:00 UTC.

Originated IPv4 prefixes: 6

Originated IPv6 prefixes: 1

MyView Summary



- RIPE NCC Access login required
- Customised selection of widgets
- It's like an extra tab, specifically for your queries
- By default, available for one type of resource (ASN or IP)
- Can't be shared



Exercise D

MyView

Refer to the exercise booklet



Comparing Networks

Section 8

Why compare networks?



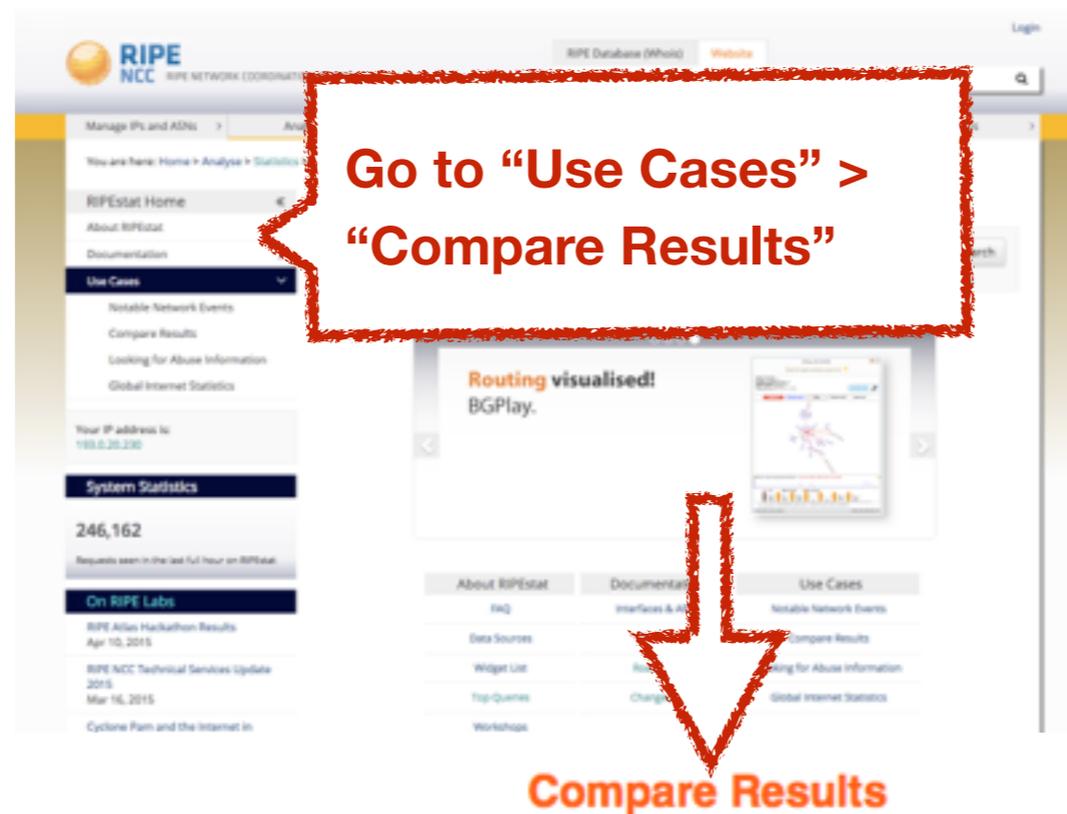
- Want to peer with AS-X?
 - Learn by opening multiple widgets about AS-X
- Choosing upstream ?
 - Compare AS-X with AS-Y by opening same widget loaded with two different ASNs
- Internet outage in a country?
 - Open multiple country-related widgets in same view

https://labs.ripe.net/Members/suzanne_taylor_muzzin/ripestats-multiple-widget-and-resource-comparison

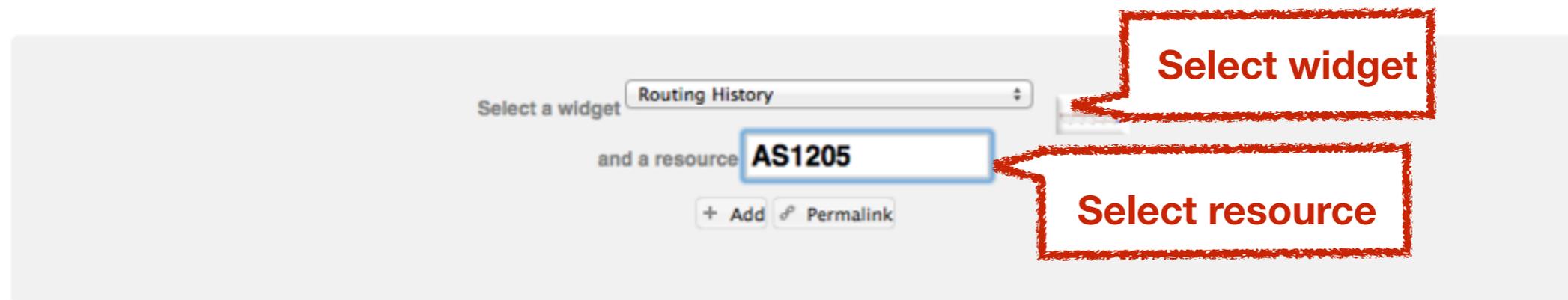


How to compare

- Compare results in different widgets



Select up to six different widgets from the list to compare at one time. Different resources can be queried for each widget.



Compare results



1 Select "Routing History" widget

2 enter "AS3333"

3

Routing History (as3333)

Switch to Table View

Show all of 9 rows

AS3333

Routing History (as1205)

Switch to Table View

Show all of 9 rows

AS1205

Prefix Size Distribution (as1205)

by number of Prefixes - Addresses

IPv4 1 (100%)

IPv6 2 (40%)

IPv6 1 (16%)

Showing results for AS1205 as of 2014-08-15 08:00:00 UTC

Results exclude routes with very low visibility (less than 3 RIR peers seeing).

Compare results



Compare Results

Select up to six different widgets from the list to compare at one time. Different resources can be queried for each widget.

Select a widget and a resource
+ Add **Permalink**

Use the permalink to share this page
<https://stat.ripe.net/special/compare-results#widget-container-0.resource=as1205&widget-container-0.widgetType=prefix-size-distribution&widget-cont>

Routing History (as3333)

Switch to Table View

Show of 9 rows

AS3333

Showing results for AS3333 from 2004-01-01 00:00:00 UTC to 2014-08-15 00:00:00 UTC

Routing History (as1205)

Switch to Table View

Show of 9 rows

AS1205

Showing results for AS1205 from 2004-01-01 00:00:00 UTC to 2014-08-15 00:00:00 UTC

Prefix Size Distribution (as1205)

by number of Prefixes Addresses

Share via
"Permalink"

Compare resources summary



- No login required
- Add widgets AND input query for each widget (ASN, IP, etc.)
- It is a result page with widgets and query results
- Share it via a permalink

Comparing countries in one widget



- Compare the growth of ASNs in DE and NL
- See IPv6 adoption rate in four countries at the same time
- Analyse IP hijacking with 'BGP Update Activity Widget'

<https://labs.ripe.net/Members/wilhelm/bgp-leaks-in-indonesia>

https://labs.ripe.net/Members/suzanne_taylor_muzzin/new-in-ripestat-in-widget-comparison-and-monitoring

In-widget comparison



- Country Routing Statistics





Exercise E

Comparing Results

Refer to the exercise booklet



Exercise F

RIPEstat Use Cases

Use Cases



- How can you see whether someone has hijacked your prefixes?
- How can you see whether you had an outage?



Questions



christian.teuschel@ripe.net
@cteuschel



RIPE Atlas

Overview 2 - RIPE Atlas



RIPE Atlas

- Introduction to RIPE Atlas
- What you can get from RIPE Atlas as a visitor
- Exploring public probes
 - *Live Demo*
- Finding public measurements
 - *Exercise F: Analyse results*
- Creating a measurement
 - *Exercise G: Create a measurement*
- Network Monitoring
 - *Exercise H: Setting up 'Status Checks'*
- *More RIPE Atlas features - optional*
- How to host a probe
- ~~Advanced topics - not part of this workshop~~
 - ~~Use cases and success stories~~
 - ~~RIPE Atlas anchors~~
 - ~~RIPE Atlas community~~



Introduction to RIPE Atlas

Section 9

RIPE Atlas



The screenshot shows a web browser window displaying the Wikipedia article for RIPE Atlas. The browser's address bar shows the URL https://en.wikipedia.org/wiki/RIPE_Atlas. The page features the Wikipedia logo on the left, a navigation menu at the top, and a search bar. The main content area includes the article title "RIPE Atlas", a sub-header "From Wikipedia, the free encyclopedia", and a paragraph describing the platform as a global, open, distributed Internet measurement platform. A "Contents" table of contents is visible, listing sections from History to Categories. A world map with red and green dots representing measurement devices is also present.

RIPE Atlas – Wikipedia, the free encyclopedia

en.wikipedia.org/wiki/RIPE_Atlas

Becha 0 Talk Sandbox Preferences Beta Watchlist Contributions Log out

Article Talk Read Edit source Edit More Search

RIPE Atlas

From Wikipedia, the free encyclopedia

RIPE Atlas is a global, open, distributed Internet measurement platform, consisting of thousands of measurement devices that measure Internet connectivity in real time.

Contents [hide]

- 1 History
- 2 Technical details
- 3 Community
- 4 Research papers
- 5 Similar projects
- 6 References
- 7 External links
- 8 Categories



Definition

- RIPE Atlas = global active measurements platform
- Goal: View Internet reachability
- Probes hosted by volunteers
- Measurements performed towards root name servers
 - Visualised as Internet traffic maps
- Users can also run customised measurements
 - ping, traceroute, DNS & SSL/TLS, NTP and HTTP*

RIPE Atlas in numbers: April 2016



- 9,300+ probes connected
- 350+ active probes in SEE countries
- Countries: 181
- Originating ASNs:
3,398 (IPv4) = 6,4% coverage
1,246 (IPv6) = 11,21% coverage

Overview on SEE countries

	Connected	Disconnected	Anchor
Albania (AL)	19	7	0
Slovenia (SI)	46	5	1
Serbia (RS)	42	6	2
Kosovo (XK)	0	0	0
Croatia (HR)	43	6	0
Macedonia (MK)	16	4	0
Romania (RO)	56	9	1
Bulgaria (BG)	81	18	3
Bosnia and Herzegovina	9	3	0
Montenegro (ME)	4	0	0

Measurements Devices



- v1 & v2: Lantronix XPort Pro
- v3: TP-Link TL-MR3020 powered from USB port
 - Does not work as a wireless router
 - Same functionality as the old probe
- RIPE Atlas anchor: Soekris net6501-70

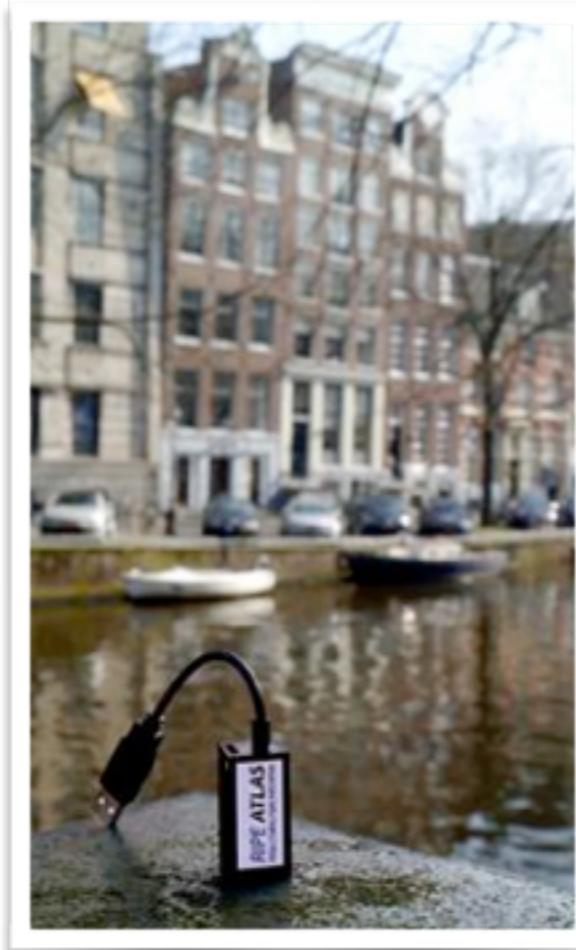


Most Popular Features



- 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
- New: “Time Travel”, LatencyMON, DomainMON
- Status checks (Icinga & Nagios)

Probe Photos





Contacting RIPE Atlas

- <https://atlas.ripe.net>
- Users mailing list: ripe-atlas@ripe.net
- Articles & updates on RIPE Labs:
<https://labs.ripe.net/atlas>
- Questions and bugs: atlas@ripe.net
- Twitter: [@RIPE_Atlas](https://twitter.com/RIPE_Atlas) and [#RIPEAtlas](https://twitter.com/RIPE_Atlas)



What You Can Get From RIPE Atlas As A Visitor

Section 10

Internet Traffic Maps



- RIPE Atlas <<
- About RIPE Atlas >
- Get Involved >
- Probes and Anchors >
- Measurements, Maps and Tools** v
- Measurements
- Internet Maps
- Tools
- Resources >
- RIPE NCC Members
- My Atlas >
- Staff Pages >

Internet Maps

DNS Root Instances



Shows, for each probe, which root DNS server instance the probe ends up querying, when they ask a particular root server. In other words, it shows the "gravitational radius" for root DNS server instances.

Comparative DNS Root RTT



Shows a comparison of response time for DNS SOA queries to all the root DNS servers. For each probe, a marker shows the "best" root server with colour identifying the related minimum response time.

Root Server Performance



This map shows the reply time to the SOA query of a particular root DNS server, over the selected transport protocol (UDP, TCP or comparison of the two) for each probe.

RTT to Fixed Destinations



Shows the colour coding for the RTT value for the particular destination for each probe. The minimum / average / maximum values are based on standard "ping" measurements.

Reachability of Fixed Destinations

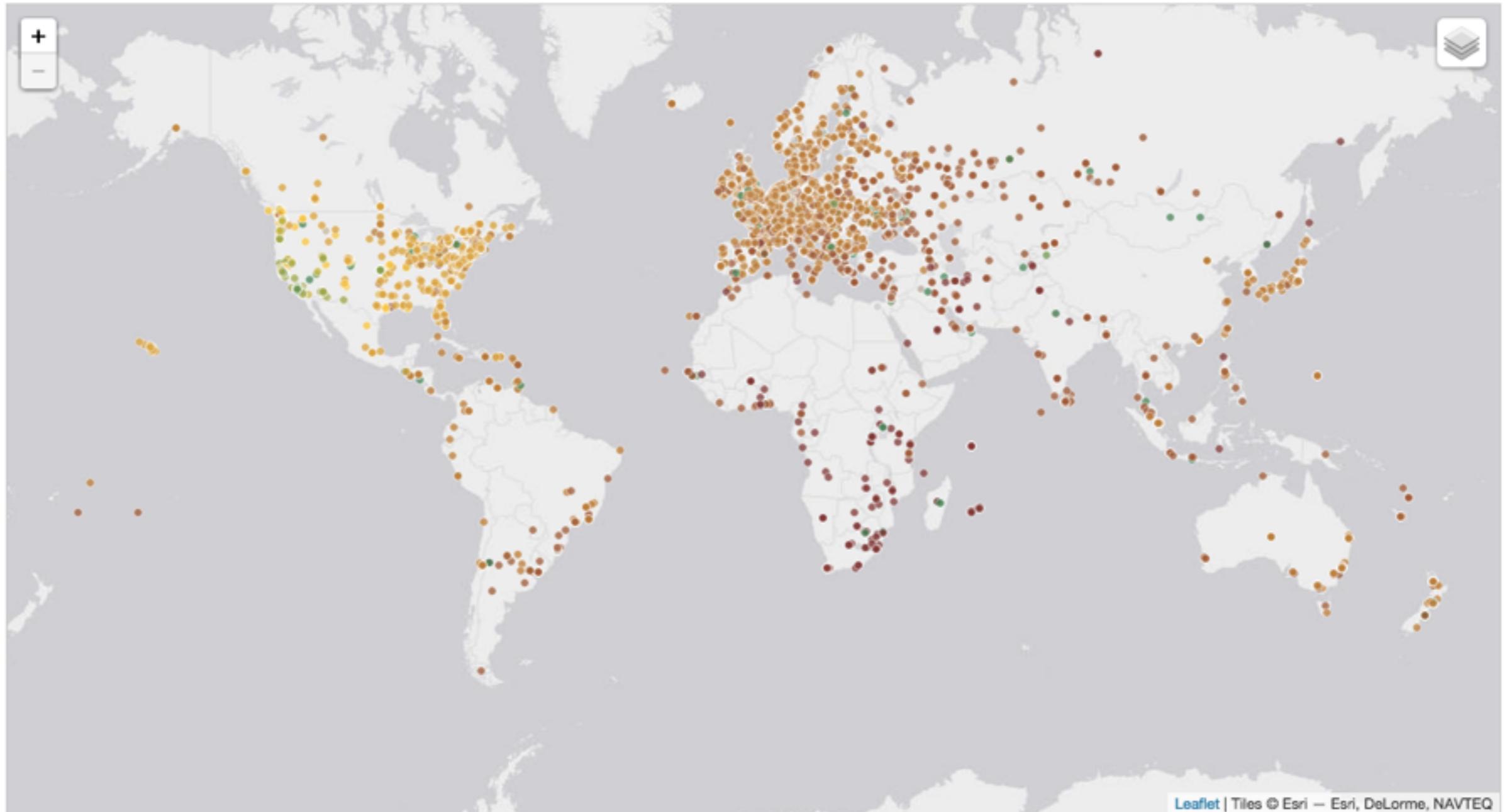


Shows if the particular fixed destination is reachable or not from each probe. Red markers indicate that the specific destination for these probes are unreachable and green reachable.

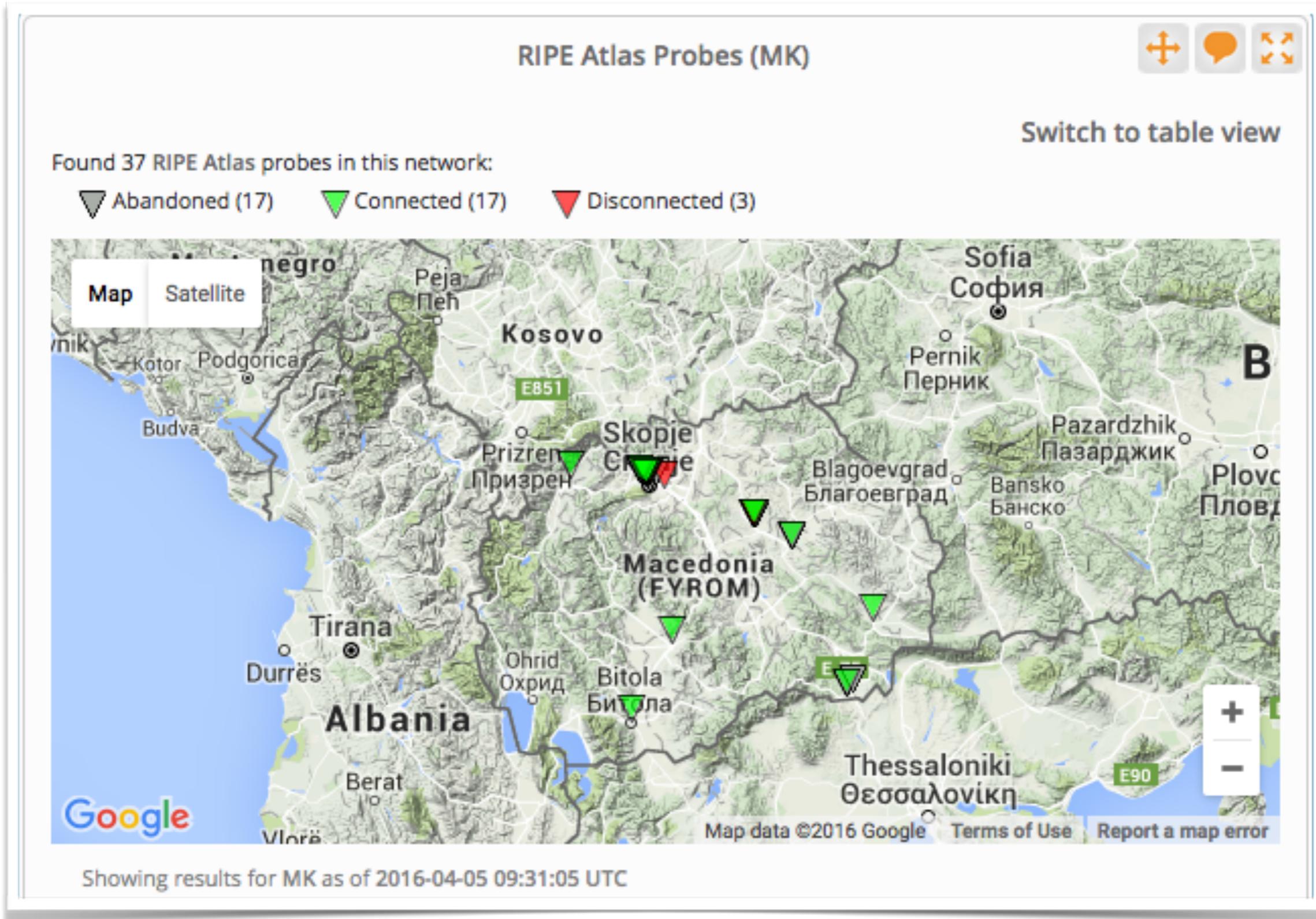
Where is B-root?



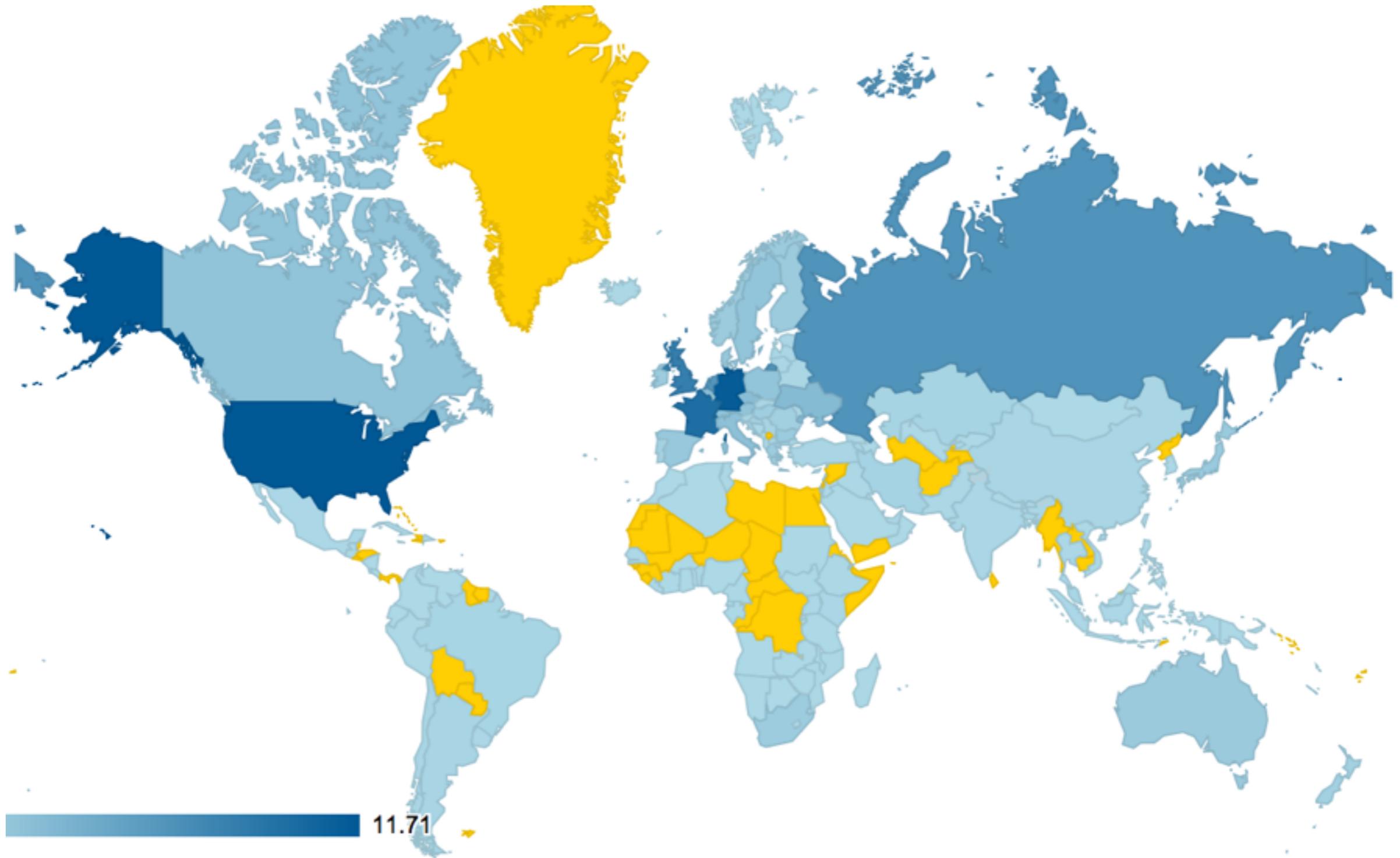
We display measurement results from the last hour only.



Probes per ASN (in RIPEstat)



Where we want to place probes



Articles, papers, use cases, experiences



0 comments **RIPE Atlas: Measurements With Tagged Probes Coming Soon** Suzanne Taylor Muzzin — Sep 12, 2014 12:05 PM

User Tags: Cable, Home, NAT
System Tags: V1, Resolves A Correctly, Resolves AAAA Correctly, IPv4 Works

We've been busy working on a number of developments, and we're really excited about particular that will be ready soon: creating customised measurements using tagged probes. Learn more about it - along with some other recent additions - and let us know what you

Tags: atlas, measurements, tools

» Read

0 comments **Time Warner Cable Outage** Emile Aben — Aug 28, 2014 04:50 PM



The Time Warner Cable network suffered an outage on 27 August 2014 between approximately 9:40 and 10:55 UTC. We looked at some interesting details of this outage using RIS and RIPE Atlas.

Tags: atlas, routing

» Read

0 comments **RIPE Atlas Midsummer Update 2014** Fatemah Mafi — Jul 24, 2014 05:30 PM



Since RIPE 68 in Warsaw, the RIPE NCC has developed and released RIPE Atlas. We would like to inform the community of what we've been working on and how you can benefit from the RIPE Atlas service.

Tags: atlas, statistics

0 comments **How RIPE Atlas Helped Wikipedia Users** Emile Aben — Jul 09, 2014 12:25 PM

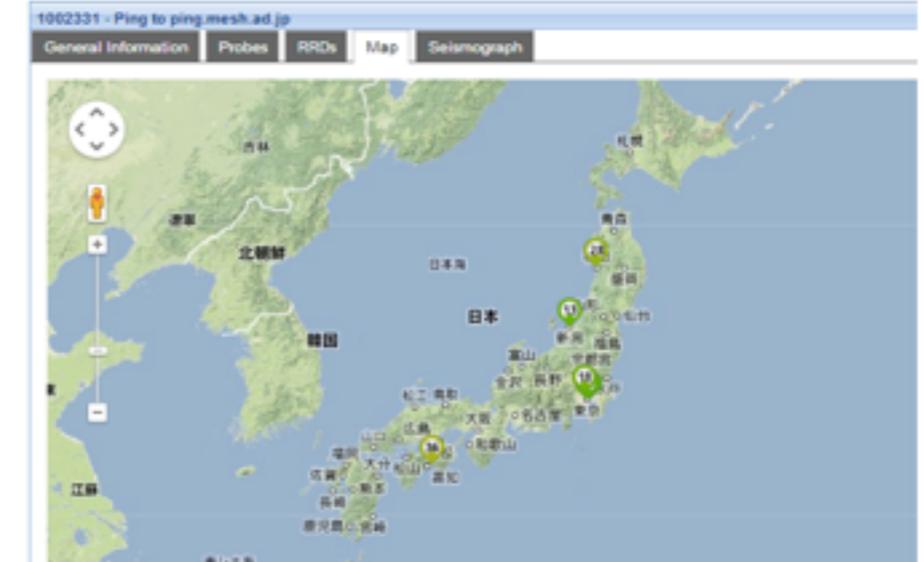


Engineers from the Wikimedia Foundation and the RIPE NCC recently launched a project to measure the latency of Wikimedia sites for users worldwide. The project aims to find ways to decrease latency and improve performance for users around the world.

標準以外の計測先の追加

任意の宛先 (UDM) を登録して計測を行うことも可能です。My Atlas>Measurements>New リックして計測先を作成します。任意の宛先への計測には「クレジット」が必要になります。プロの稼働時間に応じて (24時間連続稼働すると21,600クレジットが貯まる) 溜まっていき、UDP TraceRouteを行う度に消費 (pingは1回につき3クレジットを消費) されます。

biglobe (ping.mesh.ad.jp) へのUDM



1 پست • صفحه 1 از 1

ai!vid
Information and Communications Technology
Khoramyar
پست ها : 122
تاریخ عضویت: شنبه ۰۹ فروردین ۱۳۹۳
pm 12:52 2013
times 52 :Has thanked
times 57 :Been thanked

پروژه بین المللی سنجش اینترنت - رایب اطلس

توسط Khoramyar • سه شنبه مارس 18, 2014 1:42 pm

سازمان رایب - <http://www.ripe.net> - به عنوان یکی از پنج سازمان متولی منابع اینترنت جهانی پروژه بسیار جالب و جذابی را به نام پروژه اطلس شروع کرده است.

وب سایت رسمی پروژه اطلس: [/https://atlas.ripe.net](https://atlas.ripe.net)

کاشگران کوچک شبکه:

سازمان رایب، با تغییر دادن نرم افزار مودم های کوچکی از شرکت TPLink آنها را به Probe ها یا کاشگر های کوچکی تبدیل کرده و آنها را به رایگان در اختیار متقاضیان میگذارد. متقاضیان از کشور های مختلفی آنها را دریافت میکنند و به اینترنت های منازل و محل کارشان متصل میکنند و این کاشگرها از نزدیک ترین مودم به پروتوکول DHCP آی پی دریافت کرده و از خط اینترنت با مراکز سنجش رایب تماس میگیرند. مراکز سنجش رایب، به صورت ریموت به این کاشگر ها دستور میدهند که چه سنجش هایی را انجام دهند.

این سنجش ها شامل دستور های ساده شبکه مثل Ping - Traceroute و چند سنجش دیگر مثل DNS و امتال آنها است.

عکس یک کاشگر رایب اطلس:



Looking Up Public Probes

Section 11

Searching for probes



- <https://atlas.ripe.net/probes/>

Filter based on
ASN, country,
location...

The screenshot shows the RIPE NCC website's 'Probes' page. At the top, there is a search bar for IP addresses or ASNs. Below the navigation menu, a breadcrumb trail indicates the current location: Home > Analyse > Internet Measurements > RIPE Atlas > Probes. The main heading is 'Probes', followed by a brief description and three links: 'Learn more about probes', 'See the probes map', and 'Apply for your own probe'. A filter bar allows users to filter by 'id/asn/country/description', with dropdown menus for 'Any Status', 'IPv4/v6', and 'Any Country'. Below the filter bar, there are tabs for 'Public' and 'Login to see more'. The main content is a table of probes with columns for Id, ASN v4, ASN v6, Country, Description, and Connection Status. Each row includes a small flag icon for the country and a lock icon for connection status.

Id	ASN v4	ASN v6	Country	Description	Connection Status
6175	1103	1103		SURFnet bv	🔒 4 weeks
6146	60781	60781		Leaseweb Network B.V.	🔒 4 weeks
6152	28753	28753		Leaseweb Network B.V.	🔒 4 weeks
6137	3333	3333		nl-ams-as3333-preprod	🔒 4 weeks
6147	33280	33280		Afilias	🔒 4 weeks
6112	197216	197216		Delta Softmedia Ltd	🔒 4 weeks
6161	27843	27843		Optical Technologies	🔒 4 weeks
6142	63403	63403		Afilias	🔒 4 weeks
6008	2607	2607		AA sk-bts-as2607	🔒 4 weeks
6001	3333	3333		AA nl-ams-as3333	🔒 4 weeks

Probe page - Live demo



» You are here: Home > Analyse > Internet Measurements > RIPE Atlas > Probes > Probe #10010

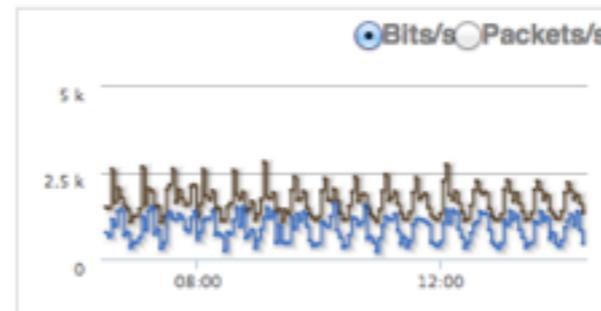
Probe #10010 (Register)

General Network Built-in Measurements User-defined Measurements

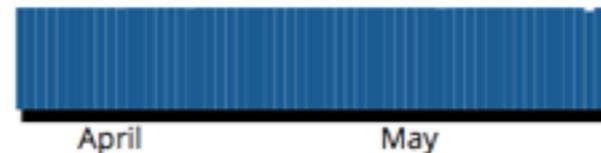
General Information [Edit](#)

Id	10010
MAC Address	F8:D1:11:A9:F3:2C
Architecture	tl-mr3020
Firmware Version	4680 (1070)
Router Type	
Bandwidth Limit	Not set
DNS Entry	Off
Shared Publicly	Yes
User Tags	NAT Chello 200MB
System Tags	V3 Resolves A Correctly Resolves AAAA Correctly IPv4 Works Auto GEOIP city IPv4 Capable IPv4 RFC1918

Connection & Traffic [Edit](#)



Connected Time [3 days, 9 hours](#)



 [3 days, 9 hours](#)

Firmware #10010
4680

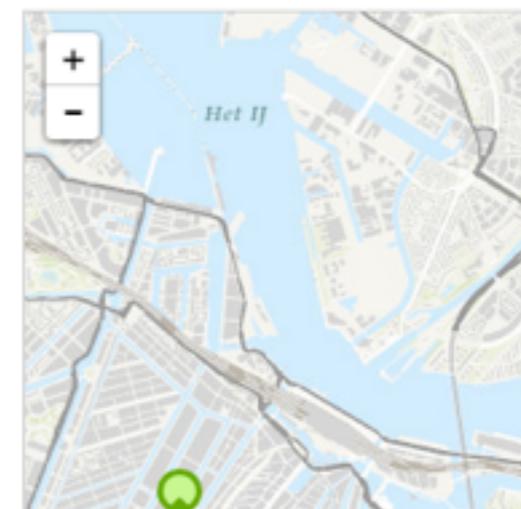
Architecture 
tl-mr3020

MAC Address
F8:D1:11:A9:F3:2C

The displayed location is an automatic best guess of the city based on IP address.

By manually setting a more accurate location you can help to improve the usefulness and correctness of RIPE Atlas.

[Update Location](#)



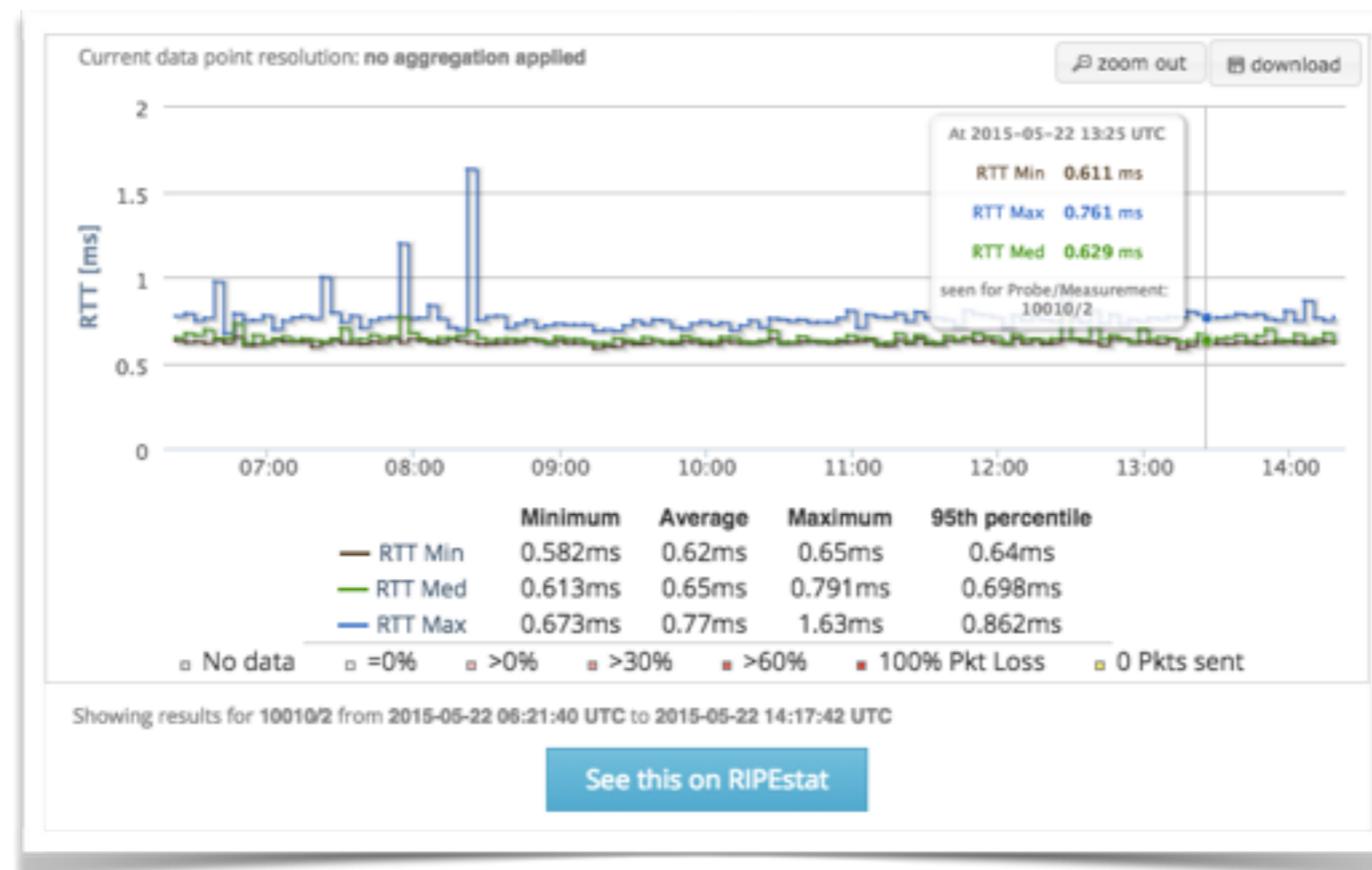
Management Sharing [Edit](#)

Only the probe host is permitted to administer this probe.

Zoomable Ping Graph



- Replace multiple RRDs graphs: zoom in/out in time, in the same graph
- Easier visualisation of an event's details
- Selection of RTT class (max, min, average)





Finding Results of Public Measurements

Section 12

Looking up Measurements Results



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

The screenshot shows the RIPE Atlas website interface. At the top, there are navigation tabs: Manage IPs and ASNs, Analyse (selected), Participate, Get Support, Publications, and About Us. A dropdown menu is open under 'Analyse', showing options like RIPE Atlas, About RIPE Atlas, Get Involved, Probes and Anchors, Measurements, Maps and Tools (selected), Internet Maps, Tools, Resources, and RIPE NCC Members. The main content area displays a list of measurements with columns for ID, status, target, description, probes, time, and status. A filter bar is visible above the table, allowing filtering by target and/or description, status, IP version, type, and time range.

			Description	Probes	Time (UTC)	Status
		nog.net	de-fra-as5580.anchors.atlas.ripe.net	0	2019-11-14 00:30 No Stop Defined	⚙️
1411440	○ ⚡	de-muc-as5539.anchors.atlas...	de-muc-as5539.anchors.atlas.ripe.net	0	2019-08-01 00:15 No Stop Defined	⚙️
3625872	Ⓢ ⚡	uk-lon-as5459.anchors.atlas...	Traceroute measurement to uk-lon-as5459.anchors...	Calculating...	2016-03-17 12:00 2016-03-21 12:00	⚙️
3625873	Ⓢ ⚡	ca-mtr-as852.anchors.atlas....	Traceroute measurement to ca-mtr-as852.anchors....	Calculating...	2016-03-17 12:00 2016-03-21 12:00	⚙️
3625874	Ⓢ ⚡	it-mil-as16004.anchors.atla...	Traceroute measurement to it-mil-as16004.anchor...	Calculating...	2016-03-17 12:00 2016-03-21 12:00	⚙️
3625875	○ ⚡	nl-haa-as201682.anchors.atl...	Traceroute measurement to nl-haa-as201682.ancho...	Calculating...	2016-03-17 10:42 No Stop Defined	⚙️
3625876	○ ⚡	nl-haa-as201682.anchors.atl...	Traceroute measurement to nl-haa-as201682.ancho...	Calculating...	2016-03-17 10:42 No Stop Defined	⚙️

Downloading Measurements Results



- Click on msm, then “Download”

- Or go to URL

- Or use the API

- Results in JSON

- Libraries for parsing available on GitHub

- <https://github.com/RIPE-NCC/ripe.atlas.sagan>

- <https://github.com/RIPE-Atlas-Community/>

A screenshot of the RIPE Atlas web interface for downloading measurement results. The page title is "DNS measurement to j.root-servers.net". There are four tabs: "General Information", "Probes", "Map", and "Download Results" (which is active). Below the tabs, it says "Download the raw measurement result data here." and "You can use this form to download the data through your browser, or use the preview on the right to help you query the REST API directly." The form includes: "Start Date*" with a dropdown menu showing "2015-05-11 (start time of this measur...)" and a note "All dates are start-of-day"; "Stop Date*" with a dropdown menu showing "2015-05-11 (start time of this measur...)" and a note "All dates are end-of-day"; "Format" with a dropdown menu showing "JSON"; and a "Download" button. To the right, under "URL Preview", a text box shows the REST API URL: "https://atlas.ripe.net/api/v1/measurement/1999490/result/?start=1431302400&stop=1431388799&format=json".

Search for Measurements by Target in RIPEstat



RIPEstat — Internet Measurements and Analysis

https://stat.ripe.net/widget/atlas-targets#w.resource=8.8.8.8

You are here: Home > Data & Tools > RIPEstat > atlas-targets

RIPE Atlas Measurement Targets (8.8.8.8)

8.8.8.8

Show 10 targets/page Search:

Measurement ID	Stopped	Type	Target IP	Target Hostname
1040720	ongoing	ping	8.8.8.8	google-public-dns-a.google.com
1006491	ongoing	traceroute	8.8.8.8	not specified
1006192	ongoing	ping	8.8.8.8	not specified
1004827	ongoing	traceroute	8.8.8.8	not specified
1002630	ongoing	ping	8.8.8.8	not specified
1478085	2014-02-24 13:41 UTC	dns	8.8.8.5	not specified

Go to “RIPEstat >
“RIPE Atlas Activity”

Use Existing Measurements



- There are many measurements already running!
- Search for existing public measurements first...
- Only then schedule your own measurement if you don't find what you're looking for



Exercise G

Analyse Measurements Results

Refer to the exercise booklet



Creating a Measurement

Section 13

Logging In



- Create a RIPE NCC Access account
 - Same for LIR Portal, RIPE Atlas, RIPEstat, RIPE Labs...
- Advanced
- ‘LIR contact’: additional benefits!
 - Membership benefits for RIPE Atlas
 - Share probe management with LIR colleagues
 - Historical RIPE Database view in RIPEstat
- Add yourself as ‘contact’ in LIR Portal

Scheduling a Measurement



- Log into atlas.ripe.net
- “My Atlas” > “Measurements”
- “New Measurement” or “One-off”
 - Most are periodic and last a long time
 - Choose type, target, frequency, # of probes, region...
 - You will spend credits
- <https://atlas.ripe.net/doc/udm>
- Or use the API:

<https://atlas.ripe.net/docs/measurement-creation-api/>

Credit System



- Measurements cost credits
 - ping = 10 credits, traceroute = 20, etc.
- Why? Fairness and avoid overload
- Hosting a probe earns credits
- Earn extra credits by:
 - Being a member
 - Hosting an anchor
 - Sponsoring probes

<https://atlas.ripe.net/doc/credits>

Credits



You are here: Home > Analyse > Internet Measurements > RIPE Atlas > My Atlas > My Credits

- RIPE Atlas <<
- About RIPE Atlas >
- Get Involved >
- Results >
- My Atlas** v
- Probes
- Measurements
- Credits
- API Keys
- Messages
- Ambassador Probes
- LIR Benefits
 - Claim 1 Million Credits
 - IPv6 Connectivity Test
 - Quick Look
- Settings

Account Information

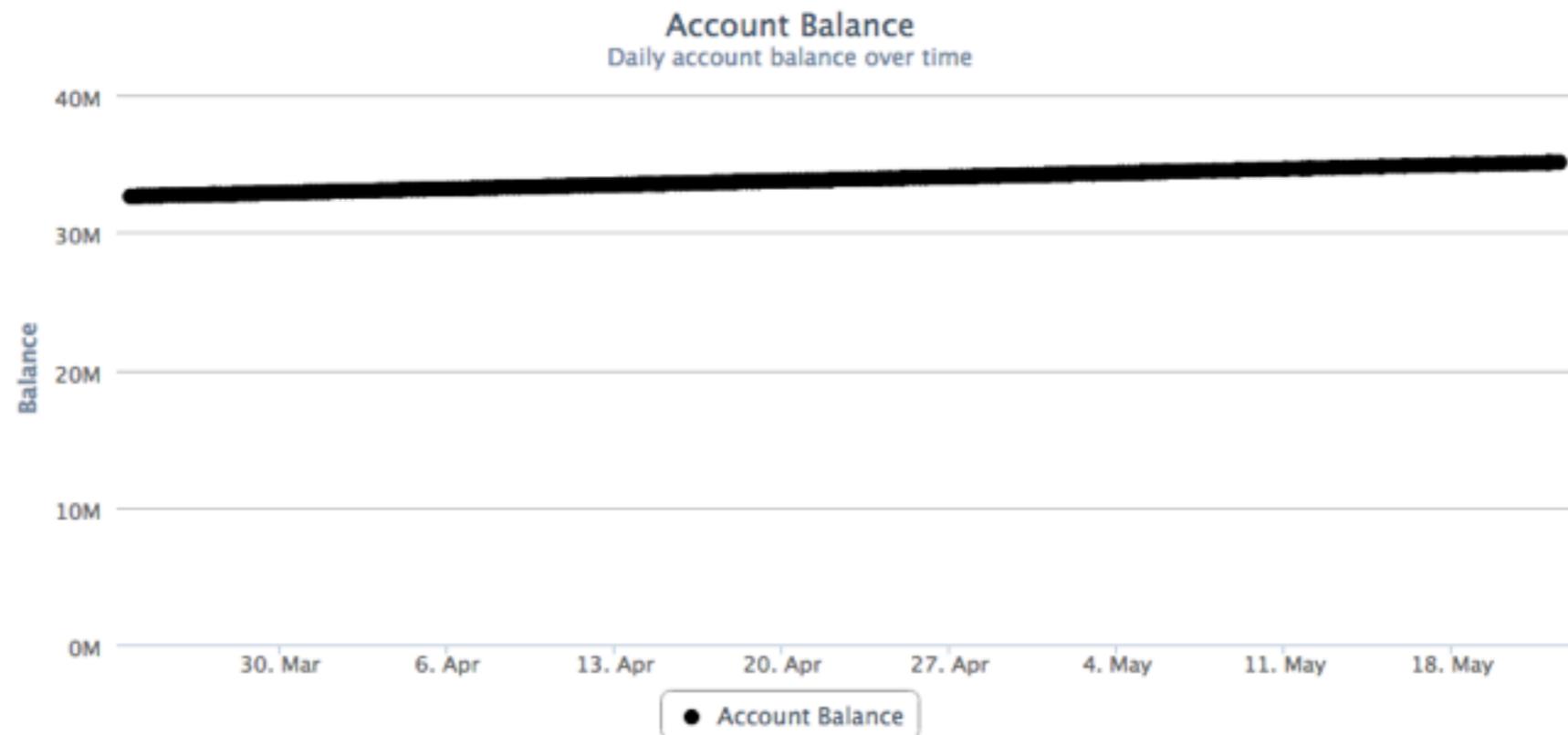
This is where you're able to view the history of your credit use. There are visualisations available, and you can also transfer credits to someone else.

35,107,046
1,760.00 credits / hour

- History
- Charts & Archives
- Transfer**

Give credits to someone

History





Exercise H

Create A Measurement

Refer to the exercise booklet



Network Monitoring

Section 13

Network Monitoring



- Network operators use tools to monitor network health
 - Nagios & Icinga
- Tools receive input from RIPE Atlas via the API
- Benefits:
 - Pings from 1000 out of thousands of probes around the world
 - See your network from the outside
 - Plug into your existing practices

Integration with Monitoring Systems



1. Create a RIPE Atlas ping measurement
2. Go to “Status Checks” URL
3. Add your alerts in Icinga or Nagios



Creating Status Checks



- Status Checks work via RIPE Atlas' RESTful API
 - https://atlas.ripe.net/api/v1/status-checks/MEASUREMENT_ID/
- You define the alert parameters, for example:
 - Threshold for the percentage of probes that successfully received a reply
 - How many most recent measurements to base it on
- What is the maximum packet loss acceptable
- Documentation:
 - <https://atlas.ripe.net/docs/status-checks/>

Icinga Examples



- Community of operators contributed configuration code!
 - Making use of the built-in “check_http” plugin
- GitHub repo examples:
 - https://github.com/RIPE-Atlas-Community/ripe-atlas-community-contrib/blob/master/scripts_for_nagios_icinga_alerts
- Post on Icinga blog:
 - <https://www.icinga.org/2014/03/05/monitoring-ripe-atlas-status-with-icinga-2/>



Exercise I

Setting Up Status Checks

Refer to the exercise booklet



More RIPE Atlas Features

Section 15

Latest Results API



- <https://atlas.ripe.net/docs/measurement-latest-api/>
 - Widget monitoring value in real time (100 probes pinging websites worldwide)
 - Alert based on average measurements per hour
 - Big network event, e.g. Internet outage in a region
 - DNS domain monitoring; configurable measurements using ten RIPE Atlas anchors
- https://labs.ripe.net/Members/suzanne_taylor_muzzin/ripe-atlas-latest-results-api-and-parsing-library

Secure Measurement creation and sharing



- Use API keys to:
 - Create measurements without logging in
 - Securely share your measurement data with others
- To create, manage and delete API keys:
 - <https://atlas.ripe.net/keys/>
 - <https://atlas.ripe.net/docs/keys2/>
- Examples:
 - <https://atlas.ripe.net/docs/rest/>

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
- Measurements triggered by “command servers”
 - Inverse ssh tunnels
- Source code published

Additional Membership Benefits



- RIPE Atlas:
 - Guaranteed approval to host a probe
 - Do NOT have to host a probe in order to perform customised measurements
 - 1,000,000 extra credits monthly via LIR Portal
 - “Quick Look” measurements via LIR Portal
 - IPv6 reachability testing (free - no credits needed)
 - Sharing probe management with LIR colleagues
- RIPEstat:
 - Historical view of RIPE Database objects



Take part in the **RIPE Atlas community**

Section 16

RIPE Atlas community (part 1)



- Individual volunteers host probes in homes or offices
- Organisations host RIPE Atlas anchors
- Sponsor organisations give financial support or host multiple probes in their own networks

RIPE Atlas community (part 2)



- Ambassadors help distribute probes at conferences, give presentations, etc.
- Developers contribute free and open software
- Network operators create measurements to monitor and troubleshoot
- Researchers and students write papers





Hosting a probe

- Create a RIPE NCC Access account
- Go to <https://atlas.ripe.net/apply>
- You will receive a probe by post
- Register your probe
- Plug in your probe
- If you receive a probe from an ambassador (trainer, sponsor, someone at a conference), just register it and plug it in!

More Hackathons!



- Join the hackathons in 2016
 - Before each RIPE Meeting - save the dates!
 - 21-22 May, Copenhagen
 - 22-23 October, Madrid





Questions



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[@RIPE_Atlas](https://twitter.com/RIPE_Atlas)

The End!

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