RPKI for Secure Routing

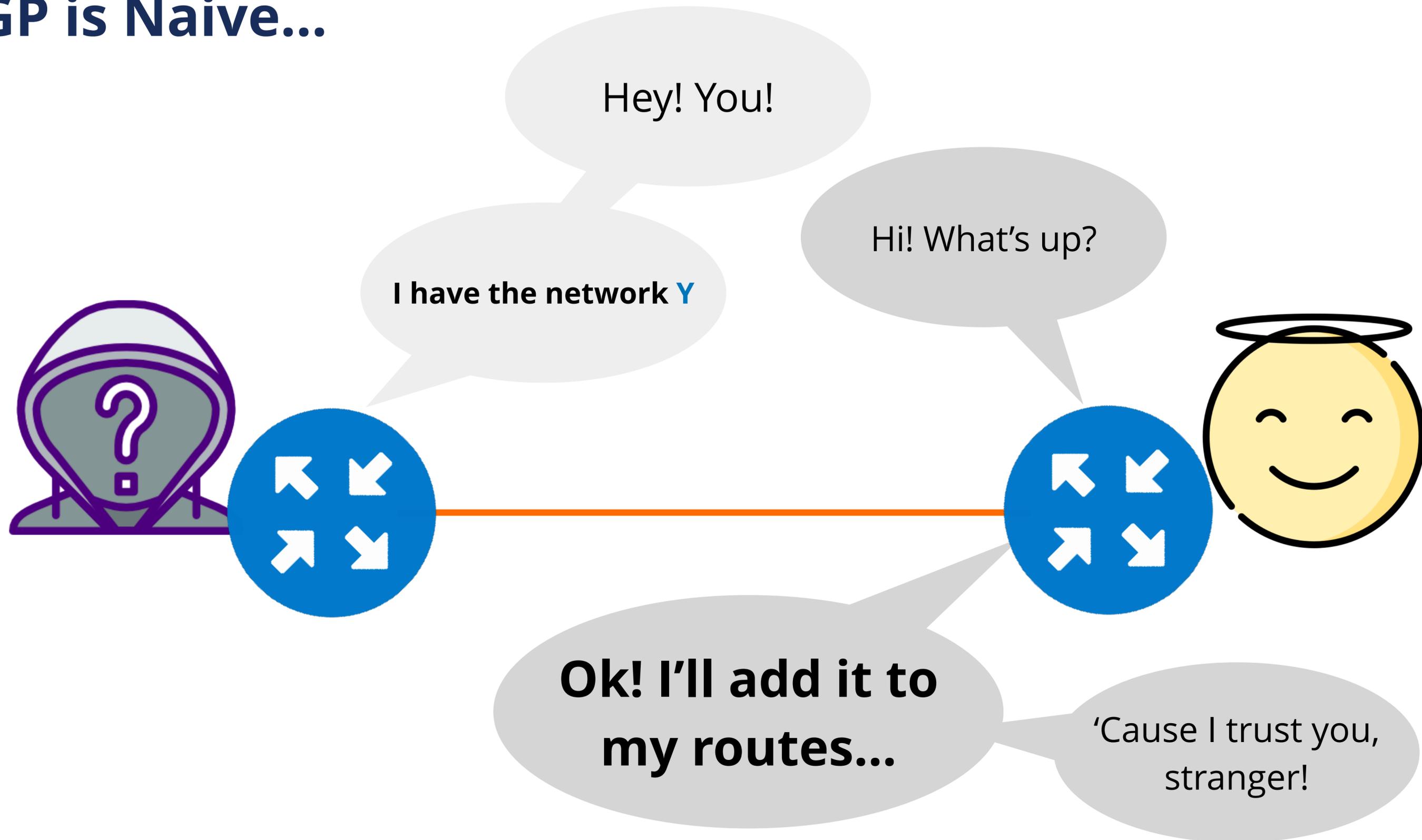Brief introduction and some statistics

Presentation

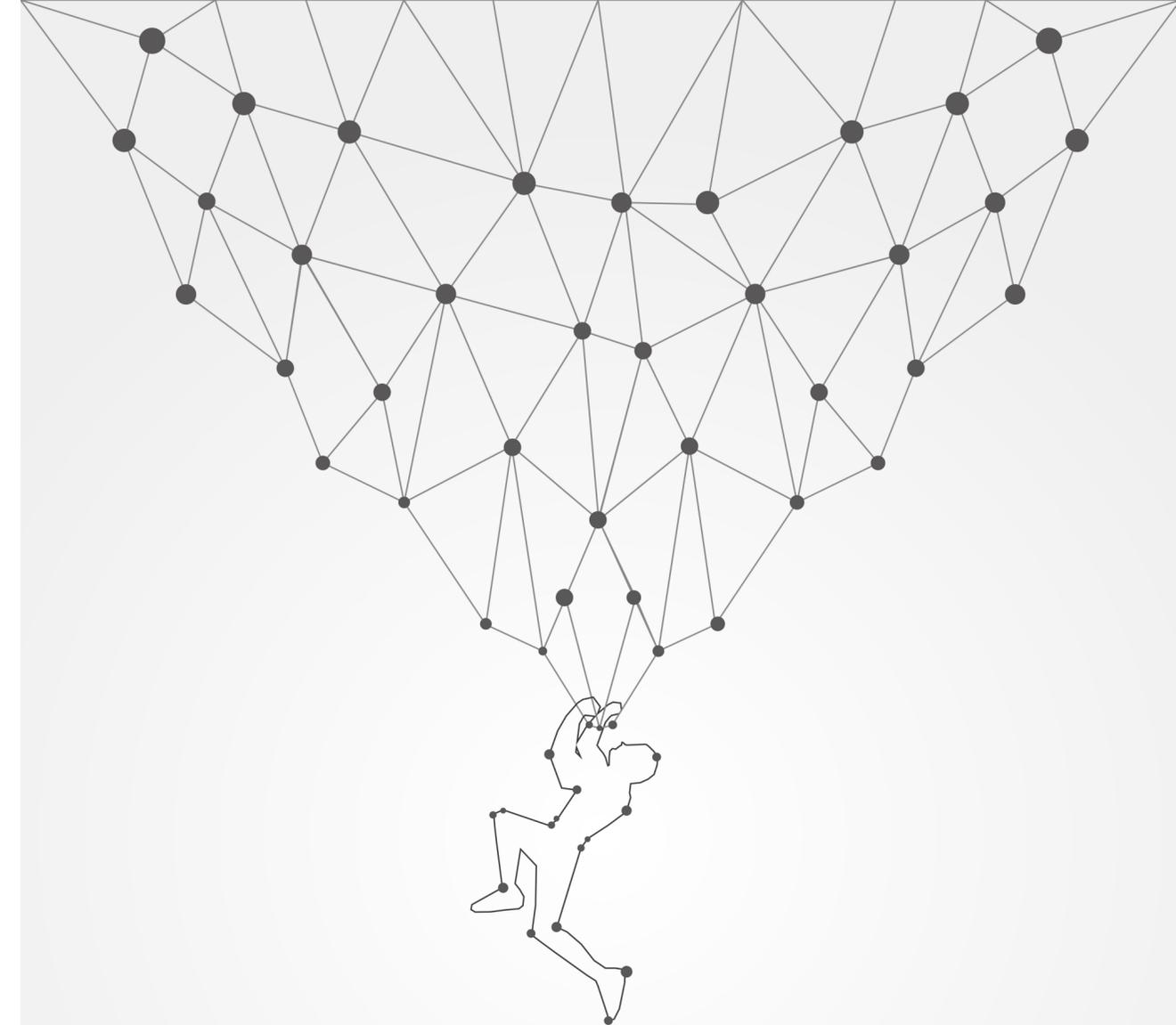**Gerardo Viviers - RIPE NCC**

About Routing Security

Brief Intro to RPKI

BGP is Naive…

Routing Incidents

- **Typing errors**

    - Also known as "fat fingers"

    - 2 and 3 are really close on our keyboards...

- **Routing policy violations**

    - Leaks, filtering misconfigurations

    - "We didn't mean this to go to the public Internet"

- **Malicious attacks**

    - Route manipulation, BGP hijack, BGP DDOS
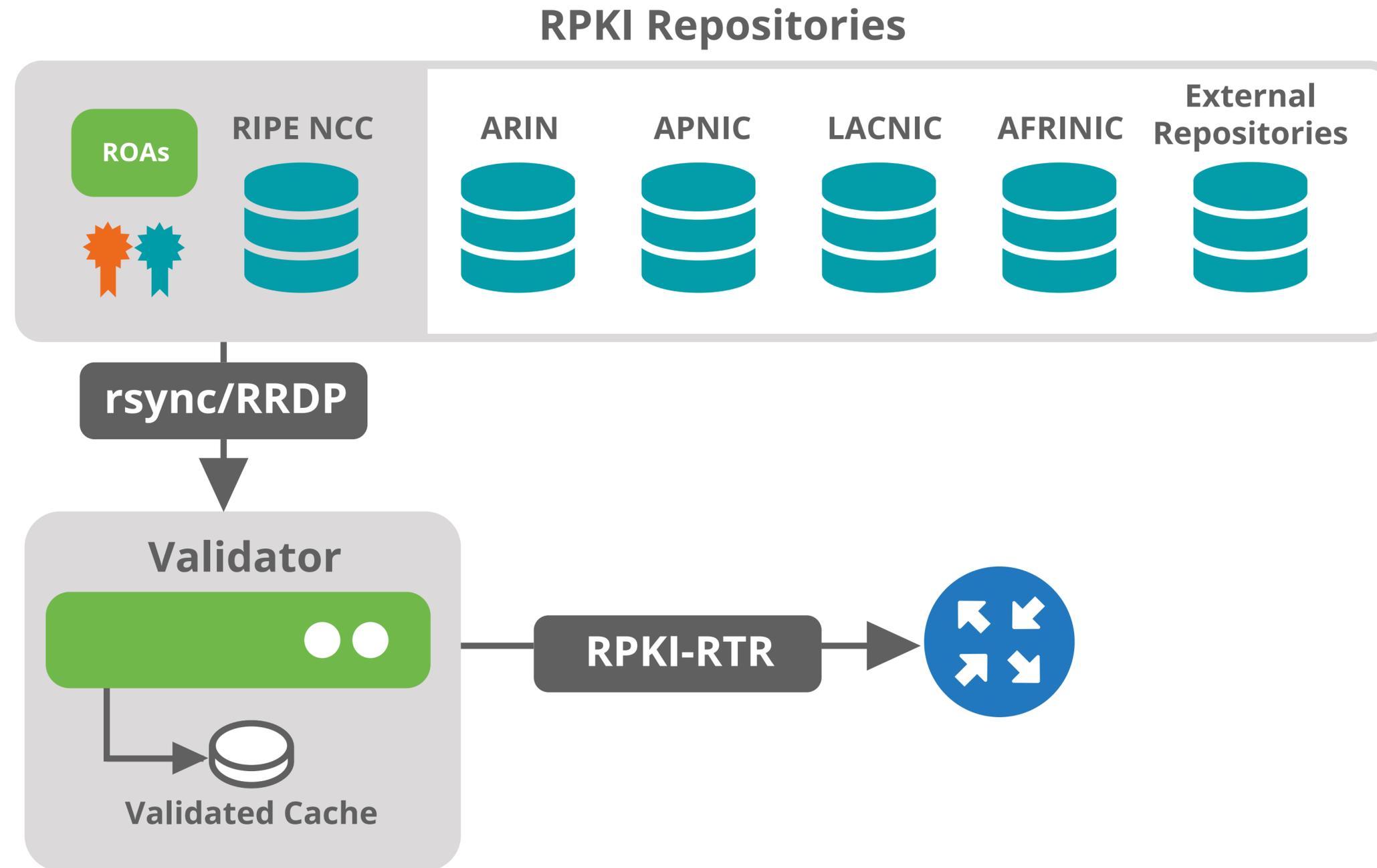
If Only We Could Do Something...

You Can Do Something!

- **Filter Routes** based on:

  - Best practices

  - Internet Routing Registry

  - **RPKI**

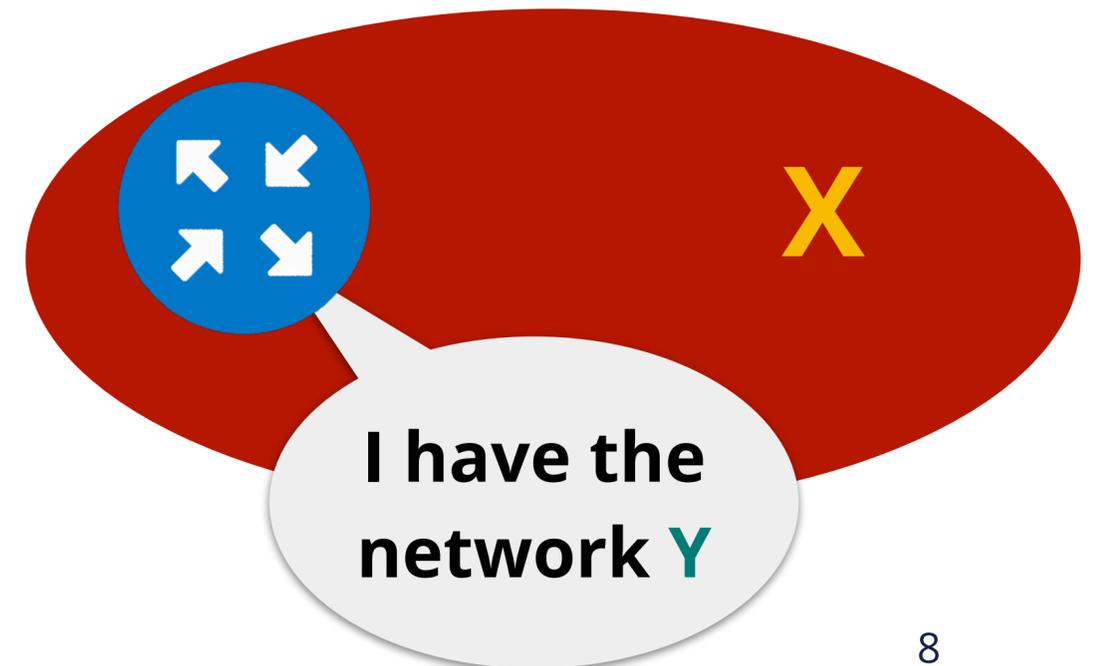- All recommendations from **MANRS**

RPKI System

RPKI Repositories

ROAs

RIPE NCC ARIN APNIC LACNIC AFRINIC External Repositories

rsync/RRDP

Validator

RPKI-RTR

Validated Cache

Routing Security using RPKI
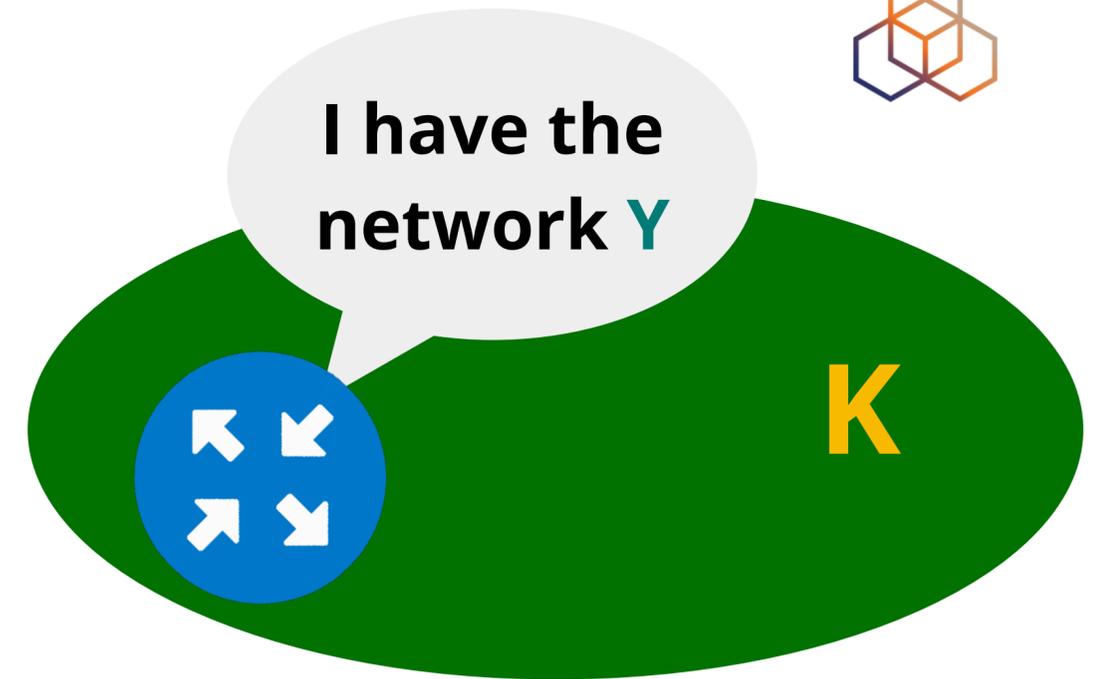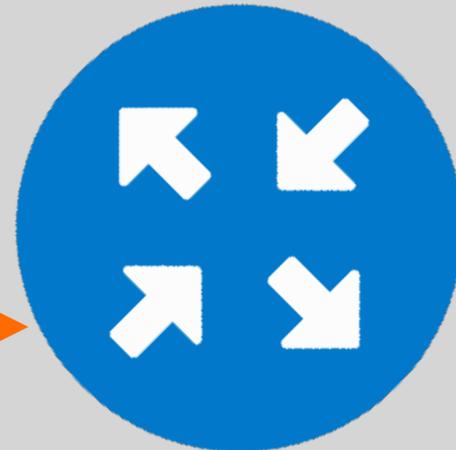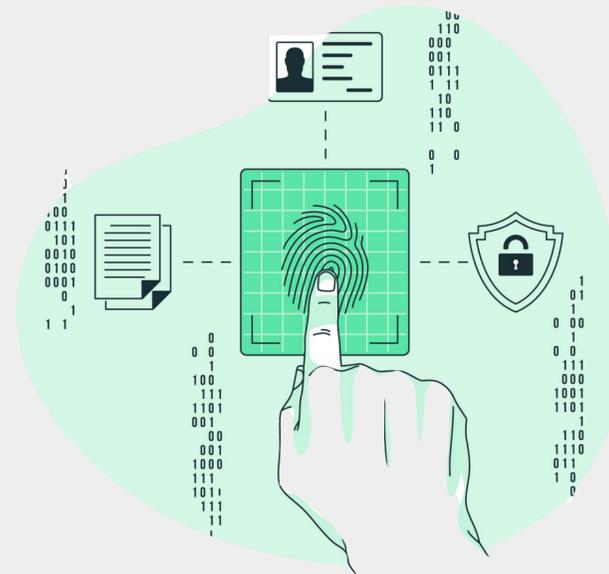
RPKI Benefits

Proof of origin

Cryptographic identity verification

Route hijacking prevention

RPKI versus IRR?

- If we compare **ROAs** and **route(6)** objects...

  - What percent of prefixes is in the IRR?

  - How many are covered by ROAs?

- IRR is **not maintained** very well

- RPKI has advantage of **all five RIRs supporting it**
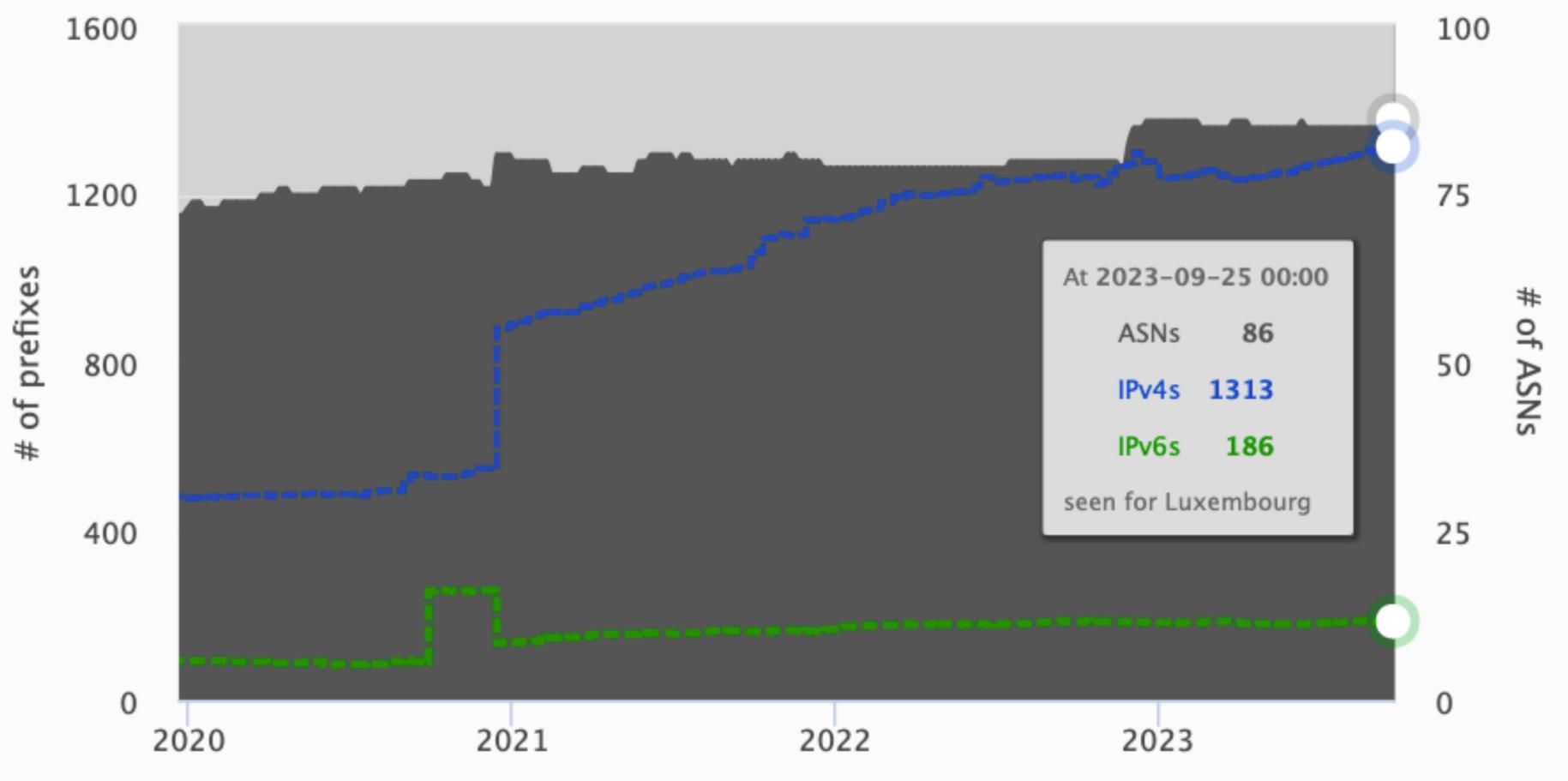
Statistics
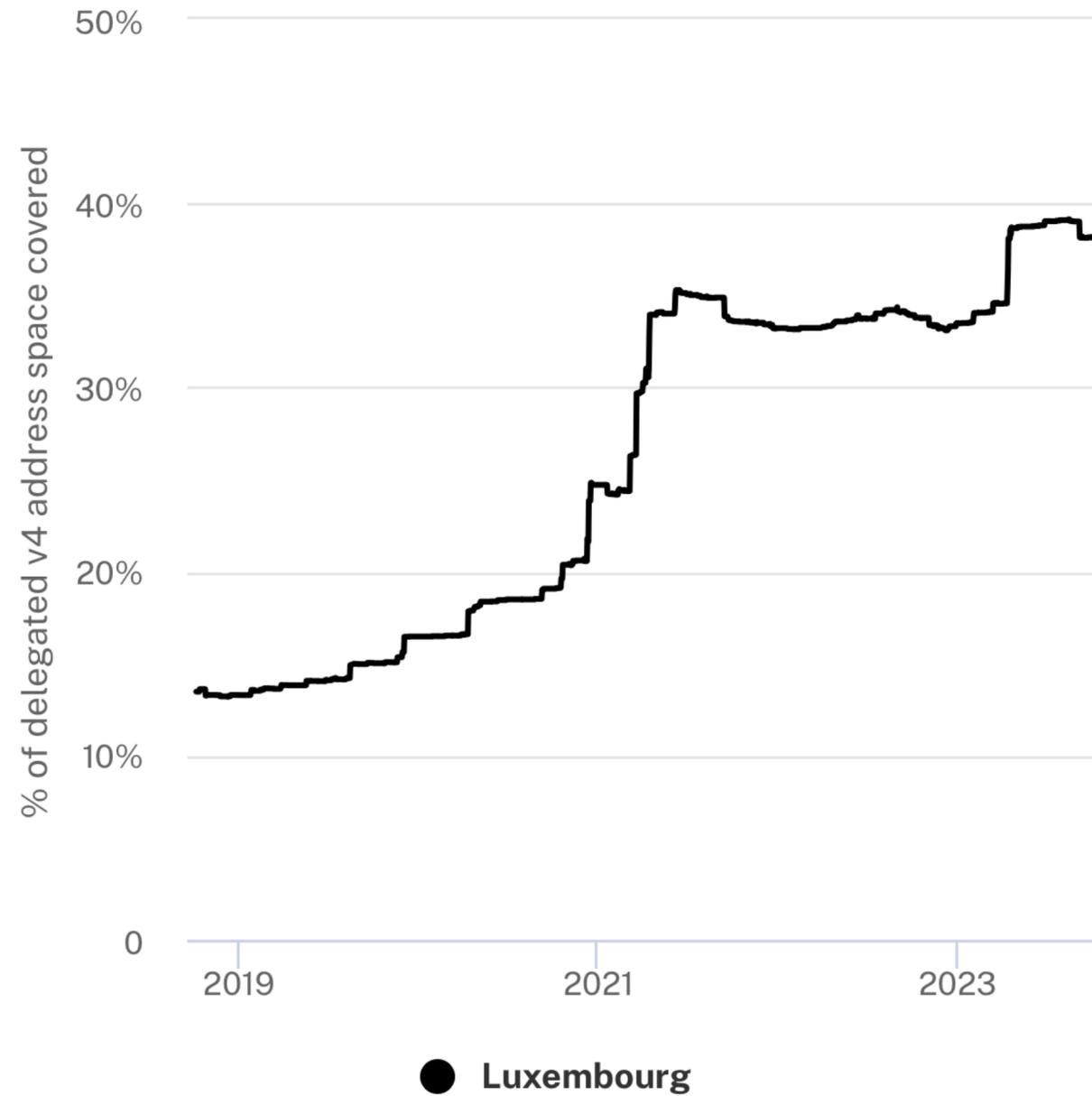
To Understand Better

Routing Statistics Luxembourg

At 2023-09-25 00:00

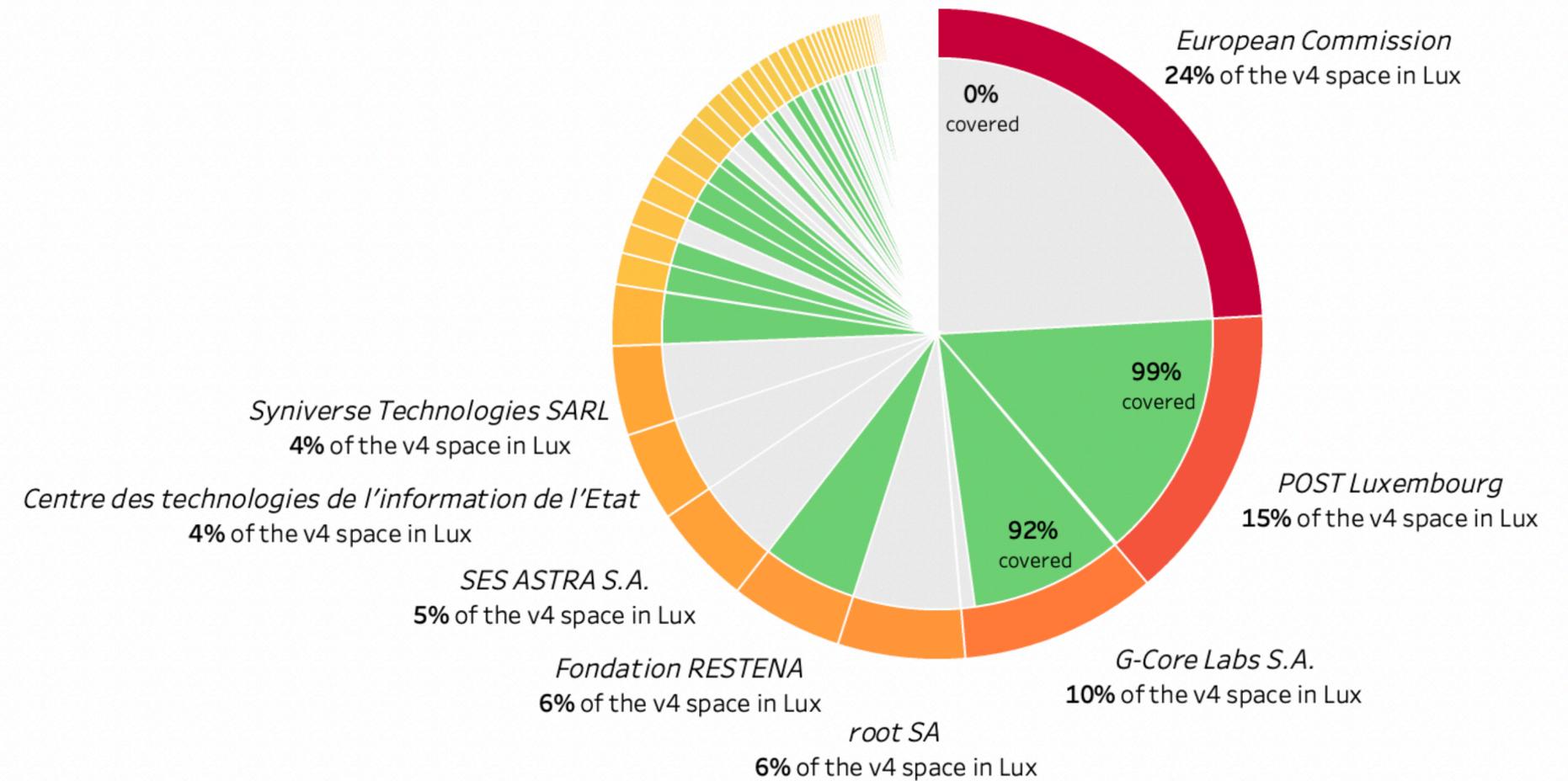ASNs   86

IPv4s   1313

IPv6s   186

seen for Luxembourg

Source: RIPEstat

ASNs: 86

IPv4:   1313

IPv6:   186

RPKI in Luxembourg

ROA Coverage

European Commission
24% of the v4 space in Lux

0% covered

99% covered

92% covered

POST Luxembourg
15% of the v4 space in Lux

G-Core Labs S.A.
10% of the v4 space in Lux

root SA
6% of the v4 space in Lux

Fondation RESTENA
6% of the v4 space in Lux

SES ASTRA S.A.
5% of the v4 space in Lux

Syniverse Technologies SARL
4% of the v4 space in Lux

Centre des technologies de l'information de l'Etat
4% of the v4 space in Lux

% of delegated v4 address space covered

50%
40%
30%
20%
10%
0

2019   2021   2023

● **Luxembourg**

Neighbour countries comparison

% of IPv4 covered by ROAs

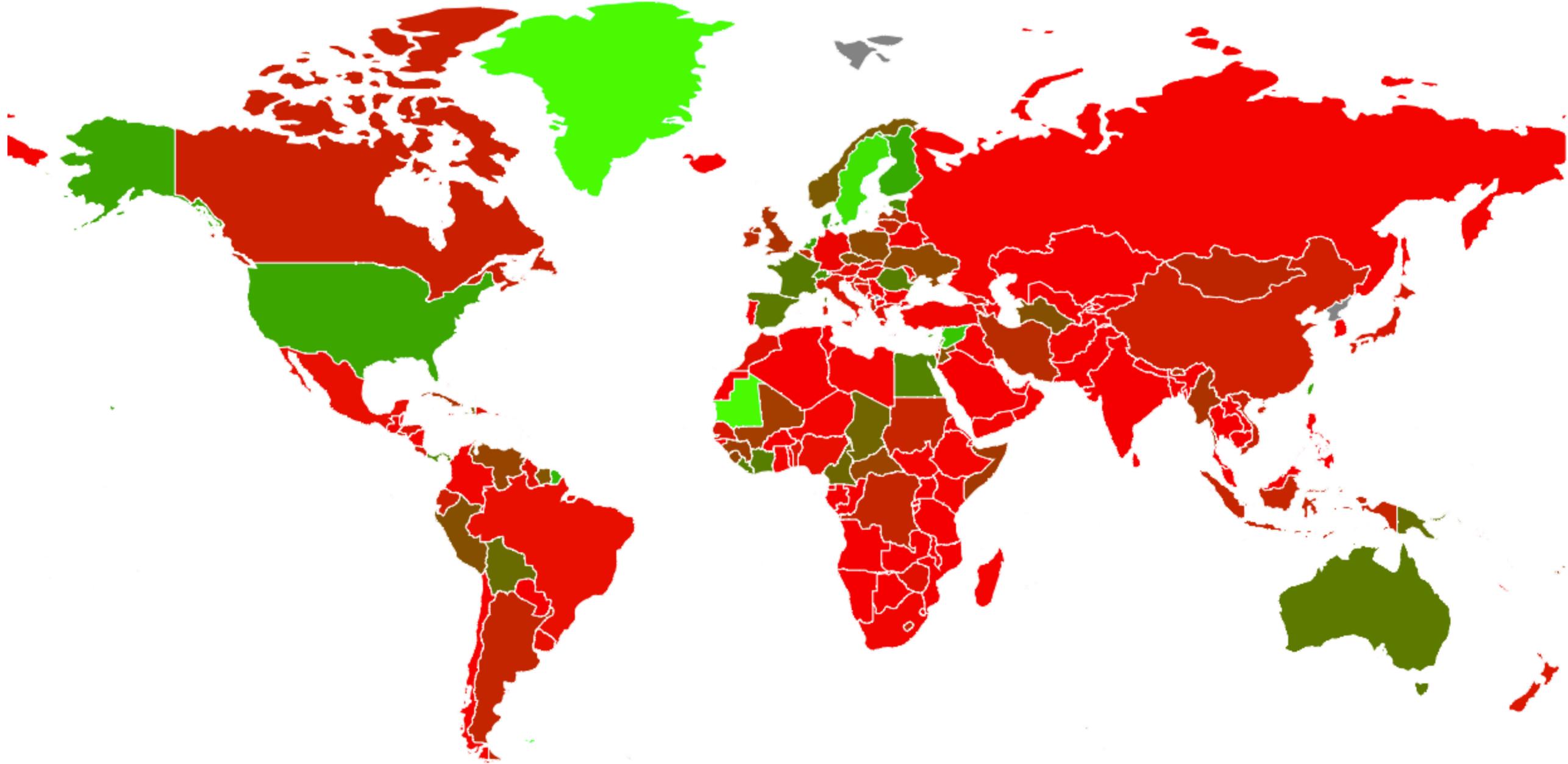| FRANCE	GERMANY	BELGIUM	SWITZERLAND	LUXEMBOURG
82%	79%	71%	55%	46%
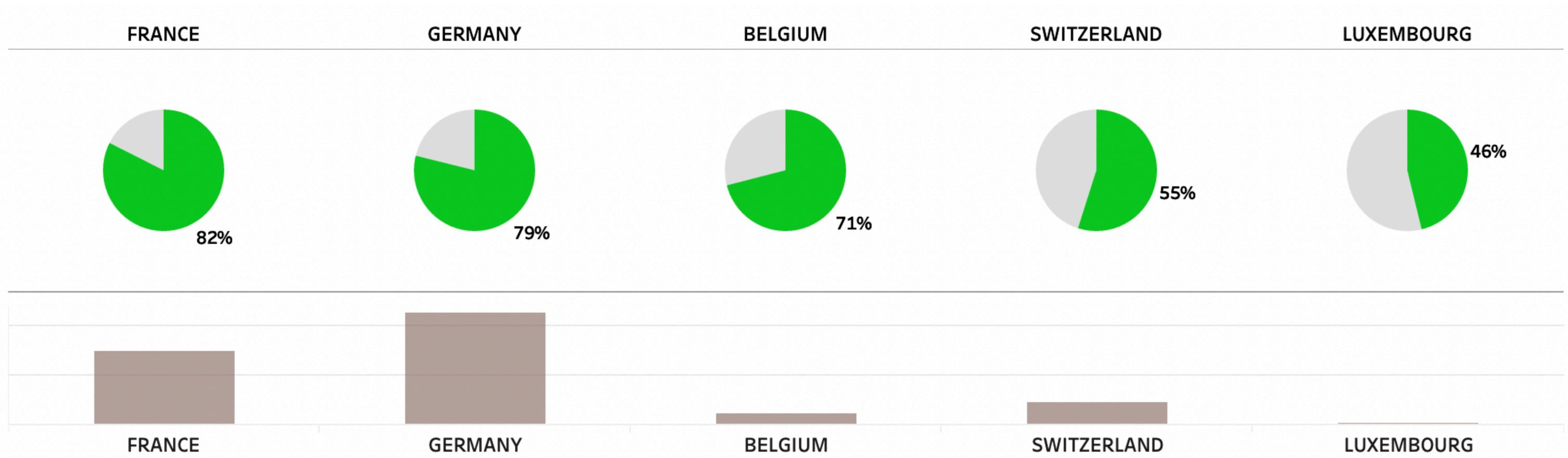
Amount of IPv4 address space

What about Route Origin Validation?

- **Creating ROAs** is only half the job…

- **Comparing against BGP** is the other half!

- This is what **ROV** is all about

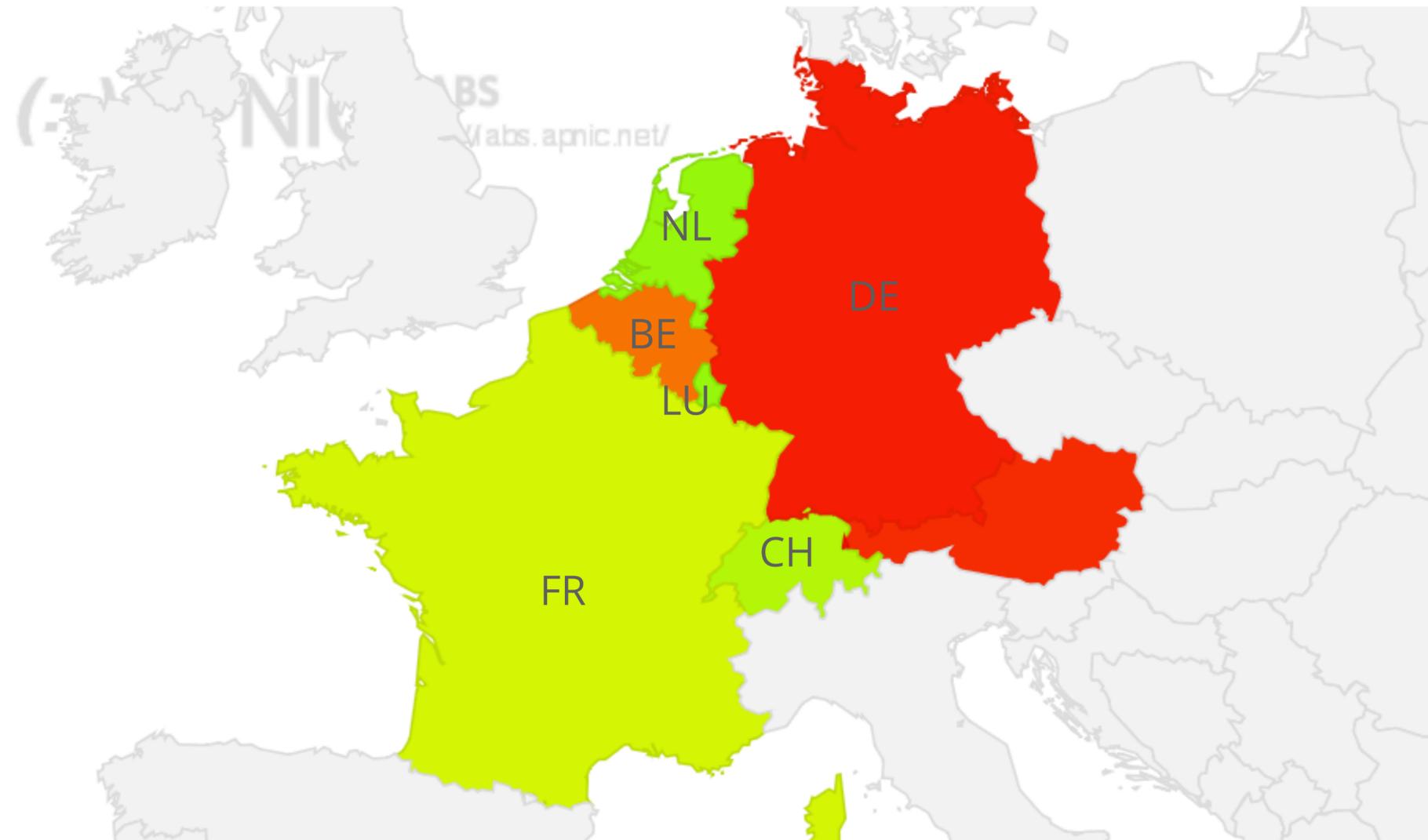- **You decide** what to do with the announcements

World Stats on ROV

Source: APNIC

Regional Stats on ROV

Country	RPKI Validates
Netherlands (NL)	71.95%
Luxembourg (LU)	65.96%
Switzerland (CH)	63.84%
France (FR)	56.59%
Belgium (BE)	22.49%
Germany (DE)	5.90%

Source: APNIC

Few ROAs, Many ROVs

- Address space is being covered by ROAs

- But not all address space...

- **Why not? What are the obstacles?**

- **The goal is to have 100% implementation of RPKI in every network**

- **End result should be a more secure Internet**

Questions

gviviers@ripe.net