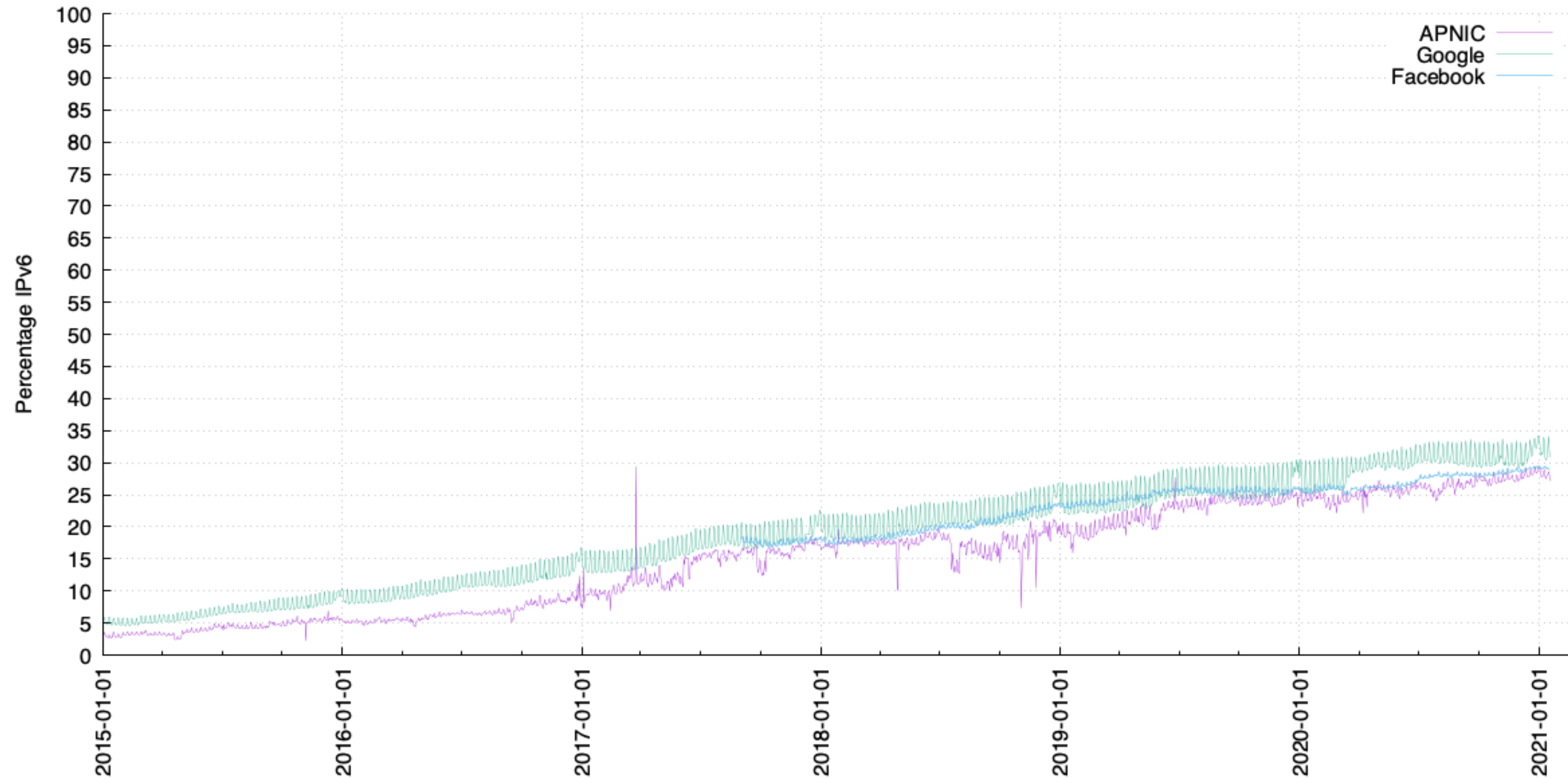# IPv6

Stephen Strowes | 26 January 2021 | Roundtable Meeting for Governments
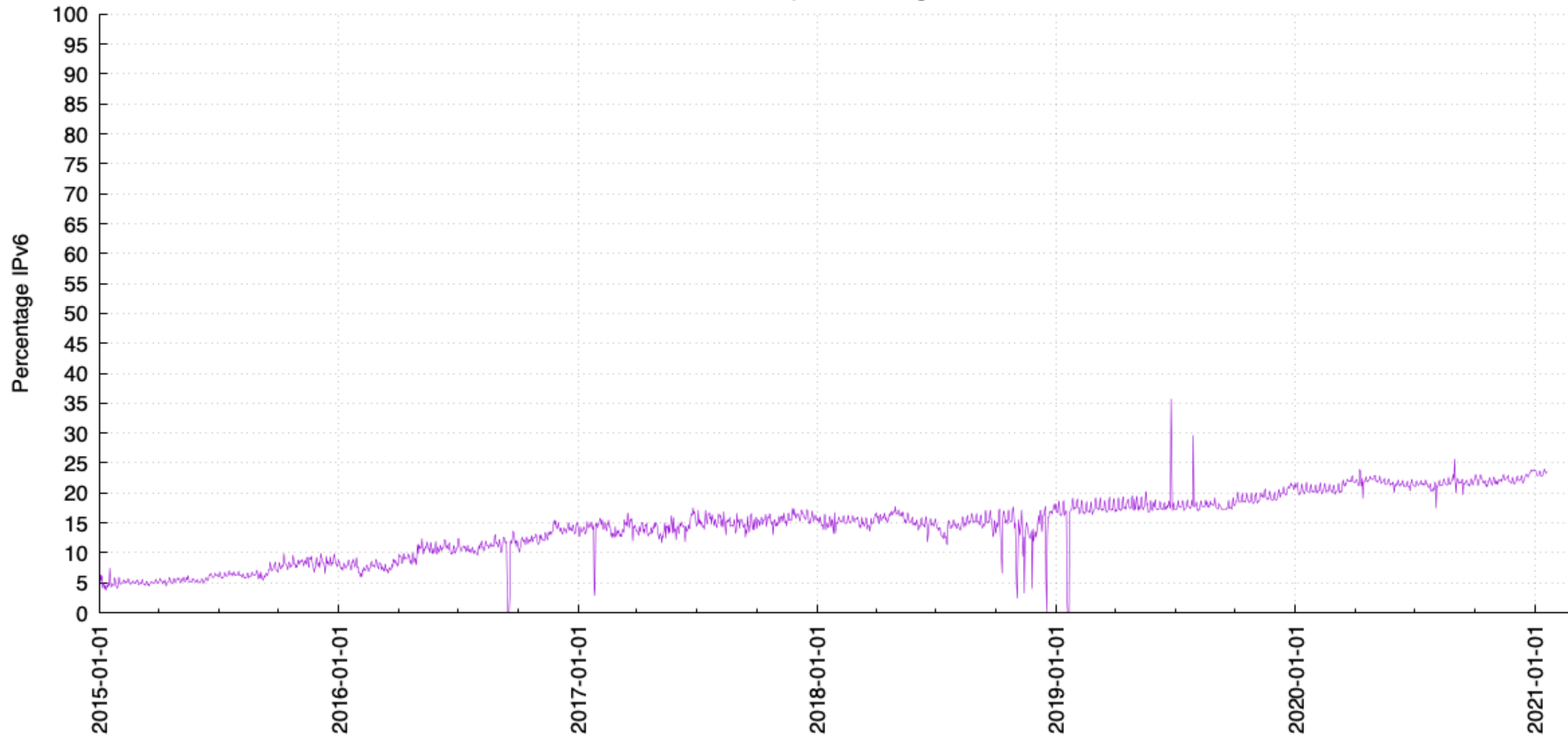
Progress

Global Trends: Daily traffic load

European Trends: APNIC data
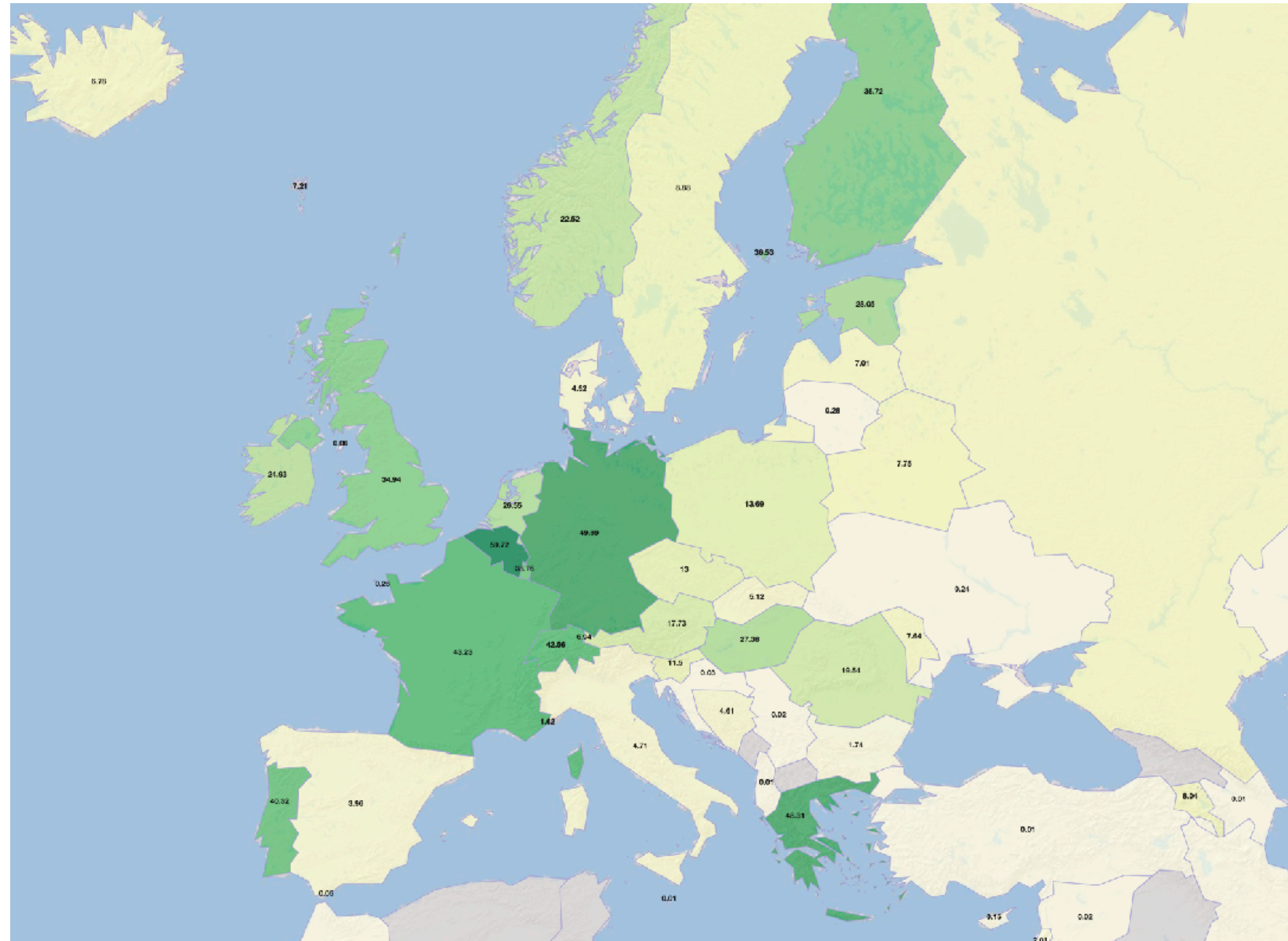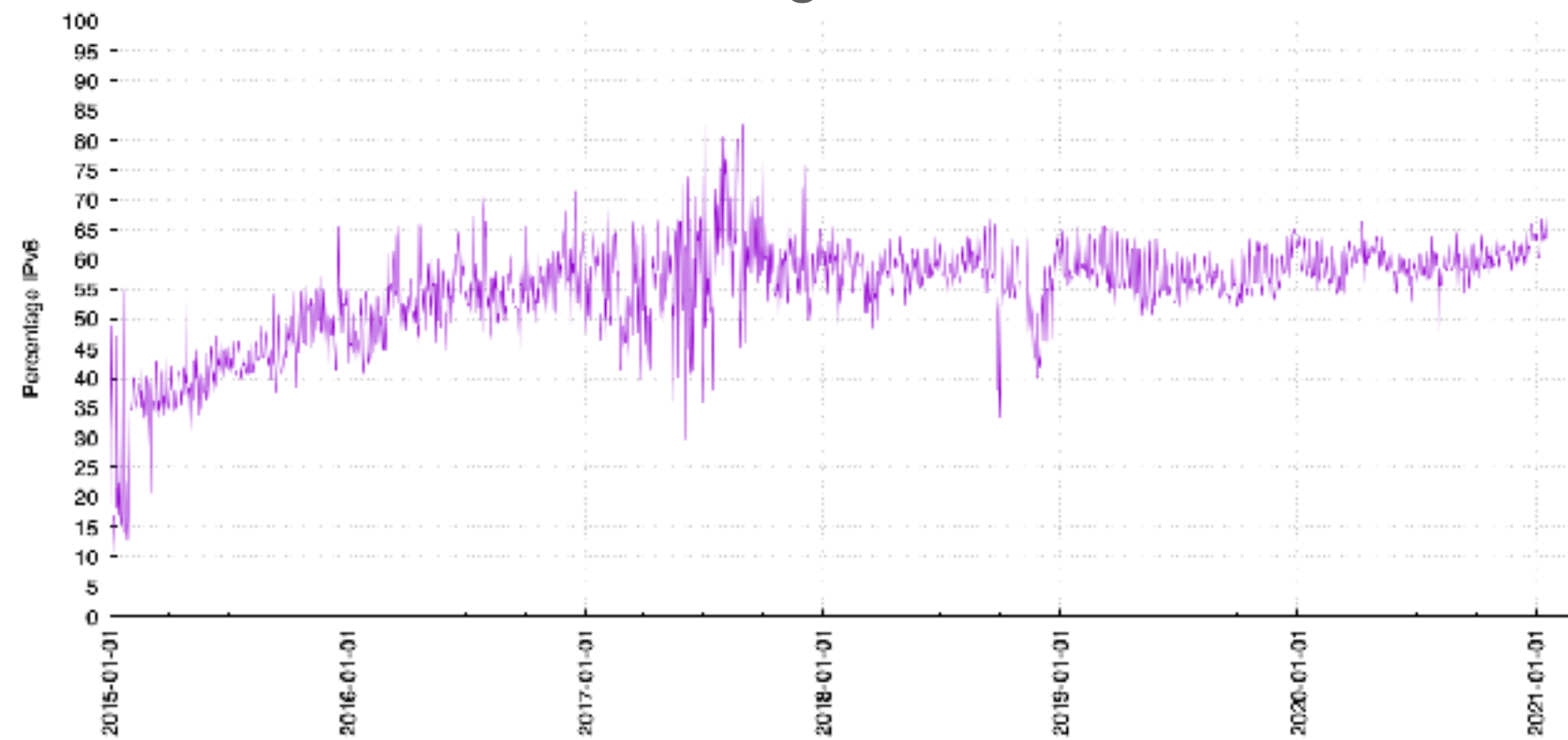
European region

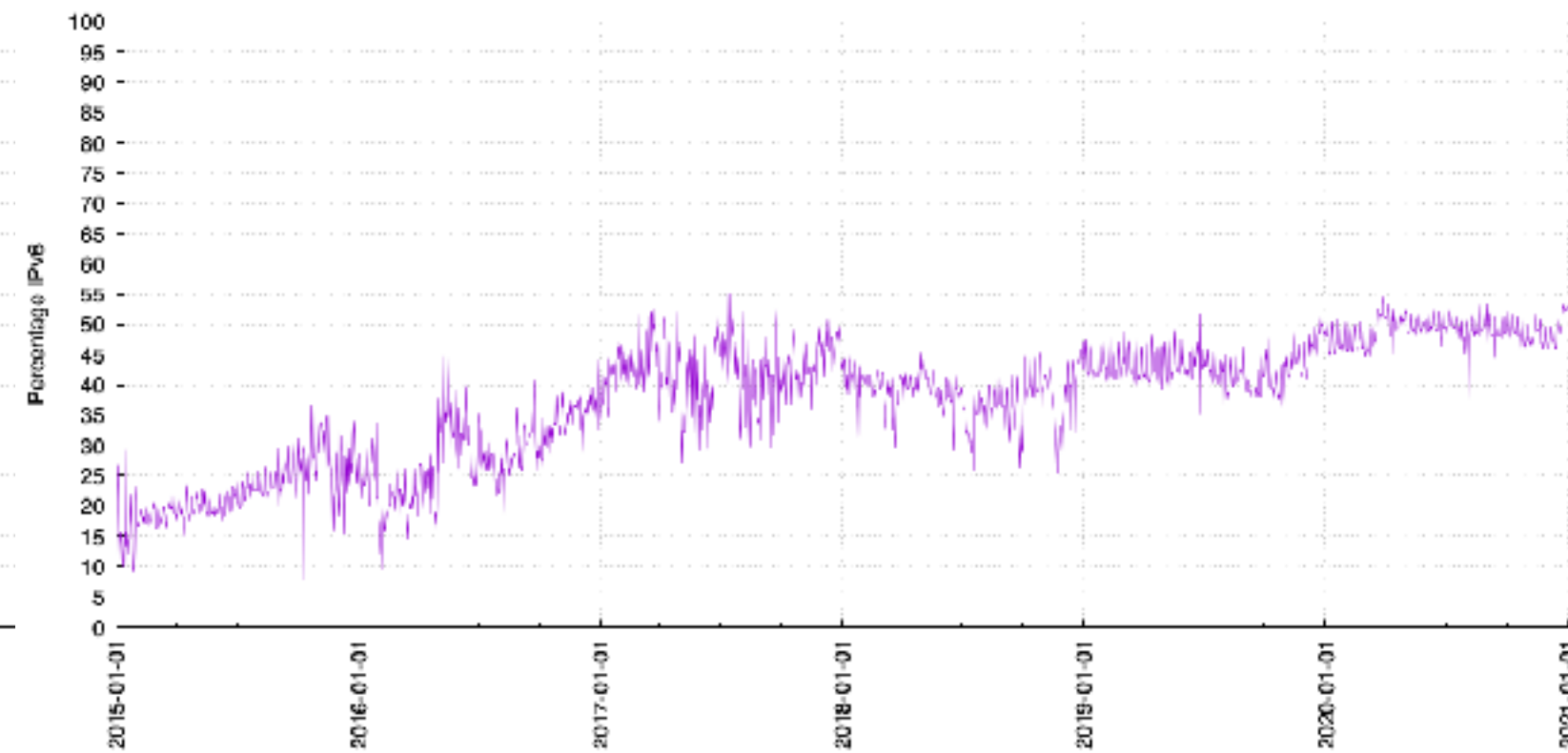# Deployment is uneven

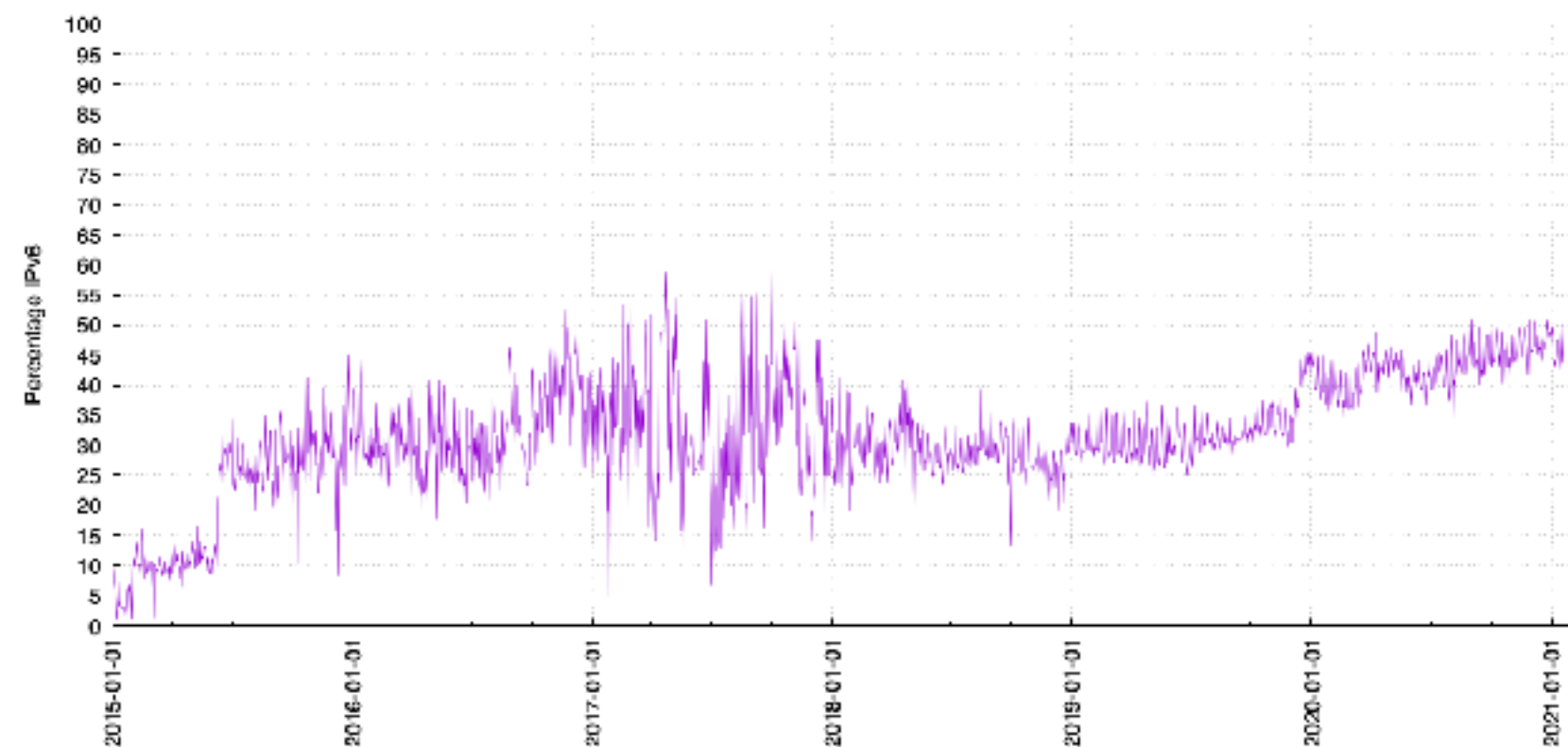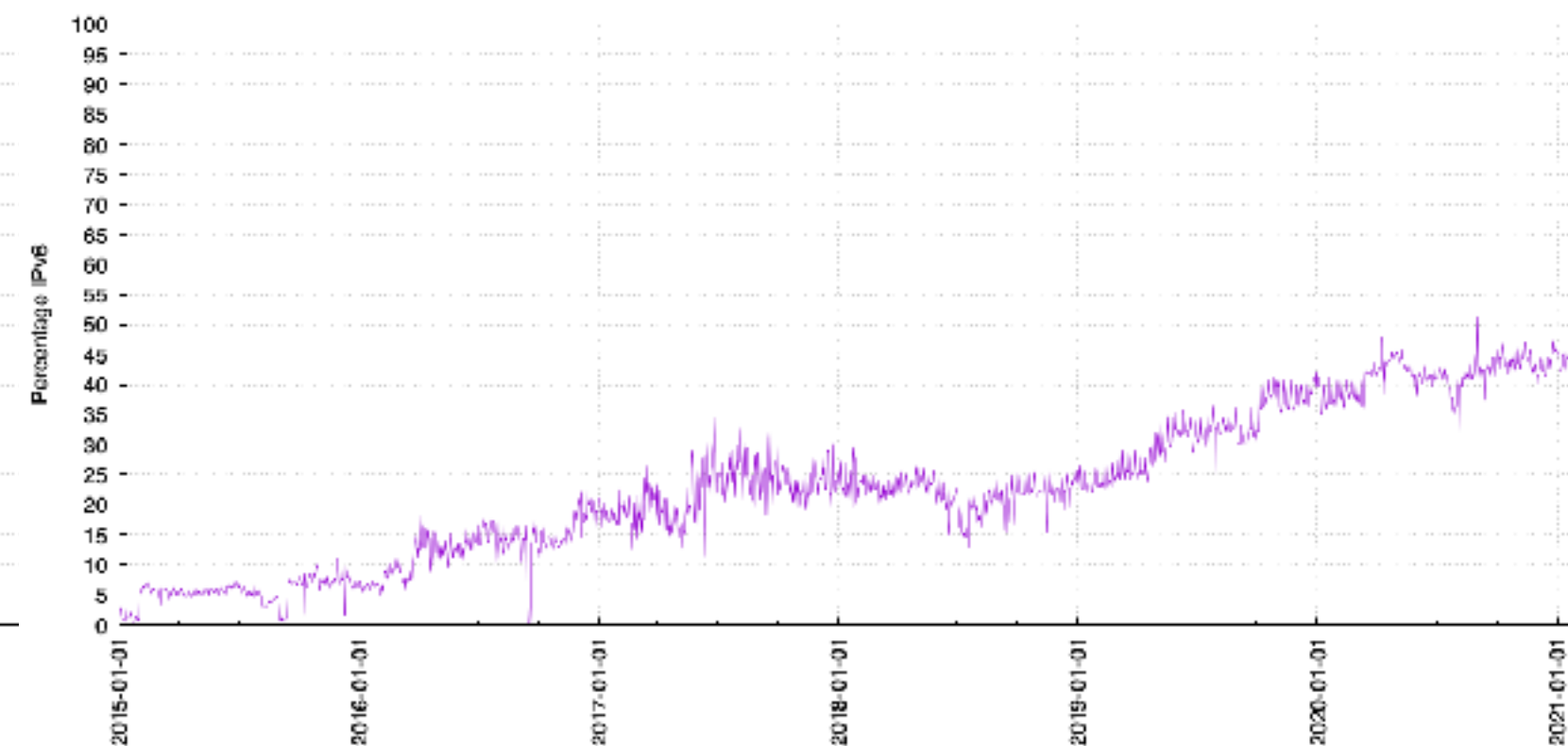# Deployment is not uniform

Europe: Top 5?

Belgium

Germany

Greece

Switzerland

France

Deployment not uniform

Belgium
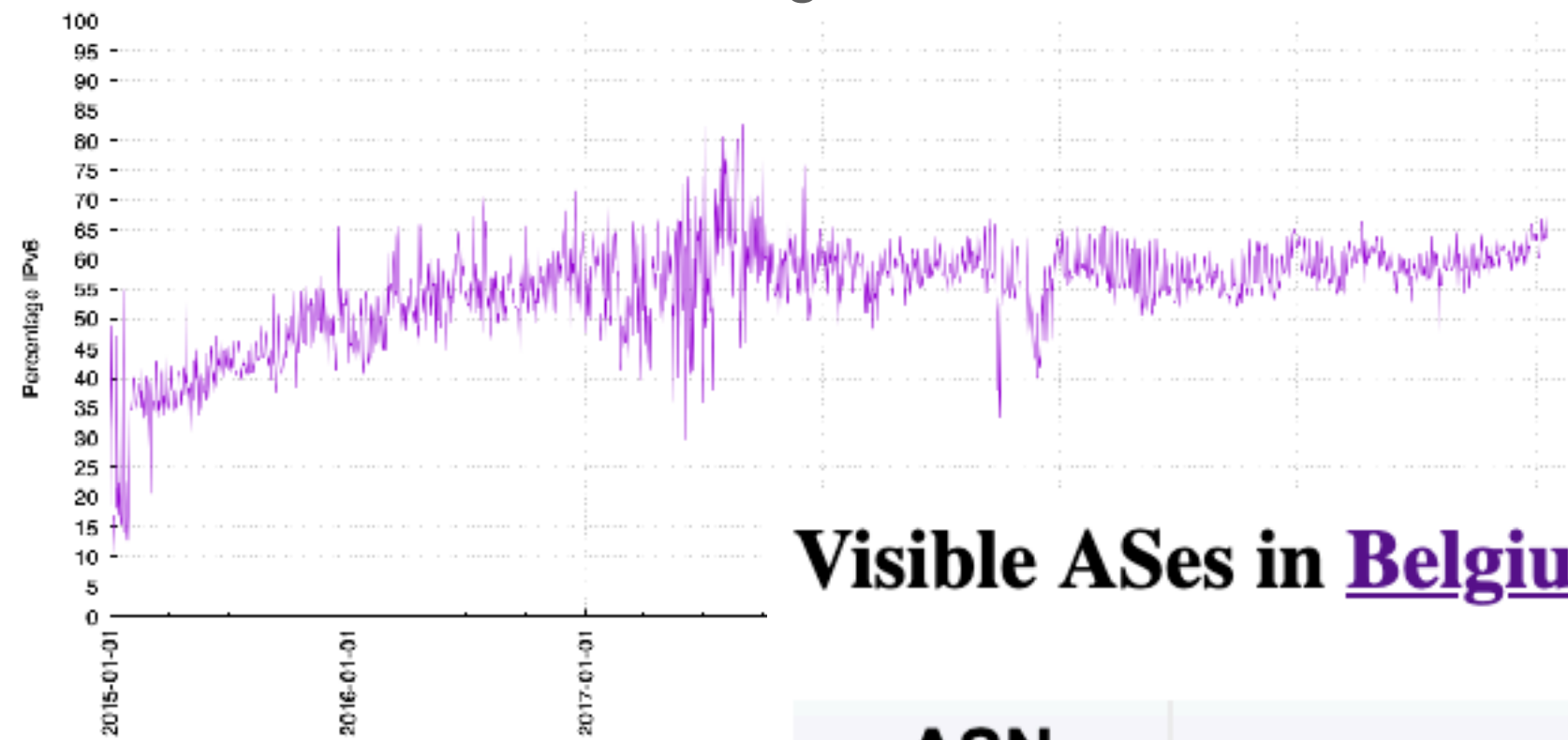
Visible ASes in Belgium

ASN	AS Name	IPv6 Capable
AS5432	BELGACOM-SKYNET-AS	65.41%
AS6848	TELENET-AS	82.90%
AS12392	ASBRUTELE VOO	84.04%
AS47377	ORANGE_BELGIUM_SA KPN Belgium Business NV has been acquired by Mobistar	0.35%
AS44944	BASE-AS Telenet Group NV/SA	17.19%
AS9031	EDPNET	2.68%
AS2611	BELNET	5.20%
AS8368	BENESOL-BACKBONE International Backbone	0.30%

Deployment not uniform

Germany
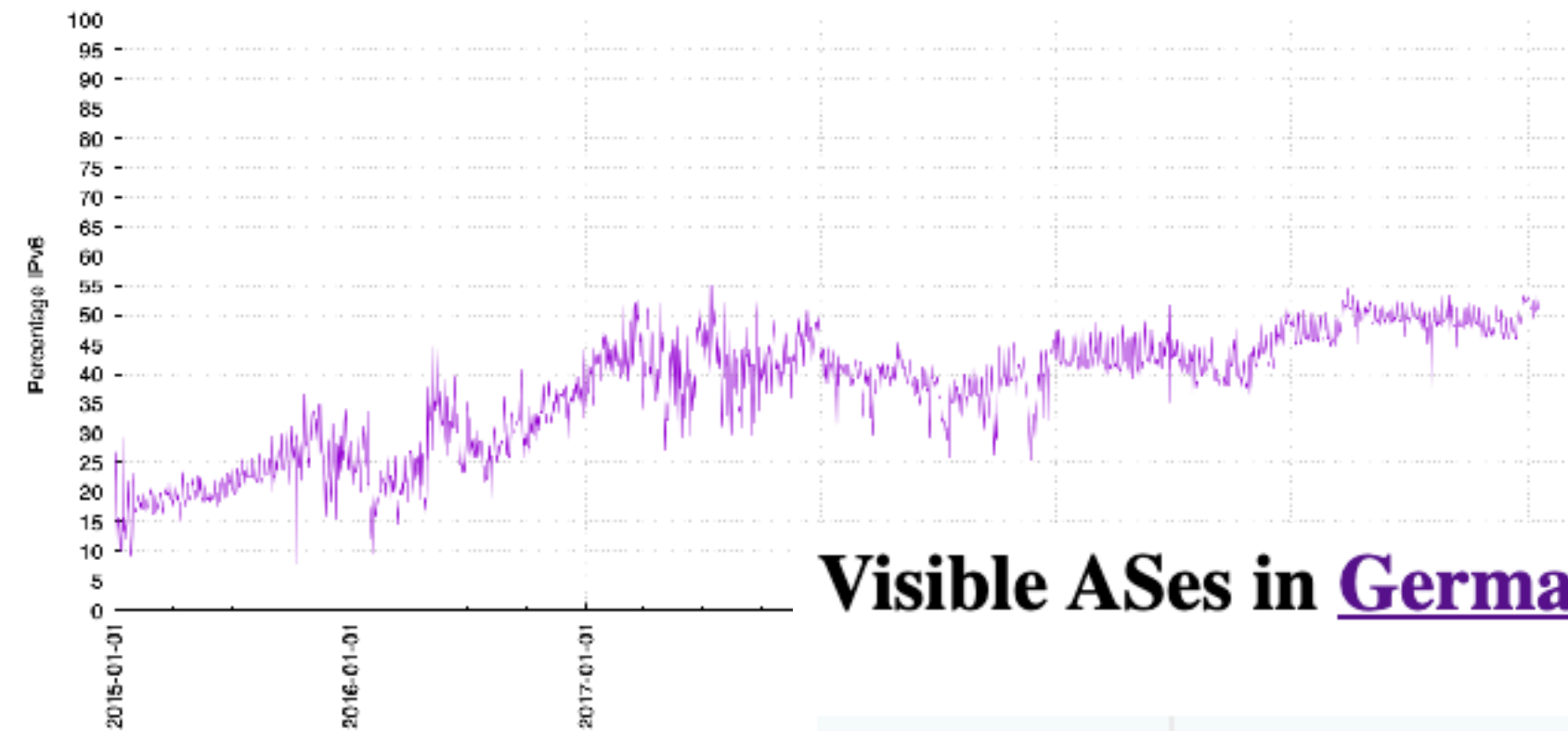
Visible ASes in Germany

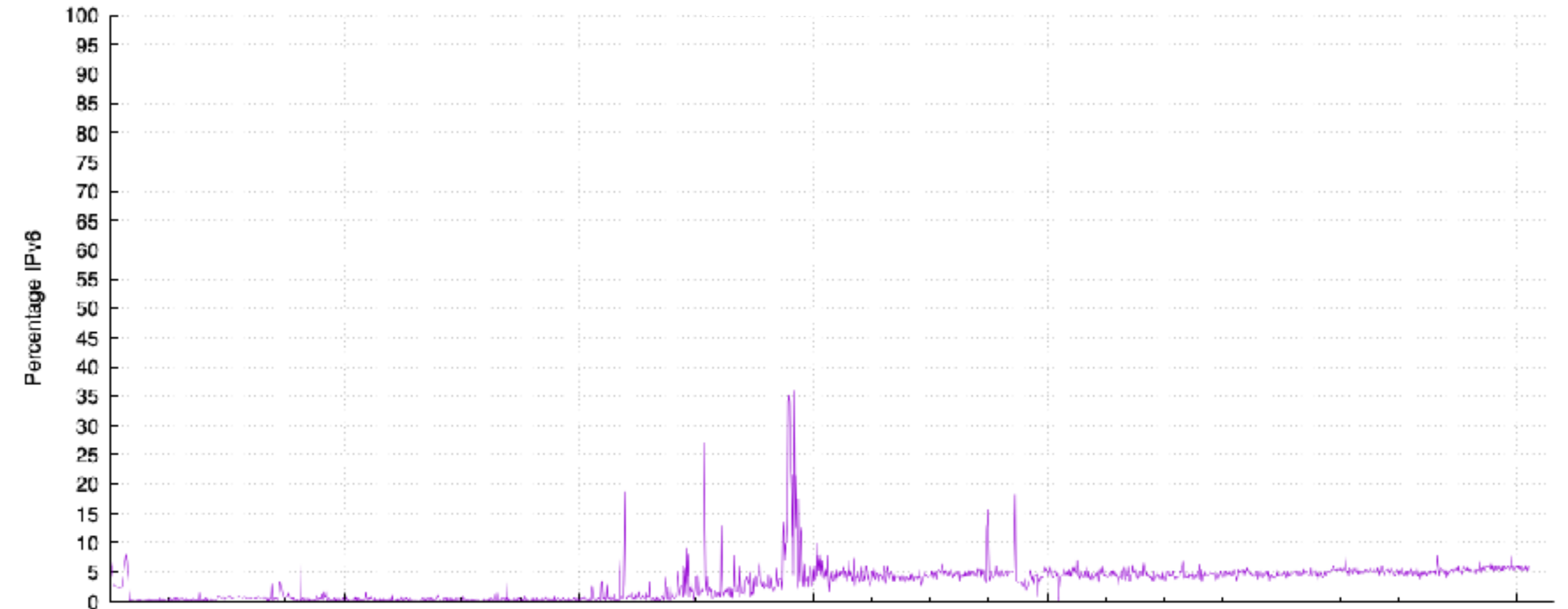| ASN	AS Name	IPv6 Capable
AS3320	DTAG Internet service provider operations	78.41%
AS3209	VODANET International IP-Backbone of Vodafone	38.63%
AS6805	TDDE-ASN1	22.22%
AS8881	VERSATEL	88.55%
AS24940	HETZNER-AS	8.70%
AS24961	MYLOC-AS	0.05%
AS9145	EWETEL Cloppenburger Strasse 310	0.44%
AS8422	NETCOLOGNE	91.40%
AS8767	MNET-AS Germany	73.46%

Europe: Signs of life?

Italy
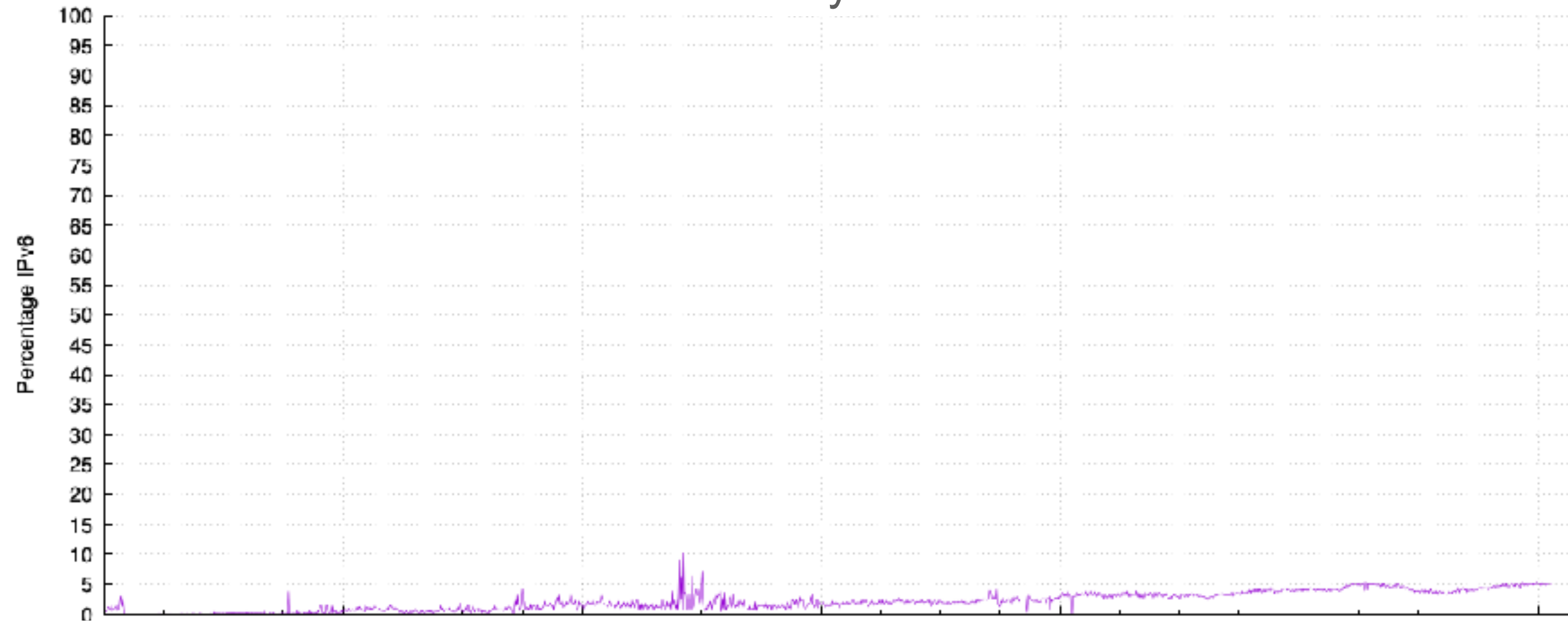
Slovakia

Denmark
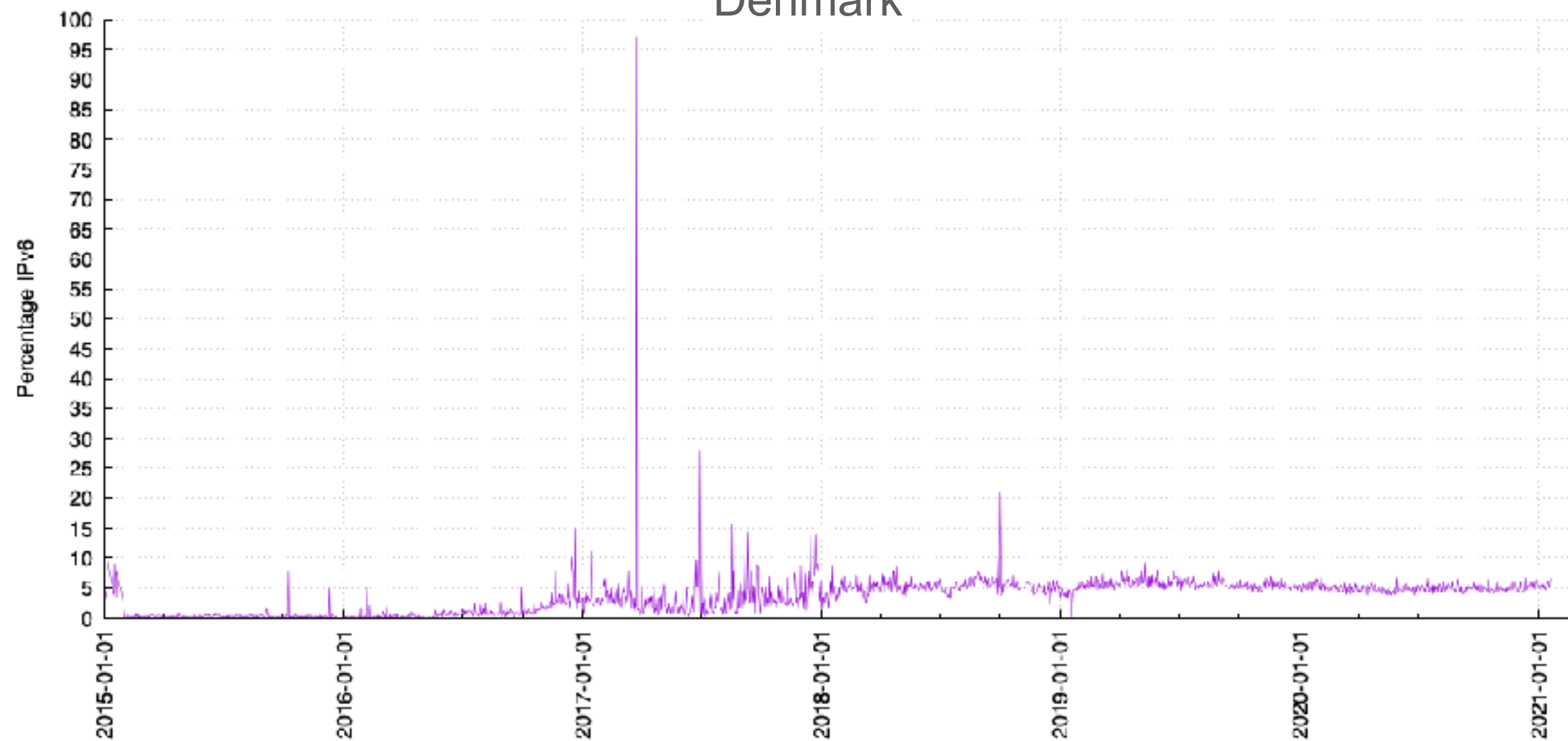
Spain
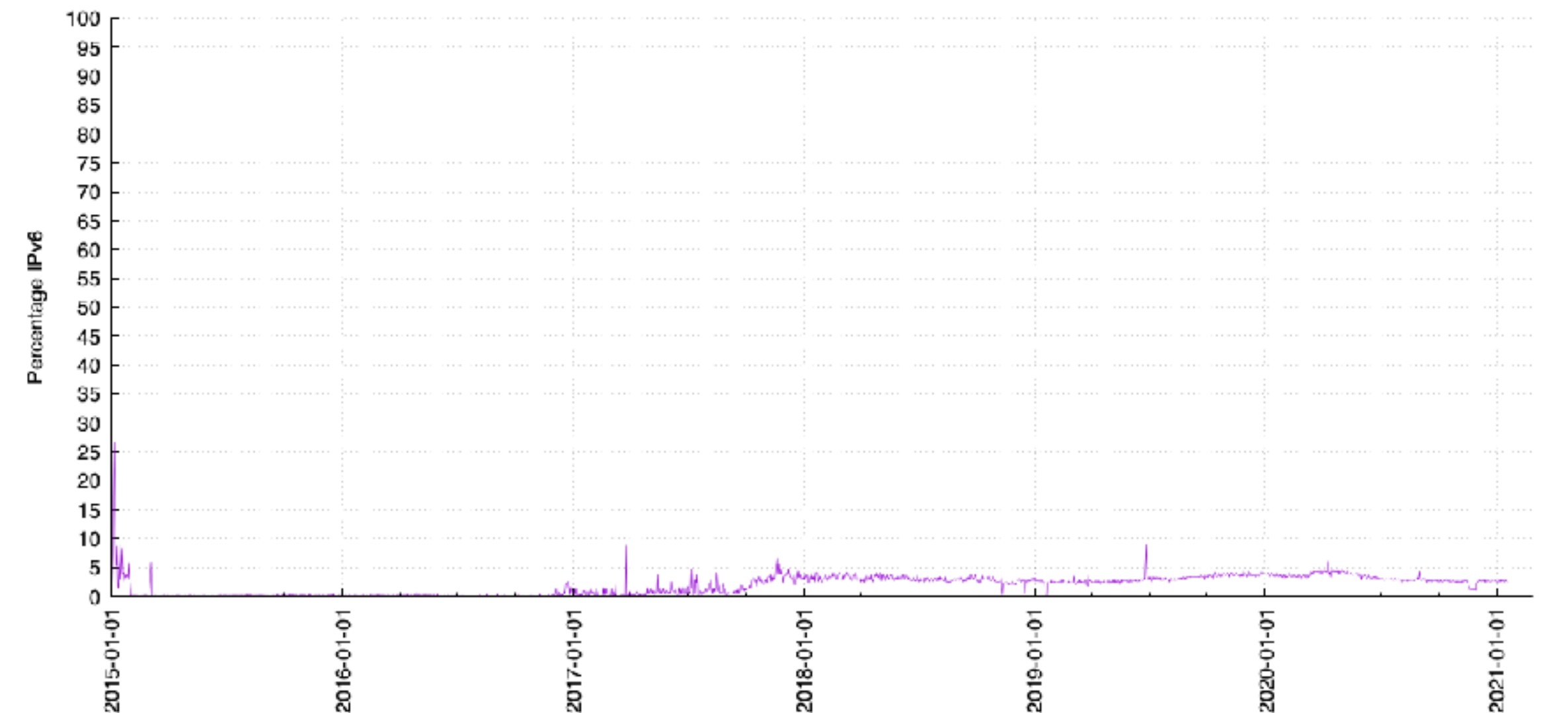
Europe: Signs of life/flat-lining

Ukraine

Croatia
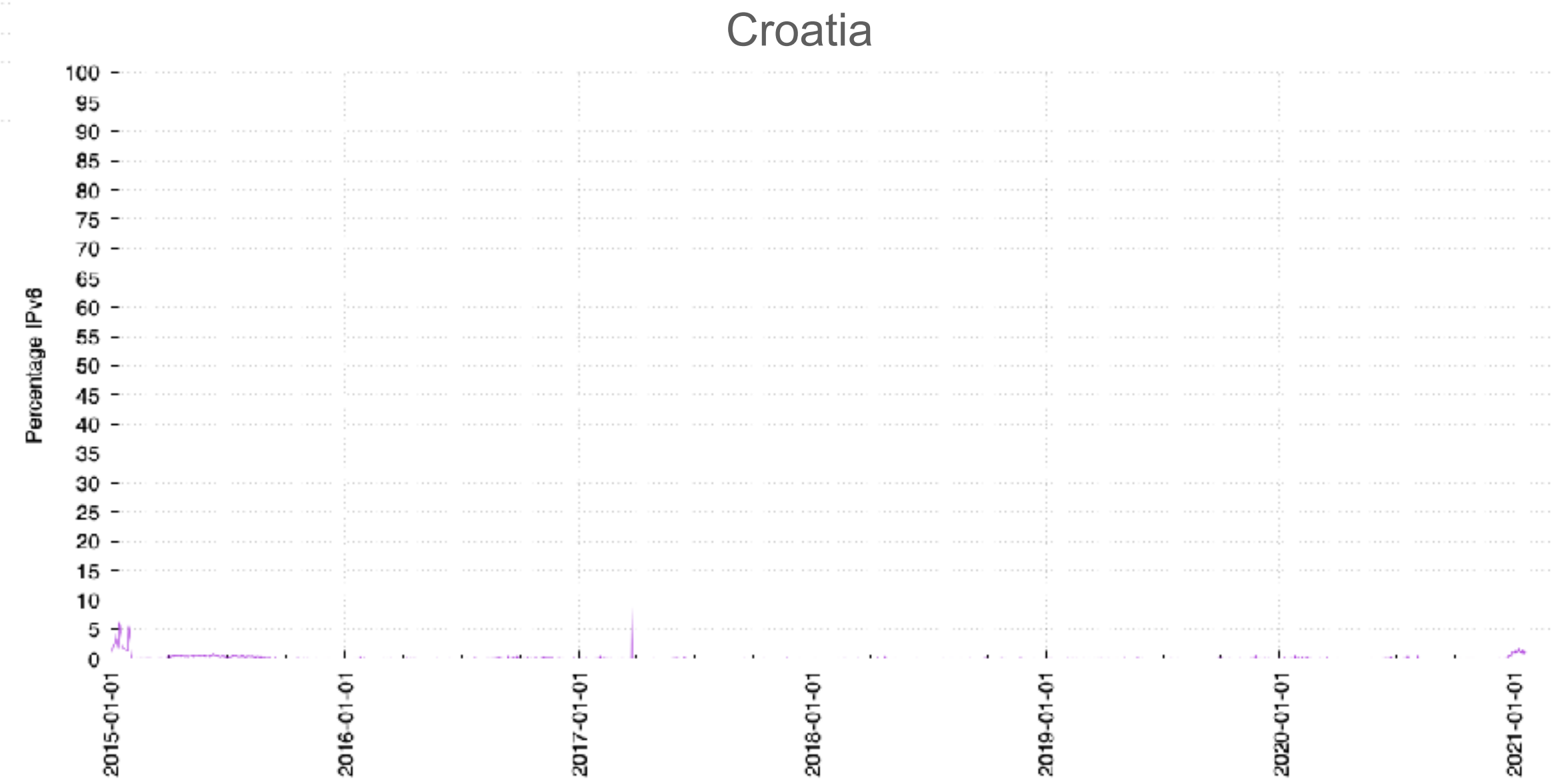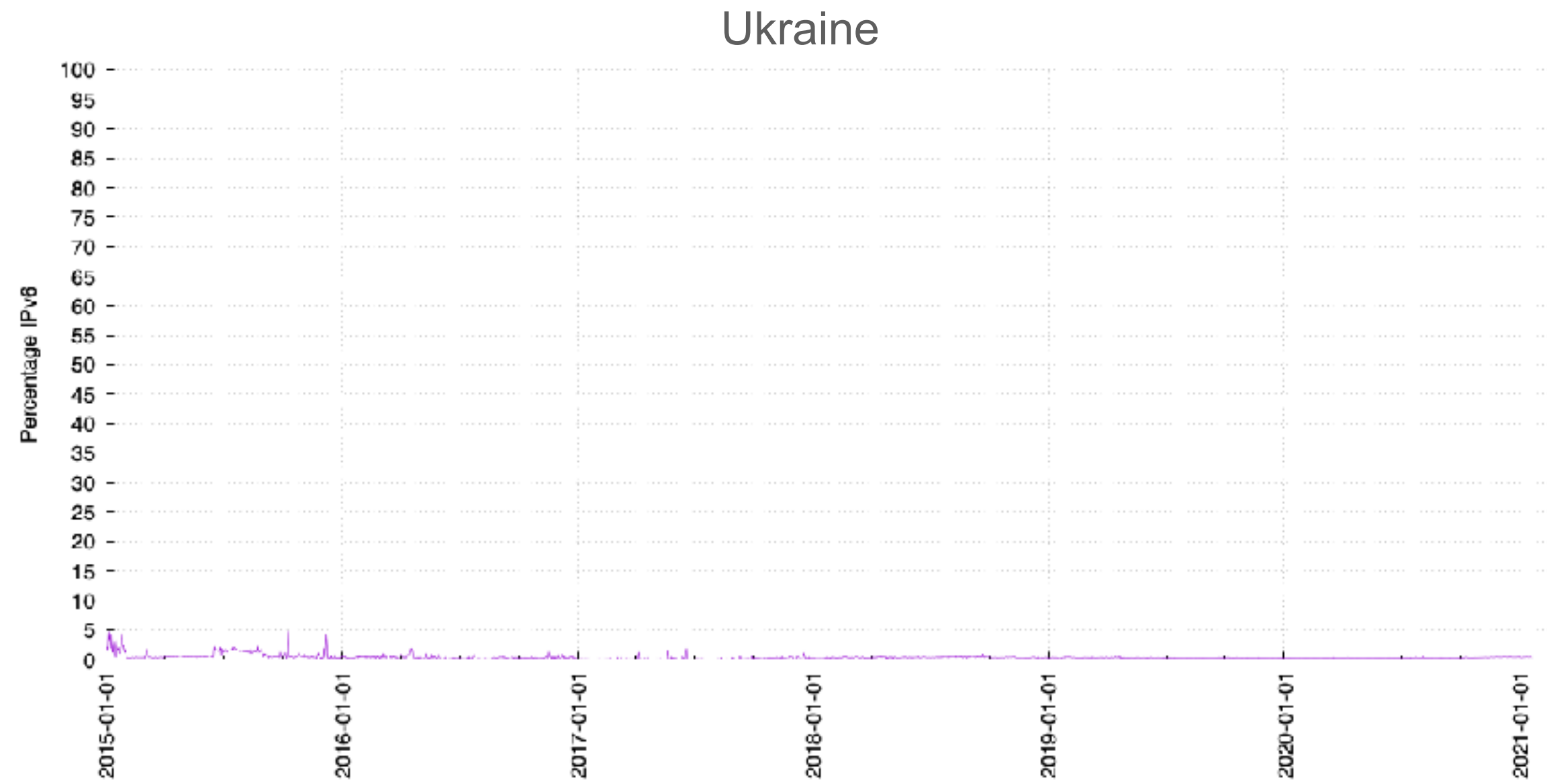
Divergent Approaches

Networks are not equal

- On a technical level:

  - Enterprises/offices

    - A real mixed bag of vendor products, ageing equipment, custom internal tools

  - Fixed-line ISP

    - Control up to the CPE

  - Cellular

    - Tight control of the network and high device turnover

Gradual Rollout vs Big-Bang

IPv6 Per-Country Deployment for AS2856: BT (UK)

IPv6 Per-Country Deployment for AS5607: Sky Broadband (UK)
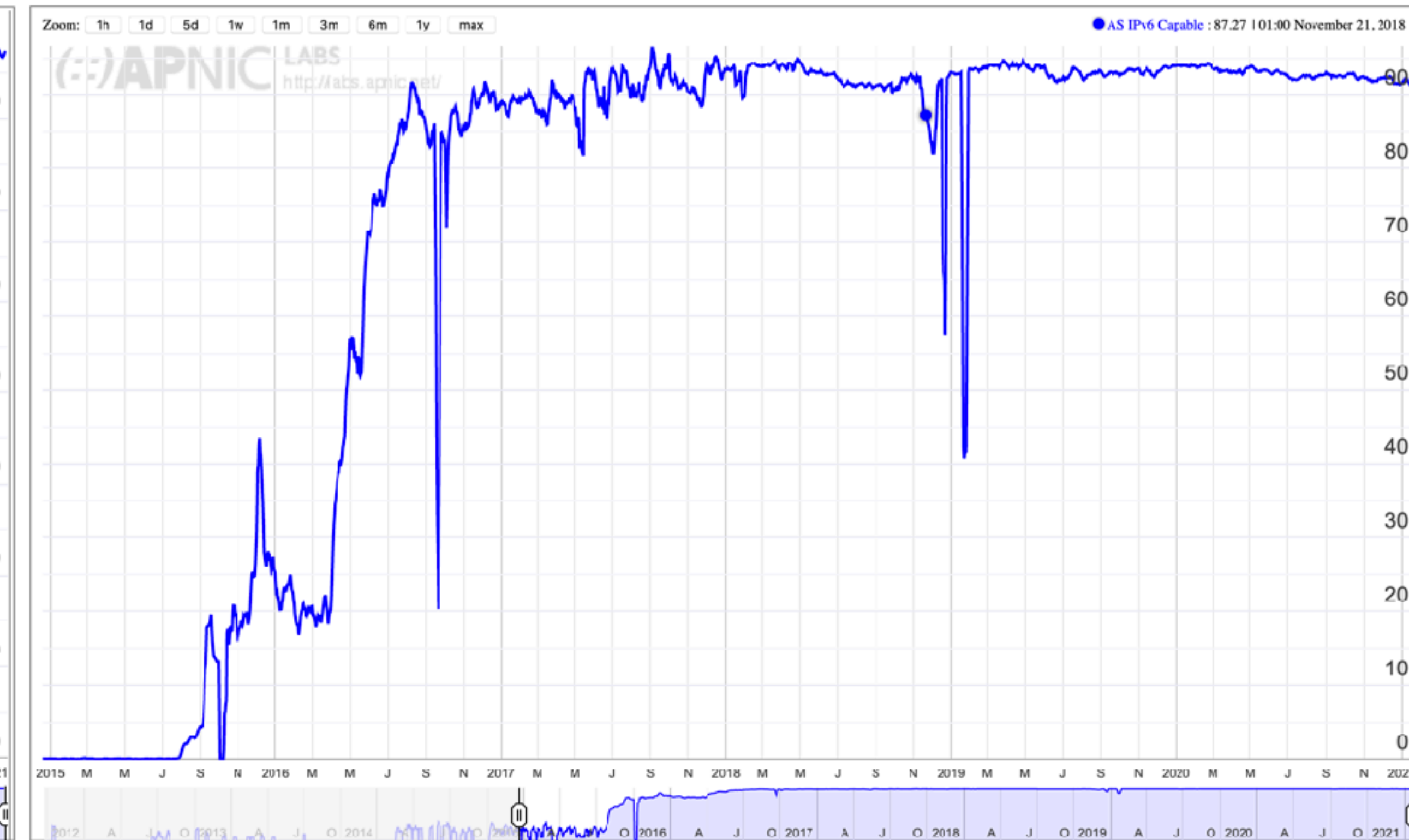
0%: Just buy more IPv4?

- You can do that, but

  - not always a fast transaction

  - issues with geolocation, reputation

  - and costs are rising
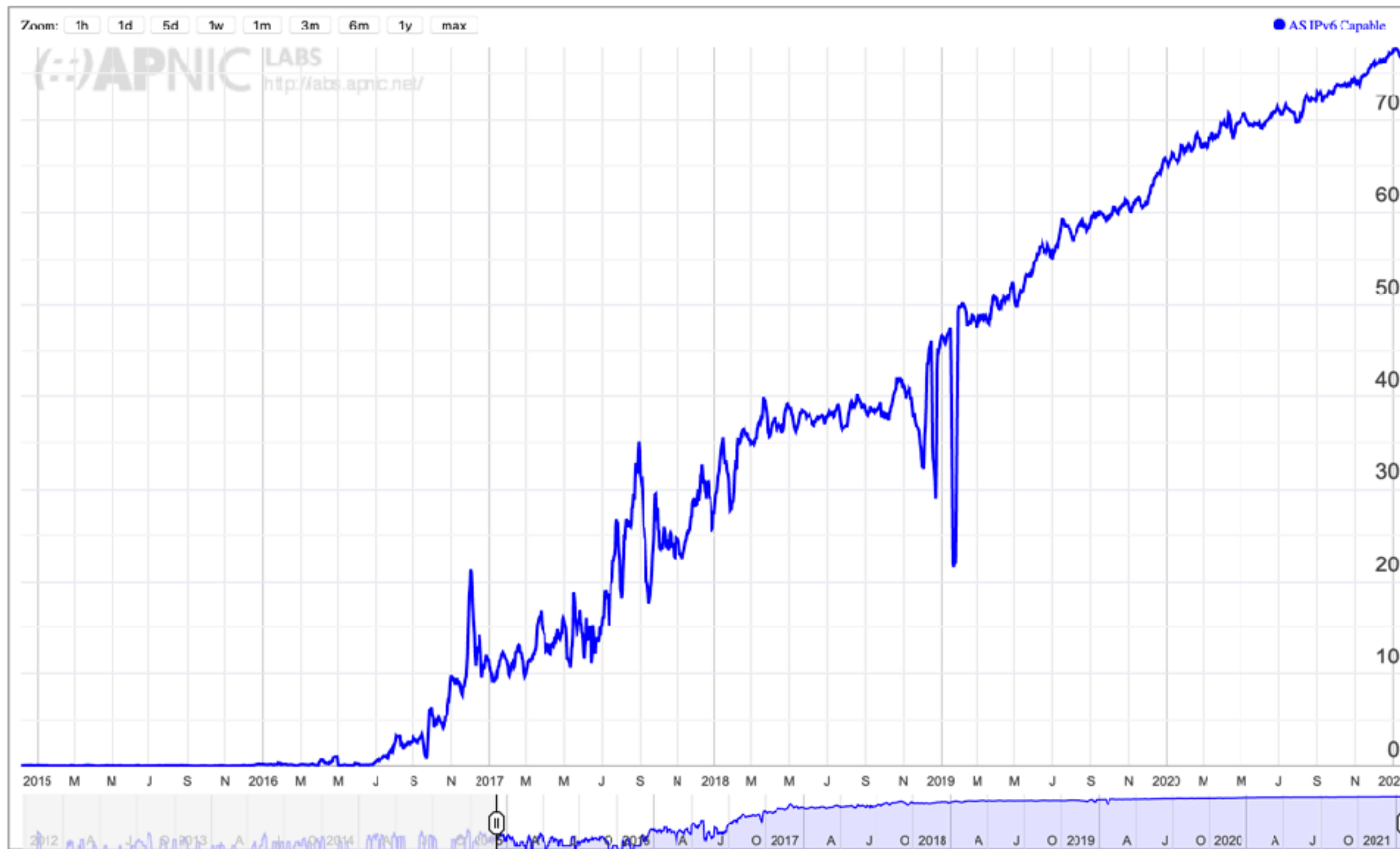

price variation over time and by deal size

https://ipv4marketgroup.com/ipv4-pricing/

IPv4 Market Prices by Size
Data from IPv4.Global/auctions

https://ipv4.global/2019-ipv4-address-market-roundup/
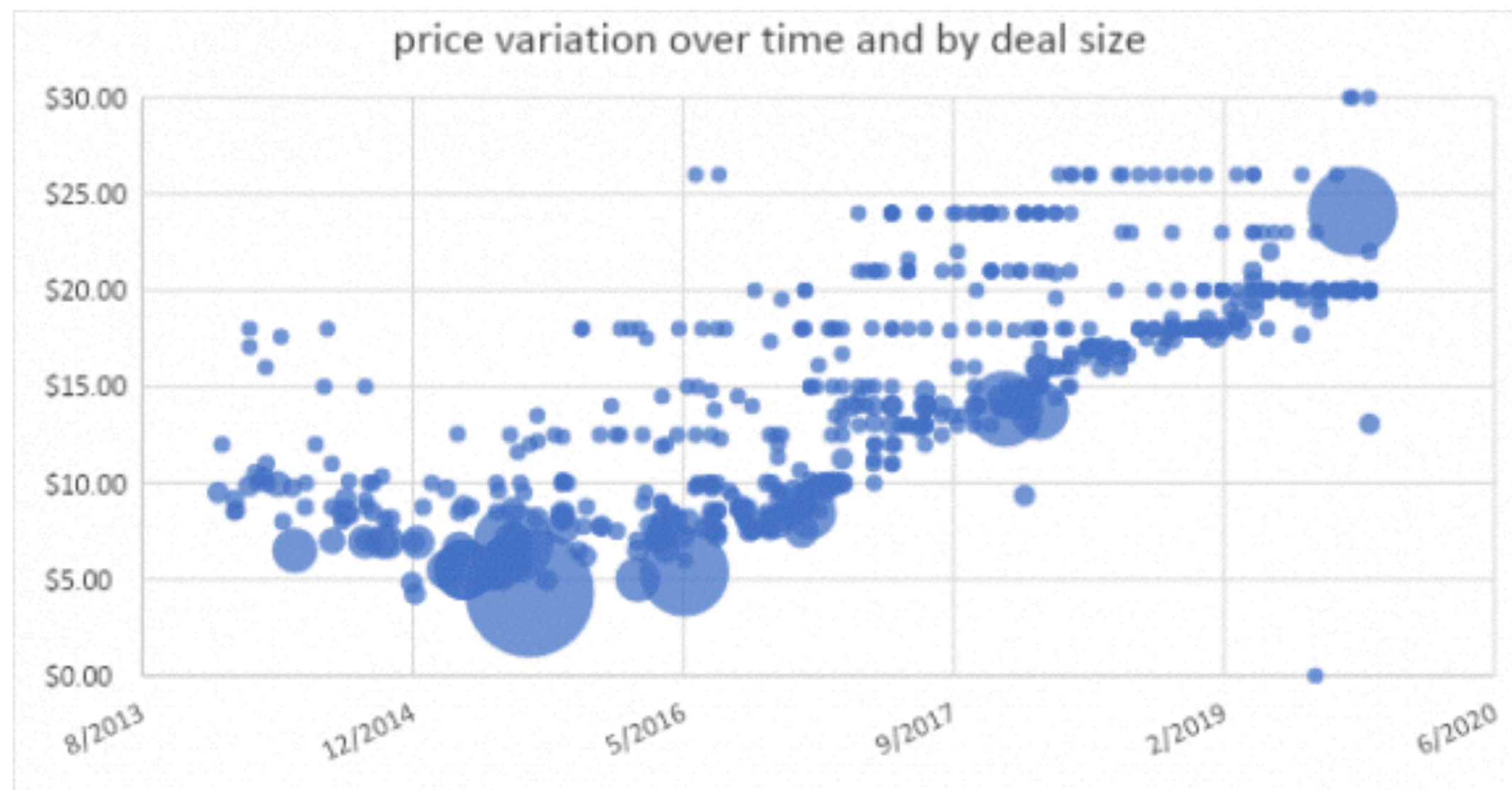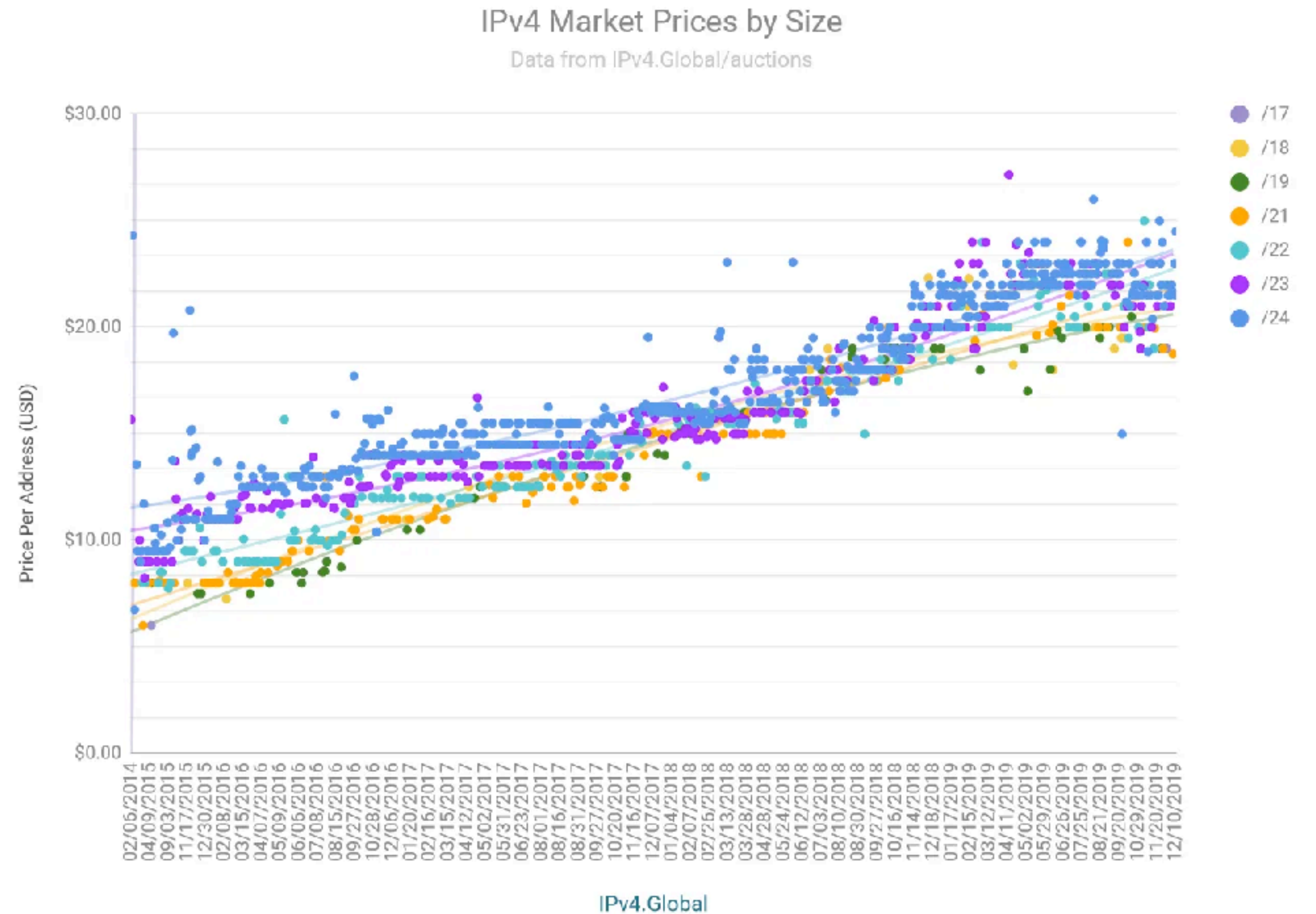
0%: How to start?

- World IPv6 Lau~~nch~~

    - https://www.worl~~d~~

- In 2015, Finla~~nd~~

    - https://www.inter~~n~~

- Coordinated e~~v~~

    - Everybody is in th~~e~~

Use of IPv6 for Finland (FI)
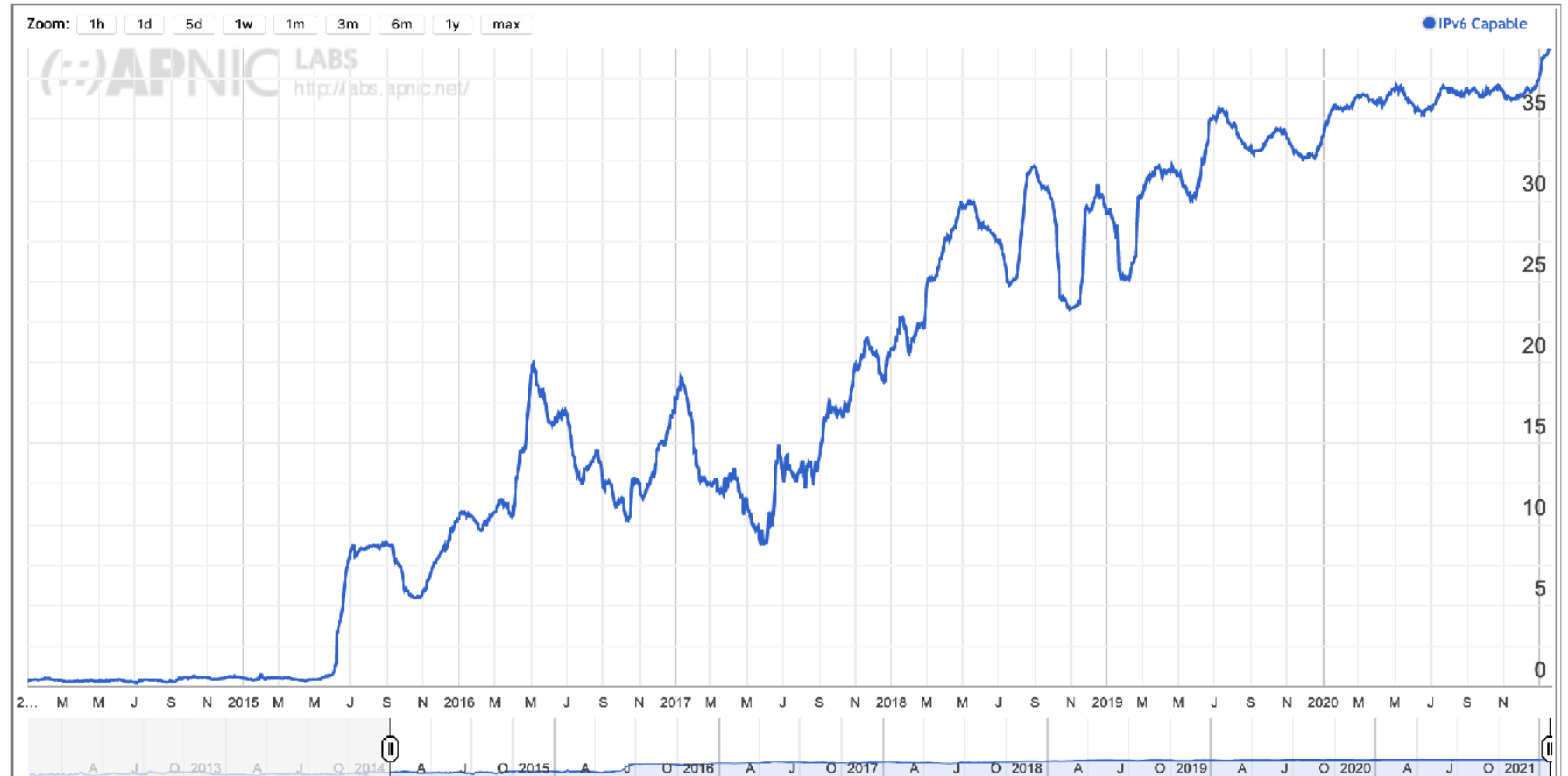
Dual-stack: Move to IPv6-only?

- Why run IPv4 on the backend at all?

  - Limits expansion

  - Increases moving parts for operators to maintain/test

  - Increases threat surface

- IPv6-only services with NAT64 are out there; *e.g.*:

  - https://ipv6onlyhosting.com/

  - https://www.mythic-beasts.com/

Dual-stack: Move to IPv6-only?

- IPv6 only backends

  - Facebook datacenters:
    https://atscaleconference.com/videos/a-history-of-ipv6-challenges-in-facebook-data-centers/

  - Google corporate sites:
    https://ripe81.ripe.net/wp-content/uploads/presentations/12-RIPE81-The-Day-I-Broke-All-The-Treadmills.pdf

  - Microsoft corporate sites:
    https://teamarin.net/2019/04/03/microsoft-works-toward-ipv6-only-single-stack-network/

  - US Federal govt:
    https://www.whitehouse.gov/wp-content/uploads/2020/11/M-21-07.pdf

- And the cell networks

  - US

  - India

Conclusions

- IPv6 deployment isn't done yet

- IPv4 costs are rising

- Industry experience is growing

  - more IPv6-only networks than ever before

- Software/hardware achieved maturity

Questions

sds@ripe.net

Resources

- Measurements

  - https://stats.labs.apnic.net/ipv6/

  - https://www.google.com/ipv6

  - https://www.facebook.com/ipv6/

  - https://6lab.cisco.com/stats/index.php

  - https://www.worldipv6launch.org/measurements/

  - http://v6asns.ripe.net/v/6