

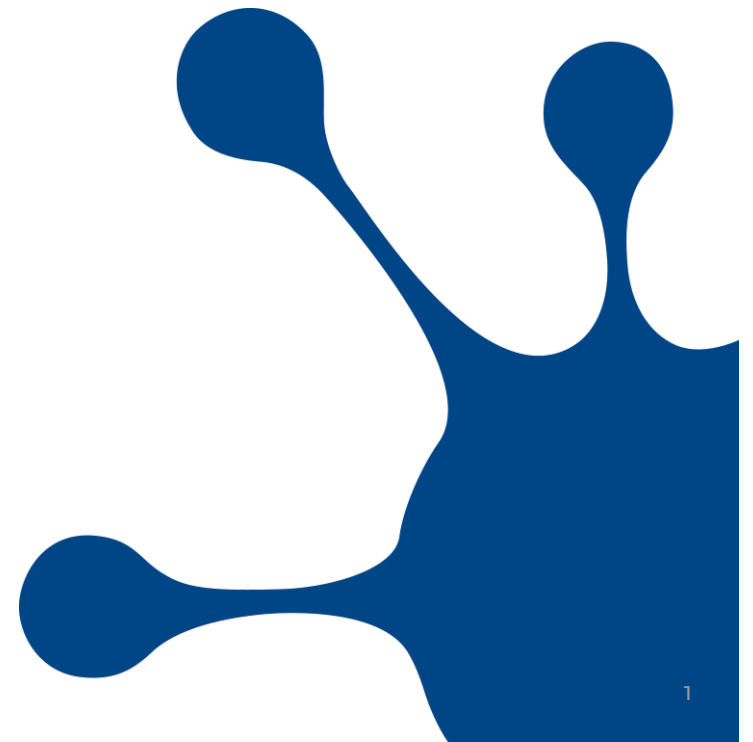
I.ROOT-SERVERS.NET

Analysis of Query Source and Anycast

Patrik Fältström

Head of Research and Development

Netnod



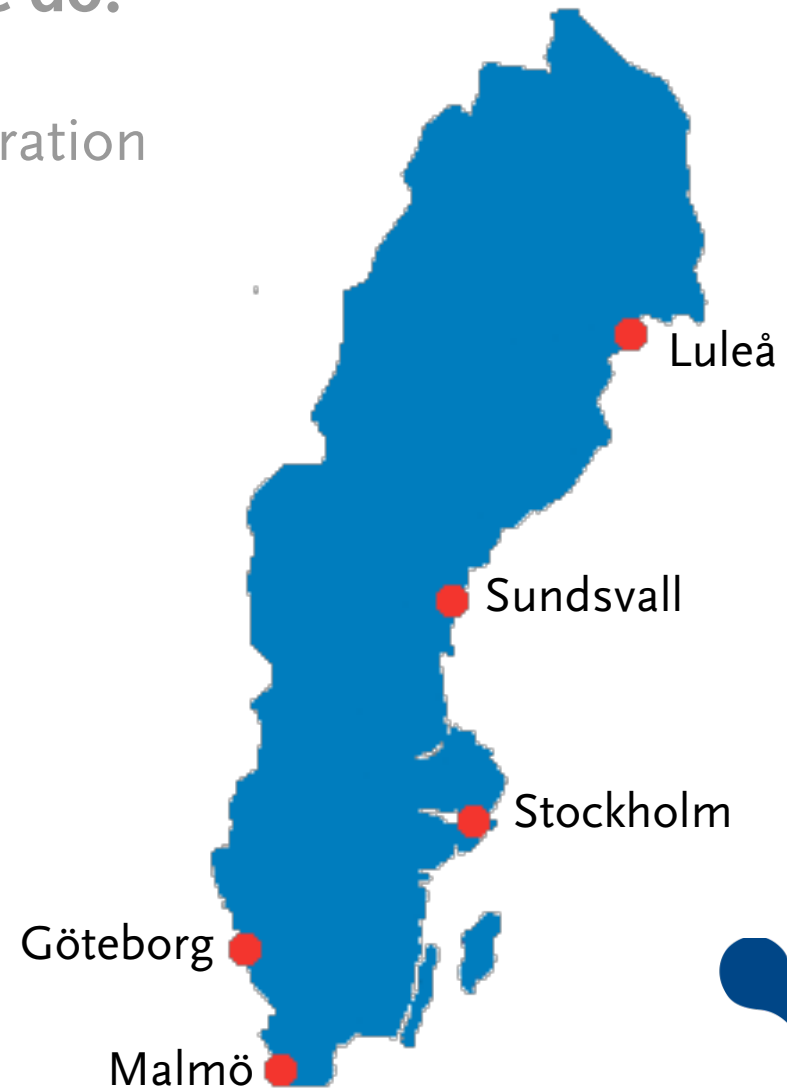
What is Netnod, and what do we do?

By a foundation fully owned incorporation

Not for profit

Provides:

- IX in 6 locations
- DNS in 55 locations
- NTP-service in 4 locations



Netnod history

1992-1996 there was a distributed IX at Royal Institute of Technology

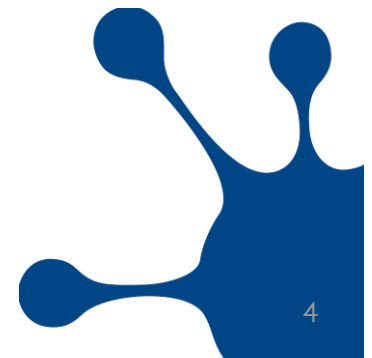
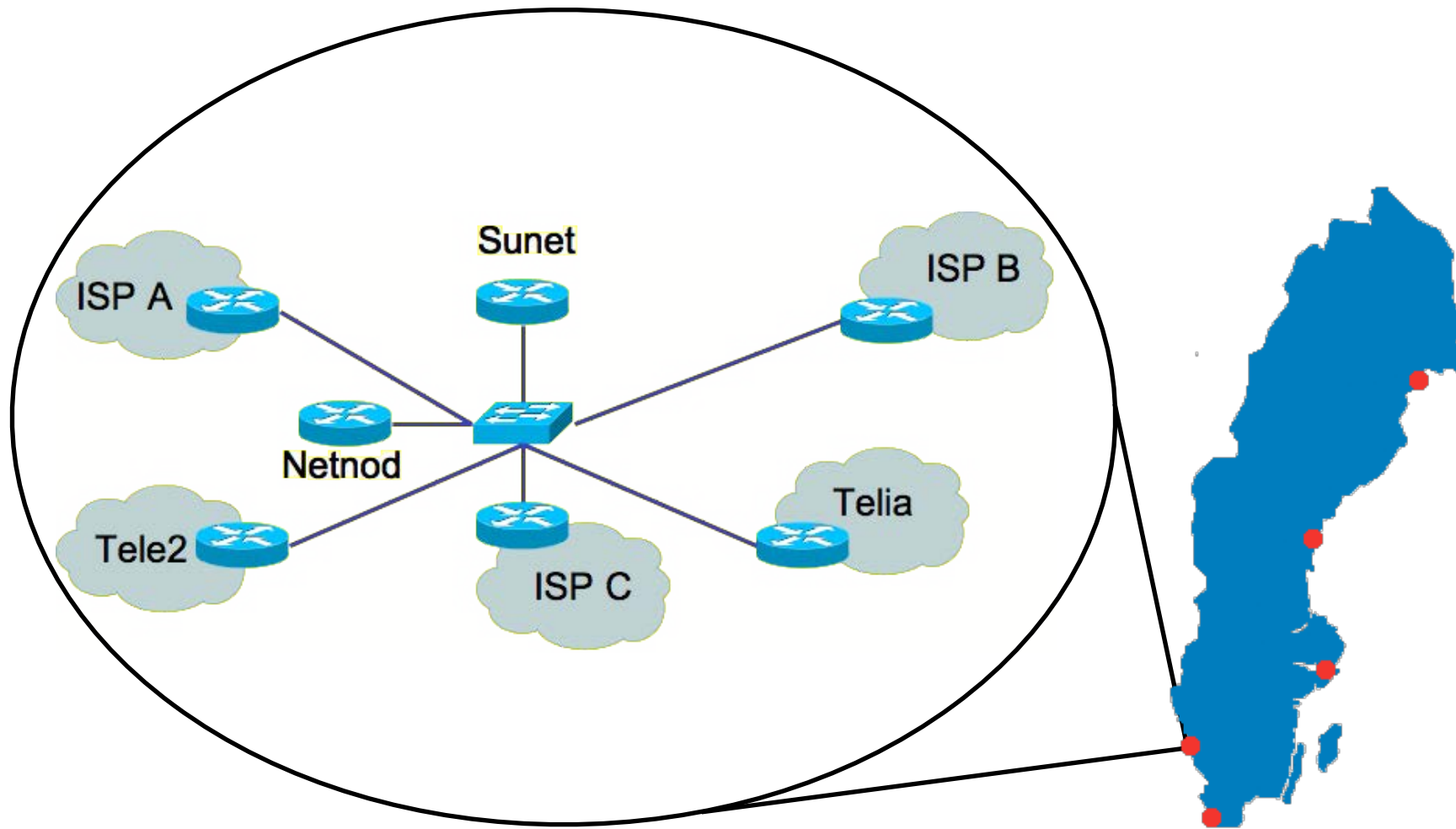
1996 the TU-foundation was created

Goal was increased robustness and security

The IX was moved to bunkers in the mountains



Same structure in all locations

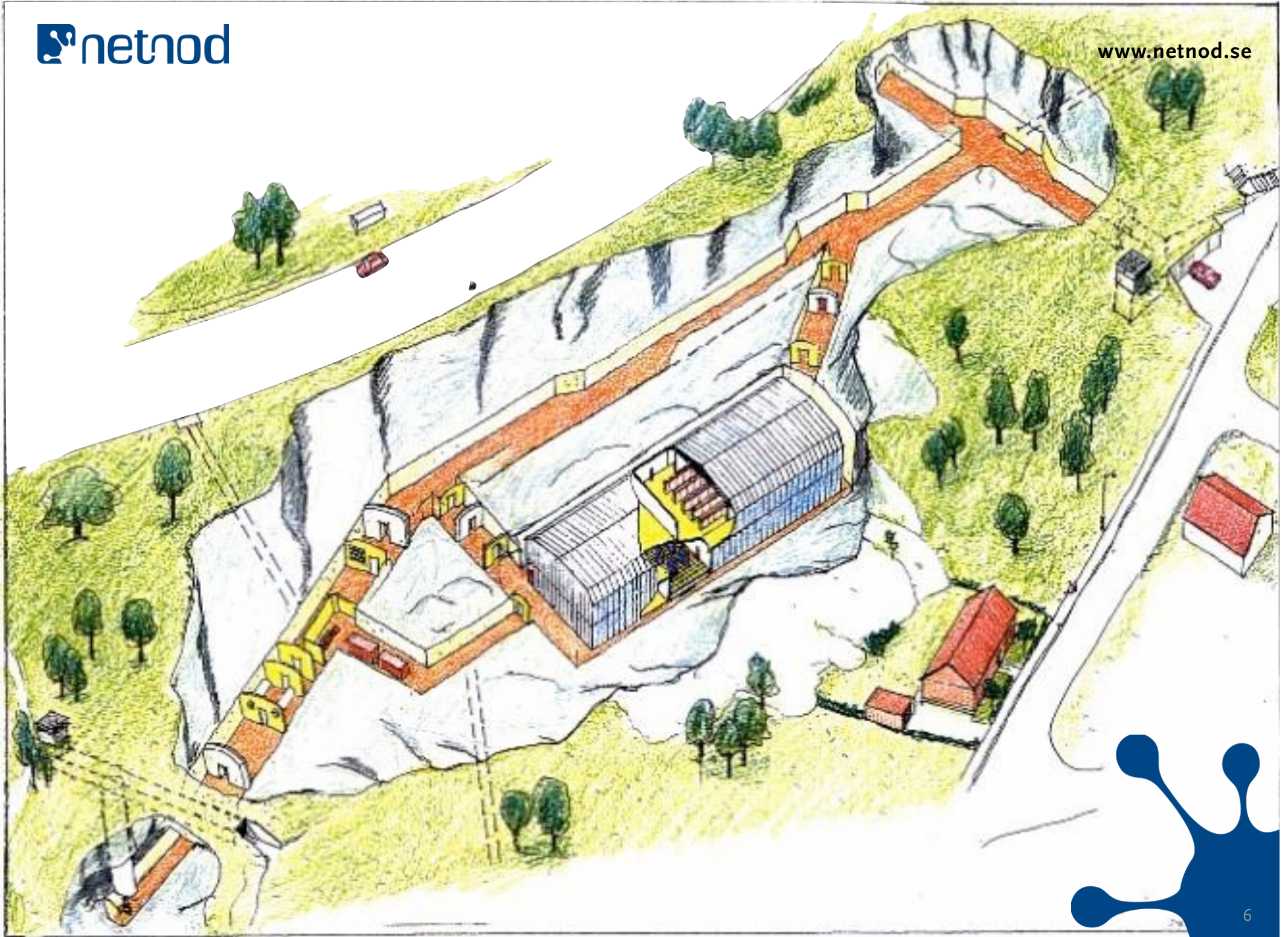


Mountain bunkers

Regulator PTS provides
colocation service

Specifically created for
telecom









DNS services hosted all over the world



100k queries per second is what we do for breakfast



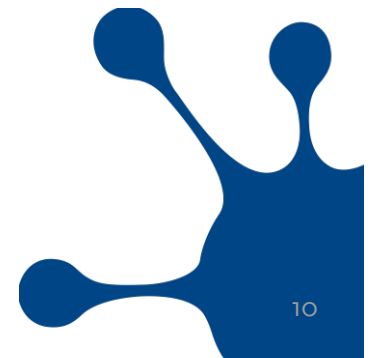
Background

We did this investigation in 2012

The result was kind of scary...

- Highest number of queries to London was from Germany...
- In Oslo, there were queries from all over the place...

It was time to see whether it is better 2015



i-root deployments

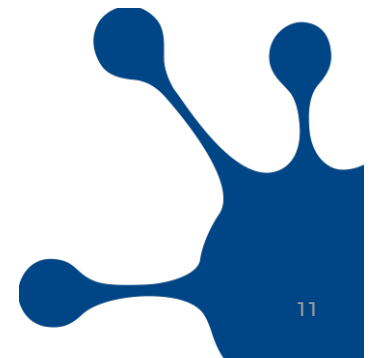
Most locations are at IX:es

A few inside Tier-1 providers

A few are where no IX exist

Global / Local distinction per peer (using no-export)

Most peers are local



Peerings

About 8000 peers with more than 2000 AS:es

Include route servers at larger IX:es

We are always looking for more peers!

➡ Yes, we do have an open peering policy

Email: peering@netnod.se

Info: <http://as8674.peeringdb.com>



Analysis of query src

Based on src IPv4 / IPv6 address

Looking at 10 largest AS:es per site

Economy represented based on RIR information

Based on snapshot in april 2015

Absolutely not 100% correct, but somewhat ok representation



Some observations

Most nodes behave as expected

5.6% IPv6

1.5% RFC1918 addresses, which should not be there

- 8.15% in Mumbai, 1.11% in Paris

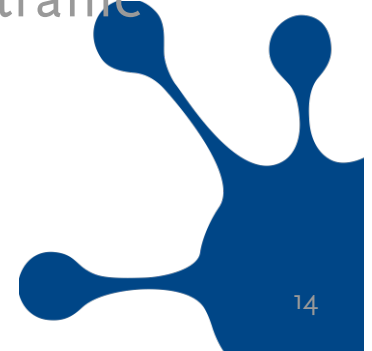
Some IX:es see traffic from places far away, very odd routing

Nodes with a lot of transit get traffic from more diverse locations

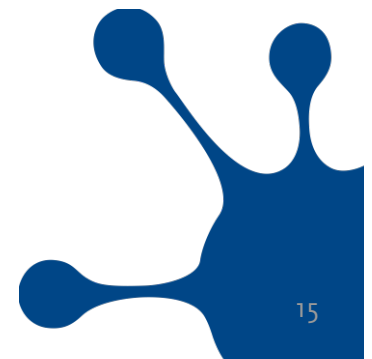
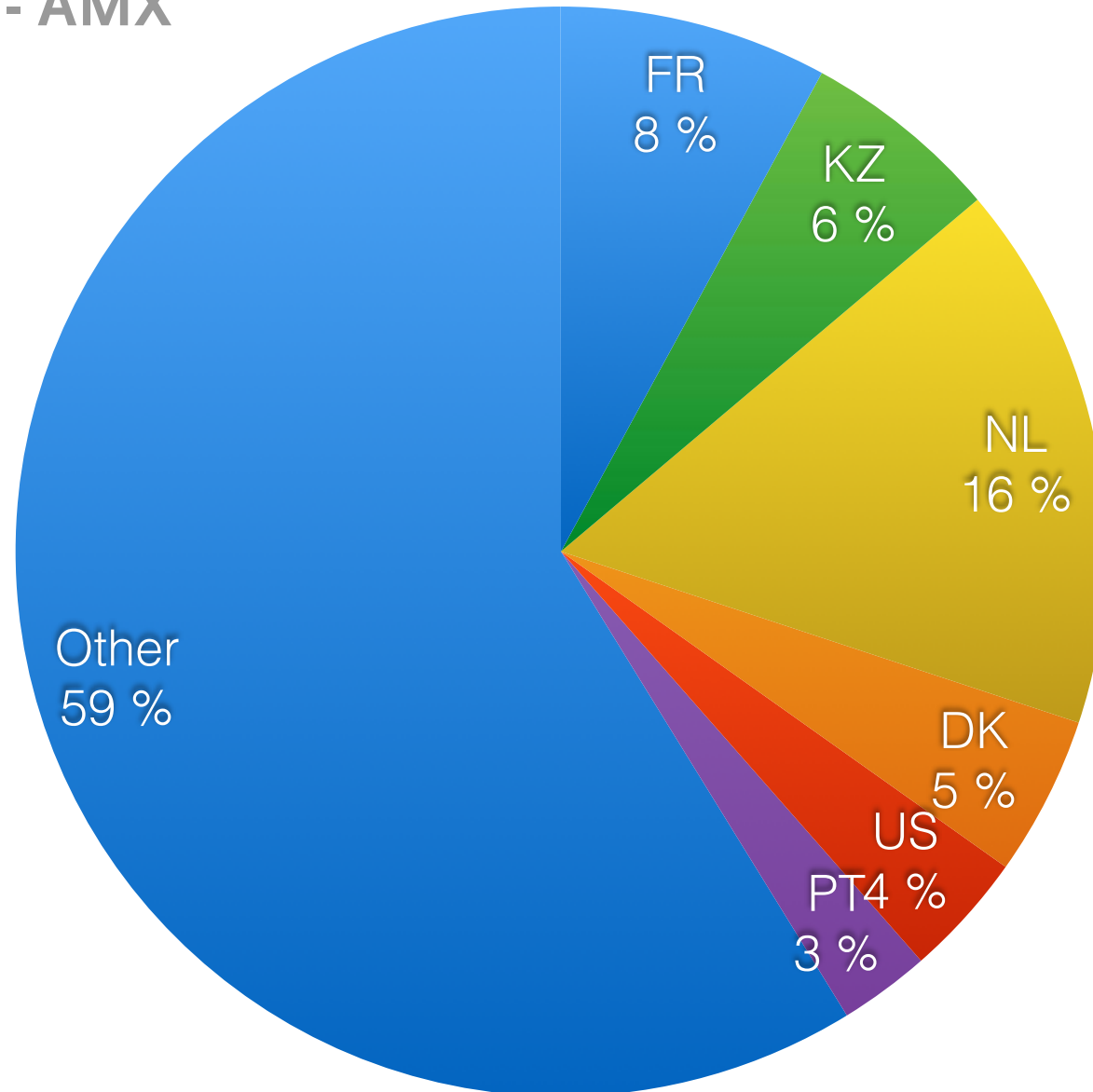
Smaller (and national) IX:es have higher percentage of local traffic

Global eyeball providers are clearly visible at some IX:es

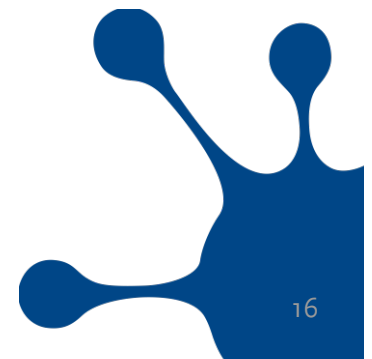
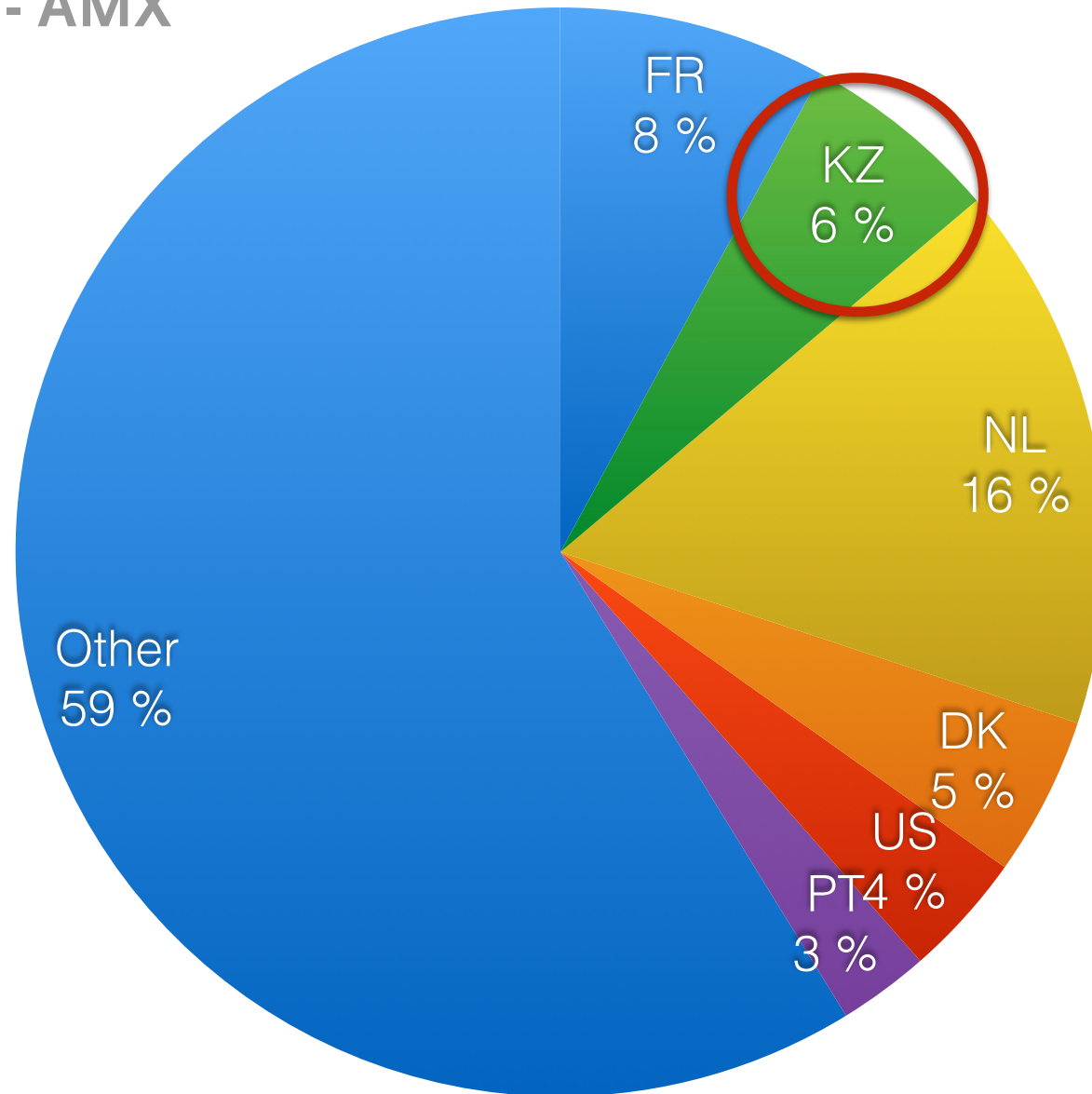
Result seems to be better today than 2012



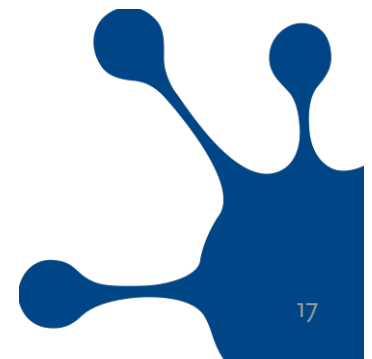
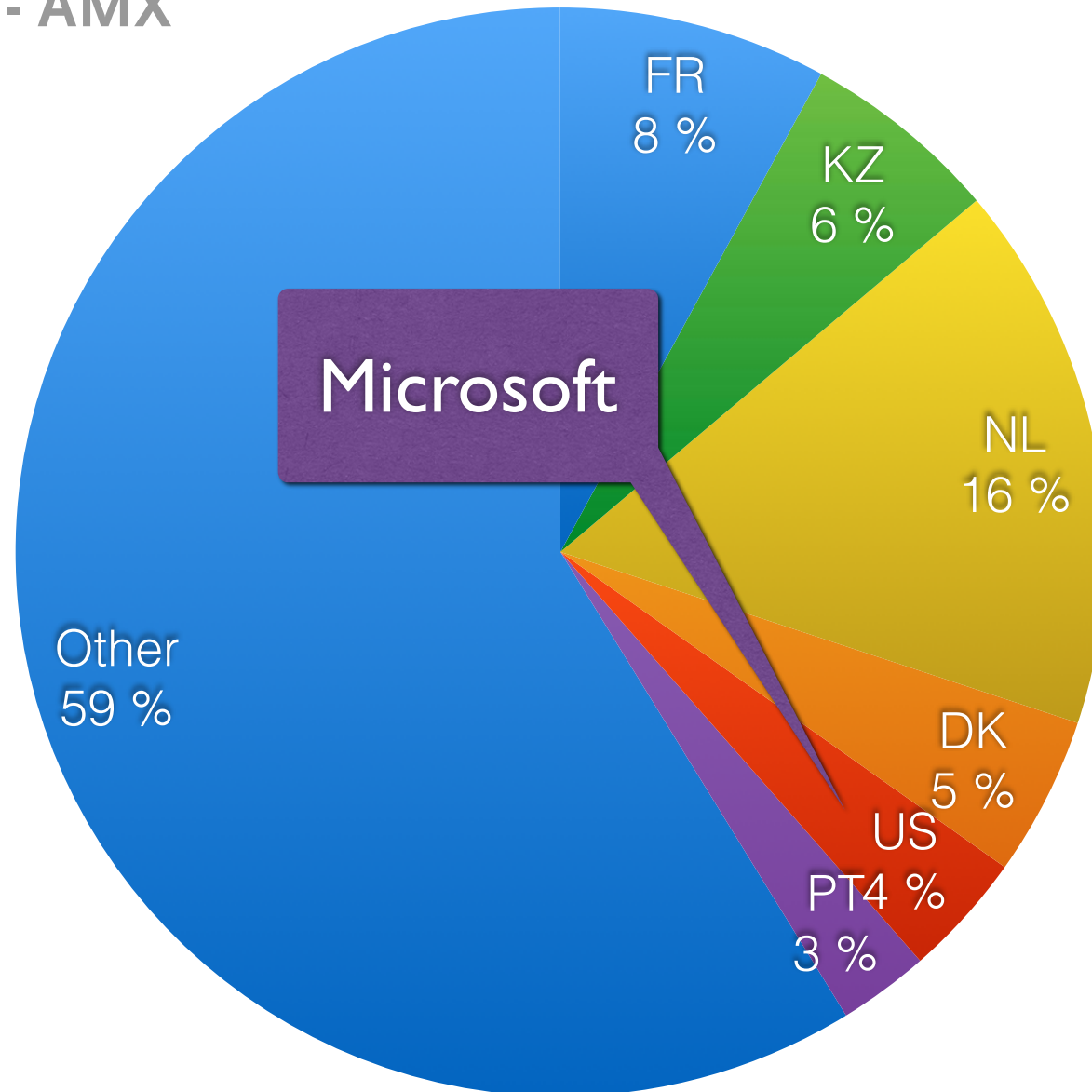
Amsterdam - AMX



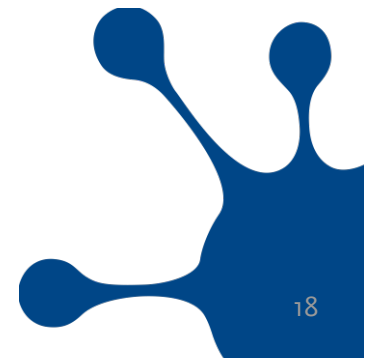
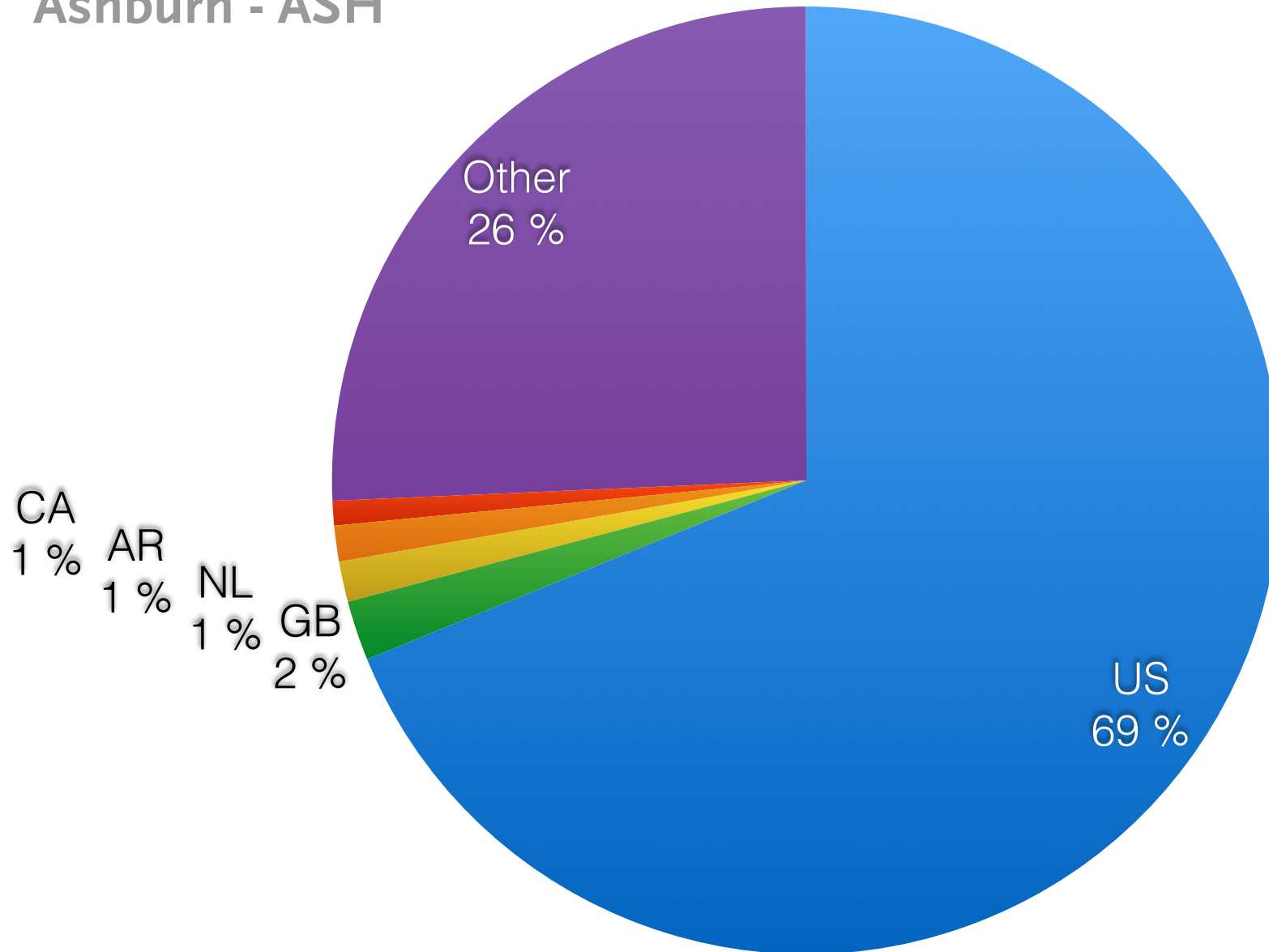
Amsterdam - AMX



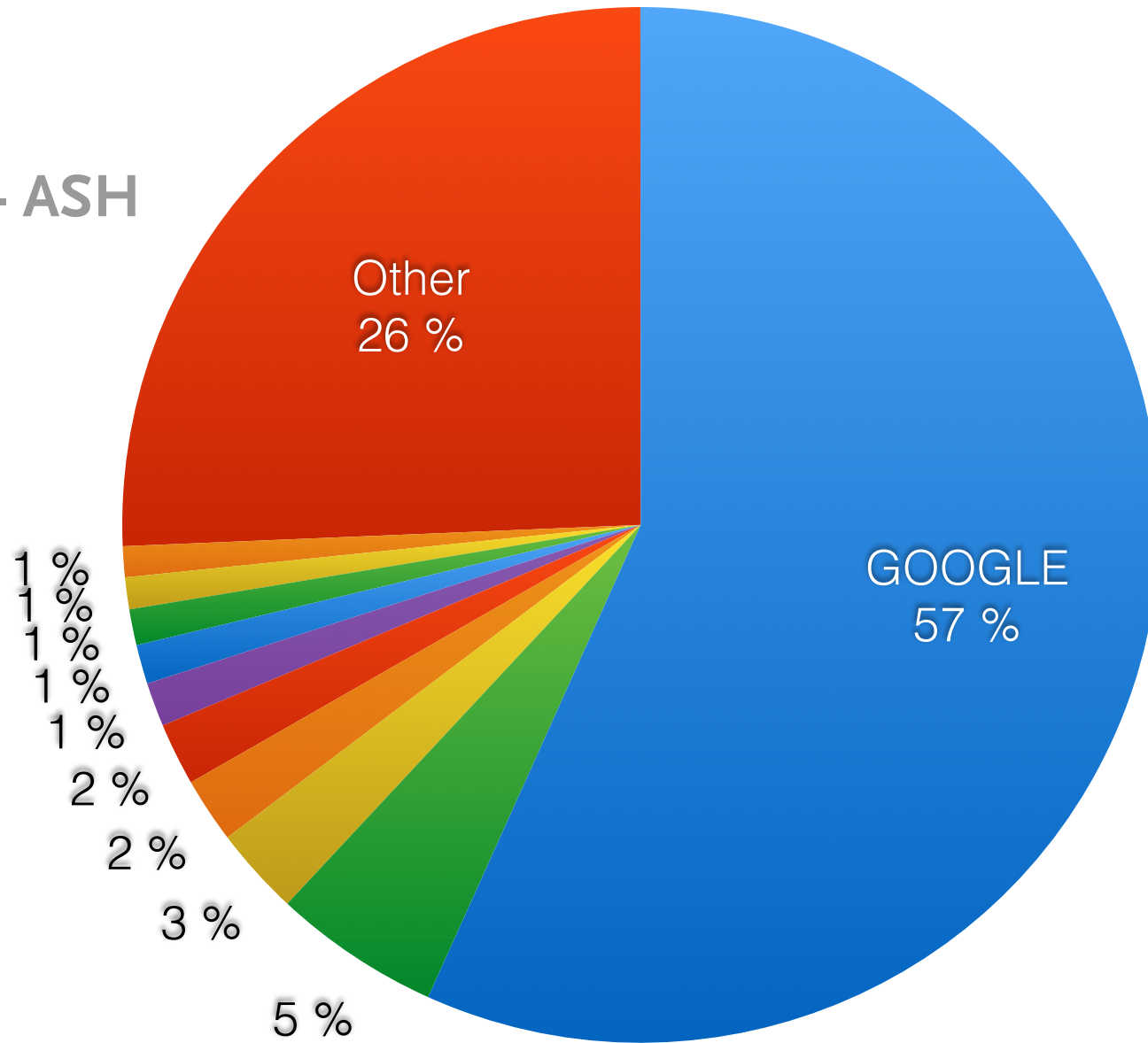
Amsterdam - AMX



Ashburn - ASH



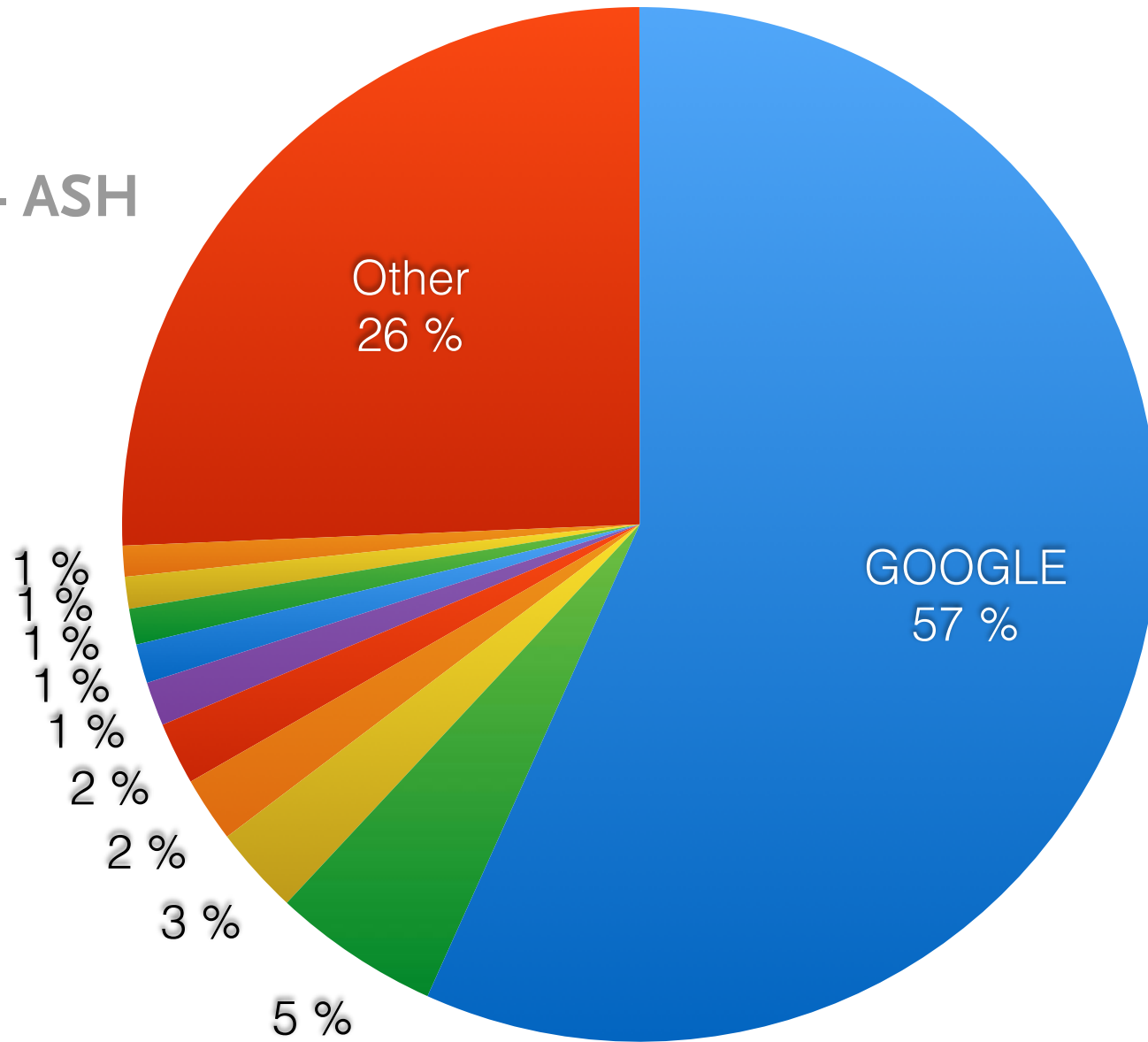
Ashburn - ASH



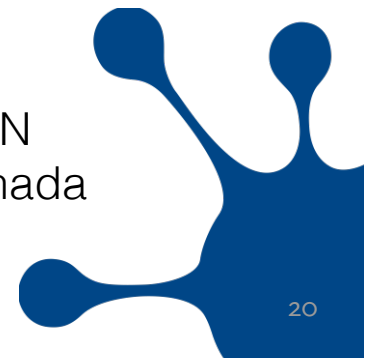
- GOOGLE
- CABLE-NET
- EDGECAST
- BSKYB
- AMAZON
- KPN
- Telecom Argentina
- Comcast
- Cox
- Bell Canada
- Other



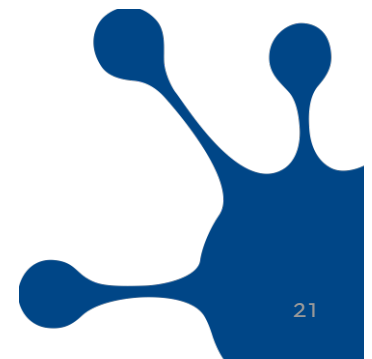
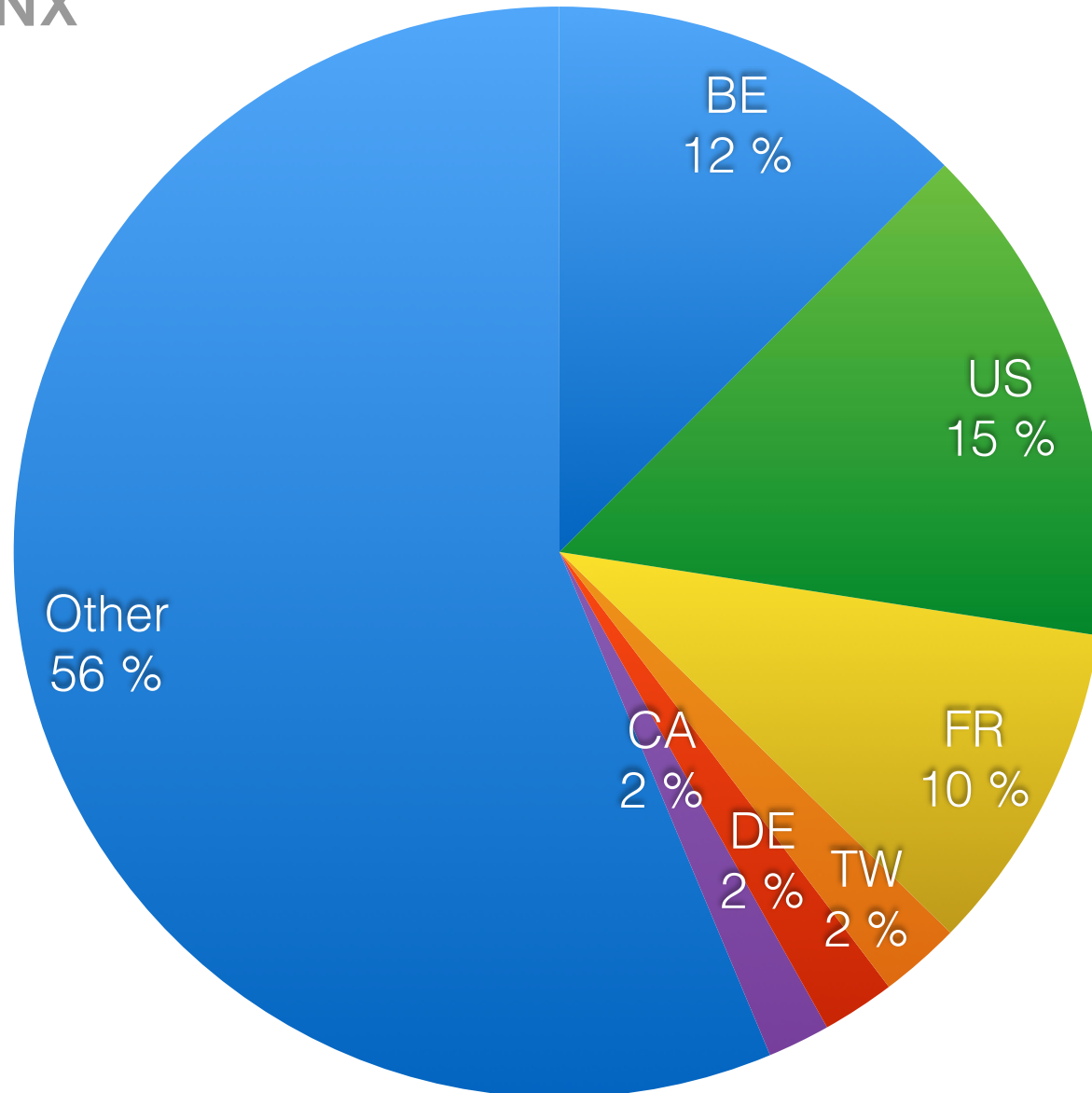
Ashburn - ASH



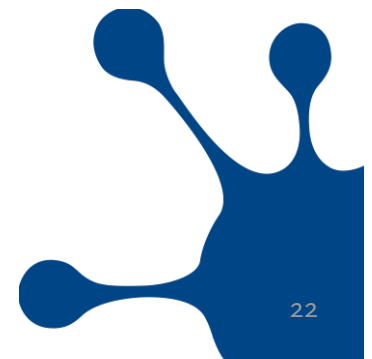
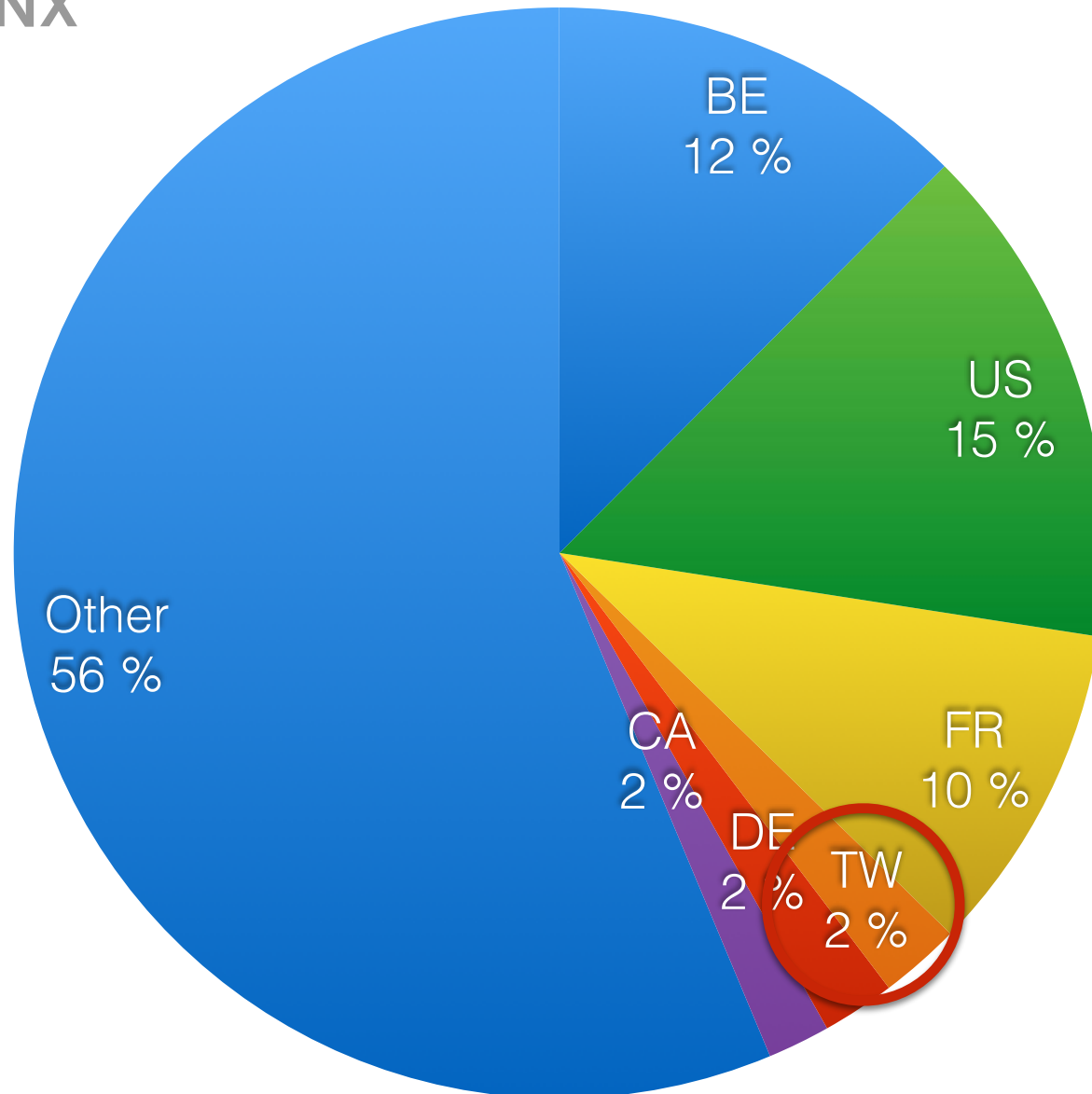
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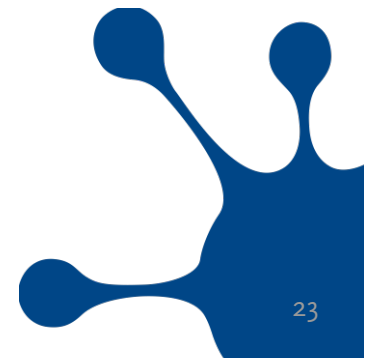
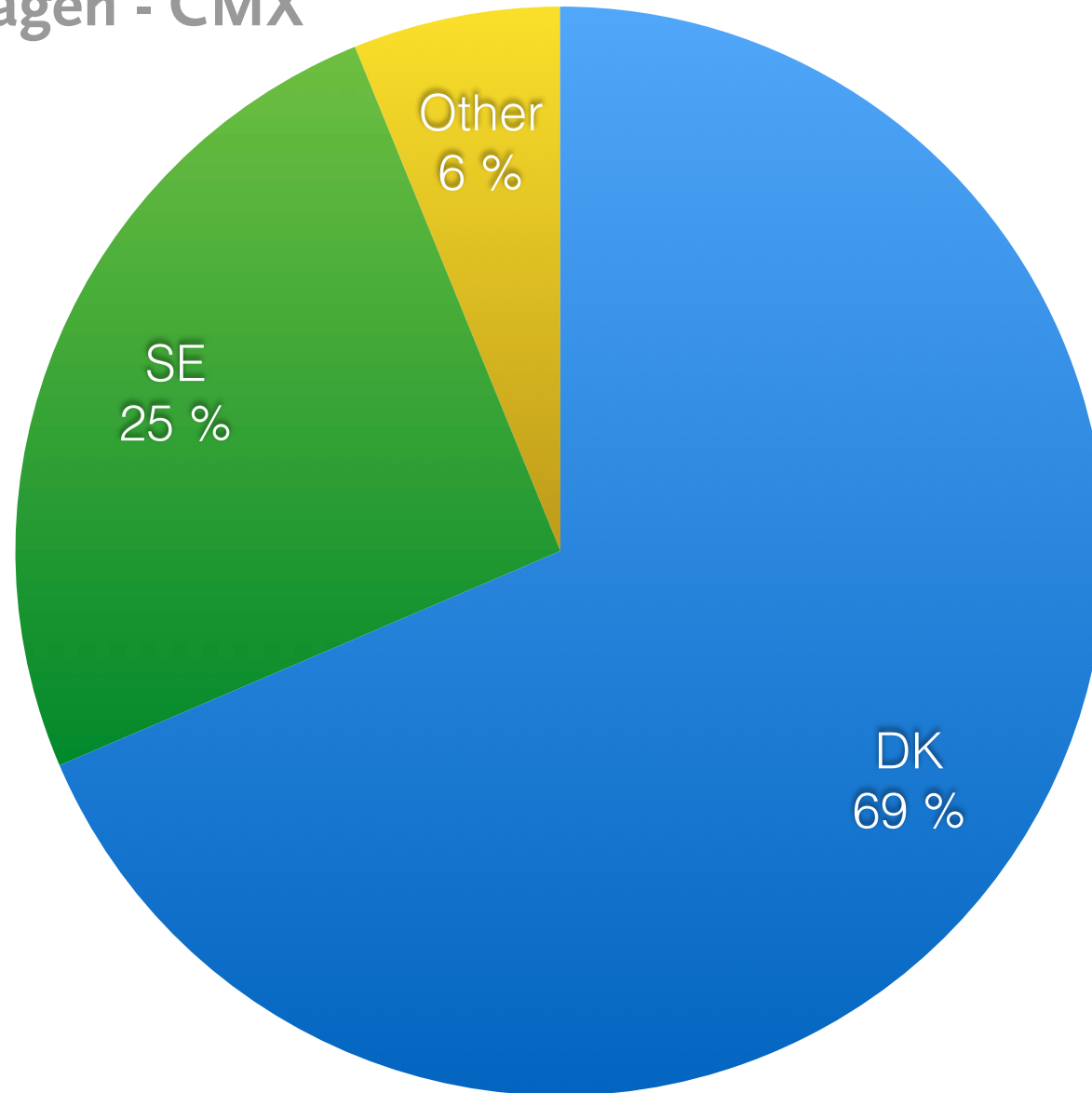
Brussels - BNX



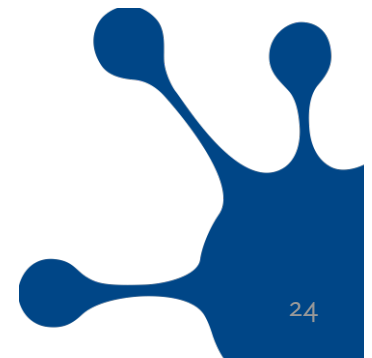
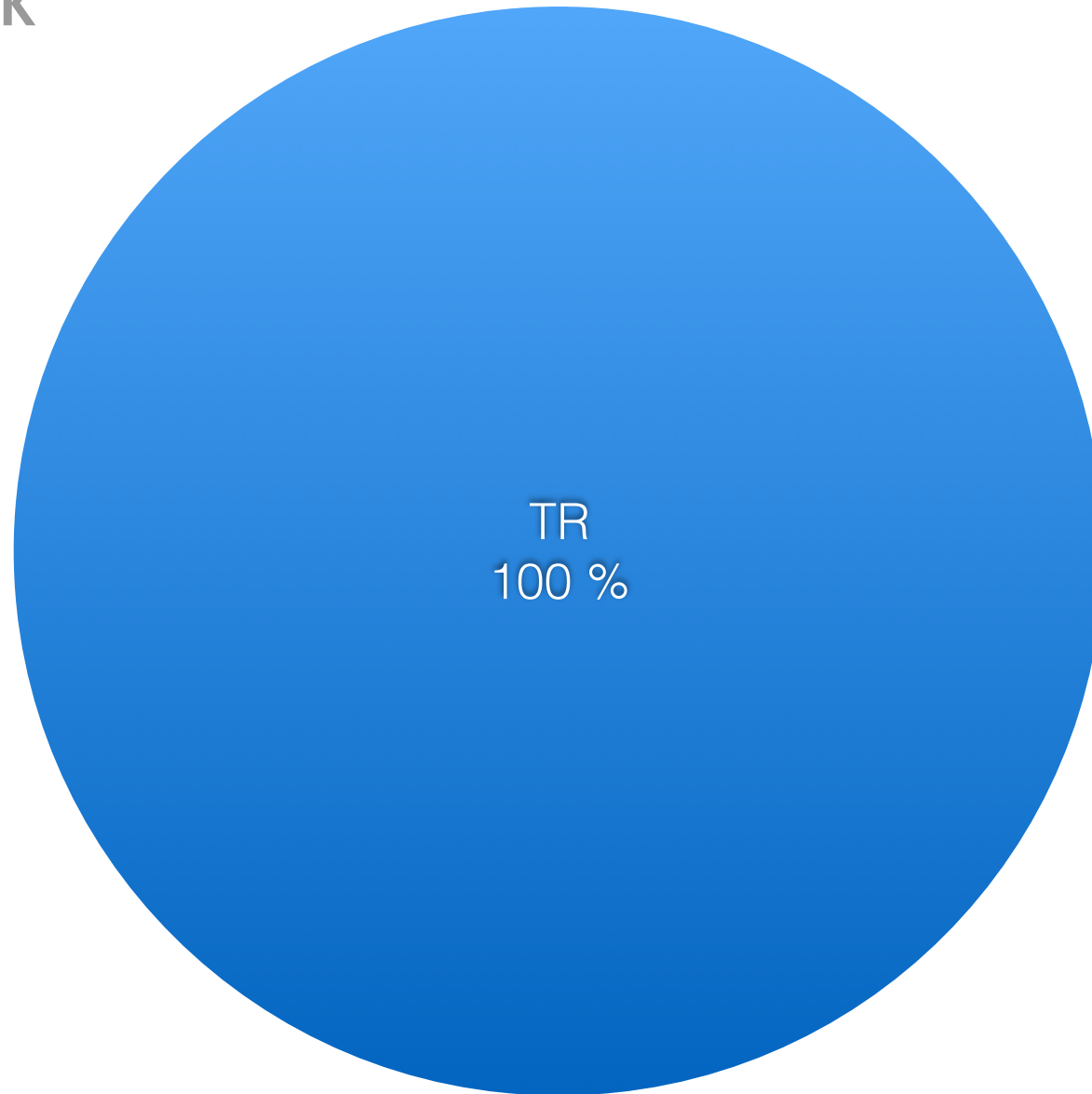
Brussels - BNX



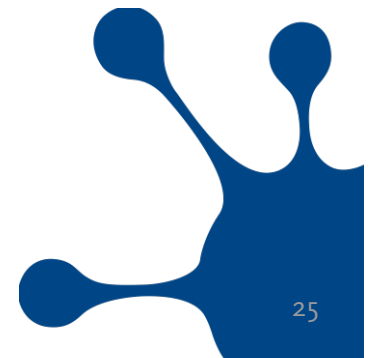
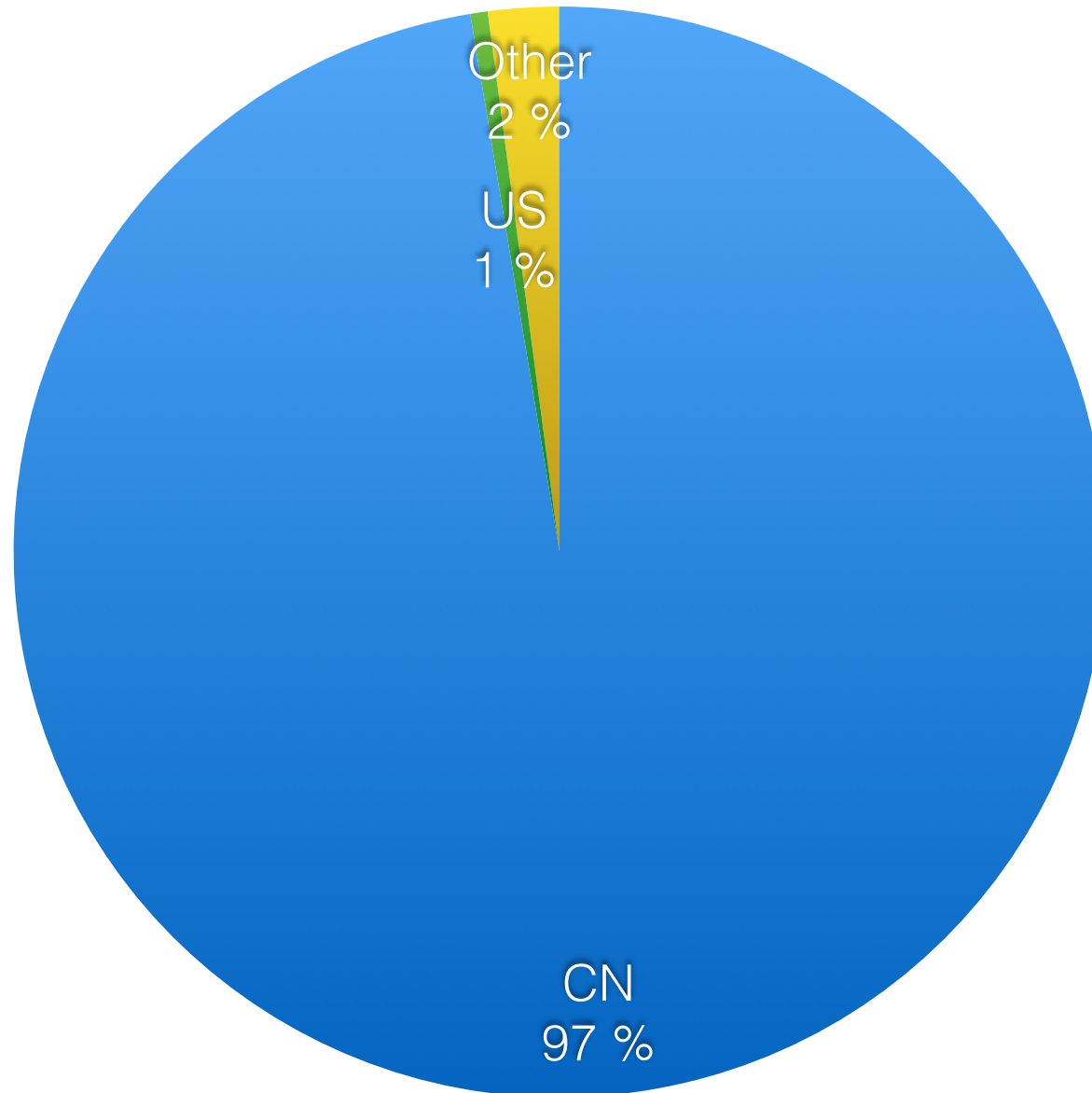
Malmö/Copenhagen - CMX



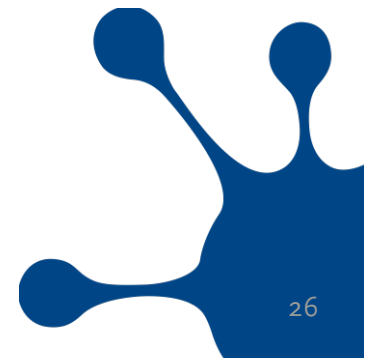
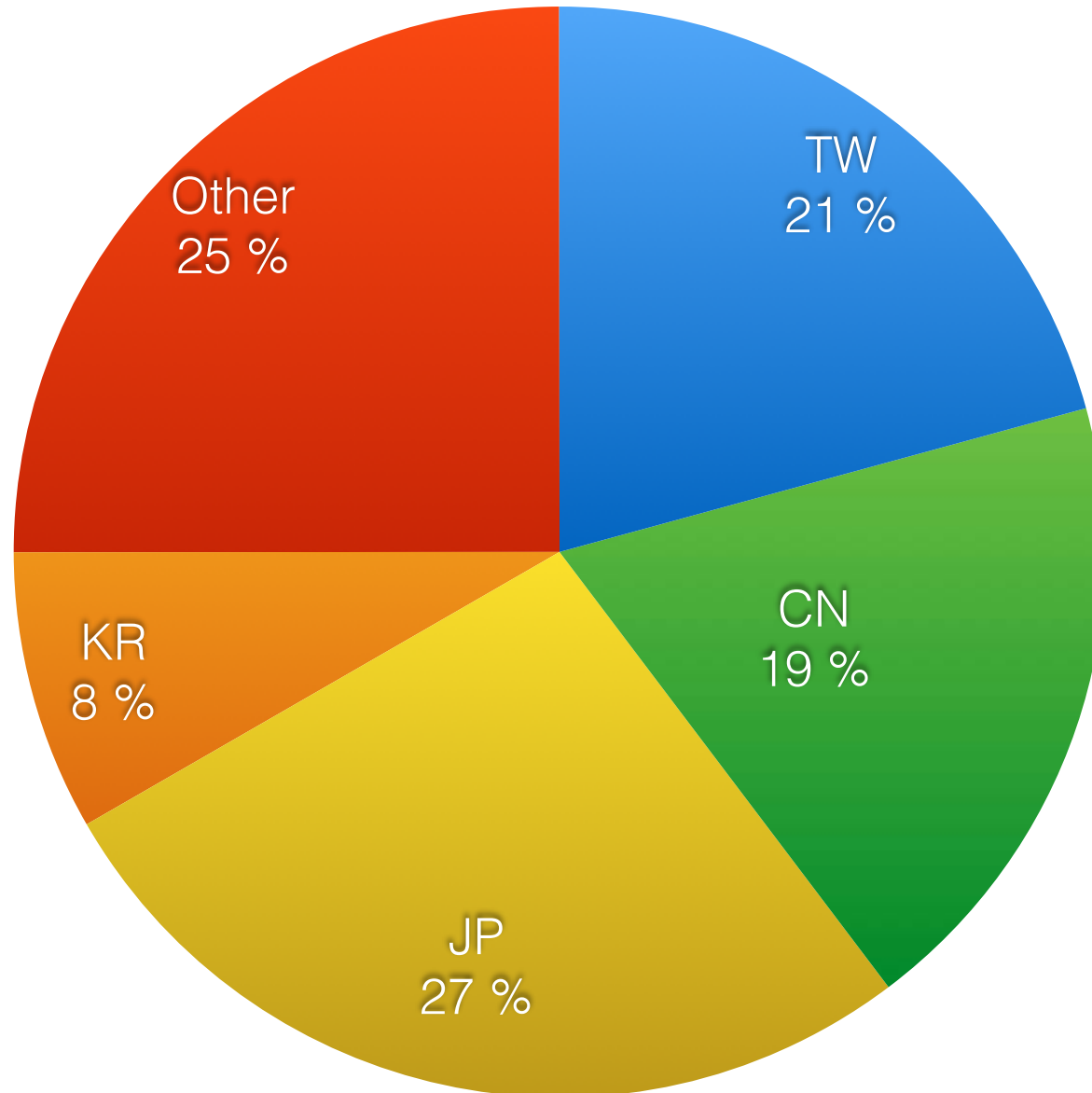
Ankara - ANK



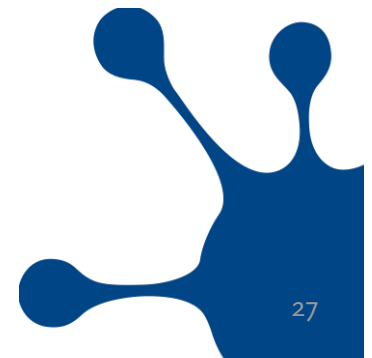
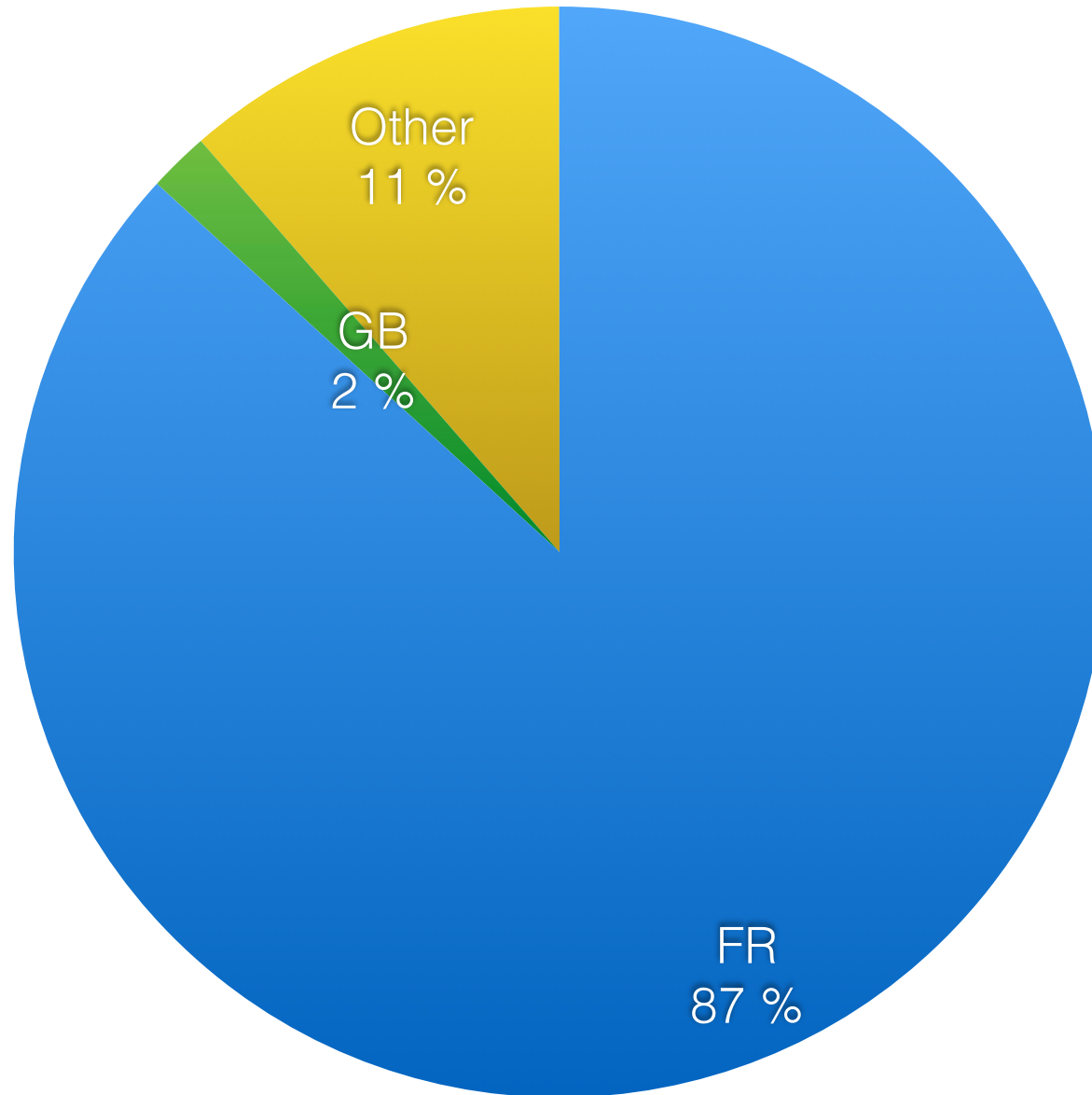
Beijing - BEI



Tokyo - TPP

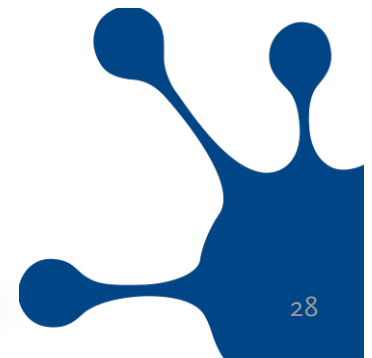
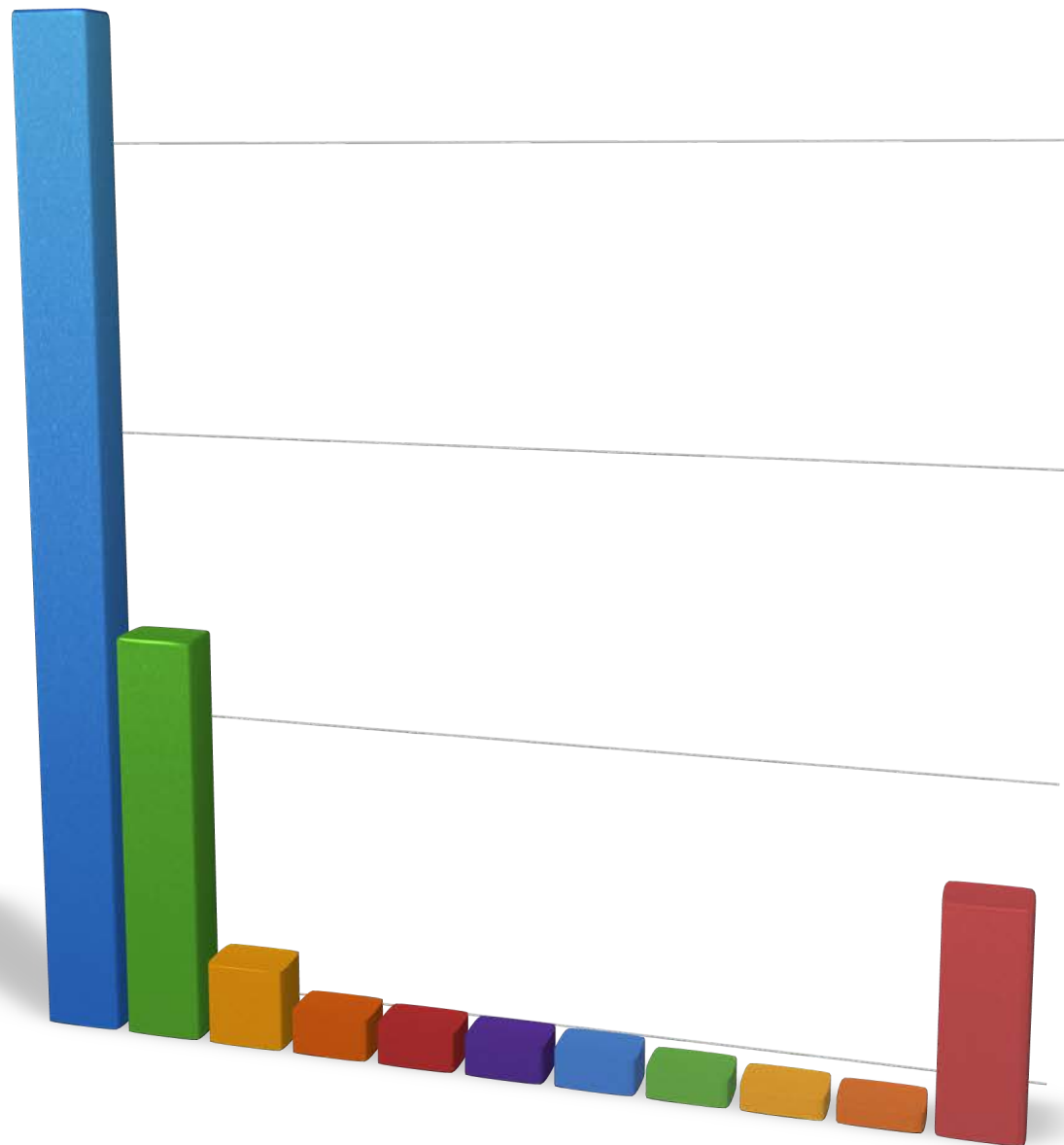


Paris - PAR

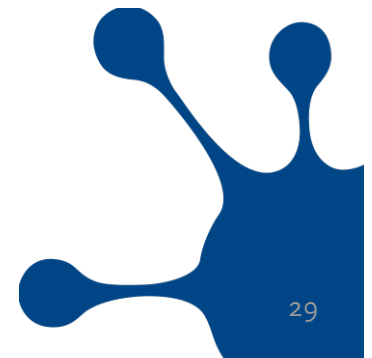
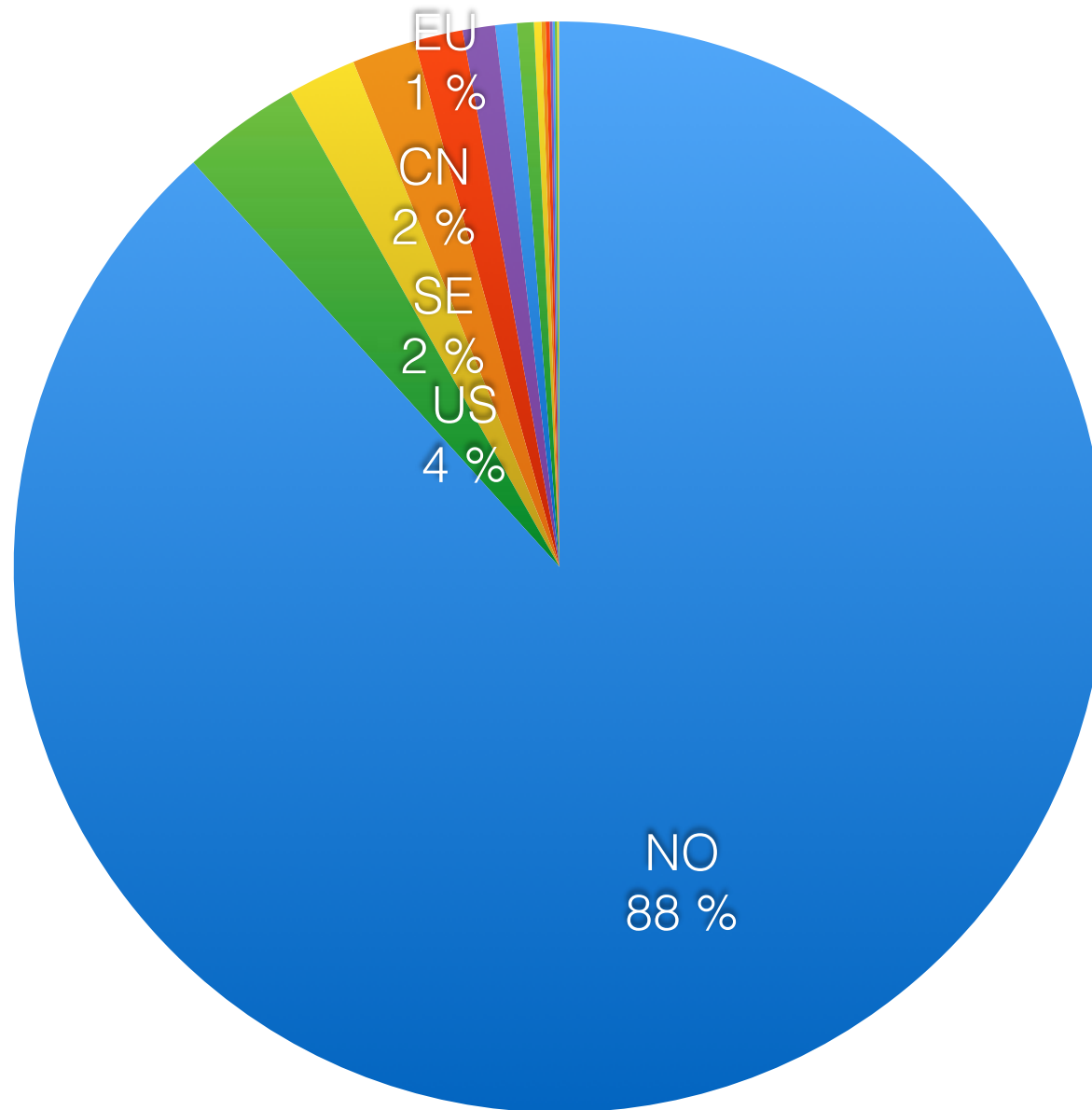


Paris - PAR

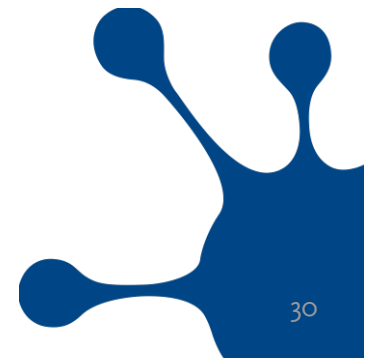
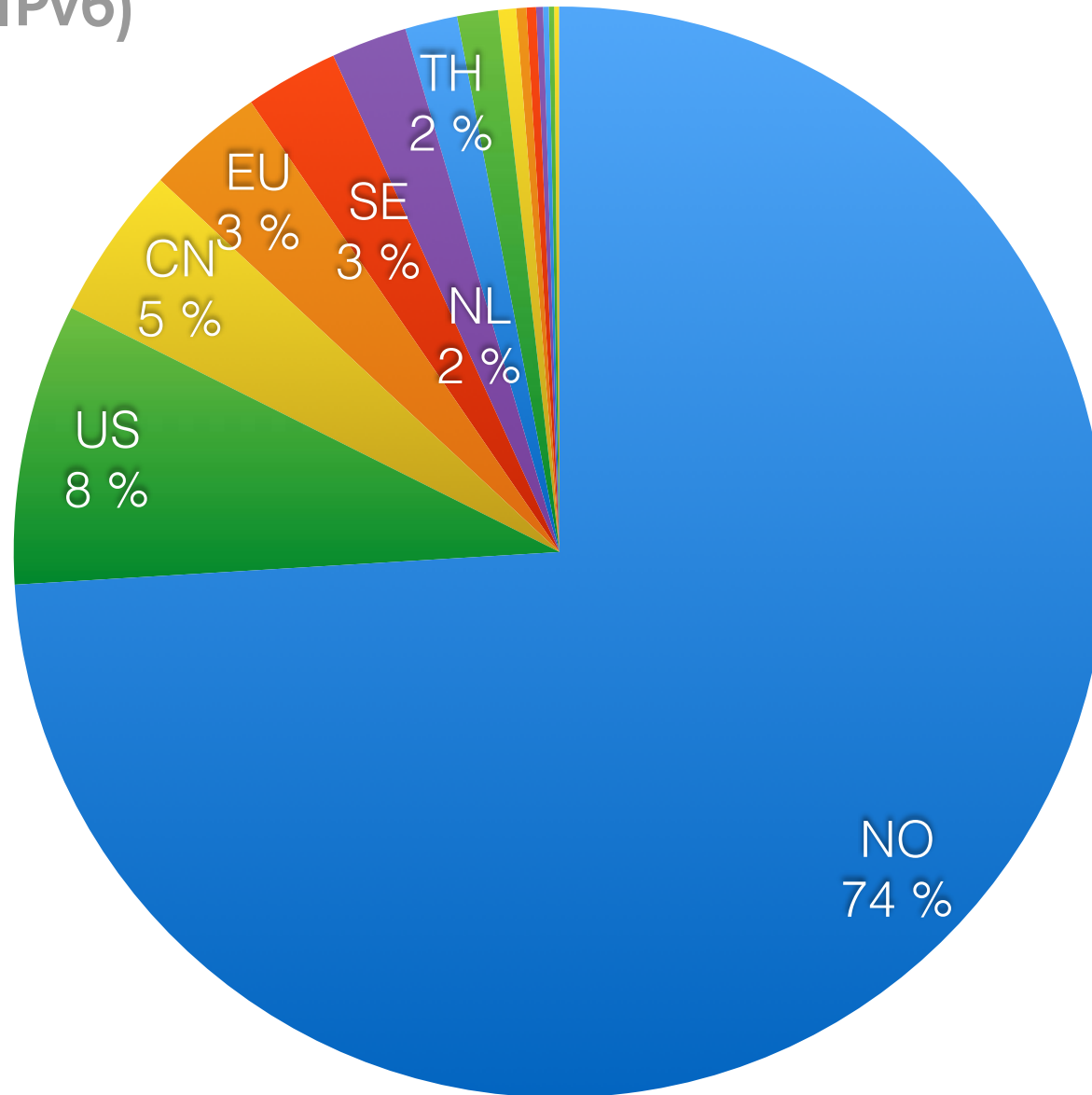
- RENATER
- COMPLETEL
- ALTITUDETELECOM
- IP SLA
- FIRSTHEBERG
- RMI-FITECH
- EASYNET
- JUSSIEU
- PARISSUD
- CEG-HOSTING
- Other



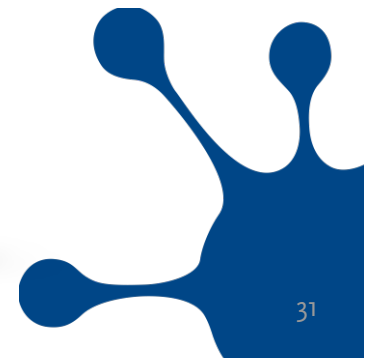
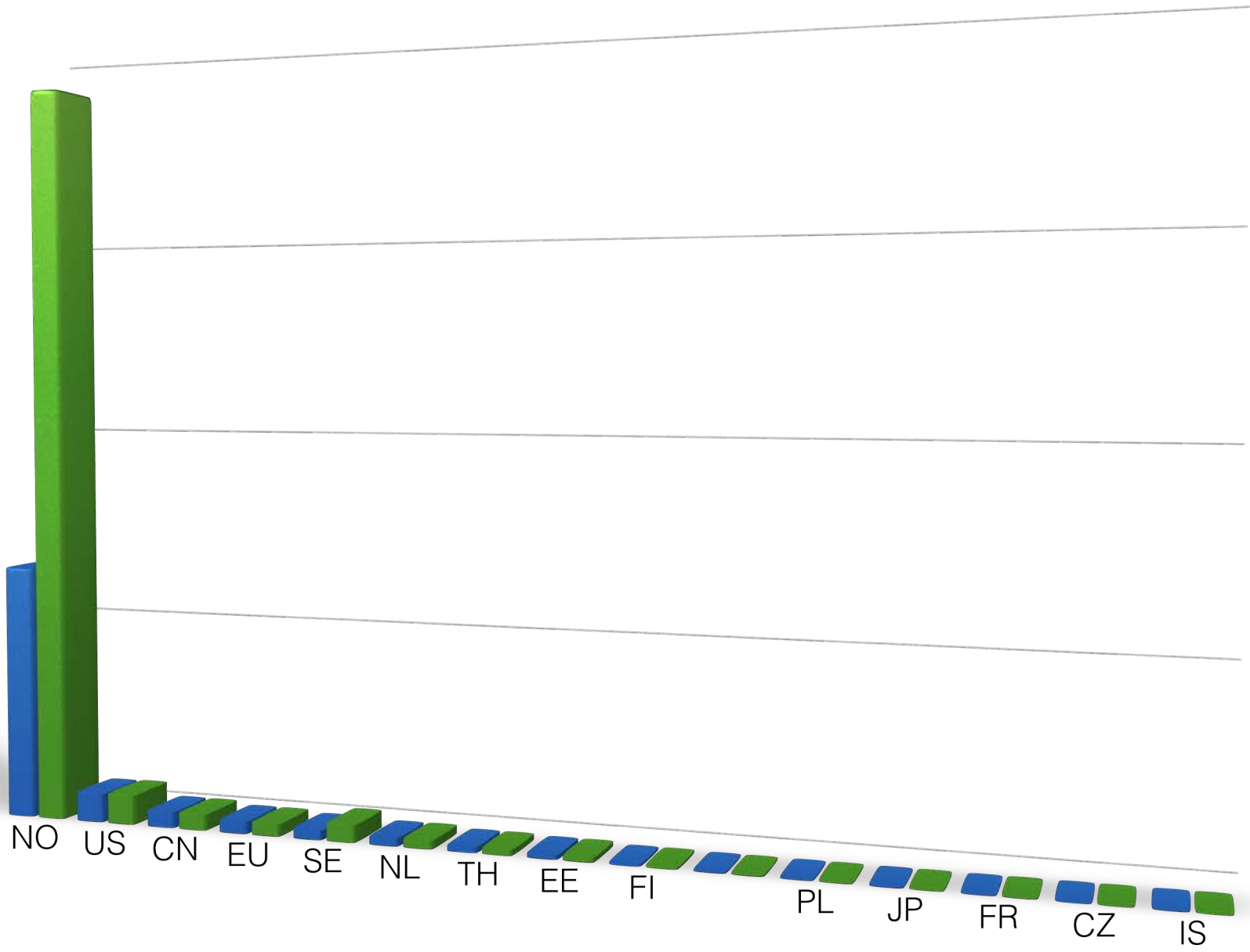
Oslo - NIX



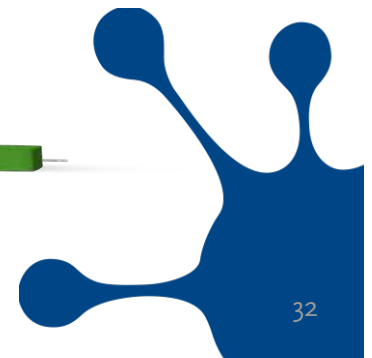
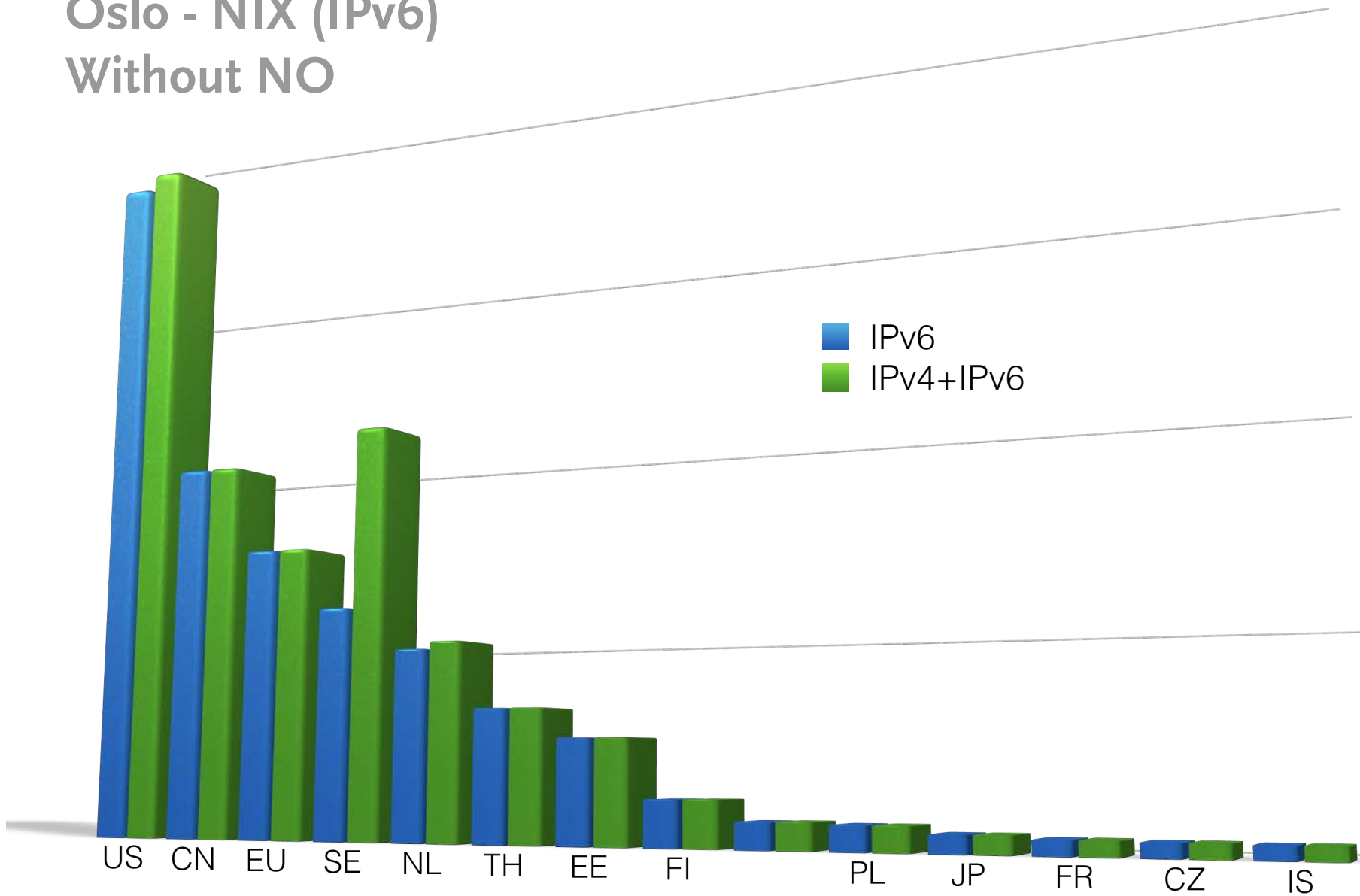
Oslo - NIX (IPv6)



Oslo - NIX (IPv6)

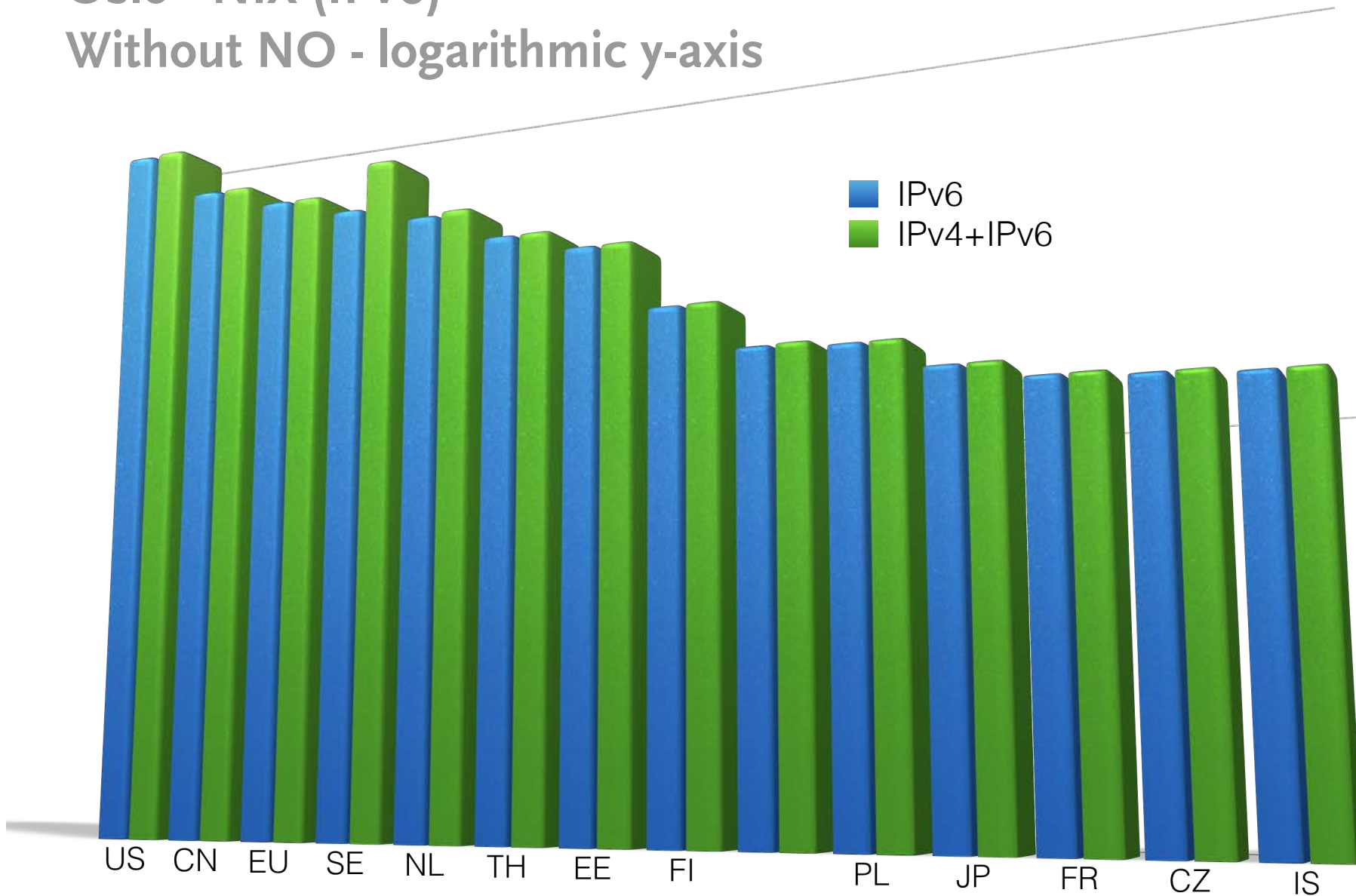


Oslo - NIX (IPv6) Without NO



Oslo - NIX (IPv6)

Without NO - logarithmic y-axis



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