

Beyond Numbers:

Navigating the “end-user” part of
the AS Ecosystem

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Autonomous System Numbers

- **4.294.967.295** maximum uint32 ASNs (for simplicity, incl. reserved)
- **116.965** currently [assigned by RIRs](#)
- **75.770** (64.78%) visible in the v4 GRT ([APNIC](#))
- The **41.195** (35.22%) not visible in the GRT could be
 - v6 only networks approx. **7.000** (6%)
 - IXPs, Route Collectors (???)
 - Private networks that require unique numbering (???)
 - Abandoned (???)
- Around 20% of RIPENCC assigned ASNs are [not routed at all](#)
- Are they a scarce resource today? **NO**



Regional Internet Registries

- Monthly avg. assignments ([IANA](#))
 - **RIPENCC: 192**
 - **APNIC: 119**
 - ARIN: 111
 - LACNIC: 52
 - AFRINIC: 12

- Will focus next on **RIPENCC** and **APNIC**

Regional Internet Registries

- [RFC1930](#) Guidelines for [...] registration of an AS (1996 –28yo)
 - Is mentioned in various documents by all the five RIRs
- [Eligibility](#) for an ASN in **APNIC** is evaluated based on **RFC1930**
 - “Requests for ASNs under these criteria will be evaluated using the guidelines described in RFC1930”
- [RIPE-679](#) ASN Assignment policies - “see **RFC1930**”
 - Policy is not clear if a request can be rejected for “**RFC1930** reasons”
 - “In order to help decrease global routing complexity, a new AS Number should be used only if a new external routing policy is required, see [RFC1930](#).”

RFC1930 sec. 5 – do I need an AS?

- Need to exchange routing info (**BGP**) (important)
- Have multiple prefixes (less important)
- Have a **unique routing policy** (important)



Where do I get an ASN from? * if needed

- Regional Internet Registries
 - From the (main) **region** the network operates in
 - One network can operate in multiple regions (ex. 174)
- **RIR** shopping is possible to some degree
 - Choosing the cheapest/easiest to deal with
 - This translates to “**out-of-region**” assignments
- **RIPENCC!**

RIPE, both NCC and the Community recap

- At RIPE 86, the out-of-region issue was [presented](#)
- **Maintenance fee** for ASNs was [proposed](#)
 - a. Recover **abandoned** ASNs (db accuracy)
 - b. **Financial incentive** to double check if you(r customers) need an ASN
 - c. Proportional **financial contribution** to the RIPENCC budget based on usage
- Maintenance fee was [rejected](#) at the GM in 2023



RIPE, the NCC

- Growing number of ASN requests coming from end-users
 - 2020: **50%**
 - 2021: **48,3%**
 - 2022: **55,1%**
 - 2023: **64,4%**
- End-users can be natural or juridical persons
- End-users have no contractual relationship with RIPENCC, only LIRs
- >50% of requests [come from natural persons](#)
- Registration Services are not happy



RIPE, the NCC

- The number of unsuccessful requests is also increasing
 - 2020: **11,8%**
 - 2021: **11,4%**
 - 2022: **13,5%**
 - 2023: **14,6%**
- Unsuccessful requests = rejected or silently dropping (not providing required documents)
- Unsuccessful requests = wasted RIPE NCC resources
 - Receiving the requests
 - Checking the documents
 - Asking for more documents
- RIPENCC resources = € paid by the members (LIRs)

The five RIRs

- ASNs visible in the v4 GRT ([APNIC](#)):
 - RIPENCC: 28621 (**12116**)* only one prefix announced
 - ARIN: 19162 (**6970**)
 - APNIC: 14135 (**4298**)
 - LACNIC: 11081 (**2615**)
 - AFRINIC: 1844 (**658**)

- RIPENCC wins with almost double 1-prefix ASNs vs ARIN

ASNs are

- 16 bit numbers **YES**
- 32 bit numbers **YES**
- BSNs (AHV/Personnummer/NIN/CHI/CNP/SSN) **NO**



What are “Personal ASNs”?

- Different opinions:
 - 2021: “[Research networks](#)” with double quotes (DENOG13)
 - 2022: A way of getting [new networkers](#) interested

On a previous slide: **ASNs are not a scarce resource today**

- World population July 2023: **8.045.311.447**
- uint32: **4.294.967.295**
 - Only 53.4% of world pop. has ASNs available
 - 1 in 2 potential network engineers would have to find a different career

Reconsider scarcity?



Personal ASNs

Do I need an ASN if I like computer networks? **NO**

Do I need an ASN if I want to be a net. eng.? **NO**

- Some professions require the person to have some type of license: doctors
- When a doctor changes workplaces the license follows
- **This is not the case with net. eng. and ASNs**



Personal ASNs

- **Do I need an ASN if I want to learn BGP? NO**
 - You don't need a personal train operated on the (inter)national railway to learn to be a train driver
 - [Courses](#) are organized and trains are provided (no BYOT)
 - [dn42](#) or similar networks
- **Do I need an ASN if I research BGP things? NO**
 - Trains are provided by NRENs and/or Universities, Schools, etc
 - [Temporary assignments](#) for academic research



ASNs

- Operating a public ASN on the Internet has global effects
 - It grants access to tools, databases otherwise not available
 - It also comes with responsibilities towards the community for keeping these functional
- Responsibilities are easily overlooked
 - There is no Internet Police
 - [Spiderman philosophy](#)



User-generated content: PeeringDB

- Self-reported by confirmed ASN contacts
- Information is used for automating things
- Network types: not free text; some options provided
 - **Educational/Research** frequently chosen by personal ASN holders
 - What does it mean? NRENs? Universities?
 - Natural persons?
- # of prefixes:
 - “Recommended max # of routes/prefixes for peering with this ASN”

- 2024: PeeringDB Feature Request: [Add new network type "Personal"](#)

PeeringDB

- Assume that I am running the **NVTR-IX*** with a TMB* cert. for privacy
 - I magically build my configs from PeeringDB data
 - I suddenly have very high prefix limits because some of my **Educational** customers announcing 1 prefix put in PDB >10.000 prefixes
- Should I not use PeeringDB anymore as it's not trustworthy?
- Is **IRR** info still trustworthy?

* Not Virtual Totally Real Internet Exchange

* [Trust Me Bro](#)



User-generated content: Geofeeds

- **RFC 8805**
 - Standardized format for geofeed CSVs
 - 3.3 Verification of Accuracy -> err. threshold -> admin review
- RIPE DB:
 - Can add as remarks:
 - Can add as geofeed:

User-generated content: Geofeeds

- Assume I'm a serious person working for a nice bank
 - I start seeing penguins accessing banking services
 - I immediately call the person handling the security feed with geolocation data
 - They notice some geofeeds are wrong (admin review)
- [RFC 8805](#) is almost 4 years old and already not usable/trustworthy



(whois) Internet Graffiti

- “I want to change my geofeed so I can watch *flix in countryX”
- “I want to change my geofeed to see if large companies take me seriously”
 - Not valid reasons for obtaining IPs/ASNs
- Incorrect/Incomplete info
- Some *really* not operational info
- Graffiti can be art or vandalism



RIPE, the NCC, and the GDPR

- Number resources
 - ASNs
 - IP addresses
 - Phone numbers (oops, these are not assigned by RIPENCC!)
- [GDPR Legitimate interest](#)
 - “Your company/organisation has a legitimate interest when the processing takes place within a client relationship [...] to prevent fraud or to ensure the network and information security of your IT systems.”



RIPE, the NCC

- bgp.tools (manually) maintains a list of personal ASNs
 - **1390** ASNs marked as personal
 - **1291** of them are assigned by RIPENCC ([NRO combined stats](#))
 - 2022 numbers by [Evan Pratten](#) and [Emile Aben](#) (aprox. 135 difference in a few months)
- Some natural persons have **more than one** ASN assigned
- Currently racing towards 2% of visible ASNs

- Top 5 sponsoring-org: for personal ASNs:
 - ORG-ZHL2-RIPE: 134 (299 all time)
 - ORG-SA4302-RIPE: 99 (278)
 - ORG-OG36-RIPE: 87 (186)
 - ORG-ICL64-RIPE: 75 (210)
 - ORG-CR158-RIPE: 52 (133)



Big sponsoring-org: Business

- Business model:
 - ASN request from RIPENCC has no costs, they one time handle paperwork
 - No worries about DB accuracy
 - Additional must-have services (BGP VMs, ...)
 - Even paid “[export your routes to RIS](#)”
- Additional services are cheap
 - Affordable
 - Less complaints for small amounts



How does this affect us?

- Directly
 - Costs of operating Registration Services translate to membership fees (**LIRs**)
- Indirectly
 - DB accuracy (**RIPENCC, everybody**)
 - Operational issues (**everybody**)
 - Data quality for actual research (**researchers**)



What can we do to fix it?

- Easy
 - Enforce existing policies (**RIPENCC**)
 - Cleanup some of the graffiti (**ASN contacts, RIPENCC**)
 - Alternative ways of creating interest in networking (**everybody**)
- Hard
 - Adapt policies (**RIPE Community**)
 - Attach maintenance fees to ASNs at least similar to PI space (**LIRs**)
 - Alternative ways of creating interest in networking (DUP!)



Feedback / Questions

- And, if this was not torture enough, we are looking for:
 - ASN operators (both “traditional” and “personal”)
 - LIR representatives
 - RIR people
- ... to fill in a short [survey](#)
- You can also contact me at r.anghel@tudelft.nl

