



RIPE NCC

RIPE NETWORK COORDINATION CENTRE

RIPE Atlas and RIPEStat

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RIPE Atlas



What is RIPE Atlas?

RIPE Atlas is the RIPE NCC's main Internet data collection system. It is a global network of devices, called probes and anchors, that actively measure Internet connectivity. Anyone can access this data via Internet traffic maps, streaming data visualisations, and an API. RIPE Atlas users can also perform customised measurements to gain valuable data about their own networks.



Or, less official...

- **A global technological *platform* for active Internet measurements**
 - It can be embedded into different *products* (including internal ones)
- **Operated by the RIPE NCC with the support and involvement of the Internet community**
 - Hosted by volunteers
- **Focused on “network-level” connectivity and reachability**
 - Allows measuring parameters from any probe to any point
- **Since 2010: the long-term and sustainability in mind**



How Midjourney AI sees RIPE Atlas measurements

RIPE Atlas distribution



- **12900 probes all over the globe**
 - 177 countries
- **965 anchors**
 - Half of them are “virtual”



RIPE Atlas probes on the map

Equipment

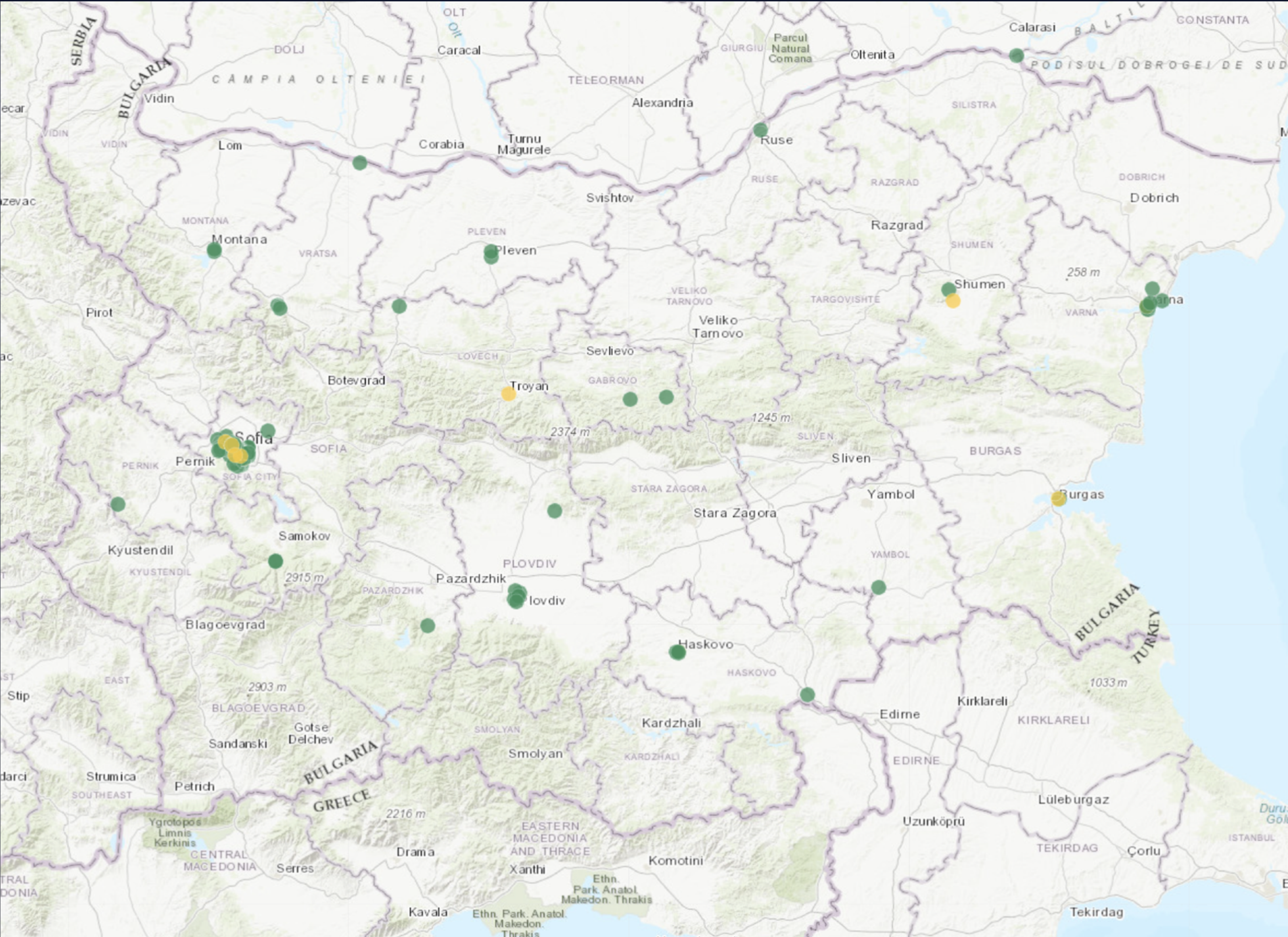


**RIPE
Atlas
probe**

**RIPE
Atlas
Anchor**

May be “virtual”
(software)

Bulgaria

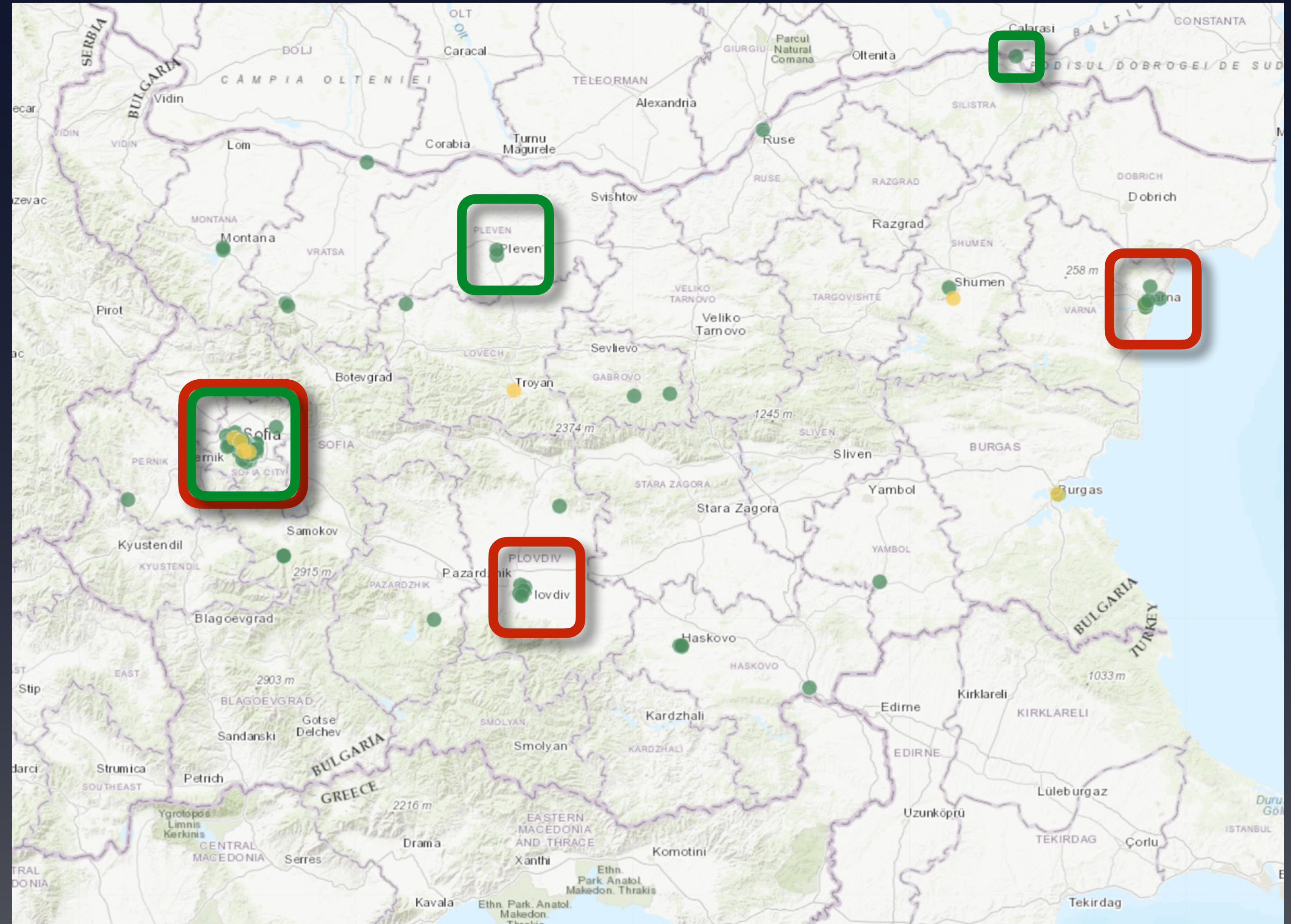


RIPE Atlas probes on the map

Bulgaria



- 83 probes at the moment
- Main points of probes concentration: Sofia, Varna, Plovdiv (red)
- The remaining probes are evenly distributed
- Five anchors: Sofia, Silistra, Pleven (green)



RIPE Atlas probes on the map



Types of measurements

● What can you measure?

- ICMP echo (ping)
- Traceroute (TCP, UDP, ICMP)
- DNS
- HTTP (restricted)
- SSL/TLS
- NTP

● Who can use the system?

- Anybody
- There are built-in measurements

● Can somebody convert it to a botnet?

- A lot of precautions and measures against it

Probe	ASN (IPv4)	ASN (IPv6)		Time (UTC)	RTT	Packet Loss
6101	53824	53824		2021-02-12 04:51	0.777	0.0%
10394	22773			2021-02-12 04:51	81.322	0.0%
19270	22773			2021-02-12 04:51	33.879	0.0%
1000732	14315			2021-02-12 04:51	12.170	0.0%

Probe	ASN (IPv4)	ASN (IPv6)		Time (UTC)	RTT	Hops	Success
162	24638			2021-02-12 04:53	2.680	7	✓
165	42548						No recent report available
224	8331	8331		2021-02-12 04:53	2.276	6	✓
241	8359	8359		2021-02-12 04:53	3.104	10	✓
401	8359	8359		2021-02-12 04:53	3.049	10	✓
567	2609	5438		2021-02-12 04:53	82.171	11	✓

Probe	ASN (IPv4)	ASN (IPv6)		Time (UTC)	Answer	Response Time
10122	35567			2021-02-12 02:25	NOERROR	40.16
10146	7922			2021-02-12 02:25	NOERROR	22.669
12851	25229			2021-02-12 02:25	NOERROR	45.347
13299	15399			2021-02-12 02:25	NOERROR	3.402
16063	6830			2021-02-12 02:25	NOERROR	84.098

Probe	ASN (IPv4)	ASN (IPv6)		Time (UTC)	Majority	Validity	Self Signed
1119	7922			2021-02-10 13:49	✗ Error: handshake_failure		
4155	20115			2021-02-10 13:49	✗ Error: handshake_failure		
4706	14051			2021-02-10 13:49	✗ Error: handshake_failure		
10597		7922		2021-02-10 13:49	Yes	Time	SAN *
11500	7922	7922		2021-02-10 13:49	Yes	Time	SAN *
12334	11351	11351		2021-02-10 13:49	Yes	Time	SAN *



Credit system

- **What is necessary for my creating measurements?**
 - So-called “credits”
- **Where do I get credits?**
 - Run your own probe/anchor on your resources (like, at your premise)
 - Get 1M of credits every month on My RIPE Portal (for LIRs)
 - Ask other participants
 - Contact RIPE NCC (provided a public research is planned)



Security Aspect

- **Probes connect to the infrastructure using SSH**
- **The very reason to run a probe is to measure, so outgoing ping, traceroute, DNS, TLS, etc., to all over is the expected behaviour!**
- **The probes don't have any publicly open ports**
 - They only initiate connections
 - This works fine with NATs too
- **Probes don't listen to local traffic**
 - No passive measurements are running
 - No snooping around



Methods to create measurements

- **On the website**
 - <https://atlas.ripe.net>
- **Command-line interface**
 - <https://github.com/RIPE-NCC/ripe-atlas-tools>
 - <https://framagit.org/bortzmeyer/blaueu>
- **Python framework**
 - <https://github.com/RIPE-NCC/ripe-atlas-cousteau>
 - <https://github.com/RIPE-NCC/ripe-atlas-sagan>
- **REST API**
 - <https://beta-docs.atlas.ripe.net/apis/>



Where results to be found?

- **Most of the results are public**

- It is possible that someone has already measured what you need and you just have to collect the results

- **RIPE Atlas API**

- <https://beta-docs.atlas.ripe.net/apis/>

- **Direct access to the RIPE Atlas storage**

- <https://data-store.ripe.net/datasets/atlas-daily-dumps/>
- Results for the last month

- **RIPE Atlas data in Google BigQuery**

- <https://github.com/RIPE-NCC/ripe-atlas-bigquery/blob/main/docs/gettingstarted.md>



Built-in “Internet Maps”

- **DNS Monitoring**

- DNS Root Instances: which one is using?
- Comparative DNS Root RTT: which one is closer?
- DNS Root Server Performance: how fast are they?
- DNSMON: a comprehensive, objective, and up-to-date overview of the quality of the high-level DNS servers
- DomainMON: monitors your own domains

- **RTT Measurements to Fixed Destinations**

- **Reachability of Fixed Destinations**



Use cases: ISPs/Telcos

- **Coping with the connectivity issues**
 - Many operators do not run Looking Glasses these days
 - Tracking control and data plane correspondence
- **Quality monitoring of the popular directions**
 - Lost packets and delays
 - Issues can be “higher” than your uplink
- **Debugging the customers’ issues (like DNS)**
 - Maybe proactive (probes in the customers’ segment)
- **Cheap way to monitor your own network**
- **It can be integrated with monitoring and management systems**



Use cases: Datacenter/Hoster

- **Verifying the visibility from the key area for customers**
 - Including potential ones
- **Uptime proofs**
- **DNS monitoring**



Use cases: Domain Registry

- **Verifying and measuring the distribution of the changes**
- **Monitoring the anycast nodes**
 - Especially important for TLDs
- **Dashboard for DNS servers in use: DomainMON**
- **Network planning**



Use cases: e-Commerce

- **Monitoring the distributed services**
 - Does the traffic from the given geography go to the right site?
 - What is the trace to a service for the given geography?
- **Dashboard for DNS servers in use: DomainMON**
- **Independent points of present monitoring**
- **Independent service monitoring and debugging**



Use cases: Academia

- **An instrument to verify theories and hypothesis**
 - “Inferring BGP Blackholing Activity in the Internet”, MIT
 - “Characterizing User-to-User Connectivity with RIPE Atlas”, Cornell Univ.
 - “Internet Anycast: Performance, Problems, & Potential”, Univ. of Maryland
 - “Broad and Load-Aware Anycast Mapping”, Univ. of S. California
 - “Automatic Metadata Generation for Active Measurement”, Univ. of Oregon
 - “Internet connectivity in disputed territories of the post-soviet space”, French Institute of Geopolitics



Use cases: Regulators

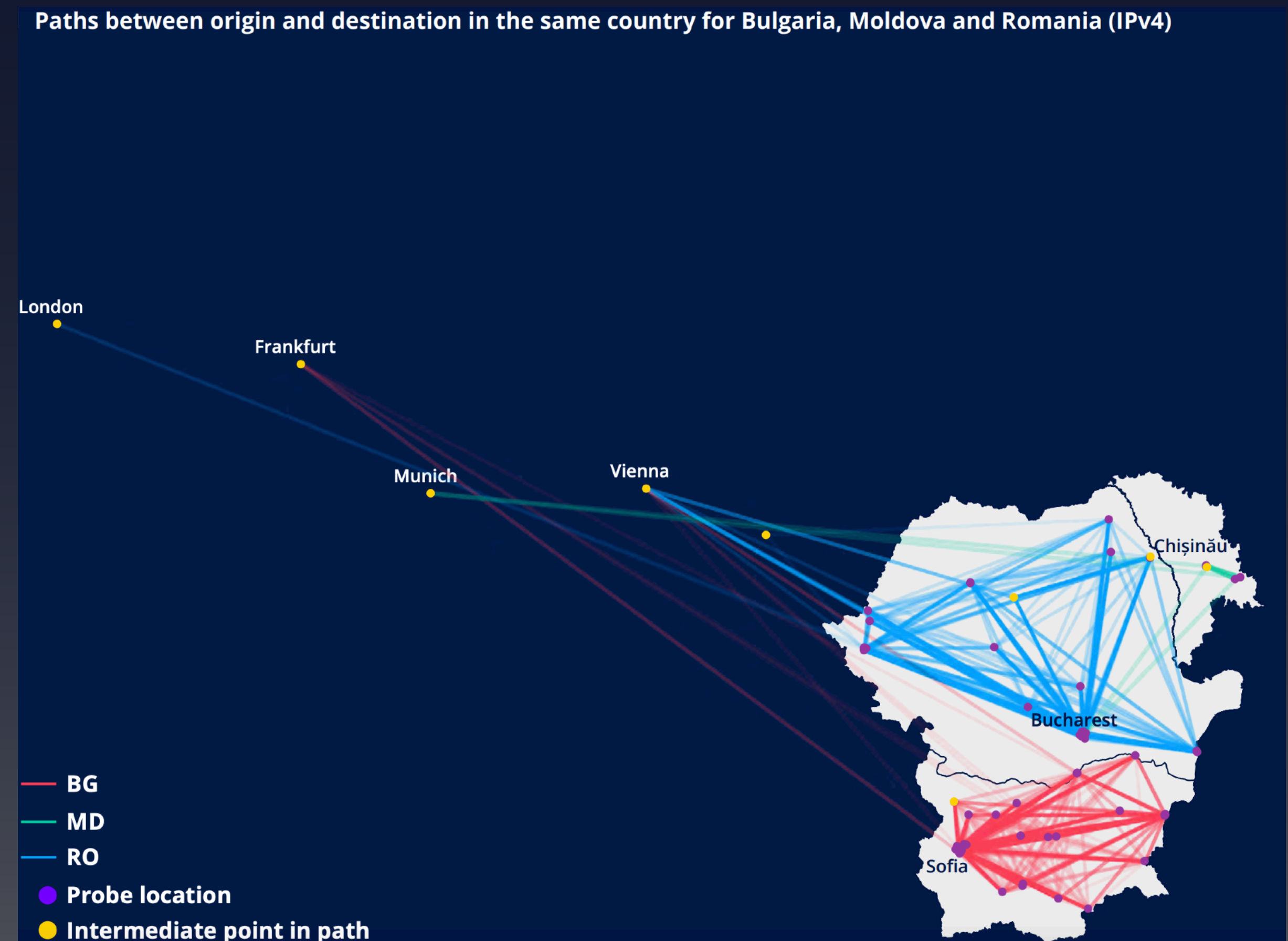
- **No real cases yet**
- **Potential areas to be considered:**
 - Statistics for the national networks
 - Trans-border traffic crossing measurements
 - Evaluating the users quality of experience while developing e-government services
- **Issues**
 - Coverage to be provided
 - Somebody has to convert the technology into a product

Example: RIPE NCC Country Reports



Traffic locality in Bulgaria, Romania, and Moldova based on Atlas measurements

(Internet Country Report: Bulgaria, Moldova, and Romania, https://labs.ripe.net/author/suzanne_taylor_muzzin/ripe-ncc-internet-country-report-bulgaria-moldova-and-romania/)





Information sources

- **How can I learn everything regarding RIPE Atlas?**
 - <https://atlas.ripe.net/>
 - RIPE NCC Trainings



RIPEStat



What is RIPEstat?

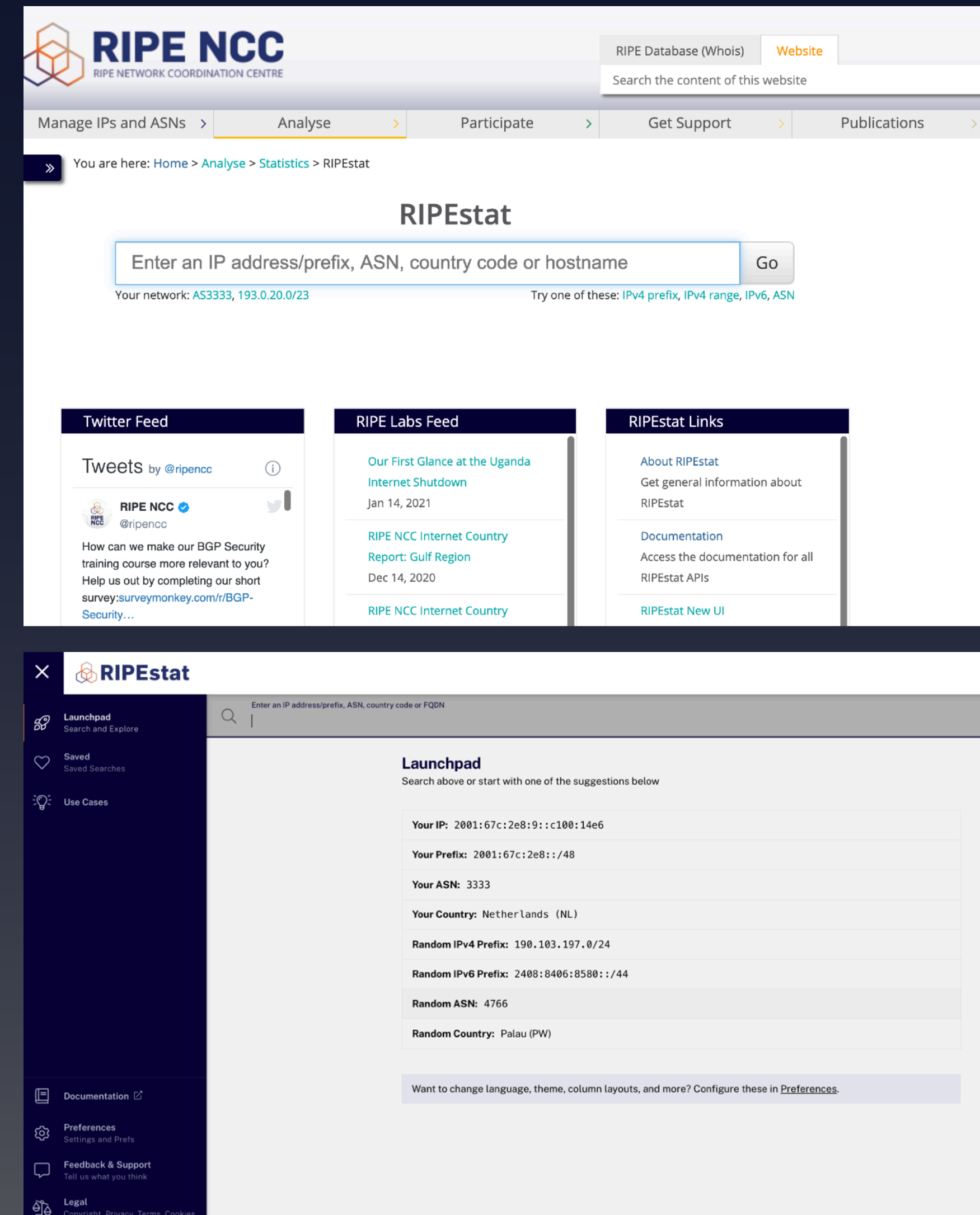
RIPEstat is a web-based interface that provides everything you ever wanted to know about IP address space, Autonomous System Numbers (ASNs), and related information for hostnames and countries in one place.

It presents registration and routing data, DNS data, geographical information, abuse contacts and more from the RIPE NCC's internal data sets as well as from external sources, such as other Regional Internet Registries and IANA. RIPEstat's main web-based interface presents this information in the form of widgets that can be embedded on any webpage. It also provides an API to access the raw data for use in advanced applications.

Our goal is to provide useful data to our members and the Internet community at large, with a focus on data related to routing and the RIPE Database. We are currently in the process of consolidating all of the RIPE NCC's public data sets into RIPEstat, so that RIPEstat will eventually become the sole interface for users accessing any of the RIPE NCC's publicly available data, making it easier for our users to retrieve this data using one consolidated, consistent and well-organised interface.

What is RIPEStat?

- The project was started in 2010
- Still developing rapidly
- Consists of thematic widgets/infocards
- Processes all available RIPE NCC data:
 - aggregates and summarizes them
 - performs statistical processing





Data sources

- **RIPE DB**
 - <https://apps.db.ripe.net/>
- **RIPE Routing Information System (RIPE RIS)**
 - <https://ris.ripe.net>
- **RIPE Atlas**
 - <https://atlas.ripe.net>
- **External sources, such as:**
 - Blacklists
 - Performance measurements
 - Geo data
 - ...
- **More details: <https://stat.ripe.net/data-source>**



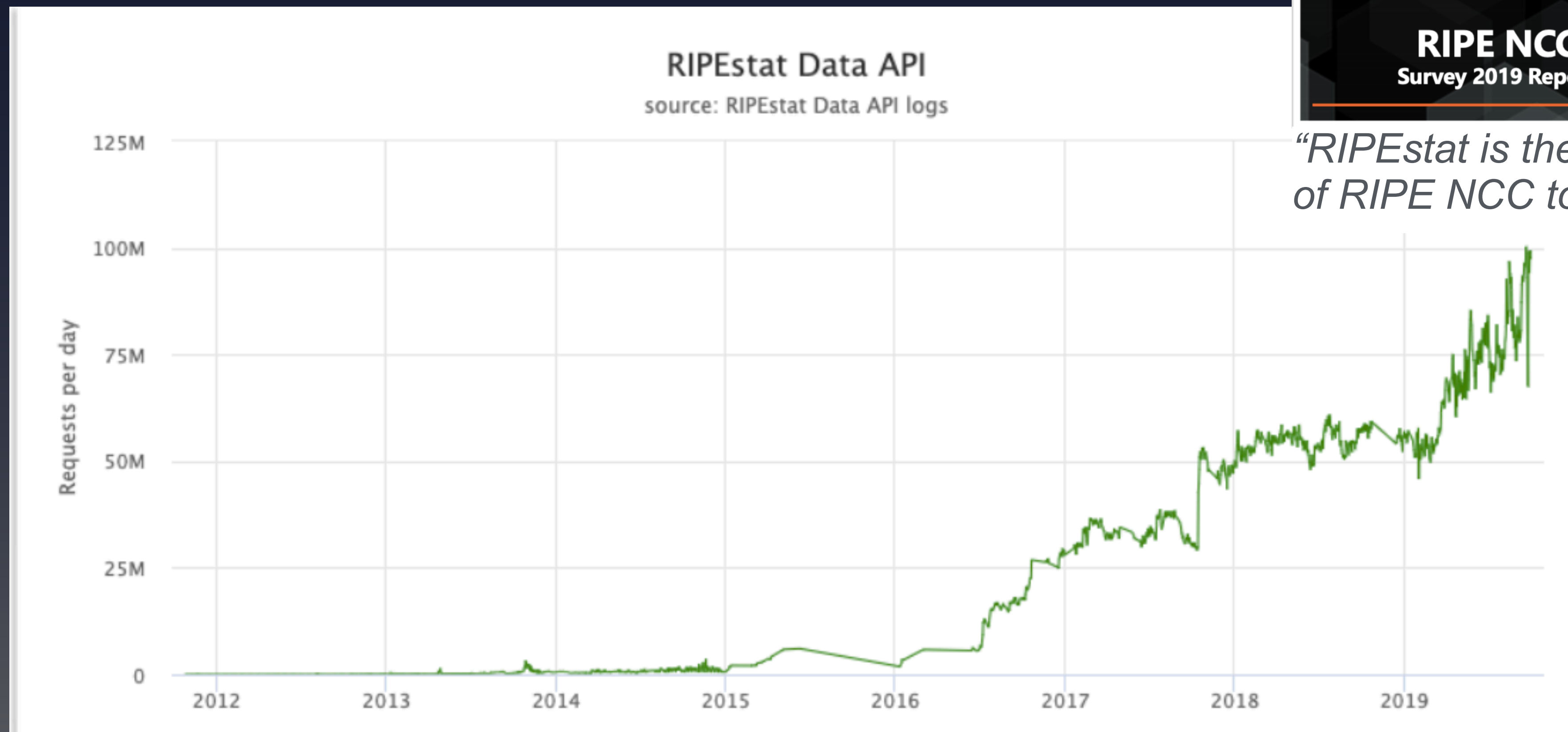
Where results to be found?

- All the results are public
- RIPEStat website
 - UI2020 (latest user interface): <https://stat.ripe.net/app/launchpad>
 - ▶ Infocards
 - UI2013 (previous user interface, to be discontinued): <https://stat.ripe.net/ui2013/>
 - ▶ Widgets
- Code to integrate widgets into your website
- REST RIPEStat Data API



RIPEstat Data API

- Core of RIPEstat
- Powering RIPEstat UIs and many other use cases



RIPE NCC
Survey 2019 Report

*“RIPEstat is the most-used tool
of RIPE NCC tools and services...”*



UI Principles: widgets/infocards

- **Widgets/Infocards are separate tools, each solving a strictly specific task**
- **When grouped in specific ways, they constitute a particular use case**
- **There are different groups of them, such as:**
 - IP space management and RIR databases
 - Routing
 - Geo data
 - ...
- **There are widgets/infocards with historical data**



IP space mgmt and RIR DBs

- **Whois data**
 - Including Historical Whois
- **Allocation history**
- **Transfers**

Whois data

- Whois matches



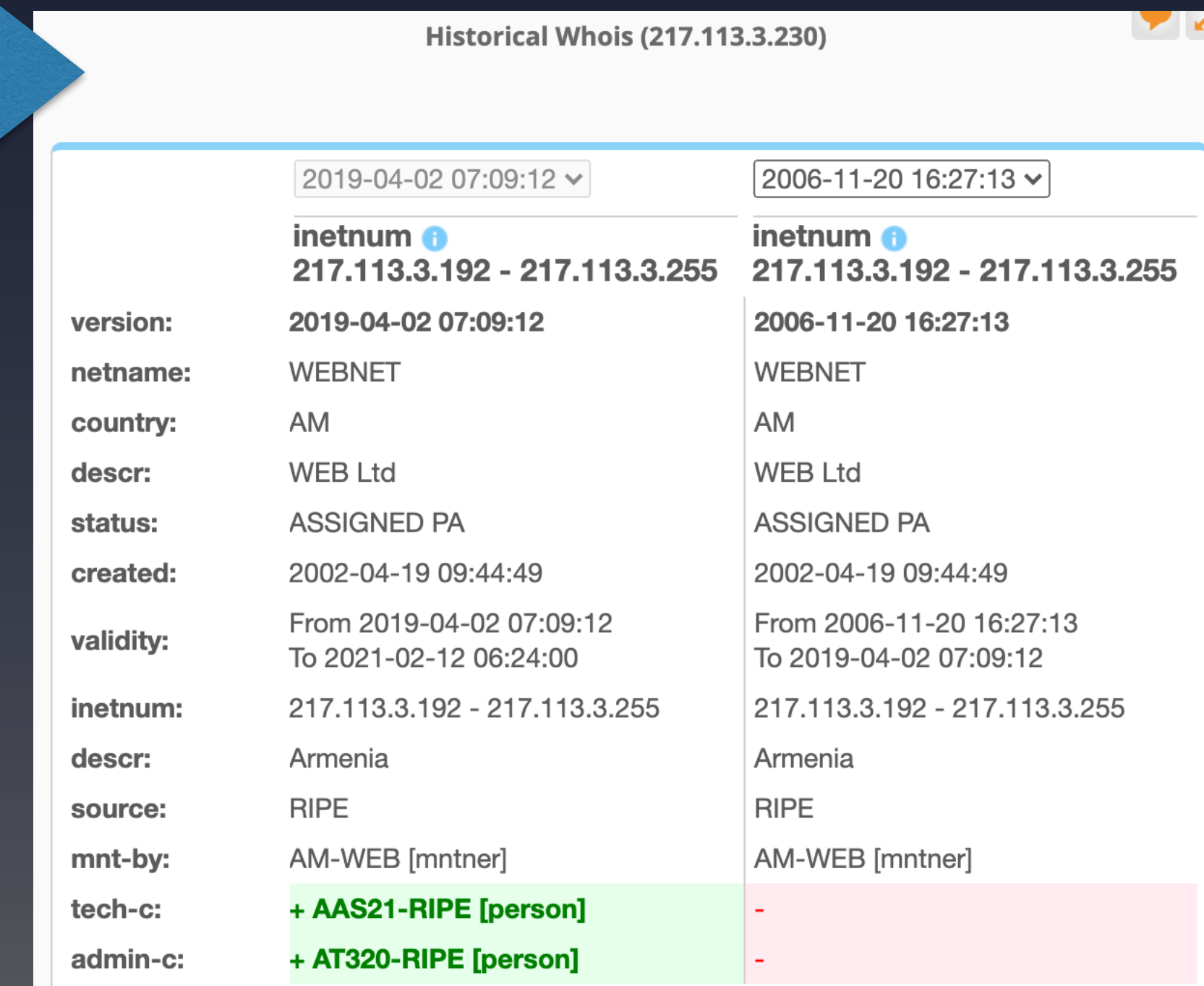
Whois Matches (217.113.3.230)

▼ Whois results (1)

inetnum	217.113.3.192/26
netname	WEBNET
descr	WEB Ltd
descr	Armenia
country	AM
admin-c	AT320-RIPE
tech-c	AAS21-RIPE
status	ASSIGNED PA
mnt-by	AM-WEB
created	2002-04-19T09:44:49Z
last-modified	2019-04-02T07:09:12Z
source	RIPE

► Routing registries results (6)

- Historical Whois



Historical Whois (217.113.3.230)

	2019-04-02 07:09:12 ▼	2006-11-20 16:27:13 ▼
	inetnum ⓘ 217.113.3.192 - 217.113.3.255	inetnum ⓘ 217.113.3.192 - 217.113.3.255
version:	2019-04-02 07:09:12	2006-11-20 16:27:13
netname:	WEBNET	WEBNET
country:	AM	AM
descr:	WEB Ltd	WEB Ltd
status:	ASSIGNED PA	ASSIGNED PA
created:	2002-04-19 09:44:49	2002-04-19 09:44:49
validity:	From 2019-04-02 07:09:12 To 2021-02-12 06:24:00	From 2006-11-20 16:27:13 To 2019-04-02 07:09:12
inetnum:	217.113.3.192 - 217.113.3.255	217.113.3.192 - 217.113.3.255
descr:	Armenia	Armenia
source:	RIPE	RIPE
mnt-by:	AM-WEB [mntner]	AM-WEB [mntner]
tech-c:	+ AAS21-RIPE [person]	-
admin-c:	+ AT320-RIPE [person]	-



Routing

- **Routing status**
 - Including RPKI Status
- **Prefix consistency**
- **Routing history**
- **BGP Looking Glass**
- **BGPlay**

Prefix consistency



Prefix Routing Consistency (217.113.3.230)

Show **10** entries Search:

prefix	Origin	ASN Name	In RIS	RIPE IRR	Other IRRs	RPKI
217.113.0.0/21	AS16190	AS16190 - WEB LLC	yes	yes	no	
217.113.0.0/22	AS16190	AS16190 - WEB LLC	yes	yes	no	
217.113.3.0/24	AS16190	AS16190 - WEB LLC	no	yes	no	

Showing 1 to 3 of 3 entries

Showing results for 217.113.3.230 as of 2021-02-12 00:00:00 UTC

BGP Looking Glass



BGP Looking Glass (217.113.3.230)

Advanced Settings

Select RRCs to be visible: All - None

☒ RRC00

☒ RRC01

☒ RRC24

☒ RRC23

☒ RRC12

☒ RRC03

☒ RRC20

☒ RRC21

☒ RRC22

☒ RRC15

☒ RRC04

☒ RRC05

☒ RRC18

☒ RRC07

☒ RRC13

☒ RRC19

☒ RRC11

☒ RRC14

☒ RRC16

☒ RRC06

☒ RRC10

▼ 21 RRCs see 342 peers announcing 217.113.0.0/22 originated by AS16190. [EXPAND EVERYTHING]

▼ RRC00 in Amsterdam, Netherlands sees 1 ASN originating 217.113.0.0/22.
(AS16190)

▼ AS16190 is seen as the origin by 64 peers.

▼ 2.56.11.1 is announcing route AS34854 AS6682 AS49800 AS16190.

Origin: IGP
Next Hop: 2.56.11.1
Peer: 2.56.11.1
Community: 6682:10103 6682:30104 6682:30205 6682:30215
6682:30400 6682:60155 15169:13000 32934:10008
34854:1002 65005:32934 65101:1085 65102:1000 65103:276
65104:150
AS Path: 34854 6682 49800 16190
Last Updated: 2021-02-11T02:43:21
Latest Time: 2021-02-12T06:26:23

► 5.178.95.254 is announcing route AS59919 AS41327 AS6682 AS49800 AS16190.

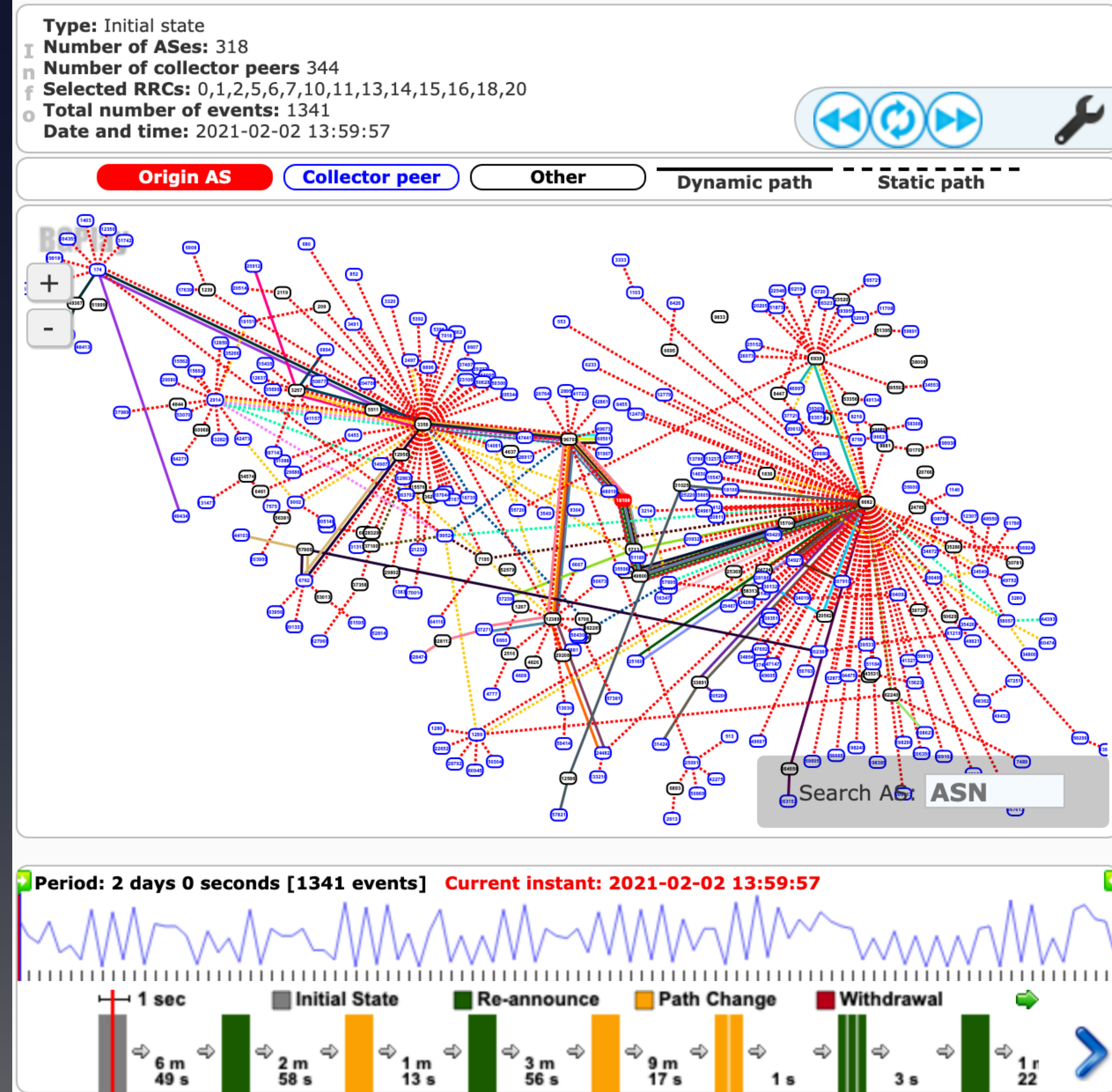
Alex Semenyaka | RIPE NCC Days Sofia | 28 June 2023

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BGPlay

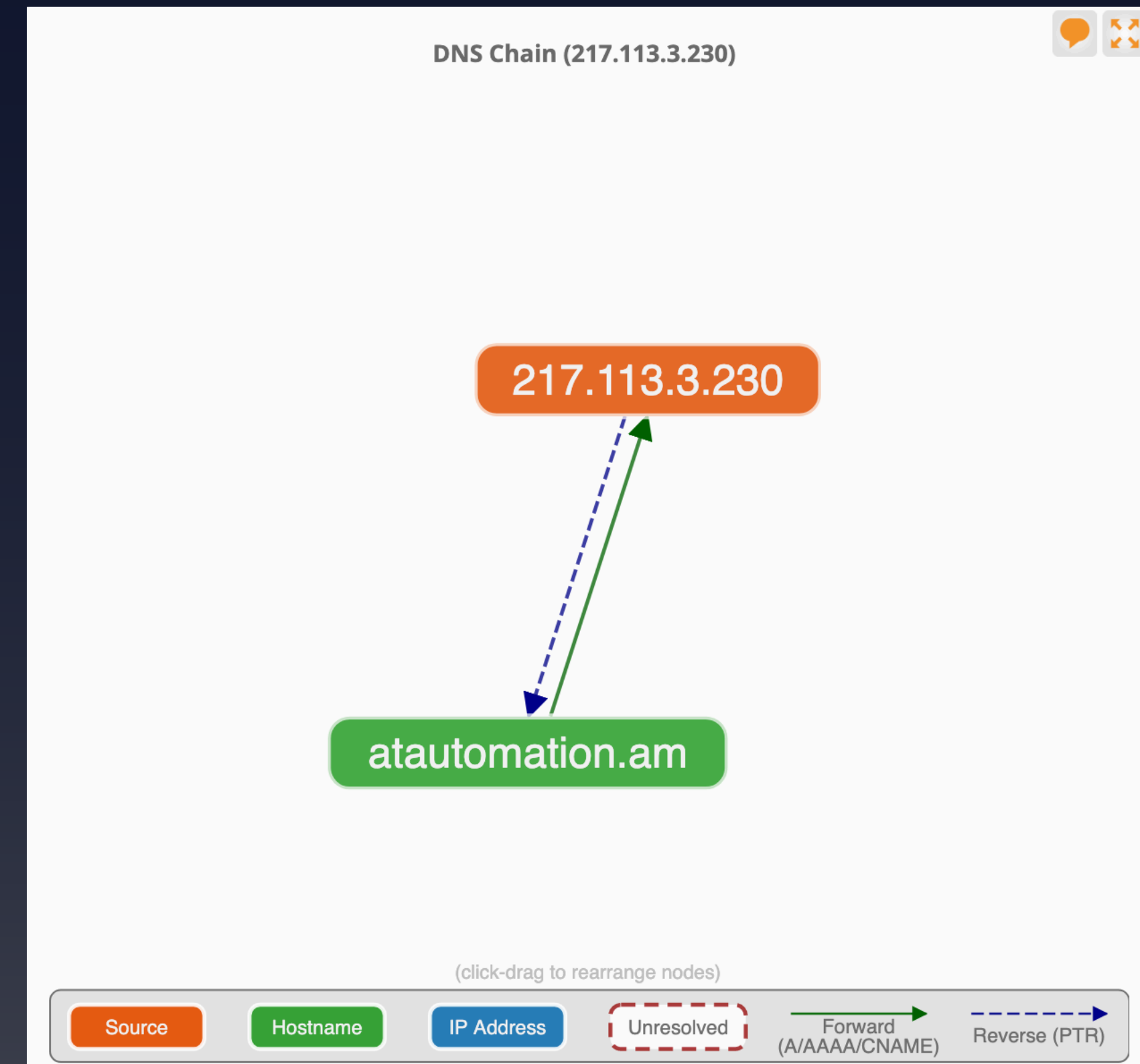
- Tool to visualise/animate the state of BGP routing (“control plane”)
- Use cases:
 - Visibility analysis (IPv4/IPv6), route flapping
 - Multi-homed prefixes, prefix hijacks, etc.



DNS



- **Reverse DNS Data**
 - Including the consistency check
- **DNS Chain**



DNS consistency check



DNS Check (armix.am) BETA

Reload this widget by entering a resource here

Choose a test result

2021-02-12 06:38:00 | error

Some tests show errors! Please take a look at the details below.

SYSTEM

INFO x 3

BASIC

INFO x 7

ADDRESS

INFO x 2, NOTICE x 2

CONNECTIVITY

INFO x 6, WARNING x 2, ERROR x 2

CONSISTENCY

INFO x 4, NOTICE x 1, WARNING x 4

DNSSEC

NOTICE x 2

DELEGATION

INFO x 8, NOTICE x 1

NAMESERVER

INFO x 12, NOTICE x 1

SYNTAX

INFO x 10

ZONE

INFO x 4, NOTICE x 3, WARNING x 1

DNS consistency check



DNS Check (armix.am) BETA

Reload this widget by entering a resource here

Choose a test result

2021-02-12 06:38:00 | error

Some tests show errors! Please take a look at the details below.

SYSTEM

INFO x 3

BASIC

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ADDRESS

INFO x 2, NOTICE x 2

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INFO x 6, WARNING x 2, ERROR x 2

CONSISTENCY

INFO x 4, NOTICE x 1, WARNING x 4

DNSSEC

NOTICE x 2

DELEGATION

INFO x 8, NOTICE x 1

NAMESERVER

INFO x 12, NOTICE x 1

SYNTAX

INFO x 10

ZONE

INFO x 4, NOTICE x 3, WARNING x 1

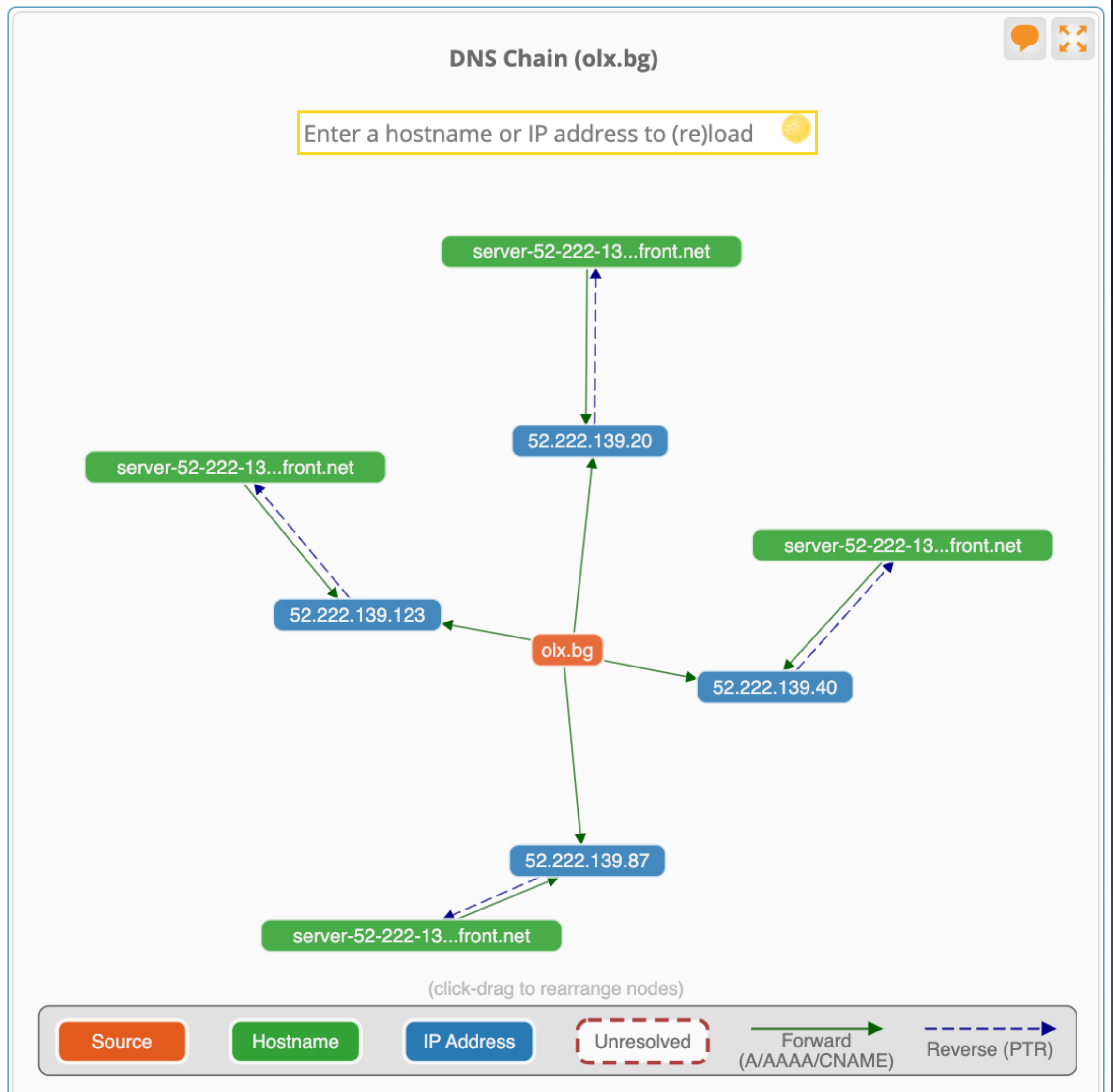
CONNECTIVITY

INFO x 6, WARNING x 2, ERROR x 2

Level	Message
ERROR	Nameserver ns.armix.am/217.113.3.230 not accessible over UDP on port 53.
ERROR	Nameserver ns.armix.am/217.113.3.230 not accessible over TCP on port 53.
WARNING	All nameservers IPv4 addresses are in the same AS (16190).
WARNING	All nameservers are in the same AS (16190).
INFO	Nameserver ns.r.am/217.113.0.8 accessible over UDP on port 53.

Showing 1 to 5 of 10 entries

DNS chain



Anti-abuse



- Abuse contact finder
- Blacklists check

Abuse contact finder



Abuse Contact Finder (217.113.3.230)

Email-Contact

albert@web.am

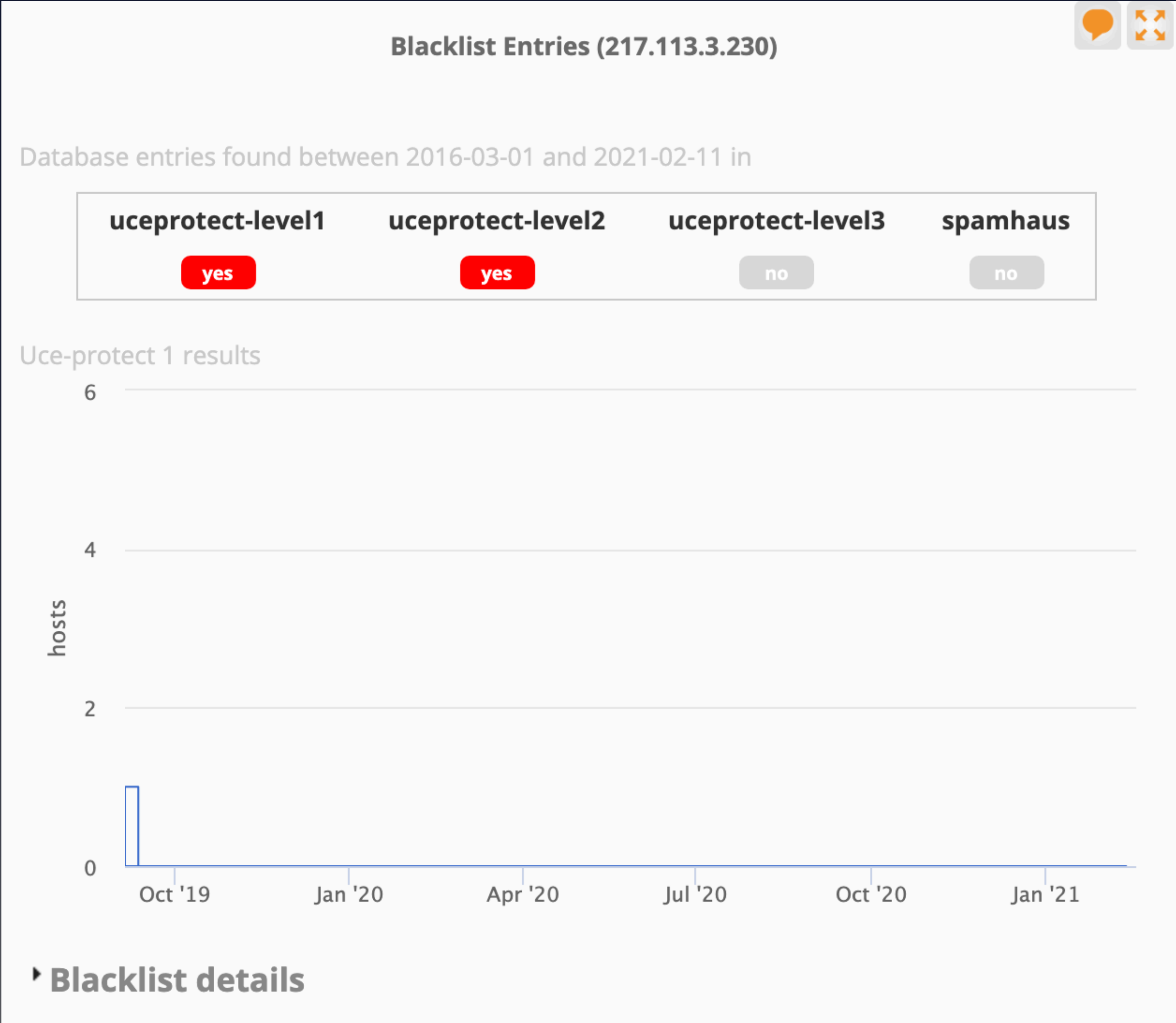
☒ Resource information

Details

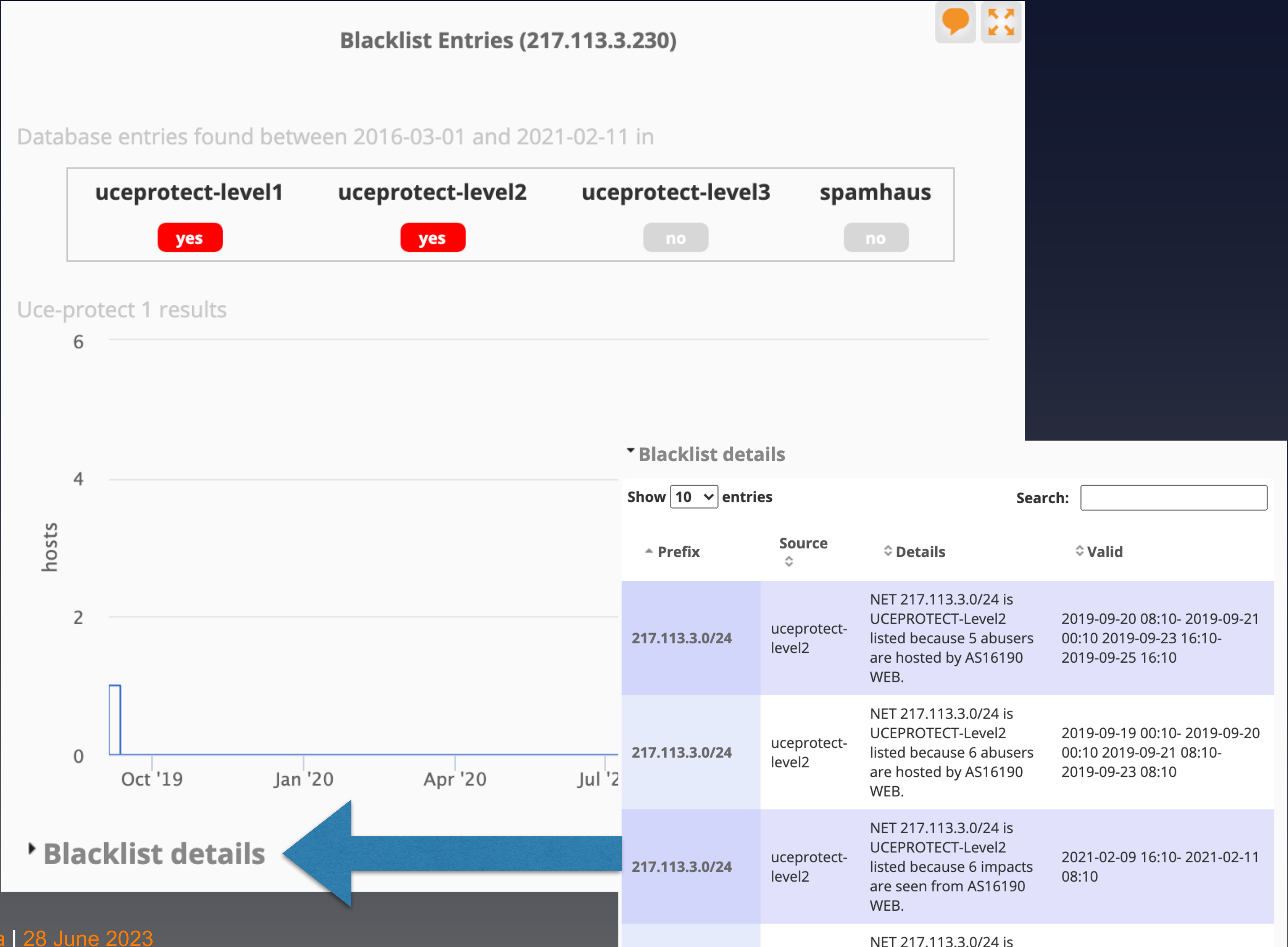
- Results for

217.113.3.230 ↗
albert@web.am from abuse-contact role

Blacklists check



Blacklists check





Geographical data

- **Country according to the RIR DB**
 - Including the historical data
- **MaxMind GeoLite2 data**



To sum up

- **Who can use it?**
 - Anybody!
- **Is this service for human use only?**
 - No, there are huge tremendous opportunities to integrate it into automated systems
- **How can I learn everything regarding RIPEStat?**
 - <https://stat.ripe.net/>
 - RIPE NCC Trainings



Questions



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