



**RIPE NCC**

RIPE NETWORK COORDINATION CENTRE

# RIPE NCC Internet Measurement Services

For the Good of Your Internet

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# RIPE NCC Strategy 2021–2026



- “Be a **centre of excellence for data, measurements and tools** that provide insight on the Internet and its operations”
- RIPE NCC Internet measurement tools and services:
  - Routing Information Service (RIS)
  - RIPEstat
  - RIPE Atlas



# Routing Information Service

# Routing Information Service (RIS)



- RIS is a routing data collection platform
  - It collects raw BGP data from peers
  - and stores BGP messages and routing table dumps
- Historical and live data
  - Historical data since 1999 ([ripe-200](#))
  - All (historical) data is publicly available



# Actual Routing Data



- RIS shows you what is really happening on the Internet
  - which AS is announcing which address block
  - and where it is visible
  - right now or in the past
- As opposed to information in the RIPE Database and other Routing registries:
  - Route object in the RIPE Database - is this still up to date?
  - RIS - real routing information
  - Routing consistency check - make a note

# Why Collect BGP Data?

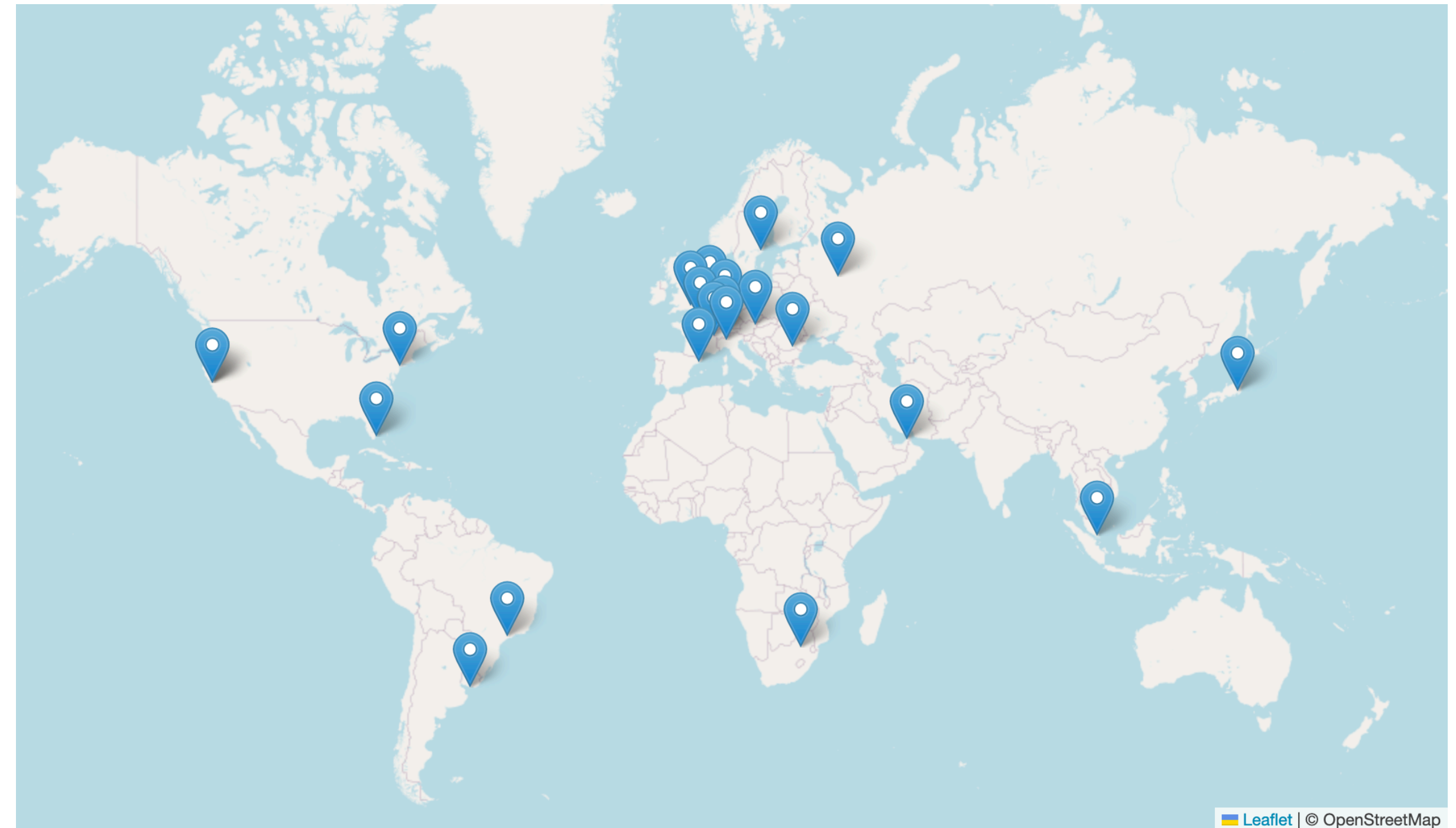


- BGP doesn't have in-built security mechanisms and routing incidents are not rare
- Troubleshooting is difficult
  - Routing problems and Looking glasses are temporary
- BGP history is recorded to track what has happened
  - It allows operators to identify and address security risks
  - Better visibility → Greater security → Lower risk of a BGP attacks

# Remote Route Collectors (RRCs)



- 23 Route collectors deployed at IXPs
  - 1516 peering sessions
  - 604 peer ASes
- They collect raw BGP data from peers



# RRC's Locations



Collector	Location	IXP	Deployed	Removed	Collector	Location	IXP	Deployed	
<b>RRC00</b>	Amsterdam	Multi-hop	1999		<b>RRC13</b>	Moscow	MSK-IX	2005	
<b>RRC01</b>	London	LINX	2000		<b>RRC14</b>	Palo Alto	PAIX	2005	
<b>RRC02</b>	Paris	SFINX	2001	2008	<b>RRC15</b>	Sao Paulo	PTT-Metro SP	2006	
<b>RRC03</b>	Amsterdam	AMS-IX	2001		<b>RRC16</b>	Miami	NOTA	2008	
<b>RRC04</b>	Geneva	CIXP	2001		<b>RRC18</b>	Barcelona	CATNIX	2015	
<b>RRC05</b>	Vienna	VIX	2001		<b>RRC19</b>	Johannesburg	NAPAfrica JB	2016	
<b>RRC06</b>	Tokyo	DIX-IE	2001		<b>RRC20</b>	Zurich	SwissIX	2015	
<b>RRC07</b>	Stockholm	Netnod	2002		<b>RRC21</b>	Paris	FranceIX	2015	
<b>RRC08</b>	San Jose	MAE-West	2002	2004	<b>RRC22</b>	Bucharest	InterLAN	2017	
<b>RRC09</b>	Zurich	TIX	2003	2004	<b>RRC23</b>	Singapore	Equinix SG	2017	
<b>RRC10</b>	Milan	MIX	2003		<b>RRC24</b>	Montevideo	LACNIC multi-hop	2019	
<b>RRC11</b>	New York	NYIIX	2004		<b>RRC25</b>	Amsterdam	Multi-hop	2021	
<b>RRC12</b>	Frankfurt	DE-CIX	2004		<b>RRC26</b>	Dubai	UAE-IX	2021	

# Who is RIS for?



- Network operators
  - To monitor Internet routing and to troubleshoot accidents
  - Build open source tools based on RIS Data
- Researchers
  - To investigate notable routing incidents (i.e. network disruptions in specific countries, service outages, etc.)
- Policy makers
  - To develop future plans based on routing trends



# How Can You Use RIS?



- Raw data - archived MRT files
- RIS Live - Live stream
- RISwhois - Whois query interface
- RIPEstat - Routing check, BGPPlay visualisations
- Find more at ris.ripe.net



The screenshot shows the RIS Live interface at [ris-live.ripe.net](https://ris-live.ripe.net). It features a 'Demo' section with a configuration form for a WebSocket subscription. The form includes fields for 'prefix', 'path', 'type', 'require', 'moreSpecific', 'lessSpecific', 'host', and 'peer', along with checkboxes for 'includeRaw' and 'acknowledge'. Below the form is a 'Code examples' section with tabs for 'Javascript' and 'Python', showing code snippets for subscribing to the RIS Live stream. On the right, the 'Live RIS BGP messages' section shows a 'Connected' status and a stream of JSON messages. The first message is an UPDATE for the prefix 198.32.160.122/22, received from peer 198.32.160.122. The second message is another UPDATE for the prefix 2001:504:1::a539:6998/1, received from peer 2001:504:1::a539:6998.

# Other Tools That Use RIS



- [bgp.he.net](https://bgp.he.net)
  - This service uses RIS data and provides a **dashboard** with various aspects of the Internet routing system
- [BGPalerter](#)
  - This software **monitors** RIS data in near real-time to detect route hijacks and other incidents
- [Internet Health Report](#), [Georgia Tech IODA](#)
  - These research projects use RIS data to build experimental views using Internet routing data



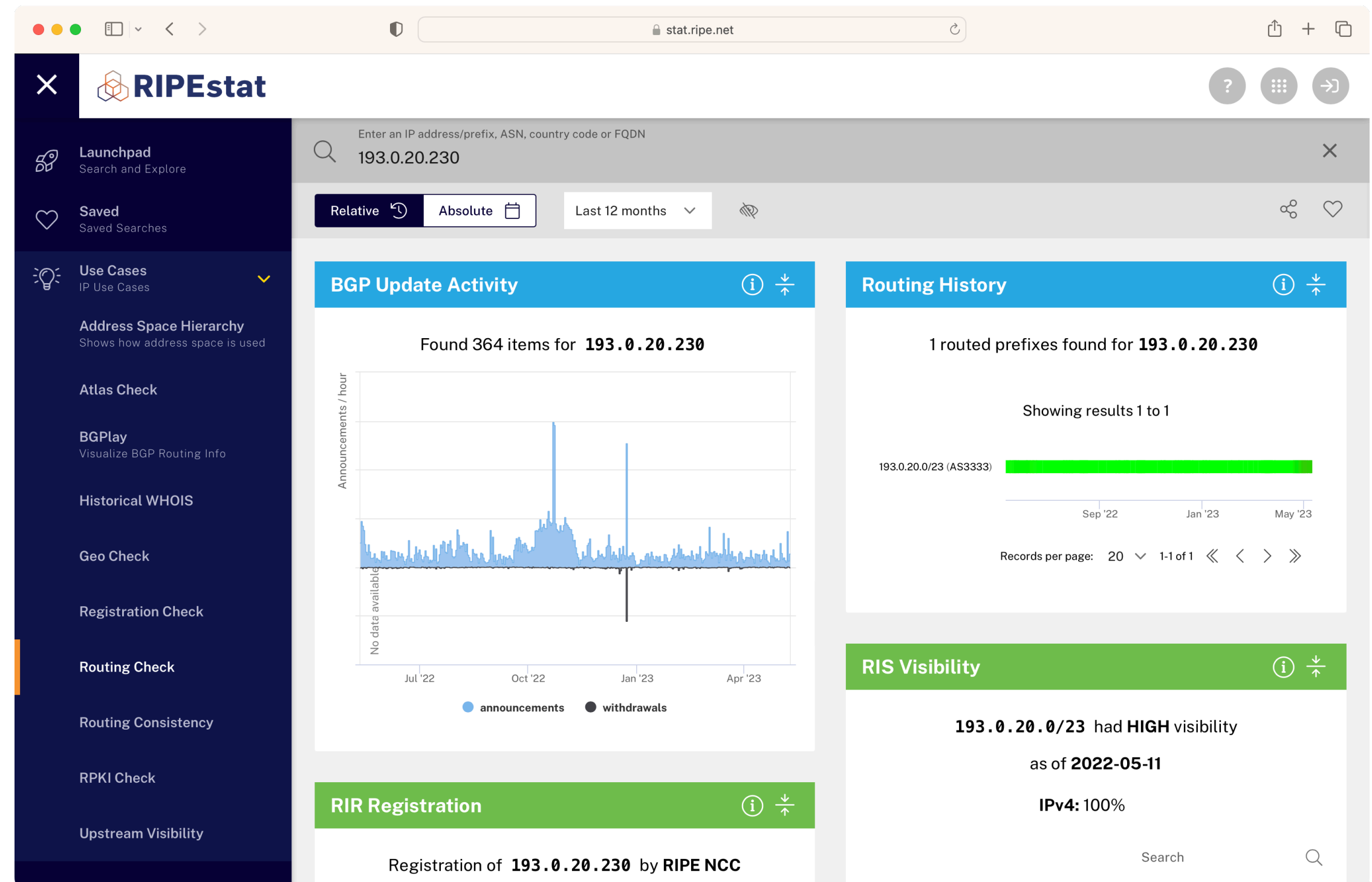
**RIPEstat**



# What is RIPEstat?



- Information service for Internet-related data
- RIPEstat provides:
  - information on IP address space and Autonomous System Numbers (ASNs)
  - statistics on specific hostnames and countries
  - visualisations of Internet routing



# RIPEstat Data Sources



- More than 35 different datasets
  - RIPE Database and the registry data from other RIRs
  - BGP routing data (RIS)
  - RIPE Atlas
  - Geolocation
  - RPKI
  - M-Lab, Speedchecker, etc.
  - More details at <https://stat.ripe.net/data-sources>
- New datasets are constantly added!
  - E.g. new feature to check multiple DNS-based blocklists in real-time

# Quick Intro (1)



- Search by IP address/prefix (IPv4, IPv6), ASN, country code or fully qualified domain name (FQDN)
- Launchpad suggestions are pulled from your network or are random suggestions

RIPEstat  
Calendar  
https://www.google.com/calendar/render

Launchpad  
Search and Explore

Saved  
Saved Searches

Use Cases

Documentation

Preferences  
Settings and Prefs

Enter an IP address/prefix, ASN, country code or FQDN

SEARCH

Launchpad  
Search above or start with one of the suggestions below

Your IP: 2001:67c:2e8:9::c100:14e6

Your Prefix: 2001:67c:2e8::/48

Your ASN: 3333

Your Country: Netherlands (NL)

Random IPv4 Prefix: 69.6.173.0/24

Random IPv6 Prefix: 2620:10a:a001::/48

Random ASN: 61302

Random Country: Guadeloupe (GP)

Want to change language, theme, column layouts, and more? Configure these in [Preferences](#).



# Quick Intro (2)

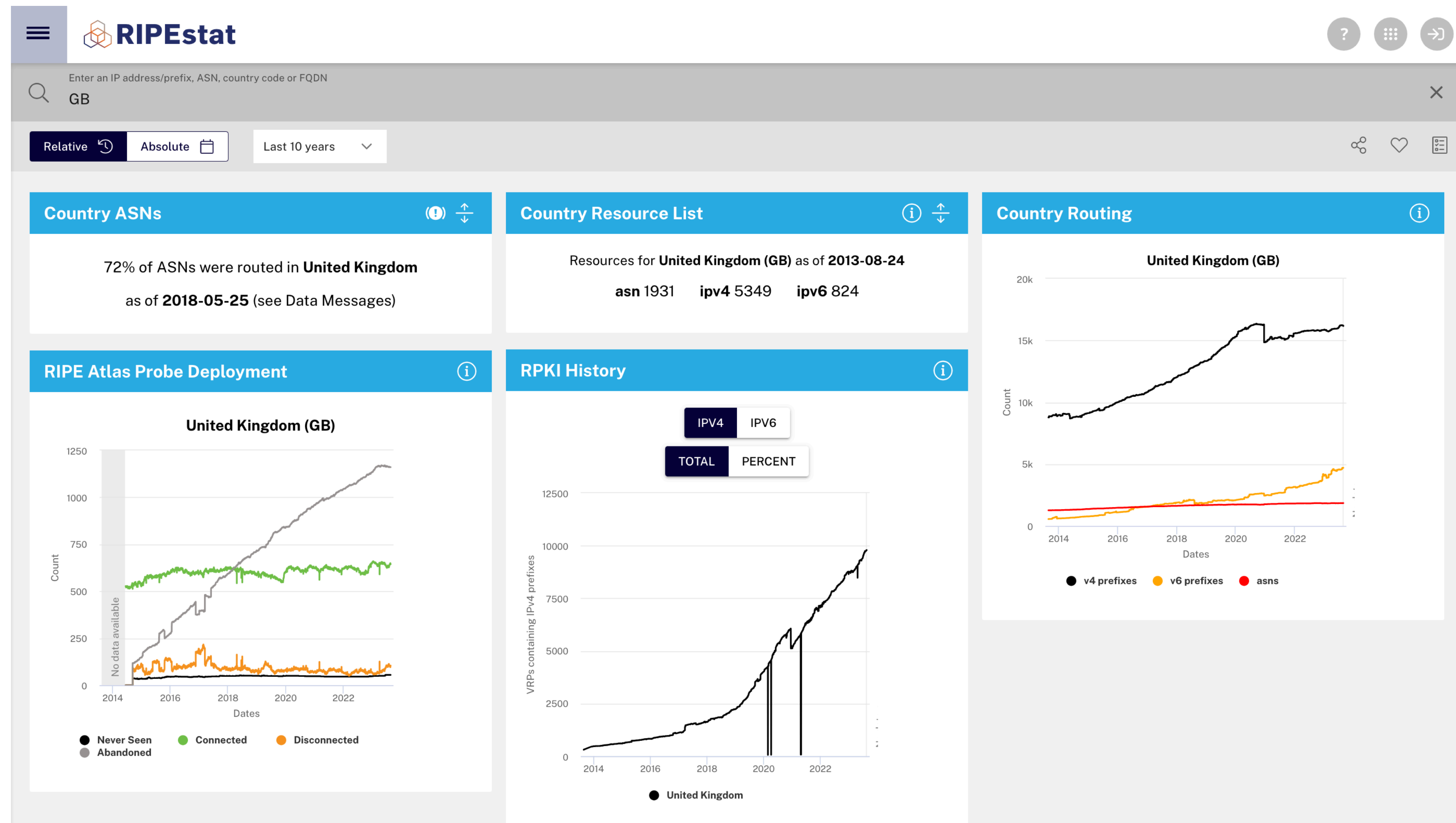


- Use cases are based on the resource type/search:
  - IP address/prefix (IPv4, IPv6),
  - ASN,
  - country code,
  - fully qualified domain name (FQDN)
- You can play with the timeframe:
  - Relative
  - Absolute
- Expand for more info

The screenshot shows the RIPEstat interface with a search bar containing '786'. The left sidebar lists various tools like 'Launchpad', 'Saved', 'Use Cases', 'Atlas Check', 'Historical WHOIS', 'Geo Check', 'Registration Check', 'Reverse DNS Consistency', 'Routing Check', 'Routing Consistency', and 'RPKI Check'. The main content area displays several metrics for AS786:

- Abuse Contact:** irt@jisc.ac.uk
- AS Name:** AS786, JANET - Jisc Services Limited
- AS Path Length:** AS786 has a median average path length of 3.17
- BGP Update Activity:** Found 520 items for AS786
- Announced Prefixes:** AS786 has 508 prefixes
- AS Neighbours:** Unique ASNs: 98. IPv4: 39 left, 31 right, 25 uncertain. IPv6: 28 left, 5 right, 16 uncertain.
- AS Prefix Count:** AS786 has 191 IPv4 Prefixes and 8 IPv6 Prefixes
- IANA:** AS1-AS1876 is delegated to ARIN

# Use Cases: Country Stats – GB

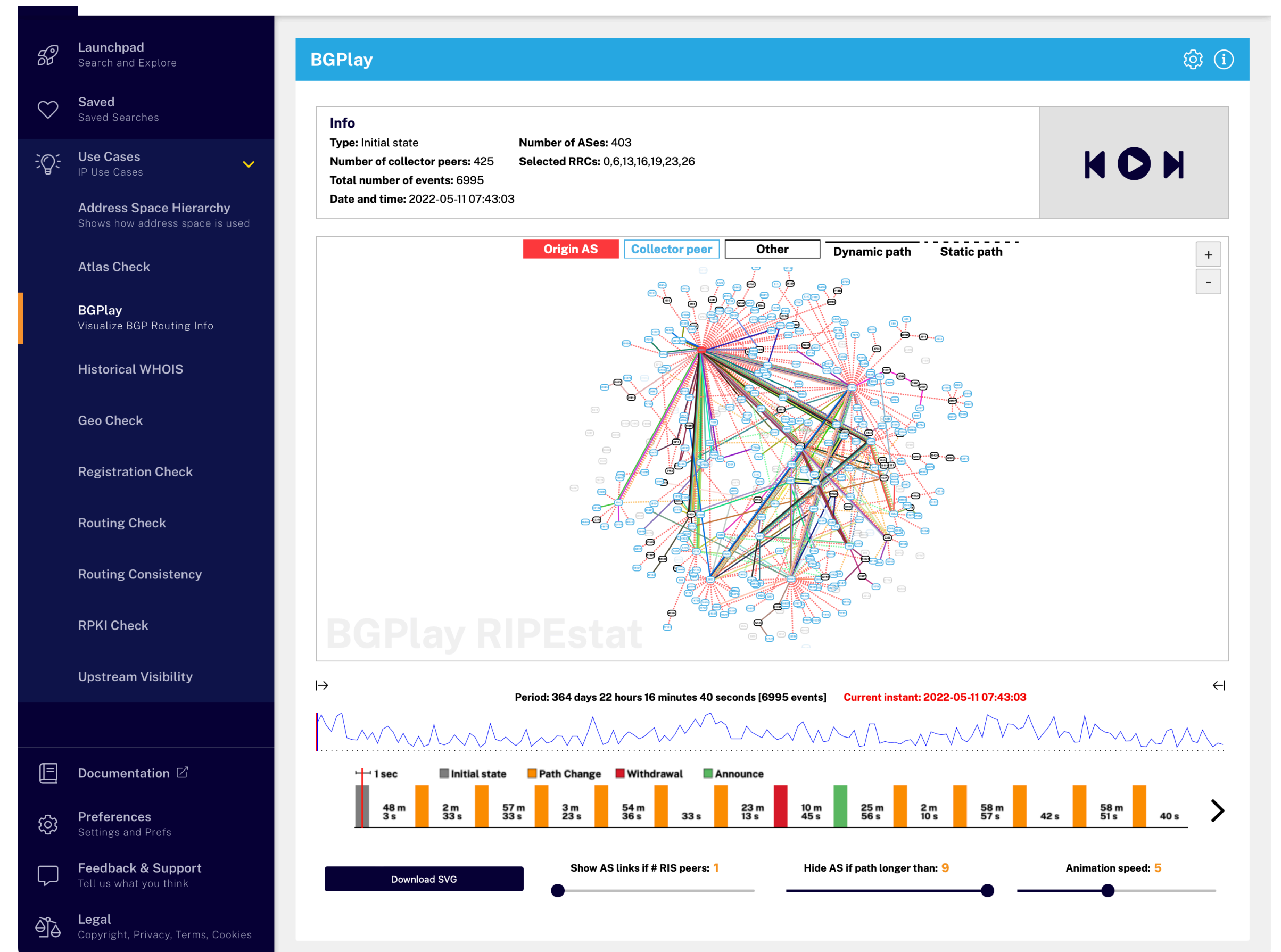




# Use Cases: BGPlay



- BGPlay shows the routing history related to a specific set of resources (prefixes, Autonomous Systems, IPs)
- BGPlay visualises changes in BGP announcements for a specific destination over time
- As seen by RIS



# Use Cases: Routing Consistency



- Routing Consistency compares:
  - objects in Routing Registries with observed real-world routing (seen by RIS)
  - RPKI validation status where applicable

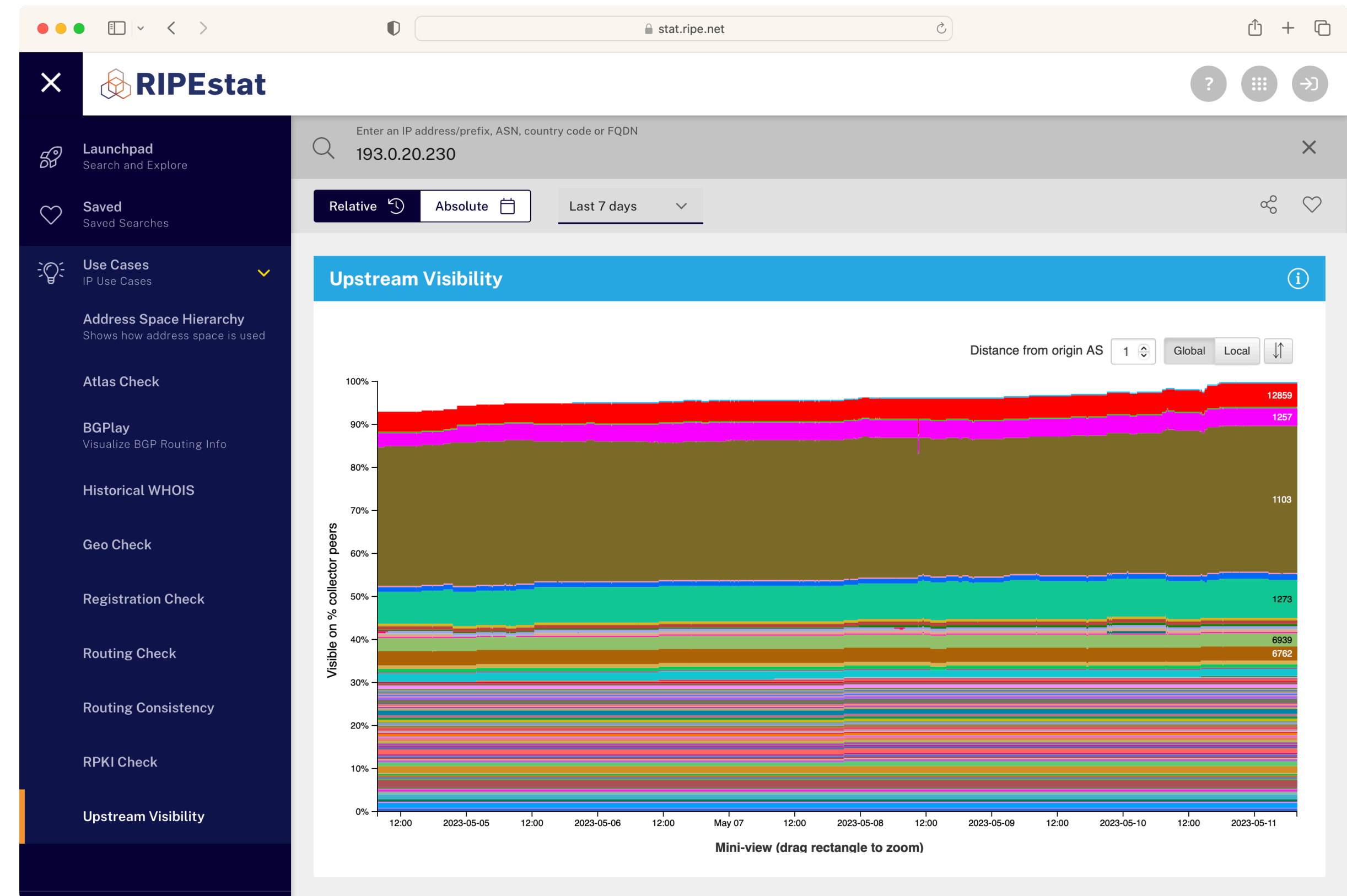
The screenshot shows the RIPEstat website interface. The search bar contains the IP address 193.0.20.230. The main content area displays the 'Routing Consistency' results for this IP. A table shows one record found for the prefix 193.0.20.0/23, with an origin of 3333, marked as 'in BGP (RIS)', and a green smiley face icon indicating RPKI ROV status. The table also shows IRRs (RIPE) and VRPs (maxLength: 23).

Prefix ↑	Origin	in BGP (RIS)	IRRs	RPKI ROV	VRPs
193.0.20.0/23	3333	✓	RIPE	😊	✓ maxLength: 23

# Use Cases: Upstream Visibility



- The Upstream Visibility provides a concise way of visualising routing data of a specified prefix





# Use Cases: Routing Check (1)



- Routing Status of your prefix
- Announced routes to a prefix via RIS Looking Glass
- RPKI Origin Validation

The screenshot shows the RIPEstat website interface. The search bar contains the IP address 193.0.20.230. The main content area is divided into three panels:

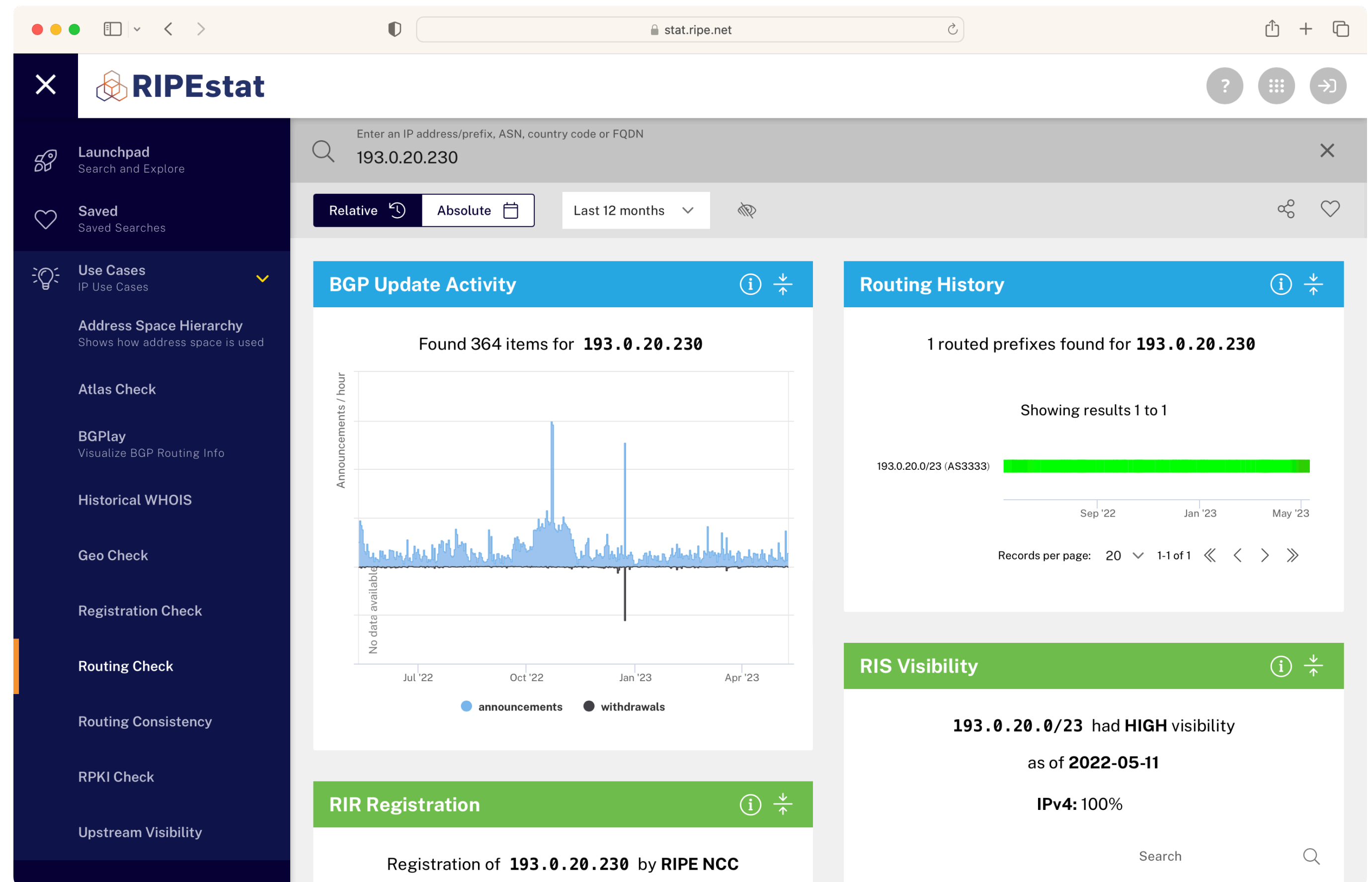
- Prefix Status:** Shows that 193.0.20.0/23 is announced by AS3333. A table below indicates that 193.0.20.230 is covered by this prefix. The table shows the origin as AS3333 (RIPE-NCC-AS - Reseaux IP Europeens Network Coordination Centre (RIPE NCC)).
- RPKI Origin Validation:** Shows that AS3333 is a VALID origin for 193.0.20.0/23. A table below provides details: STATUS (valid), VRP, ORIGIN (3333), PREFIX (193.0.20.0/23), and MAX\_LENGTH (23).
- RIS Looking Glass:** Shows 407 records found for 193.0.20.230. It lists the RRC00 Amsterdam, Netherlands and states that AS3333 is origin for 48 peers. A table below shows the last updated date and AS path for several records.

Last Updated	AS Path
2023-05-03	34854 3333
2023-05-05	59919 12779 3333
2023-03-29	202365 1103 3333
2023-05-04	49134 53356 6939 3333
2023-03-29	50304 1103 3333

# Use Cases: Routing Check (2)



- BGP Update Activity
- RIR Registration
- Routing History
- RIS Visibility
- RIPEstat Data API





**RIPE Atlas**

# RIPE Atlas



- RIPE Atlas is the RIPE NCC's **Internet measurement platform**
- It is a global network of devices that actively measure Internet connectivity, reachability and performance
- 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 information about their own networks

# How we Collect Data?



- 12,000+ RIPE Atlas probes connected in 169 countries
- 781 RIPE Atlas Anchors
- 14,000+ results collected per second
- 33,000+ measurements currently running
- <https://atlas.ripe.net/>



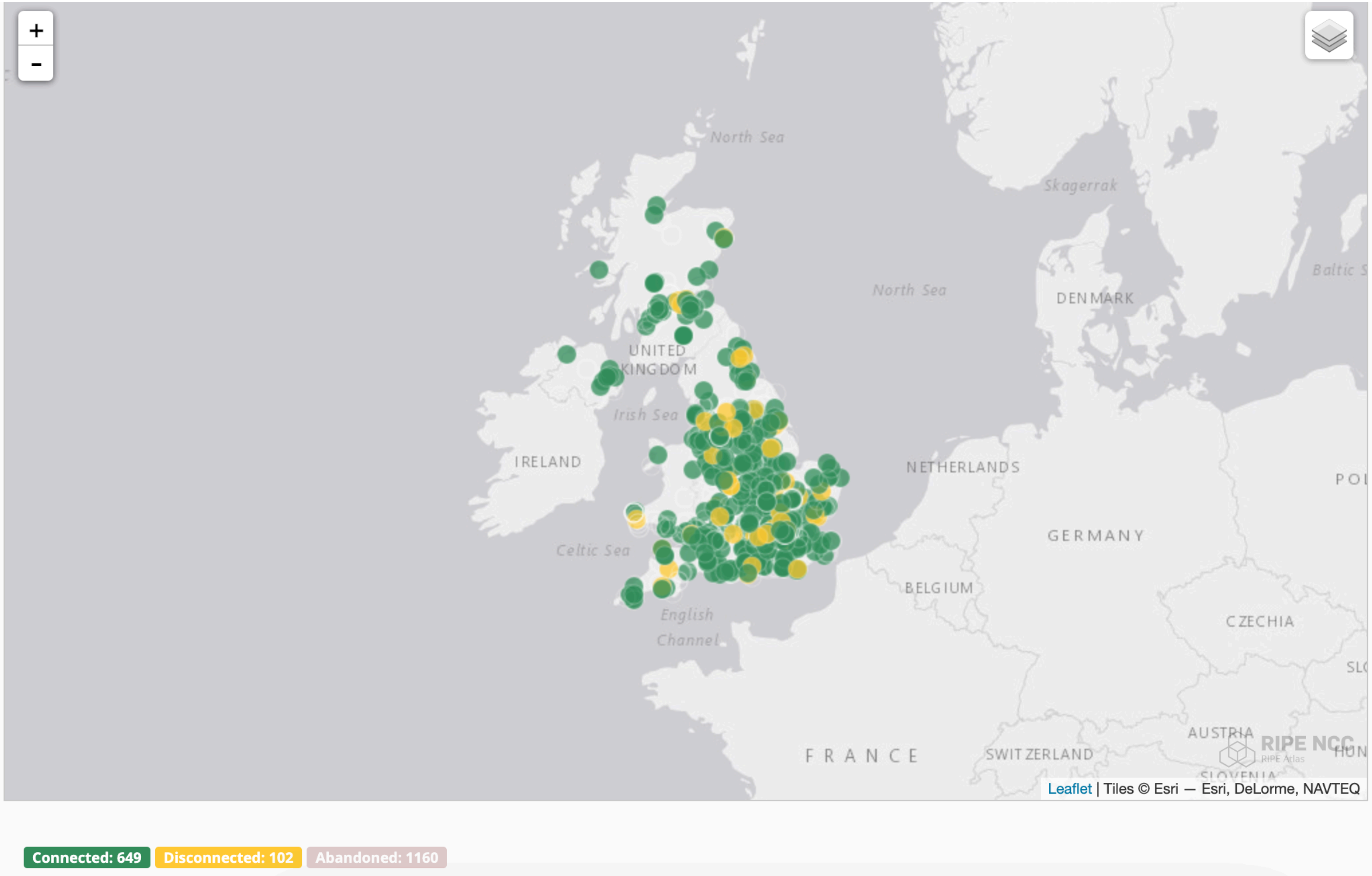


# RIPE Atlas Anchors



- More robust probes mostly for data centres
- Either physical hardware or a virtual machine
- Generally more reliable and better connected than probes
- Have all features of probes plus extra server features
  - DNS server
  - HTTP(S) server
- Full mesh of ping and traceroute measurements is scheduled between all anchors

# RIPE Atlas in the UK – Geographical Distribution



# Networks Coverage in the UK



Network (ASN)	Network Name	Estimated User Population %	IPv4 Public Probes	IPv4 Private Probes	IPv4 Total Probes	IPv6 Public Probes	IPv6 Private Probes	IPv6 Total Probes	More
2856	BT-UK-AS	24.11	56	11	67	37	8	45	<a href="#">View</a>
5607	BSKYB-BROADBAND-AS	23.88	14	2	16	10	1	11	<a href="#">View</a>
5089	NTL	18.44	56	8	64	0	0	0	<a href="#">View</a>
13285	OPALTELECOM-AS	6.41	12	1	13	0	0	0	<a href="#">View</a>
5378	unspecified	3.45	13	0	13	0	0	0	<a href="#">View</a>
6871	Plusnet	3.05	20	9	29	0	0	0	<a href="#">View</a>
12576	EE	2.7	4	0	4	0	0	0	<a href="#">View</a>
9105	TISCALI-UK	2.57	6	0	6	0	0	0	<a href="#">View</a>
35228	O2BROADBAND	2.09	0	0	0	0	0	0	<a href="#">Apply for a probe</a>
206067	H3GUK	1.84	3	0	3	0	0	0	<a href="#">View</a>
25135	vodafone_uk_asn	1.42	1	0	1	0	0	0	<a href="#">View</a>
12390	KINGSTON-UK-AS	0.53	3	0	3	0	0	0	<a href="#">View</a>
16276	OVH	0.47	0	0	0	0	0	0	<a href="#">Apply for a probe</a>
62240	Clouvider	0.38	0	0	0	0	0	0	<a href="#">Apply for a probe</a>



# RIPE Atlas Measurements



- **Built-in global** measurements towards root nameservers
  - Visualised as Internet traffic maps
- **Built-in regional** measurements towards “anchors”
- **Customised** measurements run by users

# Customised Measurements (1)



- Customised measurements allow:
  - Monitor network reachability from thousands of vantage points worldwide
  - Measure packet loss on suspected bad link
  - Test anycast deployment
  - Check the responsiveness of DNS infrastructure, such as root name servers
  - Test IPv6 connectivity
- A complete collection of use cases, published research and analyses based on RIPE Atlas is published on [RIPE Labs](#)



# Customised Measurements (2)



- RIPE Atlas customised measurements are available to:
  - RIPE Atlas probe hosts
  - anchor hosts
  - sponsors
  - RIPE NCC members
- How it works?
  - earn credits by hosting or sponsoring one or more probes
  - pick your destination and customise your measurements

# Want to Learn More?



- Check our webinars:
  - [Using RIPE Atlas](#)
  - [RIPEStat](#)





Join us at

**RIPE 87**  
Rome, Italy  
27 Nov - 1 Dec 2023





# Questions



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