

Hoe IPv6-only is IPv6-only en... hoe snel is het?

Ijtsch van Beijnum
BGPexpert.com

stipv6 congres
Den Haag, 8 november 2016

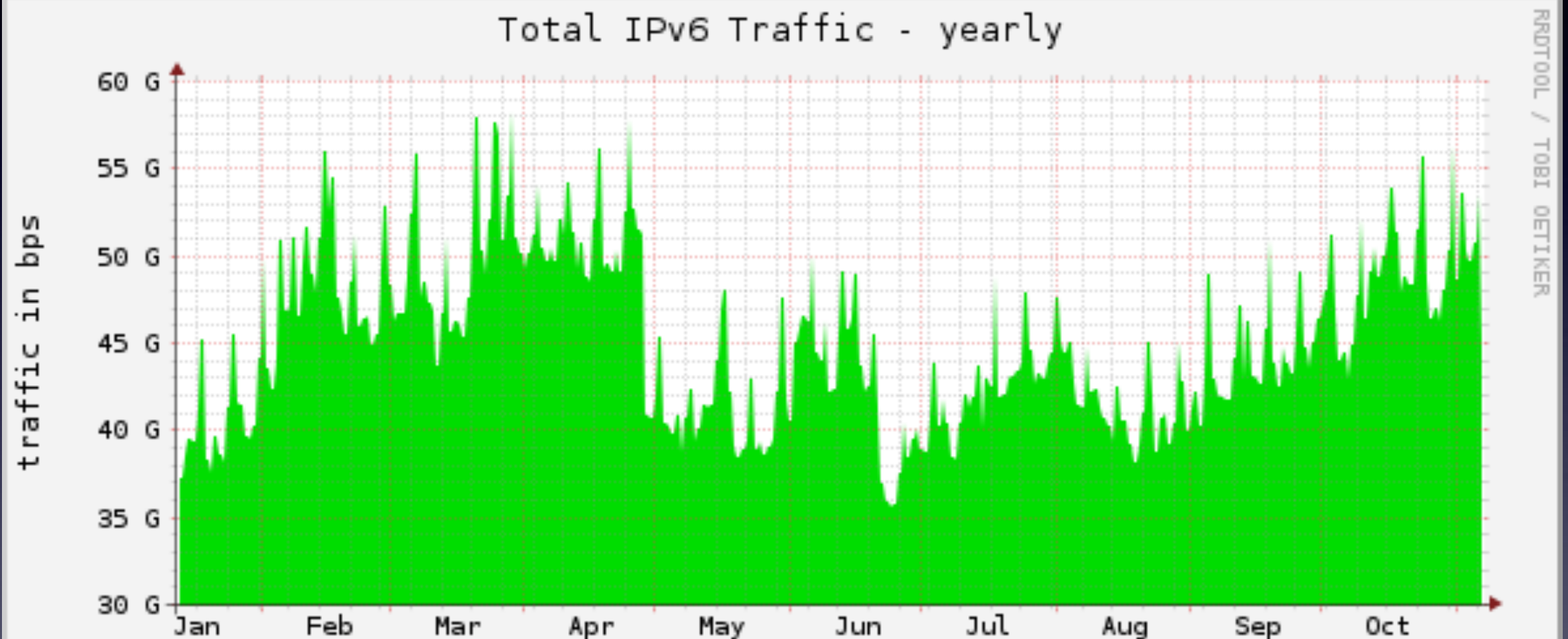
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IPv6: hoe ver zijn we?

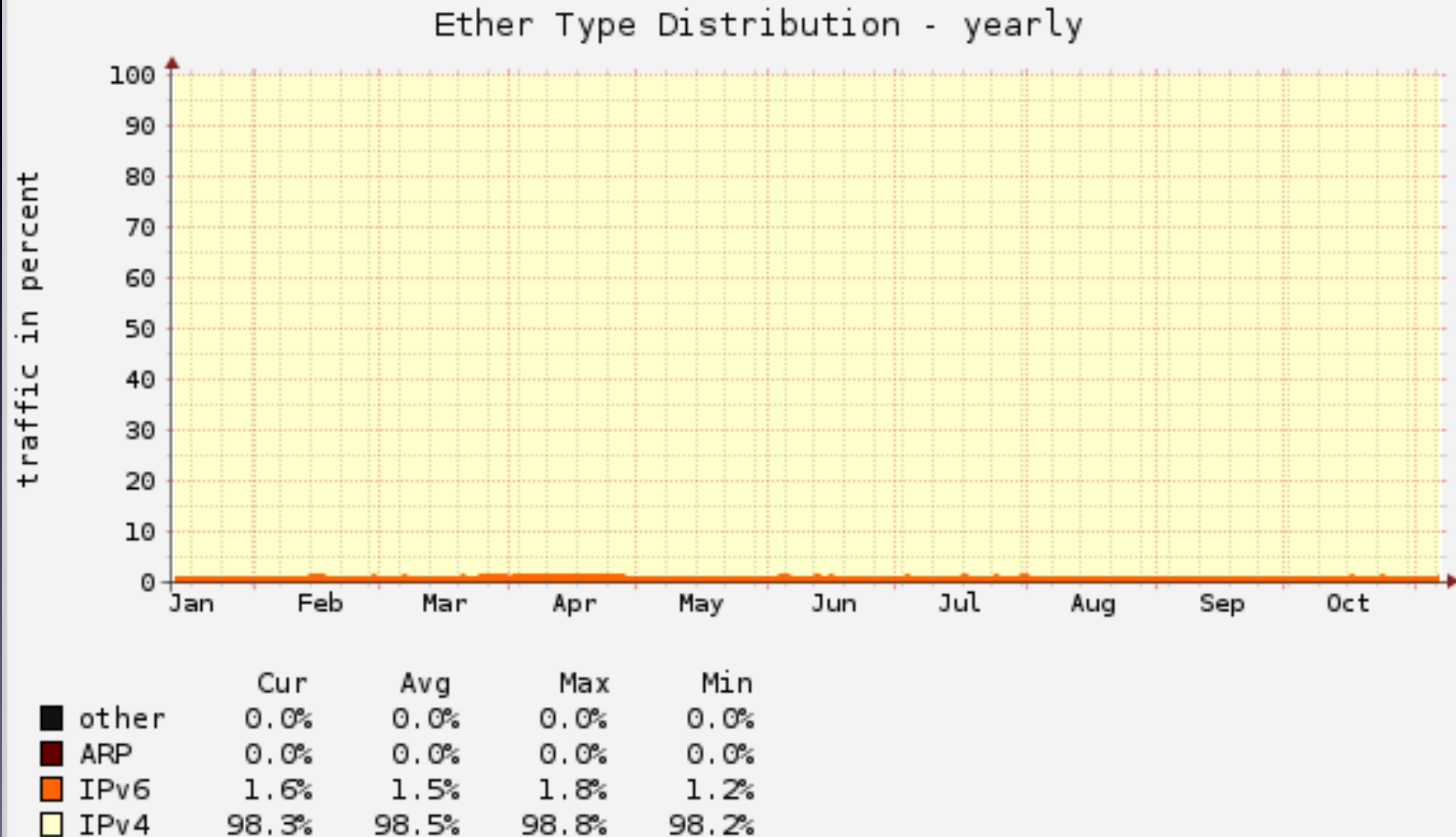
AMS-IX



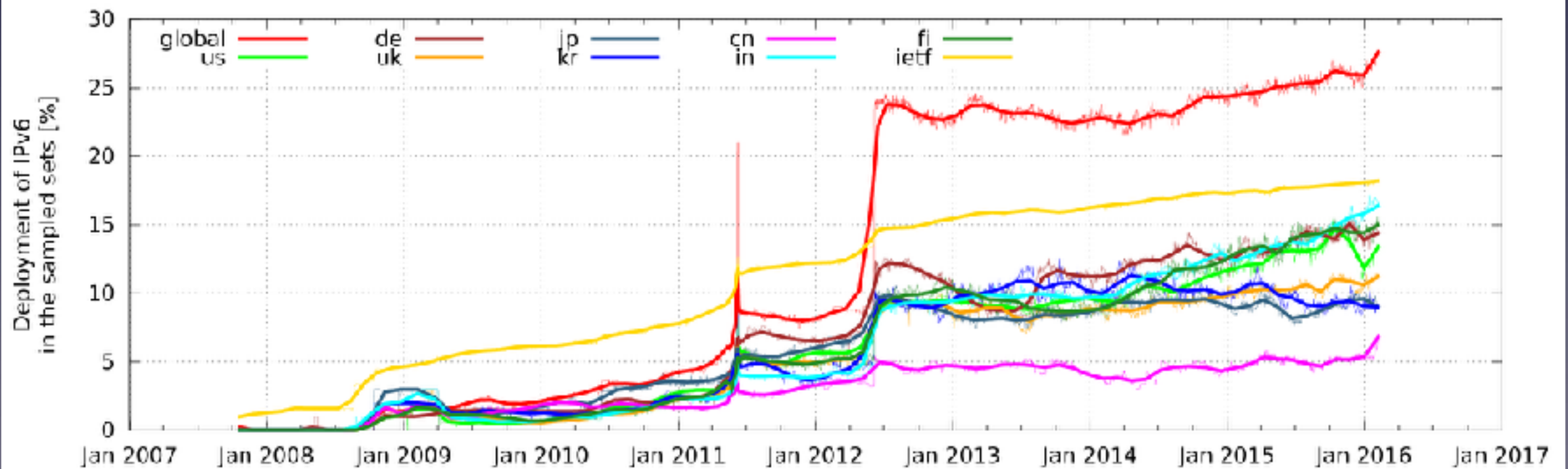
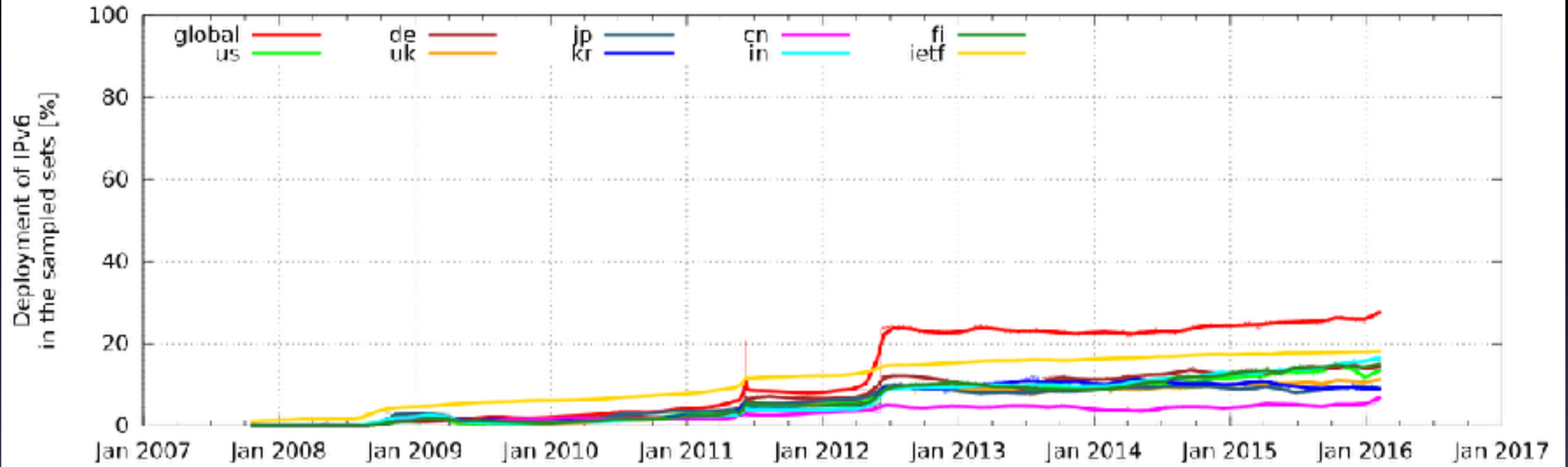
Cur = 45.0 Gbps
Avg = 45.3 Gbps
Max = 58.3 Gbps
Min = 35.6 Gbps

AMS-IX

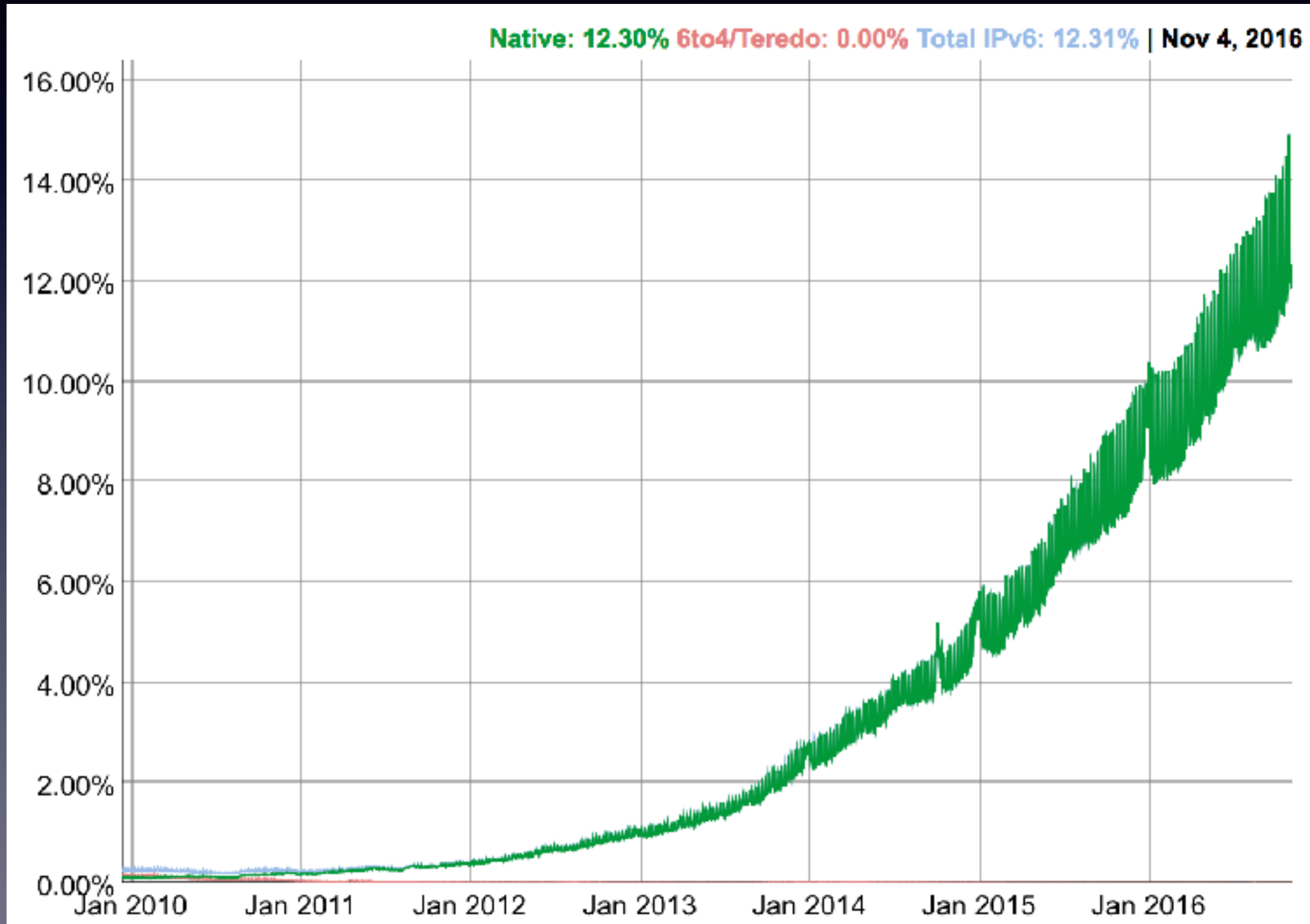
RRDTOOL / TOBI OETIKER



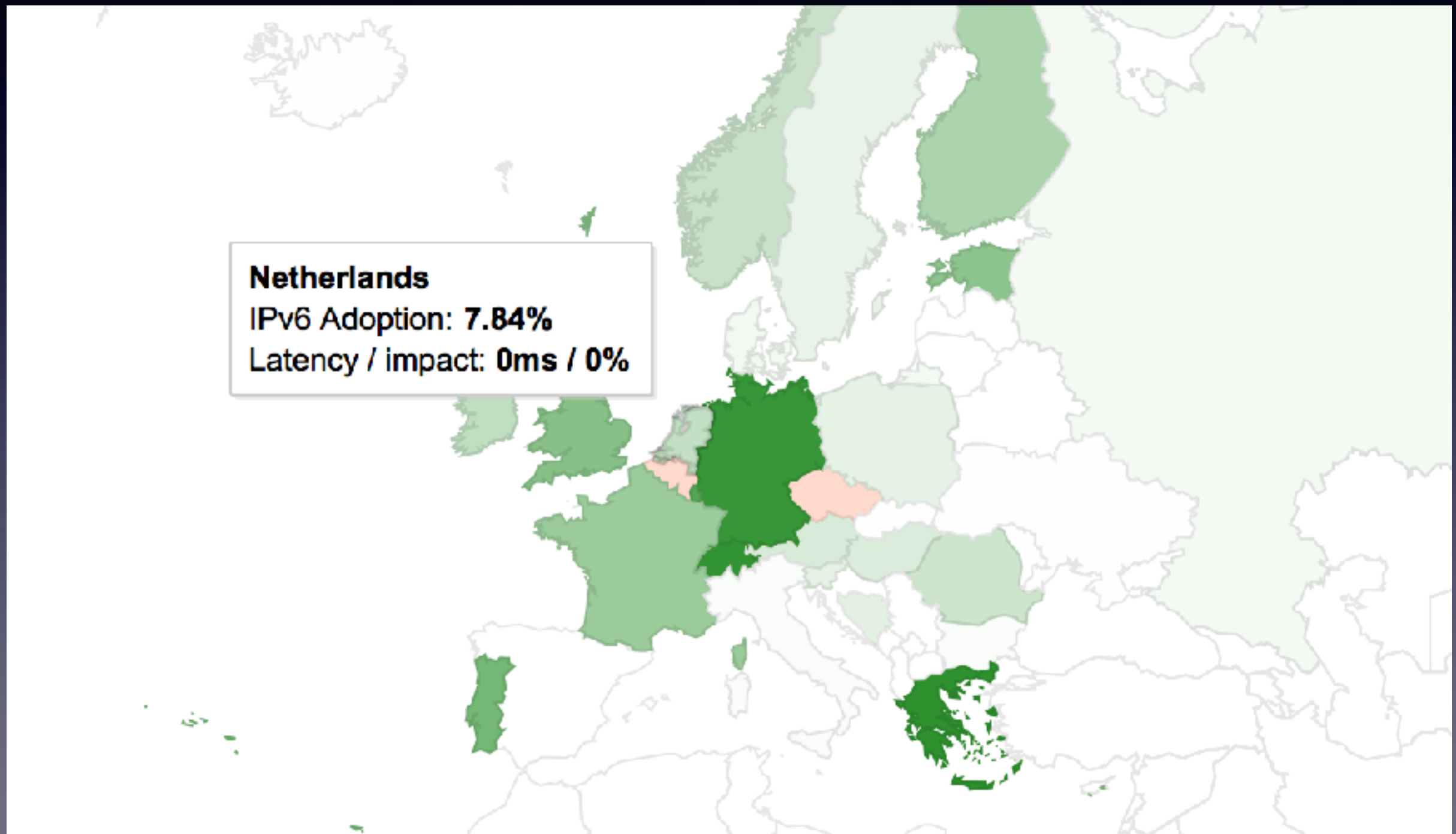
eggert.org



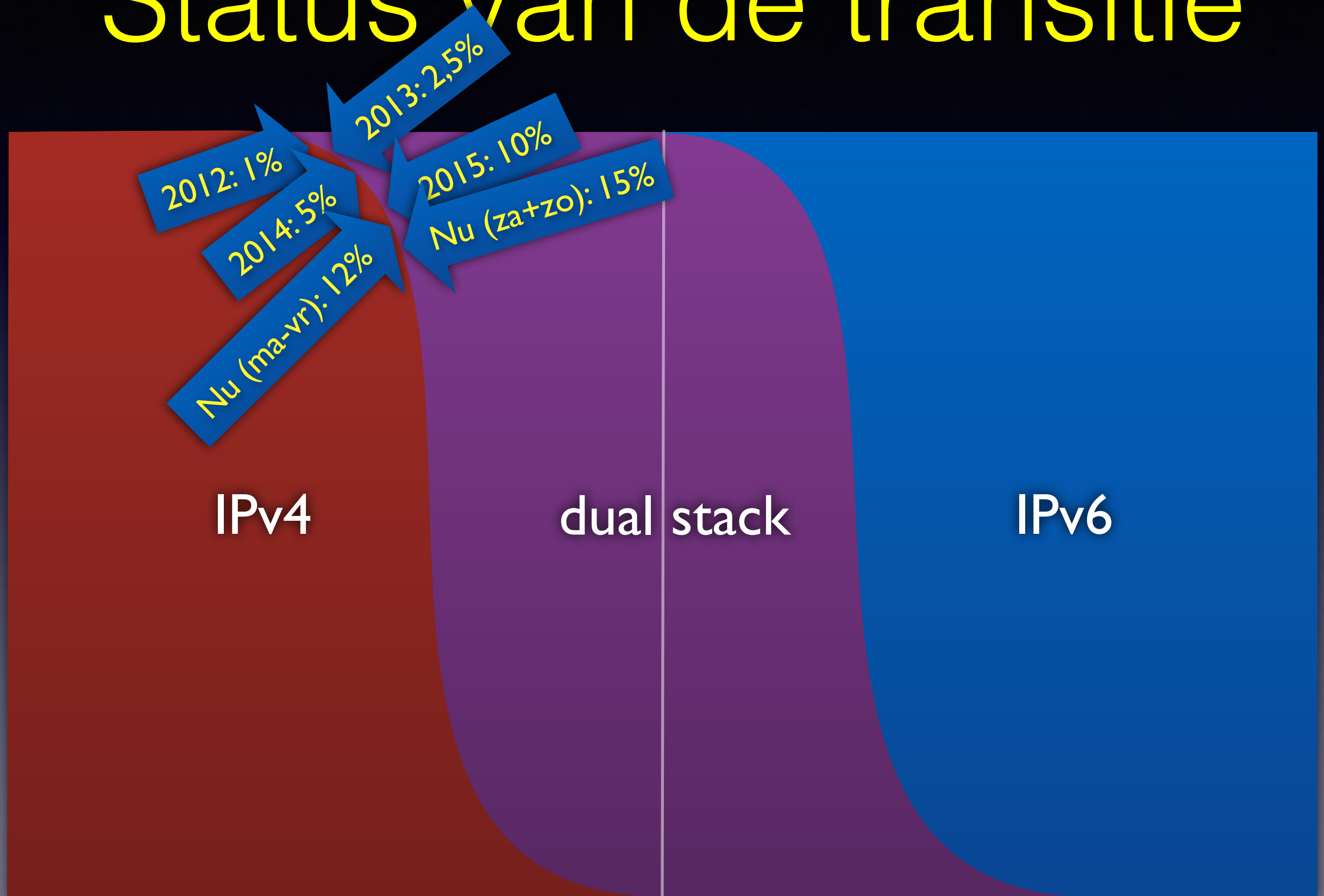
Google



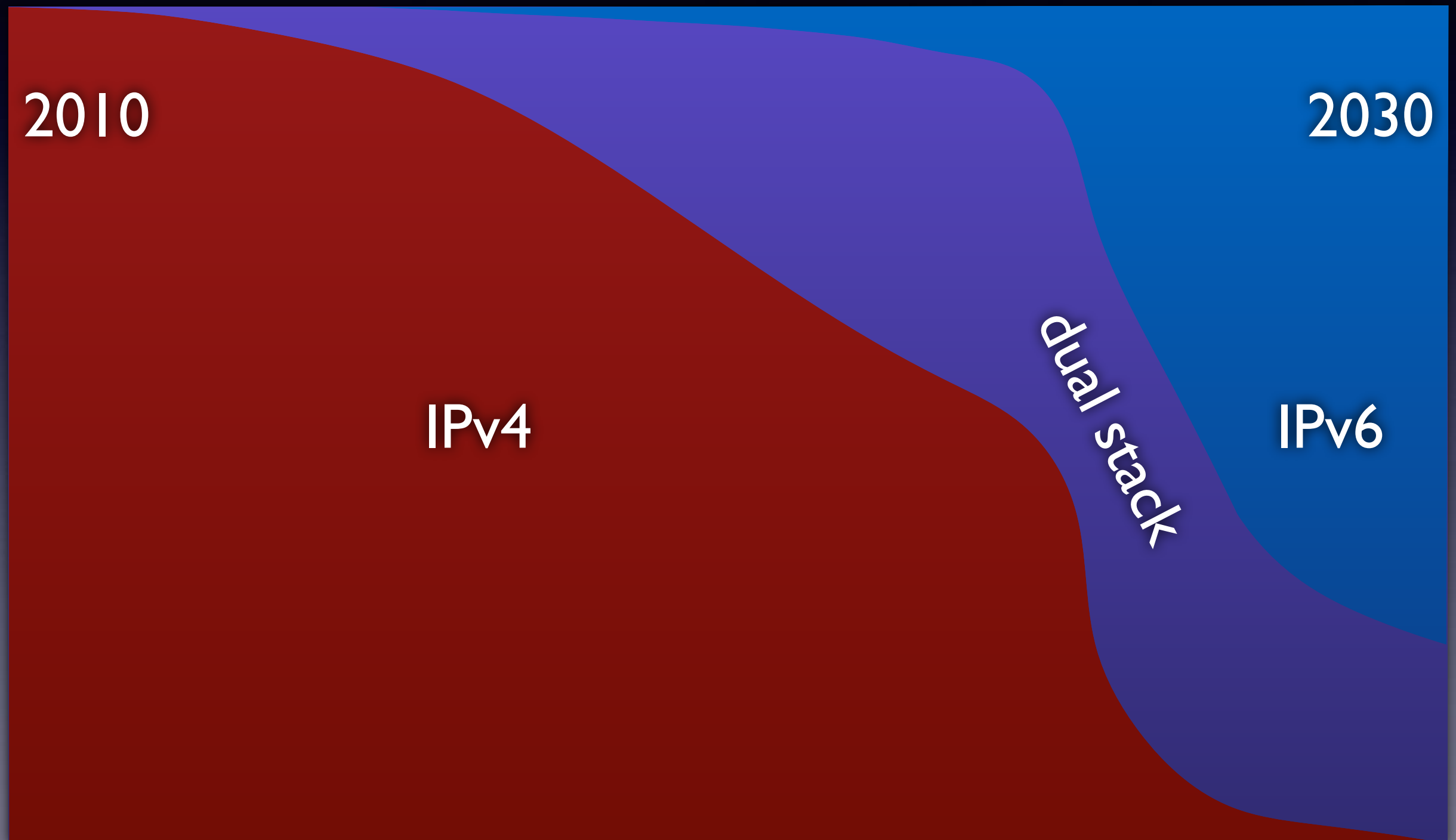
Google: per land



Status van de transitie



De toekomst?



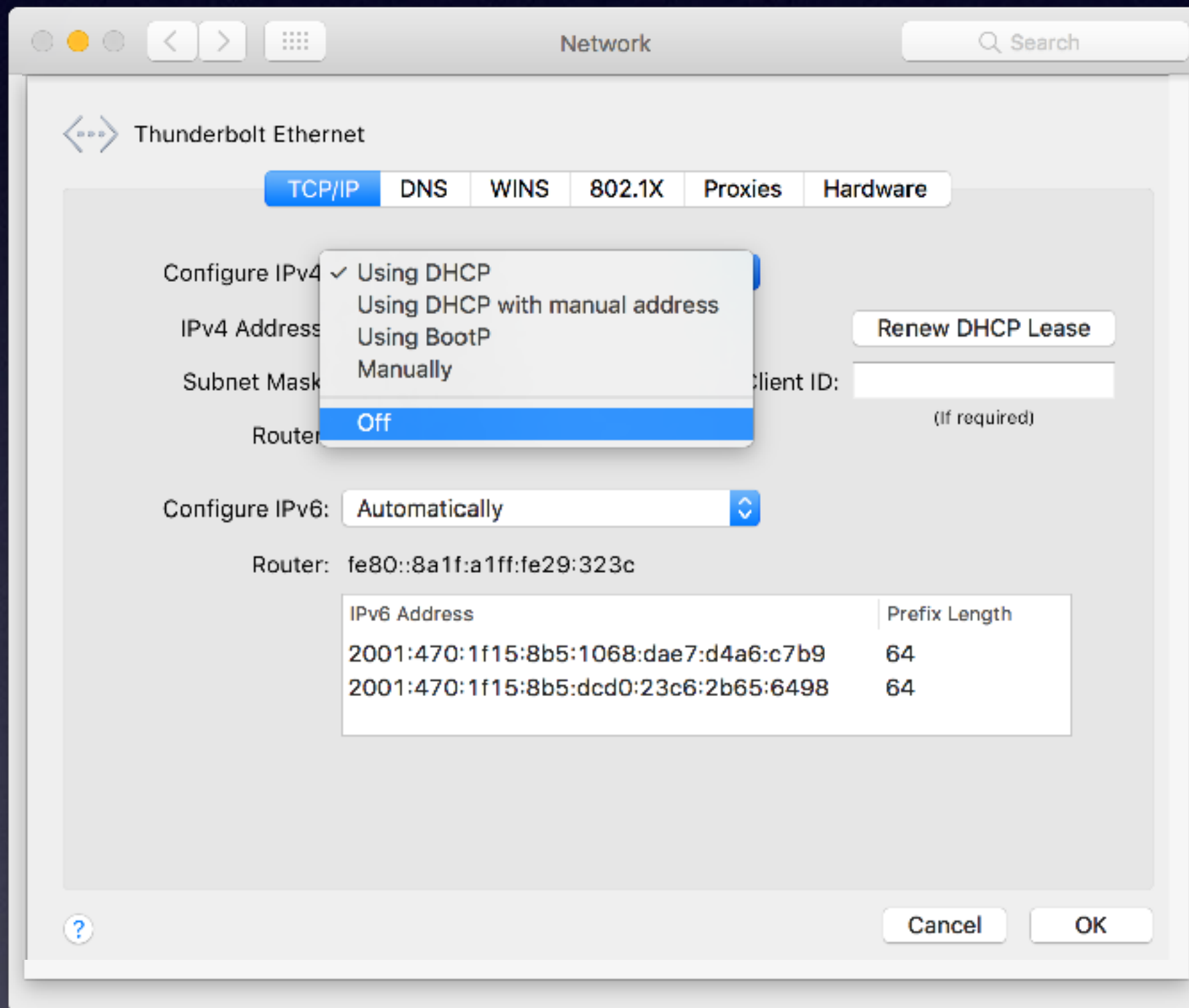
Maar... dat is allemaal
dual stack!

Wanneer gaan we over
op alleen IPv6?

Terminologie

- IPv4 = alleen v4, geen v6
- Dual stack = zowel IPv4 als IPv6
- "IPv6" $\approx$ dual stack ?
- IPv6-only = ...?

IPv6-only (1)



IPv6-only (2)

ars PREMIER

FEATURES —

The night the IETF turned off IPv4

At a meeting this week, the Internet Engineering Task Force decided to kill ...

ILJITSCH VAN BEIJNUM - 3/14/2008, 2:05 AM

Taking a detour from IPv4

After working on the new Internet Protocol version 6 (IPv6) for a decade and a half, the Internet Engineering Task Force decided it was time to turn off the old protocol (IPv4 or just IP). So this is what they did for an hour on the network used at the IETF meeting in Philadelphia this week. Network traffic plummeted from some 30Mbps to around 3Mbps as the meeting attendees who had IPv6 enabled could now only get at IPv6-reachable destinations on the Internet. Leslie Daigle, chief Internet technology officer for the [Internet Society](#), who coordinated the IPv4 outage, considers the outage a success.



IETF attendees bracing themselves for the loss of IPv4

A huge wireless network provided connectivity to the attendees. The Philadelphia meeting was hosted by Comcast, which [provided a 100Gbps connection](#) with a 10Gbps backup and a 100Mbps backup for the backup. For years now, the IETF meeting network has supported both IPv4 and IPv6. During this meeting, there was also a separate IPv6-only wireless LAN. Yesterday evening, shortly before 7 PM, the mixed IPv4/IPv6 network was turned off, forcing the IETF to proverbially eat its own dog food and talk to the world outside the meeting hotel through the remaining IPv6-only network.

IPv6-only (3)



People / federated-user-3 / Home / IPv6



Office network transition to IPv6 only

Created by Dick Visser, last modified on Mar 22, 2013

I was wondering if it would be possible to run parts of the TERENA Secretariat office network on IPv6 only.

Our office has a /24 IPv4 and a /48 IPv6 network since 2002, and all our public services are available on IPv4 and IPv6.

Since we have native IPv6 connectivity in our office, it seems that the first step would be to remove IPv4 from services that are only used internally.

This page keeps track of progress, bugs, and issues.

- Some services are only accessible via IPv4 (Microsoft Update, hostupdate.vmware.com, Secunia.com). A dual stack proxy does the protocol translation. If those web sites were the only problems on the IPv6-only system, this is just what you need, and you can avoid using additional complex systems such as NAT64/DNS64.

IPv6-only (3a - 3c)

- IPv6 en geen IPv4, maar wel:
 - a. NAT64/DNS64: vertaalt IPv6 naar IPv4
 - b. 464XLAT: vertaalt IPv4 $\rightarrow$ IPv6 $\rightarrow$ IPv4
 - c. DS-Lite: tunnelt IPv4 over IPv6-only netwerk
- Plus steeds IPv4 NAT

De verschillen

- IPv4 op systeem uitzetten:
 - applicaties kunnen denken dat je niet met het internet verbonden bent
 - lokale service discovery werkt soms niet
- Alleen IPv6-router, geen NAT64/XLAT/DS-Lite:
 - kan lokaal nog IPv4 doen (service discovery)
 - maar geen IPv4-only sites bereiken
 - of IPv4-only applicaties gebruiken

De verschillen (2)

- Alleen IPv6-router + NAT64/DNS64:
 - kan IPv4-only sites bereiken
 - maar geen IPv4-only applicaties
 - geen "IPv4 literals" (<http://149.20.64.69/>)
- XLAT464 of DS-Lite:
 - (bijna) alles werkt!

Dus?

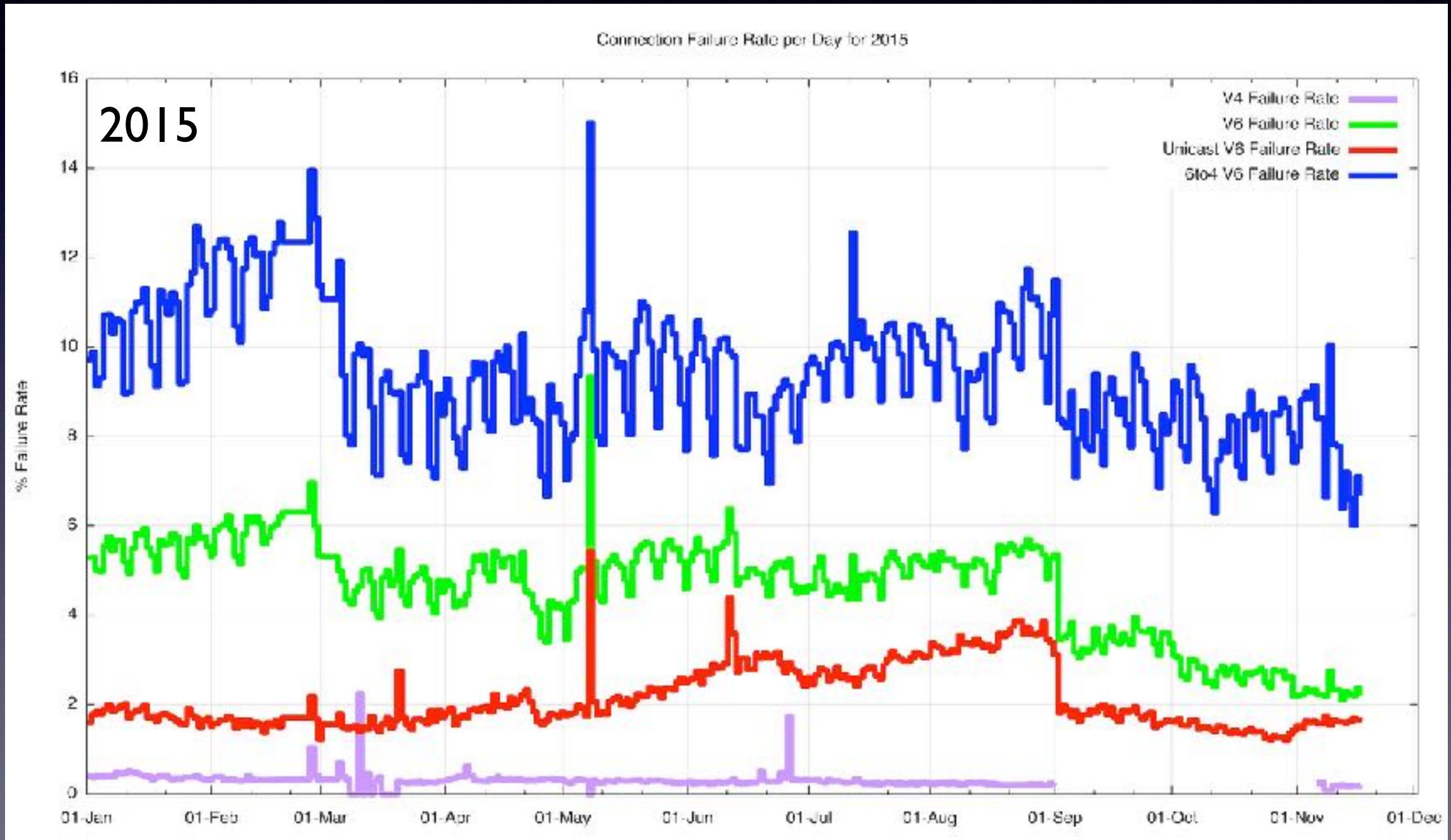
- Verreweg de meeste IPv6 is dual stack
- Grote buitenlandse mobiele netwerken doen IPv6-only op hun netwerk maar wel met NAT64 en meestal 464XLAT
- Sommige ISPs (ex-UPC?) doen IPv6-only op hun netwerk + DS-Lite IPv4 = grote IPv4 NAT bij ISP
- Echte IPv6-only *zeer* zeldzaam

Dual stack:
wat is sneller, v4 of v6?

ping / ping6

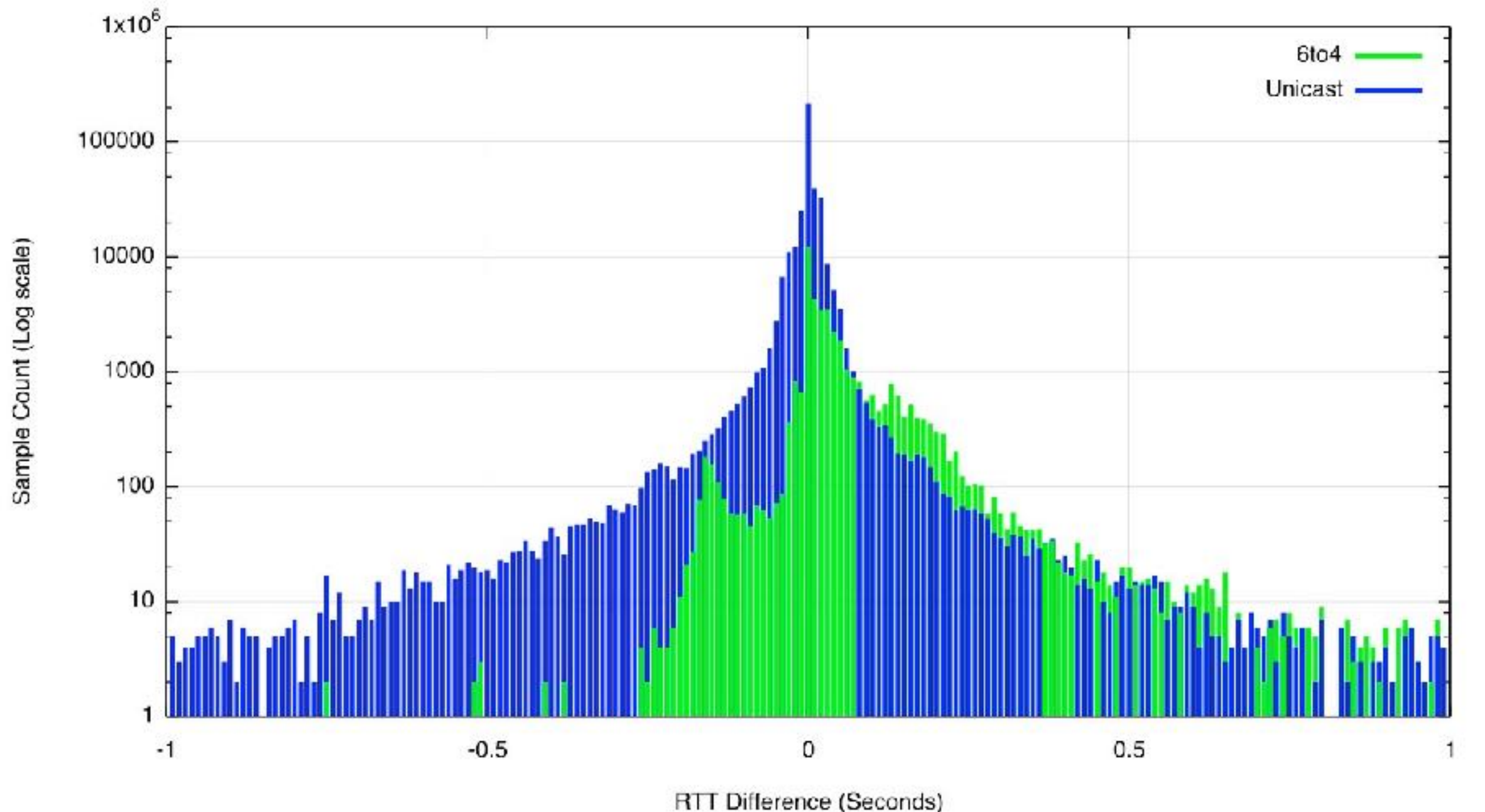
	IPv4	IPv6	+/-
www.google.com	2118	1887	-10.9%
www.ams-ix.net	2510	2217	-11.7%
www.ietf.org	1660	1402	-15.5%
www.isc.org	144814	145981	+0.8%
www.stipv6.nl	15166	12324	-18.7%
www.wikipedia.org	1760	1002	-43.1%
www.facebook.com	72512	118041	+62.8%
www.yahoo.com	20086	21044	+4.8%
www.apple.com	1656	122037	+7269.4%
www.nasa.gov	2040	7756	+280.2%

Geen verbinding



<http://www.potaroo.net/ispcol/2015-11/v6perf.html>

IPv6 RTT t.o.v. IPv4



<http://www.potaroo.net/ispcol/2015-11/v6perf.html>

Dus...

- IPv6 is vaak sneller dan IPv4! 😄😄😄😄😄😄
- waarom?
 - geen NAT
 - de betere ISPs doen IPv6 = beter pad?
- Maar ook vaak langzamer... 😬😬😬😬
- Moraal van het verhaal: happy eyeballs

Happy eyeballs

- Als een systeem dual stack runt
- Tegelijkertijd:
 - vraag IPv4-adres aan DNS en probeer dan een verbinding te maken
 - vraag IPv6-adres aan DNS en probeer dan een verbinding te maken
- Gebruik de verbinding die het eerst tot stand komt
- Blijf het betreffende protocol (een tijdje) gebruiken

Conclusies

- "Zolang we koffie hebben, drinken we koffie."
- Ofwel: goede IPv4 + goede IPv6 is mooi!
- Maar op slechte IPv4 (of slechte IPv6!) zit niemand te wachten, zet dat maar uit
 - vandaar geen 6to4 en Teredo meer!

Vragen?

