RIPE NCC
Past and Future

Hans Petter Holen
Managing Director

Hans Petter Holen | RIPE NCC Services WG | 24 May 2023

Key Take-Aways

- Before run-out, «everybody» was happy.

- Disruptions: Pandemic, Sanctions, War, Inflation, Regulations.

- Declining LIRs; Increased compliance; lead to increased costs.

- We are listening. We want your input!

Content

- Who are we?

- How do we plan?

- Looking Back: Before Runout

- Transition & Disruptions

- Annual Report 2022

- Activity plan and Budget 2023

- Future

Who are we?

Together, let's shape the future
of the Internet

Registration
Coordination
Administration
New Activities

Article 3 – The Association: Objective

The objective of the Association is to perform activities for the benefit of the Members, primarily activities that the Members need to organize as a group. This object can be sub-divided into the following activities:

- Registration Activities related to the role of the Association as Regional Internet Registry;
- Co-ordination Activities, including the support of the stable operation of the Internet;
- Administration Activities, including all regular reports and administrative support as well as all other general administrative tasks which cannot be attributed to a specific activity;
- New Activities, including all activities which are necessary to react to the rapidly changing world of the Internet; and to do all that is connected therewith or may be conducive thereto, all this in the widest sense of the word. Making profit is not an object of the Association.

Together, let's shape the future of the Internet.

RIPE NCC Mission

- As an authority on unique Internet number resources, we enable our members to operate and develop the Internet.

- As a neutral source of information and knowledge, we actively contribute to a stable and innovative Internet.

- We are a trusted steward of the open, inclusive, collaborative Internet model, connecting people, communities and stakeholders.

Strategy 2022-2026

1	**Support an open, inclusive and engaged RIPE community**
2	**Operate a trusted, efficient, accurate and resilient Registry**
3	**Enable our members and community to operate one secure, stable and resilient global Internet**
4	**Maintain a stable organisation with a robust governance structure**
5	**Attract engaged, competent and diverse staff**

Focus 2023

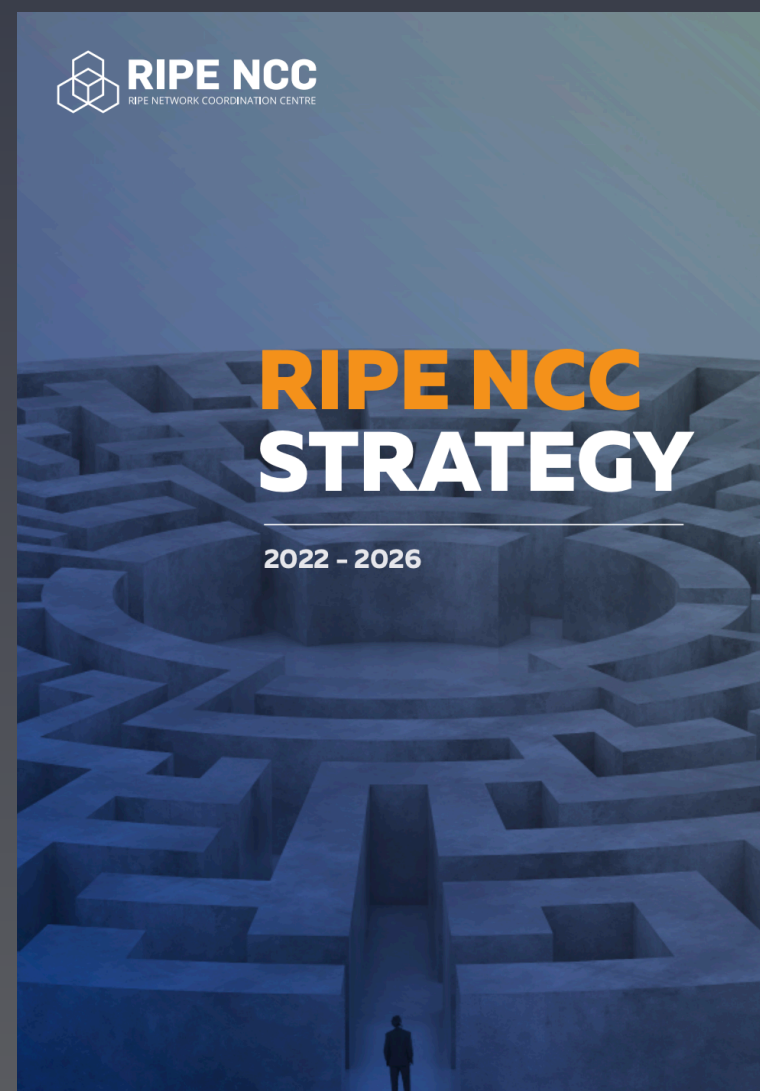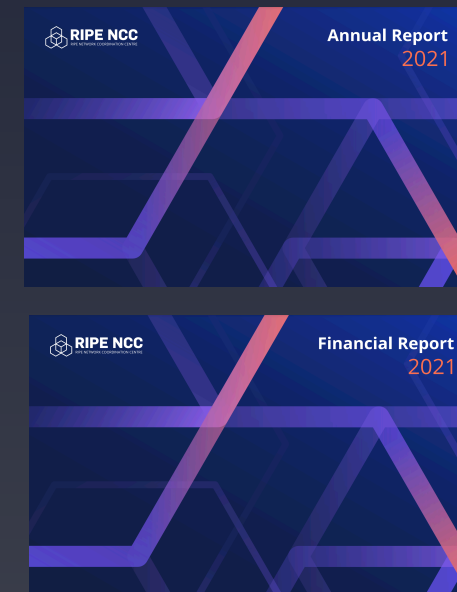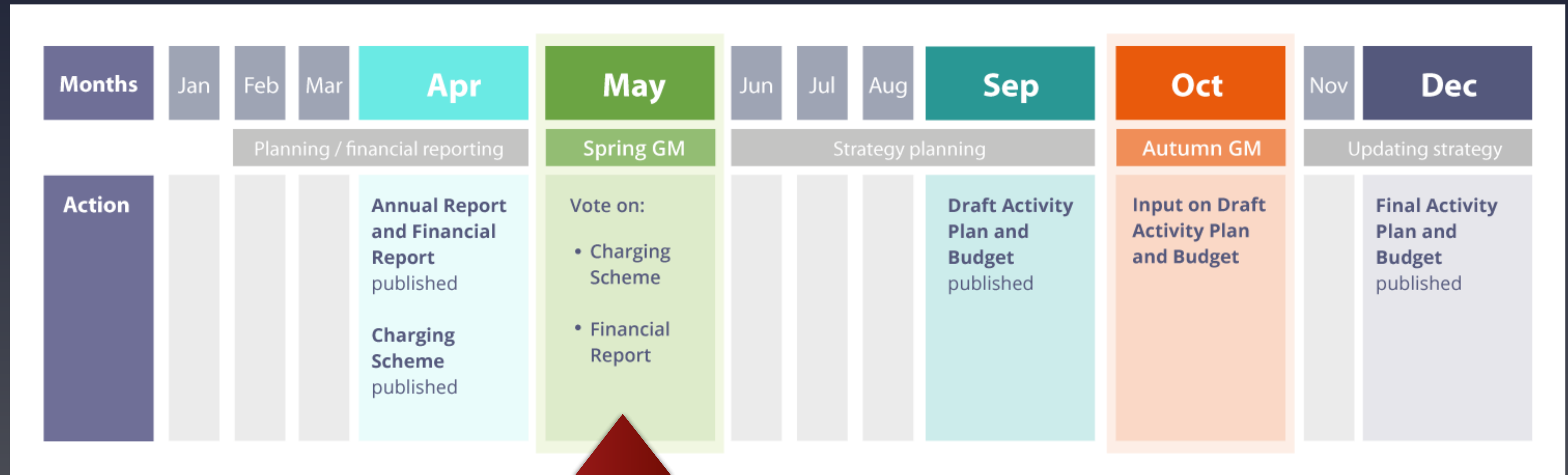|		
	4.2	Be resilient in the face of political, legislative and regulatory changes that have the potential to affect our operations.
3.1	**3.3**	Secure Internet number resources by developing and operating a resilient, externally auditable and secure Resource Certification Trust Anchor and promote RPKI
	3.4	Be a centre of excellence for data, measurements and tools that provide insight on the Internet and its operations.
	4.4	Maintain necessary levels of security and compliance with best practices and applicable regulations.
	5.2	Maintain a healthy organisational culture with engaged staff aligned with the organisational values.

Planning Cycle

How do we plan?

2020
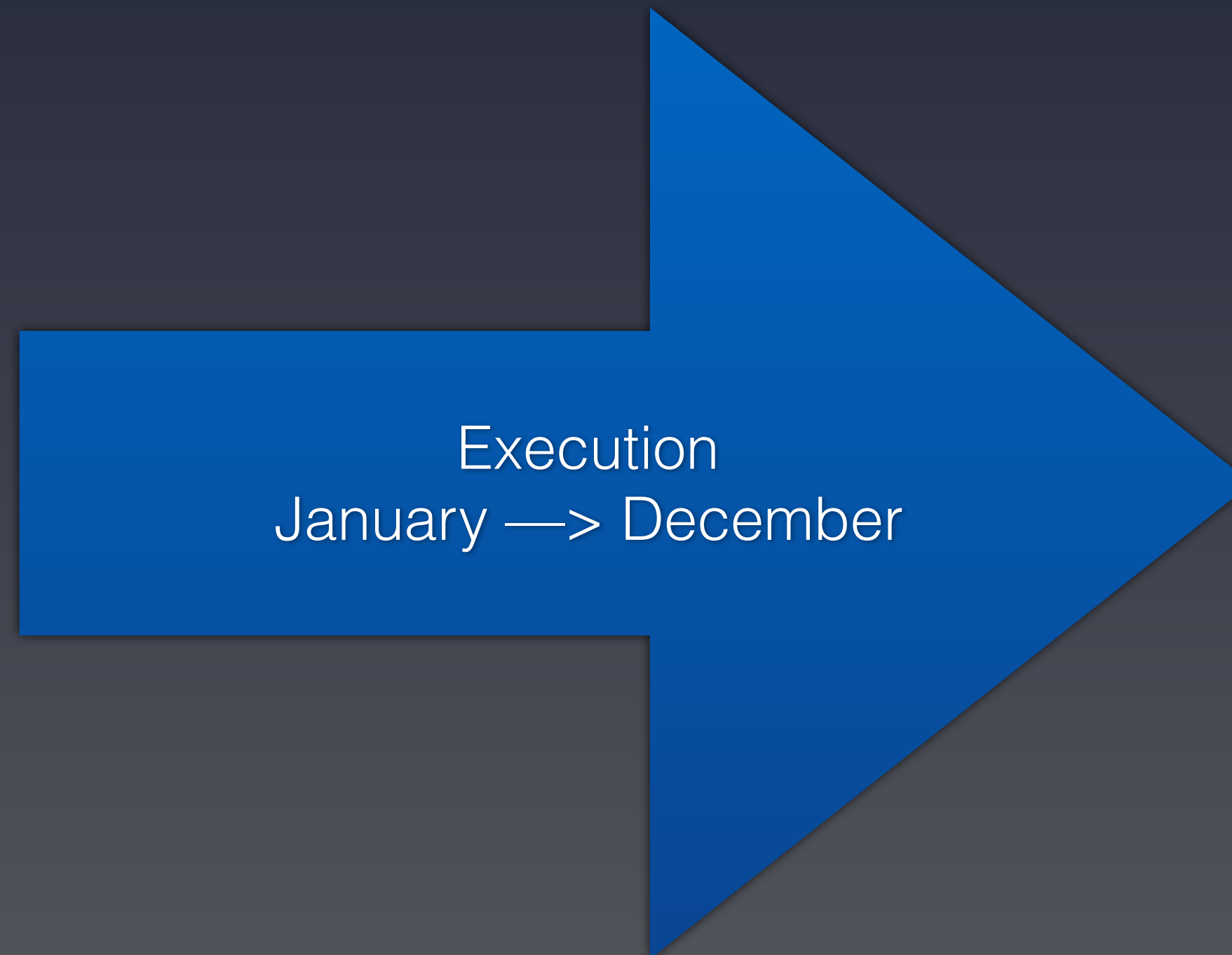
2021

2022

2023

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Planning Cycle

Months	Jan	Feb	Mar	**Apr**	**May**	Jun	Jul	Aug	**Sep**	**Oct**	Nov	**Dec**
		Planning / financial reporting			Spring GM	Strategy planning				Autumn GM		Updating strategy
Action				**Annual Report and Financial Report** published **Charging Scheme** published	Vote on: • Charging Scheme • Financial Report				**Draft Activity Plan and Budget** published	**Input on Draft Activity Plan and Budget**		**Final Activity Plan and Budget** published

We are here

From Plan to Report

Execution
January —> December

References

- RIPE NCC Strategy 2022-2026

    - https://www.ripe.net/publications/docs/ripe-774

- Activity Plan and Budget

    - https://www.ripe.net/publications/ripe-ncc-organisational-documents/budgets

- Annual Reports

    - https://www.ripe.net/publications/ripe-ncc-organisational-documents/reports

Before run-out

Looking back to 2013-2019

Before Run-Out
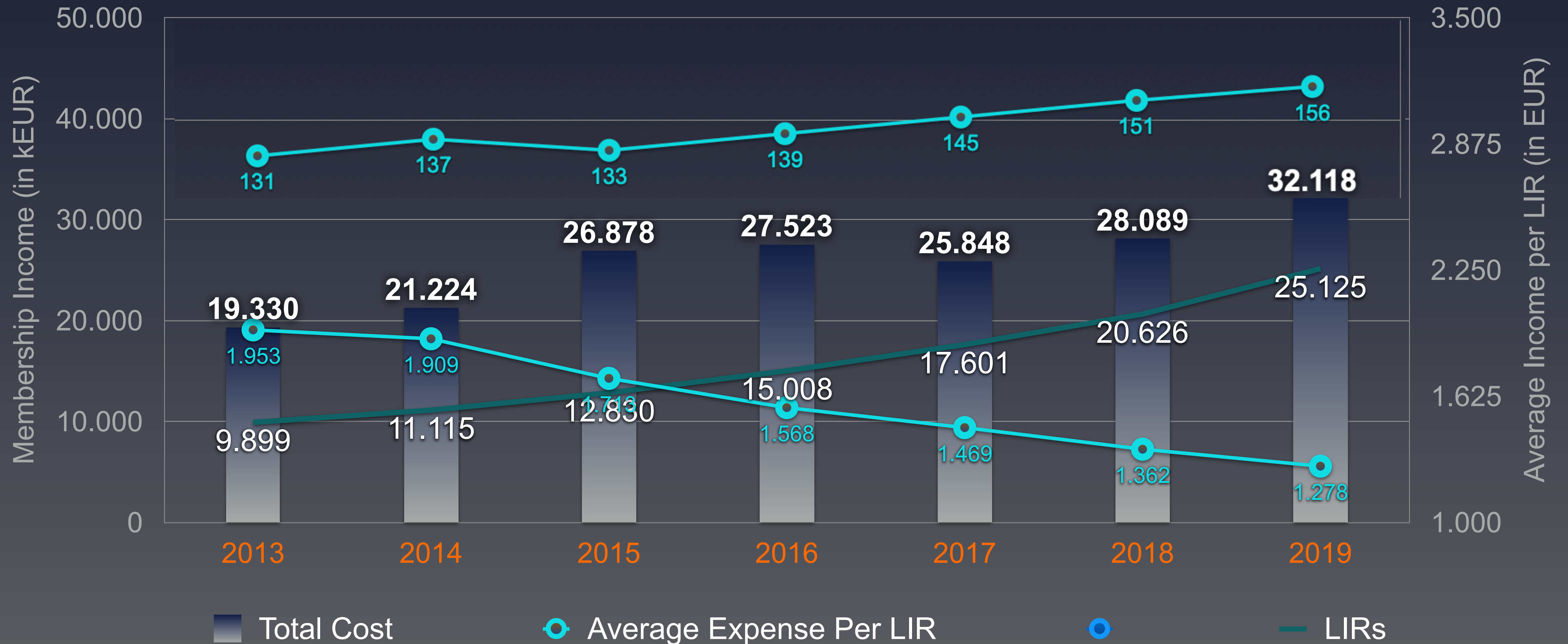
Before run-out

Year	2013	2019	Change
LIRs	9,900	25,100	154%
FTEs	131	156	19%
Total Cost	19M	32M	66%
Inflation			10%
Cost/LIR	1,953	1,278	**-35%**

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Transition & Disruptions

2019-2022

Disruptions and Mitigations

- Sanctions

- Regulations, GDPR & NIS, NIS2 and national security regulations

- Banks increased scrutiny due to Anti-Money Laundry regulations (and Sanctions)

- Pandemic

- War

- Energy Crisis

- Inflation

- Established Security, Risk and Compliance Team led by a CISO

- Increased legal team

- Invested in automation of sanctions screening

- Started to implement formal compliance framework for RPKI

- Manual cleanup in internal systems

- Reviewed all job descriptions and conducted external benchmarking

- Implemented new financial governance

After run-out

Year	2019	2022	Change
LIRs	25,100	23,400	-7%
FTEs	156	172	10%
Total Cost	32M	35M	9%
Inflation			17%
Cost/LIR	1,278	1,480	**16%**

Annual Report

2022

HIGHLIGHTS OF THE YEAR

RIPE NCC Days Tashkent Read more

Internet Measurement Day: Serbia Read more

CAPIF 1 Read more

New live chat feature Read more

Updated IPv6 Fundamentals e-learning course Read more

Internet Governance e-learning course Read more

SEE 10 Read more

New service announcements dashboard Read more

Government Roundtable for the Middle East Read more

JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER

Government Roundtable for Europe Read more

Executive Board resolution on the provision of critical services Read more

Quantum Internet Hackathon Read more

RIPE 85 Read more

MENOG 22 Read more

Internet Measurement Day: Georgia Read more

RIPE 84 Read more

Bulgaria, Moldova and Romania Country Report Read more

New RIPE NCC Forum Read more

Nordic Region Country Report Read more

BGP Security Associate Certified Professionals exam and e-learning course Read more

MEMBERSHIP OVERVIEW

All numbers are as of 31 December 2022. Please note that one member can hold more than one LIR.

23,383	1,732	122	20,231	15,226
Total number of active LIRs	New LIRs	Member countries	Total number of active members	Members with an IPv6 allocation

TOP 10

MEMBERS BY COUNTRY

DE	2,235
GB	2,061
RU	1,538
FR	1,267
NL	1,172
IT	1,141
SP	1,017
CH	717
PL	681
TR	532

TOP 10

NEW MEMBERS BY COUNTRY

DE	111
GB	107
NL	70
RU	67
FR	65
TR	50
ES	47
CH	37
IR	34
US	25

TOP 10

LIRS BY COUNTRY

DE	2,427
GB	2,377
RU	2,045
NL	1,643
FR	1,396
IT	1,208
ES	1,147
CH	758
PL	733
TR	593

TRANSFERS OVERVIEW

Here is an overview of resource transfers between the RIPE NCC and other RIRs, and within the RIPE NCC service region. The figures below include policy transfers and other transfers resulting from an internal shifting of resources (e.g. mergers and acquisitions).
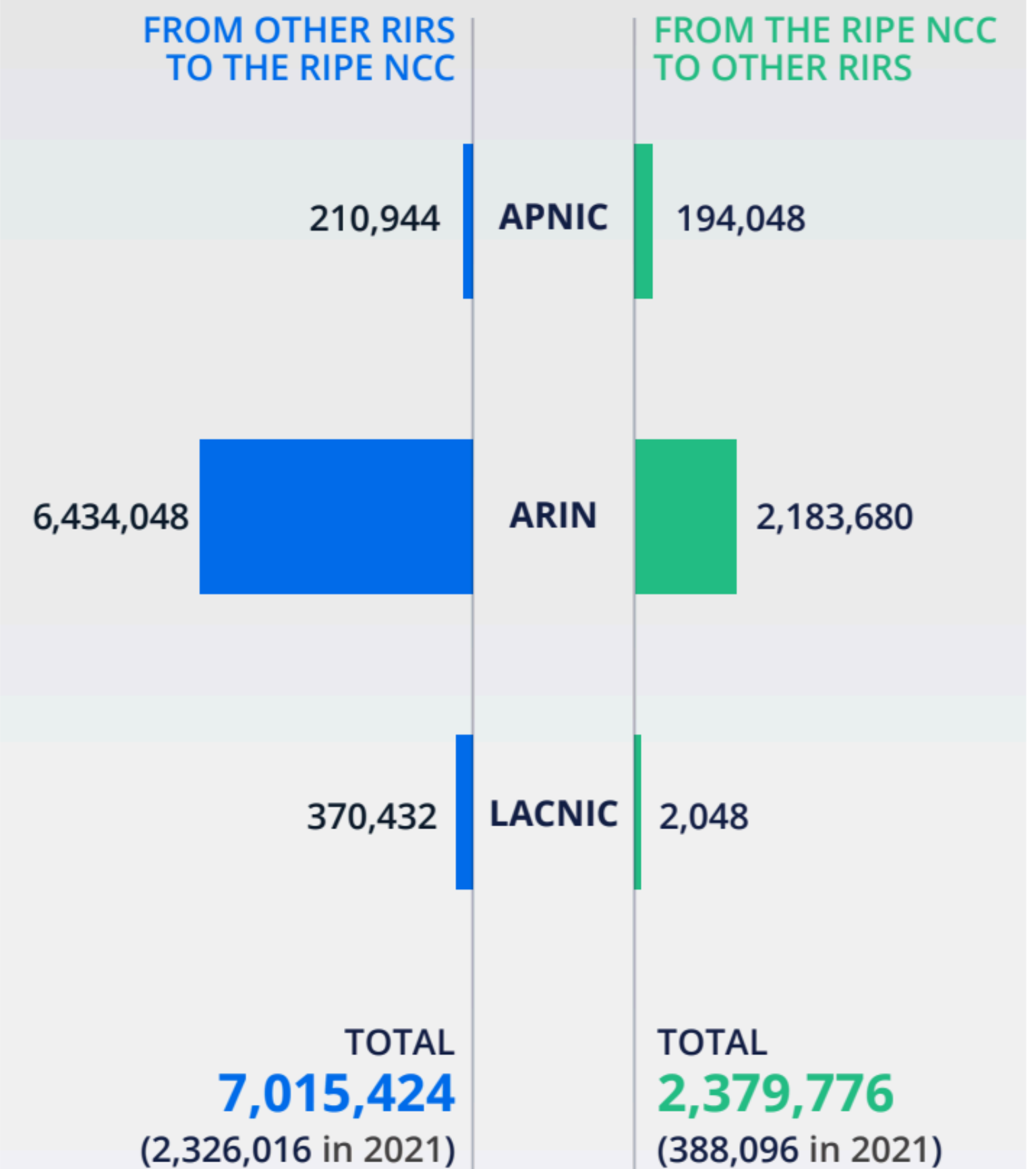
INTRA-RIR TRANSFERS BY COUNTRY - TOP 10 (IPv4 addresses)

IN		OUT
16,669,696	**FR**	16,602,624
3,415,872	**DE**	3,620,416
1,872,128	**RU**	1,910,784
865,792	**GB**	1,394,176
1,053,952	**BE**	1,048,832
1,083,648	**SE**	724,736
504,064	**NL**	743,424
519,680	**ES**	526,336
523,136	**PL**	472,192
724,736	**US**	157,952

27,232,704   TOTAL   **27,201,472**

TRANSFERS WITHIN THE RIPE NCC'S SERVICE REGION

IPv4

ADDRESSES
PI 823,028
PA 30,484,736

BLOCKS
PI 909
PA 4,232

IPv6

BLOCKS
PI 67 (/48)
PA 1,049 (/32)

TOTAL
31,307,764

TOTAL
5,141

TOTAL
1,116
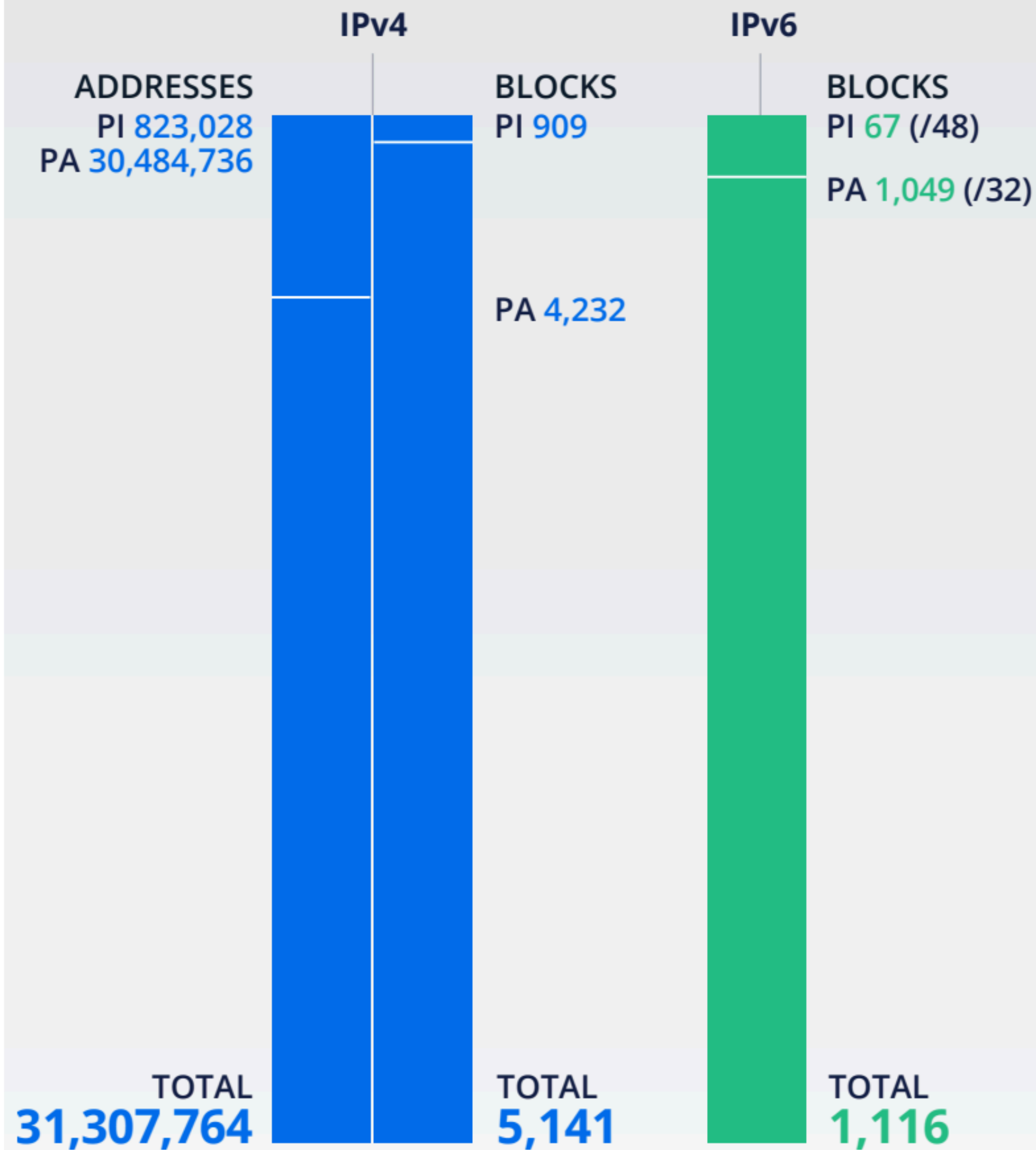
INTER-RIR TRANSFERS (IPv4 addresses)

FROM OTHER RIRS TO THE RIPE NCC		FROM THE RIPE NCC TO OTHER RIRS
210,944	**APNIC**	194,048
6,434,048	**ARIN**	2,183,680
370,432	**LACNIC**	2,048

TOTAL
7,015,424
(2,326,016 in 2021)

TOTAL
2,379,776
(388,096 in 2021)

REPORTS AND INVESTIGATIONS

REPORTS RECEIVED VIA THE ABUSE FORM

TOTAL
467

ABUSE-C VALIDATION INVESTIGATIONS

TOTAL
3,496

1,069 LIR resources

1,503 LIR accounts

924 End users
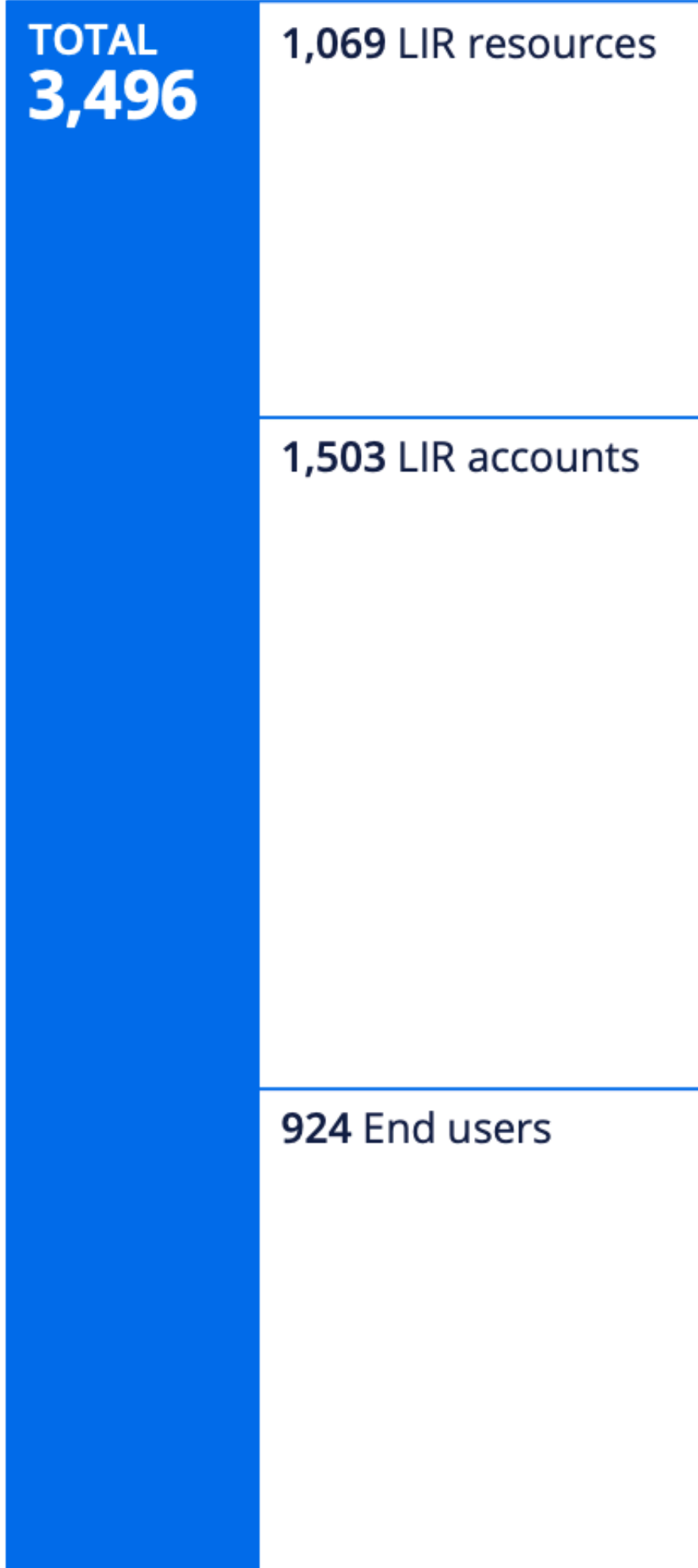
RIPE NCC SECURITY INCIDENTS

Security incidents are detected through alerts from our security monitoring systems, internal and external reports and security testing activities.
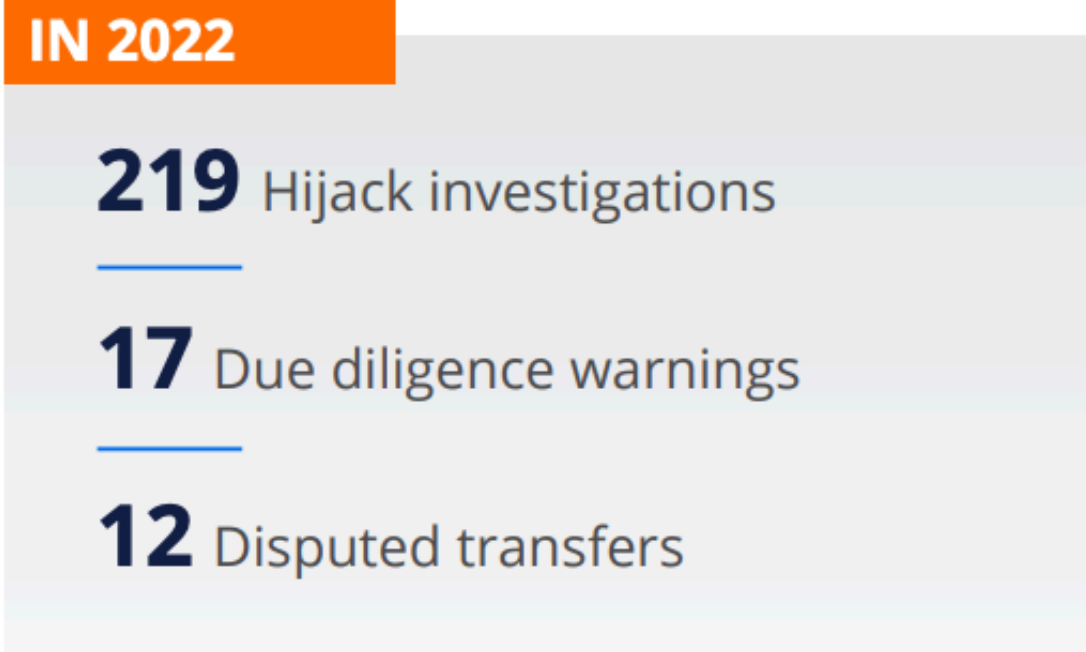
SECURITY REPORTS

We encourage the reporting of vulnerabilities in line with our Responsible Disclosure Policy.

IN 2022

1 Low-impact security incident

2 Medium-impact security incidents

0 High-impact security incidents

515 Security-related reports received

81 Reports were relevant

READ MORE

HIJACK INVESTIGATIONS

IN 2022

219 Hijack investigations

17 Due diligence warnings

12 Disputed transfers

DNS AND K-ROOT

The RIPE NCC runs two independent and equally important DNS services. The first is K-root, one of the 13 Internet root name servers. The K-root service is provided by a set of distributed nodes using IPv4 and IPv6 anycast. The second is a DNS service for RIPE NCC zones, reverse DNS, and secondary DNS, which we refer to as AuthDNS.

We continue to improve resiliency and availability of both services by adding hosted nodes. This has been made possible by an improved Hosted DNS app, that allows us to accept applications for hosting both K-root and AuthDNS. Additionally, we are accepting applications to run this service on virtual servers, which makes it easier to deploy them in some places.

In 2022, we brought up five new AuthDNS nodes, bringing the total number of nodes to 14. These serve zones for reverse delegations for RIPE NCC member allocations, country code Top-Level Domain (ccTLD) secondary services and RIPE NCC authoritative zones. In the K-root cluster, 11 instances were added, while one instance was decommissioned, bringing the total to 100.

LEGEND

▲ AuthDNS   ● Existing
● K-Root   ● New

RIPE ATLAS PROBES AND ANCHORS

	Probes connected	Probes shipped	Total anchors connected	Results collected per second	Total users	Active users	ASNs covered (IPv4)	ASNs covered (IPv6)	Countries covered
2022	12,600	809	799	~14,000	~63,900	~14,600	~3,720	~1,760	169
2021	11,832	55	718	13,177	58,200	15,055	3,572	1,628	165
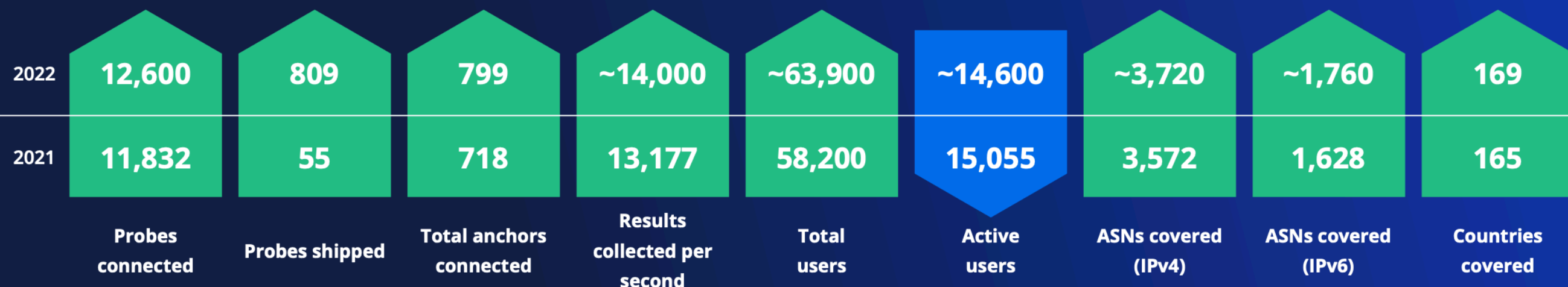
RIPE ATLAS

RIPE Atlas is a leading Internet active measurement network that collects unique data, providing both live and historical information about networks' reliability, reachability and connectivity.

In 2022 the growth of the network was mostly fuelled by the installation of more software probes and anchors. In the second part of the year we started distributing hardware probes and increased both the number of connected probes and covered networks. During the year we also started changing the software probe package to match more closely what professional package maintainers require; over time we expect this will result in the inclusion of the package in various Linux distributions, making it easier to install and manage.

During the year we restarted work on the RIPE Atlas user interface, modernised parts of the APIs, stabilised data delivery (bulk downloads and streaming) and revamped the documentation pages. We also started looking at hosting our big data backend using cloud services and renewing our support interface for ambassadors.

READ MORE

RIPEstat

RIPEstat provides users with essential information on IP address space and Autonomous System Numbers (ASNs) along with related statistics on specific hostnames and countries.

READ MORE

IN 2022

Total number of requests to the Data API
23,607,360,913

Visits from unique IP addresses
1,520,572

Number of visitors' countries
137

HIGHLIGHTS

Released new features based on RPKI data
For example, RPKI ROA/VRP information has been added to our Routing Consistency UIs.

Greater focus on service quality
We developed a custom test framework to help find code bugs.

Released improvements and new use cases in the new UI
For example, BGPlay was moved to the new UI.

Released a new blocklist feature
Blocklist information from DNS-based blocklists are shown in real time in our UIs.

RIPE NCC Open House on RIPEstat
The RIPEstat developer team engaged with users at this RIPE NCC-organised event.

Optimised backends
Calls to RISwhois and for abuse contacts now return up to 10 times faster.
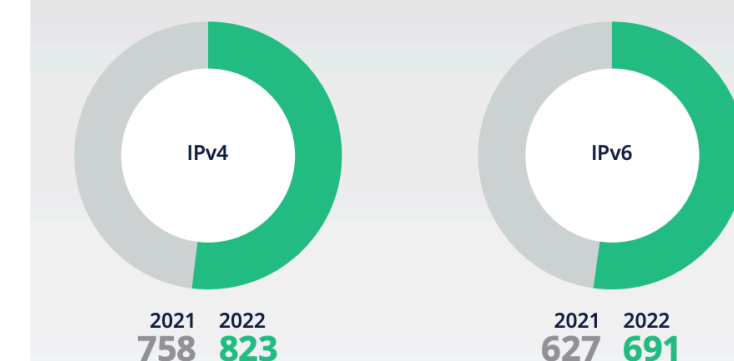

RIS

The Routing Information Service (RIS) collects routing data from several key locations. We run this globally distributed system to gain insight into the Internet routing system.
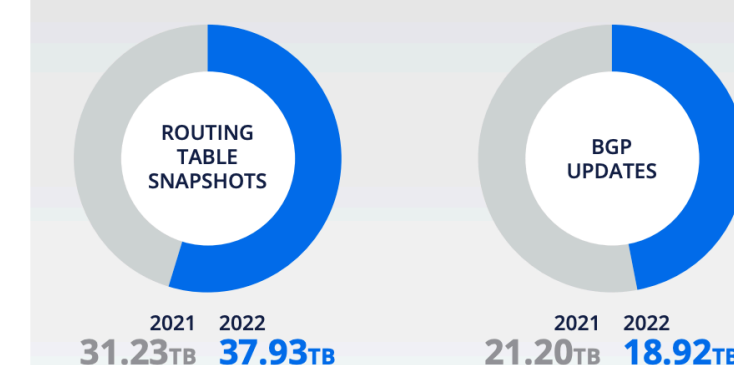
This is used both in RIPEstat and in many external systems to debug and monitor Internet routing. In 2022, we improved the documentation for RIS (https://ris.ripe.net/docs/) and made data delivery more timely and predictable.

READ MORE

BGP SESSIONS FEEDING RIS

IPv4
2021 **758** 2022 **823**

IPv6
2021 **627** 2022 **691**

DATA VOLUME

ROUTING TABLE SNAPSHOTS
2021 **31.23**TB 2022 **37.93**TB

BGP UPDATES
2021 **21.20**TB 2022 **18.92**TB*
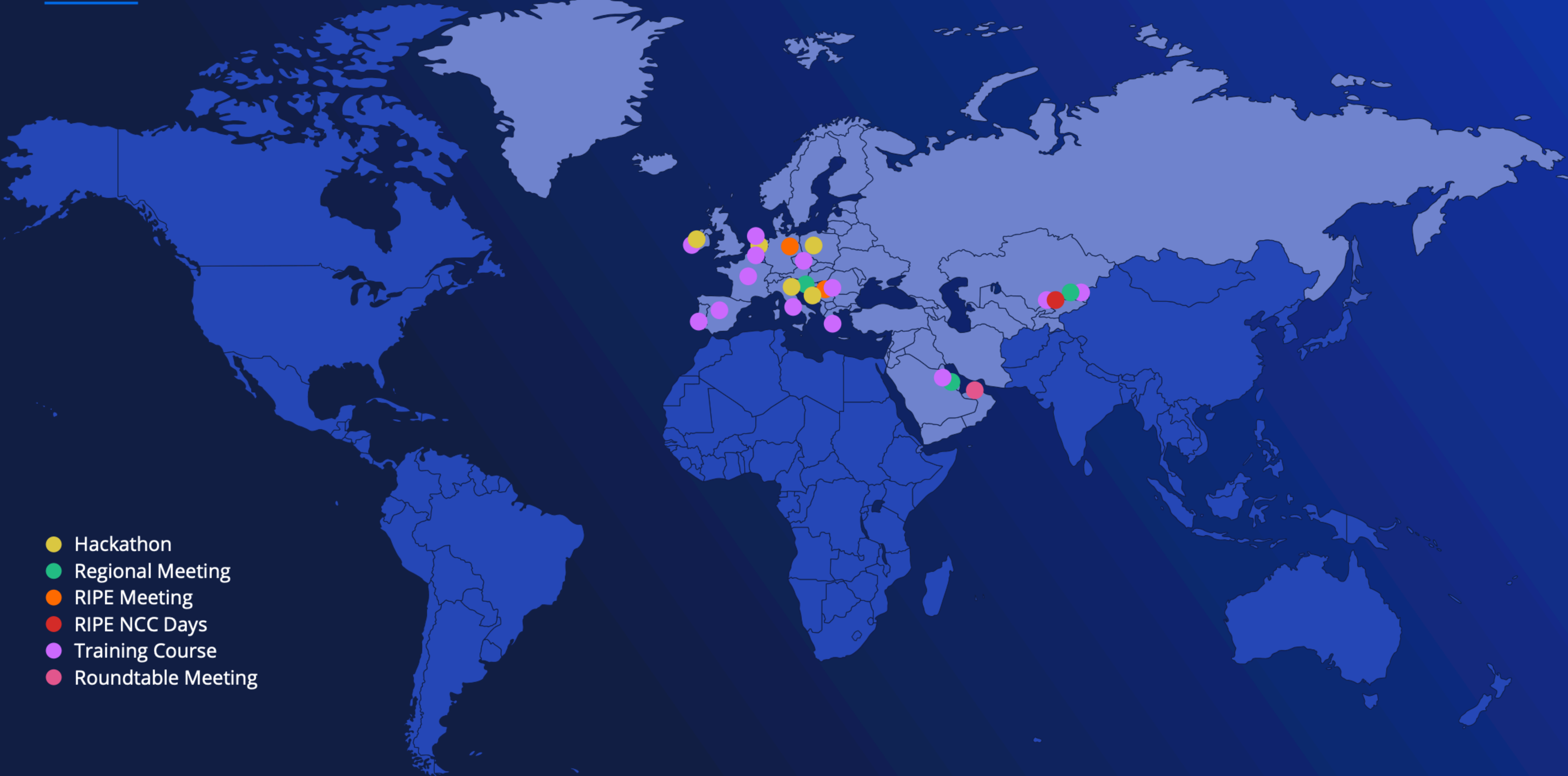
* The volume of BGP updates decreased (relative to the previous year) due to an increased focus on data quality, even though the number of peers and routes grew.

OUR IN-PERSON EVENTS IN 2022

- Hackathon
- Regional Meeting
- RIPE Meeting
- RIPE NCC Days
- Training Course
- Roundtable Meeting

LEARNING AND DEVELOPMENT

In 2022, we were excited to finally be able to give face-to-face training sessions again. In April of 2022, we hosted our first in-person training course in Amsterdam since the pandemic started.

The response was positive, and soon after we could increase the number of face-to-face sessions, ending the year with 13 total trips. Rather than prioritising the development of new training options, we are also focusing on quality. As part of this we ended our support for some webinars (such as RIPEstat Data API, RIPEstat and IPv6 Prefix Calculation).

In addition to our regular webinars and courses, we also carried out six IPv6 Fundamentals and Security Assisted Learning Sessions with the Dutch and Iraqi governments with the help of our RIPE NCC Academy and Certified Professionals exams.

READ MORE

IN 2022

Top 10 webinars	Activity	Sessions	Participants
• BGP Security: IRR and Filtering • LIRs: Managing IP Addresses and ASNs • Introduction to IPv6	Webinar	42	903
• Basic IPv6 Protocol Security • RPKI Operations	L&D Open House	2	75
• RIPE Database Applications	Face-to-Face Training Course	21	411
• Webinar for New LIRs • IPv6 Security Myths, Filtering and Tips	Internal Training Programme	22	384
• IPv6 Addressing Plan • IPv6 Host Configuration	Workshop	15	378

RIPE NCC ACADEMY

The RIPE NCC Academy offers free online courses on a number of important networking topics. Our Academy courses are also paired with corresponding RIPE NCC Certified Professionals exams, preparing learners to get certified in a particular skill.

This year, the RIPE NCC Academy launched three new e-learning courses: IPv6 Fundamentals, Internet Governance and BGP Security, which is paired with the BGP Security Associate Certified Professionals exam. We also added a Microlearning lesson this year called 'Why RPKI?'
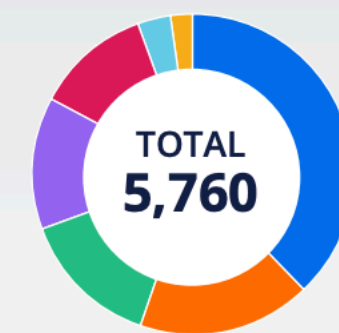
Course Enrolments in 2022

TOTAL 5,760

2,189	IPv6 Fundamentals
1,007	RIPE Database
806	Microlearning
775	BGP Security
673	IPv6 Security
188	Introduction to IPv6
122	Internet Governance

RIPE NCC CERTIFIED PROFESSIONALS

A RIPE NCC certification validates expertise in the fields of IP address management, IPv6 technologies and network security.

Our certifications show the ability to use best practices in line with RFCs, as recommended by industry experts. RIPE NCC Certified Professionals earn a digital badge that can easily be verified by any third party, like your employer or customers.

We currently offer four certifications:
• RIPE Database Associate
• IPv6 Fundamentals - Analyst
• IPv6 Security Expert
• BGP Security Associate

In December 2022, we released the BGP Security Associate exam, which certifies the ability to implement appropriate security measures to protect BGP sessions. The new exam was also accompanied by the BGP Security e-learning course, which was launched in the RIPE NCC Academy. By the end of 2022, we were proud to see that our exam takers had earned almost 2,000 certifications.

604 badges were issued between 1 January and 31 December 2022, bringing us to a total of 1,917 certifications so far.

NOGS AND REGIONAL EVENTS

In 2022, we presented at the following NOGs:

IRNOG UKNOF PLNOG ESNOG FRNOG FINOG CSNOG KZNOG Baykal NOG

ITNOG NONOG RONOG GRNOG NLNOG NANOG HRNOG RSNOG LUNOG GENOG

■ Sponsored and Presented at   ■ Presented at

SEE

The SEE 10/RIPE NCC Regional Meeting took place in Ljubljana, Slovenia from 11-12 April 2022. The meeting was hybrid and saw 144 people registered from 23 countries.

The event focused on topics related to the Internet in South East Europe, including:

- A presentation on the historical development of Internet in the region
- A panel discussion with local Internet pioneers, who shared their experiences building Internet infrastructure in former Yugoslavia
- Updates from local IXPs on peering and interconnection

Other key topics were RPKI, IPv6 and Anycast, as well as an update on the Keep Ukraine Connected initiative.

READ MORE

MENOG

MENOG 22 took place from 4-8 December 2022 in Manama, Bahrain. This was the first physical MENOG meeting since 2019.

The event was held in English with Arabic translation available. The event saw 184 people checked in from 30 countries.

The meeting agenda included recent developments in BGP security and IPv6 in the region, as well as a panel discussion on how peering has developed in the Middle East over the past ten years.

The event also encouraged peering between participants with short peering personals presentations at the end of each session.

READ MORE

CAPIF

The first-ever Central Asia Peering and Interconnection Forum (CAPIF 1) was developed to support the needs of the Internet communities in Iran, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan. The meetings took place in Almaty, Kazakhstan from 16-17 November 2022 with 195 attendees from 15 countries.

As a landlocked region, Central Asia faces some unique challenges, but also has potential to serve as a crossroads of interconnection for other regions and countries, including China, Iran, Russia and the Caucasus. At the meeting, research on Internet measurements and connectivity in Central Asia was presented.

The meeting also included a panel discussion on the regulatory environment in Central Asia and talks on DNS, DDoS protection, routing security and peering economics, among other topics.

READ MORE

RIPE NCC DAYS

After a break due to the pandemic, RIPE NCC Days returned, this time in Tashkent, Uzbekistan from 22-23 September 2022. 136 people checked from 7 different countries. At the event, there was a presentation from the RIPE NCC about the state of the Internet in Uzbekistan, followed by several panels on topics such as:

- Current Internet development in Uzbekistan
- How to support more interconnection in the region
- IPv6 deployment needs in Central Asia
- Local community development initiatives

There were also many talks on useful measurements and tools, routing security and IP resource management.

READ MORE

INTERNET MEASUREMENT DAYS

In 2022, we continued with our Internet Measurement Days format and organised two online sessions for Serbia and Georgia with a total of 125 attendees.

READ MORE

RIPE 84

RIPE 84 took place in Berlin, Germany from 16-20 May 2022.

Our first hybrid meeting received 769 attendees from 61 countries. There were 228 newcomers and an average of 211 viewers online each day.
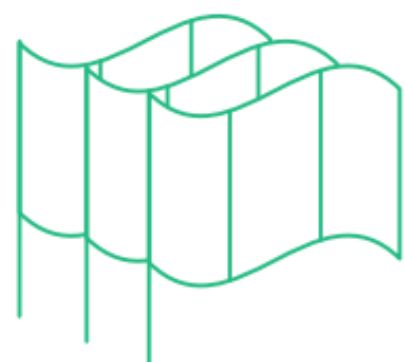
READ MORE

LOCATION
BERLIN, GERMANY

ATTENDEES ONSITE
769

ATTENDEES ONLINE
185

COUNTRIES
61

RIPE 85

RIPE 85 took place in Belgrade, Serbia from 24-28 October 2022.

494 people from 72 countries registered to attend RIPE 85. There were 202 newcomers and an average of 539 viewers online each day.
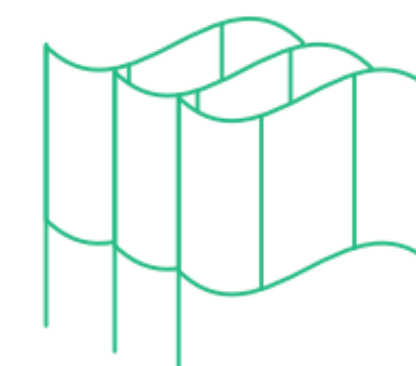
READ MORE

LOCATION
BELGRADE, SERBIA

ATTENDEES ONSITE
494

ATTENDEES ONLINE
225

COUNTRIES
72

THE COMMUNITY PROJECTS FUND

Through the RIPE NCC Community Projects Fund, we aim to support projects of value to the operation, resilience and sustainability of the Internet, with a focus on tools and services benefitting the technical community in our service region.

There's no shortage of creative solutions in our community, and this fund gives innovators the chance to work on their project for 'the Good of the Internet'.

The RIPE NCC Community Projects Fund opened its call for applications in May 2022. The application period was open for just over eight weeks, and 39 applications from 20 different countries were submitted to the Selection Committee.

READ MORE

PROJECTS FUNDED IN 2022

Elevating Demand-side Cybersecurity Through Business Procurement
Wout de Natris

AI4NetMon 2.0
Aristotle University of Thessaloniki

Internet Standards Observatory
DNS Research Federation

ARTEMIS Lite
Foundation for Research and Technology - Hellas (FORTH)

Internet Identifiers in Time of War
iNGO European Media Platform

deSEC: Secure DNSSEC Hosting (Continued Operations and Development)
deSEC e.V.

Can We Extend IPv6? - A Measurement Project
University of Aberdeen

fpdns2: DNS Fingerprinting Tool
Grenoble Alps University

RIPE LABS

RIPE Labs is an open platform for network operators, researchers, developers and others to share case studies, best practices, deployment experiences, prototypes, research and more.

We also use RIPE Labs to share ideas and ask for feedback from the RIPE community, as well as trial prototypes of our tools. In 2022, we launched two major new initiatives on RIPE Labs:
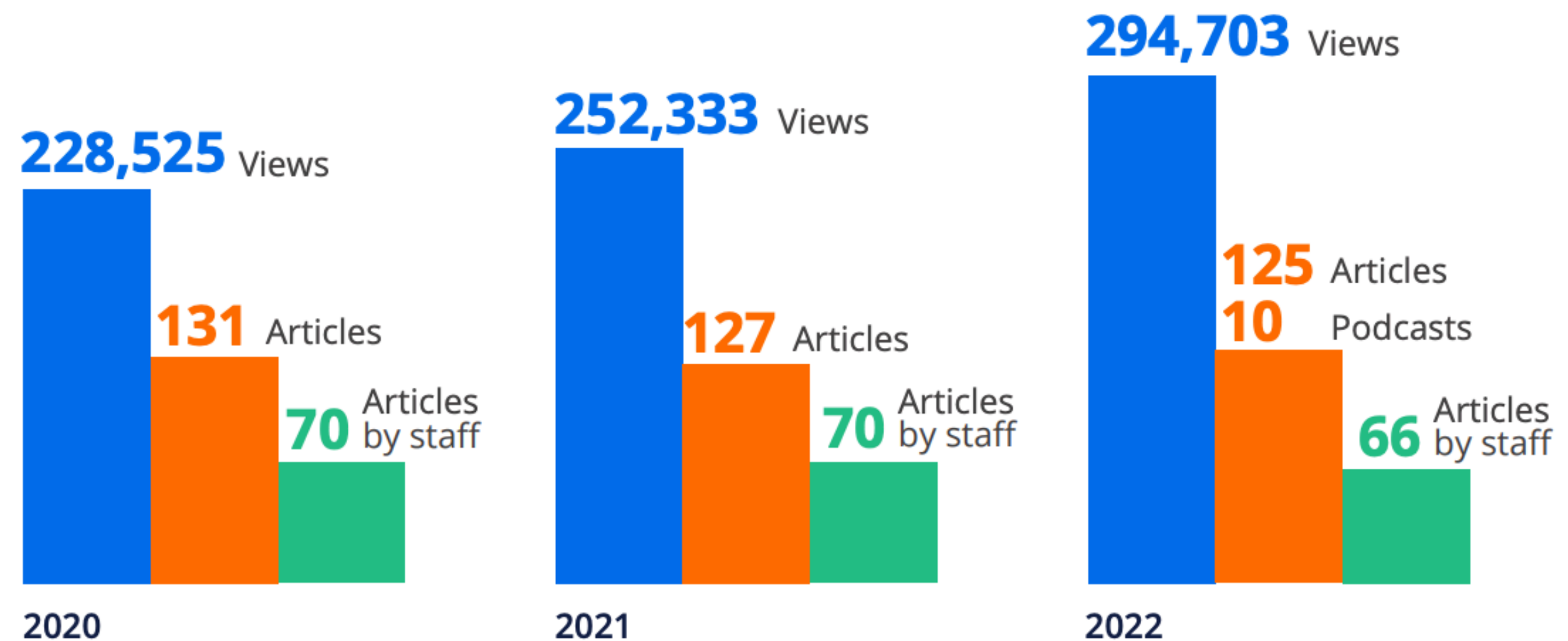
The RIPE Labs Article Competition

We held two competitions throughout the year, which received a total of 17 entries.

- **RIPE Labs Article Competition #1 - RIPE 84**
  Bias in Internet Measurement Infrastructure -
  Pavlos Sermpezis

- **RIPE Labs Article Competition #2 - RIPE 85**
  Where Did My Packet Go? Measuring the Impact of RPKI ROV -
  Koen van Hove

The RIPE Labs Podcast
Starting in April, we published 10 episodes of the new RIPE Labs podcast through 2022.

THREE MOST-READ RIPE LABS ARTICLES IN 2022

240/4 As Seen by RIPE Atlas
👁 **14,125** VIEWS

READ MORE

The Resilience of the Internet in Ukraine
👁 **8,535** VIEWS

READ MORE

EU Sanctions and Our Russian Membership
👁 **5,911** VIEWS

READ MORE

228,525 Views
131 Articles
70 Articles by staff
2020

252,333 Views
127 Articles
70 Articles by staff
2021

294,703 Views
125 Articles
10 Podcasts
66 Articles by staff
2022

Activity Plan & Budget 2023

RIPE 85

Activity Plan & Budget 2023

- Presented at RIPE 85

- Approved December 2022 by the Executive Board

Budget 2023

Year	2022	2023B	
LIRs	23,400	22,500	-4%
FTEs	172	190	10%
Total Cost	35M	40M	15%
Inflation			10%
Cost/LIR	1,480	1,778	**20%**

Future

Looking ahead to 2026

Estimates 2023

Year	2022	2023B	22/23B	2023E	22/23E
LIRs	23,400	22,500	-4%	*22,500*	*-4%*
FTEs	172	190	10%	*185*	*8%*
Total Cost	35M	40M	15%	*37,5M*	*7%*
Inflation			10%	*5,2%*	
Cost/LIR	1,480	1,778	**20%**	*1,666*	***13%***

Scenario 2024-2026

Year	2022	2023E	2024E	2025E	2026E
LIRs	23,400	22,500	21,500	20,500	20,500
FTEs	172	185			185
Total Cost	35M	37,5M	39M	40M	41M
Est Inflation		5,2%	3%	3%	3%
CBS Inflation		5,2%	2,2%	2,0%	
Cost/LIR	1,480	1,666	1,814	1,951	2,000

Activity Plan & Budget 2024

May	RIPE 86 & RIPE NCC Survey
June	Executive Board Direction
August	Leadership Direction
September	Draft Activity Plan
October	Draft Budget
November	RIPE 87
December	**Final Activity Plan and Budget**

Key Take-Aways

- Before run-out, «everybody» was happy.

- Disruptions: Pandemic, Sanctions, War, Inflation, Regulations.

- Declining LIRs; Increased compliance; lead to increased costs.

- We are listening. We want your input! Respond to the Survey!

Questions ❓

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