



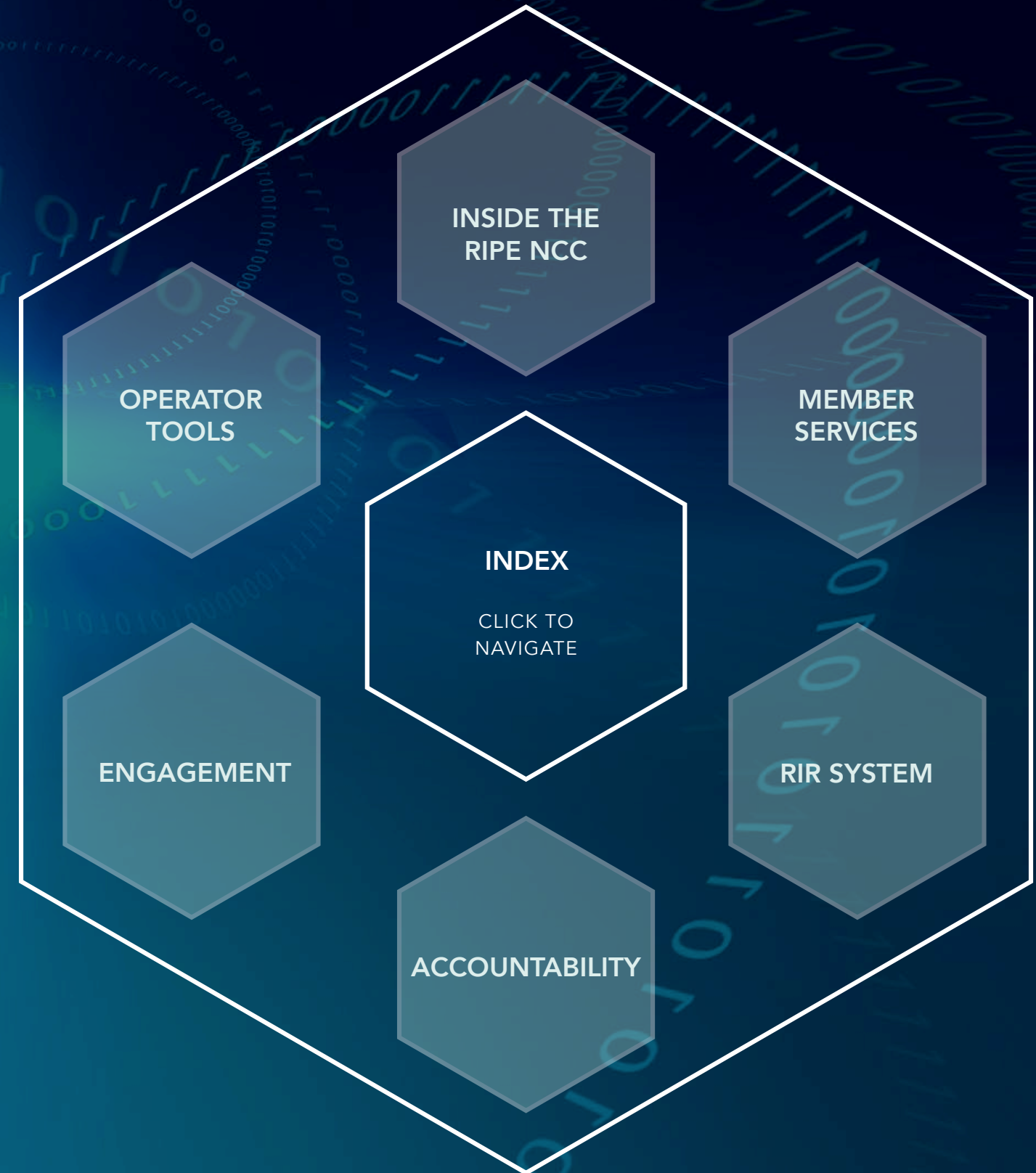
RIPE NCC

RIPE NETWORK COORDINATION CENTRE

ANNUAL REPORT 2017

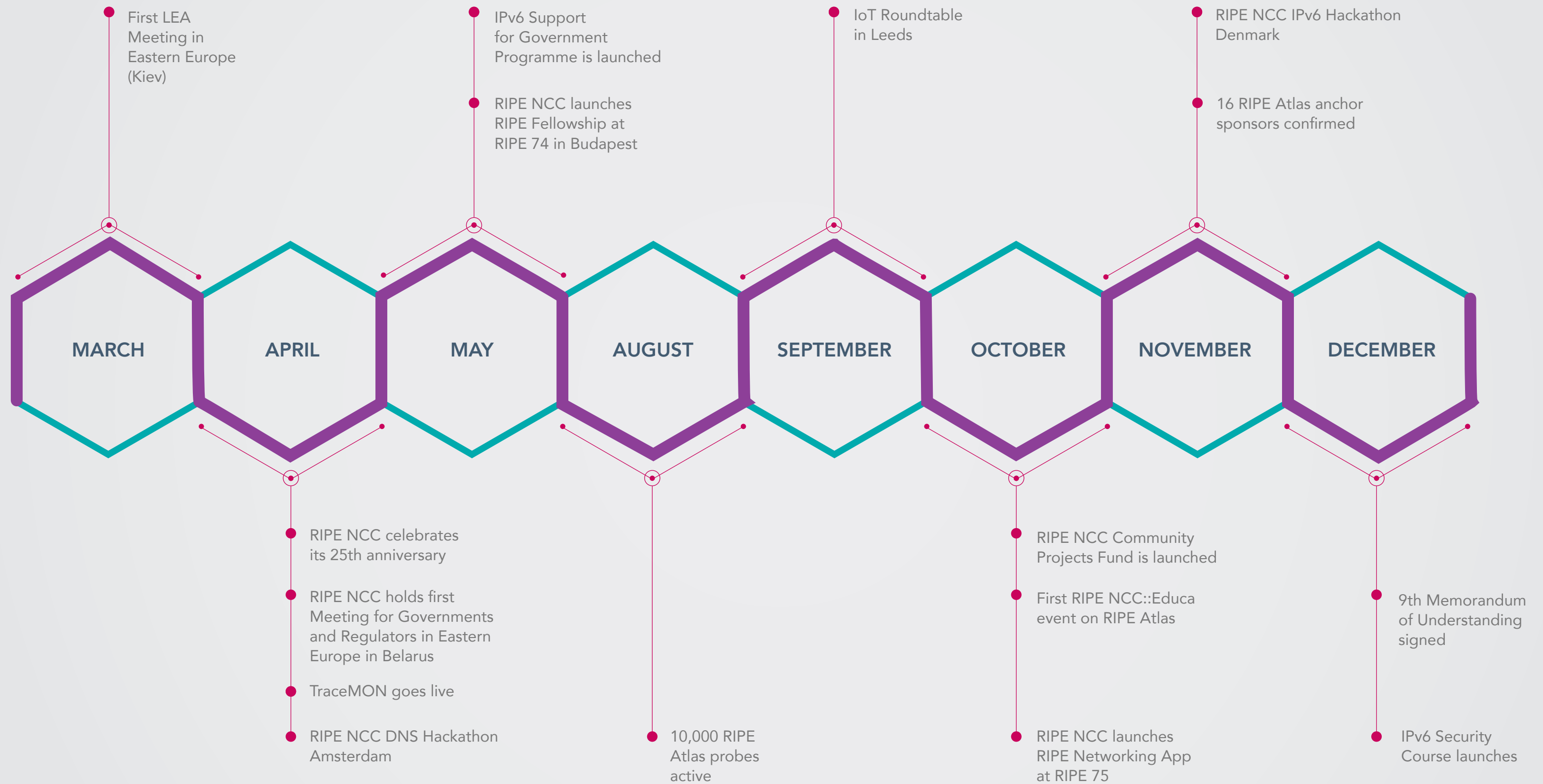
We serve our members by delivering a high-quality registry and supporting the core Internet infrastructure.

We connect people within and beyond the technical community through our inclusive, multi-stakeholder approach, we contribute to an innovative and reliable Internet.





INSIDE THE RIPE NCC





AXEL PAWLIK

RIPE NCC
Managing Director



NIGEL TITLEY

Chairman of the RIPE NCC
Executive Board

Welcome to the RIPE NCC's Annual Report for 2017. This document outlines how we performed the activities described in the RIPE NCC Activity Plan and Budget 2017 and is a key part of how we remain accountable to our membership.

Last year the RIPE NCC celebrated 25 years as a Regional Internet Registry. This is a good opportunity to reflect on just how far we've come, having grown from a handful of volunteers to a professional organisation delivering high-quality services to over 18,000 members in 77 countries in our service region. The RIPE NCC is much more than a registry: it supports the RIPE community, delivers training courses, analyses network events, develops tools and manages critical Internet infrastructure.

In 2017, extra focus went to several key areas: maintaining a high-quality registry, enhancing RIR stability through good governance and accountability, increased efficiency through automation, and engaging with our members, the RIPE community and other stakeholders.

In this year's Annual Report, we're shining a light on the people behind the success of the RIPE NCC as an organisation. For 25 years, the dedication and expertise of the RIPE NCC's staff has helped us to innovate and support a growing membership and build new connections with the technical community.

RIPE NCC EXECUTIVE BOARD



L - R: [DMITRY BURKOV](#) | [CHRISTIAN KAUFMANN](#) | [SALAM YAMOUT](#) | [REMCO VAN MOOK](#) | [NIGEL TITLEY](#) | [MARIA HÄLL](#) | [JÁNOS ZSAKÓ](#)

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These figures are not part of the Financial Report and as such have not been audited by an external third party. They are indications based on an internal time registration methodology that is executed on a monthly basis. These figures serve only as indications of the costs relating to these activities.

	Budget Operational Expenses 2017	Actual Operational Expenses 2017	Variation
Registry Maintenance	3,220	3,275	55
RIPE Database	893	794	(99)
Resource Certification (RPKI)	573	92	(481)
LIR Portal	518	842	324
Regional Internet Registry	5,204	5,003	(201)
Training	1,138	1,212	74
RIPEstat	677	356	(321)
RIPE Atlas and RIS	1,174	1,395	221
Other Services	454	520	66
Services	3,443	3,483	40
DNS and K-root Operations	700	534	(166)
Data Analysis and Scientific Support	357	563	206
RIPE Labs	240	210	(30)
External Relations	2,245	2,427	182
Member Outreach	1,476	1,454	(22)
IPv6 Support	167	141	(26)
RIPE Meetings	1,809	1,658	(151)
RIPE Policy and Community Support	230	85	(145)
ICANN/IANA/IEFT/ISOC/RIRs	1,098	1,246	148
Good of the Internet Initiative	553	537	(16)
Coordination Activities	8,875	8,855	(20)
IT and Information Security	2,475	2,441	(34)
Facilities (Rent and Utilities)	1,241	1,007	(234)
Management and HR	2,372	2,532	160
Finance and Administration	851	887	36
Legal Activities	190	187	(3)
Organisational Activities	454	250	(204)
Internal	7,583	7,304	(279)
RIPE NCC	25,105	24,645	(460)

Note: Operational expenses do not include depreciation and bad debts.



FELIPE VICTOLLA SILVEIRA

Manager Software Engineering

“Research shows that identity-diverse groups can outperform homogeneous groups of high-ability problem solvers.

In the Software Engineering Department, we made deliberate changes to the hiring process with the goal of increasing the diversity in our teams.”

Relocated to open, flexible office located in the centre of Amsterdam.

37%

Female

63%

Male

30+

Languages Spoken

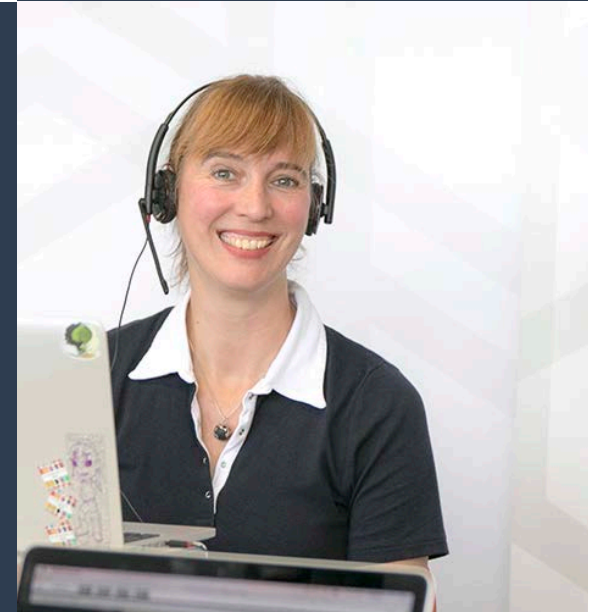
153

Staff Members



38

Nationalities



Highly collaborative, international and creative environment.

RIPE NCC Collabrathon

June 2017



Amsterdam

Central Station



In April 2017, the RIPE NCC celebrated 25 years as a Regional Internet Registry, providing registry and coordination services for the RIPE community. We were proud to have reached this quarter-century landmark, which is quite an achievement in Internet industry terms.

The formation of the RIPE NCC came when the early members of the RIPE community realised that the Internet would not remain a small experiment for very long, and a more dedicated structure would be needed to help coordinate activities in Europe.

Having existed legally at first within what is now GEANT, the RIPE NCC began formal operations at the High Energy Physics Institute (NIKHEF) in Amsterdam on 1 April 1992, with Daniel Karrenberg as RIPE NCC Manager.

“Experience in the RIPE community, and in the Internet community at large, has shown that certain information and coordination services are needed for the proper functioning of the Internet.”

RIPE-19, “RIPE Network Coordination Centre” (1990)

The First Hours of the RIPE NCC

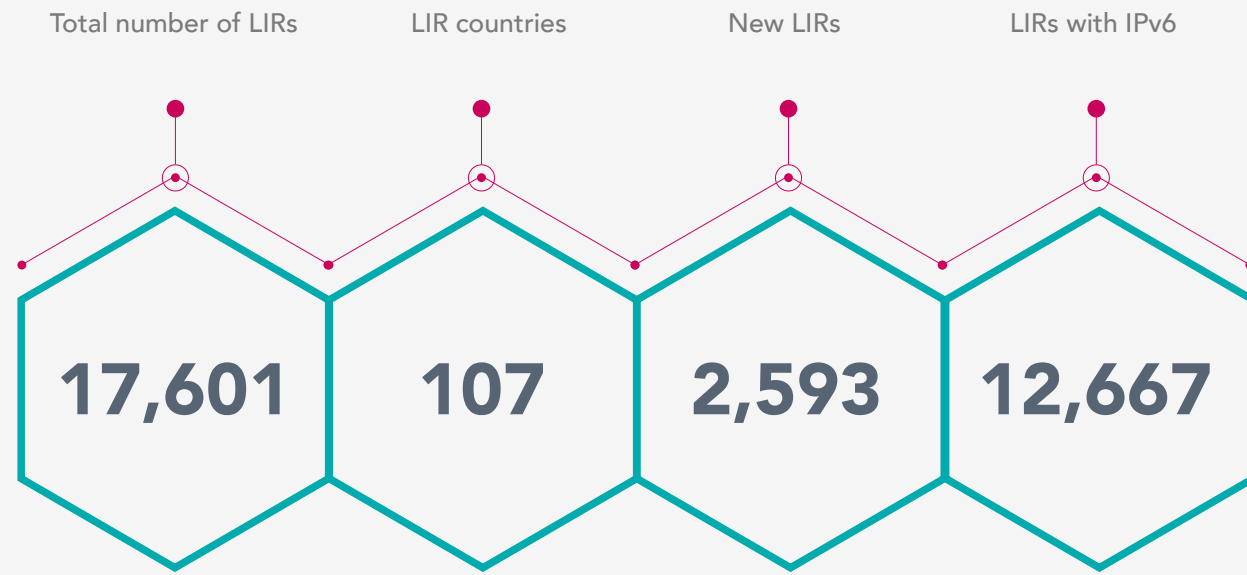
March 1992 - NIKHEF Amsterdam - Main Computer Room: “We have connectivity!” Marten called out. “Running the check script,” Daniel responded. The two young engineers were intently looking at their screens, totally oblivious to anything around them: the noise of the air-conditioning fans, the blinking lights of communications equipment and the whining of the high-speed disk drives.

[Read More](#)





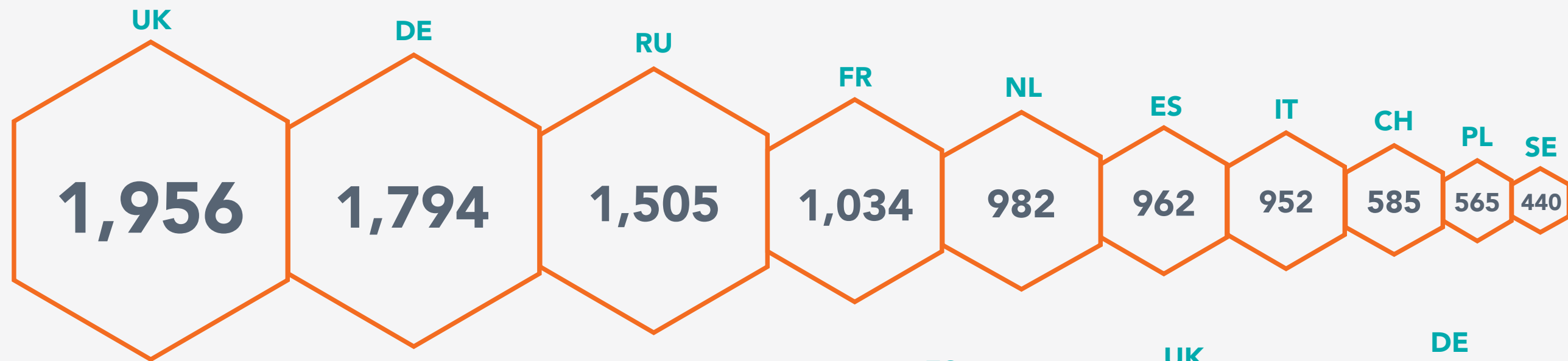
MEMBER SERVICES



Member Updates

The RIPE NCC sends a digest of updates relevant for members once a month to ncc-announce@ripe.net and posts them [online](#). Updates include important operational updates, announcements for new training courses, the latest RIPE Labs articles, meeting updates (RIPE Meetings, RIPE NCC Regional Meetings), new features for our tools and software and much more.

Top ten member countries:



Top ten new member applications by country:



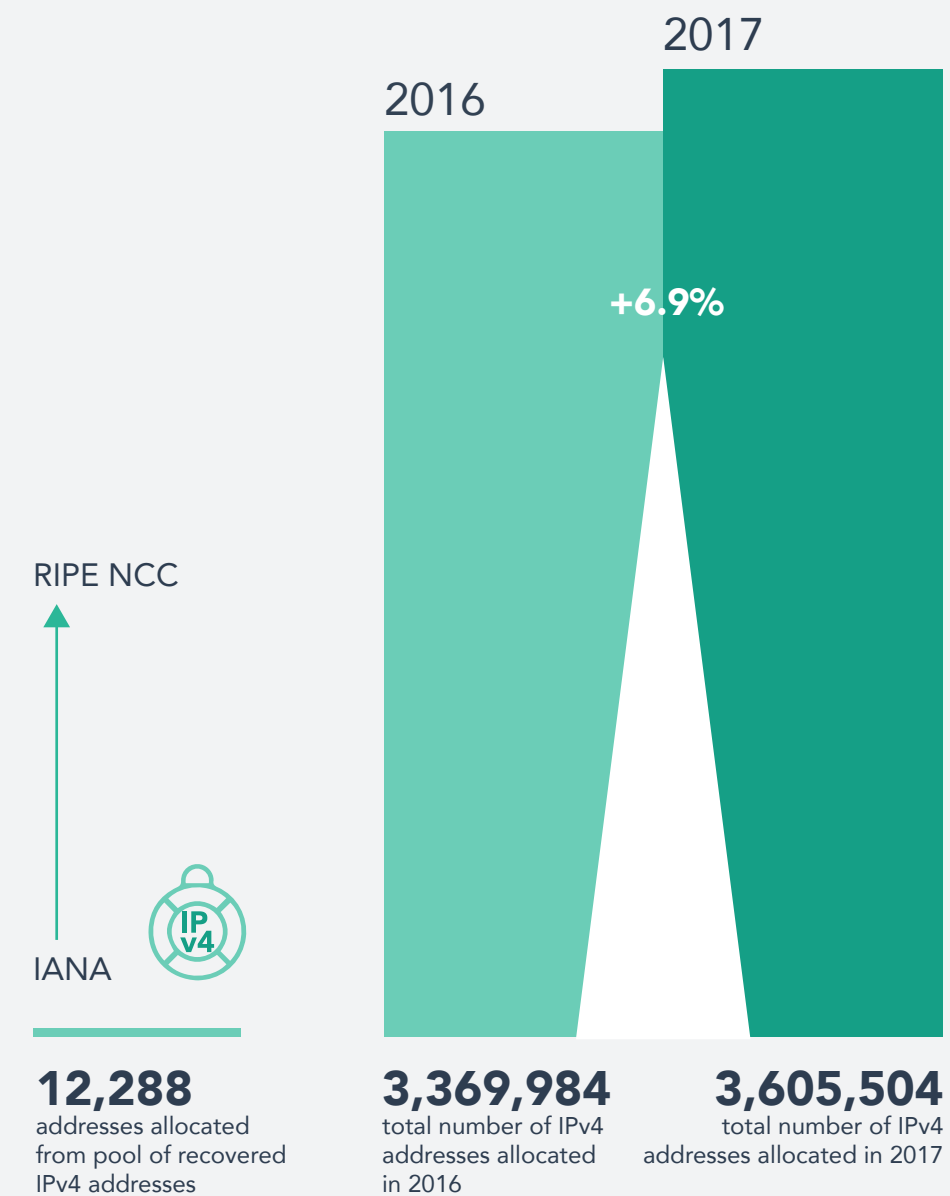
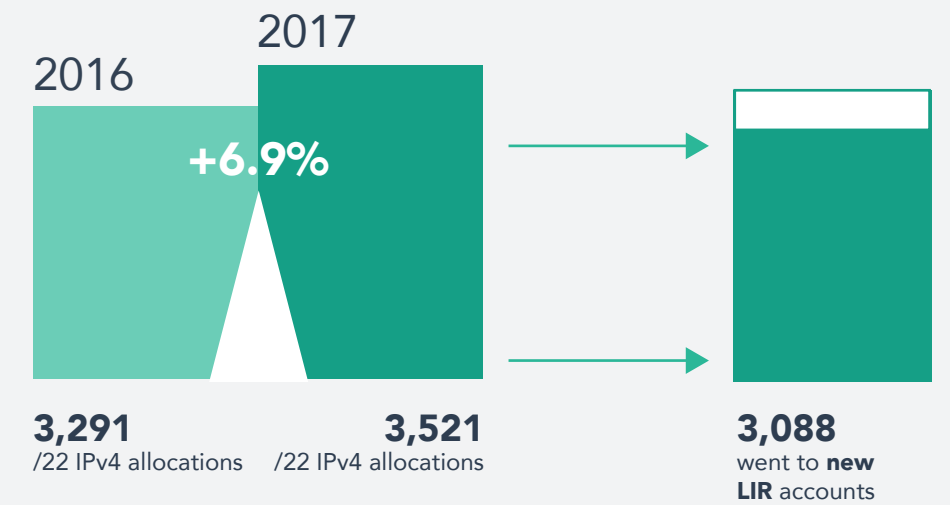
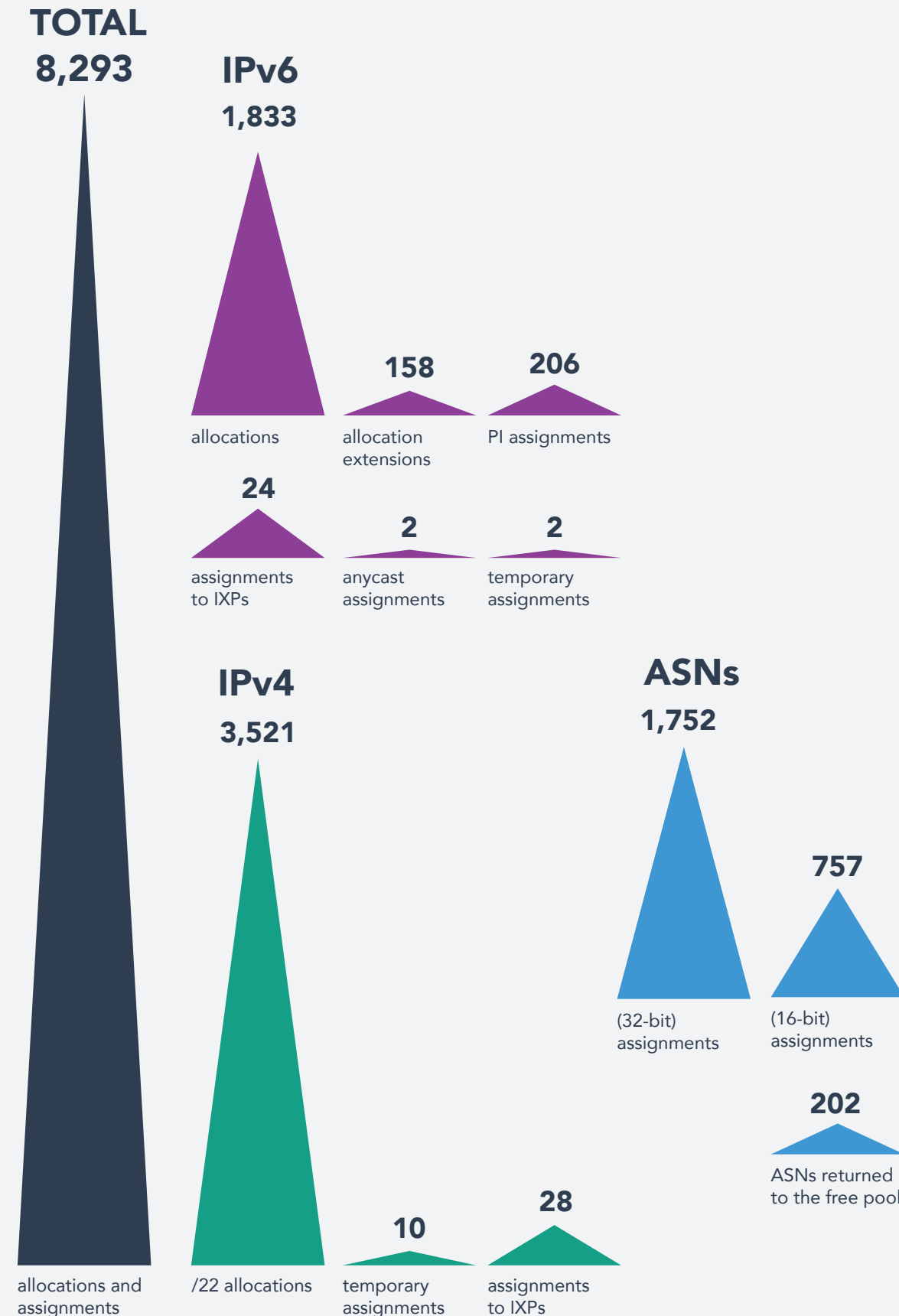
Our most prominent activity is to act as the Regional Internet Registry (RIR) providing global Internet resources and related services (IPv4, IPv6 and AS Number resources) to our members.

We maintain a registry of all Internet number resources we allocate, the details of which can be found in the RIPE Database. This helps to maintain a well-organised and efficient Internet, and it also helps safeguard the number resources in use.

We are one of five RIRs that collectively serve the global Internet community. All RIRs are allocated blocks of Internet resources by the IANA/PTI. We then break these blocks down into smaller blocks and allocate them to our members, upon request.

[Read More](#)

ALLOCATIONS AND ASSIGNMENTS





STEFANIA FOKAEOS

Internet Resource Analyst

“By talking to our members we have an opportunity to better understand their needs, answer their questions and raise awareness about how and why it’s so important to keep their registration data as up-to-date as possible.

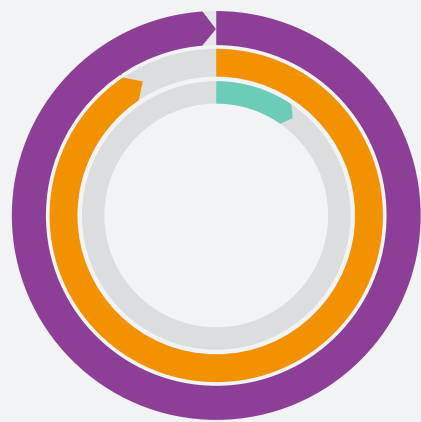
Personally, the chance to engage with our members like this helps us to build a personal connection. I’m a people person, and this part of my job really motivates me!”



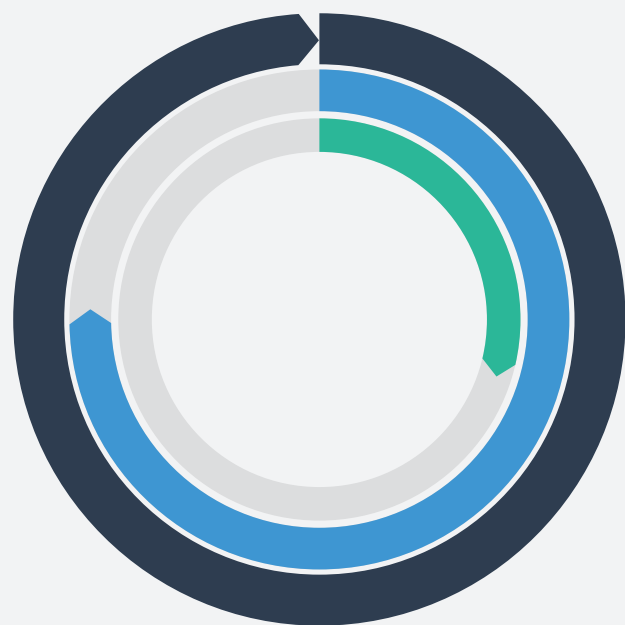
ADDRESS BLOCKS TRANSFERRED

2017

IPv6 TRANSFERS



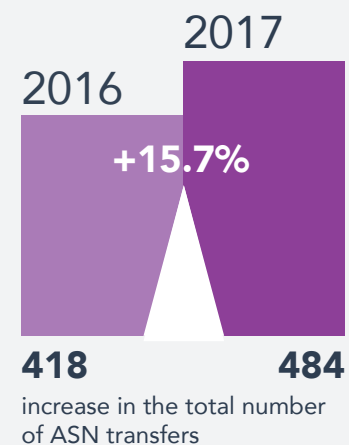
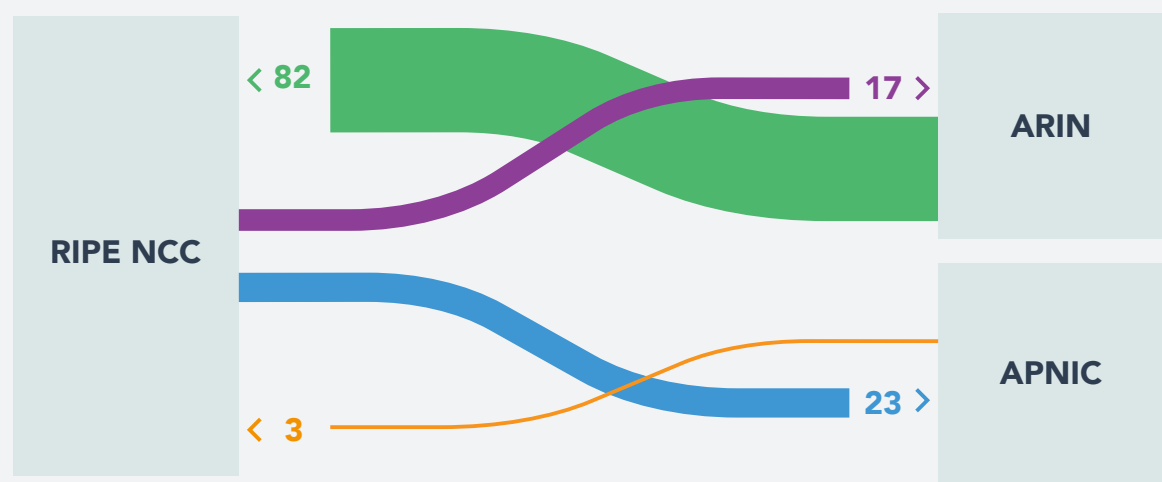
IPv4 TRANSFERS



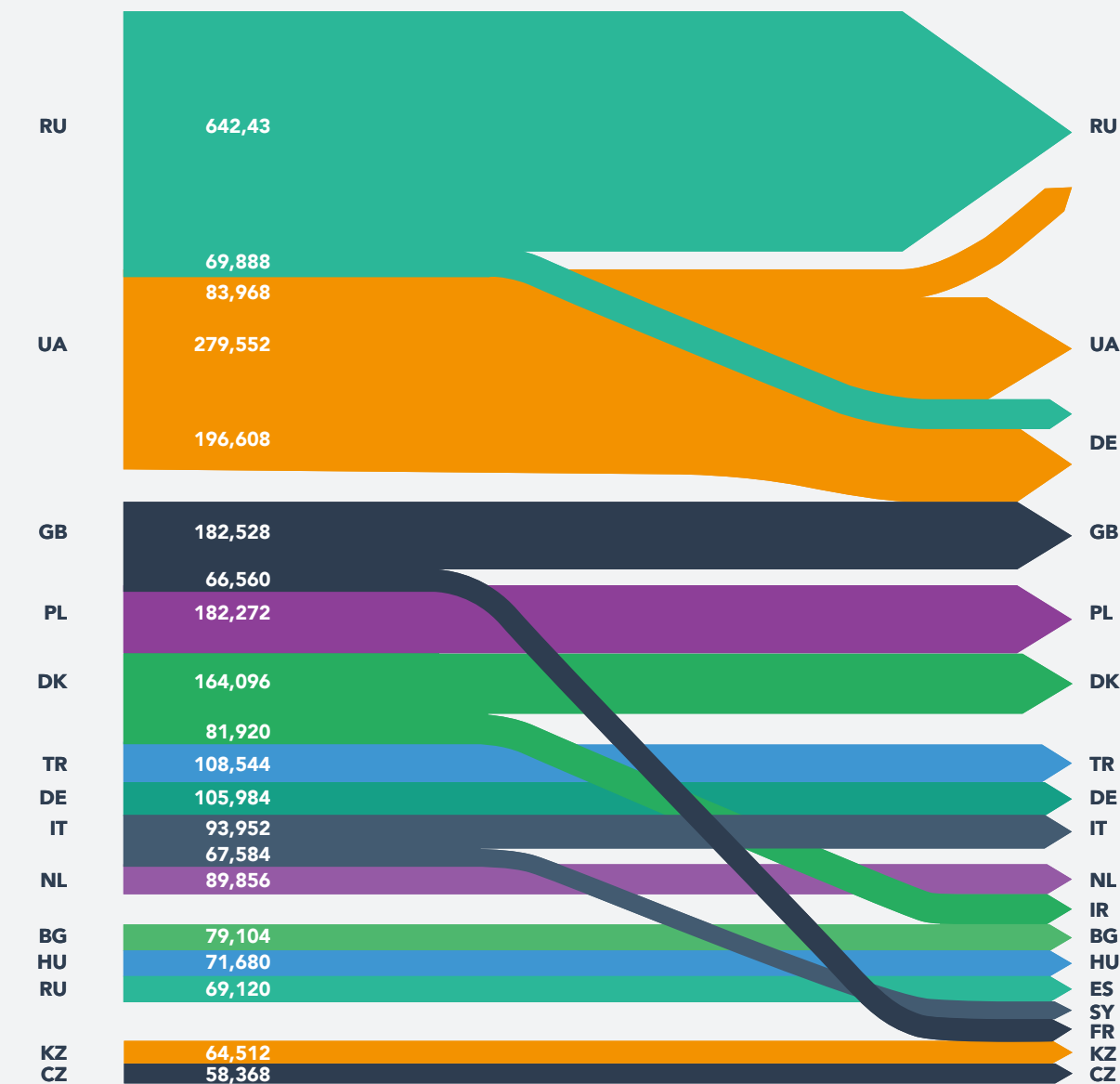
- 237 IPv6 | TRANSFERS
- 215 allocations | (3,247 /32s)
- 22 PI assignments | (22 /48s)

- 2,200 IPv4 | TRANSFERS
- 21,383,424 IPv4 addresses
- 1,594 IPv4 | PA allocations
- 20,615,168 addresses
- 606 IPv4 | PI assignments
- 768,256 addresses

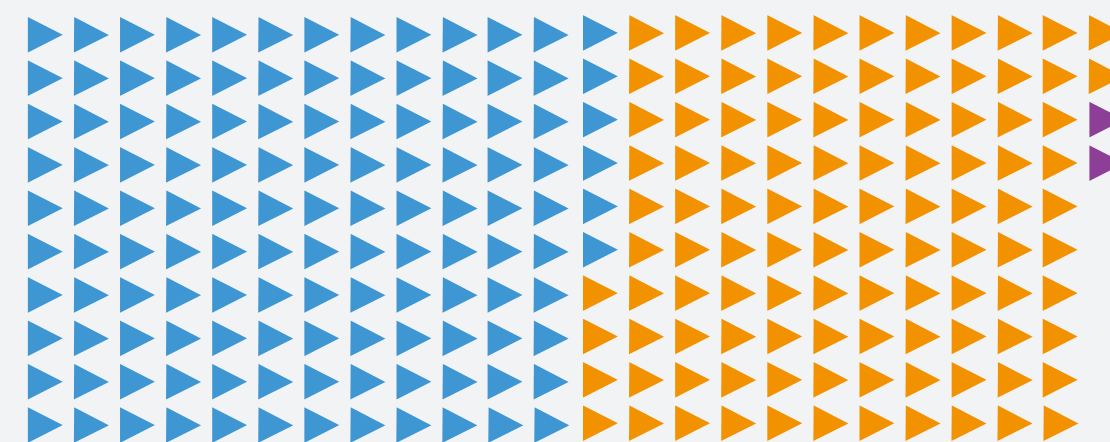
125 IPv4 INTER-RIR TRANSFERS 2,310,912 addresses



TRANSFER FLOW IPv4 ADDRESSES



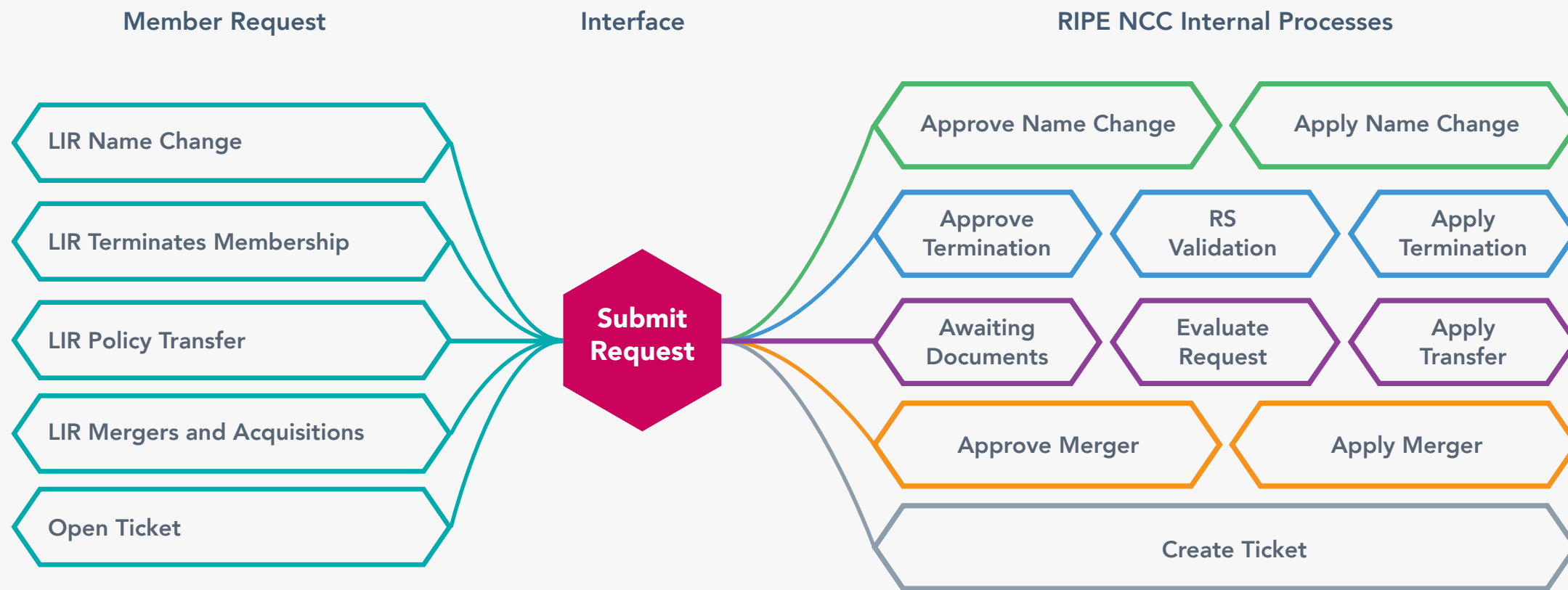
INTER-RIR IPv4 TRANSFERS



2,310,912 total addresses

- 30 legacy resources
1,161,728 addresses
- 89 PA allocations
1,131,520 addresses
- 6 PI assignments
17,664 addresses

▷ = 10,000 addresses



KATIE PETRUSHA

Senior Technical Analyst

“I help our customer-facing departments translate the needs of our members into a software solution. By analysing internal processes, I find ways to streamline and improve our tools. We work to ensure that we build software that matches our users’ needs and is elegant, robust, modern and maintainable.”

Our members use the LIR Portal to manage their Internet number resource allocations and assignments, view billing details, register for the RIPE NCC General Meeting, check the status of tickets and register for RIPE NCC Training Courses. In 2017, our software teams focused on backend work to integrate all of our tools for a more efficient, streamlined user experience.

- ▶ Completed foundational backend work to prepare for significant changes to improve request wizards in 2018
- ▶ Integrated RIPE Database web interface and the LIR Portal for a more intuitive user experience - resources can be reviewed in a single place
- ▶ 40% drop in number of RIPE Database tickets in 2017 thanks to user interface improvements in the RIPE Database
- ▶ Launch of new ticketing system to replace legacy system



OLIVIA MIJNALS-RUIMWIJK

Training Coordinator

“I am responsible for all the logistics around our training courses. I am the interface between RIPE NCC Training Services and our members and stakeholders. I ensure that our course participants know where and when to show up, that all our materials are up-to-date and in stock, and, of course, that the trainers don't sleep under a bridge (if they are nice ;-)”

Our international team of trainers travel throughout our service region year-round to deliver in-depth courses that help our members optimise their network operations.

LIR Training Course

Are you a new LIR? This course will teach you everything you need to know about our procedures, RIPE Policies and how we allocate resources and how you interact with us.

RIPE Database Training Course

Gain a comprehensive understanding of the RIPE Database and how to use it efficiently and effectively.

Basic IPv6 Training Course

We lay out the building blocks to build your deployment.

Advanced IPv6 Training Course

Once the basics are learned, go deeper with IGP, BGP, security and configuration.

IPv6 Security Training Course (new!)

Gain insight into industry best practice and gain a high-level understanding of the most pressing IPv6 security concerns today.



BGP Operation and Security Training Course

Learn about route reflectors, policy, filtering, route selection, BGP security, bogon filtering, Internet Routing Registries and the Resource Certification (RPKI) framework.

DNSSEC Training Course

Learn basic DNS theory, public key encryption basics and how to secure your domain name servers and zones.

Measurements and Tools Training Course

Learn how to make the most out of RIPE NCC's powerhouse operator tools: RIPEstat and RIPE Atlas.

[Read More](#)



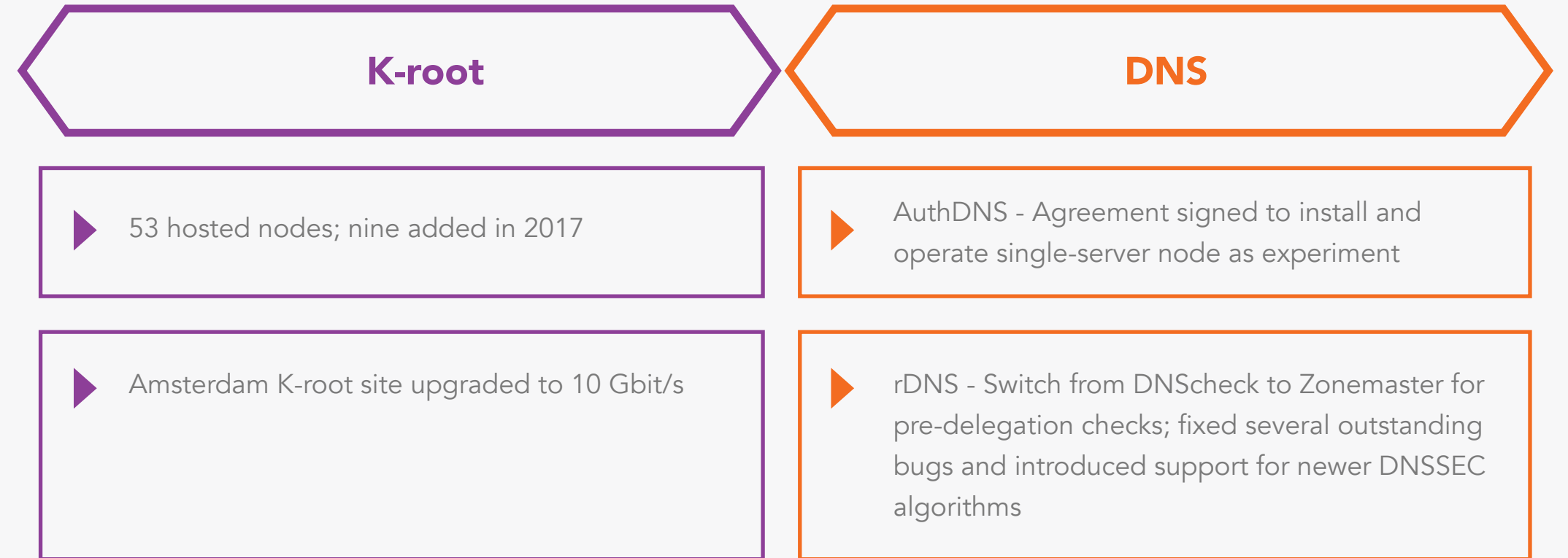
RIR SYSTEM



COLIN PETRIE

Senior System Engineer

“I’m proud of the work we did in 2017 to replace the RIS route collectors with a new, more scalable platform that will allow us to support more peers and more collectors in the future. We’ll also be able to provide near real-time data for RIS in the future.”

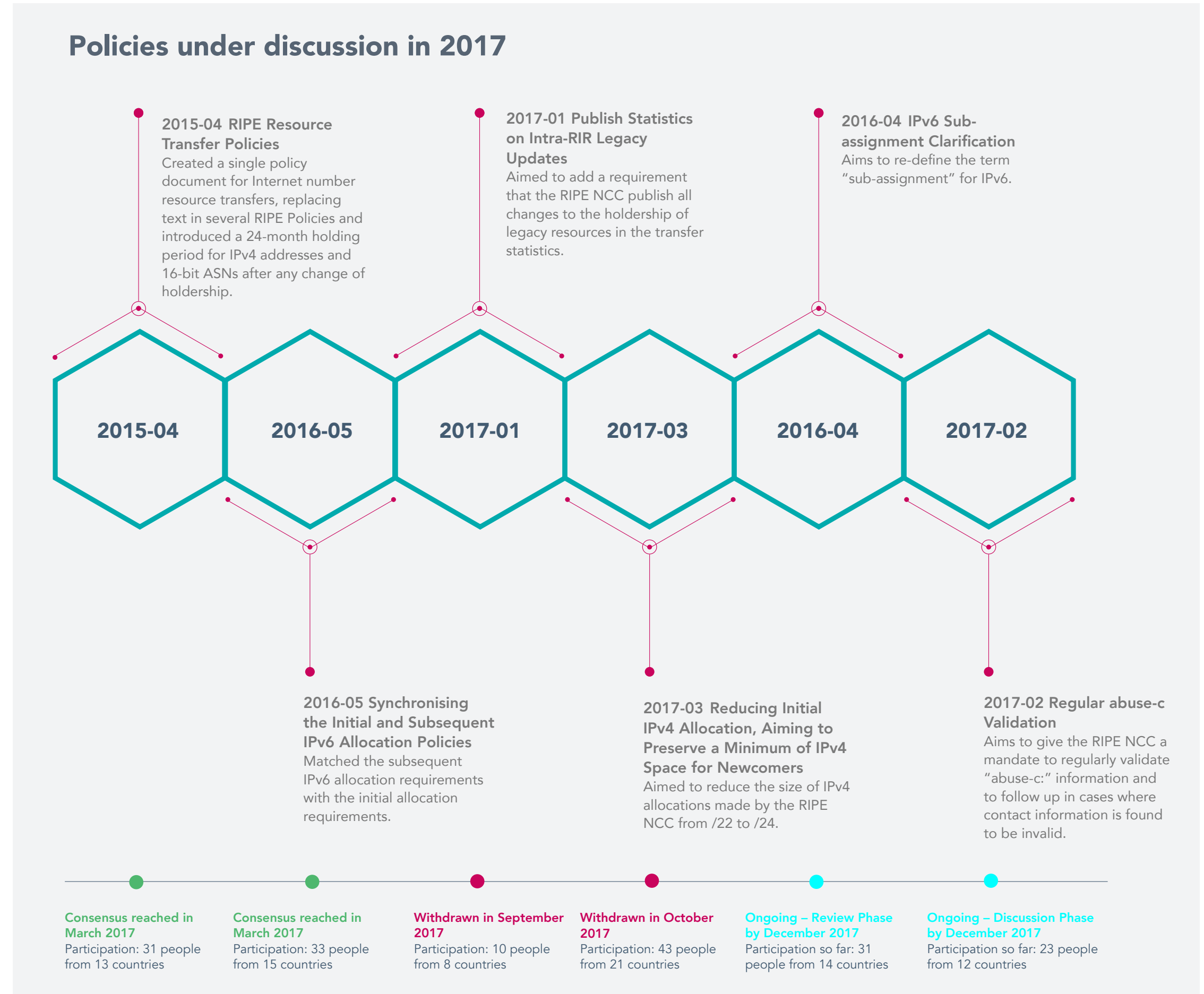


The RIPE NCC provides core services that support the stability of the Internet. We host K-root, one of 13 global root name servers. We run a DNS service from a cluster of servers in Amsterdam, London and Stockholm that serve zones for reverse delegations for RIPE NCC member allocations, country code Top-Level Domains (ccTLD) secondary services and RIPE NCC authoritative zones. We also operate the Routing Information Service (RIS), which tracks changes in the global routing system by collecting and storing Border Gateway Protocol (BGP) routing information using 19 Remote Route Collectors (RRCs) located at major Internet exchanges around the world.

The RIPE community develops and sets policies through a long-established, open, bottom-up process of discussion and consensus-based decision making. These discussions take place at RIPE Meetings and on RIPE Working Group mailing lists. Consensus on a policy can only be reached on a mailing list.

- 11 people from eight countries submitted a policy proposal to the PDP
- Almost 100 people from 28 countries participated in the PDP in 2017
- Proposal 2017-03 (Reducing the initial IPv4 allocation) was the most popular discussion with more than 100 posts

[Read More](#)





The RIPE NCC is responsible for keeping the RIPE Registry comprehensive, correct and up-to-date. With millions of records to maintain, we keep on top of this work year round by completing Assisted Registry Checks (ARCs) with our members, investigating abuse and hijack reports, and working with our members to reclaim unused resources. This work is a collaborative endeavour that spans the organisation and the RIPE community to ensure that the RIPE Registry remains a trusted backbone of Internet networking and resiliency.



SPENCER PAYTON

Internet Resource Analyst

“Providing services to such a diverse community is a truly fascinating part of working for the RIPE NCC. Protecting the interests of so many resource holders in today’s dynamic world makes a certain level of due diligence necessary and unavoidable. We strive to maintain an accurate registry while serving our customers in the best way we can.”



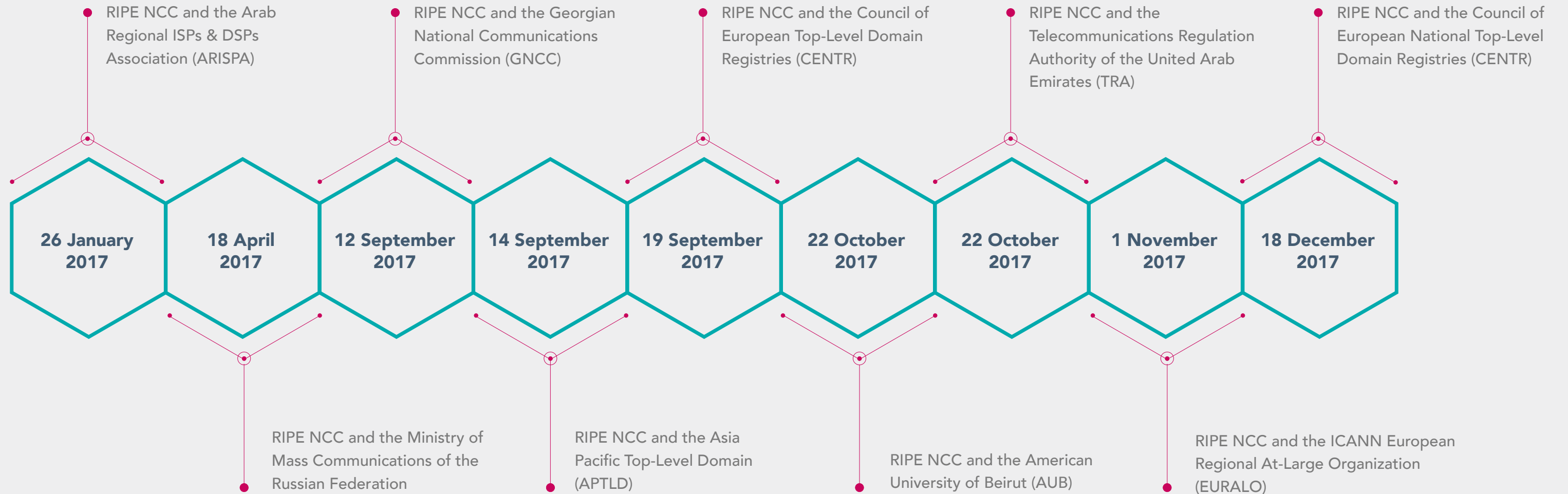
ACCOUNTABILITY



Formalising our engagement with external organisations helps us to broaden support for the RIPE community, the RIPE NCC and the global registry system. We aim to support greater understanding and more effective coordination and cooperation with technical coordination organisations, industry groups, public regulators, law enforcement groups and academic institutions (to name just a few). One way of doing this is through Memoranda of Understanding; the RIPE NCC signed eight in 2017.

[Read More](#)

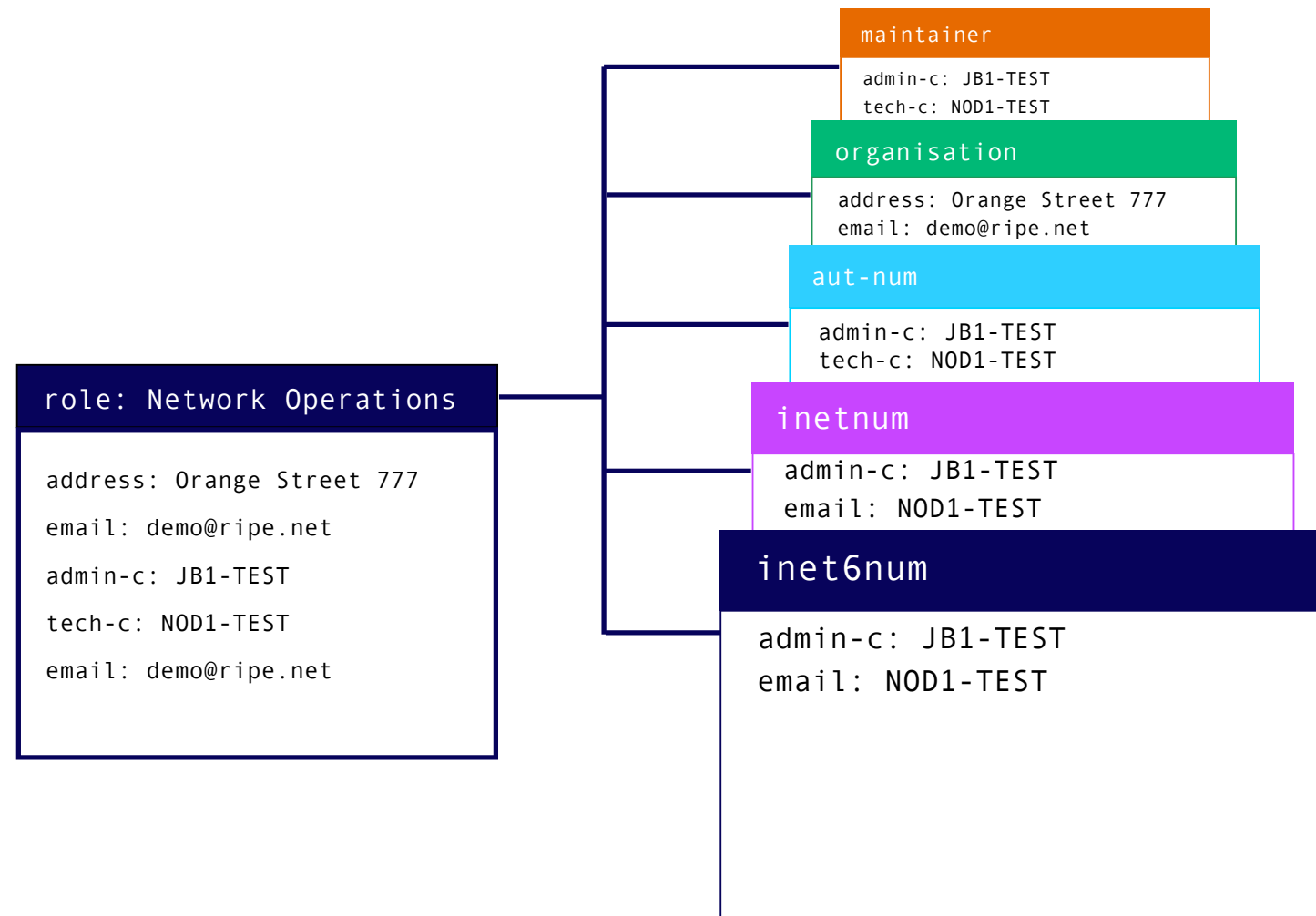
RIPE NCC (Axel Pawlik, MD) and CENTR (Peter van Roste, General Manager) sign MoU at Internet Governance Forum 2017 in Geneva



The Data Classification and Compliance Project

As an RIR providing a range of services to both members and non-members, the RIPE NCC holds a large amount of data. We also produce our own data (such as financial data) and collect data from our employees. All of these data sets need to be classified differently and treated with the appropriate level of care. Personal data is particularly relevant in light of the new legal framework governing its protection – the General Data Protection Regulation (GDPR) – which will apply from 25 May 2018.

In 2017, an organisation-wide data classification and compliance project was launched. The goal of this project was to review all of the data sets the RIPE NCC holds and processes, and ensure that we comply with the applicable legal framework.



Example of personal information stored in the RIPE Database

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Security Reports

The RIPE NCC CSIRT (Computer Security Incident Response Team) received 35 security reports in 2017. Of these, seven contained minor security issues that required action. One report was filed with the Dutch Data Protection Authority to comply with recent Data Breach Notification legislation. This report related to a lost laptop which was later recovered. No personal data was at risk because all data was encrypted per company policy. The RIPE NCC continues to interact frequently with the security community and remains an active participant in the TF-CSIRT community.

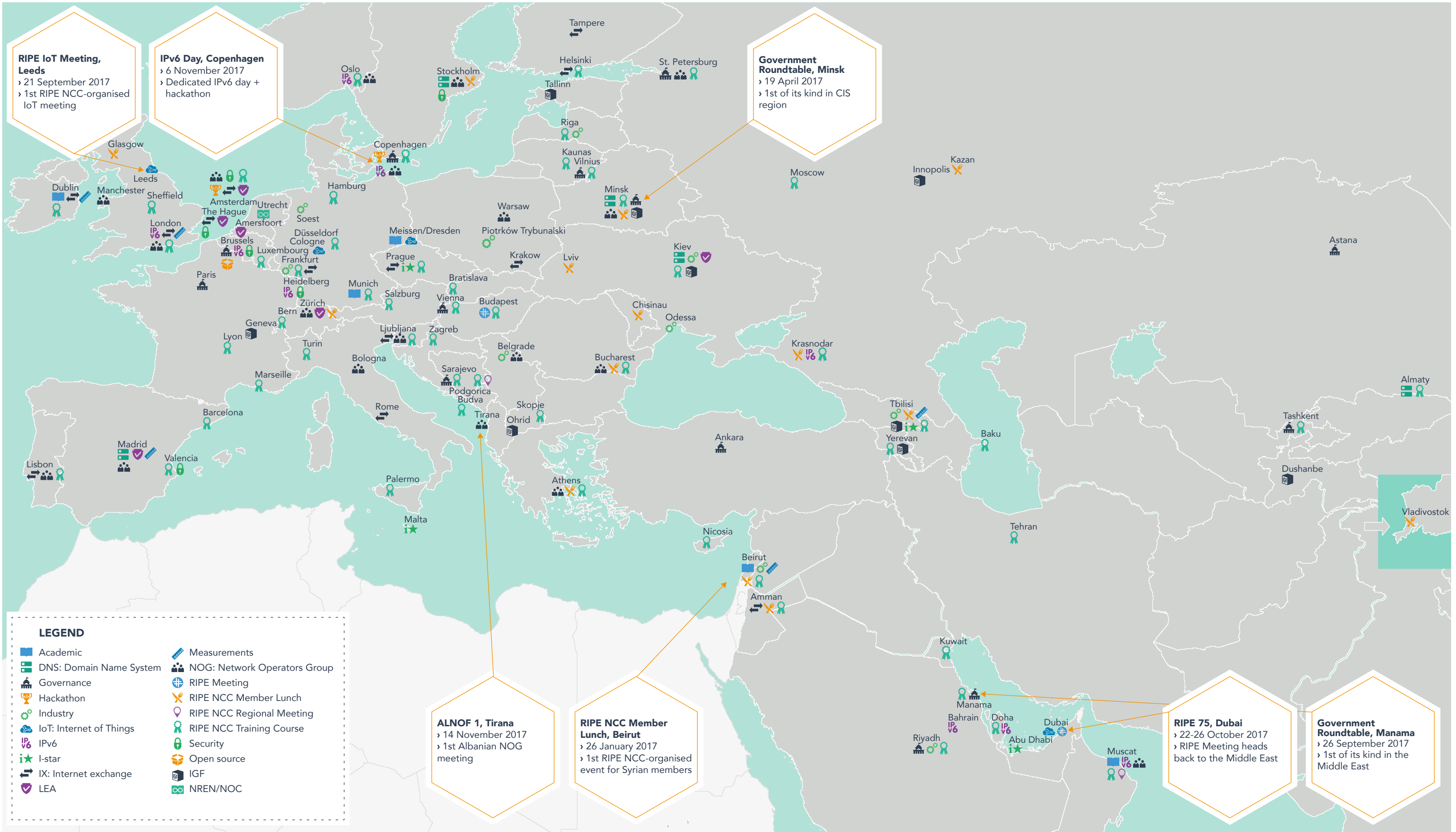
Transparency Report

The RIPE NCC receives information requests from Law Enforcement Agencies (LEAs) and tries to facilitate the provision of any required publicly available information. We do not provide confidential or private information to LEAs without a court order or other legally enforceable order or request under Dutch law.

[Read More](#)



ENGAGEMENT



RIPE IoT Meeting, Leeds
 › 21 September 2017
 › 1st RIPE NCC-organised IoT meeting

IPv6 Day, Copenhagen
 › 6 November 2017
 › Dedicated IPv6 day + hackathon

Government Roundtable, Minsk
 › 19 April 2017
 › 1st of its kind in CIS region

ALNOF 1, Tirana
 › 14 November 2017
 › 1st Albanian NOG meeting

RIPE NCC Member Lunch, Beirut
 › 26 January 2017
 › 1st RIPE NCC-organised event for Syrian members

RIPE 75, Dubai
 › 22-26 October 2017
 › RIPE Meeting heads back to the Middle East

Government Roundtable, Manama
 › 26 September 2017
 › 1st of its kind in the Middle East

LEGEND

Academic	Measurements
DNS: Domain Name System	NOG: Network Operators Group
Governance	RIPE Meeting
Hackathon	RIPE NCC Member Lunch
Industry	RIPE NCC Regional Meeting
IoT: Internet of Things	RIPE NCC Training Course
IPv6	Security
I-star	Open source
IX: Internet exchange	IGF
LEA	NREN/NOG



A RIPE Meeting is an open, inclusive five-day event that brings hundreds of people together twice a year to discuss matters at the heart of Internet operations. The main part of the meeting programme is split between plenary presentations and RIPE Working Group sessions. Attendees also participate in tutorials, workshops, Birds of Feather sessions (BoFs) and Task Forces.

RIPE Meeting Code of Conduct:

For over a quarter of a century, the RIPE community's strength comes from its breadth of experience, diversity of views, and an open, respectful exchange of ideas – values that we want all of our RIPE Meeting attendees to uphold.

Please treat each other with tolerance and respect. Free speech and an open exchange of ideas are encouraged and celebrated. Demeaning, intimidating or harming anyone at the meeting is wrong. We are especially sensitive to behaviour that offends based on gender, sexual orientation, religion, race or ethnic origin, or other perceived social, cultural, or personal difference.

[Read More](#)

RIPE 74 Hungary, Budapest

8-12 May 2017



637

Total attendees

149

Total first-time attendees

56

Countries represented

RIPE 75 Dubai, UAE

22-26 October 2017



482

Total attendees

136

Total first-time attendees

53

Countries represented

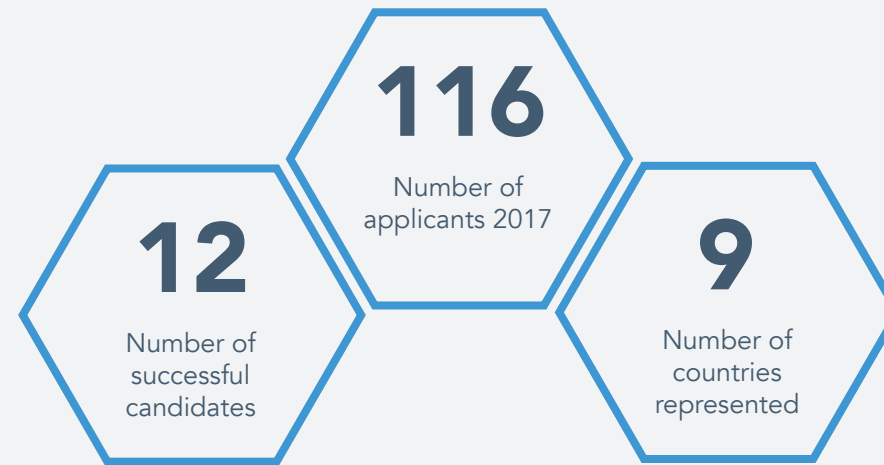


RIPE Academic Cooperation Initiative (RACI)



[Read More](#)

RIPE Fellowship



[Read More](#)

RIPE NCC Community Projects Fund

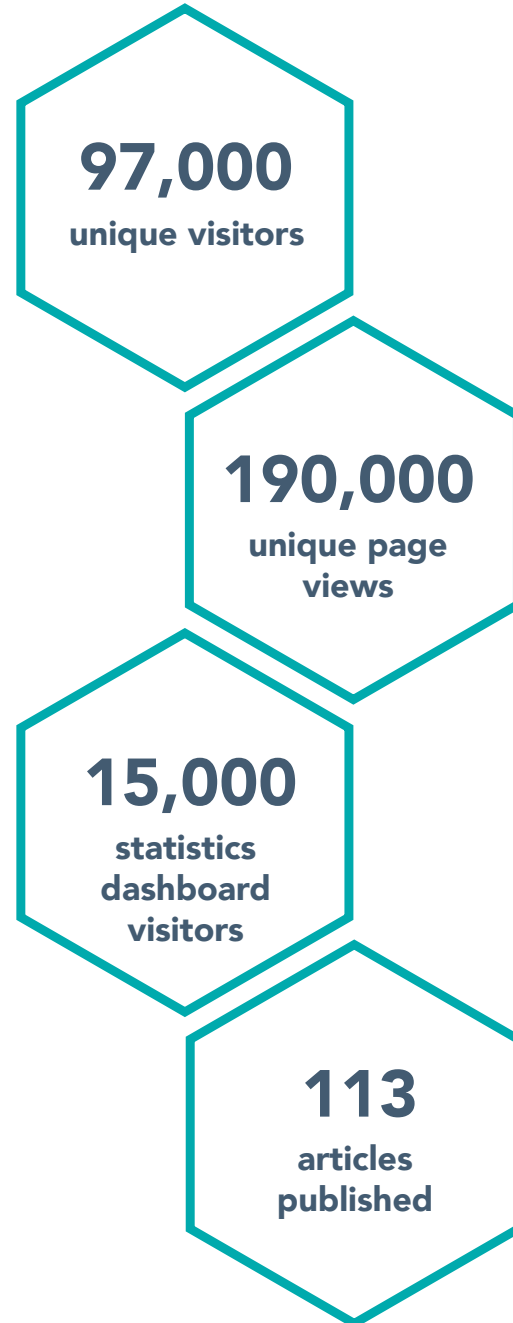


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RIPE 75 Fellows
(l-r Ahmed Aleroud, Ella Titova, Olga Kyrlyiuk, Zeina Daghles, Elif Sert, Jie Li)

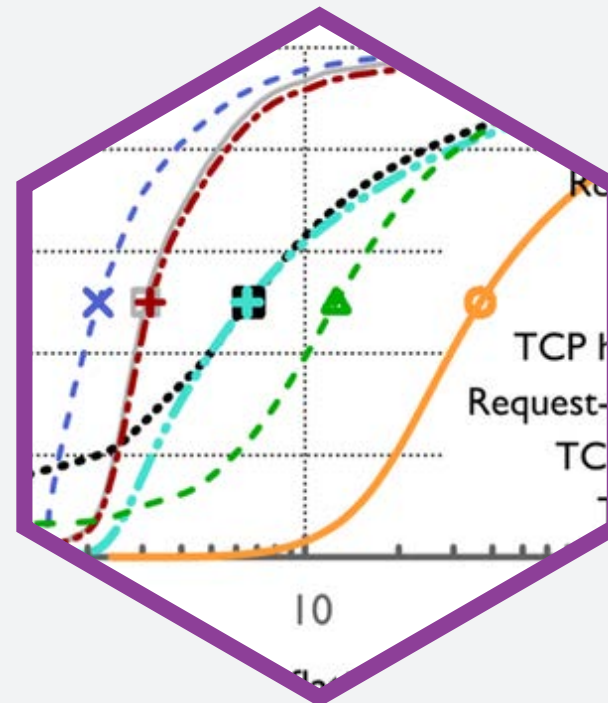
RIPE Labs is a platform designed by the RIPE NCC for network operators, developers and industry experts to showcase, test and discuss innovative Internet-related tools, ideas and analyses that can benefit the RIPE community and RIPE NCC members.



[Read More](#)

Most Popular RIPE Labs Articles Published in 2017

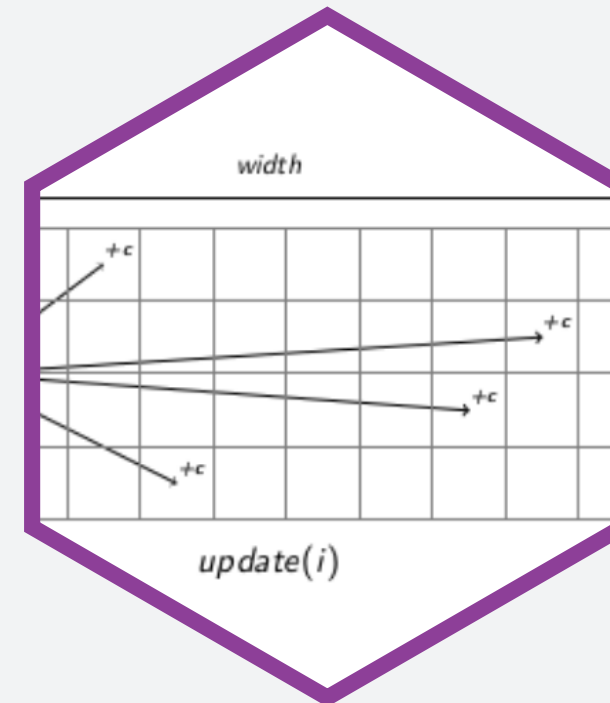
Why is the Internet so Slow?



Ilker Nadi Bozkurt and his colleagues found that the Internet is much slower than it should be. They wonder where this slowdown comes from and what can be done about it.

[Read More](#)

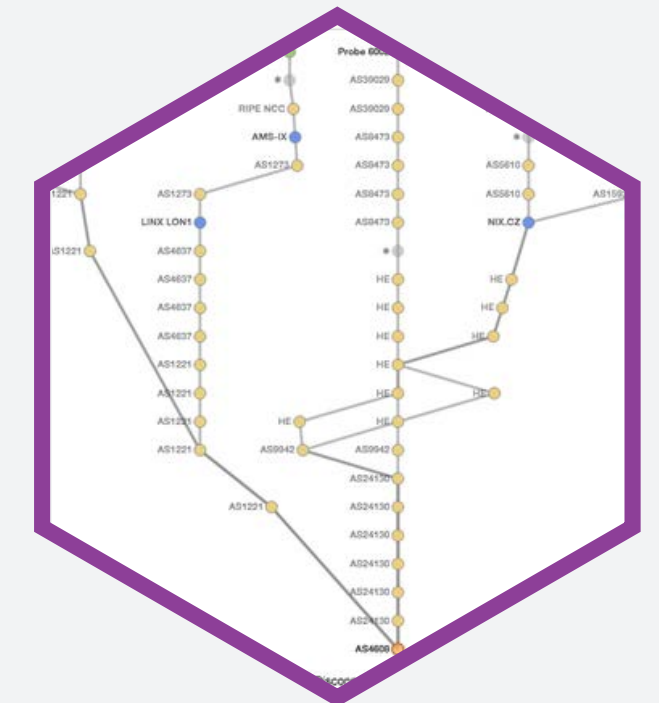
A Software-based Approach to Identify Heavy Hitters in DNS Traffic



This article presents a software-based prototype able to estimate the most-queried domain names in a stream of DNS traffic at 12Mpps (wire-rate 10GbE). The goal is to identify domains involved in random qname attacks.

[Read More](#)

TraceMON: Network Debugging Made Easy

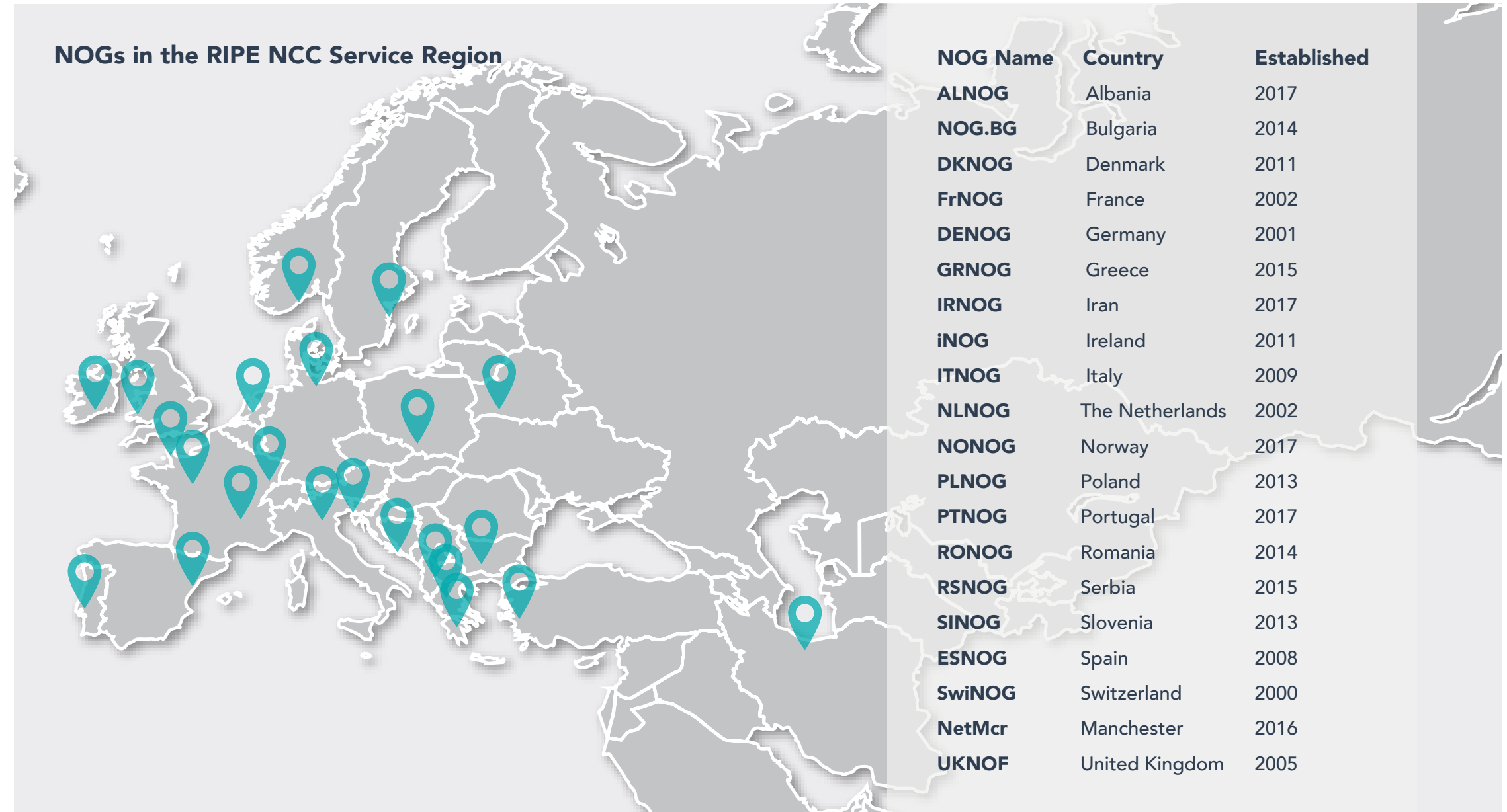


TraceMON is a client-side tool for visualising network topology generated by traceroutes reaching one or more targets in a network. It provides one-click access to a set of information useful during day-to-day operations.

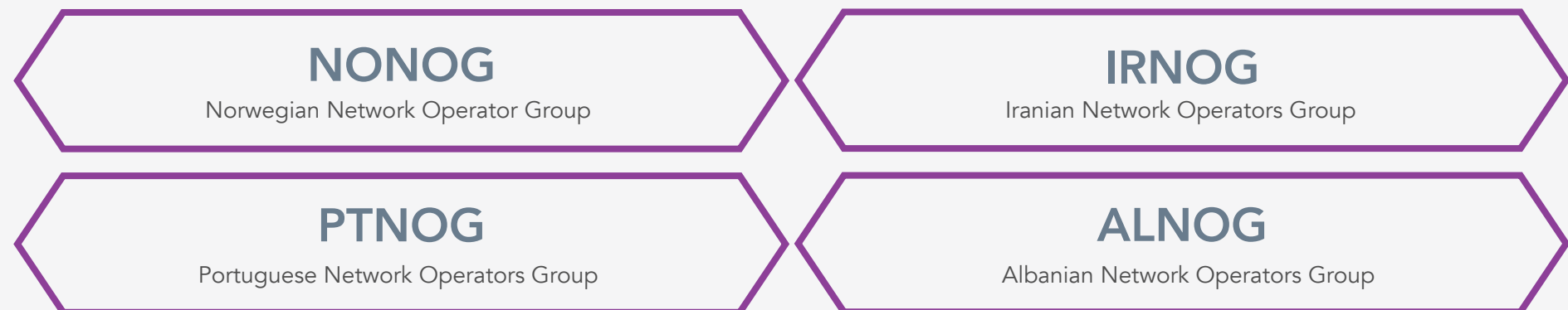
[Read More](#)

The RIPE NCC provides funding through sponsorship for local NOGs and has sent staff to speak or attend at a wide range of community events in our service region. We believe that these efforts bring great value for the Internet community because it helps the community in each country to develop in its own way while at the same time bringing a more regional or global viewpoint that can inform that local community.

The RIPE NCC established and continues to help organise the Eurasia Network Operators Group ([ENOG](#)) and the Middle East Network Operators Group ([MENOG](#)).



NOGS started in 2017:



Read more on RIPE Labs about how the RIPE NCC can help network operator groups

[Read More](#)



"I started building an addressing plan and wanted to get the most info I could online and from the community."

37
webinars

"There were many great ideas to deploy IPv6."

785
RIPE NCC Academy certificates issued

"By following both the webinars and the web-based training I've learned that it's actually not that difficult."



80
Participants in the first RIPE NCC::Educa - new full-day interactive learning event



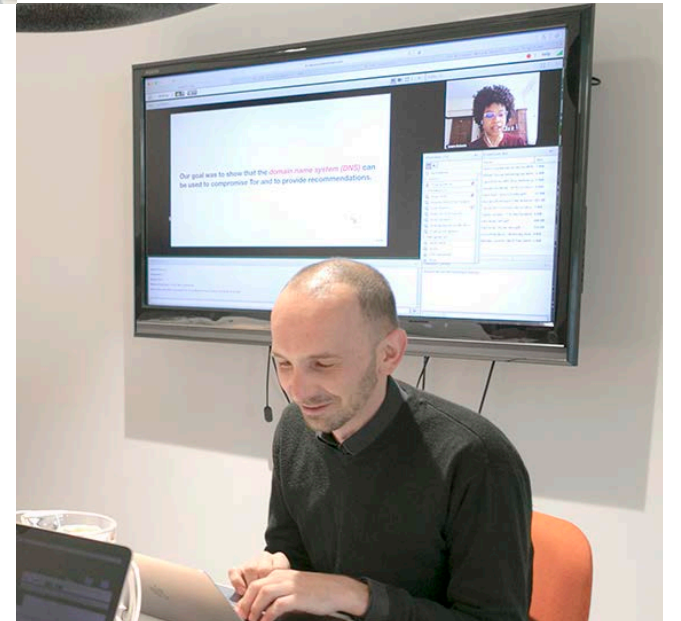
8
Train-the-Trainer courses (Moscow, Beirut, Tashkent, Muscat, Kiev, Tehran, Tbilisi, Krasnodar)

4,692
Enrolled RIPE NCC Academy users

"I like all the creativity that was in the classroom from so many of my fellow students."



"I like it because it fits into my busy work schedule."





OPERATOR TOOLS



The RIPE NCC's Research and Development Team continues to support and develop a variety of innovative tools for the performance and visualisation of a diverse set of Internet measurements. In 2017, the team redoubled its efforts to expand the scope of its academic engagement and cooperation with the wider research community, with tangible results. R&D brings its work to the community through engagement at conferences and meetings throughout the year.

RIPE Atlas

RIPE Atlas is the RIPE NCC's main Internet data collection system. It is a global network of probes that measures Internet connectivity and reachability, providing an unprecedented understanding of the state of the Internet in real time.

RIPEstat

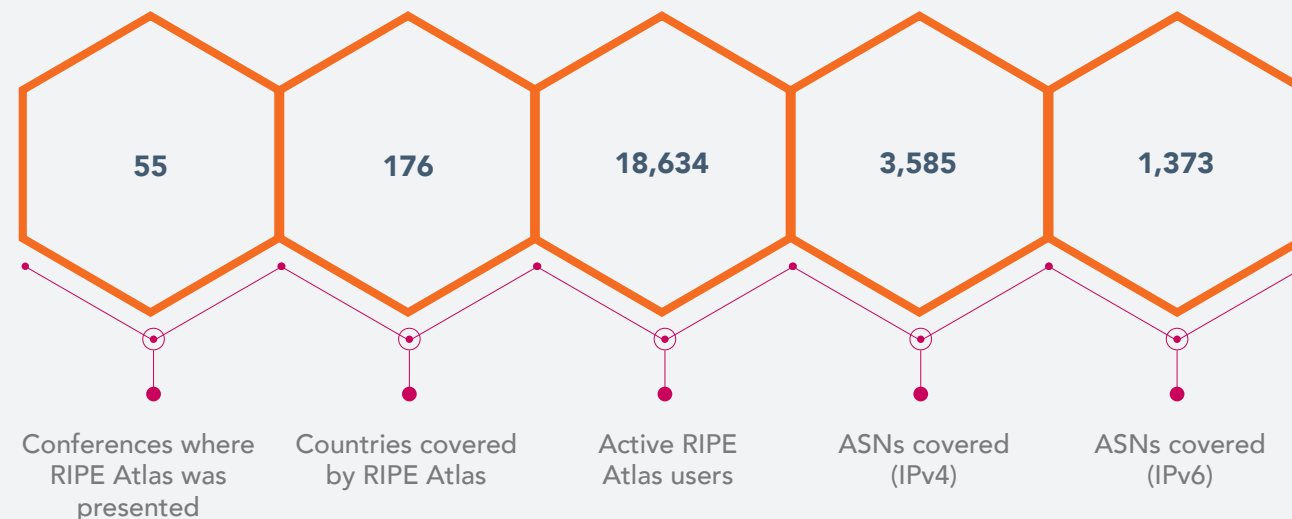
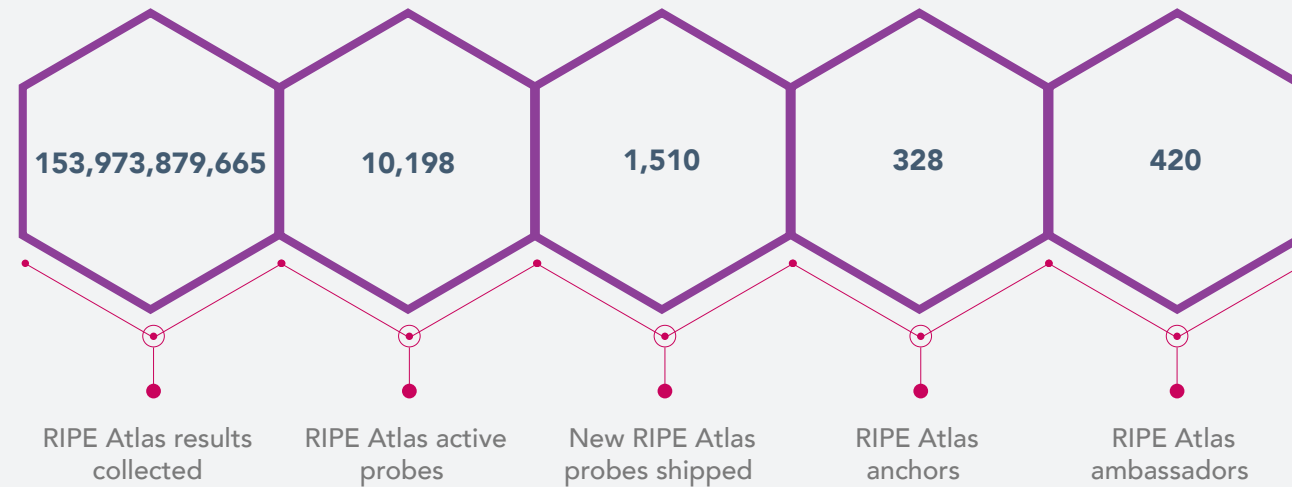
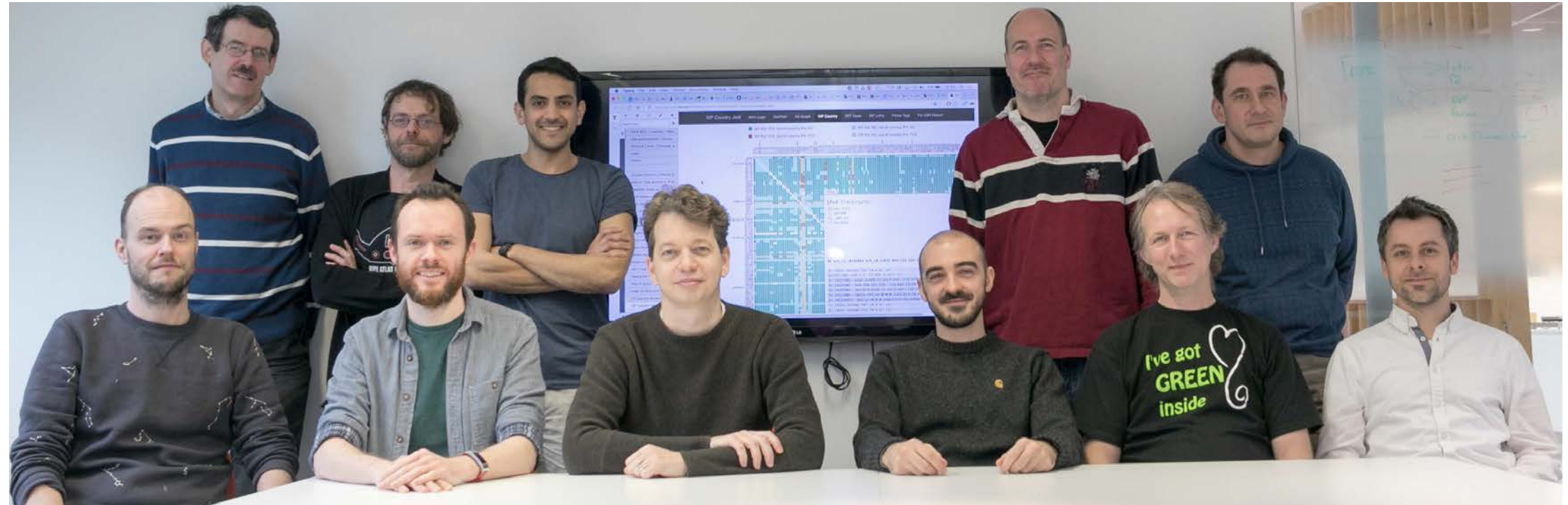
A web-based interface that provides everything you ever wanted to know about IP address space, Autonomous System Numbers (ASNs) and related information for hostnames and countries in one place.

TraceMON

A client-side tool for visualising network topology generated by traceroutes reaching one or more targets in a network. TraceMON provides one-click access to a set of information useful during day to day operations.

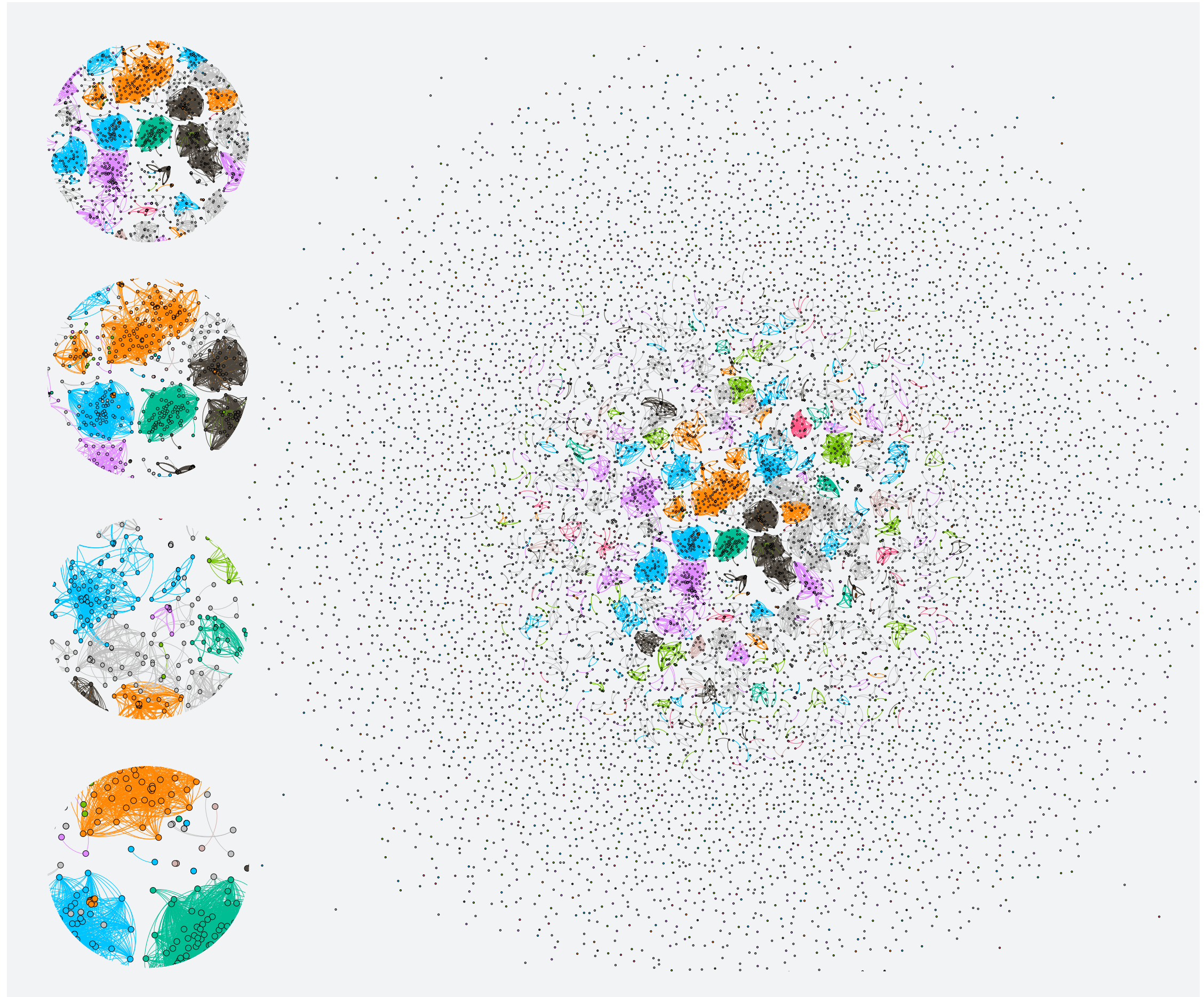
IXP Country Jedi

The IXP Country Jedi provides visualisations of Internet traffic paths (traceroutes) between RIPE Atlas probes located in the same country to examine whether the target paths take out-of-country detours or pass through IXPs.



The aim of RIPE Atlas is to create the world's largest Internet measurement network. In 2017, we reached our goal of 10,000 RIPE Atlas probes distributed across 177 countries around the world. The collective data gives us an unprecedented understanding of the state of the Internet in real time. It's like looking at the Internet through a microscope. As the Internet continues to expand at a rapid pace, so must RIPE Atlas. Our goal is to have 10% of active Autonomous Systems covered by RIPE Atlas.

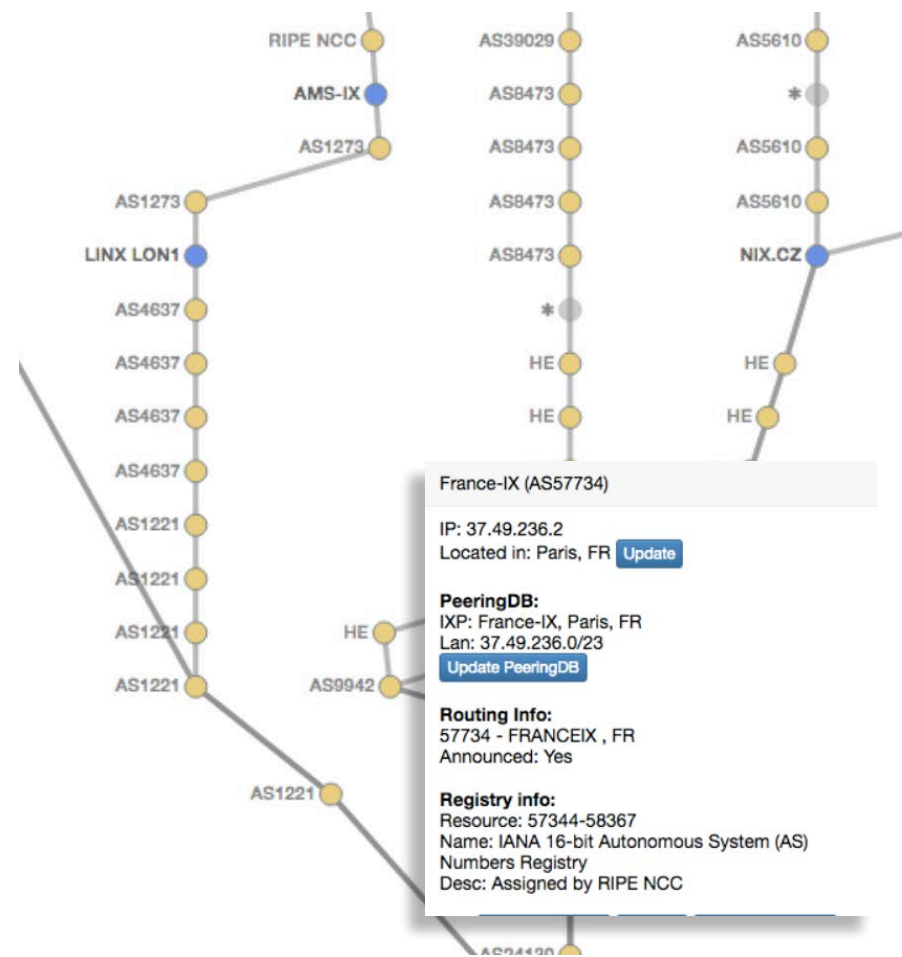
This visualisation of 10,000 probes gives us a better understanding of how unique or redundant each probe is. The lonely dots are probes that are hosted in unique locations. Dots that are closely connected represent probes that 'see' a very similar view of the Internet, thus providing a redundant and distributed view of the Internet. The zoom-ins show areas with large redundancy. Colours represent countries.



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TraceMON helps network operators monitor and investigate reachability and performance of one or more targets in a network. It uses traceroutes collected by RIPE Atlas or third-party repositories for inferring network topology and characteristics of the various network components involved.

By aggregating data from many sources, TraceMON provides a unified and quick point of access to information such as: resource holder contacts, latency, whois, BGP visibility, IP geolocation, IXP detection, reverse DNS lookup and more.

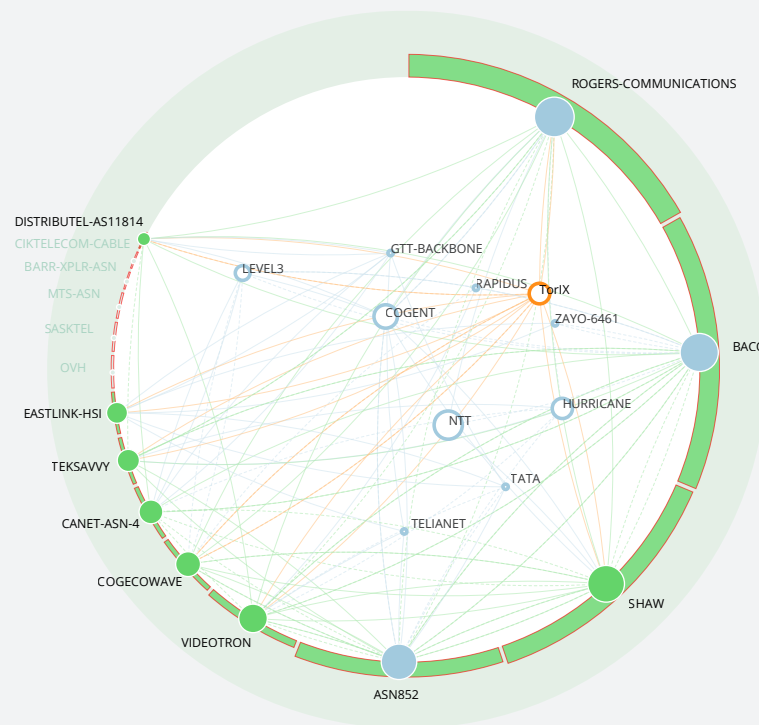
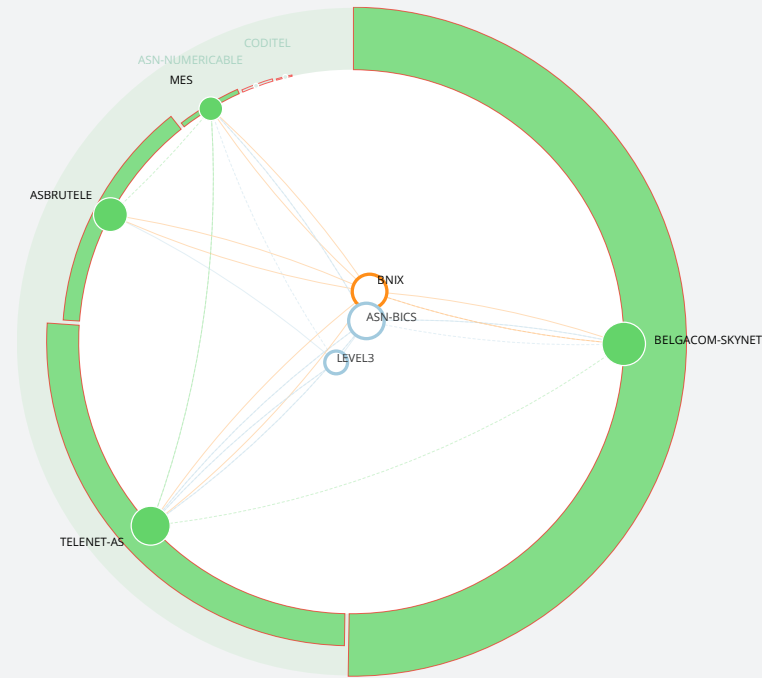


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The IXP Country Jedi uses RIPE Atlas traceroute data to show how Internet traffic paths are routed. Visualisations make it easy to determine whether target paths detour outside of a country and/or pass through an IXP.

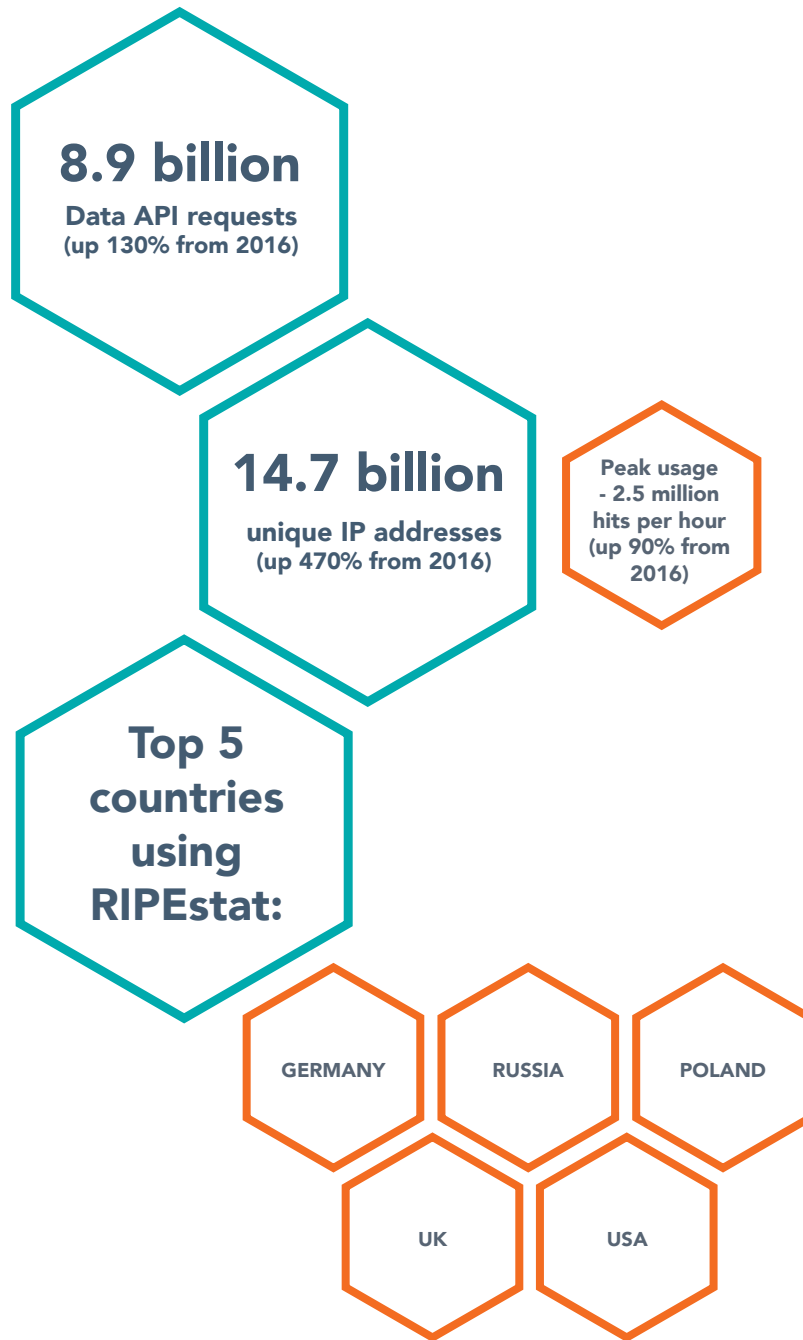
We are continuously looking for new ways to help our community gain insight into their network operations. Our latest addition to IXP Country Jedi is a visualisation that gives users insight into a country's peering ecosystem. Peer-to-peer (P2P) connections are usually low in volume but highly sensitive to delay and this feature shows what parties facilitate these connections. Are your ISPs directly connected or are the IXPs or transit networks involved in your P2P connections? Use IXP Country Jedi to find out!



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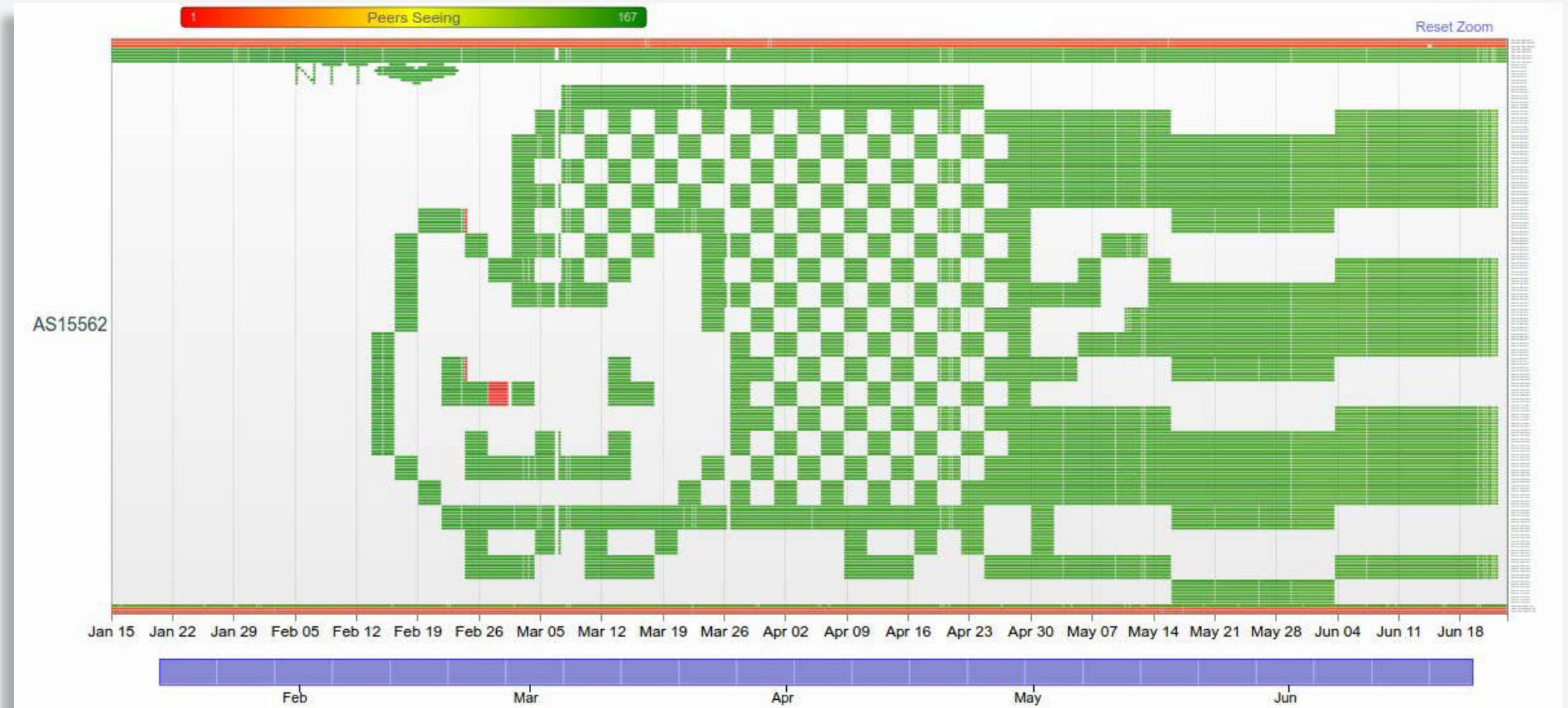


With millions of hits from across the world, users rely on this web-based interface to find out everything there is to know about IP address space, Autonomous System Numbers (ASNs) and related information for hostnames and countries in one place.



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Ultimate Geek Level Unlocked - A Creative Use Case for RIPEstat



In June 2017, a creative techie (@jobsnijders) took RIPEstat viral when he manipulated BGP data to cause a popular Japanese cat meme, Nyan Cat, to appear in RIPEstat's Routing History widget.

The tweet about this went viral with 15,000 retweets and 18,000 likes. RIPEstat had 26,000 unique visits that day, a record for any RIPE NCC service and an effective test case for RIPEstat's load balancers!

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“In 2018 and beyond, we will continue our myriad of engagement efforts to better understand the needs of our members and community and to provide services that effectively address those needs.”

Axel Pawlik
Managing Director



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