RIPE NCC
RIPE NETWORK COORDINATION CENTRE

Development in Routing Security

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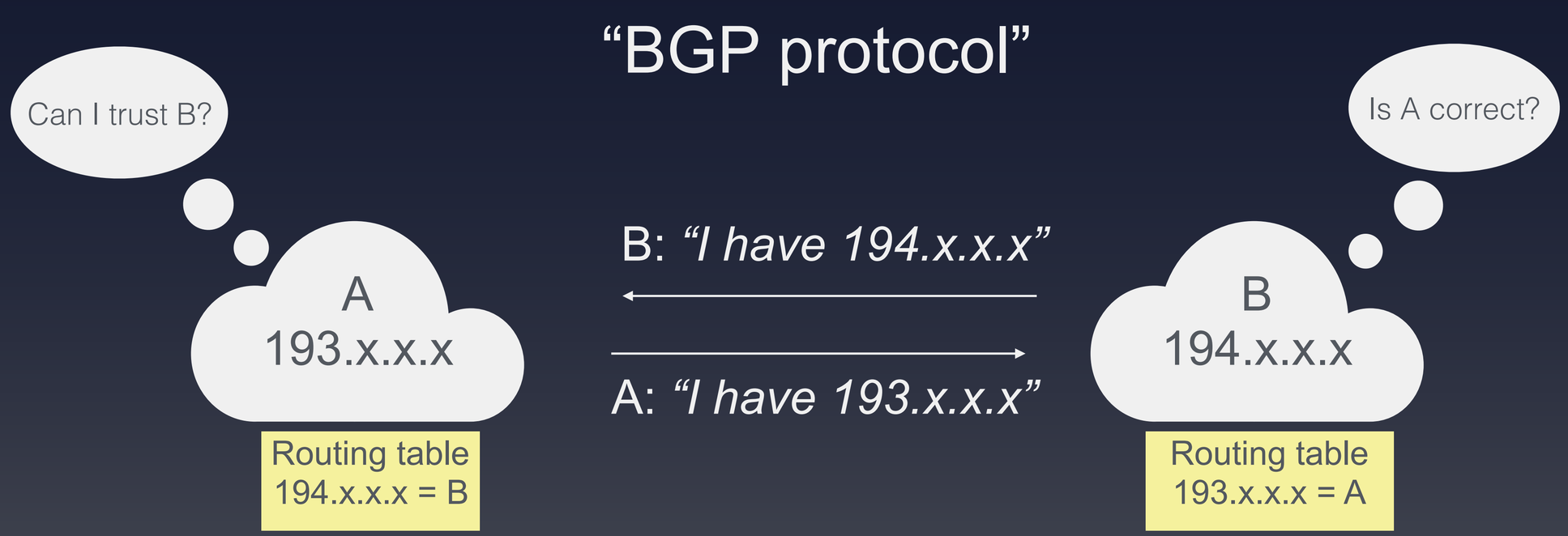
Who We Are

- We manage IP and ASN allocations in Europe, the Middle East and parts of Central Asia
  - Ensure unique holdership
  - Document holdership in the RIPE Database (whois)
  - Enable operators to document use of their address spaces

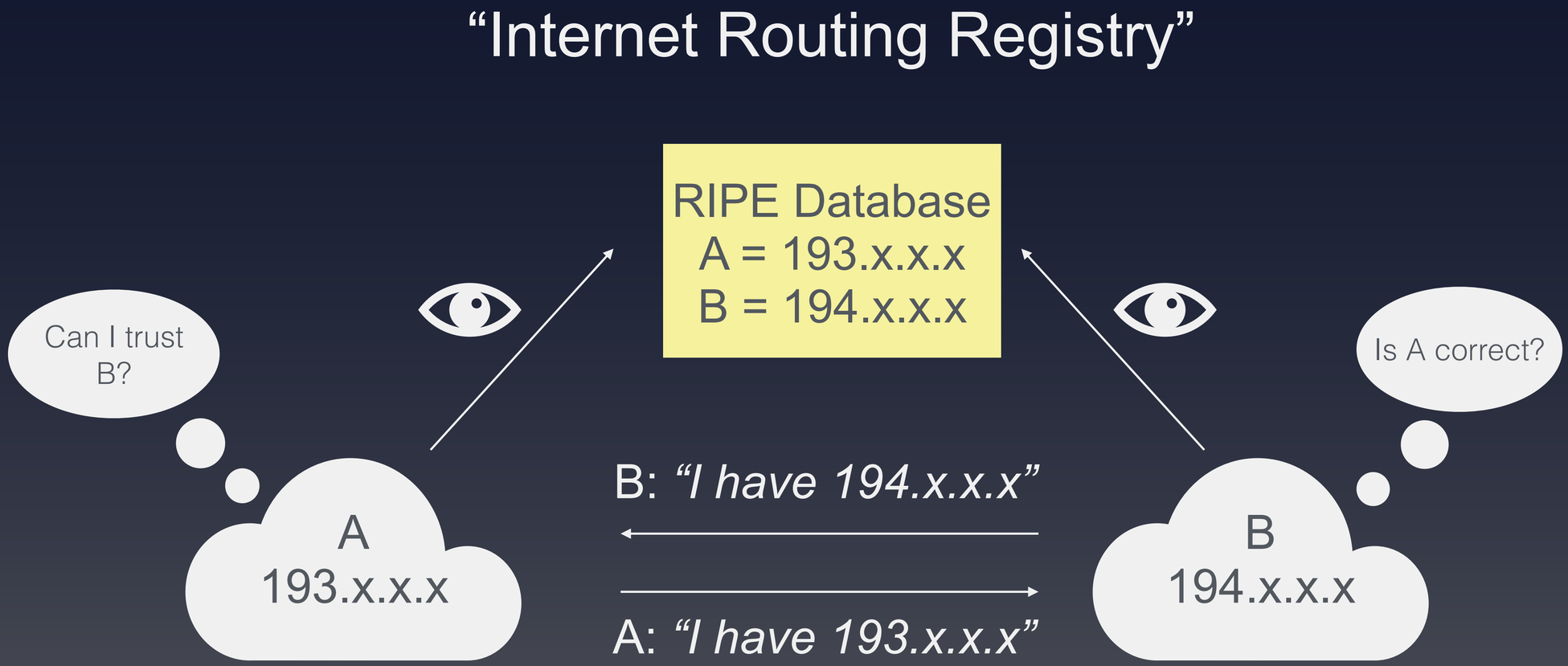
Routing Security is in Our DNA

- In 1994, RIPE-181 was the first document published that used a common language to describe routing policies
- We co-developed standards for IRR and RPKI
- We are one of the five RPKI Trust Anchors
- Our Validator tool was, until recently, the only production-grade tool to do Origin Validation

Routing on the Internet



How to Secure Routing?



Internet Routing

- Border Gateway Protocol
  - BGPv4, 1994
- The problem remains
  - No built-in security in BGP Protocol

Accidents Happen

- Fat Fingers
  - 2 and 3 are really close on our keyboards…
- Policy violations (leaks)
  - Oops, we did not want this to go to the public Internet
  - Infamous incident with Pakistan Telecom and YouTube

Or Worse…

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

Incidents Are Common

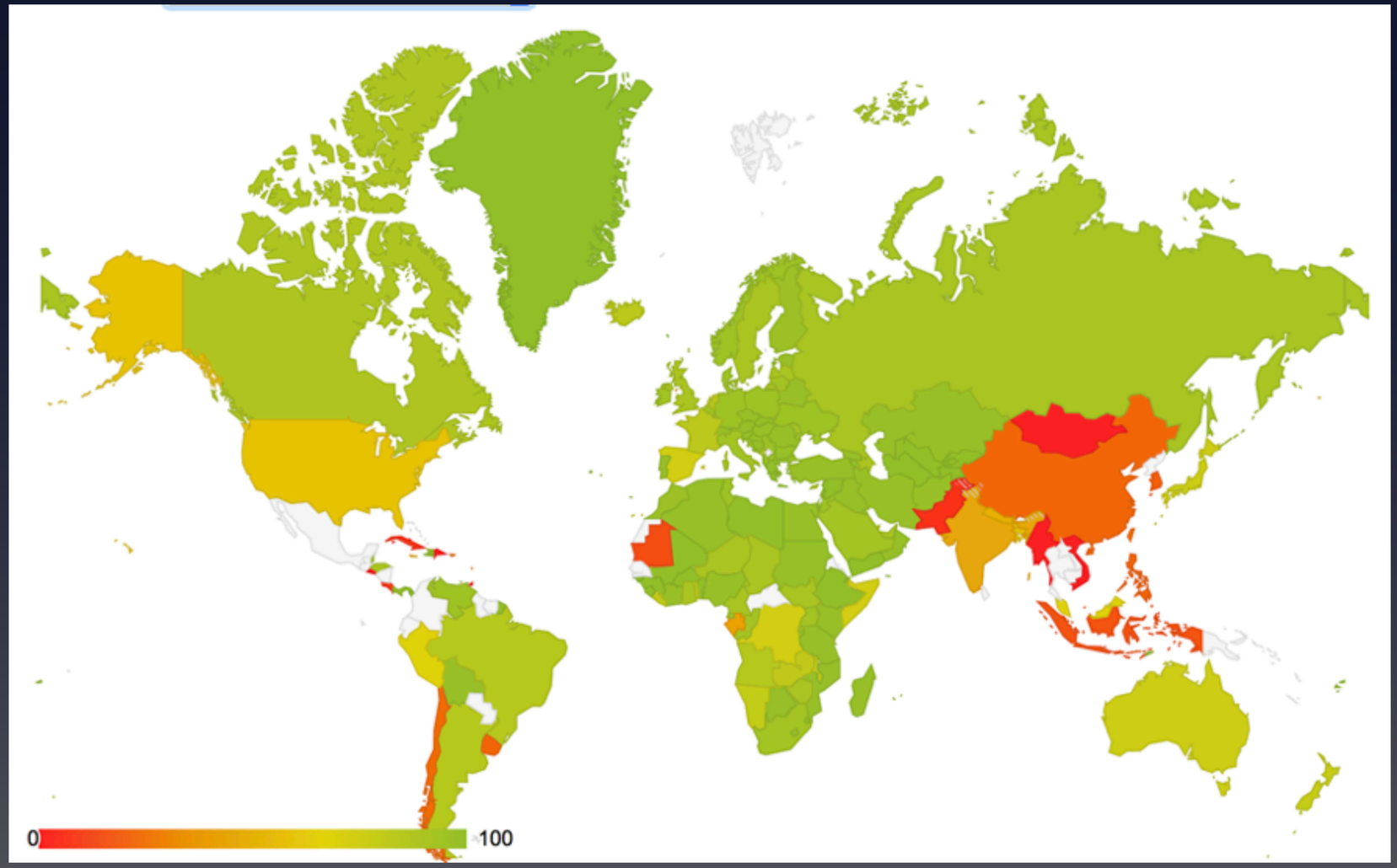
- **2017 Routing Security Review by the Internet Society**
  - 14k incidents
  - 10% of all ASNs affected
  - 3k ASNs victims of at least one incident
  - 1.5k ASNs caused at least one incident

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

Internet Routing Registry

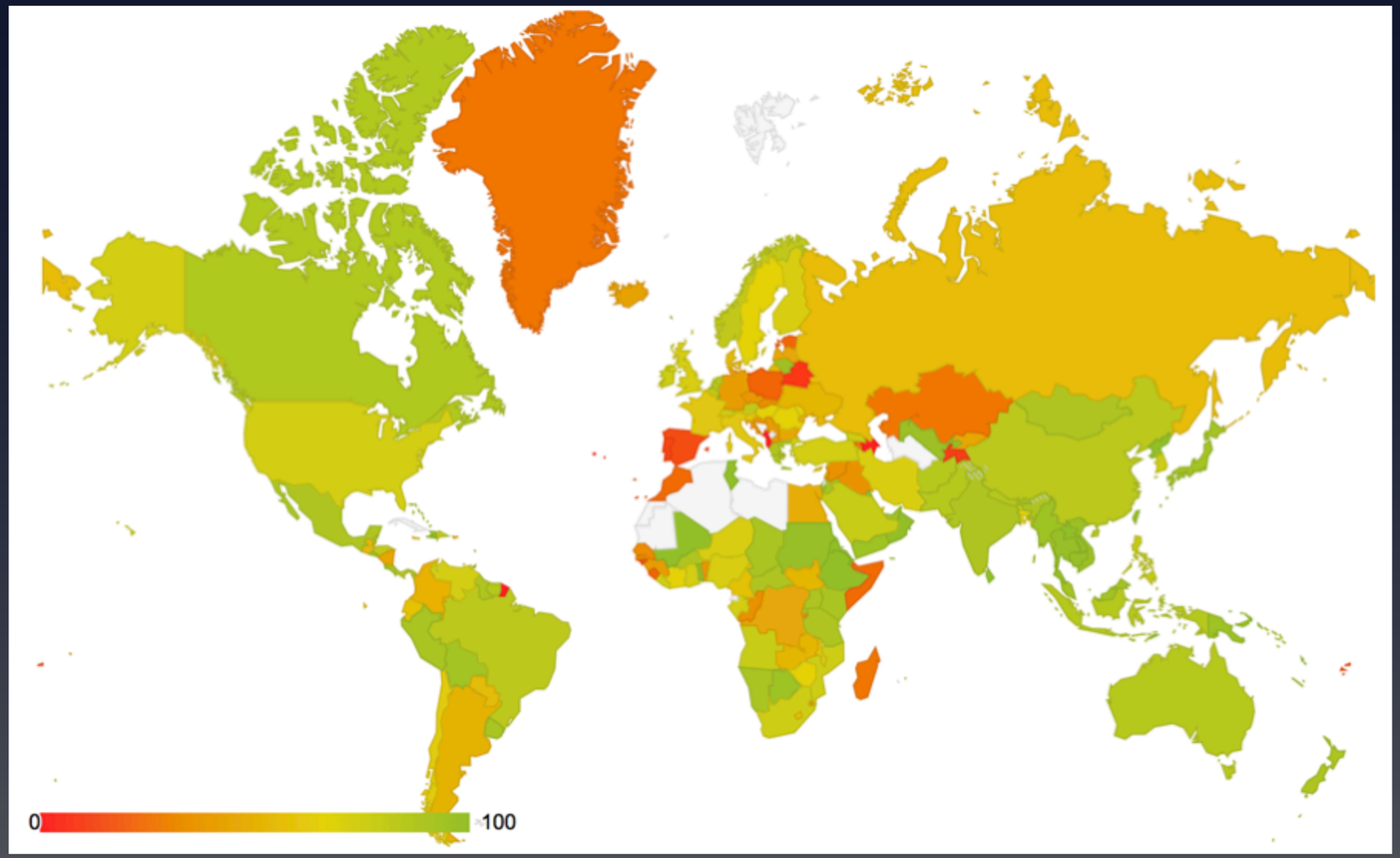
- Many exist, most widely used
  - RIPE Database
  - RADB
- Verification of holdership over resources
  - RIPE Database for RIPE region resources only
  - RADB allows paying customers to create any object
  - Lots of the other IRRs do not formally verify holdership

Accuracy - RIPE IRR



Accuracy - Valid announcements / covered announcements

Accuracy - RADB IRR



Accuracy - Valid announcements / covered announcements

Resource Public Key Infrastructure

- RPKI
  - 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

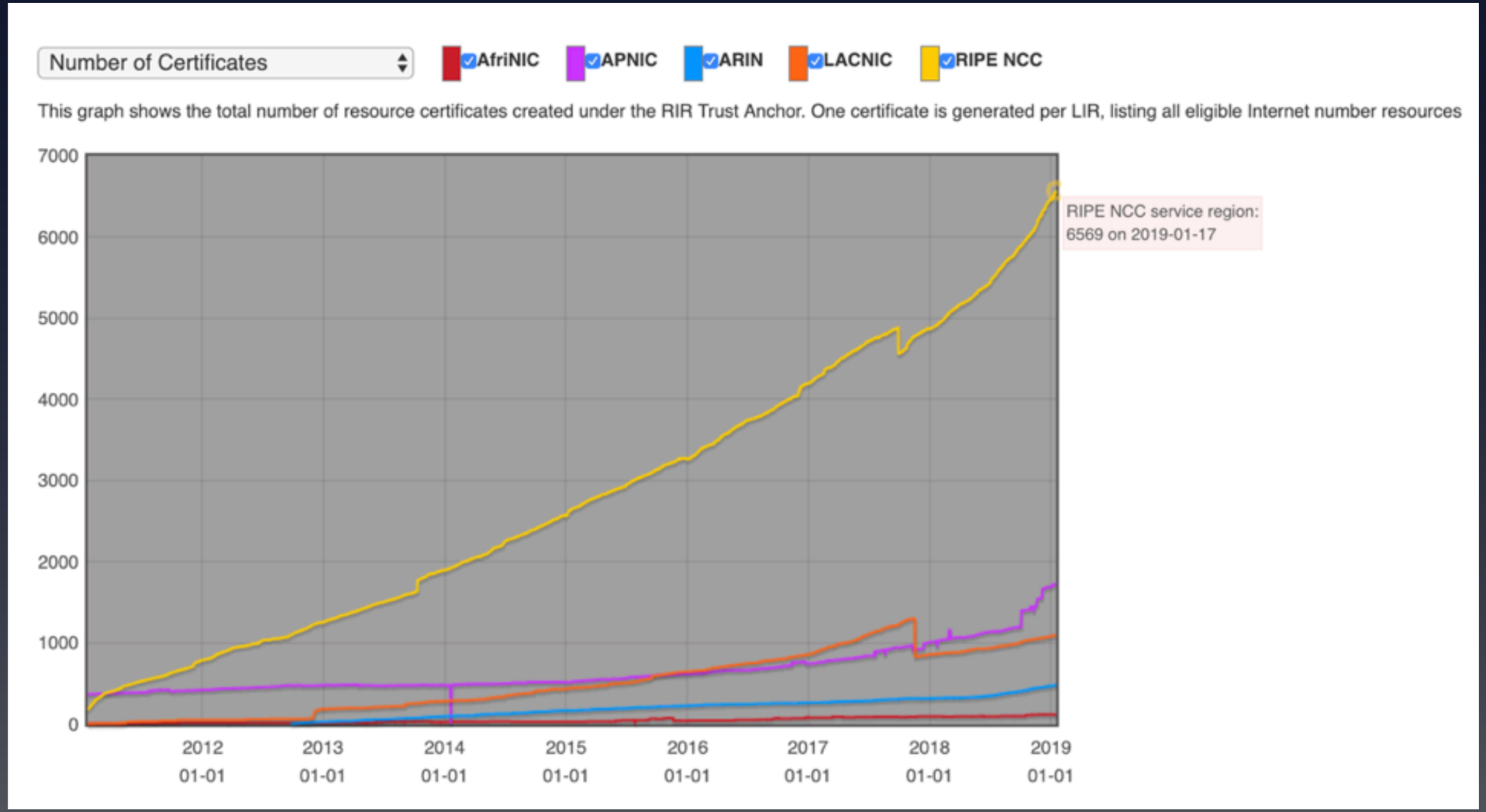
Resource Public Key Infrastructure

- Operated since 2008 by all RIRs
  - Community-driven standardisation (IETF)
  - IRR was not sufficient (incomplete, incorrect)
- Adds crypto-security to Internet Number Resources

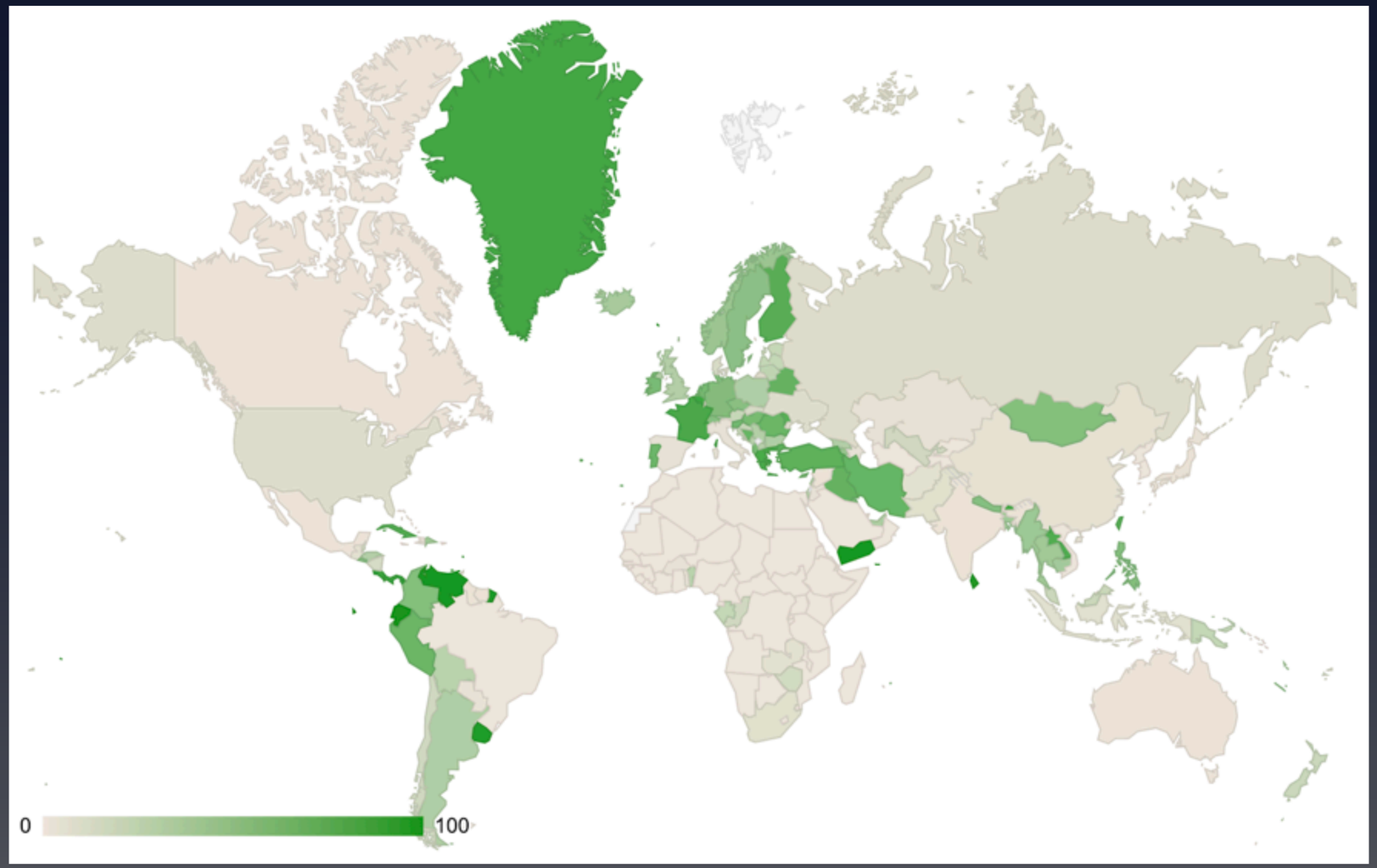
Operators Are In Control

- We show member announcements
  - Member chooses to authorise or not
  - Does not need to worry about the crypto
  - It is 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

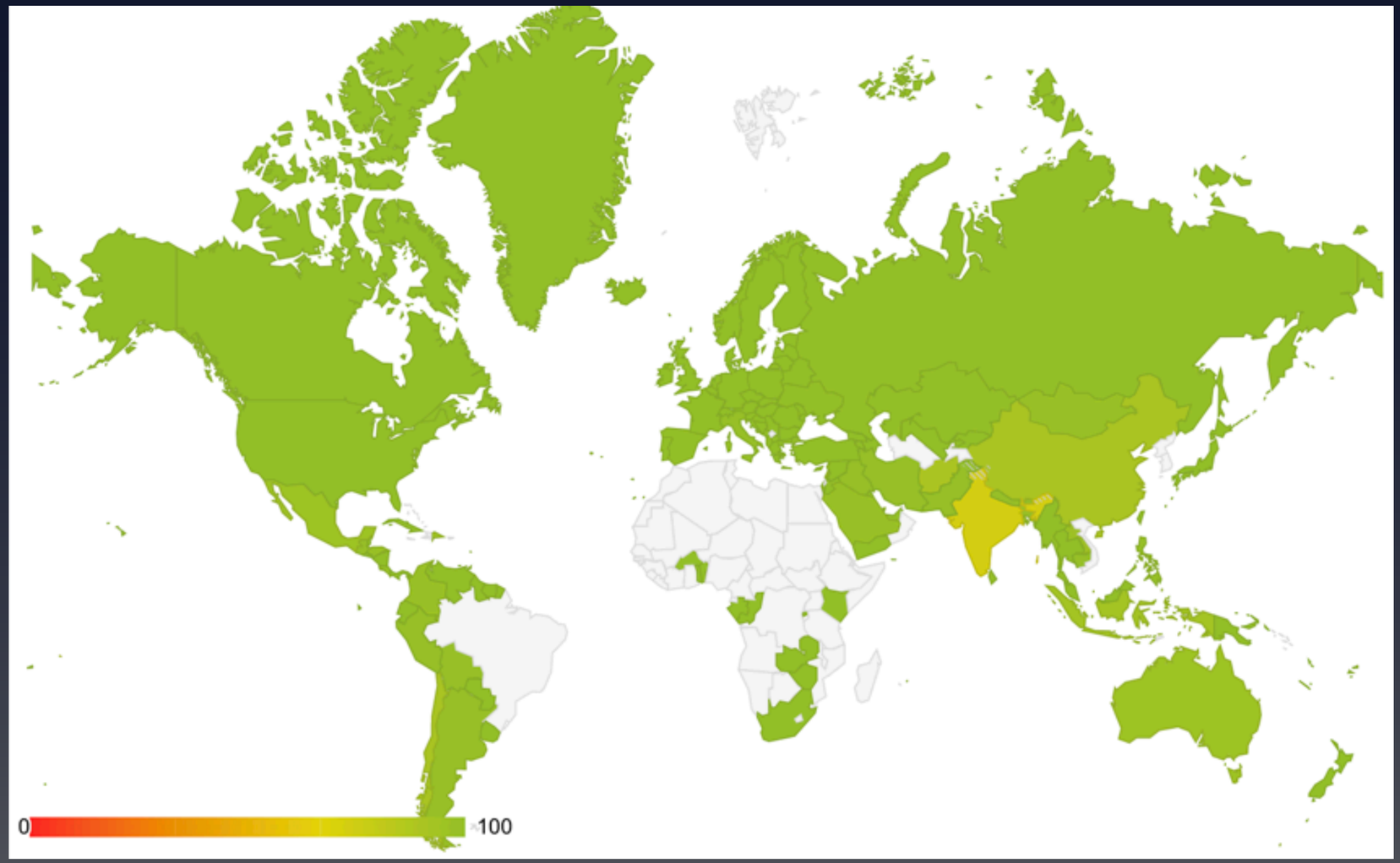
Certificates



Coverage - RPKI (all RIRs)



Accuracy - RPKI (all RIRs)



IPv4 addresses in valid announcements / covered announcements

RPKI in some European countries

Country	% Addreses	Accuracy
BE	**78%**	**100,0%**
SI	54%	100,0%
NL	53%	99,9%
DE	48%	99,9%
IE	52%	99,9%
FI	41%	99,9%
SE	43%	99,9%
GB	26%	99,8%
GR	72%	99,8%
ES	2%	99,7%
IT	**3%**	**99,0%**

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

The Road Ahead

- Ensure resiliency and stability of RPKI core
- Provide information and statistics
- Keep the focus on usability
- Policy work on improving IRR data

Making the Difference

- Is routing security on your agenda?
- Initiate the conversation with providers
- Are you leading by example?

Questions

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