RIPE NCC
RIPE NETWORK COORDINATION CENTRE

Carrier Grade NAT in Europe?

An Analytical Approach to Policy Making

Marco Hogewoning | May 2018 | RIPE 76

What Is This About

- Statistical data is only useful within a context
  - Most of the value comes by combining data sources
  - Need to understand some of the inner mechanisms
- Going to give an example using CGN
  - Disclaimer: these are all estimates and predictions
  - There is a significant error margin:
    - Not every RIPE NCC member offers Internet access
    - Enterprise, SME and other businesses are ignored
    - There is always overhead in IPv4 pool management

Rule #1:

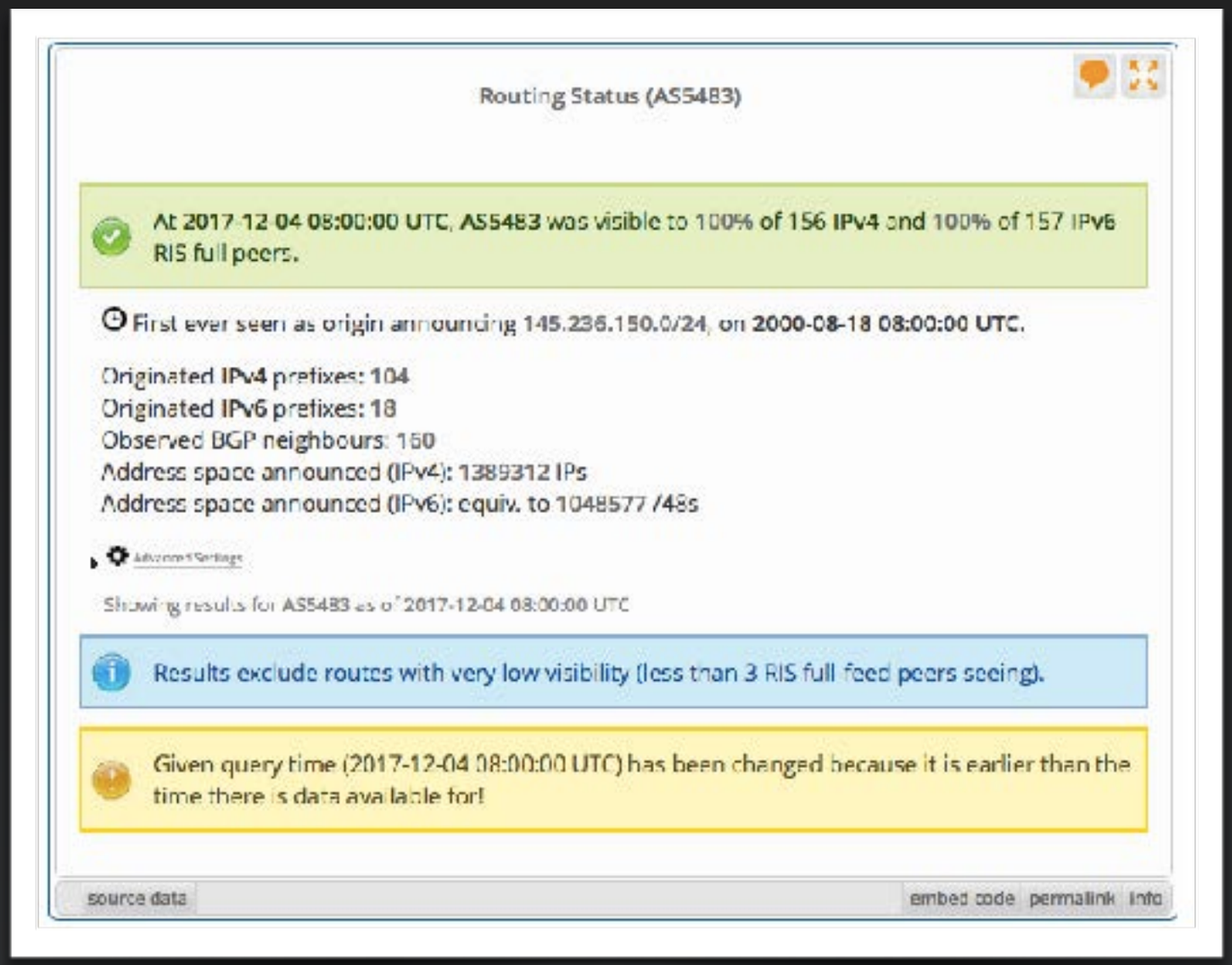
“You can only connect to the Internet if you have an IP address”

“Do you have enough addresses for every customer?”

"magic number"

Example: Magyar Telekom (Hungary)

"Size: 1.4 million IPv4 addresses"



Source: RIPEstat

How Big Is Magyar Telekom?

- 1 million fixed broadband
  - Growing 4.3% over last 12 months
- 5.4 million mobile users
  - Growing 1.9% over last 12 months
- Caveat: maybe not all mobile subscribers have data

Operational statistics – access numbers	Sep 30, 2016	Sep 30, 2017	Change (%)
Number of mobile customers (RPC)	5,301,049	5,400,966	1.9%
Postpaid share in the RPC base	58.9%	62.6%	n.a.
Total fixed voice access	1,437,116	1,420,725	(1.1%)
Total retail fixed broadband customers	1,018,564	1,062,528	4.3%
Total TV customers	978,692	1,016,192	3.8%

Source: Magyar Telecom Plc, Q3 2017 Interim Financial Report

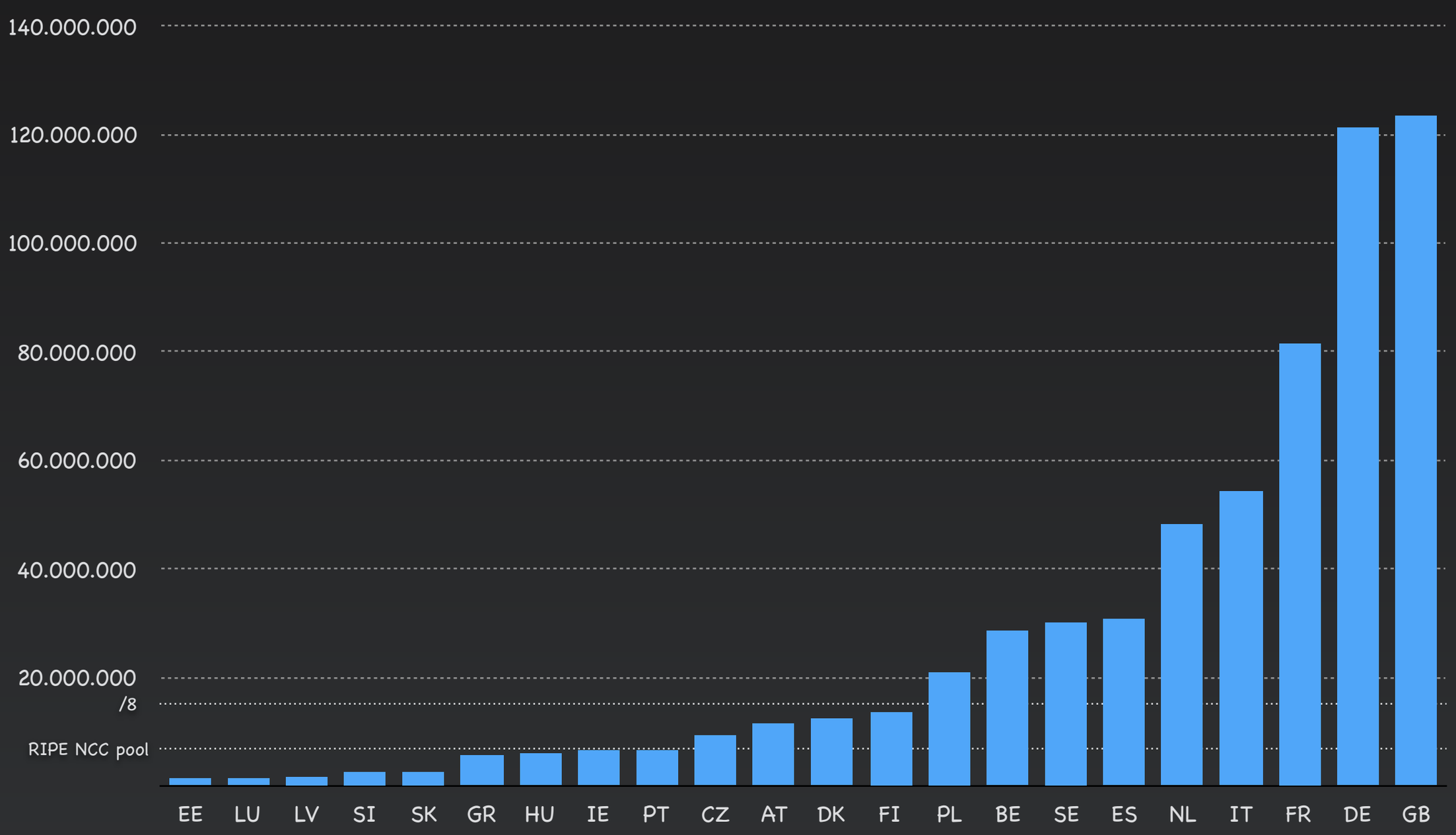
High-Level Analysis

- Magyar is reporting 6.4 million connections
  - With only 1.4 million IPv4 addresses visible
  - Likely scenario, common in market:
    - Fixed broadband to use “regular” IPv4
    - Mobile broadband uses CGN
- They are reporting growth
  - How long is this still sustainable?
  - How many customers need to share a single IP address?

Country Level

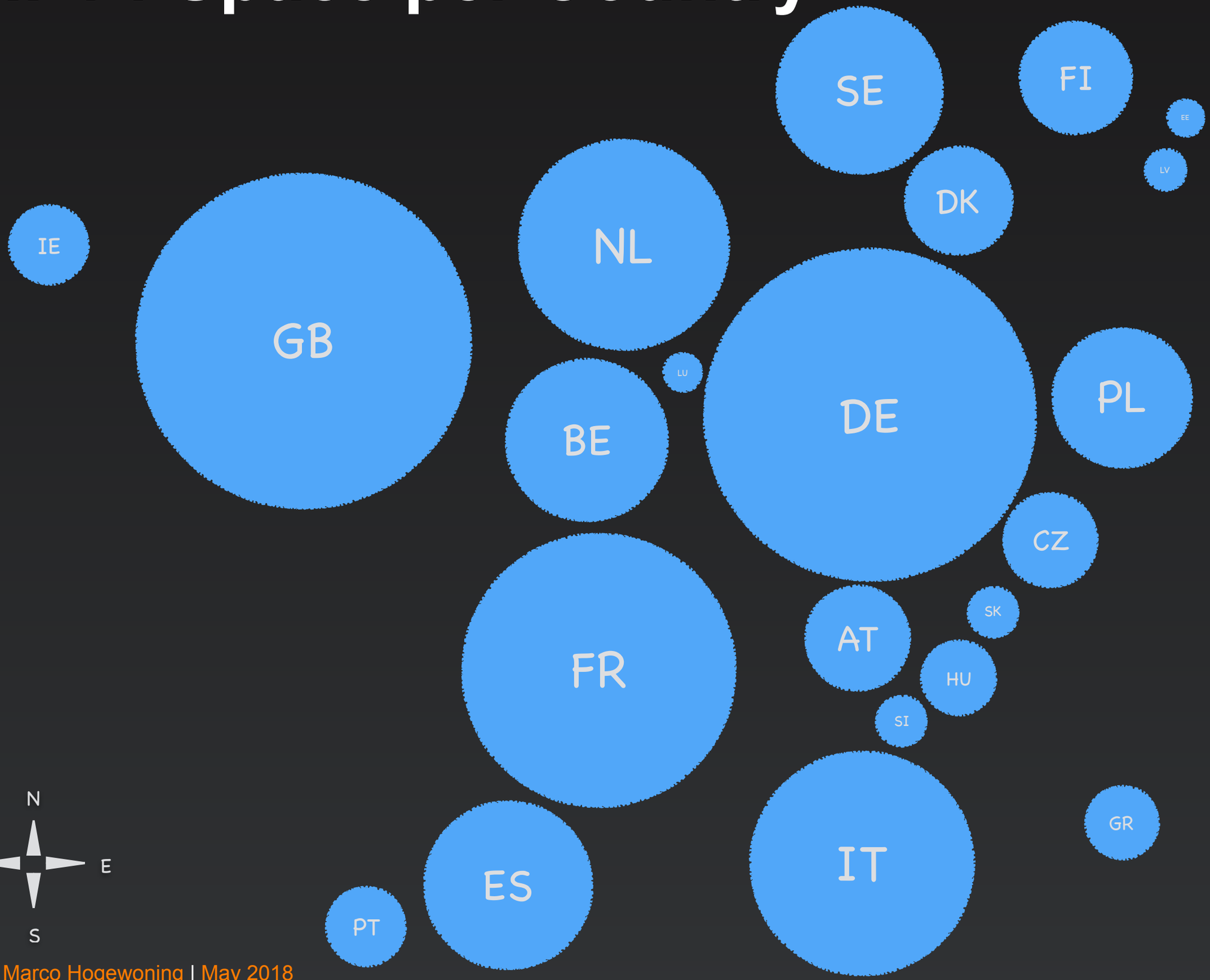
Taking a step back

IPv4 Addresses per Country

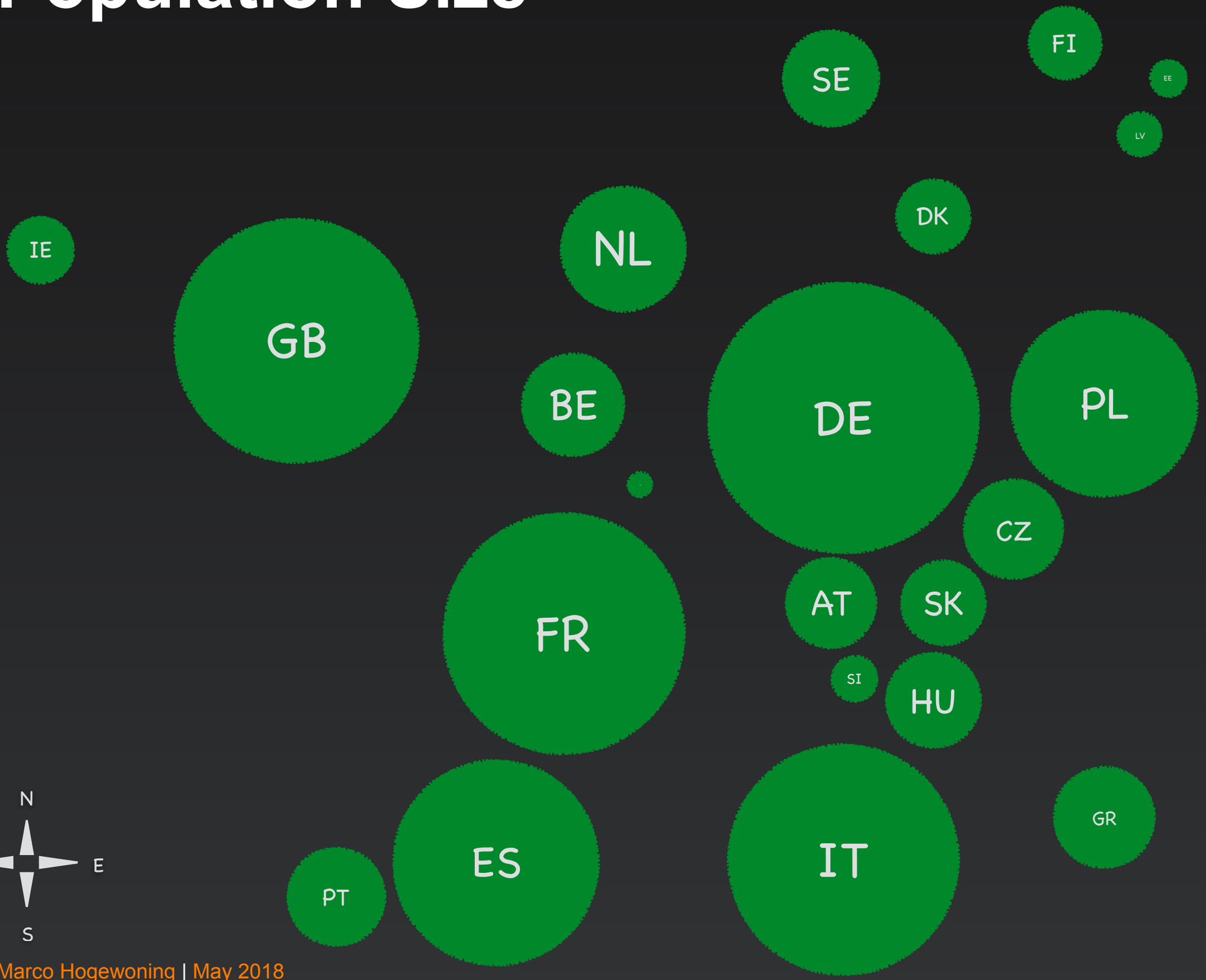


Source: RIPE Database "country" attribute

IPv4 Space per Country

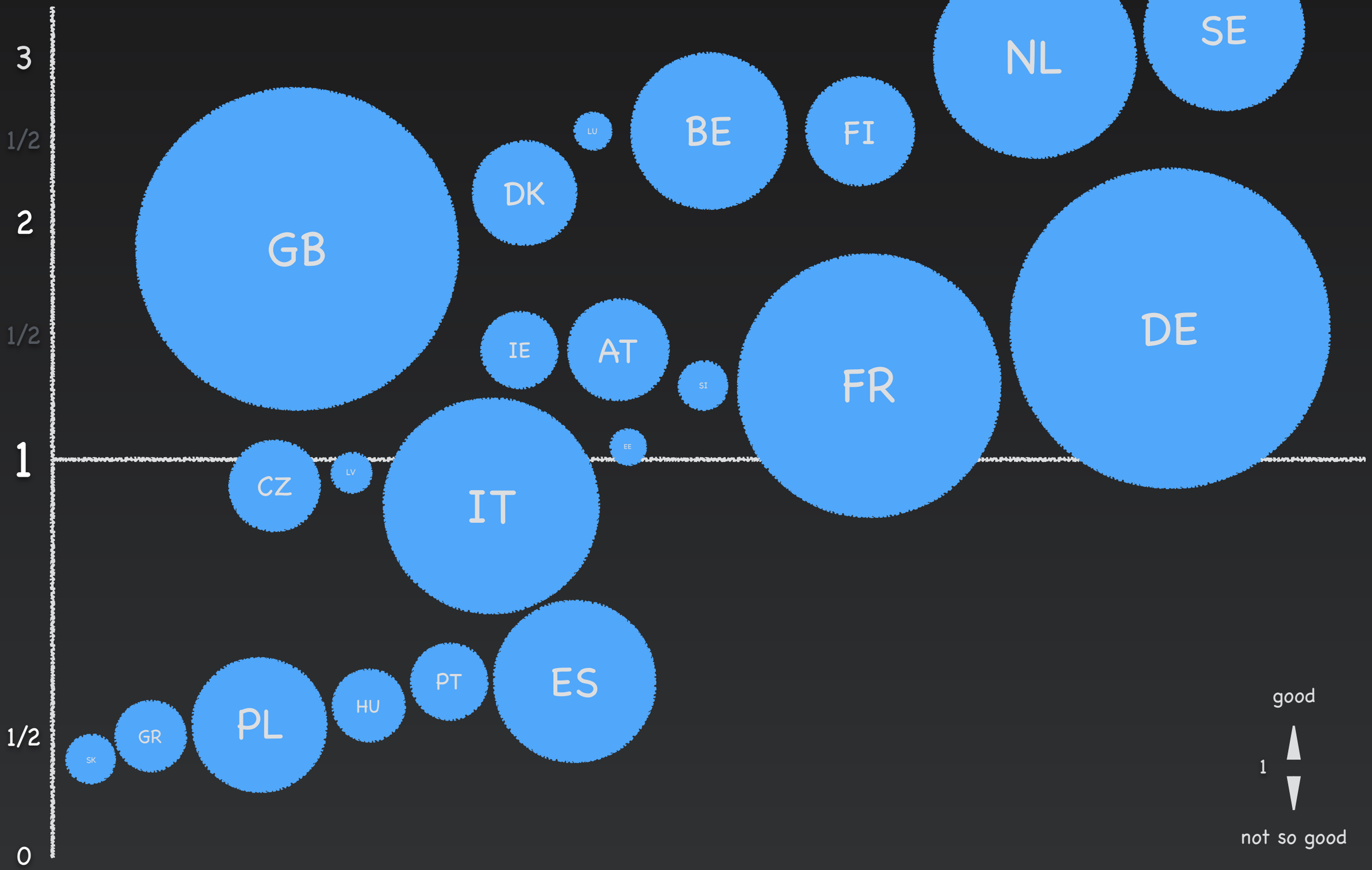


Population Size



IPv4 and Population

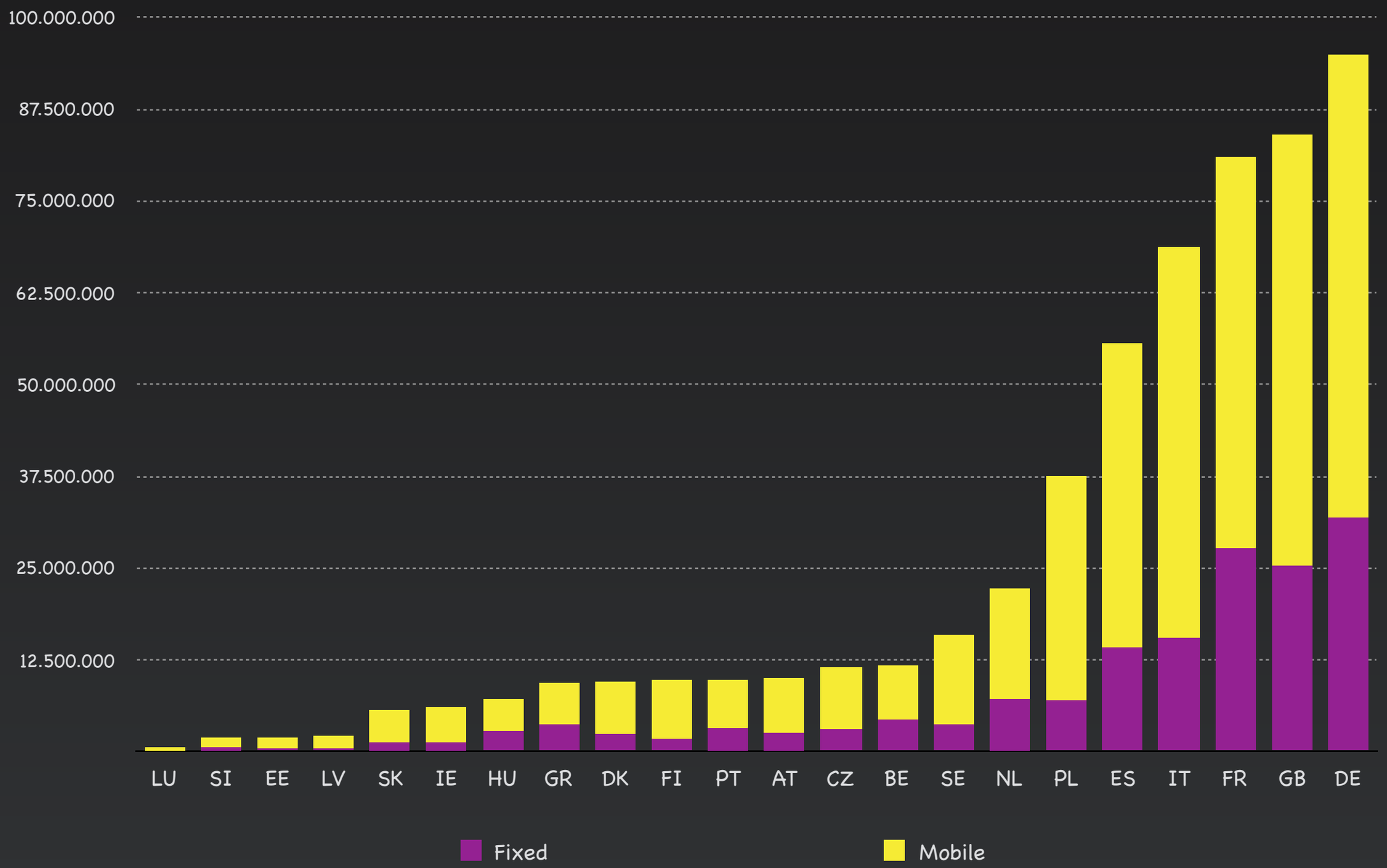
IPv4 per Capita



Sizing the Market

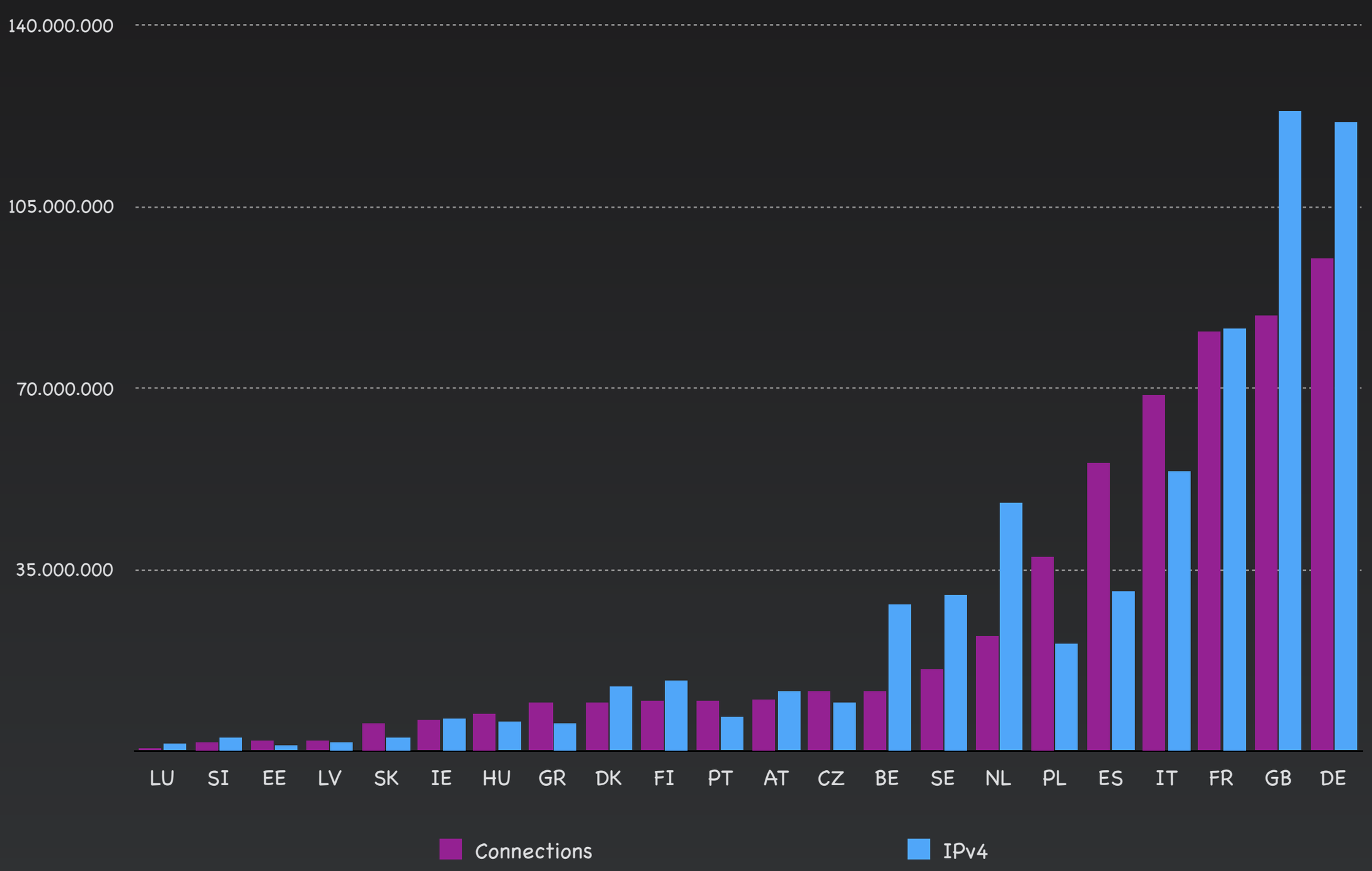
How many connections are there?

Number of Broadband Connections

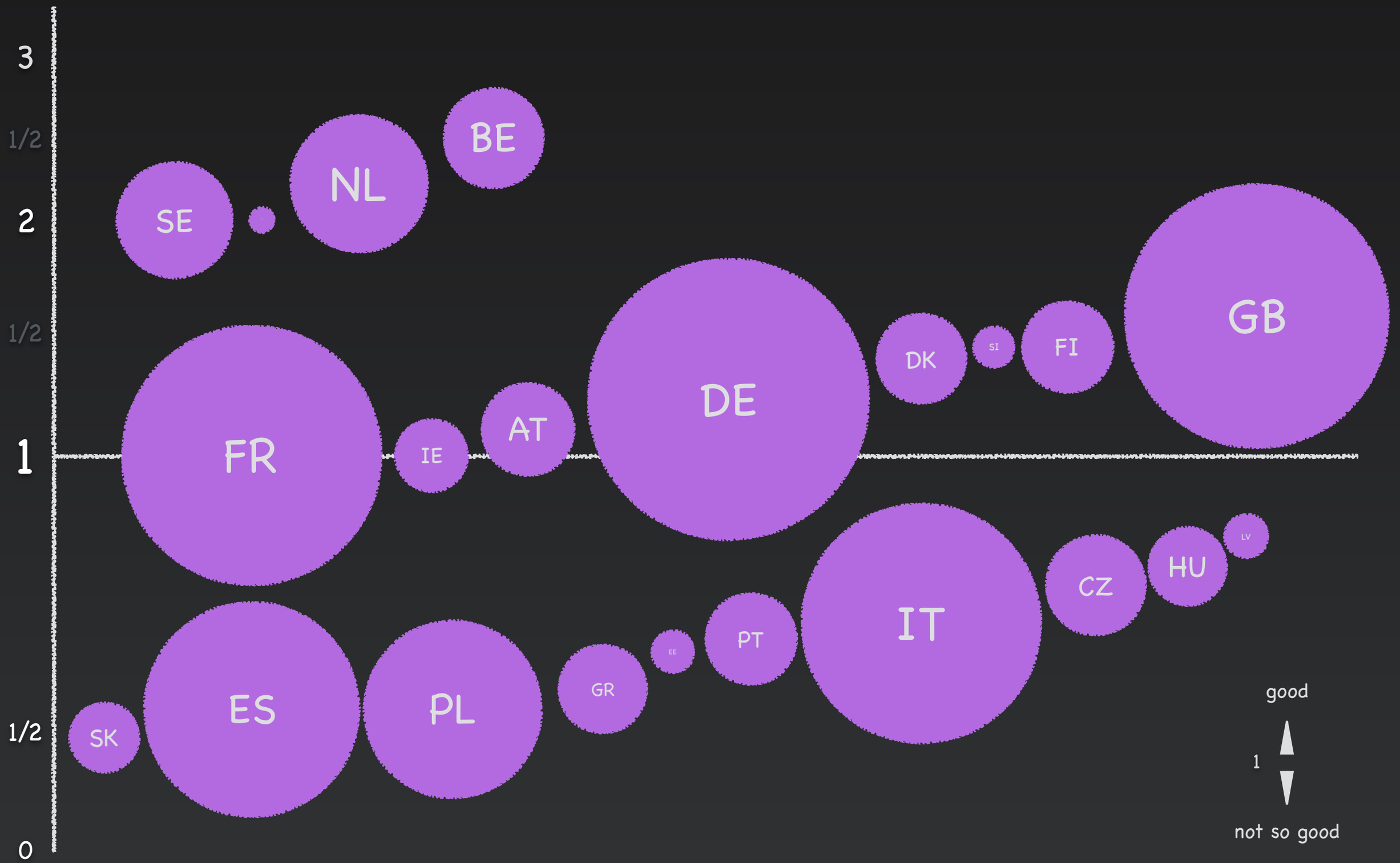


Source: OECD Broadband Portal (2016)

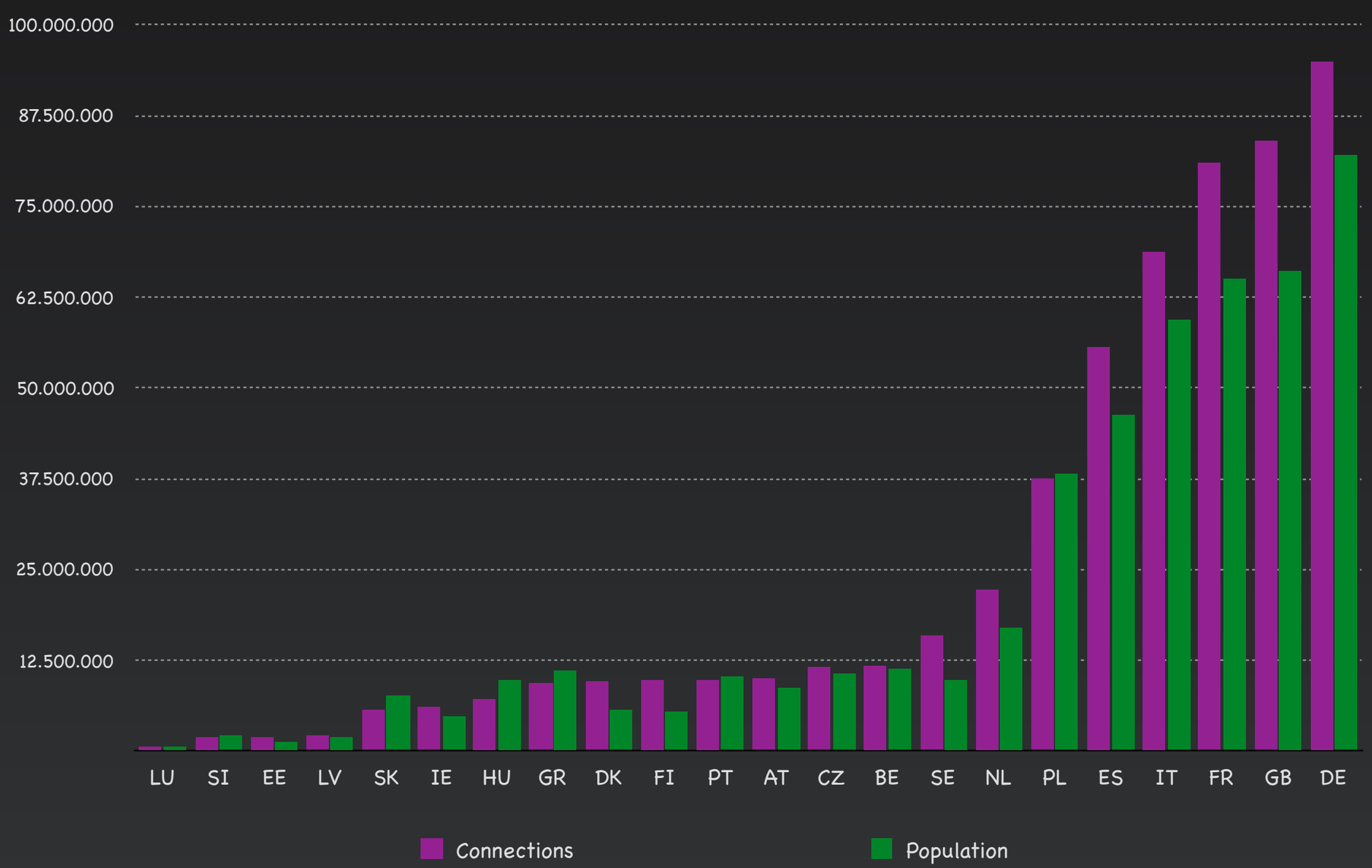
Connections and IPv4



IPv4 per Connection



Connections and Population



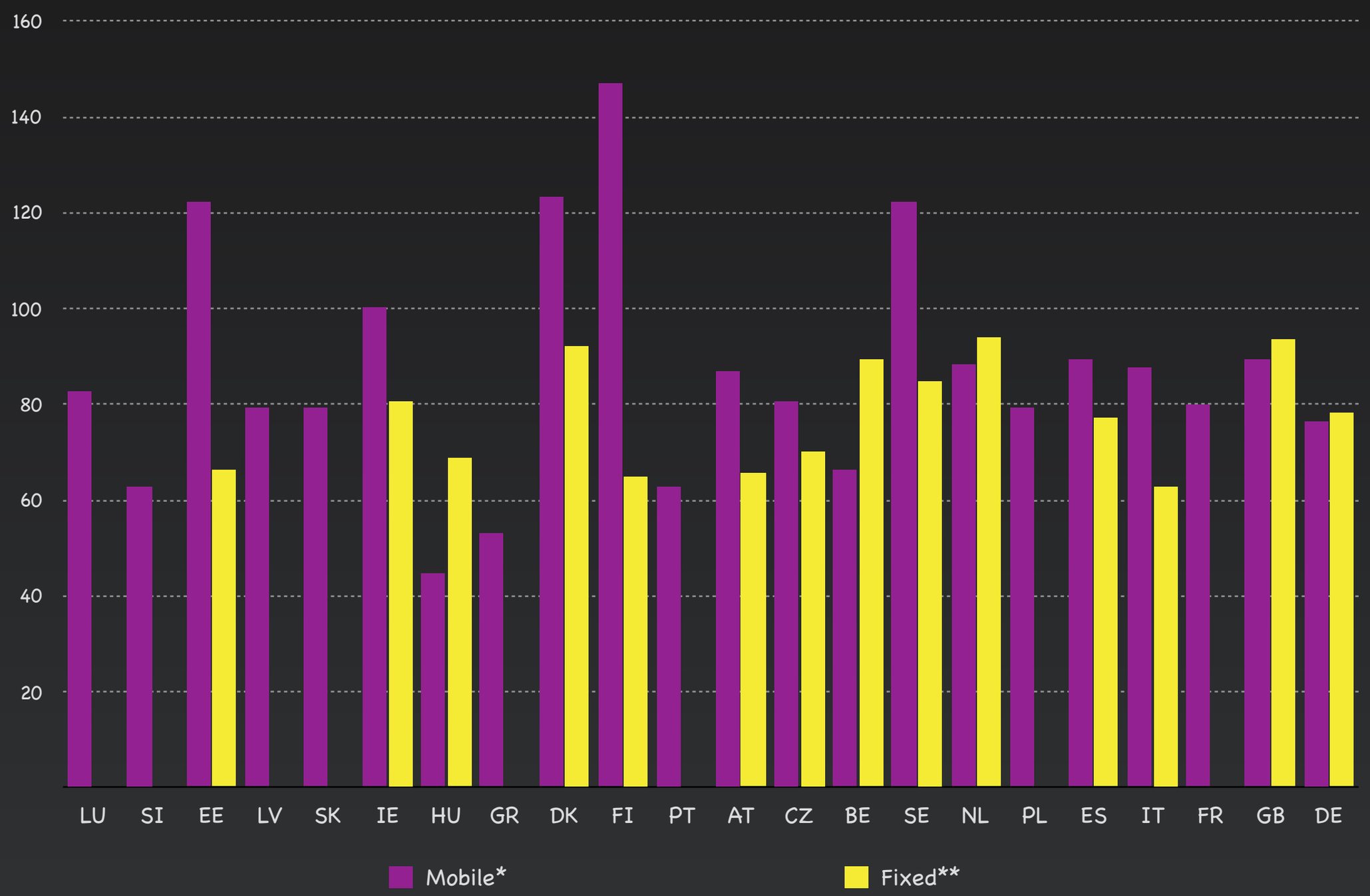
Peeking into the Future

Exploring with extrapolation

Ubiquitous Internet

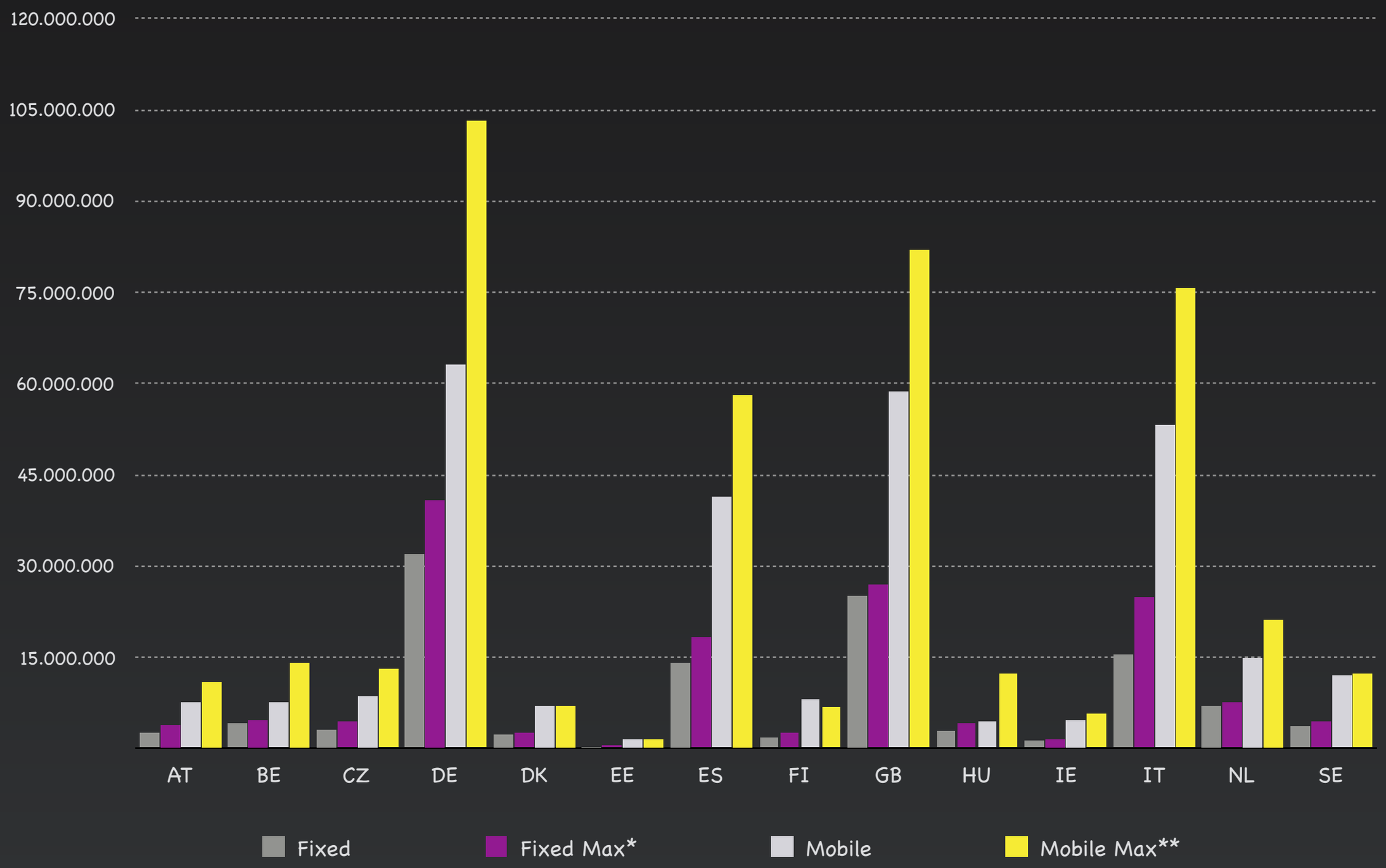
- What if everybody gets an Internet connection
  - You are likely to share the home (fixed) connection
  - “One fixed line per household”
  - Everybody gets a mobile phone (maybe two)
- Going to ignore some parts of the market:
  - Enterprise and SME
  - Machine-to-machine
  - Data centre and public/utility networks

Adding Market Coverage Data



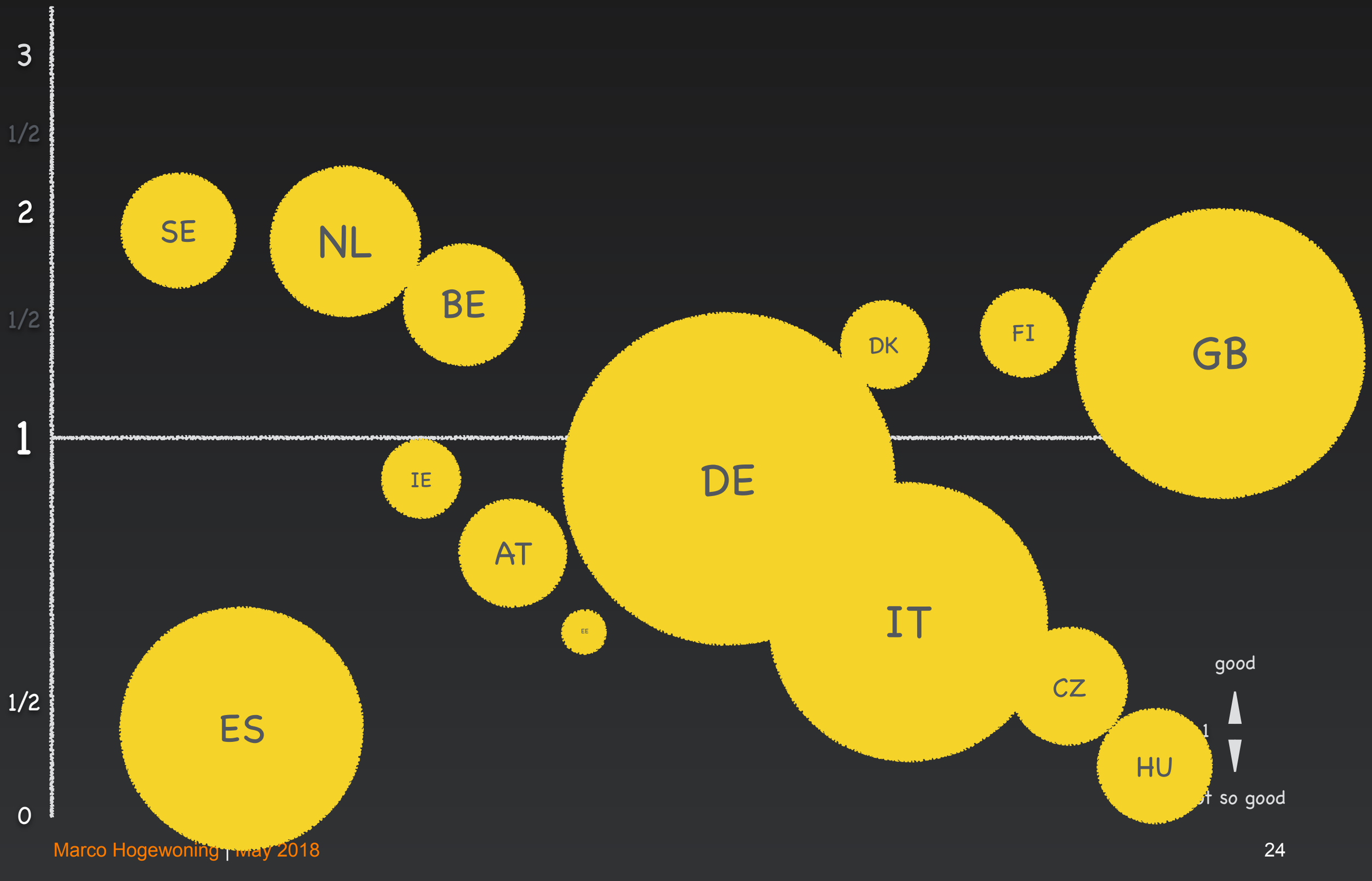
** OECD 2016 ** based on number of households (UN data)*

Theoretical Saturated Market

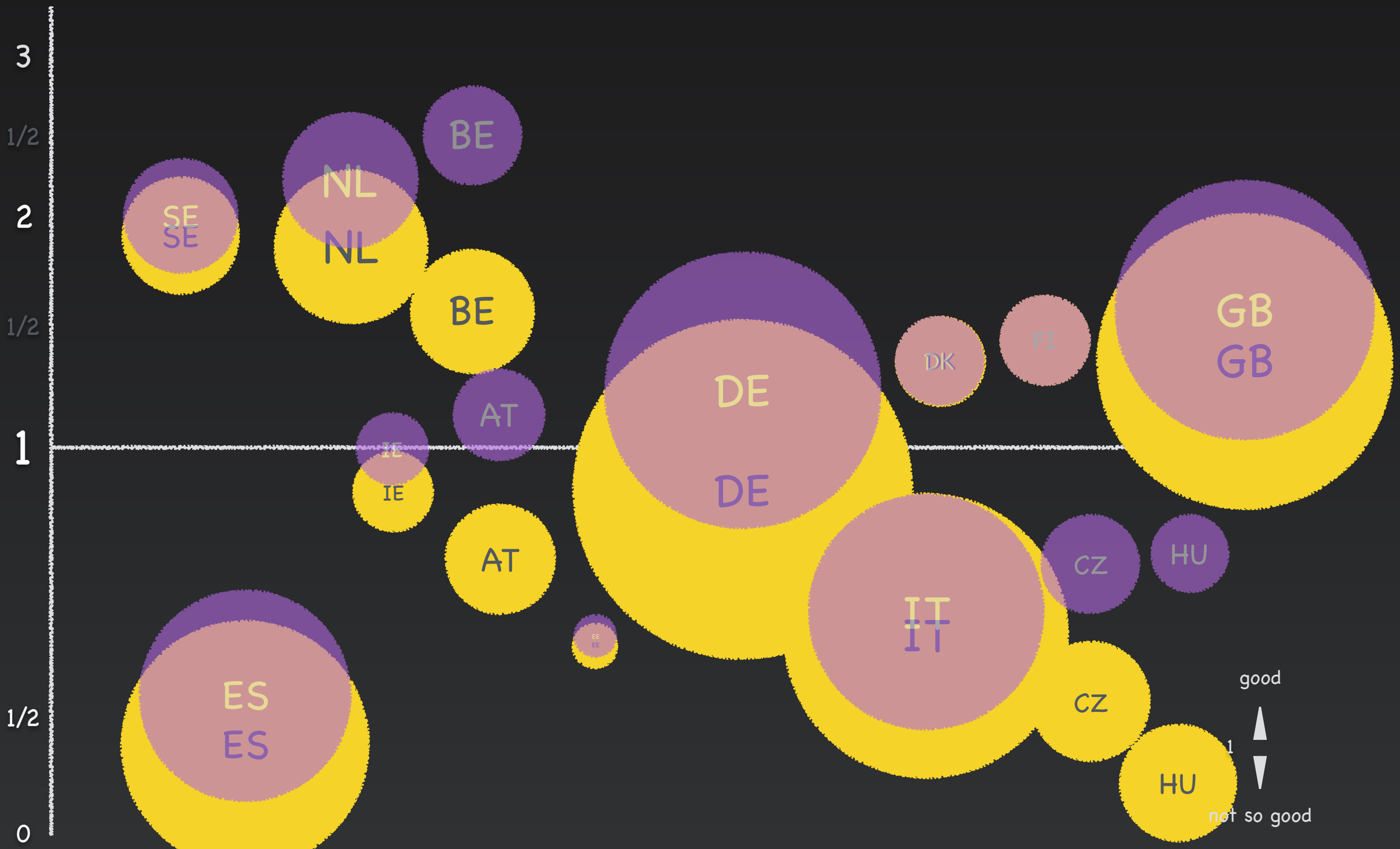


** 100% households ** 125% population*

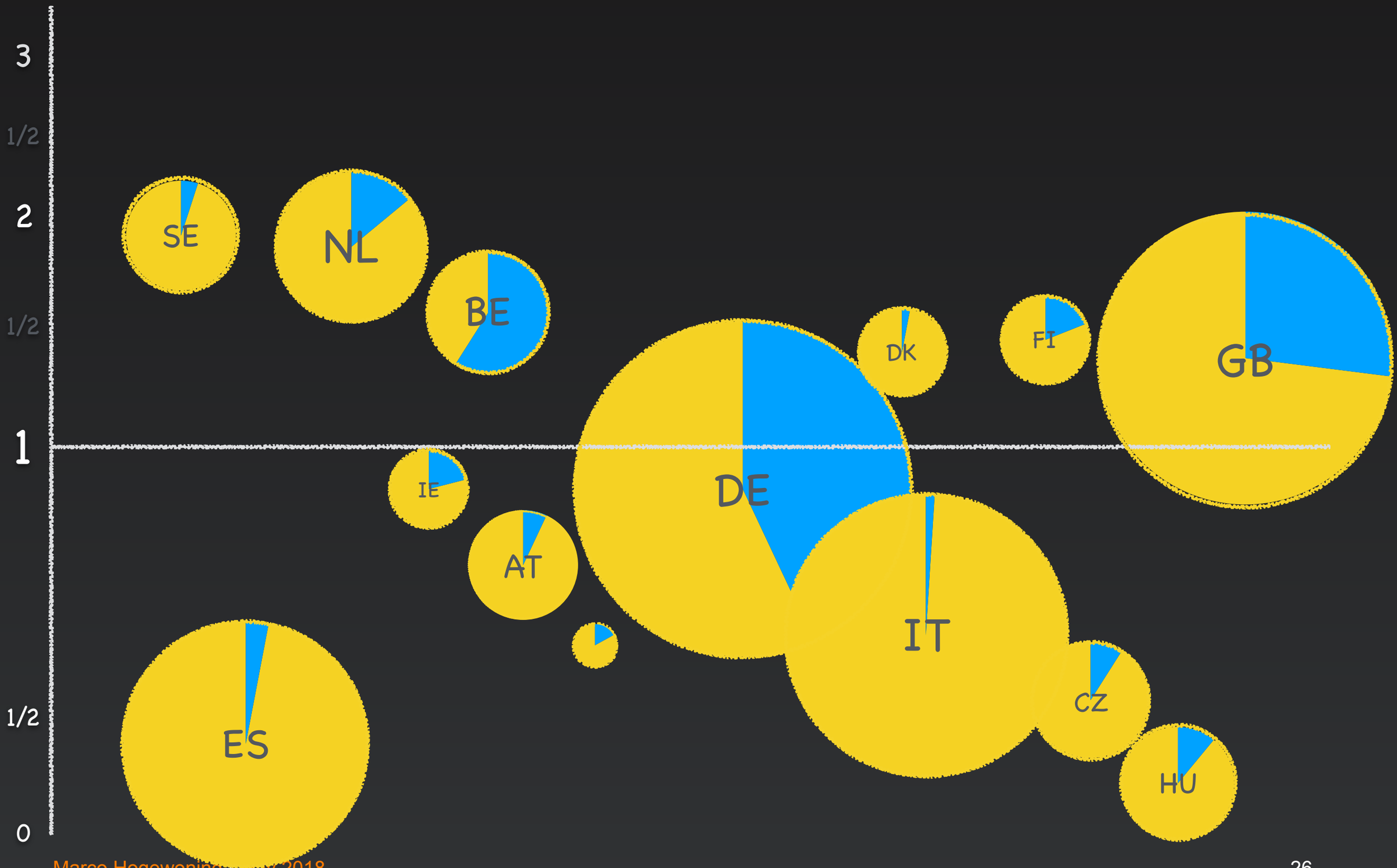
Future: IPv4 in Saturated Market



Current and Future



Percentage of IPv6



Soft Conclusions

- Many markets already have more connections than they have IP addresses available
  - Which means that they are using CGN somewhere
  - This situation is not expected to improve over time
- Some markets likely to fall below the threshold
  - Introduction of address sharing should be expected
- Not sure CGN is driving IPv6 adoption
  - No large pressure on IPv4 in Belgium

Final Thought

- Magyar Telekom reported revenue 1.8 bn
  - Reported EBITDA was EUR 545 million
- With “only” 1.4 million IPv4 addresses?
  - Over EUR 300 per IPv4 address/year
- Is CGN a cost or an investment?

Is this useful?

Open Data is Important

- Data sources used in this
  - Regional Internet Registry data (IPv4 and IPv6)
  - Financial reporting information (company numbers)
  - OECD broadband portal (connections per country)
  - UN stat (population, households)
- Manually processed
  - APIs are missing or not standardised
  - Not all data is current (households from 2011)

Questions?

marcoh@ripe.net