

# BGP, DNS and routing in Ireland

A current snapshot

Massimiliano Stucchi - INEX Meeting - 14th December 2023

# Who am I ?

- Past RIPE NCC and Internet Society
- CHIX and IXP.ge NOC
- RIPE PC, Euro-IX PC, DKNOG PC
- SwiNOG Board
- Italian FreeBSD Users Group (GUFI)
- Run AS58280



# What is this talk about ?

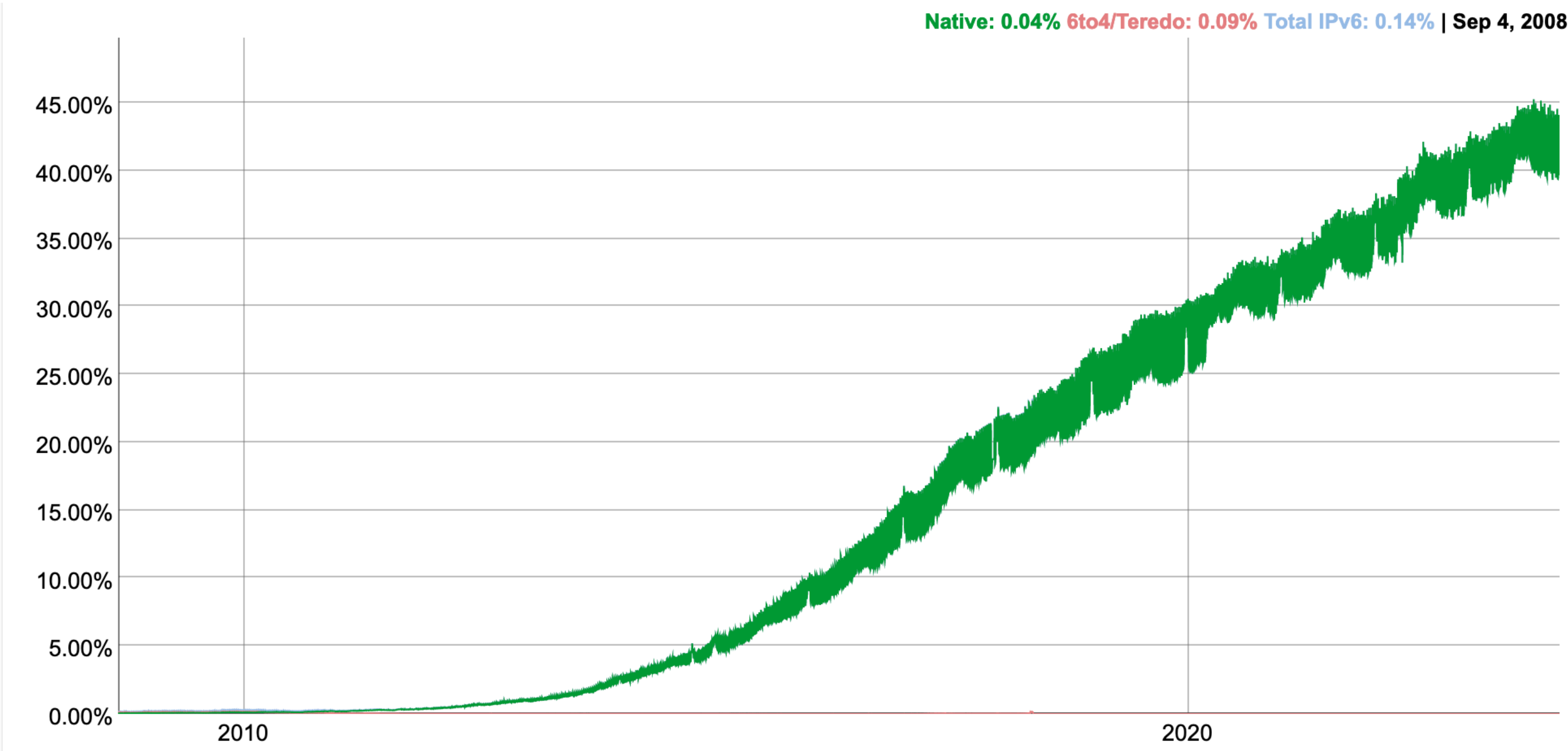
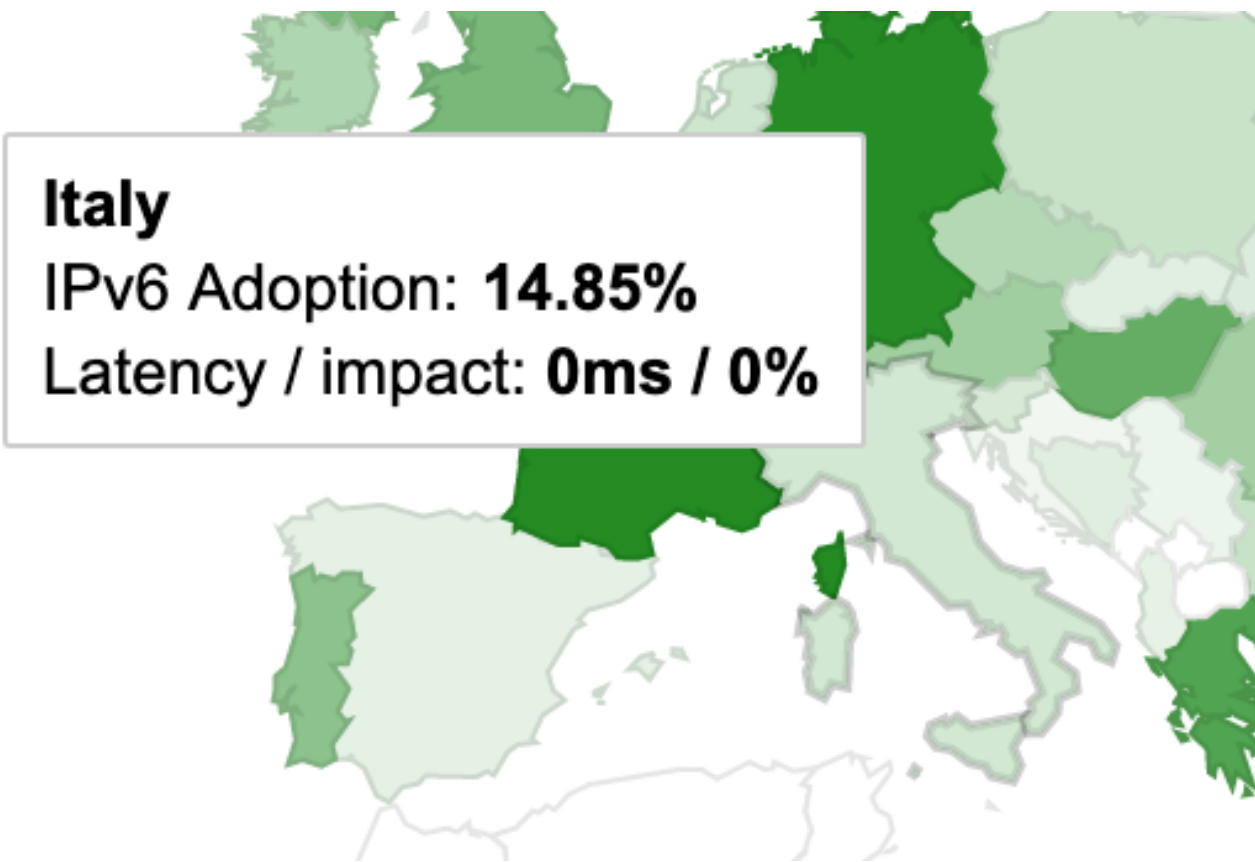
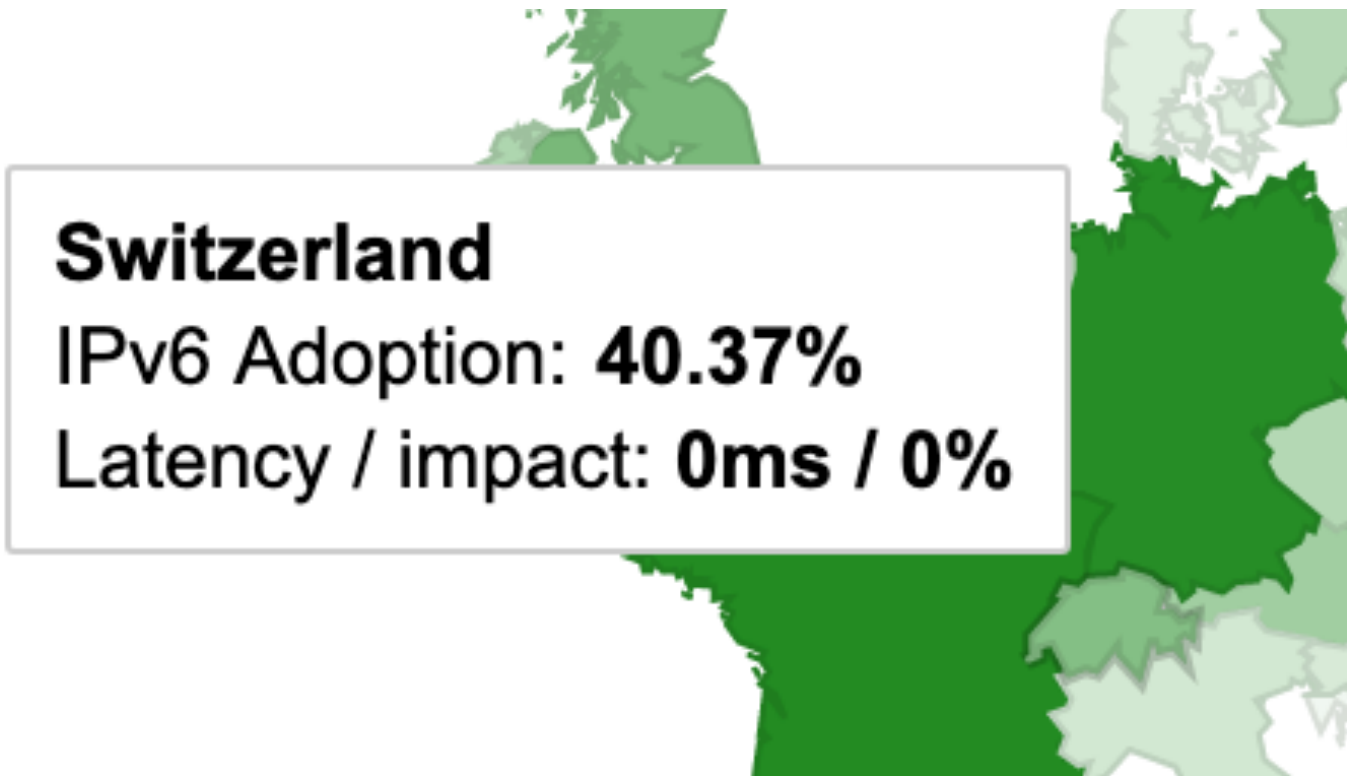
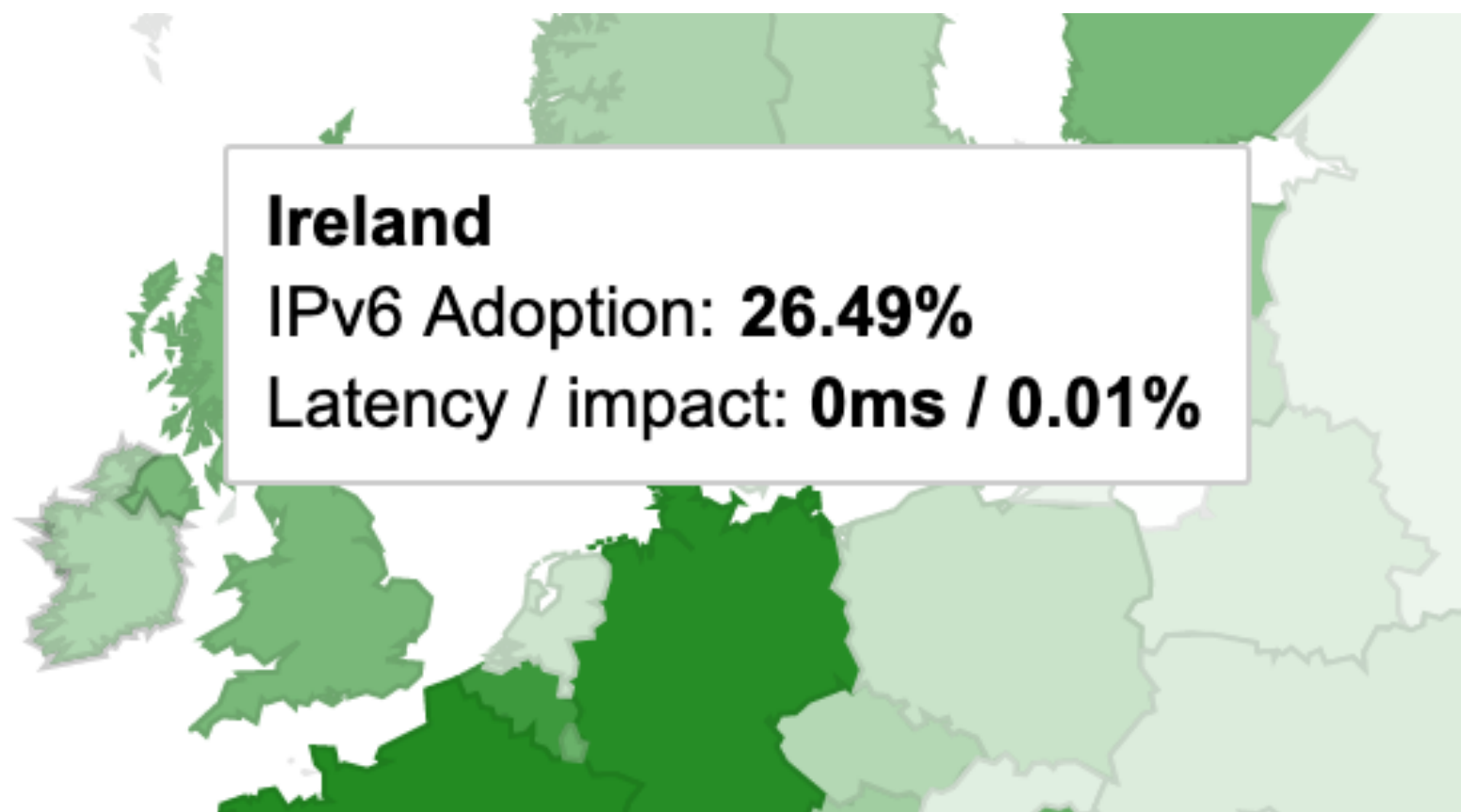
- Data that is mostly available publicly
  - And interpretation
- Data I collected
  - Or built tools to collect
- Some personal additions

# Comparing three countries

- Ireland
- Italy
- Switzerland

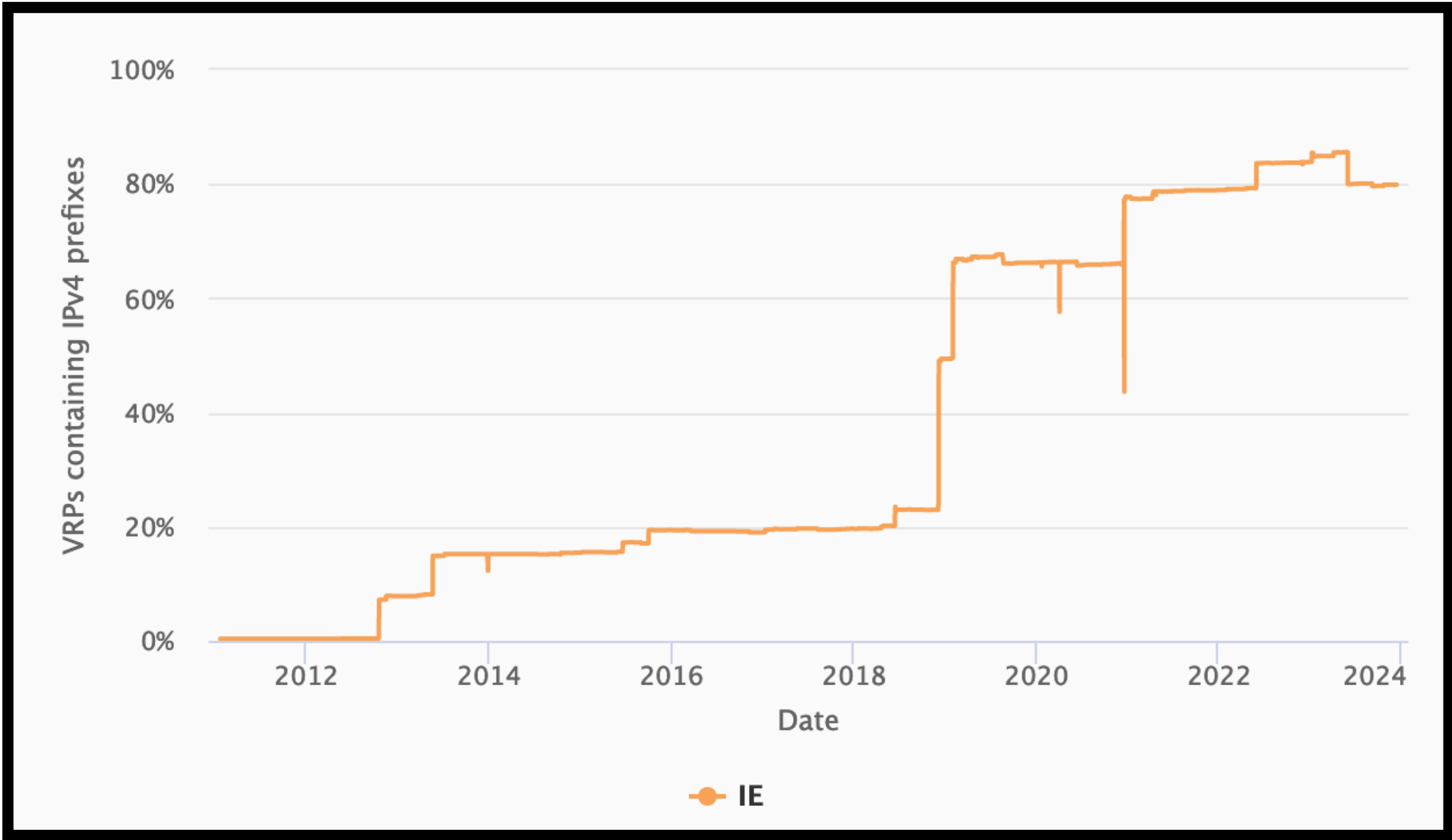


# IPv6

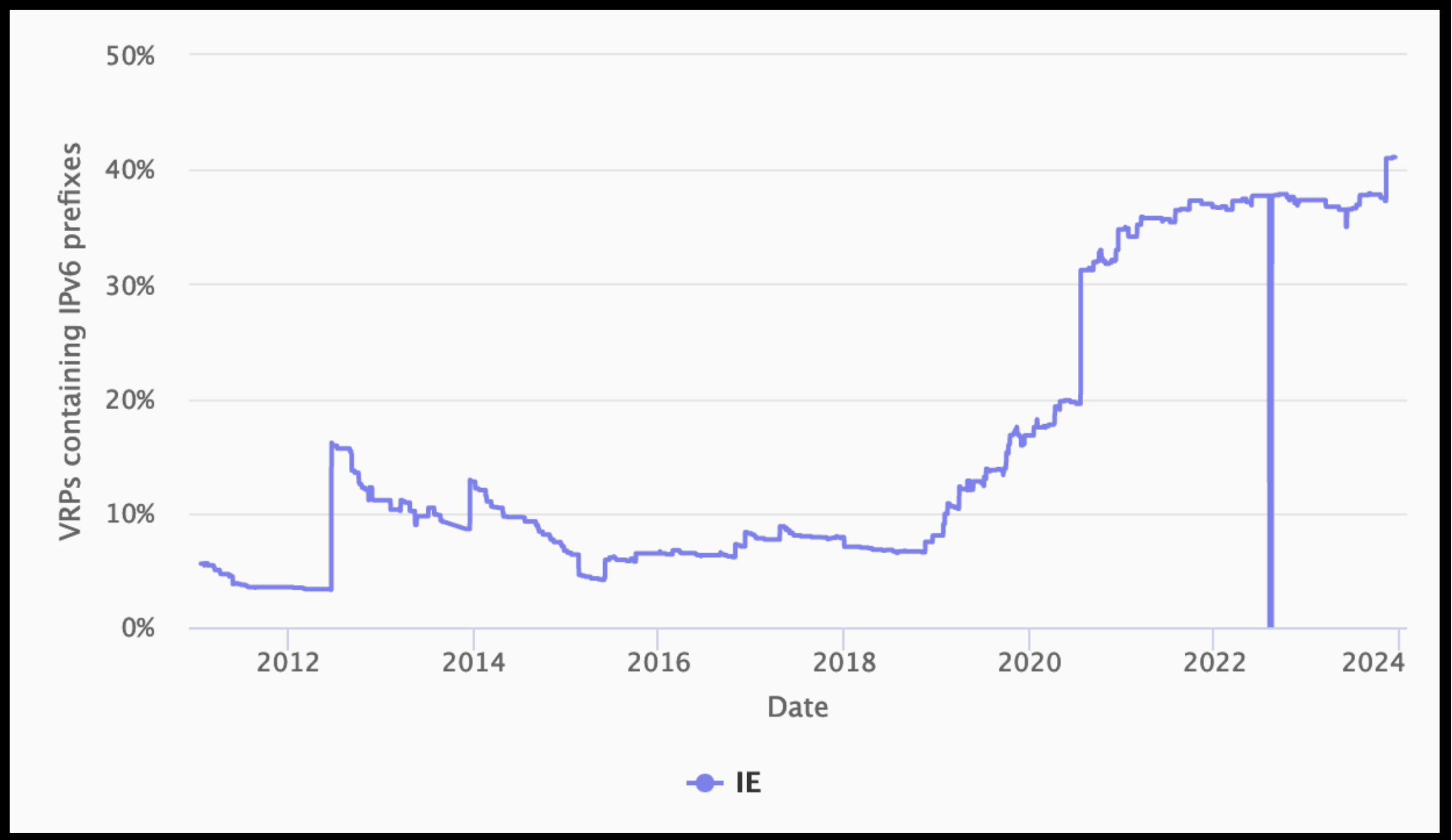


<https://www.google.com/ipv6>

# RPKI - ROAs



IPv4



IPv6

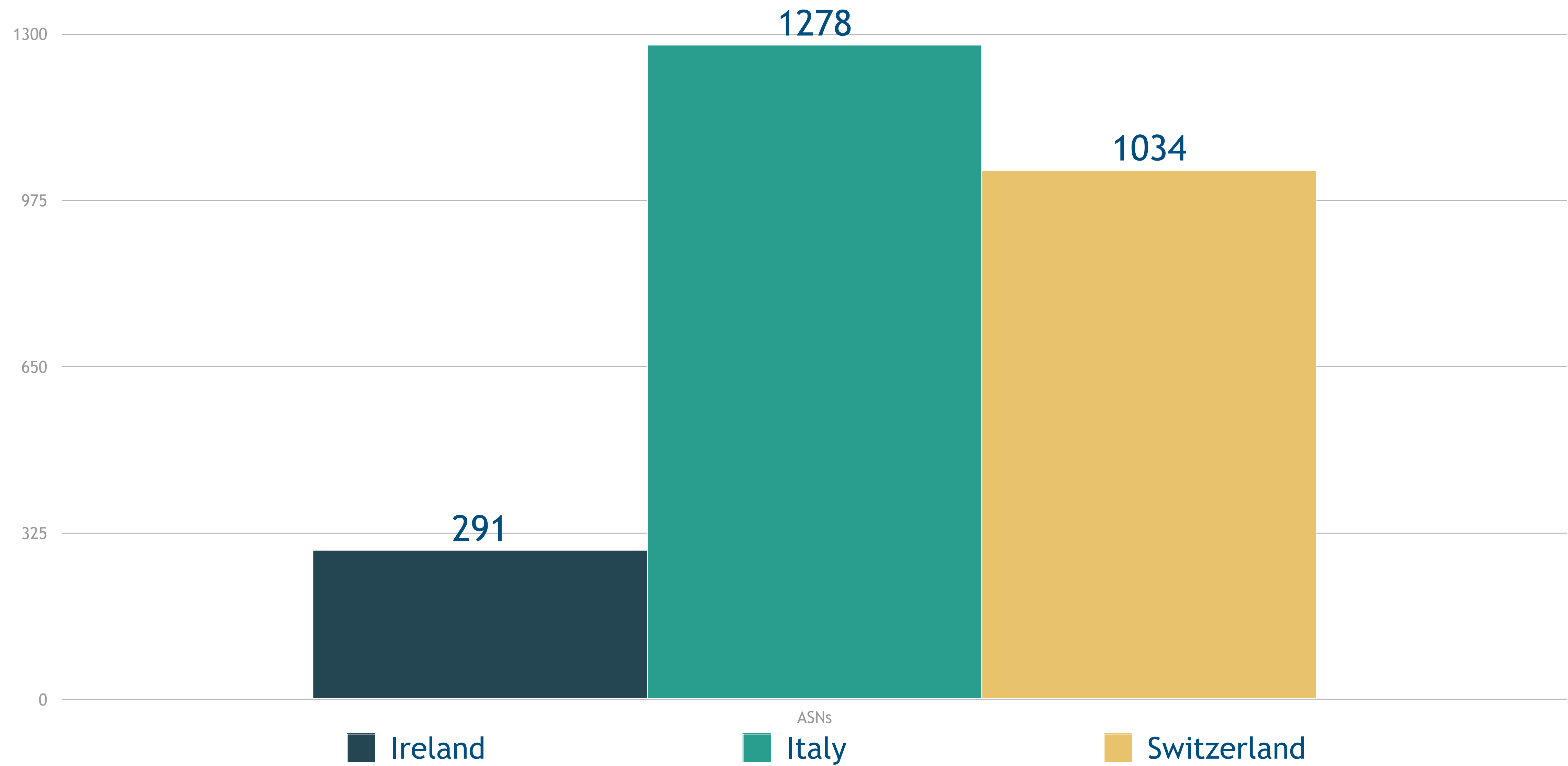
# RPKI - Validation

- 13 Networks doing validation
  - HEAnet, Virgin Media Ireland, Wireless Connect, Blacknight Internet Solutions among them
- Irish government (AS15806) doing it partially - 48%
- Amazon Ireland at 89%
- Data from <https://rovista.netsecurelab.org/>

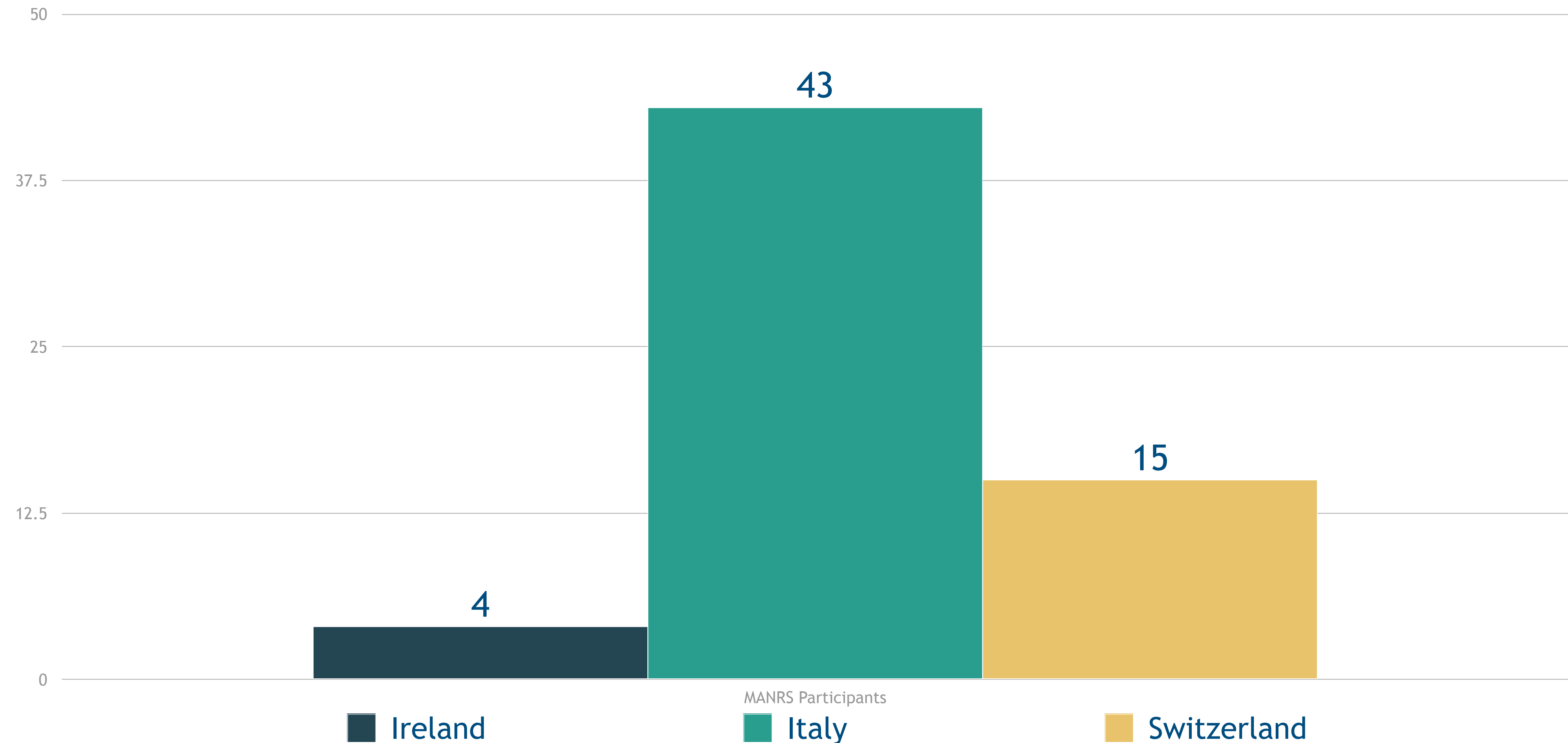
# BGP and routing



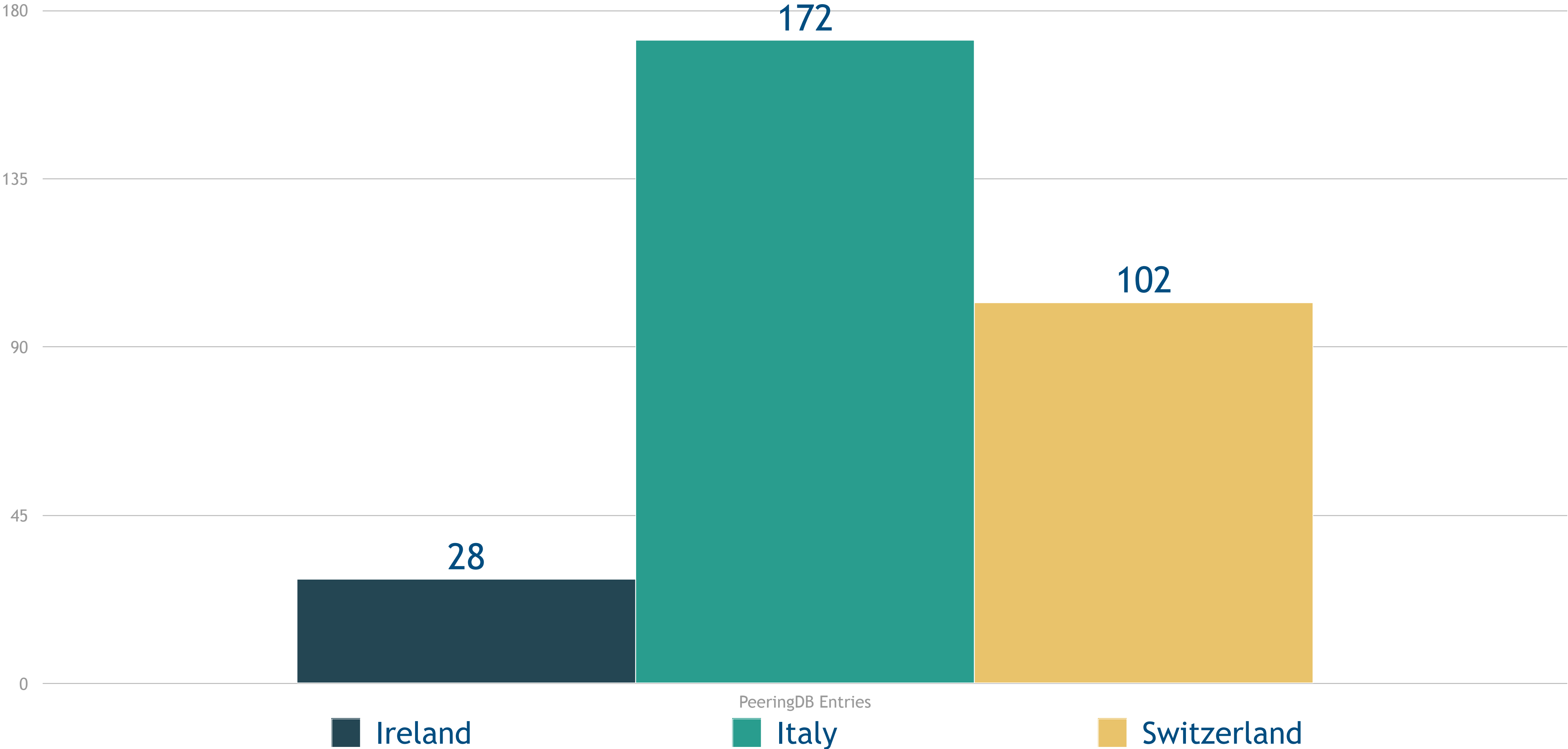
# Number of ASNs



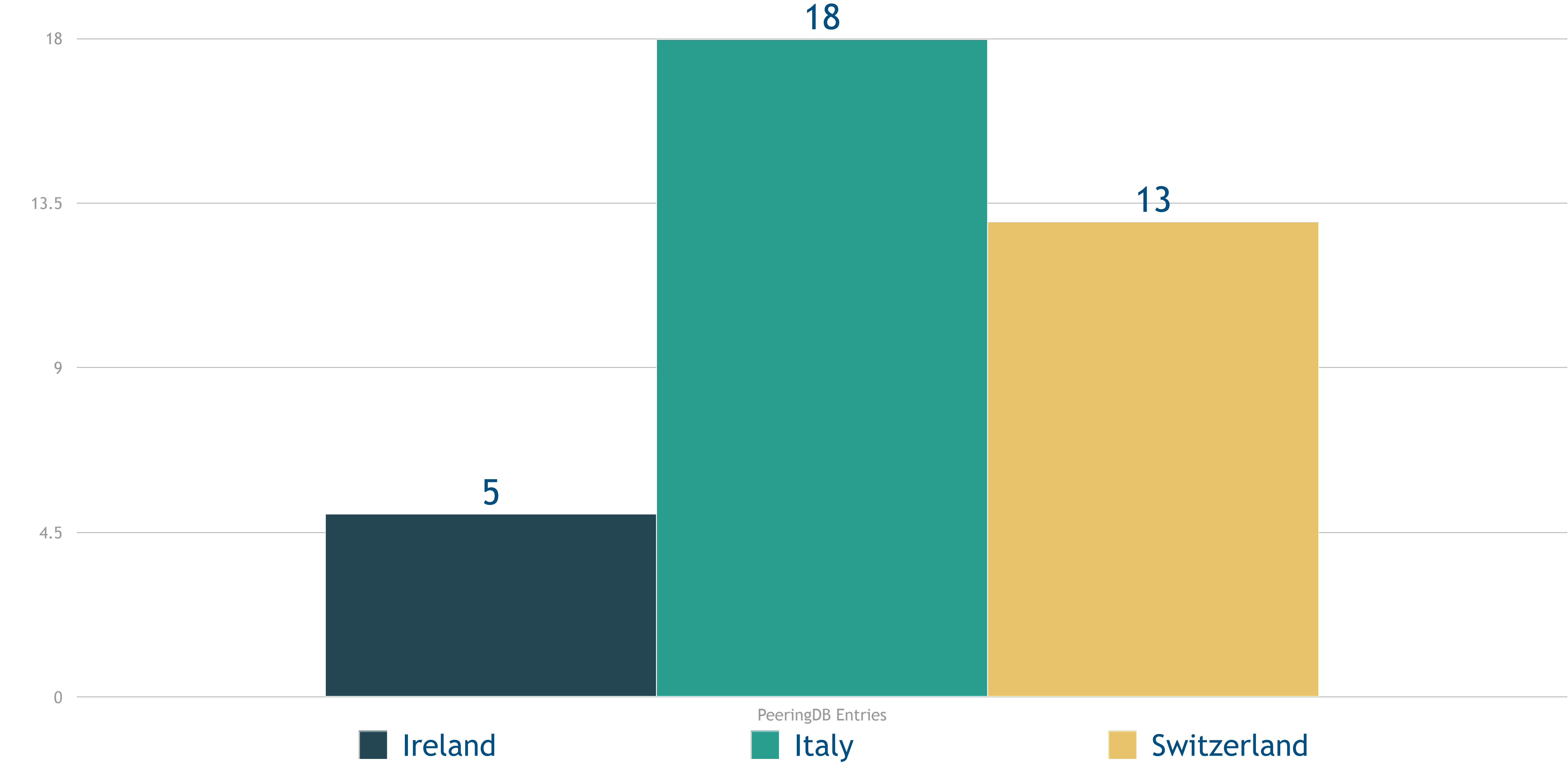
# Number of MANRS Participants



# Number of PeeringDB Entries



# Number of IXPs



# Routing data

- Operators use the IRRs as data source
  - Tools leverage it as well (bgpq4, irrtools)
- These are used to build prefix-lists and to filter appropriately on peerings or transits
- But...

**Can we trust IRR Data ?**



# IRRs sometimes apply very light checks...



# This is how you end up with this

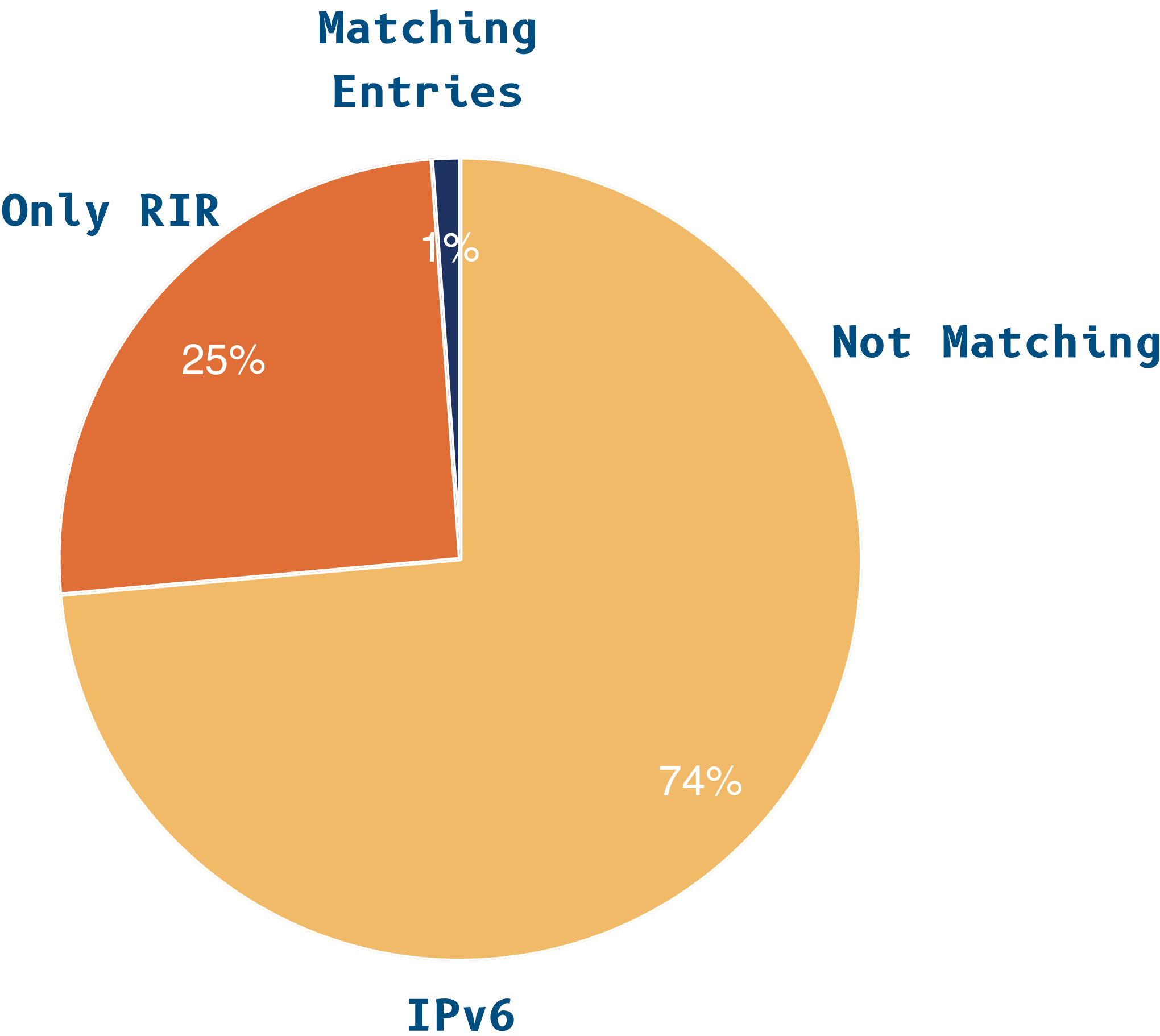
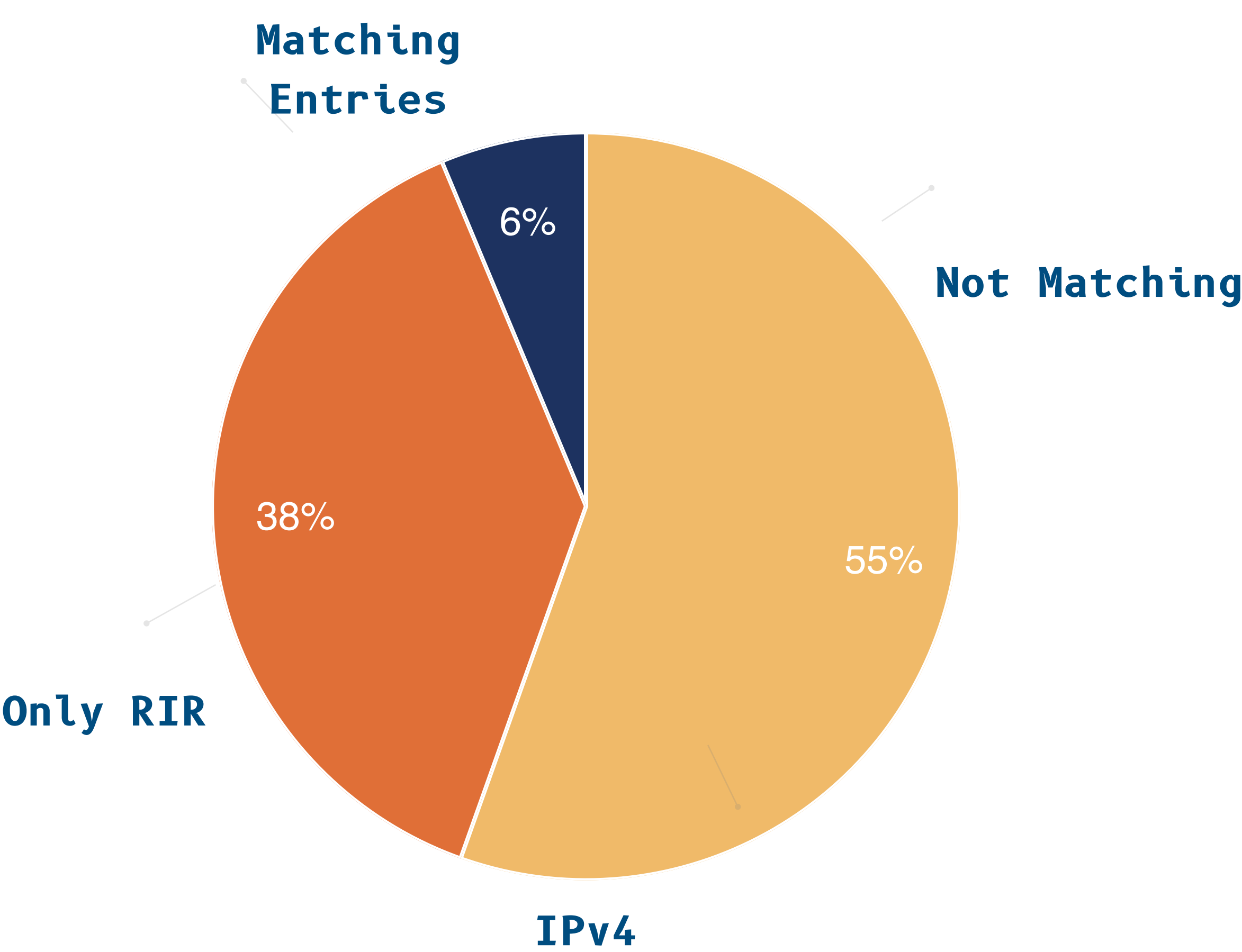
```
route6:      2a0e:5040::/29
origin:      AS58280
mnt-by:      STUCCHI-MNT
created:     2019-08-16T08:04:09Z
last-modified: 2019-08-16T08:04:09Z
source:      RIPE
```

```
route6:      2a0e:5040::/32
descr:       Vultr Customer Route
origin:      AS58280
notify:      network@choopa.com
mnt-by:      MAINT-AS20473
changed:     network@choopa.com 20210817 #12:37:45Z
source:      RADB
```

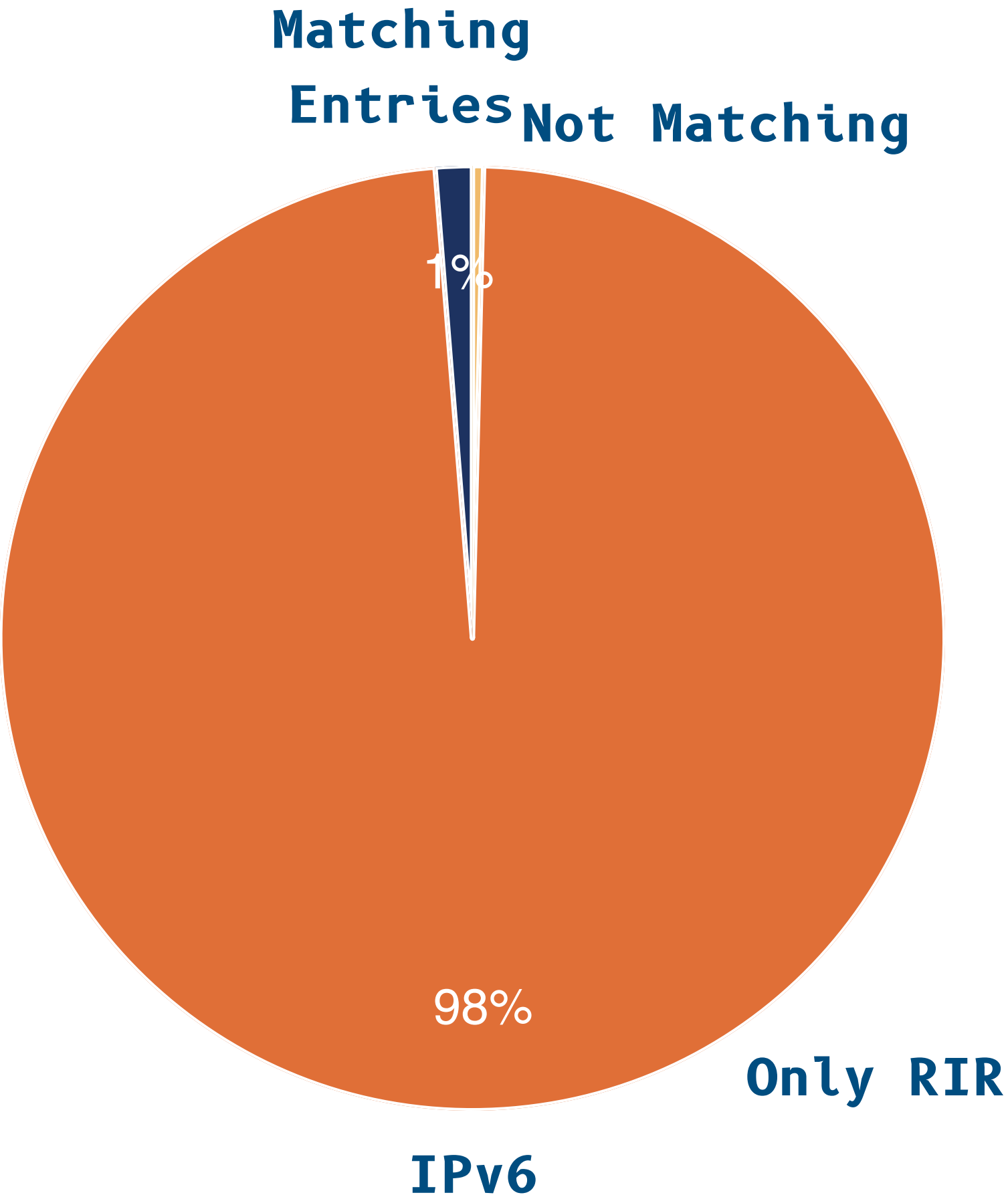
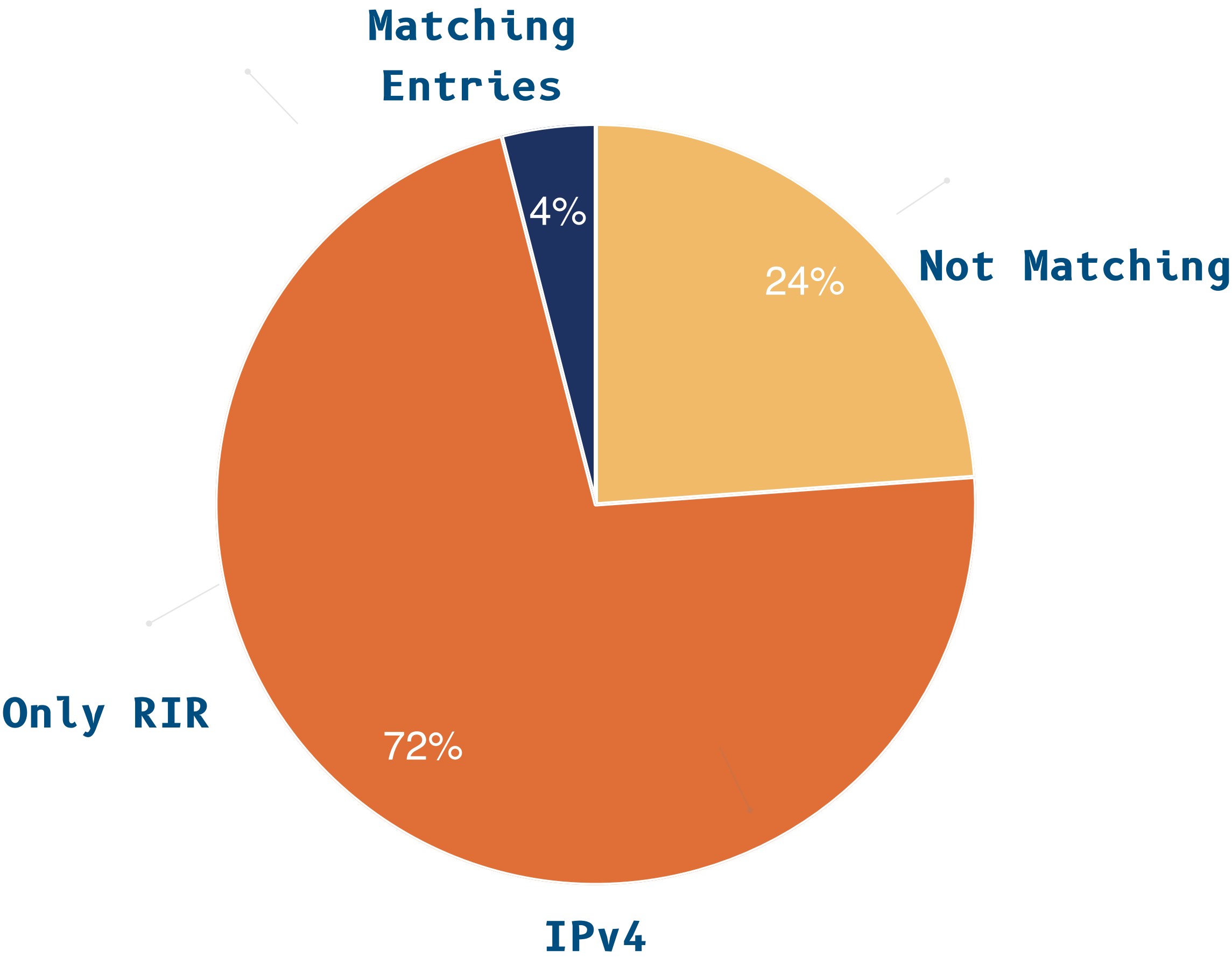
# Let's compare

- What is in RADB, ALTDB with what is in the RIRs
  - We talk about route and route6 objects
- And see if they match, or if they differ in the “origin”
  - And then check what's in BGP to define who is right and who is wrong

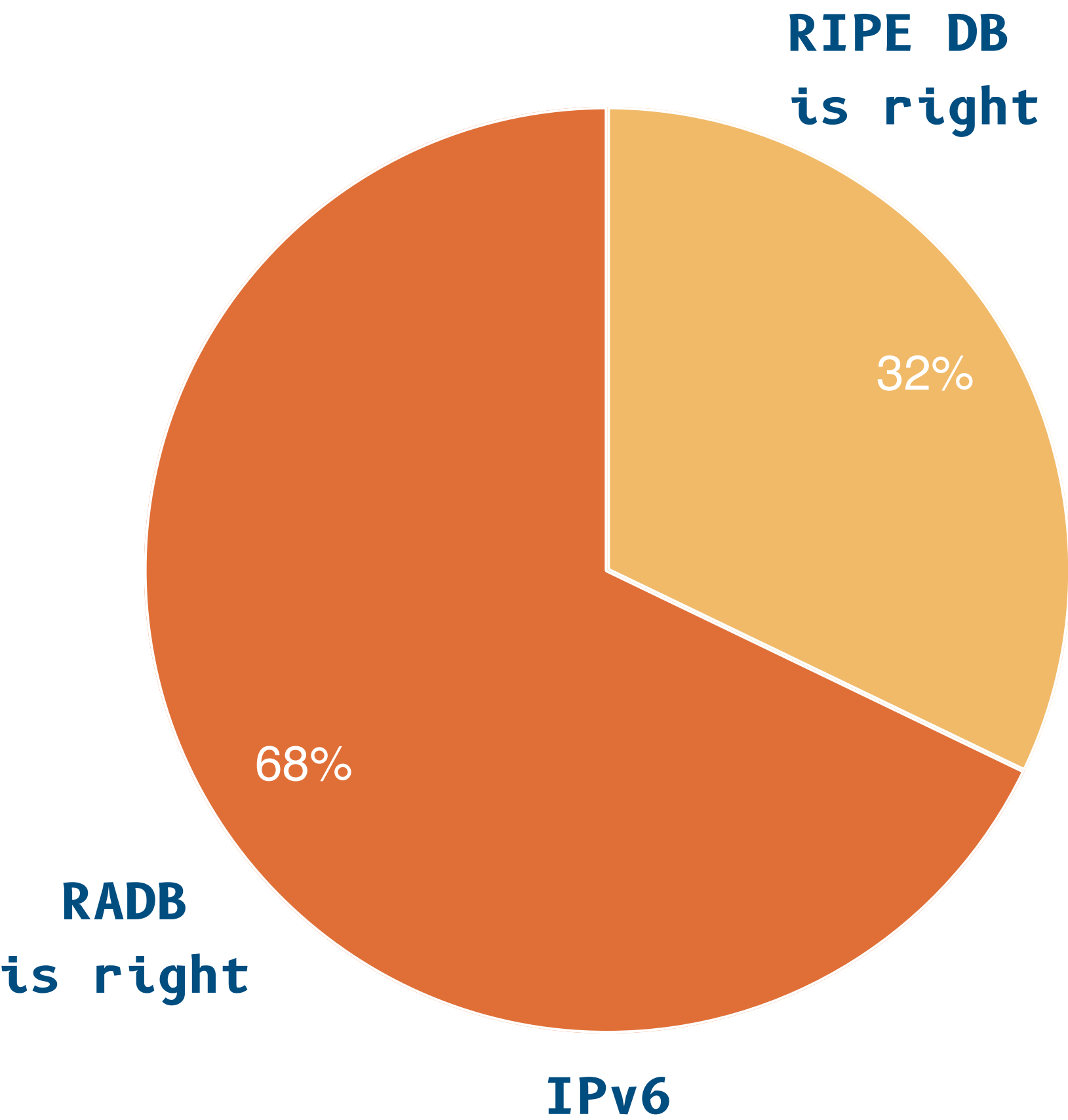
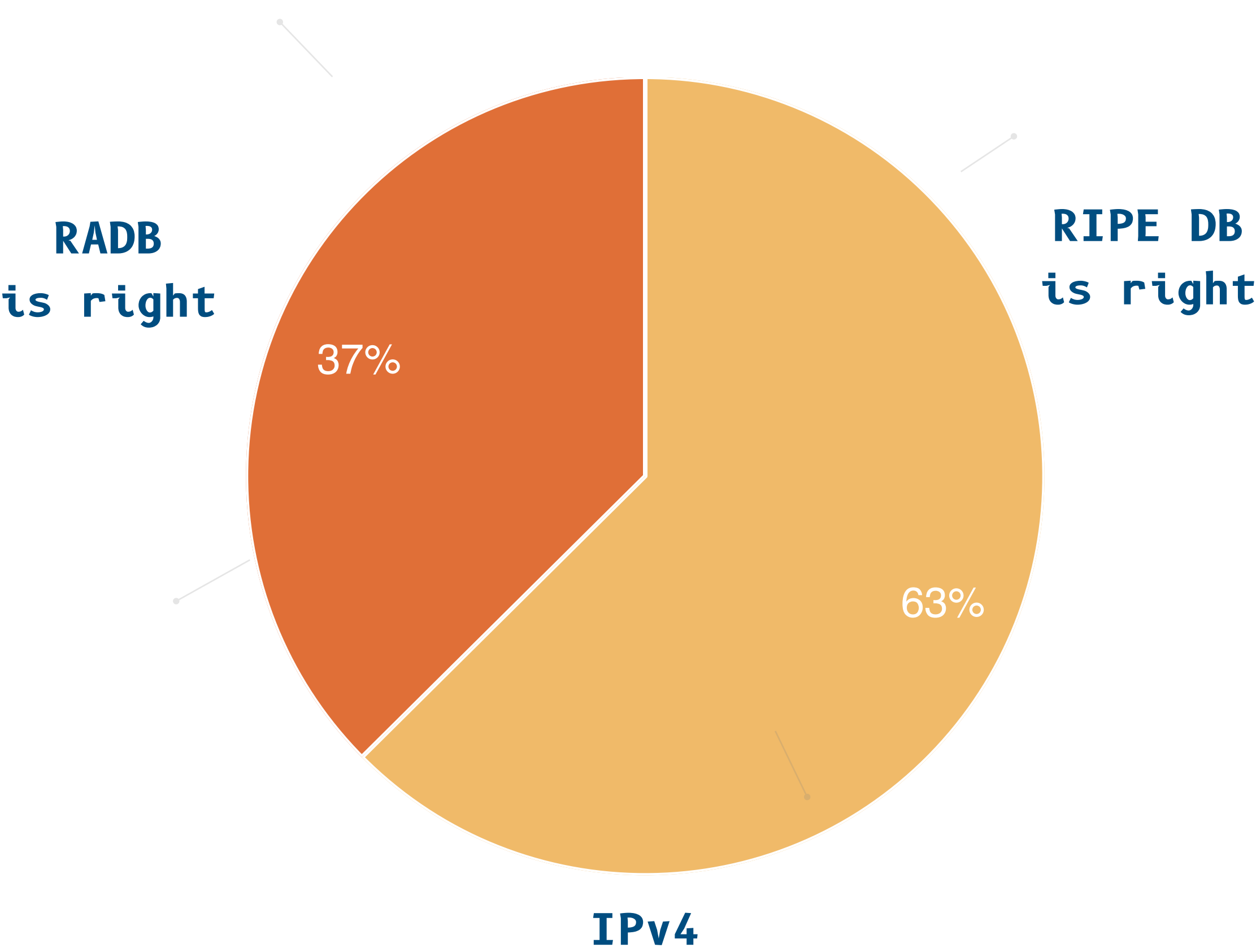
# RIRs compared to RADB - Global



# RIRs compared to RADB - RIPE Region



# Comparison with routing table. Who is right?



This is done comparing the “not matching” entries with an entry in BGP



# Data is available to everyone

- We provide this data to everyone
- All in JSON
- It is generated every 1st and 15th day of the month
- <https://data.rirstats.net/route-check/>

# Looking at upstreams

- Routing diversity is important
- Some national (ex) incumbents set bad examples
- And many small operators often choose upstreams with shared infrastructure, making them a SPoF

## AS3269 and AS16232 outage

- Outage lasted 5 hours
- It affected one-third of Italy's Internet users.
- Cost the economy nearly 142 million USD and Rogers 150M USD in customer credits.
- Rogers has also never provided a Root Cause Analysis



8 February 2023

## Italy's Internet Outage a Perfect Storm



**Massimiliano Stucchi**  
Regional Technical Advisor -  
Europe, Internet Society

Categories:  
Resilience

Italy's recent Internet outage was a failure that was years in the making and could have been negated through greater interconnectivity.

# DNS

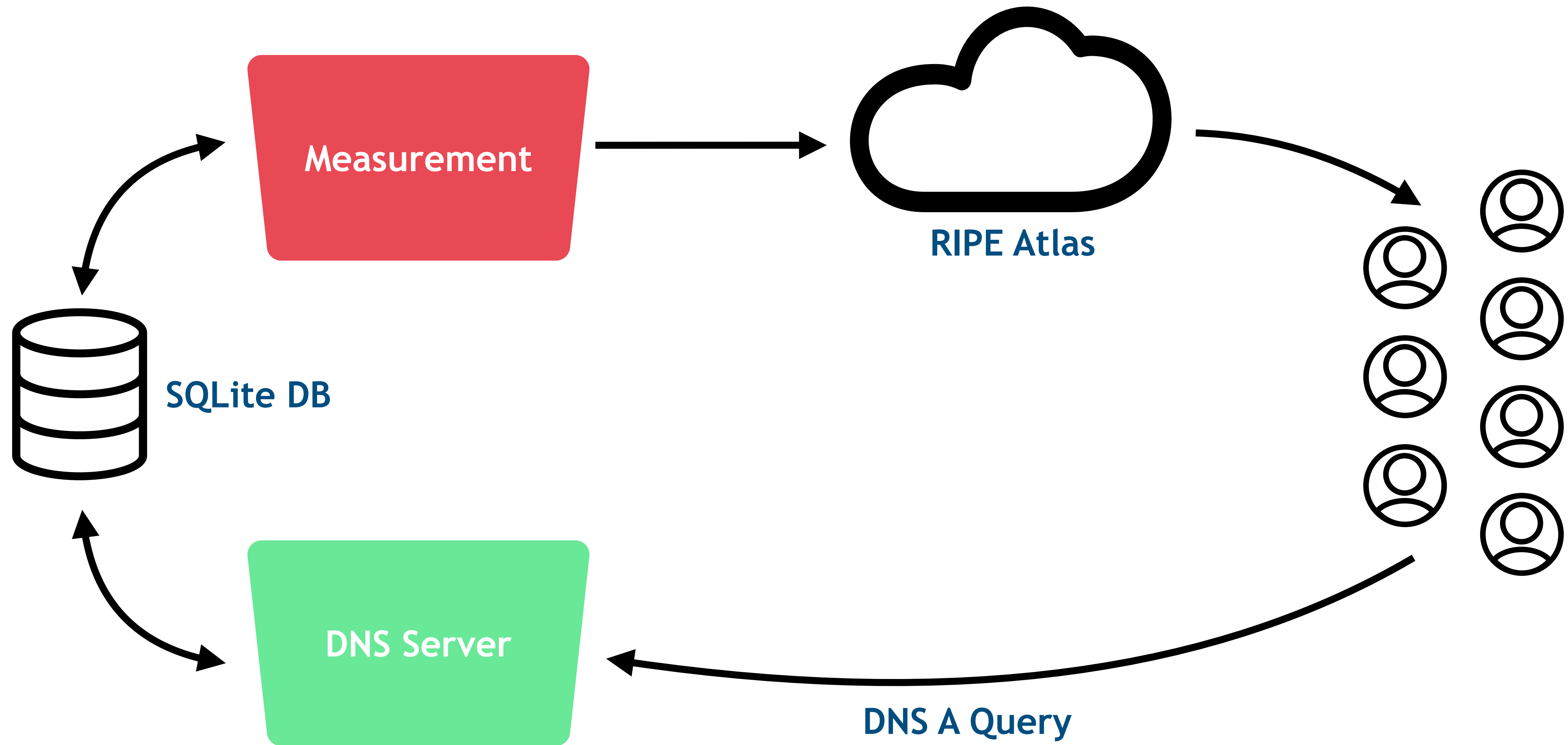
# Measuring DNS

- I will focus on resolvers this time
- There is already a lot of literature and info about authoritative DNS
- The question is “Where are the resolvers used by end users ?”

# Enter yoyoDNS

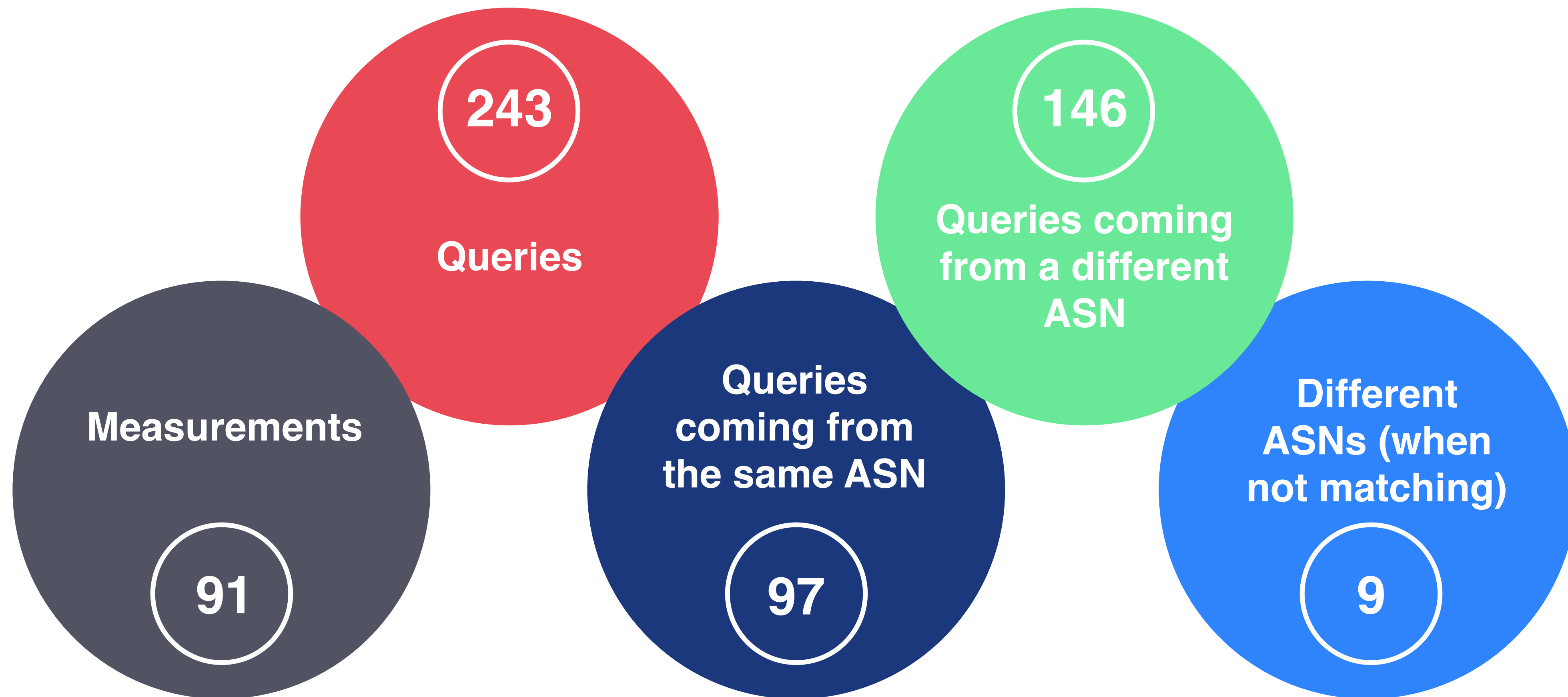
- Use RIPE Atlas to figure out where queries come from
- Generate a unique A or AAAA Record per measurement
  - [9520bbb8-c46a-48e8-b955-6950e3af992d.valid.keyrollover.ch](https://9520bbb8-c46a-48e8-b955-6950e3af992d.valid.keyrollover.ch)
- Check where the query for the A or AAAA record for that is coming from
- Use a database to match

# yoyoDNS





# Data from yoyoDNS Ireland



# Observations

- A large number of queries came from a different ASN
  - Mostly Google, but also AS42 and Cloudflare
  - MeteorMobile seems to like to use Eircom's Resolvers
- There is a good number of queries coming from hosting/Cloud orgs
  - Either the probes are hosted in a DC; or
  - The probe owner runs their own resolver in the cloud
- Numbers are in line with other countries
  - Maybe worth investigating how DNS “Censorship” works in these cases

# Conclusions

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- Lots of work is still needed on many fronts
  - MANRS “compliance”
  - RIR Cleanup
  - ROAs

# Tools and libraries used

- asn\_info
  - Get ASN Names, MANRS participation and ASNs per country
  - On pypi - pip install asn\_info
  - [https://github.com/stucchimax/asn\\_info](https://github.com/stucchimax/asn_info)

# Tools and libraries used

- pyrib
  - Get a RIB to use for your scripts
  - For now, only origin ASN is in the RIB
  - <https://github.com/stucchimax/pyrib>



# Tools and libraries used

- pyrtr
  - Get all the ROAs/VRPs off of an RPKI Relying Party (Validator)
  - Have functions to validate BGP announcements against ROAs/VRPs
  - <https://github.com/stucchimax/pyrtr>

# Tools and libraries used

- path\_distance
  - Analyse the distance between a given ASN and a series of content networks
  - Useful to have an idea of how to reach content networks
    - Or to check transit/peering networks
  - [https://github.com/stucchimax/path\\_distance](https://github.com/stucchimax/path_distance)

# Future work

- Use proxies to measure more DNS and “distance from the content”
- Improve tooling
- Generate more statistics on a regular basis
  - [rirstats.net](https://rirstats.net)

**Questions ?**



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