IPv6 Adoption over Internet Exchanges

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Pro IPv6 Disclaimer

Hurricane Electric has worked to advance IPv6 deployments globally.

- HE received its first IPv6 allocation in 2001.

- Our network completed a native IPv6 conversion in 2007.

- HE peers with more ASNs over IPv6 than any other network.

IPv6 Adoption over Internet Exchanges

Let's look at how European Internet Exchanges have progressed in adoption of IPv6.

My assumptions are:

- Internet Exchanges historically are where we grow the Internet.

- Increasing IPv6 traffic across exchanges starts with increasing IPv6 peering.
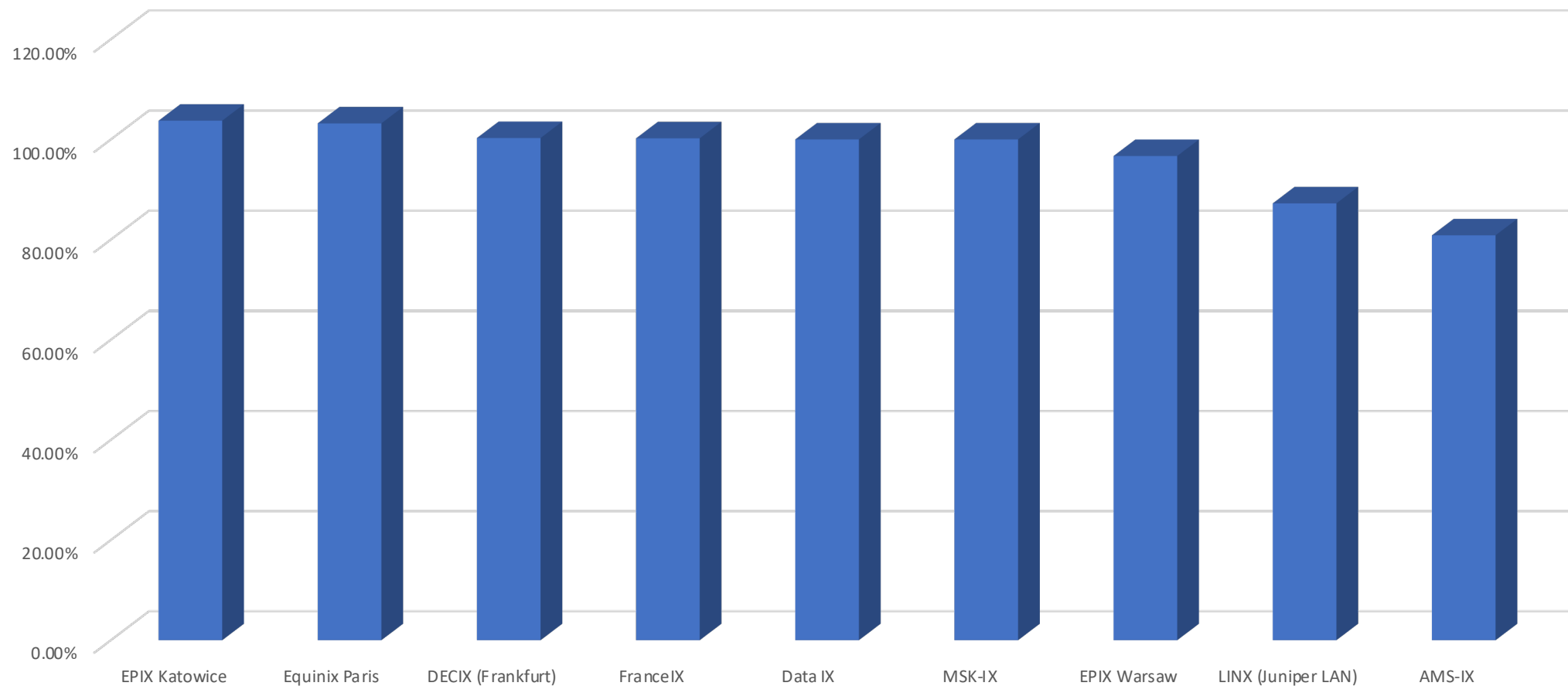
IPv6 Adoption at the top European IXs

Behavior at European exchanges shapes the industry. A few facts to keep in mind:

- 27.3 percent of all networks advertise IPv6 prefixes.

- 740 Internet Exchanges including the 5 new exchanges in 2020, 462 of which are in Europe.

- Europe hosts 7 of the top 10 Internet Exchanges by members.

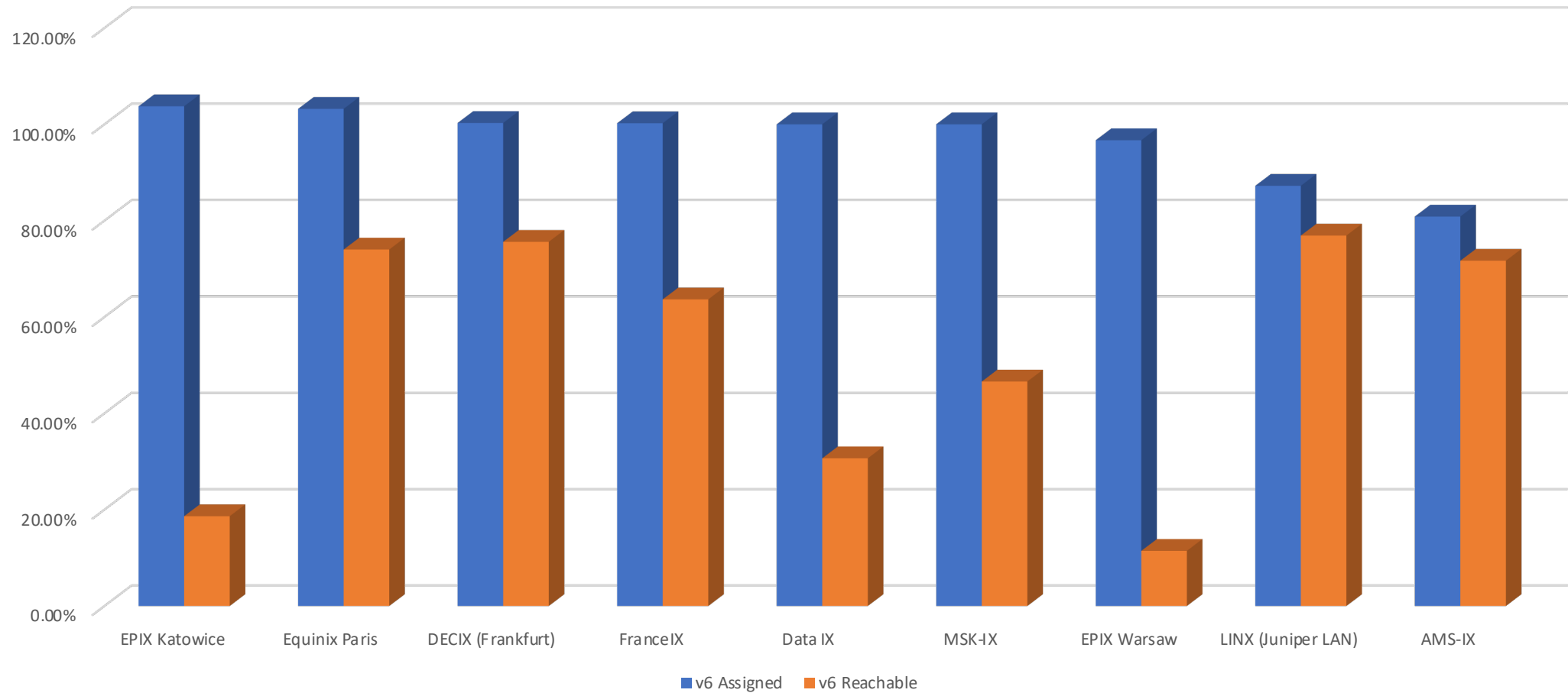- Peers are more likely to have both an IPv4 and IPv6 peering session on a European exchange.

Top European Exchanges by Members
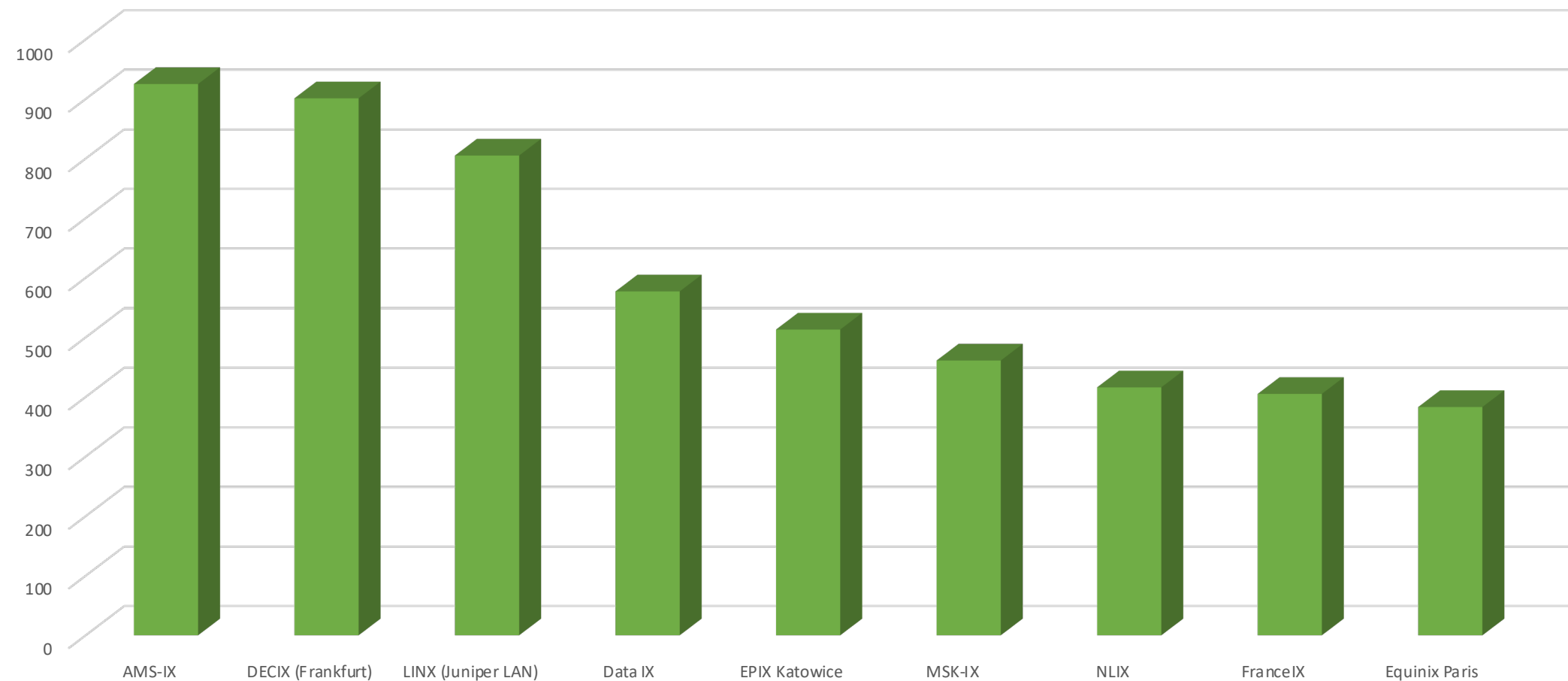
Assigned IPv6 per IPv4 at Top European IXs

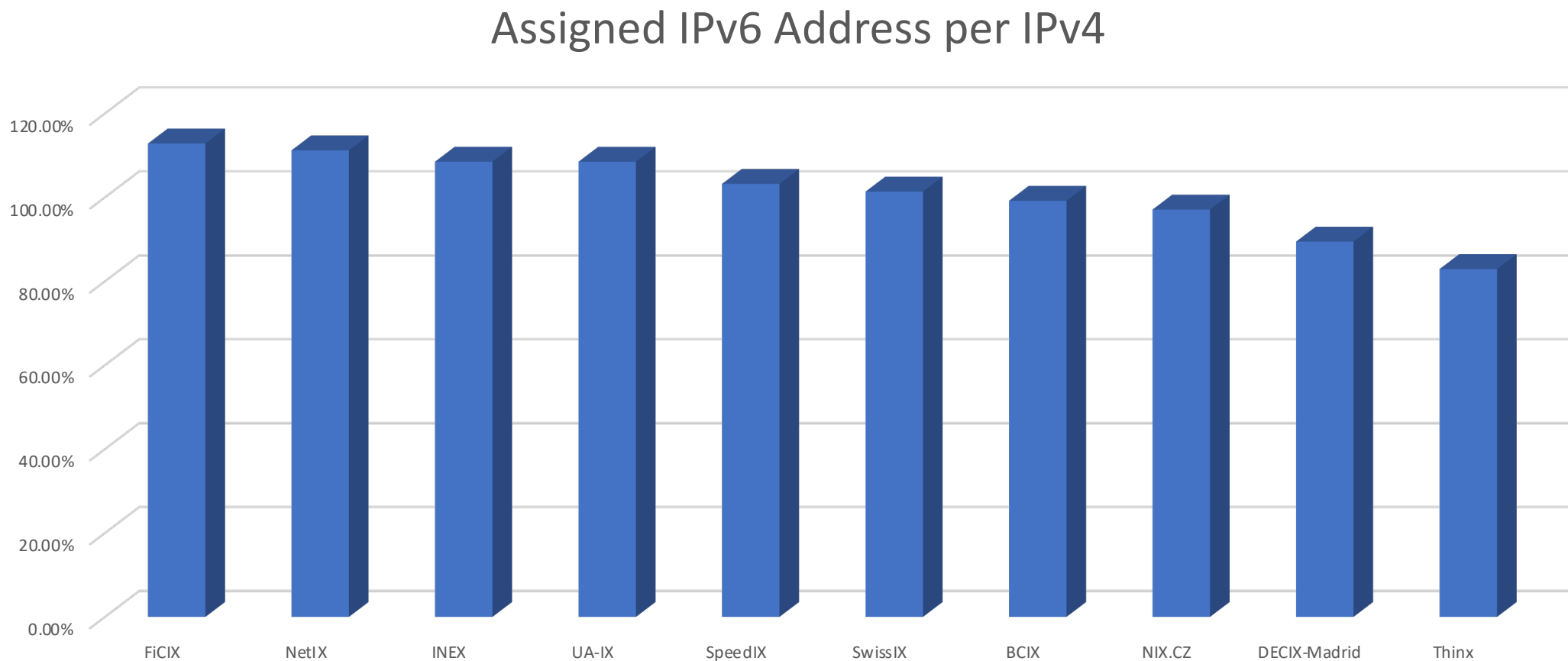# Reachable IPv6 at the Top European IXs

IPv6 Adoption over Internet Exchanges

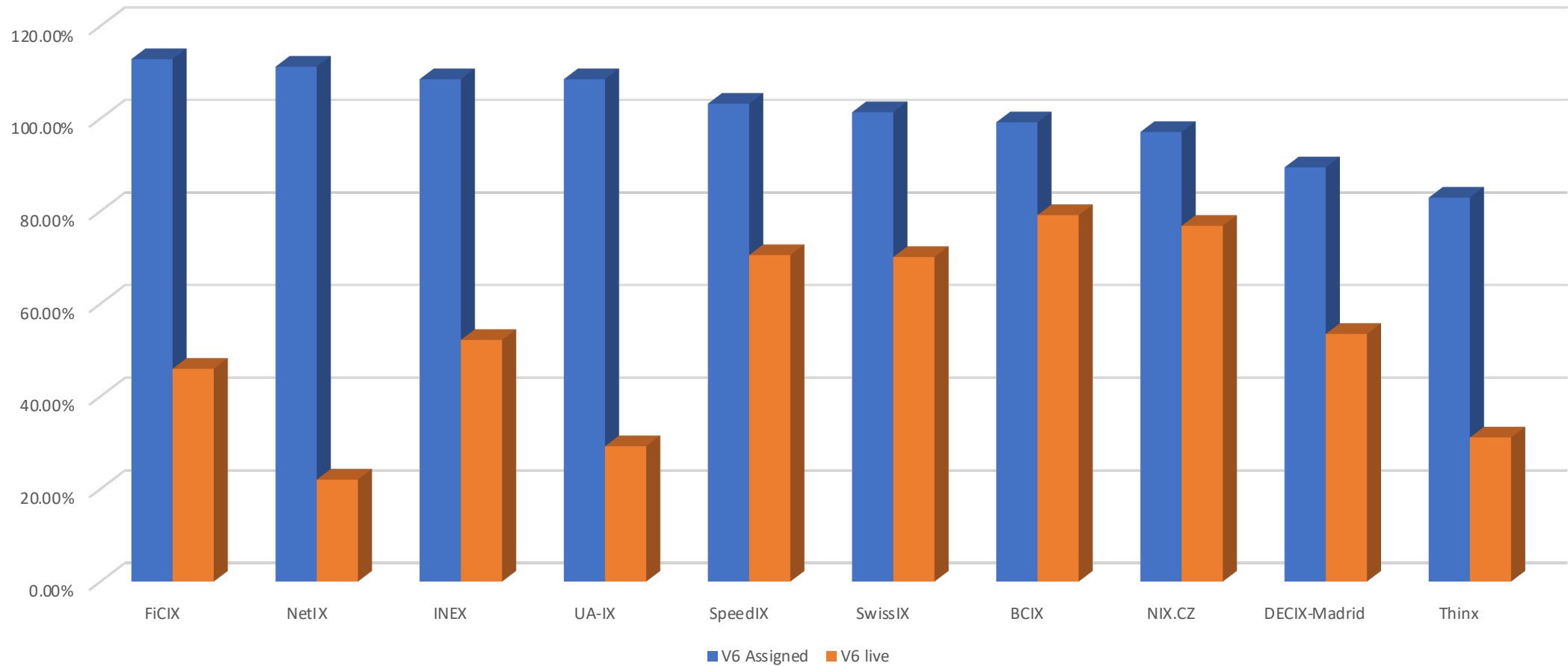This seemed like IPv6 might have some room for improvement.

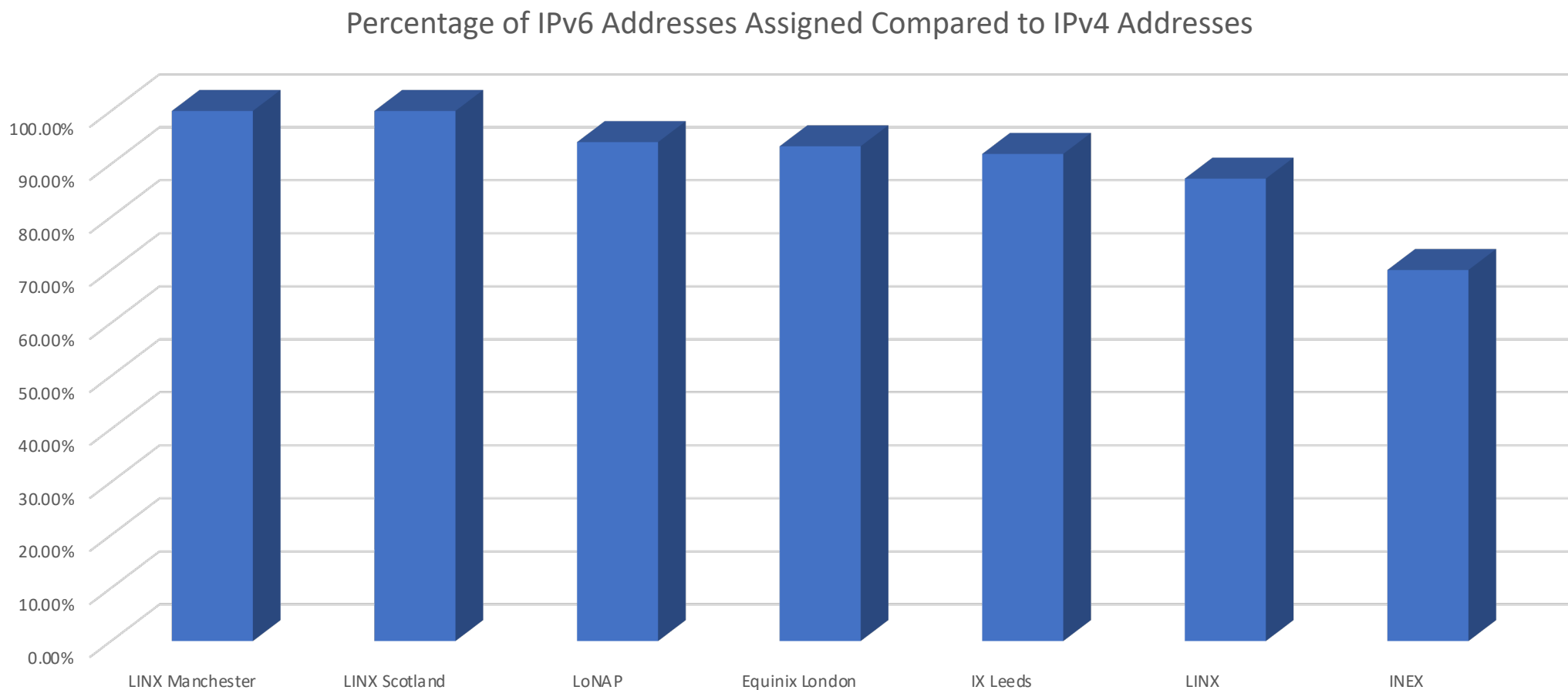Perhaps more data is needed.

Assigned IPv6 per IPv4 at Smaller IXs

Assigned IPv6 Address per IPv4

Reachable IPv6 addresses at the Smaller IXs

Assigned IPv4 to IPv6 in UK and Ireland

Percentage of IPv6 Addresses Assigned Compared to IPv4 Addresses

Reachable IPv6 Addresses in UK and Ireland
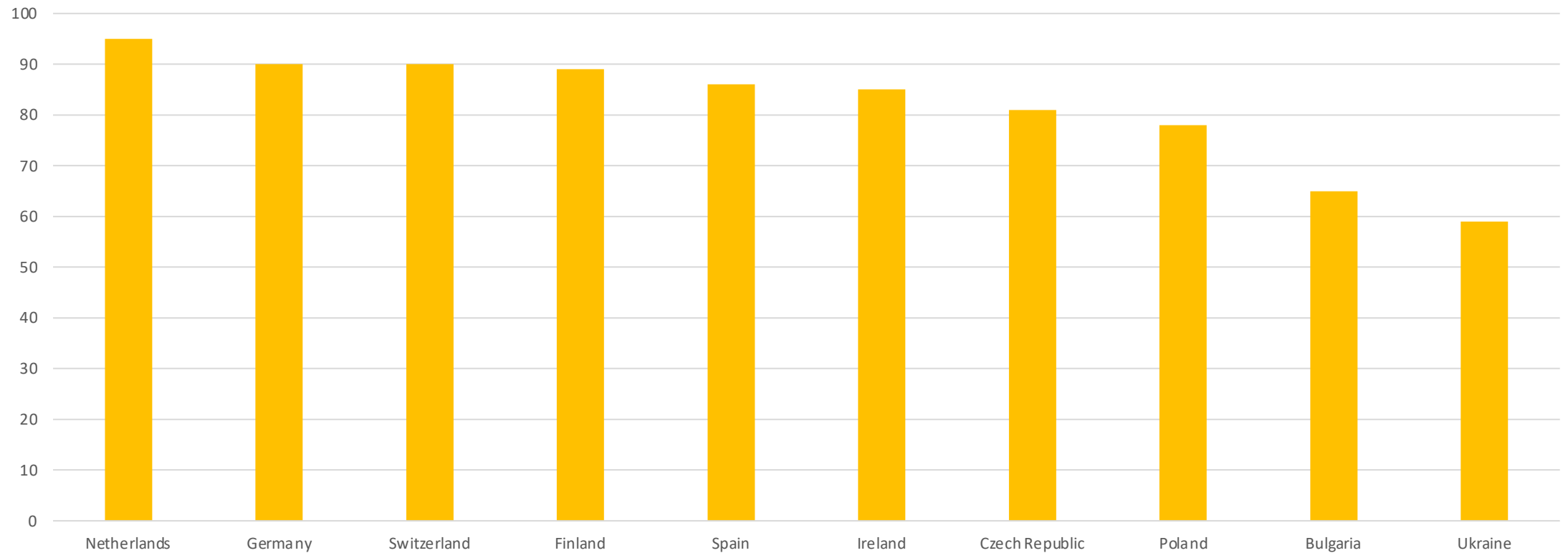
Chart Title

V6 Assigned V6 live
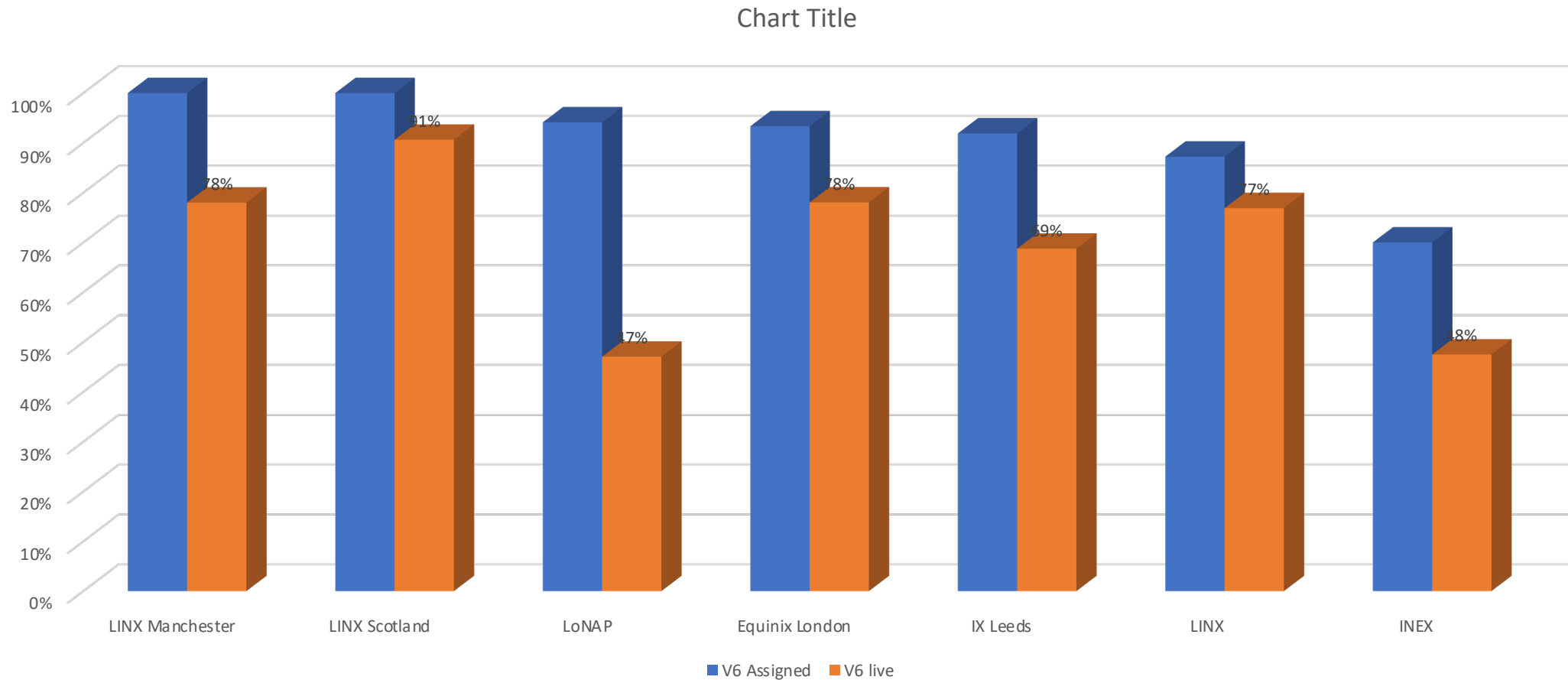
Reachable IPv6 Addresses For All IXs
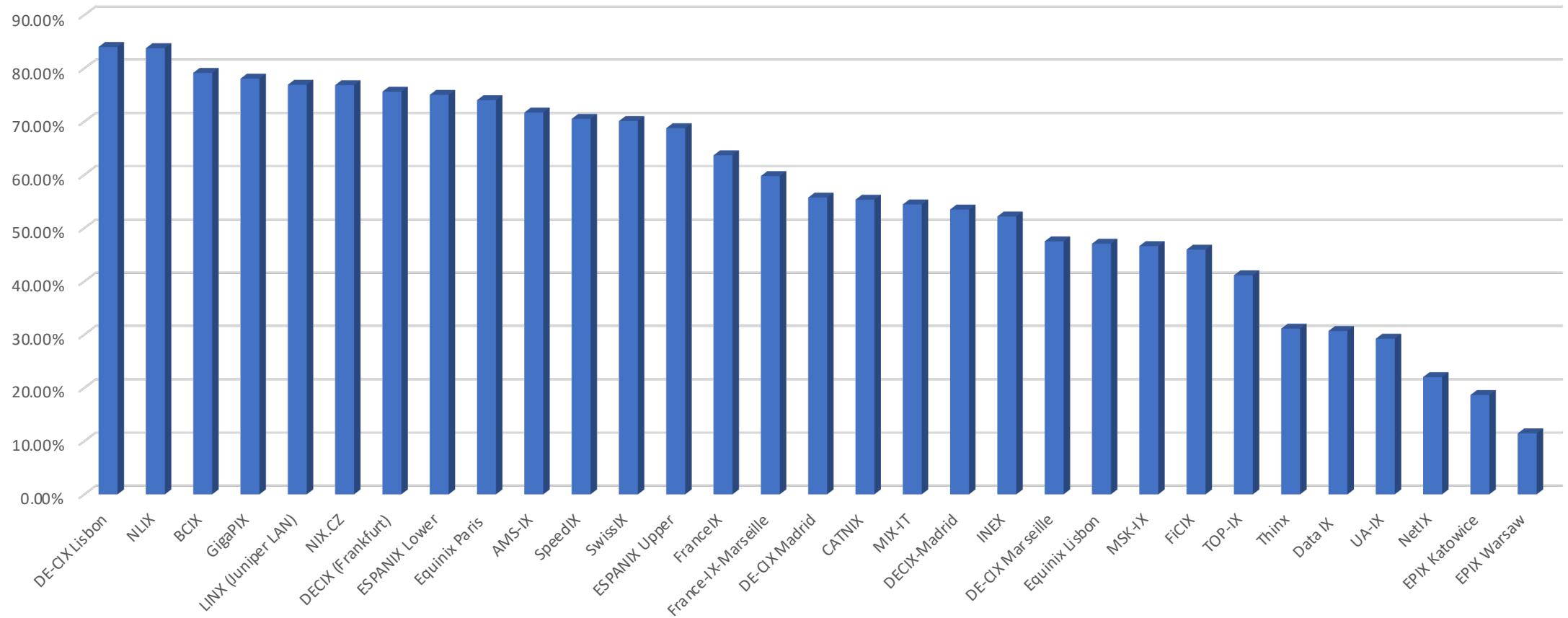
IPv6 Adoption over Internet Exchanges

Percentage of Population that are Internet Users

IPv6 Adoption over Internet Exchanges

These figures show that you can assign a network an IPv6 address, but you can't make them peer.

Based on what we just saw, a few assumptions seem reasonable:

- IPv6 routing is actively encouraged on European exchanges.

- A large percentage of Western European networks are routing IPv6, and on most exchanges, the number of networks is higher than the global average of 27.3 percent of ASNs.

- If a network isn't peering over IPv6, it's probably because it has not deployed IPv6.

Why Internet Exchanges need more IPv6 peers

RIPE distributed its final contiguous /22 and its final non-contiguous allocation last year. ARIN and LACNIC also are exhausted.

- You can NAT, but CGN solutions still required additional IP space.

- Yes, you still can buy IPv4 addresses. Current pricing averages €21 per IP. Prices are expected to double over the next two years.

- IPv4 transactions are increasing year over year as RIRs exhaust their allocations and networks.

Maximizing IPv6 Traffic Across Exchanges

IPv4 Address Transfers
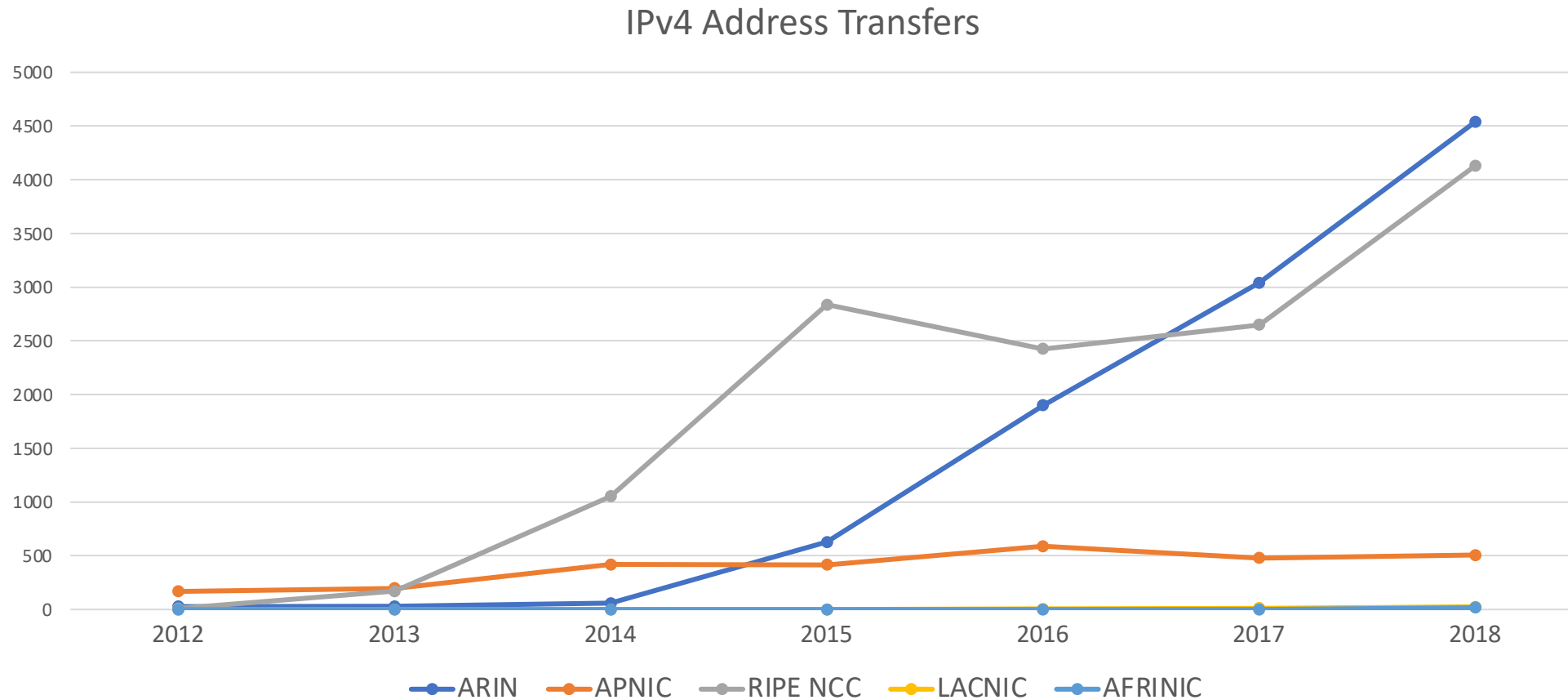
Why Internet Exchanges need more IPv6 peers

The increasing number of transactions reflects demand, and the demand is raising the price of IPv4 space.

The availability of IPv4 addresses soon will be through address brokers entirely.

- As more users are added to the Internet, demand will rise.
- The marketing and transfer of legacy IPv4 blocks means most networks will be able to get IP space.
- Demand and speculation will put pressure on the price.

Why Internet Exchanges need more IPv6 peers

It's obvious that more peering on Internet exchanges will drive more IPv6 deployment.

What might not be as obvious is encouraging the growth of IPv6 networks works in favor of those who want to stay on IPv4.

When more traffic moves to IPv6, it lessens the demand for IPv4 resources.

When networks don't deploy IPv6, they put pressure on the IPv4 supply, which increases prices and the cost of operating networks.

Why Internet Exchanges need more IPv6 peers

If you think more networks need to route traffic over IPv6, you can do something about it.

- Whenever you peer, ask to turn up IPv6 sessions with the IPv4 sessions.

- Advertise your IPv6 prefixes and ask other networks to advertise theirs.

- Check back with your IPv4-only neighbors from time to time to see if they have added IPv6 peering.

Summary

- IPv6 participation on Europe's Internet exchanges is better than the global rate of 27.32 percent.

- While IPv6 adoption continues to increase, IPv4 here to stay for the foreseeable future.

- No matter what your protocol politics, increasing peering over IPv6 will help you meet your objectives.

Thank you!

Questions?

Resources

- Internet Exchanges data
  https://bgp.he.net/report/exchanges
- "Addressing 2018" by Geoff Huston, 30 Jan 2019
  https://www.potaroo.net/ispcol/2019-01/addr2018.html

- Individuals using the Internet (% of population)
  https://data.worldbank.org/indicator/IT.NET.USER.ZS