Agenda

- Global Resource Public Key Infrastructure (RPKI) activity
- RPKI adoption at ARIN
- New features and upcoming development
- NRO RPKI Program Update

RPKI Has Come of Age

Benefits of RPKI Adoption

Provides operators another dataset to make more informed routing decisions

Protects resource holders from impact resulting from human error or nefarious activity

Reduces the overall attack surface for attempted hijacks on the greater Internet

The Numbers Tell a Story

As reported by the NIST RPKI Monitor on 7 October:

- **53.2%** of global IPv4 announcements were marked RPKI-valid

- **55.2%** of global IPv6 announcements were marked RPKI-valid

https://rpki-monitor.antd.nist.gov/ROV

RPKI is on the U.S. Government's Radar

The Office of the National Cyber Director, in conjunction with key stakeholders and appropriate federal government entities, released a **"Roadmap to Enhancing Internet Routing Security"** report in September 2024, which details the U.S. government's actions to promote BGP security and makes recommendations to improve routing security throughout the Internet ecosystem.

ROADMAP TO ENHANCING INTERNET ROUTING SECURITY – September 2024
https://www.whitehouse.gov/oncd/briefing-room/2024/09/03/fact-sheet-biden-harris-administration-releases-roadmap-to-enhance-internet-routing-security/

RPKI is on the U.S. Government's Radar

They are exploring approaches and options to
address Internet routing and Border Gateway
Protocol (BGP) security concerns and using
RPKI is a fundamental component of the plan.

ROADMAP TO ENHANCING INTERNET ROUTING SECURITY – September 2024
https://www.whitehouse.gov/oncd/briefing-room/2024/09/03/fact-sheet-biden-harris-administration-releases-roadmap-to-enhance-internet-routing-security/

Recent Standards

RFC 9582

- A Profile for Route Origin Authorizations (ROAs)

RFC 9589

- Use of the Cryptographic Message Syntax (CMS) Signing-Time Attribute

Proposed Standards

- draft-ietf-sidrops-rrdp-desynchronization-04
  Detecting RRDP Session Desynchronization

- draft-ietf-sidrops-signed-tal-16
  RPKI Signed Object for Trust Anchor Key

- draft-ietf-sidrops-aspa-profile-18
  A Profile for Autonomous System Provider Authorization

RPKI Drafts and Standards

RPKI Adoption In Our Region

Three RPKI Services to Choose From

1

Hosted RPKI

Suggested for organizations that would prefer ease of use and the least responsibility. ARIN runs the certificate authority, maintains and publishes the RPKI repository to the global networking community.

ARIN also develops RPKI tools for use by our members.

2

Delegated RPKI

Suggested for organizations that want cryptographic control of RPKI certificates; the organization should have a deeper understanding of routing security and RPKI along with a technical staff and resources to run and support the high availability repository.

3

### Repository and Publication Service

Suggested for organizations that wish to retain cryptographic control, but do not want to maintain the high availability RPKI repository and publication requirements.

RPKI Adoption – Service Type

Organizations registered
to use RPKI services: **5,894**

- Hosted – 5,754
- Delegated – 140
- Repository Service (Hybrid) – 79

Organizations registered to use RPKI

5894

5472

4879

4147

4590

| Q3 2023 | Q4 2023 | Q1 2024 | Q2 2024 | Q3 2024 |
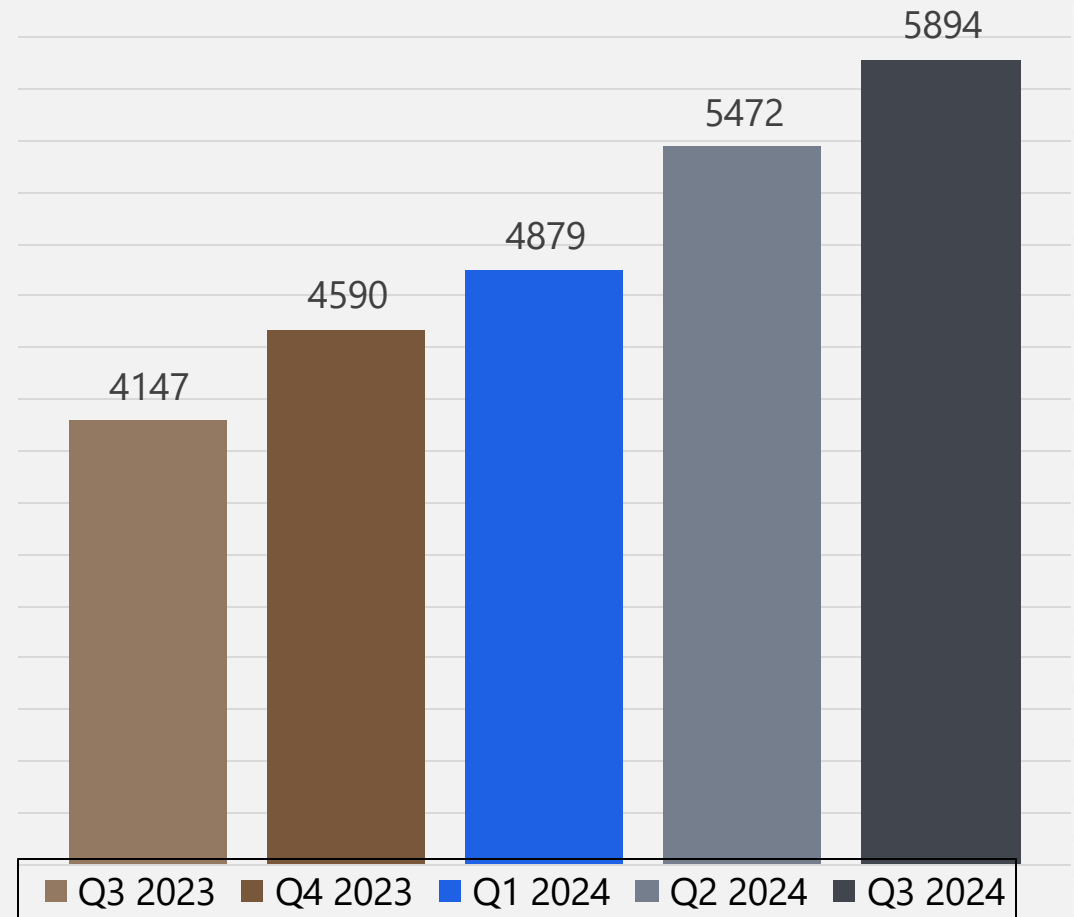
RPKI Adoption – New Registrations

- Accelerated growth in organizations who have signed up for RPKI services

- Push to get resources under a service agreement to lock in legacy fee discount

- Service provider requirement to create ROAs
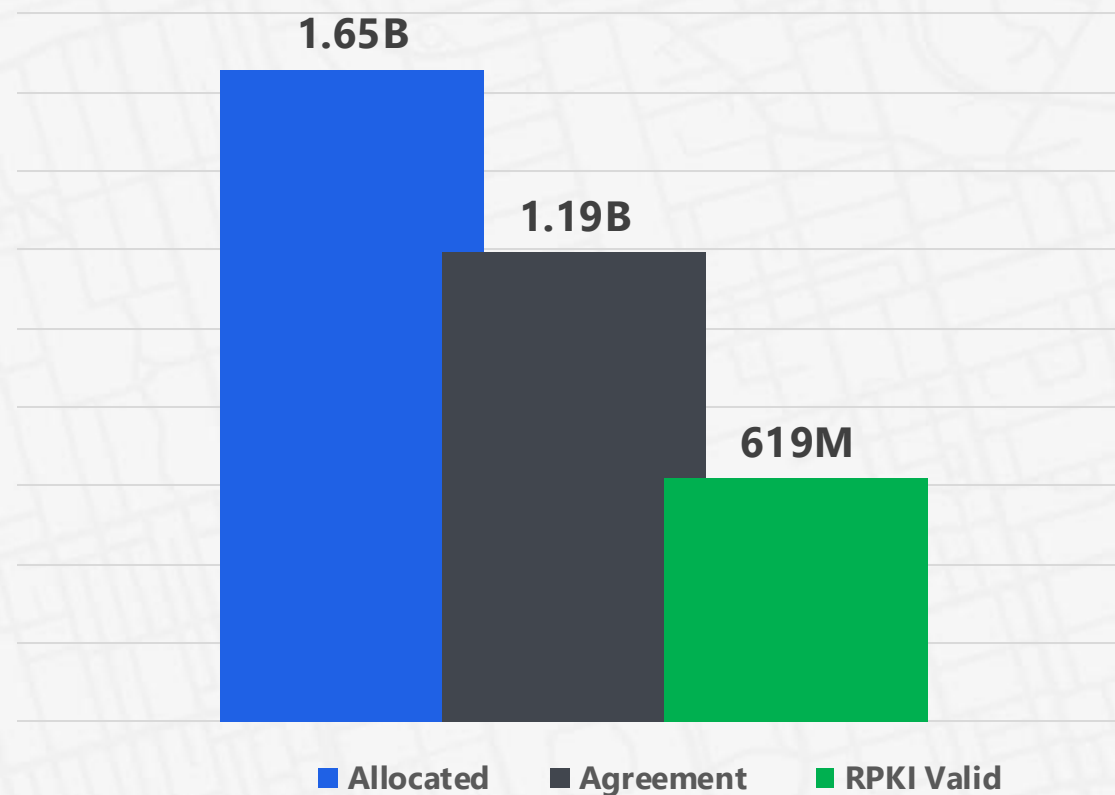
- On path to exceed 2023 growth

New RPKI Registrations

			1453	
		891		1304
712	727			

■ 2020 ■ 2021 ■ 2022 ■ 2023 ■ 2024
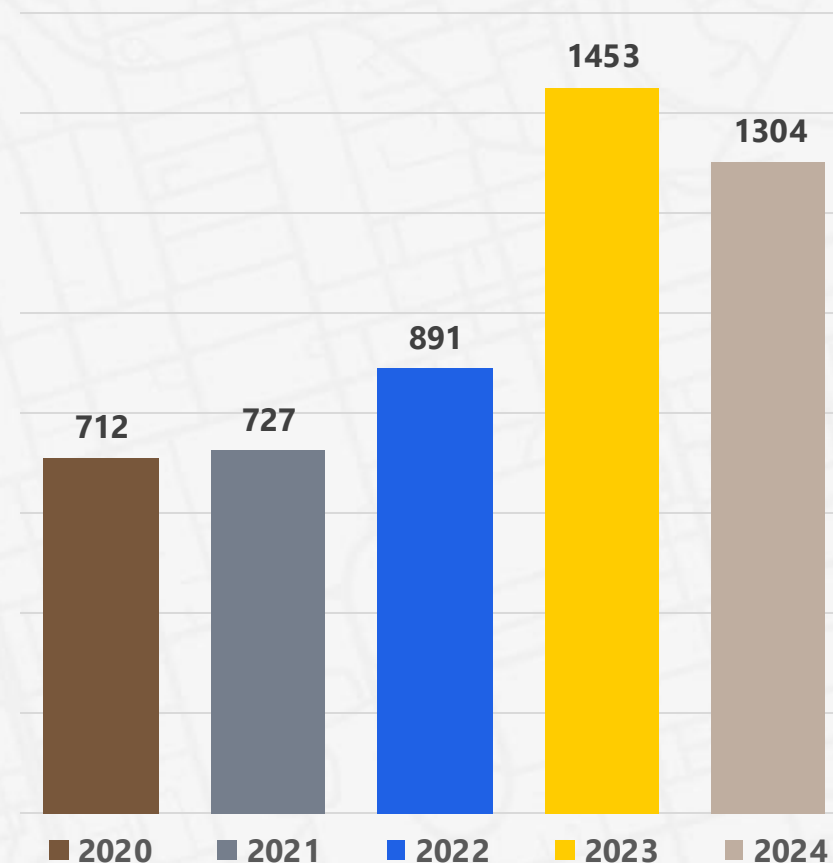
Resources Covered With RPKI

37.4% of ARIN allocated IPv4 resources are RPKI-valid

52.0% of IPv4 resources under an ARIN agreement are RPKI-valid

1.65B — Allocated
1.19B — Agreement
619M — RPKI Valid

RPKI Adoption – Entity Type

Percent of RPKI Adoption:

Government Organizations

7.6% of 804

Educational Institutions

14.6% of 2,196

Commercial/ISPs/ Enterprises/Individuals

14.4% of 39,734

Percent of Allocated IP prefixes in RPKI ROAs:

Government Organizations

4.9 of 925.8k /24s

Educational Institutions

14.6% of 1,236k /24s

Commercial/ISPs/Enterprises/ Individuals

49.2% of 6,467k /24s

Community Consultations and Upcoming Development

RPKI/BGP Intelligence Consultation Outcome

ARIN will develop a new RPKI user interface that will provide more information to organizations on the state of routing announcements of their resources in the context of RPKI validity.
This will help the organization make more informed decisions when modifying their RPKI configuration.

Development of this new service is expected to begin in late 2024.

Key features will include:

- A displayed list of Internet routing announcements in the global BGP table for an organization's certified resources.

- Determination of RPKI state based on currently available, validated repository data.

- Ability for the user to see the potential outcome to RPKI validity of Internet announcements based on a pending ROA change action.

- Suggestions for ROA changes based on both RFC standards and best current practices to achieve RPKI-valid state.

RPKI Development Pipeline

- **RPKI/ROA Intelligence (early 2025)**

- **RPKI feature enhancements to ARIN Online interface** *(future)*
  - Enabling bulk changes to RPKI objects
  - New sorting and filtering options
  - Opt out from RPKI services at user discretion

- **Number Resource Organization RPKI Working Group**
  - Efforts may result in additional development not currently in the pipeline

Help us shape the future of Routing Security at ARIN!

Submit a Suggestion at https://account.arin.net/public/acsp

NRO RPKI Program Update

User Research on Barriers for RPKI Adoption

Why?

- Are the differences in RPKI implementations between RIRs hindering RPKI adoption, more specifically ROA creation?

- If so, which differences are the most problematic?

Who?

- Network operators responsible for IP space allocated by multiple RIRs

How?

- Survey conducted in August/September

- Follow-up interviews with respondents began in September

Preliminary Survey Statistics & Data

- 203 responses to the survey
  - 90 manage IP addresses allocated by more than one RIR
  - Seven have not created ROAS yet
  - 27 have created ROAS for some of the RIRs they received IP space from but not all
  - 46 have created ROAs through all of the RIRs from which they received IP prefixes
  - (10 respondents left the survey at this point)

- 21 people expressed interest in participating in the interview
  - 11 people completed the interview (one person in writing)

Share your insights!

- What are the **main barriers or obstacles** for RPKI adoption that could be solved (or at least improved) through **better coordination and collaboration** among the RIRs?

- What barriers or challenges have you experienced?

- Please share them by sending an email with your comments and insights to rpki_program@nro.net

Thank you

Questions and Comments?