Resource Certification (RPKI)

Alex Band – Product Manager

The RIPE NCC involvement in RPKI

- The authority on who is the registered holder of an Internet Number Resource in our region
  - IPv4 and IPv6 Address Blocks
  - Autonomous System Numbers
- Information is kept in the Registry
- Accuracy and completeness are key

Digital Resource Certificates

- Based on open IETF standards (sidr)
  - RFC 5280: X.509 PKI Certificates
  - RFC 3779: Extensions for IP Addresses and ASNs

- Issued by the RIRs

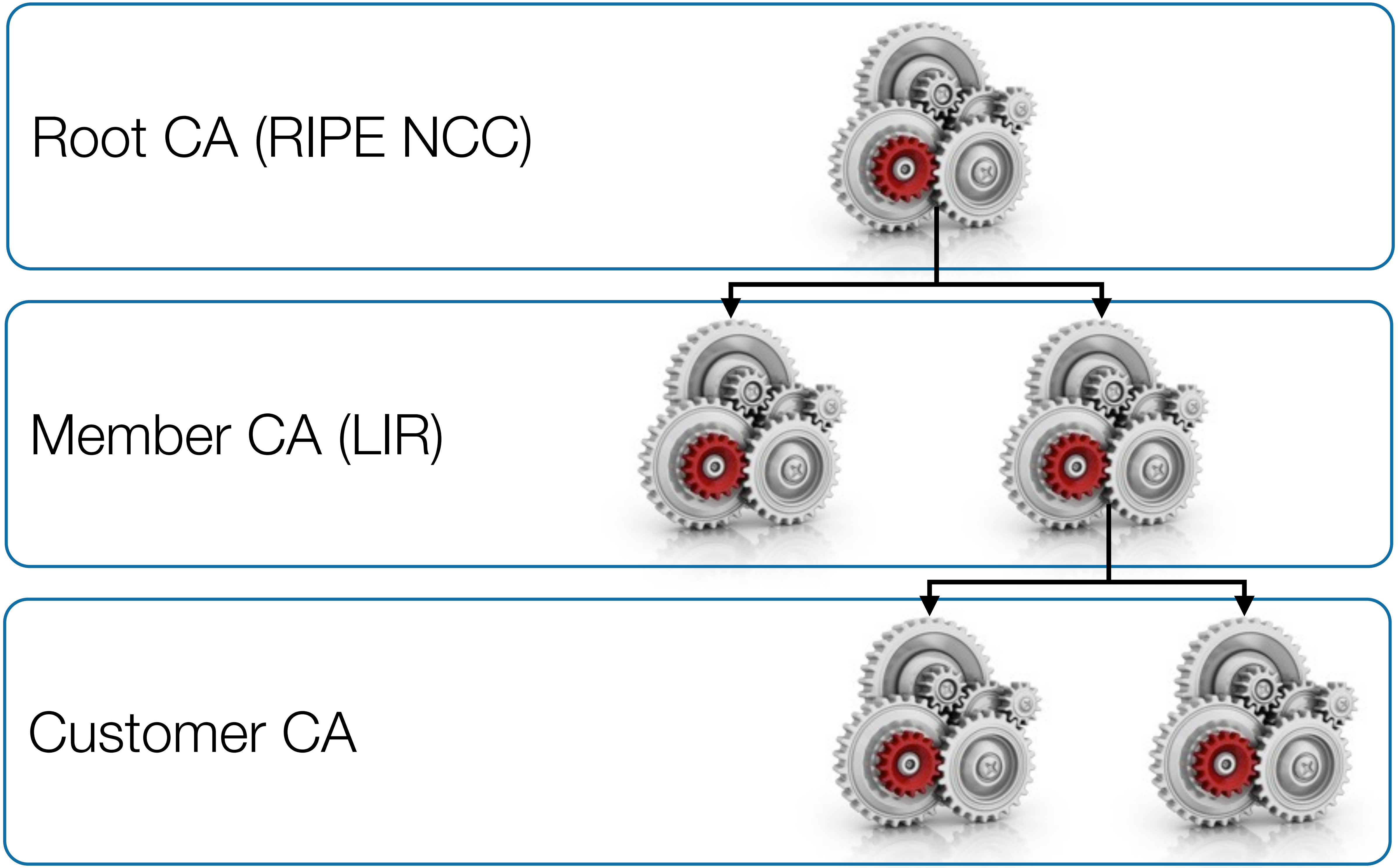
- State that an Internet number resource has been registered by the RIPE NCC

Digital Resource Certificates

- Resource Certification is a free, opt-in service
  - Your choice to request a certificate
    - Linked to registration
    - Renewed every 12 months

- Certificate does not list any identity information

Certificate Authority (CA) Structure



Root CA (RIPE NCC)

Member CA (LIR)

Customer CA

Applications for Certificates

Applications for Resource Certificates

- Make the Registry more robust
  - Offer validatable proof of holdership
- Secure and legitimise resource transfers
- Aid in securing Internet routing
  - BGP origin validation now
  - BGP path validation in the future
- System does not create additional powers for the RIRs

Management: Your Choice

- Open Source Software to run a member CA
  - Use the RIPE NCC as parent CA (trust anchor)
  - Generate and publish Certificate yourself

- RIPE NCC Hosted Platform
  - All processes are secured and automated
  - One click set-up of Resource Certificate
  - WebUI to manage Certificates in LIR Portal

Certification to Secure Internet Routing

- Members can use their resource certificate to make statements about their BGP Routing

Route Origin Authorisation (ROA):

“I authorise this Autonomous System to originate these IP prefixes”

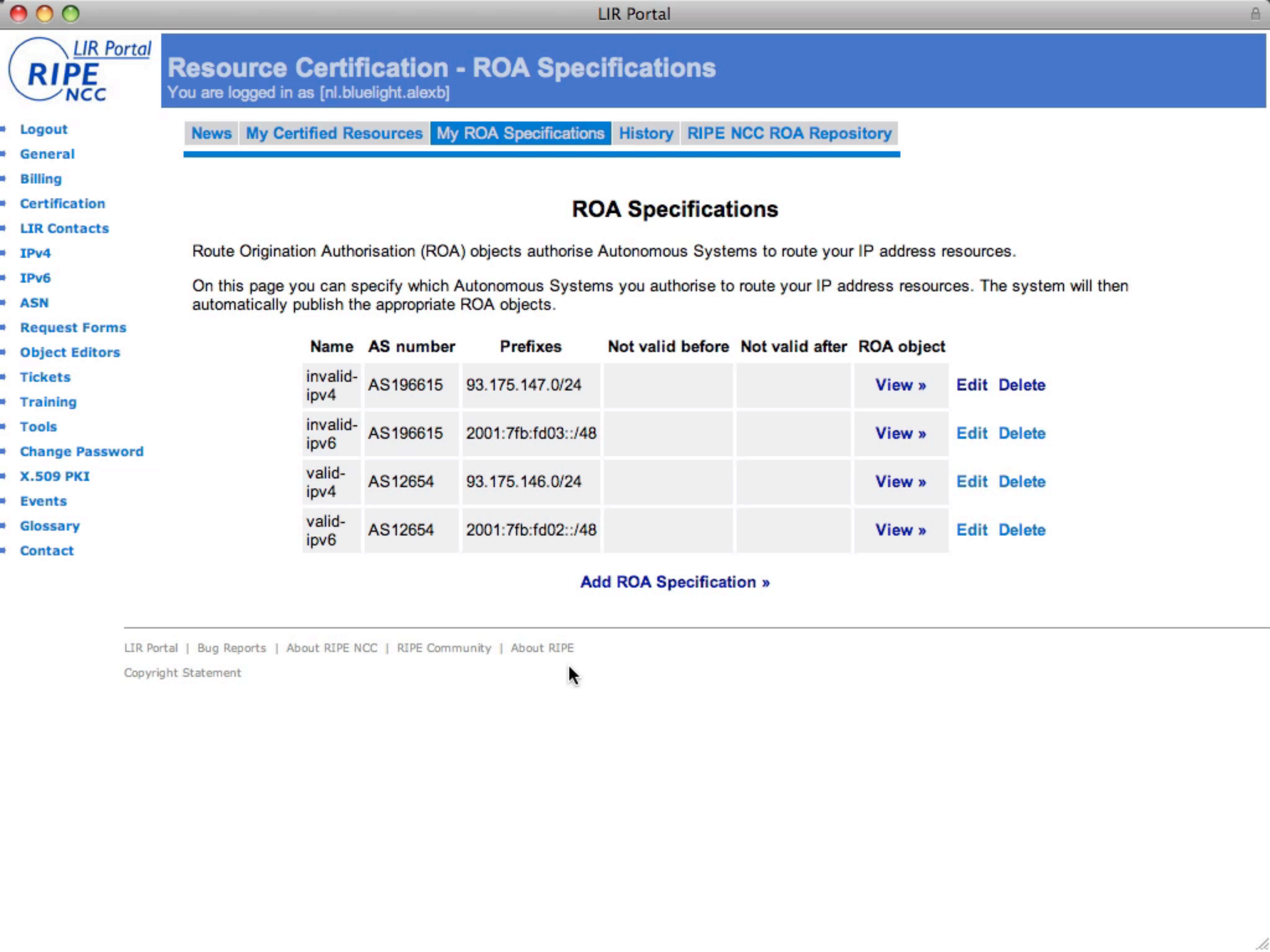
- Other network operators can set their routing preferences based on this information

Route Origin Authorisations

- Only the registered holder of a Internet number resource can create a valid ROA
- A ROA affects the RPKI validity of a route announcement:
  - VALID: ROA found, authorised announcement
  - INVALID: ROA found, unauthorised announcement
  - UNKNOWN: No ROA found (resource not yet signed)

ROA Creation

Demo



Resource Certification - ROA Specifications

You are logged in as [nl.bluelight.alexb]

- Logout
- General
- Billing
- Certification
- LIR Contacts
- IPv4
- IPv6
- ASN
- Request Forms
- Object Editors
- Tickets
- Training
- Tools
- Change Password
- X.509 PKI
- Events
- Glossary
- Contact

ROA Specifications

Route Origination Authorisation (ROA) objects authorise Autonomous Systems to route your IP address resources.

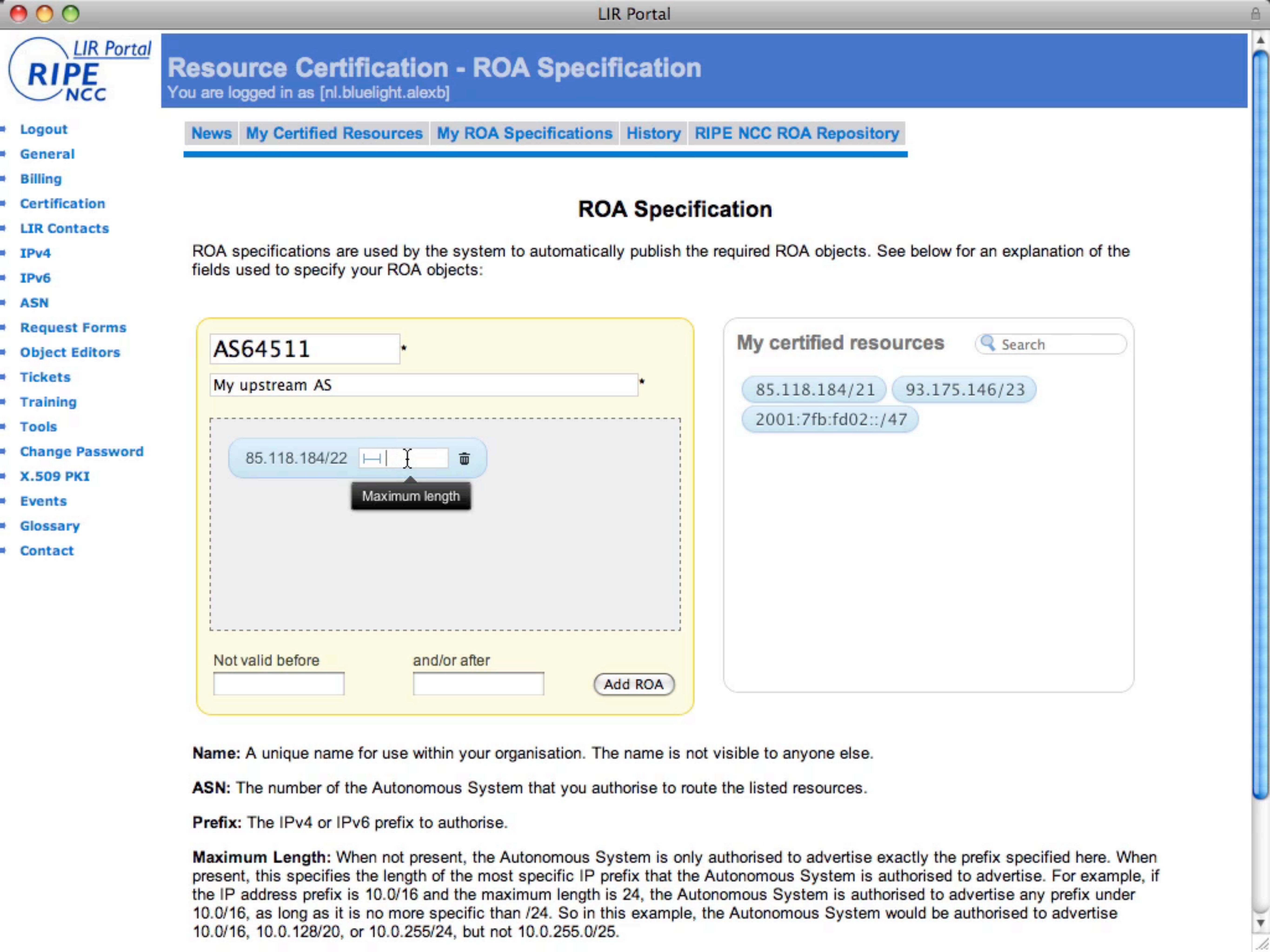
On this page you can specify which Autonomous Systems you authorise to route your IP address resources. The system will then automatically publish the appropriate ROA objects.

Name	AS number	Prefixes	Not valid before	Not valid after	ROA object	
invalid-ipv4	AS196615	93.175.147.0/24			View »	Edit Delete
invalid-ipv6	AS196615	2001:7fb:fd03::/48			View »	Edit Delete
valid-ipv4	AS12654	93.175.146.0/24			View »	Edit Delete
valid-ipv6	AS12654	2001:7fb:fd02::/48			View »	Edit Delete

Add ROA Specification »

LIR Portal | Bug Reports | About RIPE NCC | RIPE Community | About RIPE

Copyright Statement



Resource Certification - ROA Specification

You are logged in as [nl.bluelight.alexb]

ROA Specification

ROA specifications are used by the system to automatically publish the required ROA objects. See below for an explanation of the fields used to specify your ROA objects:

AS64511 *

My upstream AS *

85.118.184/22

My certified resources

85.118.184/21

93.175.146/23

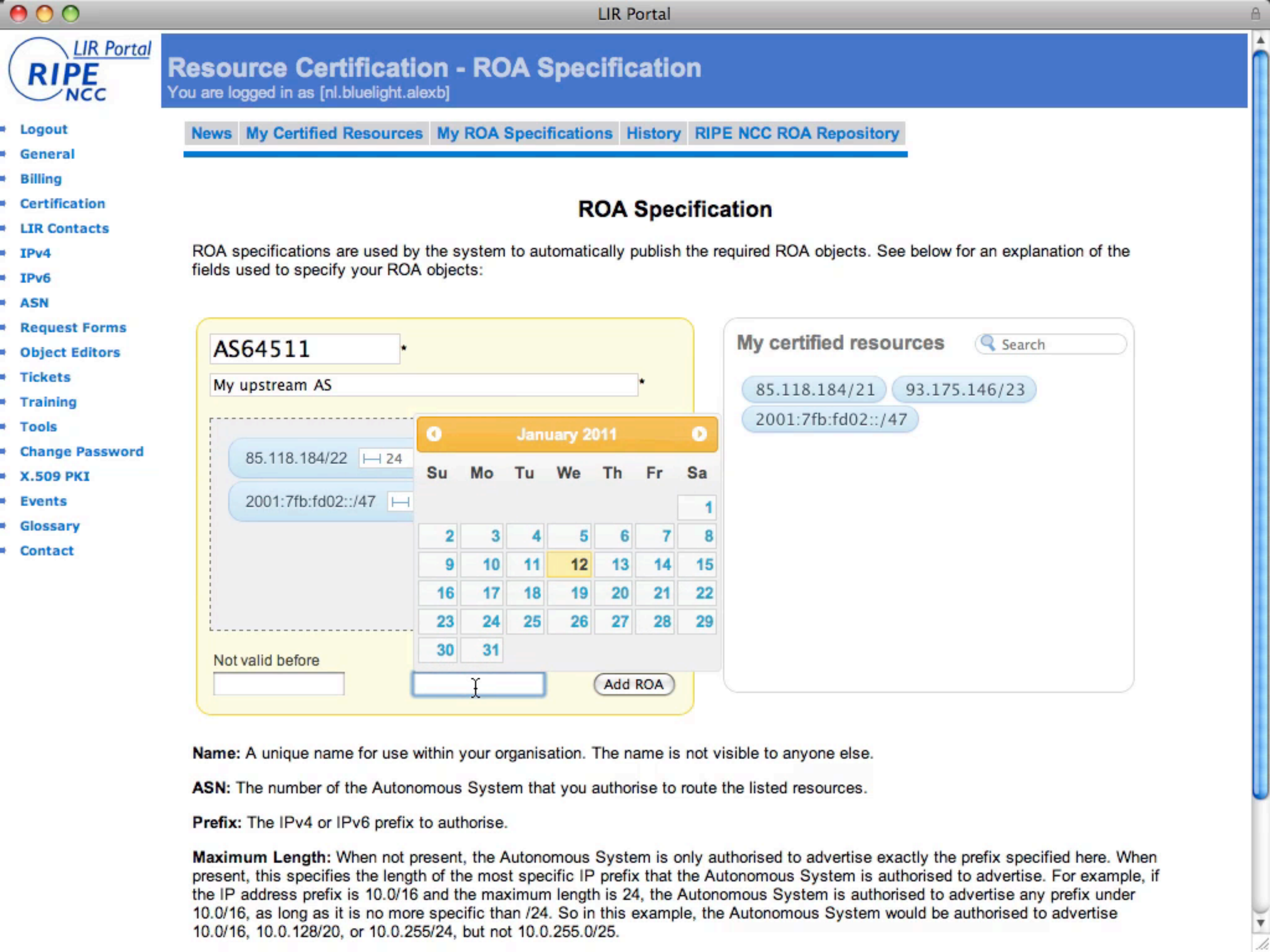
2001:7fb:fd02::/47

Name: A unique name for use within your organisation. The name is not visible to anyone else.

ASN: The number of the Autonomous System that you authorise to route the listed resources.

Prefix: The IPv4 or IPv6 prefix to authorise.

Maximum Length: When not present, the Autonomous System is only authorised to advertise exactly the prefix specified here. When present, this specifies the length of the most specific IP prefix that the Autonomous System is authorised to advertise. For example, if the IP address prefix is 10.0/16 and the maximum length is 24, the Autonomous System is authorised to advertise any prefix under 10.0/16, as long as it is no more specific than /24. So in this example, the Autonomous System would be authorised to advertise 10.0/16, 10.0.128/20, or 10.0.255/24, but not 10.0.255.0/25.



Resource Certification - ROA Specification

You are logged in as [nl.bluelight.alexb]

ROA Specification

ROA specifications are used by the system to automatically publish the required ROA objects. See below for an explanation of the fields used to specify your ROA objects:

AS64511 *

My upstream AS *

85.118.184/22 ⊢⊣ 24

2001:7fb:fd02::/47 ⊢⊣

Not valid before

My certified resources

85.118.184/21 93.175.146/23

2001:7fb:fd02::/47

Name: A unique name for use within your organisation. The name is not visible to anyone else.

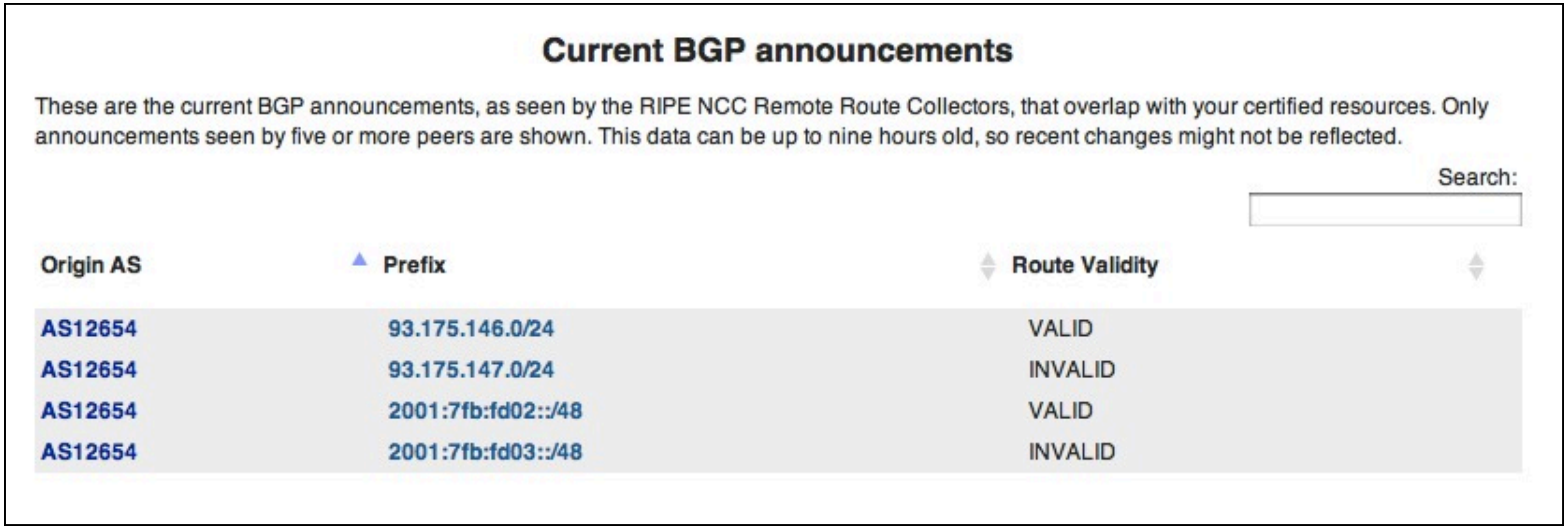
ASN: The number of the Autonomous System that you authorise to route the listed resources.

Prefix: The IPv4 or IPv6 prefix to authorise.

Maximum Length: When not present, the Autonomous System is only authorised to advertise exactly the prefix specified here. When present, this specifies the length of the most specific IP prefix that the Autonomous System is authorised to advertise. For example, if the IP address prefix is 10.0/16 and the maximum length is 24, the Autonomous System is authorised to advertise any prefix under 10.0/16, as long as it is no more specific than /24. So in this example, the Autonomous System would be authorised to advertise 10.0/16, 10.0.128/20, or 10.0.255/24, but not 10.0.255.0/25.

Data Quality and Integrity

- Use RIS Route Collectors to support Certification
  - Show the RPKI validity state of a route announcement
  - Trigger alert when ROAs mismatch BGP



Current BGP announcements

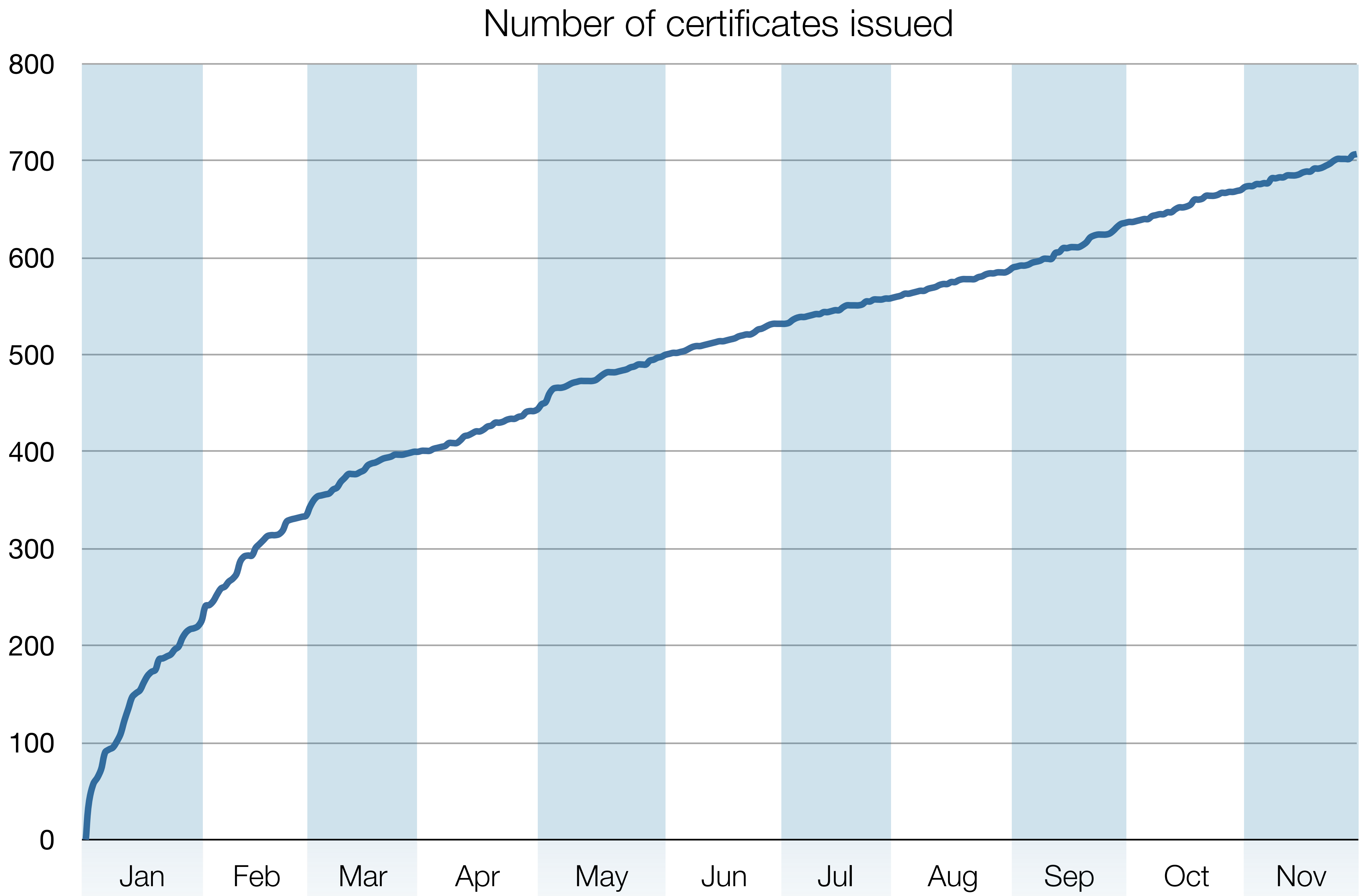
These are the current BGP announcements, as seen by the RIPE NCC Remote Route Collectors, that overlap with your certified resources. Only announcements seen by five or more peers are shown. This data can be up to nine hours old, so recent changes might not be reflected.

Origin AS	Prefix	Route Validity
AS12654	93.175.146.0/24	VALID
AS12654	93.175.147.0/24	INVALID
AS12654	2001:7fb:fd02::/48	VALID
AS12654	2001:7fb:fd03::/48	INVALID

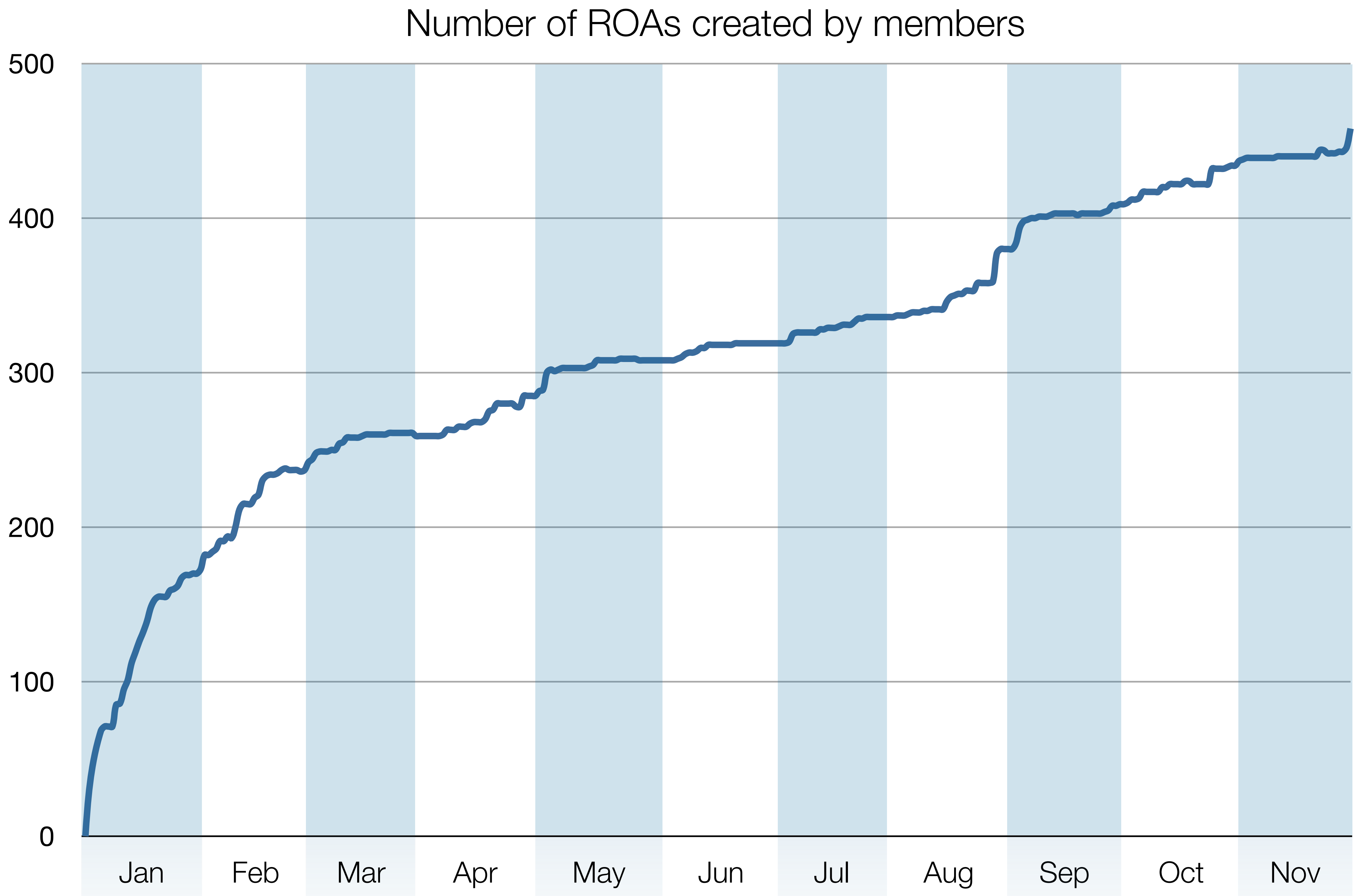
Publication of cryptographic objects

- Publication is distributed by design
  - Publish yourself or publish through a 3rd party
- Each RIR has a public repository
  - Holds Certificates, ROAs, etc.
  - Refreshed at least every 24 hrs
- Accessed using a Validation tool
  - Communication via rsync
  - Builds up a local validated cache

Adoption


Number of certificates issued
800
700
600
500
400
300
200
100
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov

Adoption


Number of ROAs created by members
500
400
300
200
100
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov

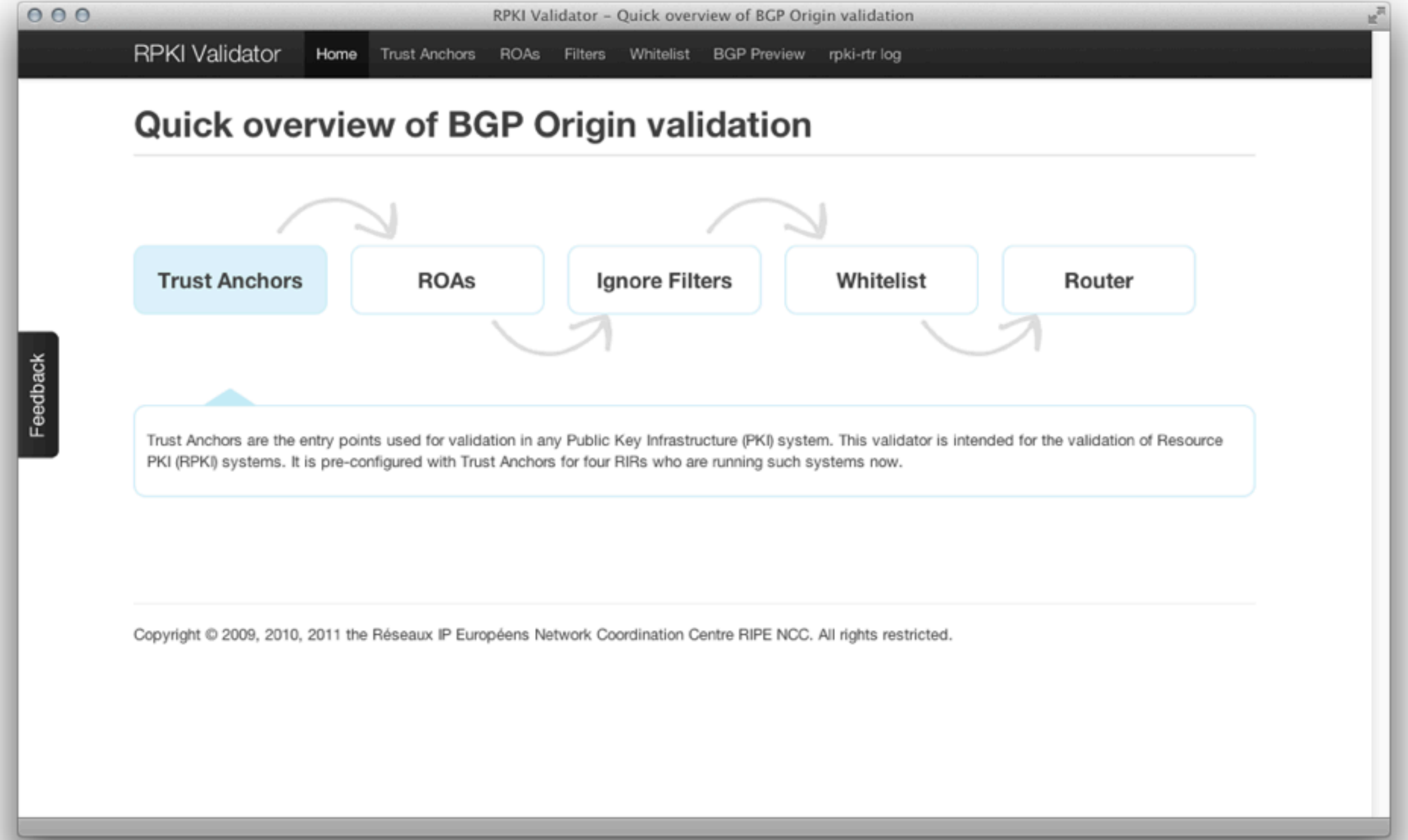
RIPE NCC RPKI Validation tool

RIPE NCC RPKI-RTR Validator

- Web-based user interface
- Periodically validates all ROA repositories
  - Downloads and processes changes automatically
- Ignore Filters (Apply RPKI status ‘Unknown’)
- Whitelist (Apply RPKI status ‘Valid’)
- RPKI-Router Support
  - Cisco, Juniper, Quagga...

Open source, BSD License

RIPE NCC RPKI-RTR Validator

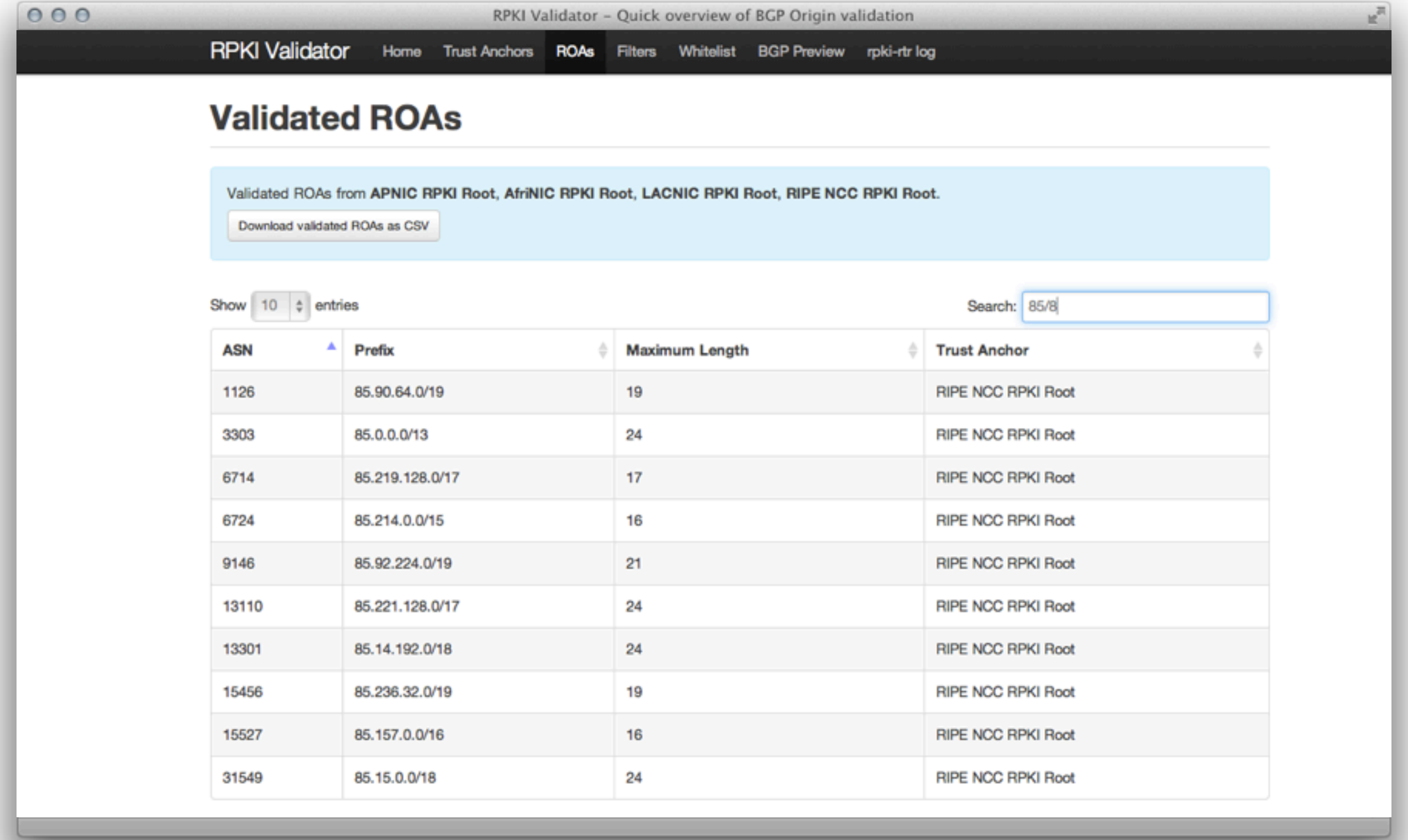


Quick overview of BGP Origin validation

Trust Anchors are the entry points used for validation in any Public Key Infrastructure (PKI) system. This validator is intended for the validation of Resource PKI (RPKI) systems. It is pre-configured with Trust Anchors for four RIRs who are running such systems now.

Copyright © 2009, 2010, 2011 the Réseaux IP Européens Network Coordination Centre RIPE NCC. All rights restricted.

RIPE NCC RPKI-RTR Validator



Validated ROAs

Validated ROAs from **APNIC RPKI Root, AfriNIC RPKI Root, LACNIC RPKI Root, RIPE NCC RPKI Root.**

ASN	Prefix	Maximum Length	Trust Anchor
1126	85.90.64.0/19	19	RIPE NCC RPKI Root
3303	85.0.0.0/13	24	RIPE NCC RPKI Root
6714	85.219.128.0/17	17	RIPE NCC RPKI Root
6724	85.214.0.0/15	16	RIPE NCC RPKI Root
9146	85.92.224.0/19	21	RIPE NCC RPKI Root
13110	85.221.128.0/17	24	RIPE NCC RPKI Root
13301	85.14.192.0/18	24	RIPE NCC RPKI Root
15456	85.236.32.0/19	19	RIPE NCC RPKI Root
15527	85.157.0.0/16	16	RIPE NCC RPKI Root
31549	85.15.0.0/18	24	RIPE NCC RPKI Root

RPKI-Router Integration

- Local Validator Tool feeds RPKI capable router with processed data set
  - Router does not do the crypto!

- Implementations in beta by Cisco and Juniper
  - Public release in Q2, 2012
- Quagga has BGP Secure Routing Extensions
  - BGP-SRx open source reference implementation

Information and Announcements

http://ripe.net/certification

#RPKI

Questions?

✉ alexb@ripe.net
alexander_band
linkedin.com/in/alexanderband