RIPE NCC
RIPE NETWORK COORDINATION CENTRE

Routing Security Toolset

The challenges of origin validation

Andrzej Wolski | 11 June 2018 | CSNOG

RIPE NCC

- Members organisation founded in 1992
- Manages IP and ASN allocations in Europe, Middle East and former Soviet Union
  - Ensure unique holdership
  - Document holdership in RIPE Database (whois)
  - Facilitate operators to document use of their addresses

Inter-Domain Routing

- Border Gateway Protocol
  - IETF Standard, RFC1105, 1989
  - BGPv2, 1990
  - BGPv3, 1991
  - BGPv4, 1994
  - Many other extensions…

- Problem remains
  - Any network (ASN) can announce any IP prefix
  - No built-in security in BGP protocol

Accidents Happen

https://www.maxpixel.net/Police-Ambulance-Accident-Cars-Crash-Car-Accident-1752868

Accidents Happen

- Fat Fingers
  - 2 and 3 are really close on our keyboards..
- Policy violations (leaks)
  - Oops, we didn’t mean this to go the public internet
  - Infamous incident Pakistan Telecom blackholed YouTube, for the world..

Or worse..

- April 2018
  - BGP and DNS hijack
  - Targeting MyEtherWallet
  - Unnoticed for 2 hours

https://pixabay.com/en/burglar-crime-criminal-theft-thief-157142/

Incidents are common

- 2017 Routing Security Review by Internet Society
  - 14k incidents
  - 10% of all ASNs affected
  - 3k ASN victim of at least one incident
  - 1.5k ASN caused at least one incident

https://www.internetsociety.org/blog/2018/01/14000-incidents-2017-routing-security-year-review/

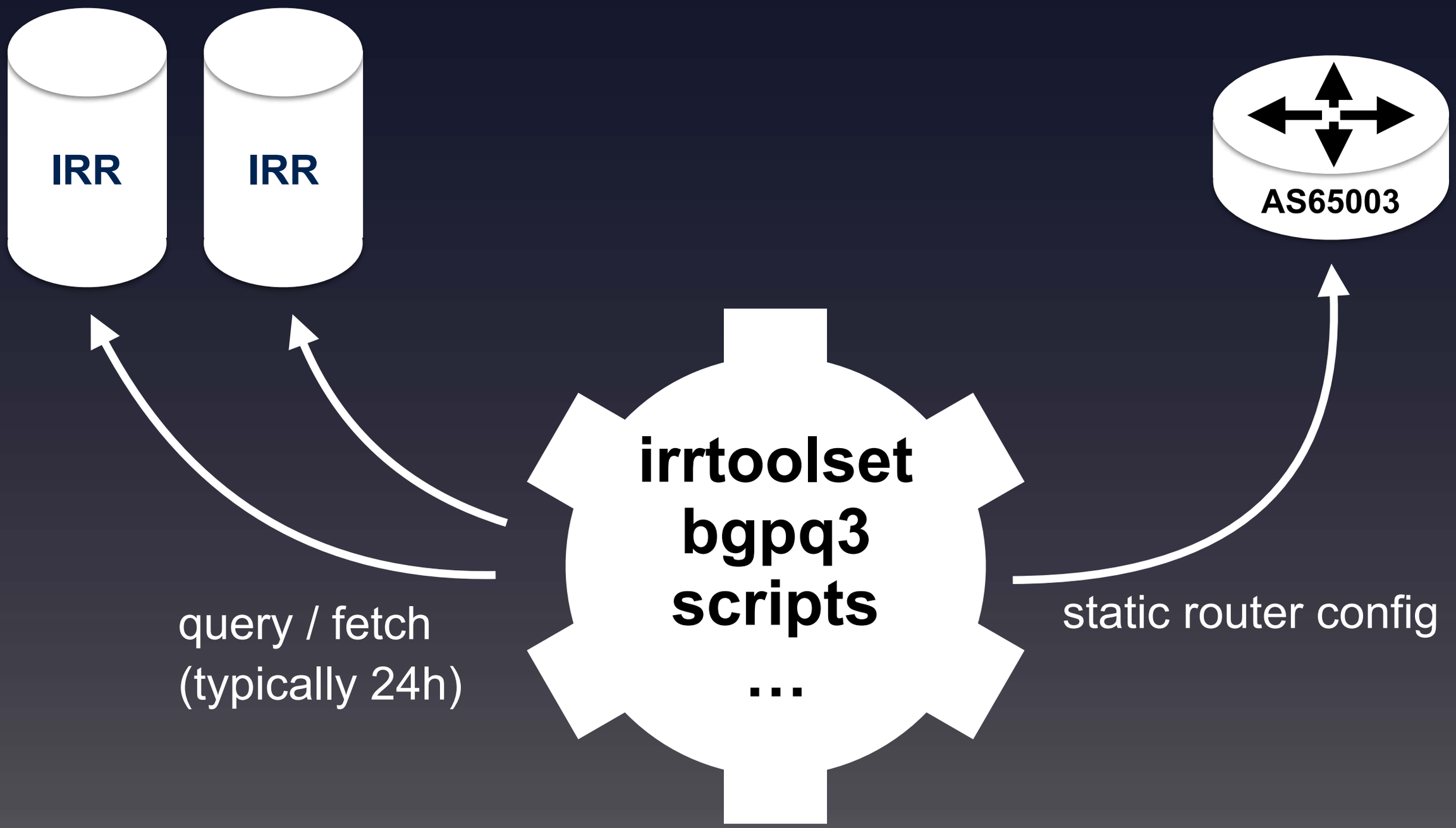
Photo by Hush Naidoo on Unsplash

Internet Routing Registry

- Many exist, most widely used
  - RIPE Database
  - RADB

- Verification of holdership over resources
  - RIPE Database for RIPE region resources only
  - RIPE Database allows anyone to create out-of-region (deprecated)
  - RADB allows paying customers to create any object
  - Lot of other IRR don’t formally verify holdership

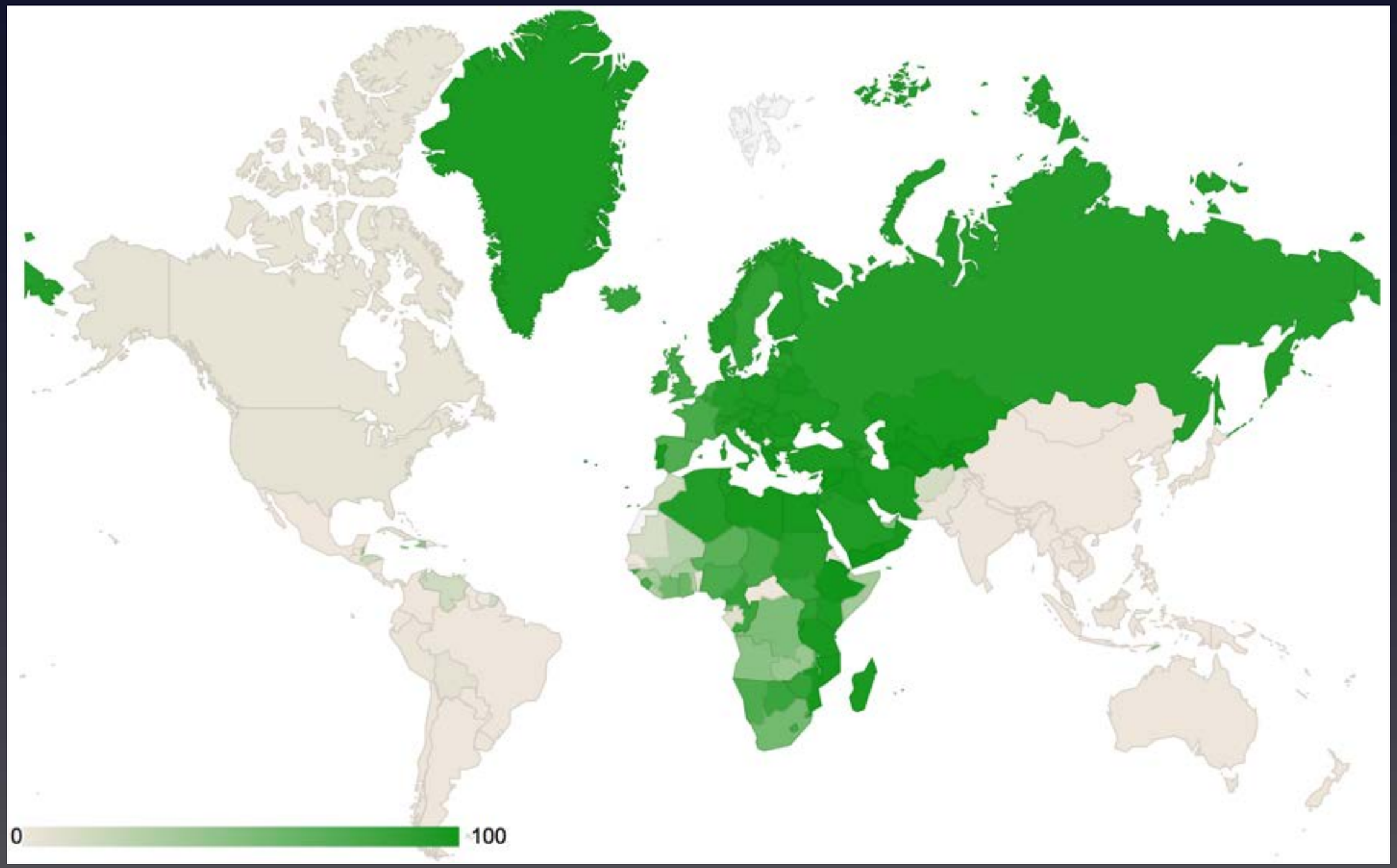
Automate using IRR



Filtering Value Proposition

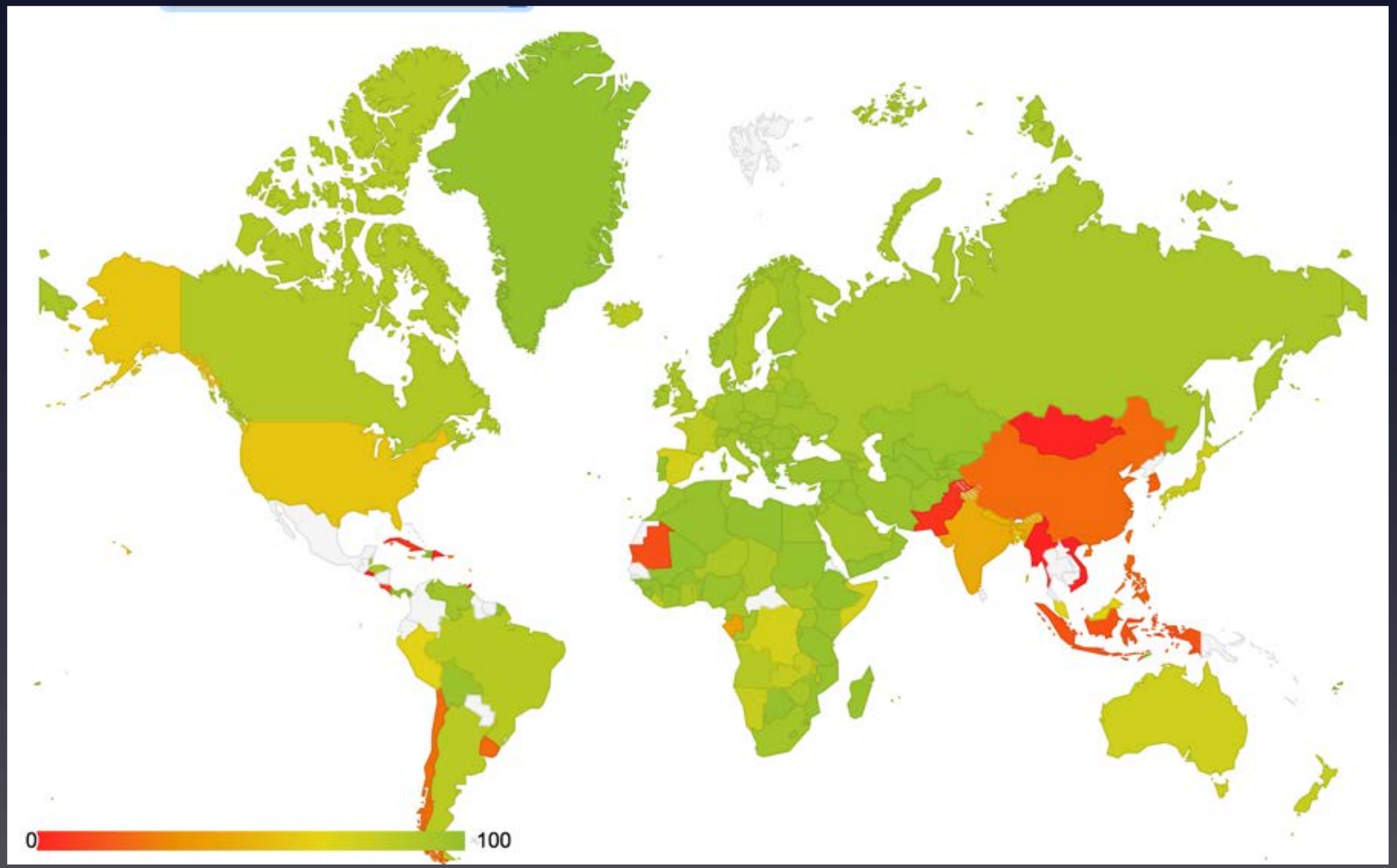
- Most commonly done by providers
- Internet Exchange points have started offering filtering as a service
- Transit providers usually do not filter
- Stub networks may filter because they want to block poisonous traffic

Coverage - RIPE IRR



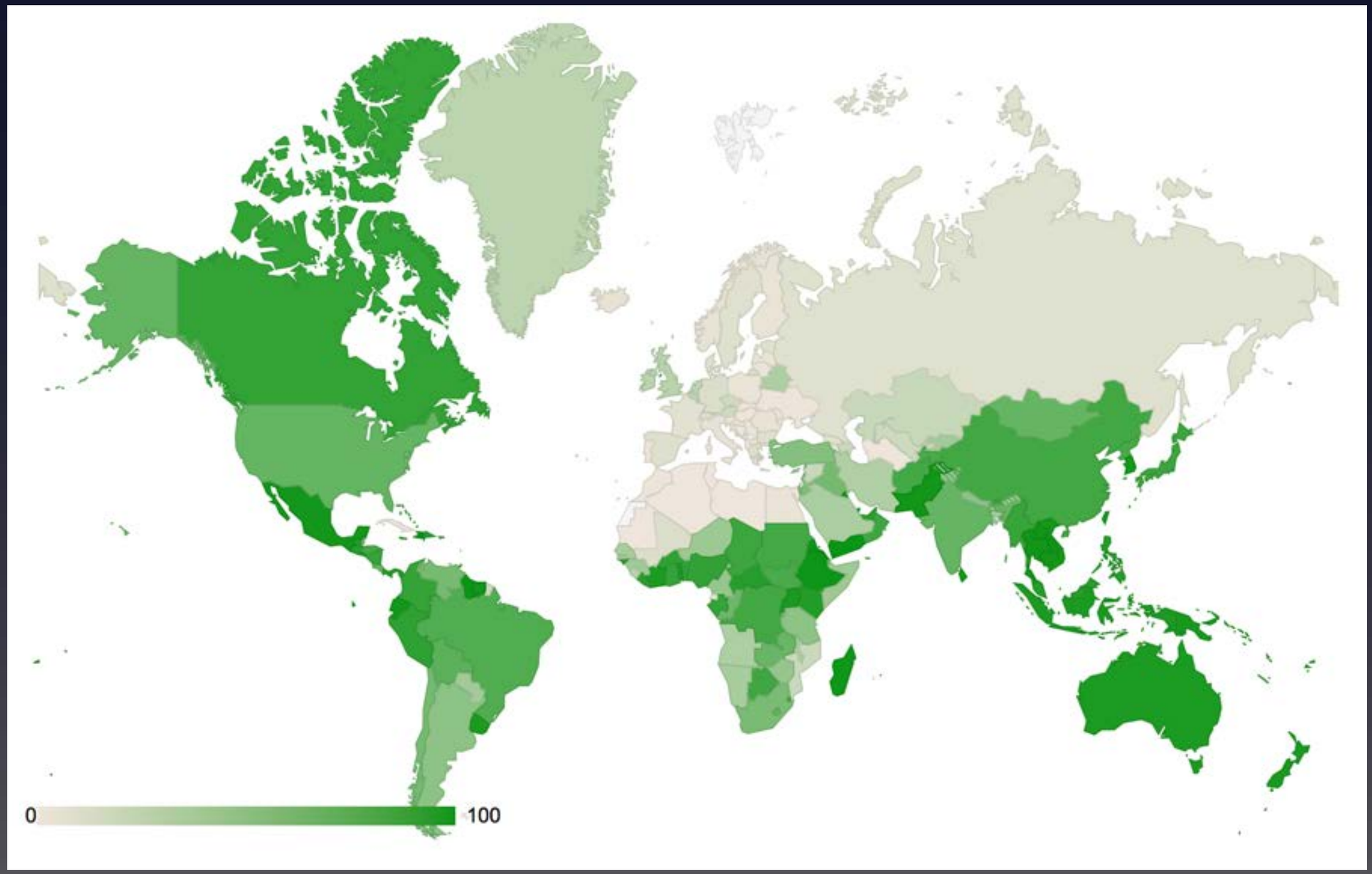
Fraction of IPv4 announcements valid according to ROUTE objects

Accuracy - RIPE IRR



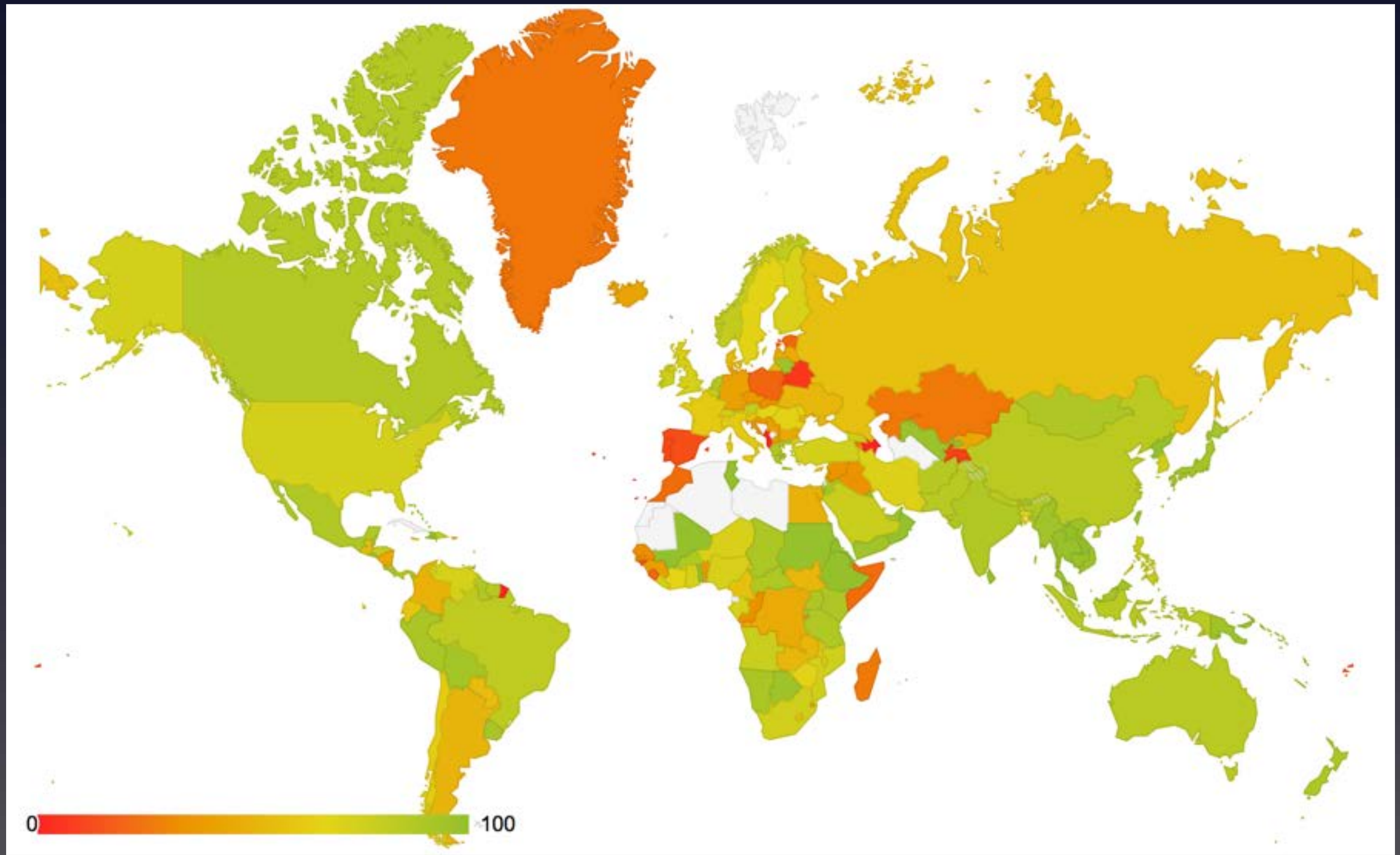
Accuracy - Valid announcements / covered announcements

Coverage - RADB IRR



Fraction of IPv4 announcements valid according to ROUTE objects

Accuracy - RADB IRR



Accuracy - Valid announcements / covered announcements

Photo by Jerry Kiesewetter on Unsplash

Resource Public Key Infrastructure

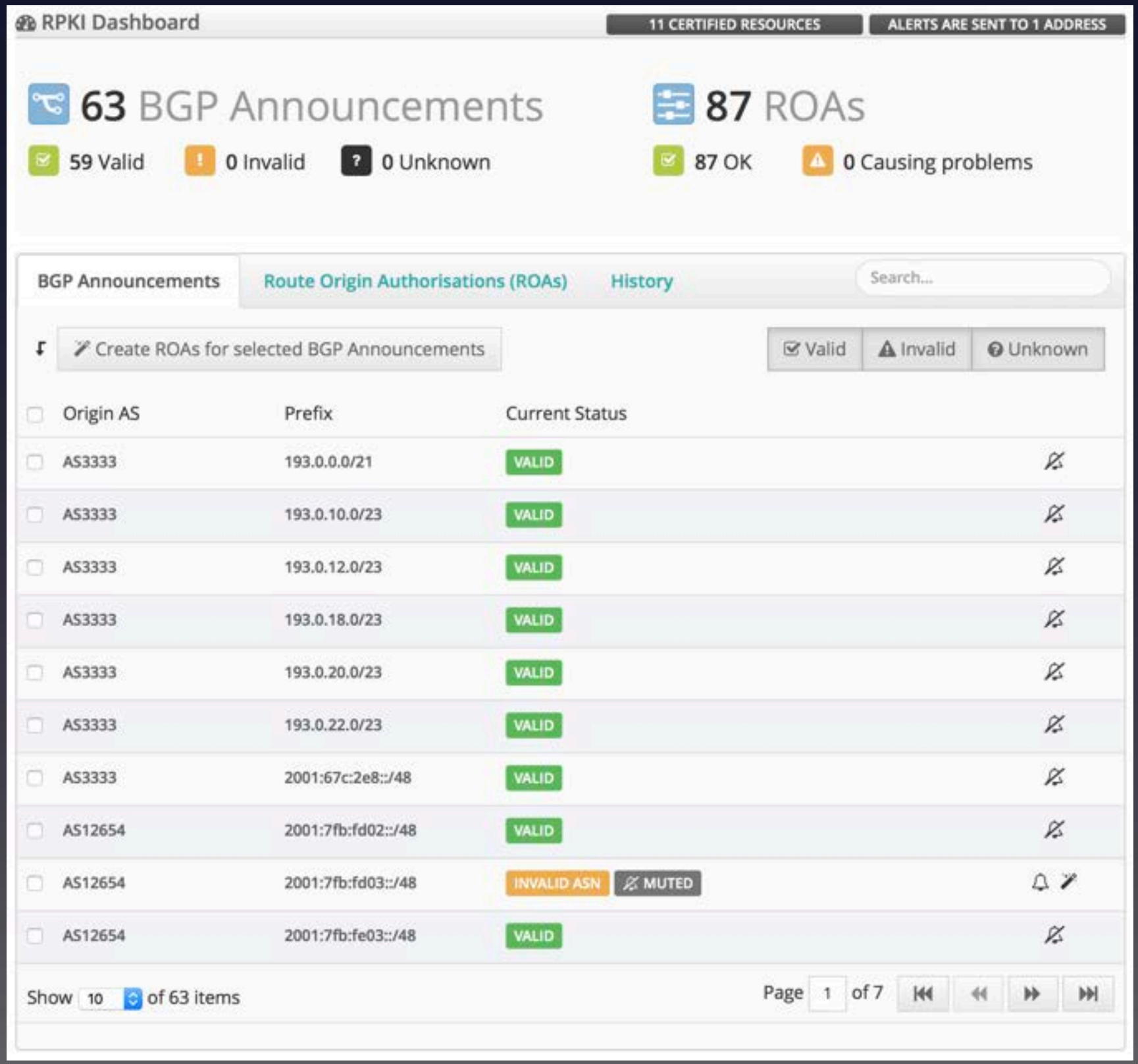
- Resource Public Key Infrastructure
  - Ties IP addresses and ASNs to public keys
  - Follows the hierarchy of the registry
- Authorised statements from resource holders
  - ASN X is authorised to announce my IP Prefix Y
  - Signed, holder of Y

Give me a button! — When I authorise

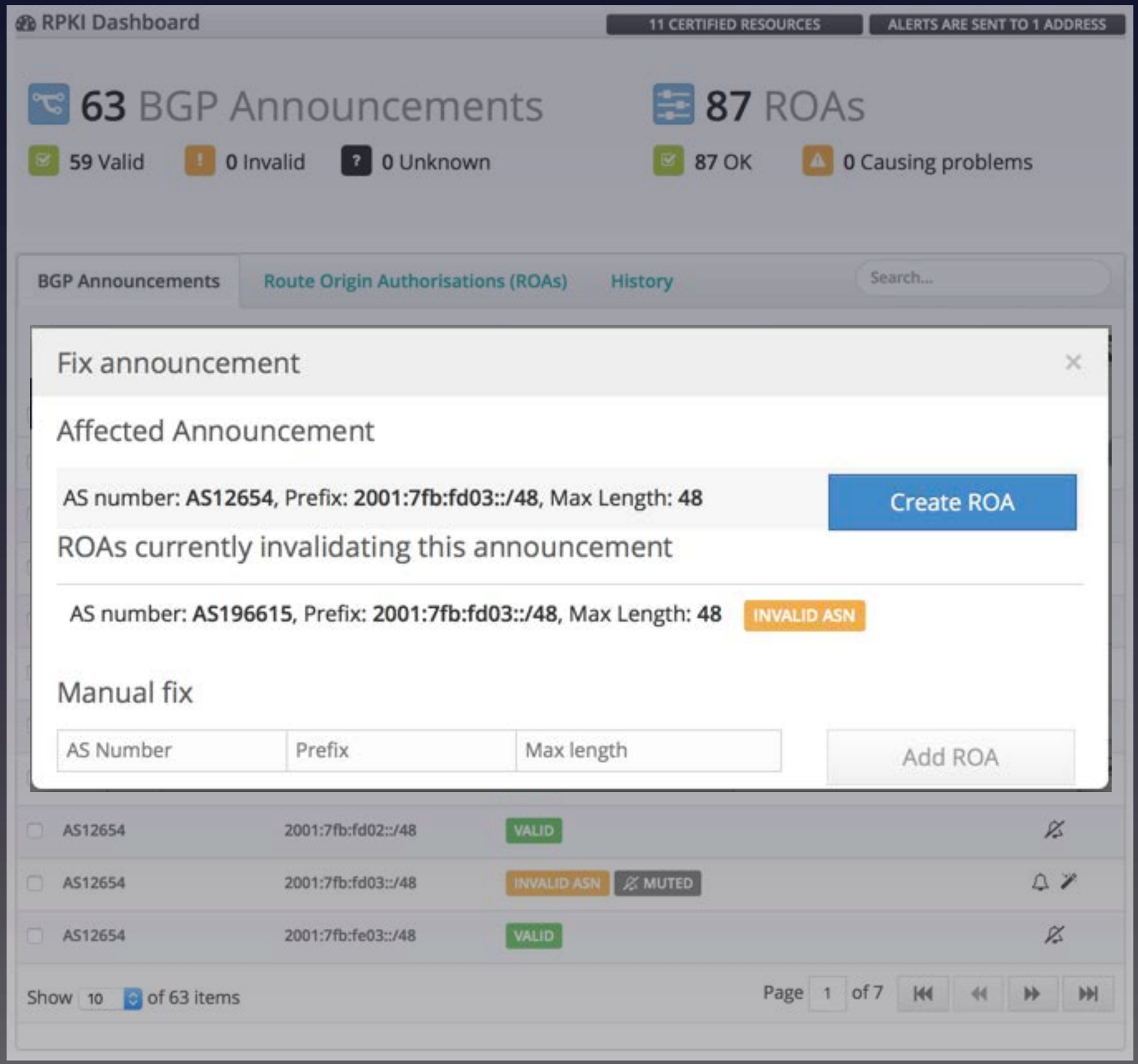
- We show members announcements
  - Member chooses to authorise, or not
  - No need to worry about the crypto
  - It’s there, but let the machines handle it..

- APNIC and Lacnic also have easy to use portals
  - Uptake and quality of data is a function of the interface

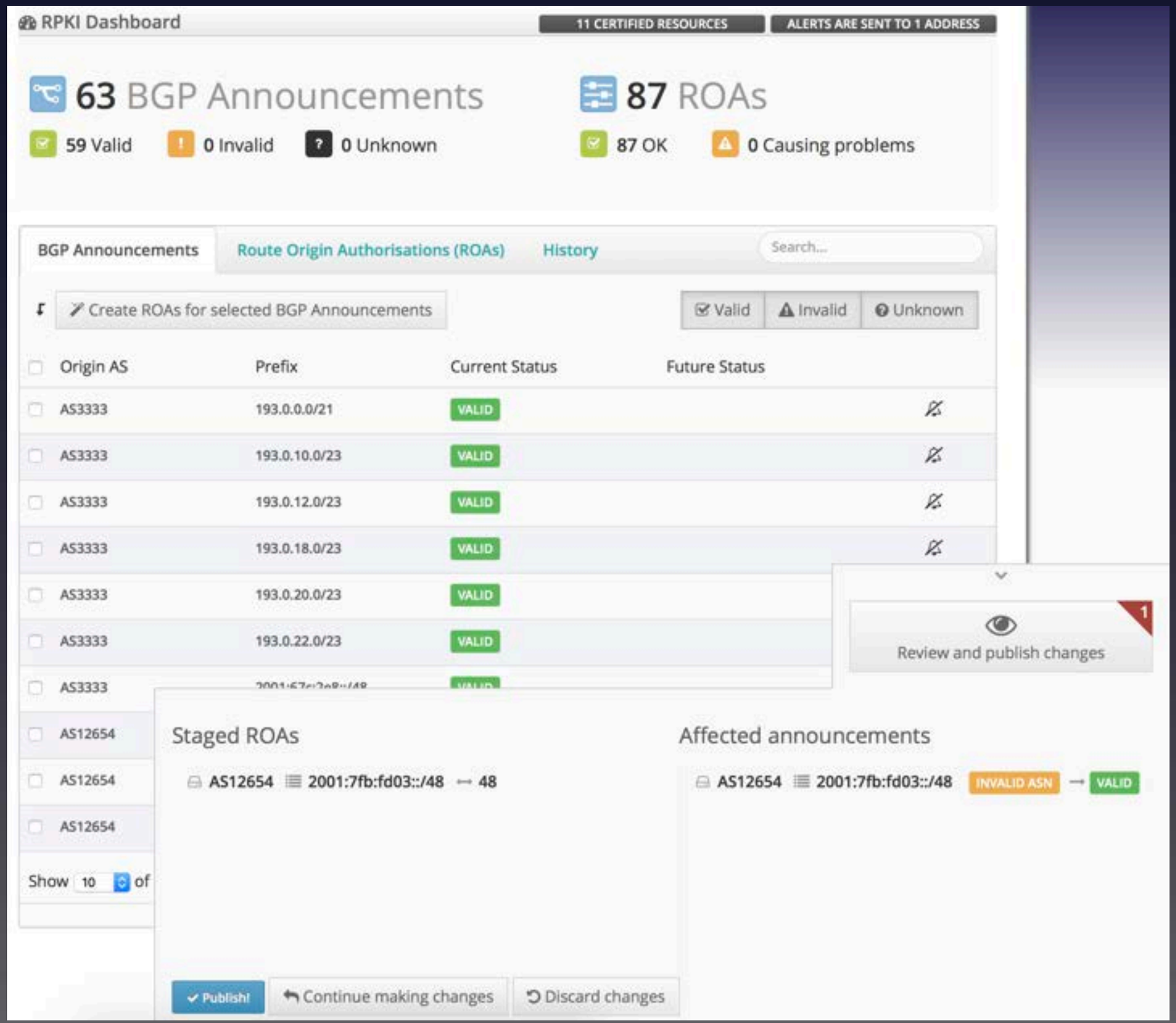
How to set up ROAs



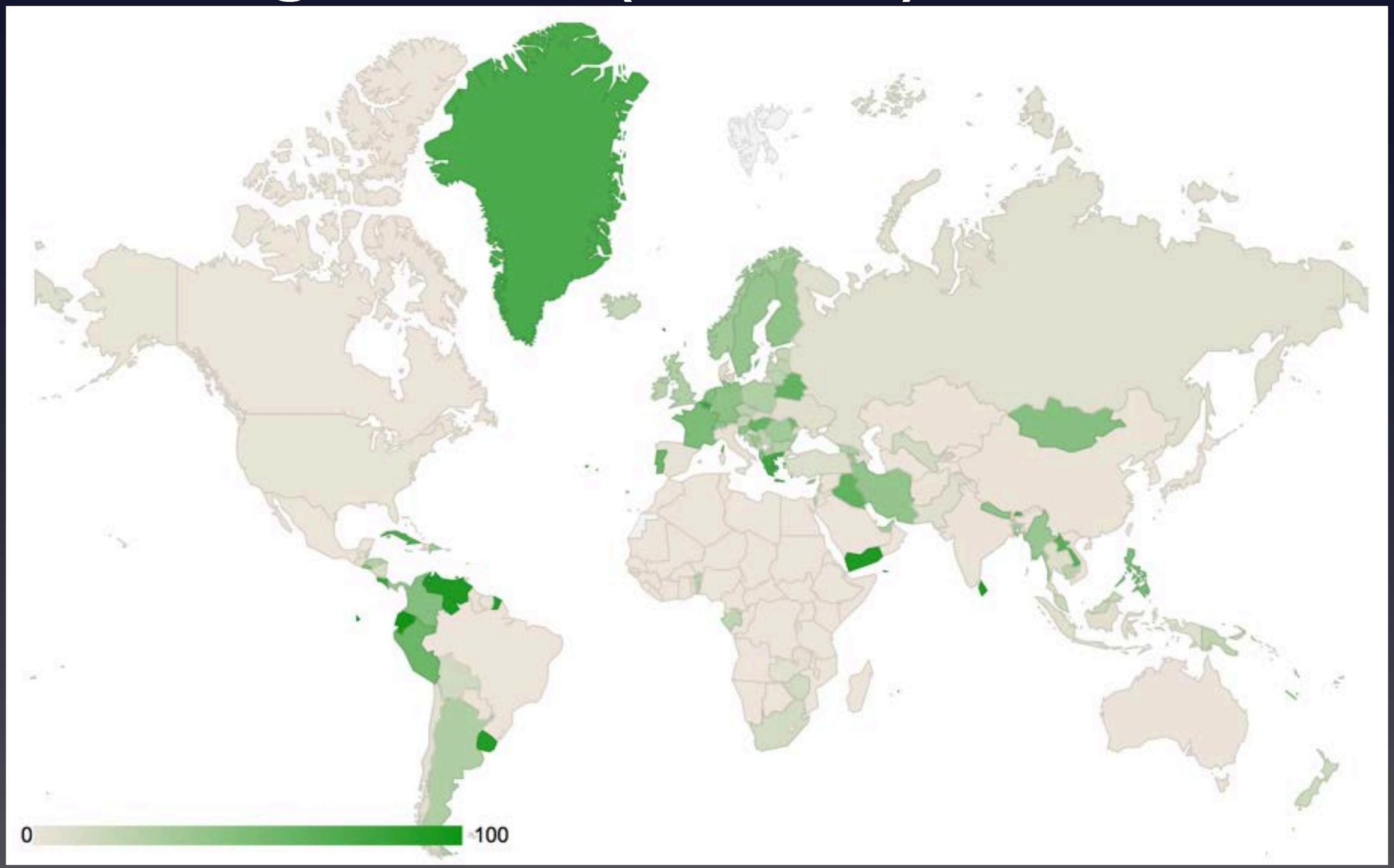
How to set up ROAs



How to set up ROAs

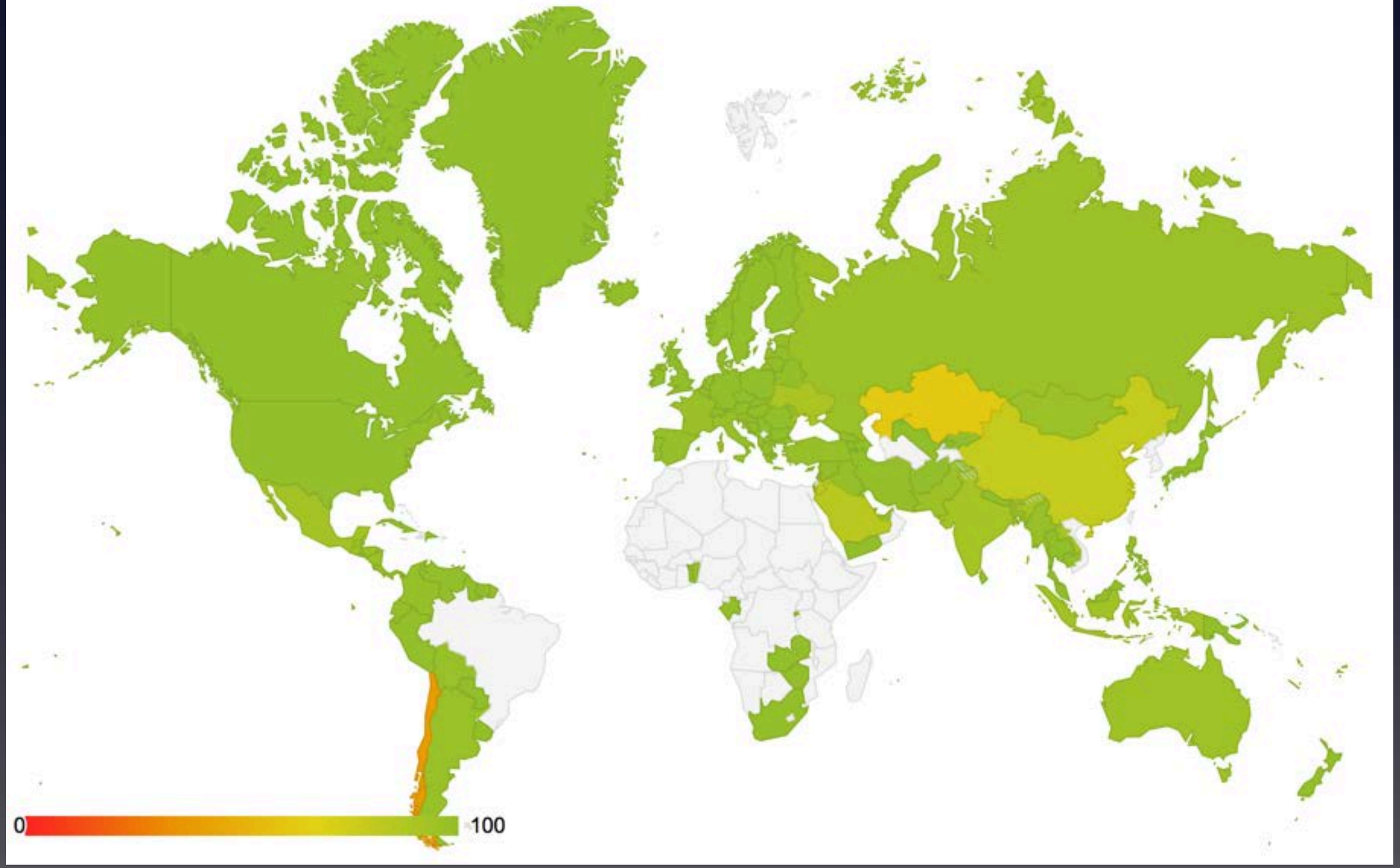


Coverage - RPKI (all RIRs)



Fraction of IPv4 announced addresses valid according to ROAs

Accuracy - RPKI (all RIRs)



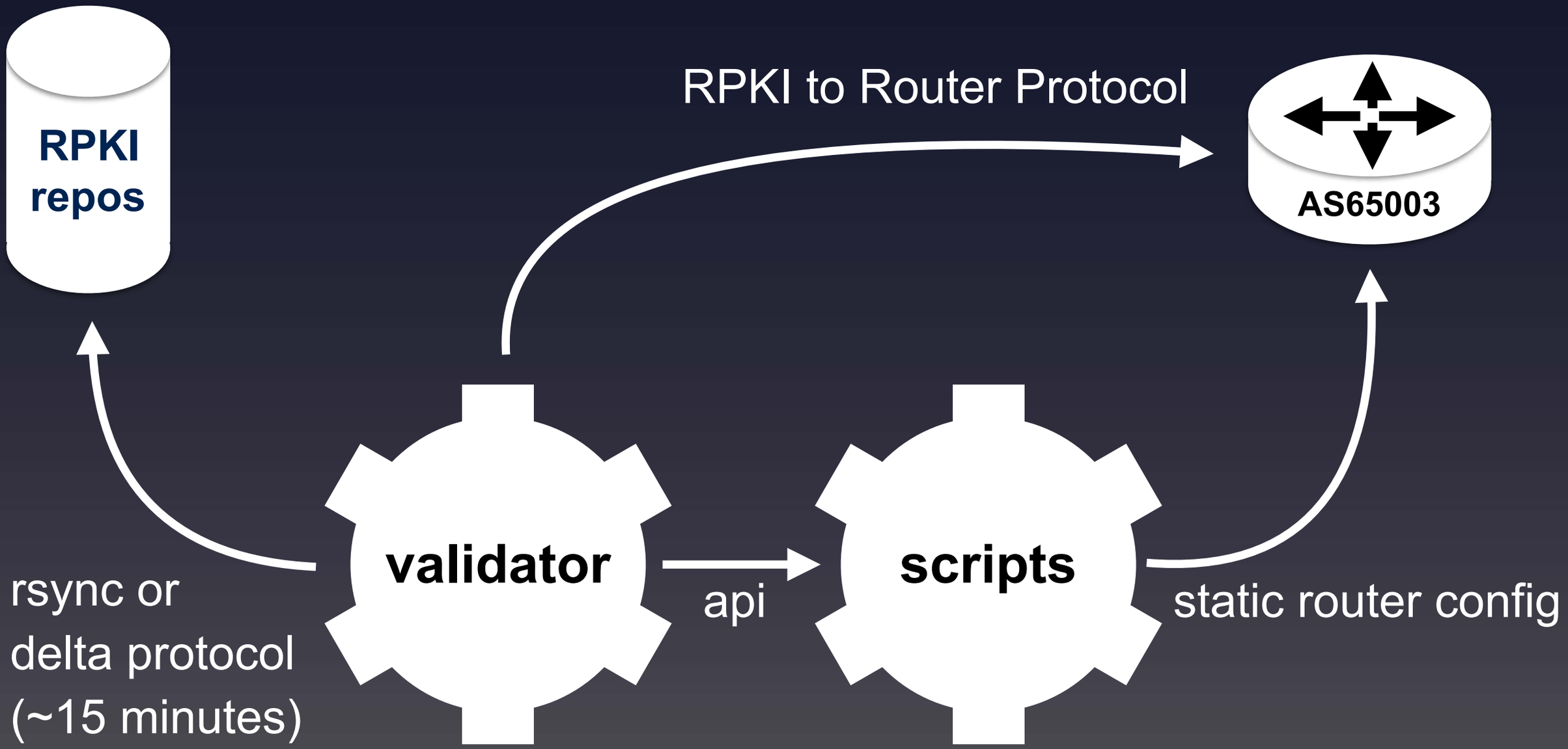
IPv4 addresses in valid announcements / covered announcements

RPKI in some European countries

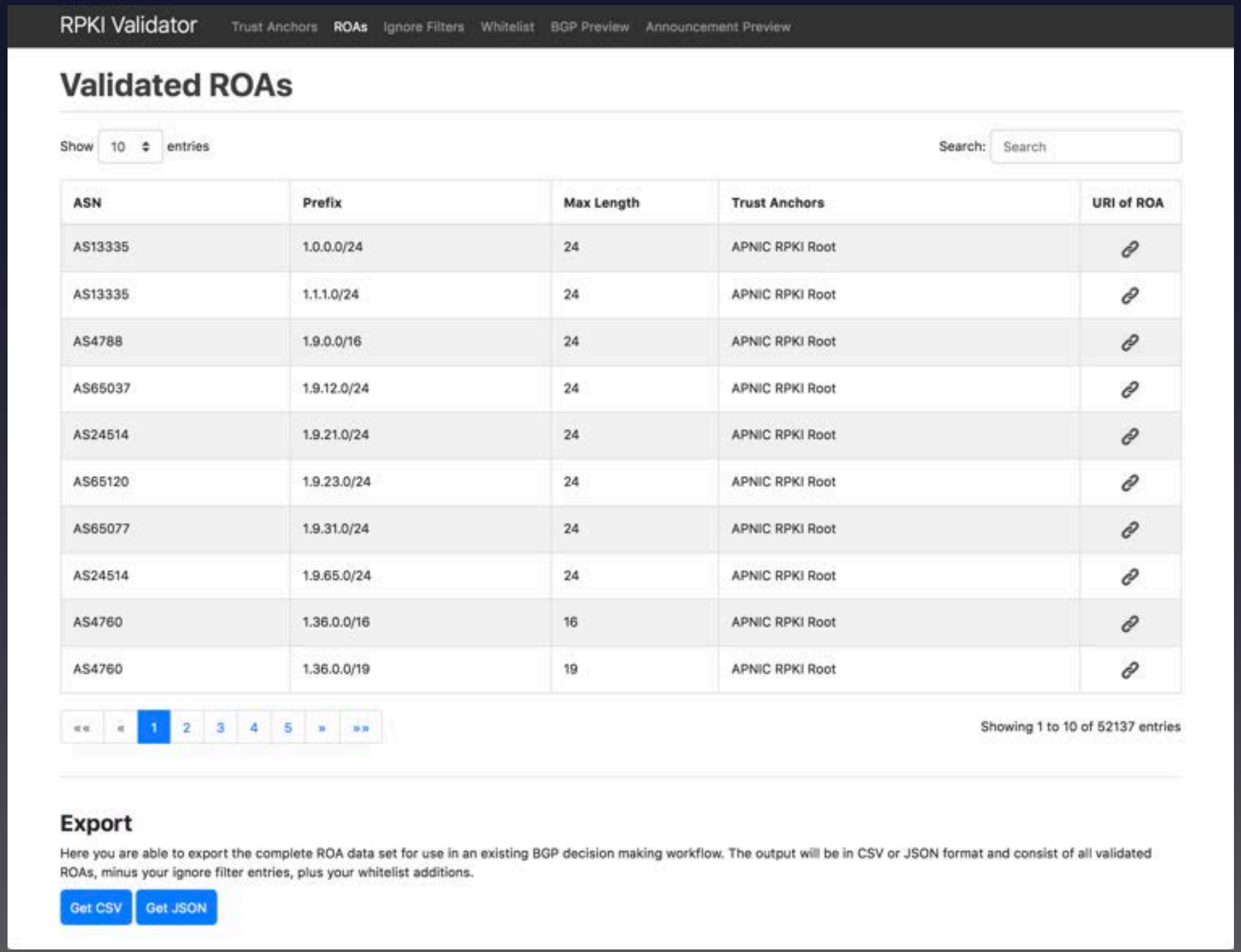
Country	% Prefixes	% Addreses	Accuracy
NL	25%	44%	99,9%
BE	27%	78%	100,0%
DE	17%	42%	100,0%
FR	26%	50%	96,9%
GB	14%	26%	99,9%
IE	20%	21%	99,9%
FI	20%	40%	100,0%
SE	12%	38%	100,0%
GR	46%	75%	100,0%
CZ	13%	23%	99,9%
SK	13%	10%	100,0%

source: https://lirportal.ripe.net/certification/content/static/statistics/world-roas.html

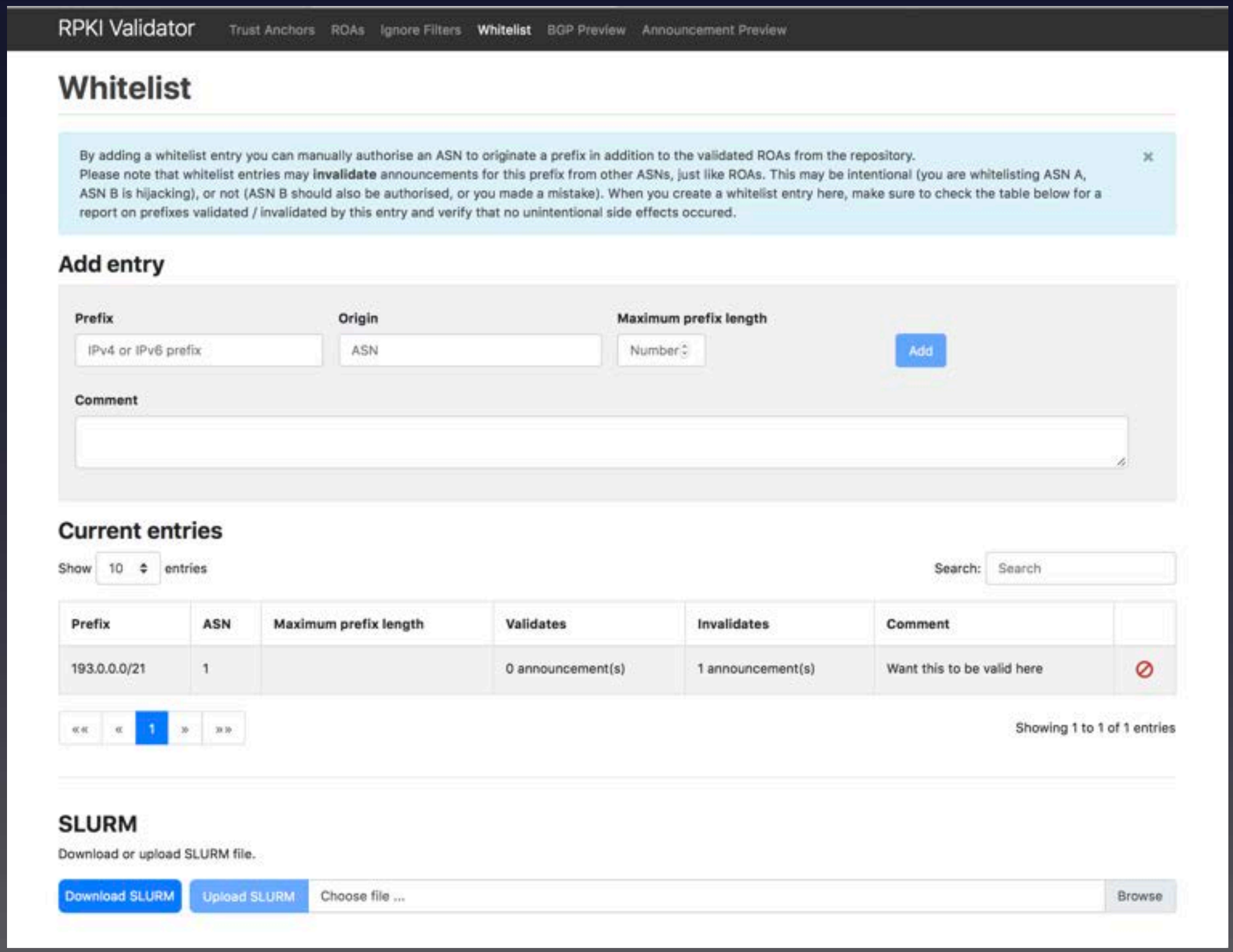
Give me a button! — When I validate



Search through validated ROAs



Manage local exceptions



Analyse any announcement

RPKI Validator Trust Anchors ROAs Ignore Filters Whitelist BGP Preview **Announcement Preview**

Announcement Preview

ASN: AS3333 **Prefix:** 193.0.0.0/21 **Status:** INVALID ASN

Relevant Validated ROAs

ASN	Prefix	Max Length	Source	URI	Status
AS1	193.0.0.0/21		Whitelist		INVALID ASN
AS3333	193.0.0.0/21	21	RIPE NCC RPKI Root	🔗	FILTERED VALID

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RPKI Validator references

- RIPE NCC RPKI Validator 2.24
  https://www.ripe.net/manage-ips-and-asns/resource-management/certification/tools-and-resources
- RIPE NCC RPKI Validator 3
  https://github.com/RIPE-NCC/rpki-validator-3/wiki
  - Release Candidate out NOW
  - Please try it! Your feedback is much appreciated
- Rcynic
  https://github.com/dragonresearch/rpki.net/
- RPSTIR
  https://github.com/bgpsecurity/rpstir

Questions

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