CGN

Was hat CGN mit IPv6 zu tun?

IPv6 Kongress Frankfurt, May 2014

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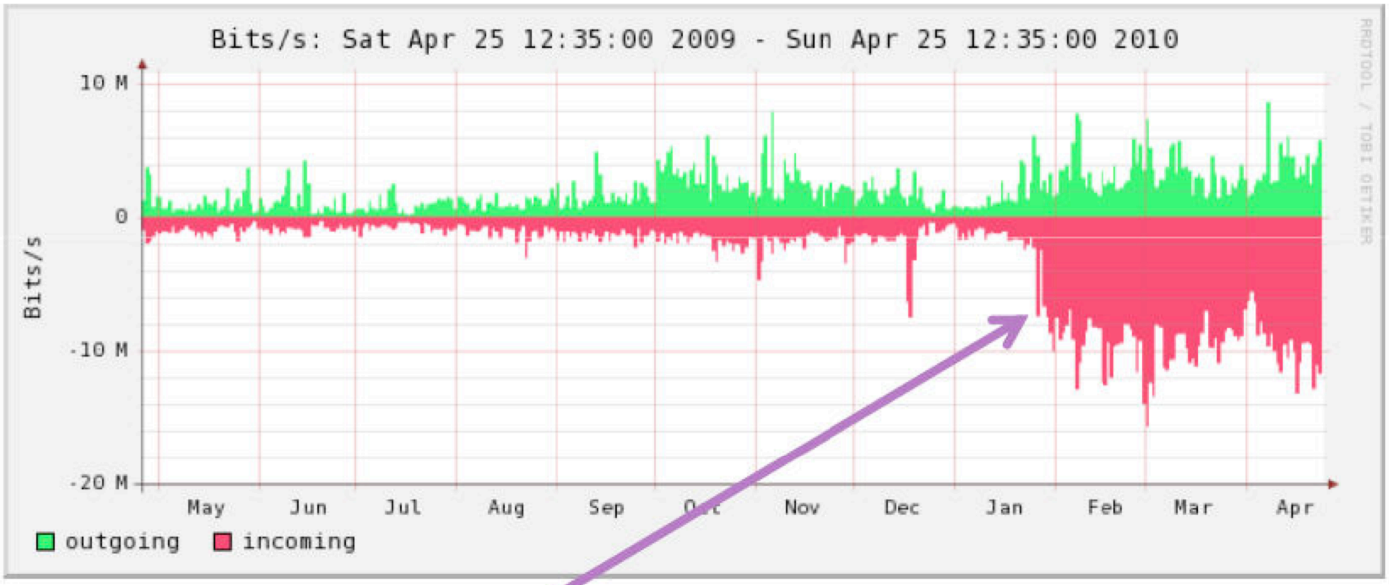
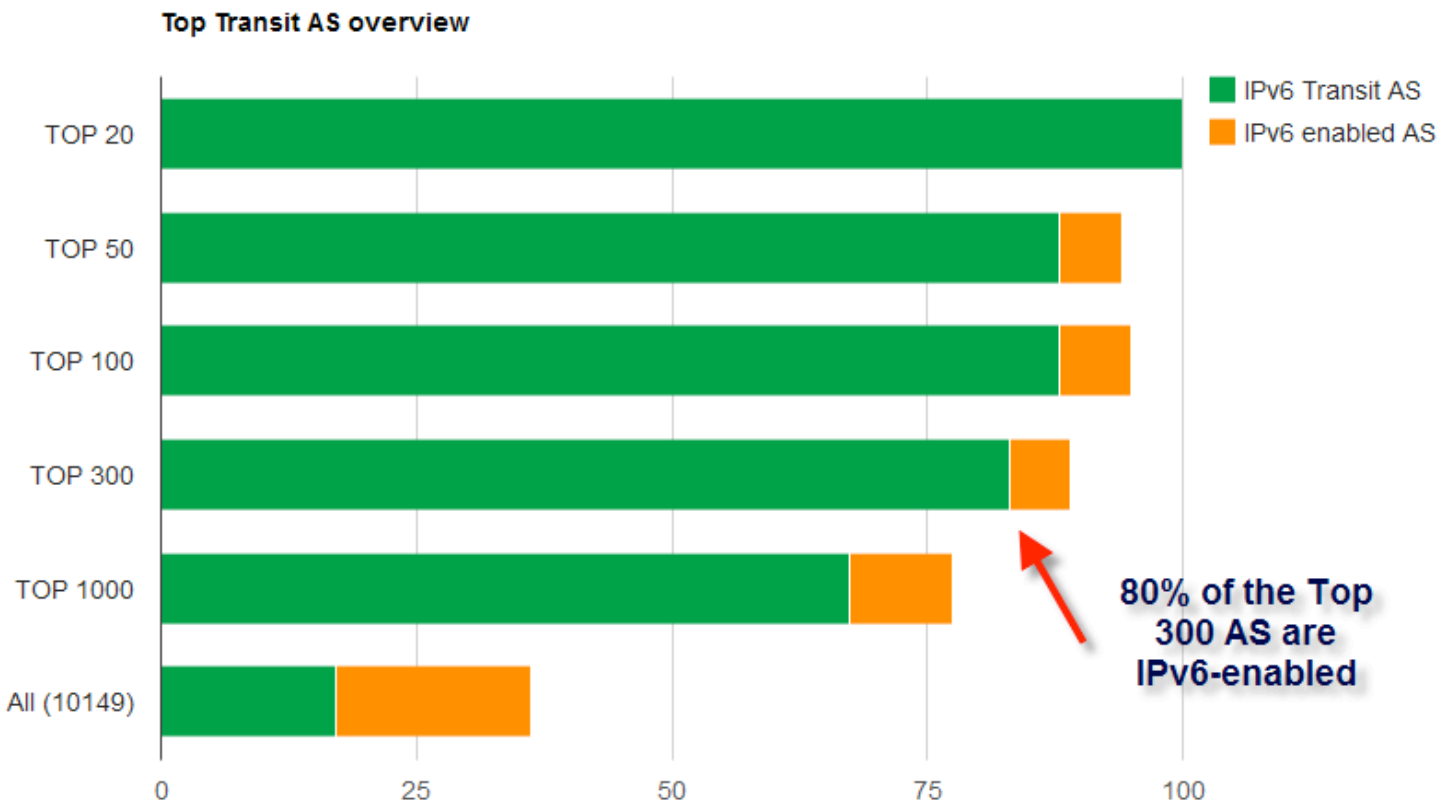
The Youtube Effect - UTC

Redefining UTC - Users – Transit - Content



Google added AAAA records for YouTube

Top Transit AS Overview



are IPv6 Transit AS

Data Source: 6lab.cisco.com

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Population and Internet Users

Region	Online Users	Population	Online in %
World	2‘405 Mio.	7‘012 Mio.	34.3%
(world in 2001	360 Mio.)		
USA/Canada	273 Mio.	348 Mio.	78.6%
Europe	518 Mio.	816 Mio.	63.5%
Middle East	90 Mio.	223 Mio.	40.2%
Latin America	254 Mio.	593 Mio.	43.0%
Africa	167 Mio.	1'073 Mio.	15.6%
Asia	1'076 Mio.	3‘922 Mio.	27.5%
Oceania/Australia	24 Mio.	35 Mio.	67.8%

www.internetworldstats.com/stats.htm

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Error 405 - You have reached the end of the...

http://www.blaha.at/

You have reached the end of the Internet.

You have reached the end of the Internet. Open a bottle of cold Lager and lean back.

Please try out the following options:

- Get outside in the fresh air.
- Start reading the books you never found time for.
- Gain further qualifications.
- Start living healthy.
- or, alternatively, try to find me.

HTTP 405 - End of Internet reached

Or else introduce IPv6!

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Just for fun ☺

Congratulations!

** Please don't forget to turn off the lights on your way out.*

You have finally reached the end of the internet!

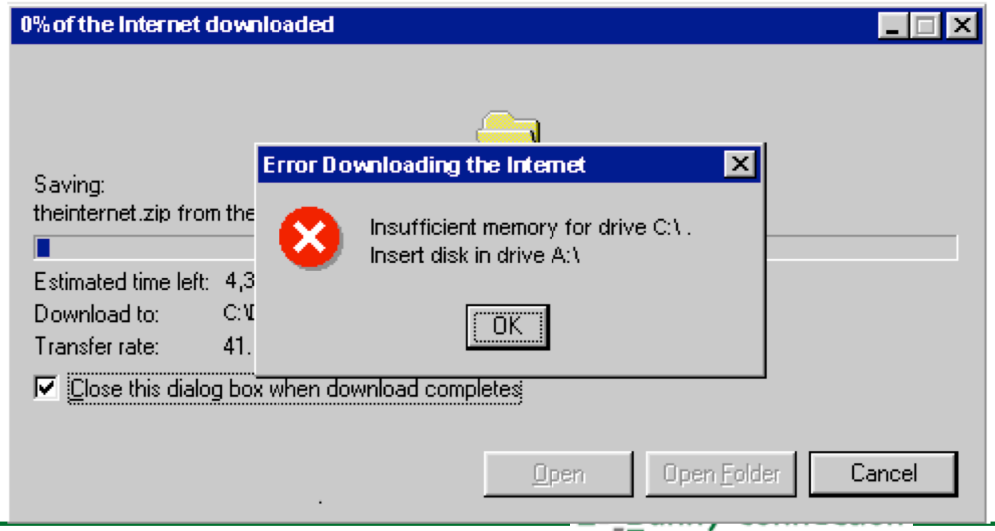
There's nothing more to see, no more links to visit.

You've done it all.

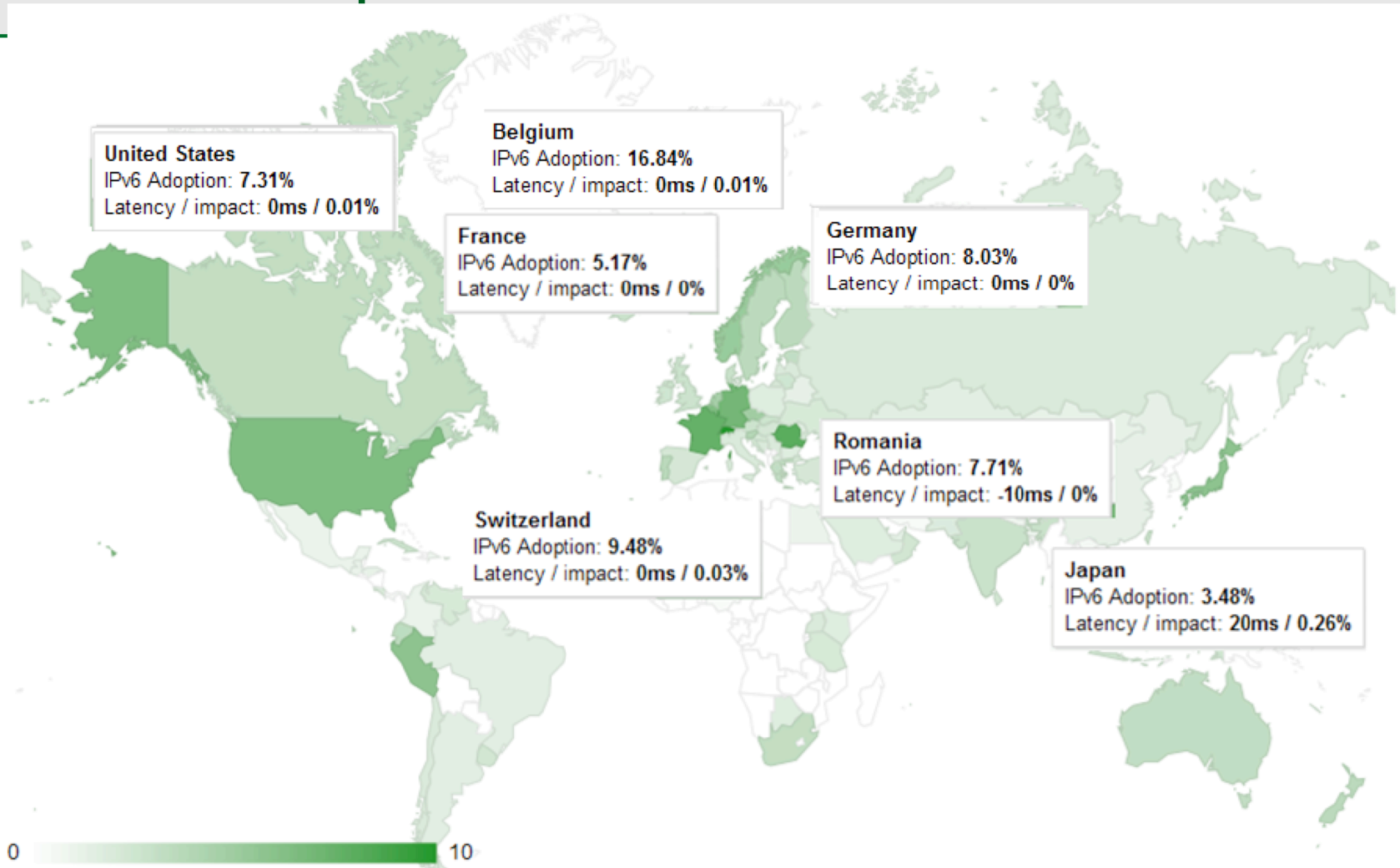
This is the very last page on the very last server at the very far end of the internet.

You should now turn off your computer and go do something useful with the rest of your life. *

In order to save time, we will now start downloading the internet to your local drive.



IPv6 Adoption



http://www.google.com/ipv6/statistics.html

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How many users are these?

Country	Population Mio	Internet Users	Penetration rate	% of IPv6 Users	Number of IPv6 Users
Switzerland	7.9	6.5	82%	9.5%	650'000
Germany	81	67	83%	8.0%	5.2 Mio
France	65	52	79%	5.2%	2.7 Mio
Belgium	10	8	81%	16%	1.2 Mio
USA	313	245	78%	7.3%	17.0 Mio
China	1'343	538	40%	1.1%	5.9 Mio
Japan	127	101	79%	3.48%	3.5 Mio
Global	**7 Bio**	**2.4 Bio**	**34%**	**3.5%**	**84 Mio**

Doubling approx. every nine month

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Address Allocation IPv4 - Worldview

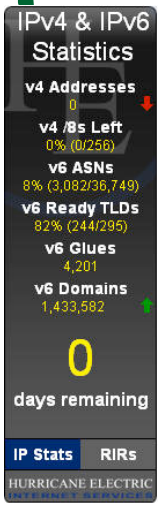
- IANA Pool (unallocated addresses)
  - October 2005 64 /8 (Class A)
  - January 2008 42 /8
  - January 2009 34 /8
  - January 2010 24 /8
  - June 2010 16 /8
  - October 2010 12 /8
  - Feb 3, 2011 zero

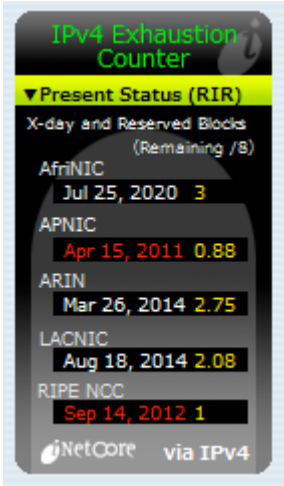
  (Doubling consumation in 2010!)

- Projected end of IPv4 pools:
  - IANA Pool Feb 3, 2011
  - RIR Pools 2012 - 2014

- Source: http://www.potaroo.net/tools/ipv4

http://ipv6.he.net





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IPv4 Exhaustion at RIRs

- APNIC final /8 policy became active on April 15, 2011
  To extend the life of APNIC's last /8 for as long as possible, under the final /8 policy, each organization can only receive one block of the minimum allocation size (a /22)

- RipeNCC announced on September 14, 2012, that it began to allocate IPv4 address space from the last /8 of IPv4 address space it holds. The maximum IPv4 allocatoin an LIR get is a /22.

- ARIN announced on April 23, 2014 that it is down to its final /8 of available space in its inventory and has moved into Phase Four of its IPv4 Countdown Plan. All IPv4 requests are now subject to Countdown Plan processes.

Internet Growth

The IPv4 based Internet will not stop working, but it will stop growing, while the IPv6 based Internet is designed to grow for generations to come. (Tony Hain)

- Online World population in
  - 2001 360 Mio
  - 2005 938 Mio 14% global penetration rate
  - 2009 1.4 Bio 21% "
  - 2011 2.1 Bio 28% " 99.9% IPv4 users
  - 2013 2.3 Bio End of IPv4
  - 2015 5 Bio? More? Percentage of IPv6-only users?

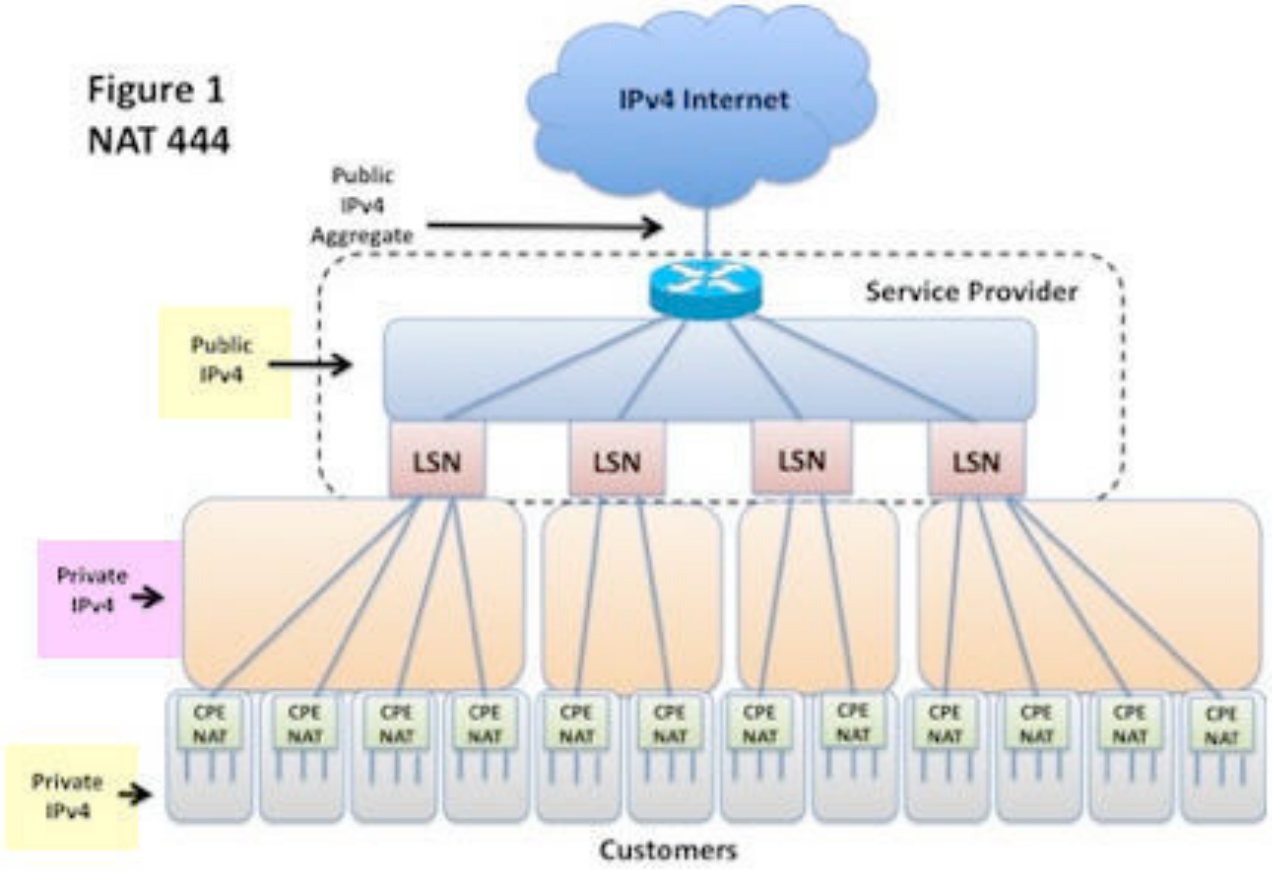
New Internet Users

- Will have:
  - NATed IPv4 Internet Access (possibly multiple NATs with CGN) – to extend IPv4 address space and native IPv6 in parallel
  - IPv6-only Internet Access with translation for IPv4 Internet (NAT64/DNS64) – to make IPv4 work over an IPv6-only network

- Internet Access to IPv6 sites will soon outperform access to the IPv4 Internet
  - As a content provider you are interested in offering your content over IPv6 as soon as possible
  - Business Analytics! Geolocation don't work with NAT (why is Google interested in the deployment of IPv6? ;-)

NAT444

Figure 1
NAT 444



From Network World Article by Jeff Doyle "Large Scale NAT Architectures"

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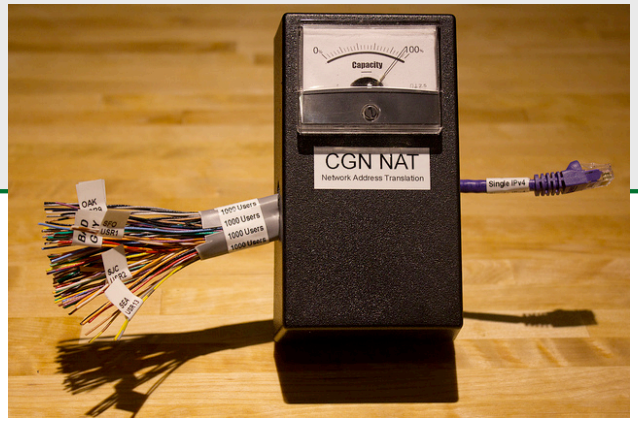
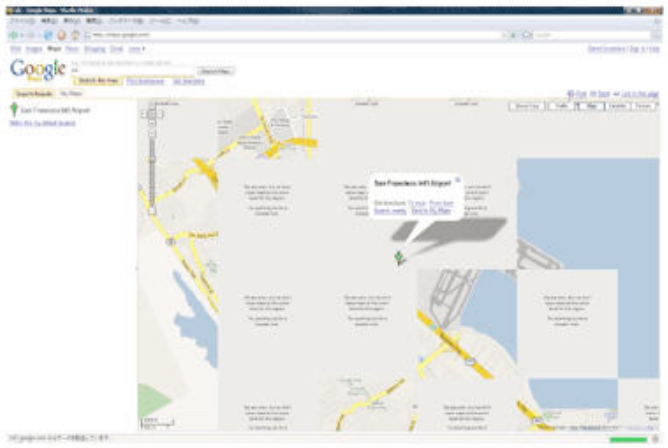
CGN – your bottleneck



- For many no way around it
- Costly to implement
- Costly and difficult to manage
- Costly and difficult to log (customer /= IP address (log connections at port level)
- Security! Blacklists!
- Bad user experience, failing applications
- Performance issues
- Location unclear (geolocation)

Max 15 Connections



- Deploy IPv6!

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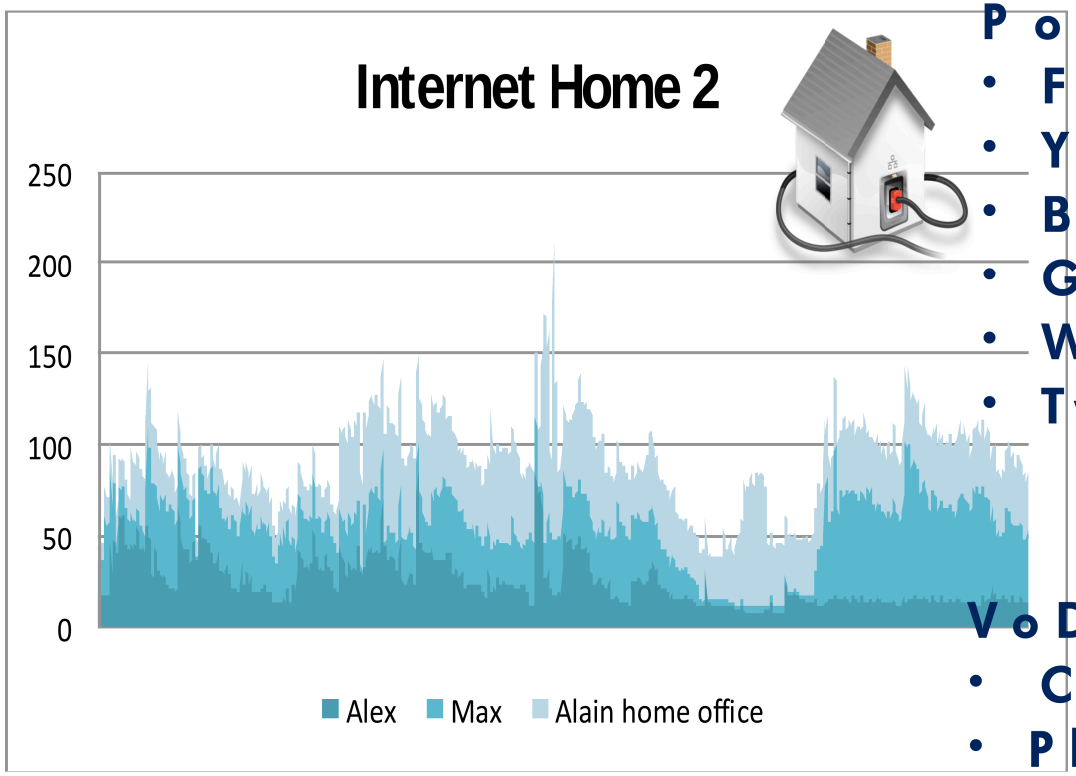
Real world Session Statistics



Peer to Peer:

- **BitTorrent: >700**

Portals/Social

- Facebook: 40 sessi
- Yahoo: 110 sessions
- Bing: 30
- G+: 30
- Wikipedia: 50
- Twitter : 20

VoD/TV Replay platfo

- Canal plus : 70 ses
- Pluzz.fr: 95 sessions
- BBC : 45 sessions
- CNN: 50

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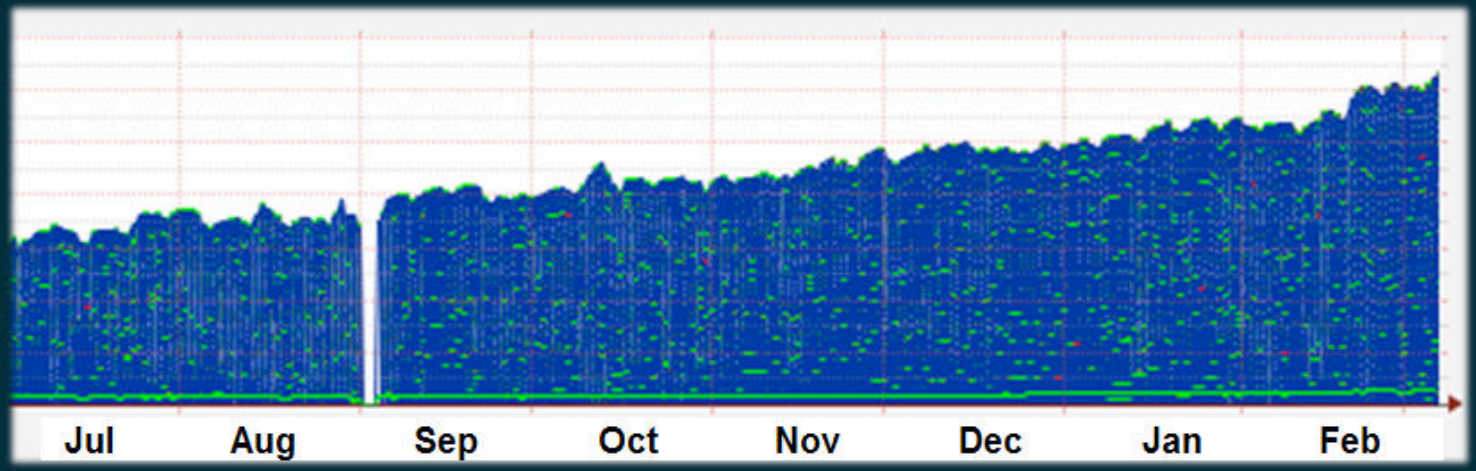
Connections on the rise

NAT44 Session State Growth in a Real Mobile Network



X 2 over 8 months. Accelerating with Smartphone penetration
=> More sophisticated apps => more tcp sessions + keepalive

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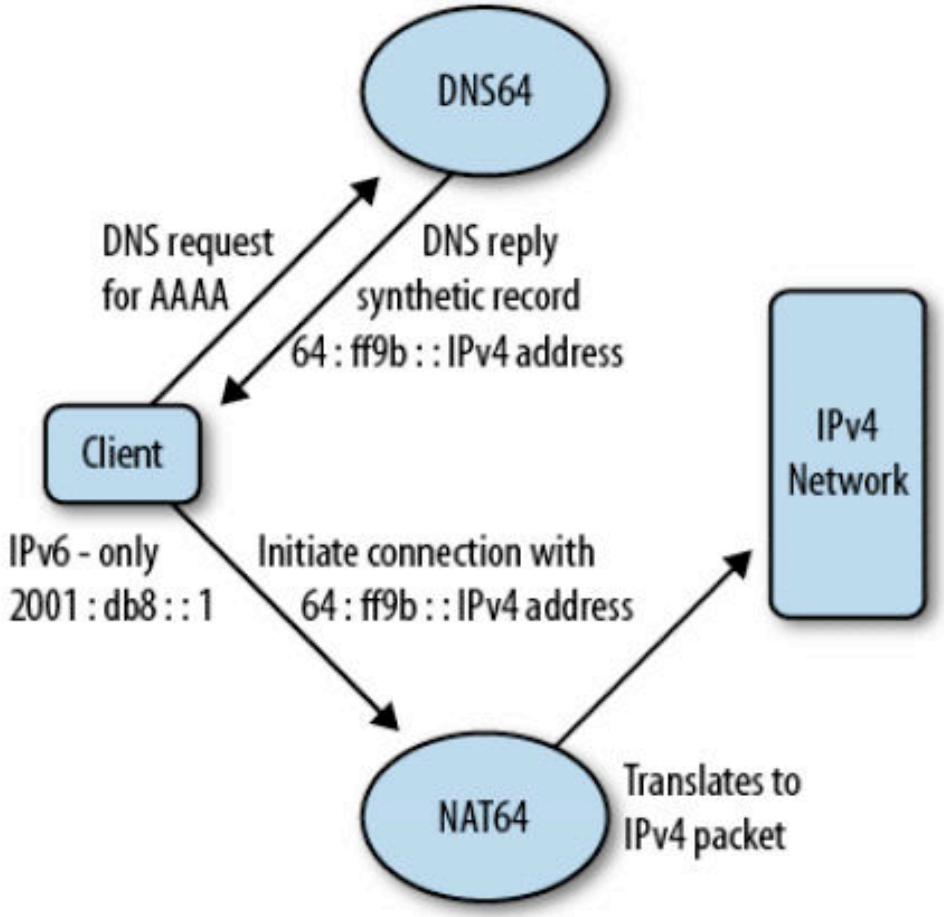
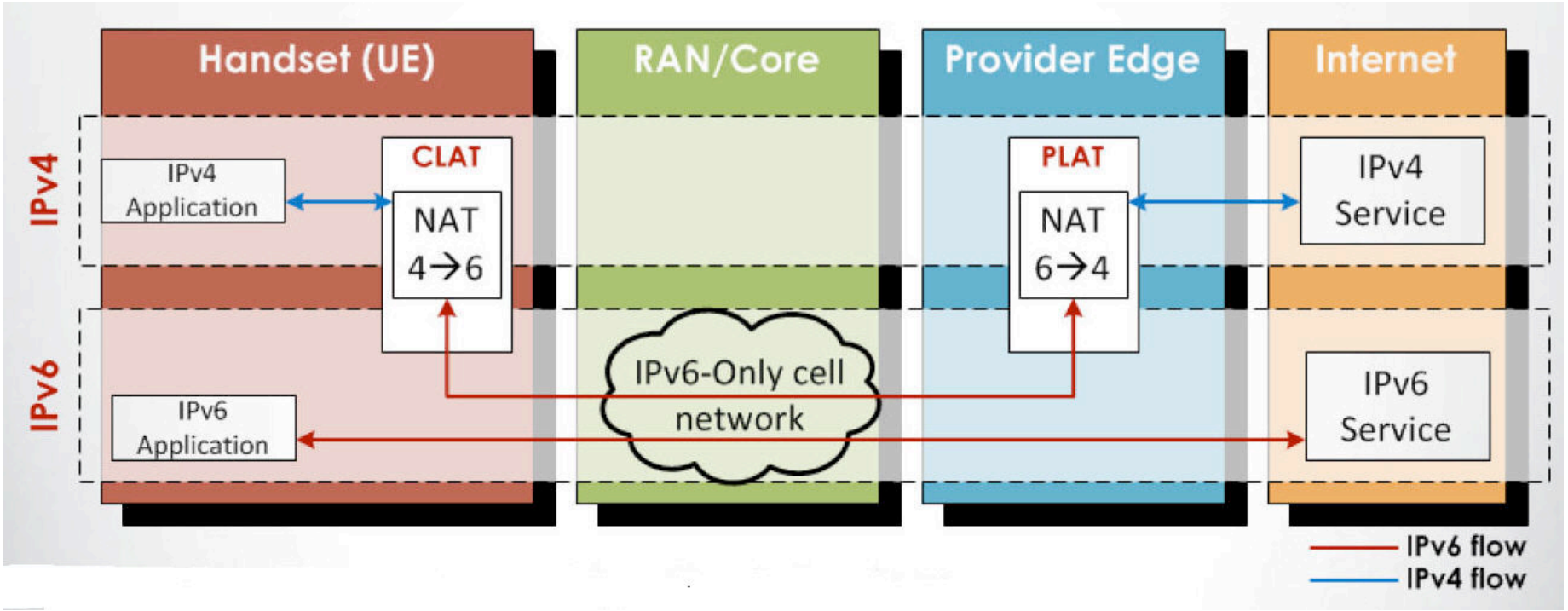
IPv6-only - NAT64/DNS64



464XLAT

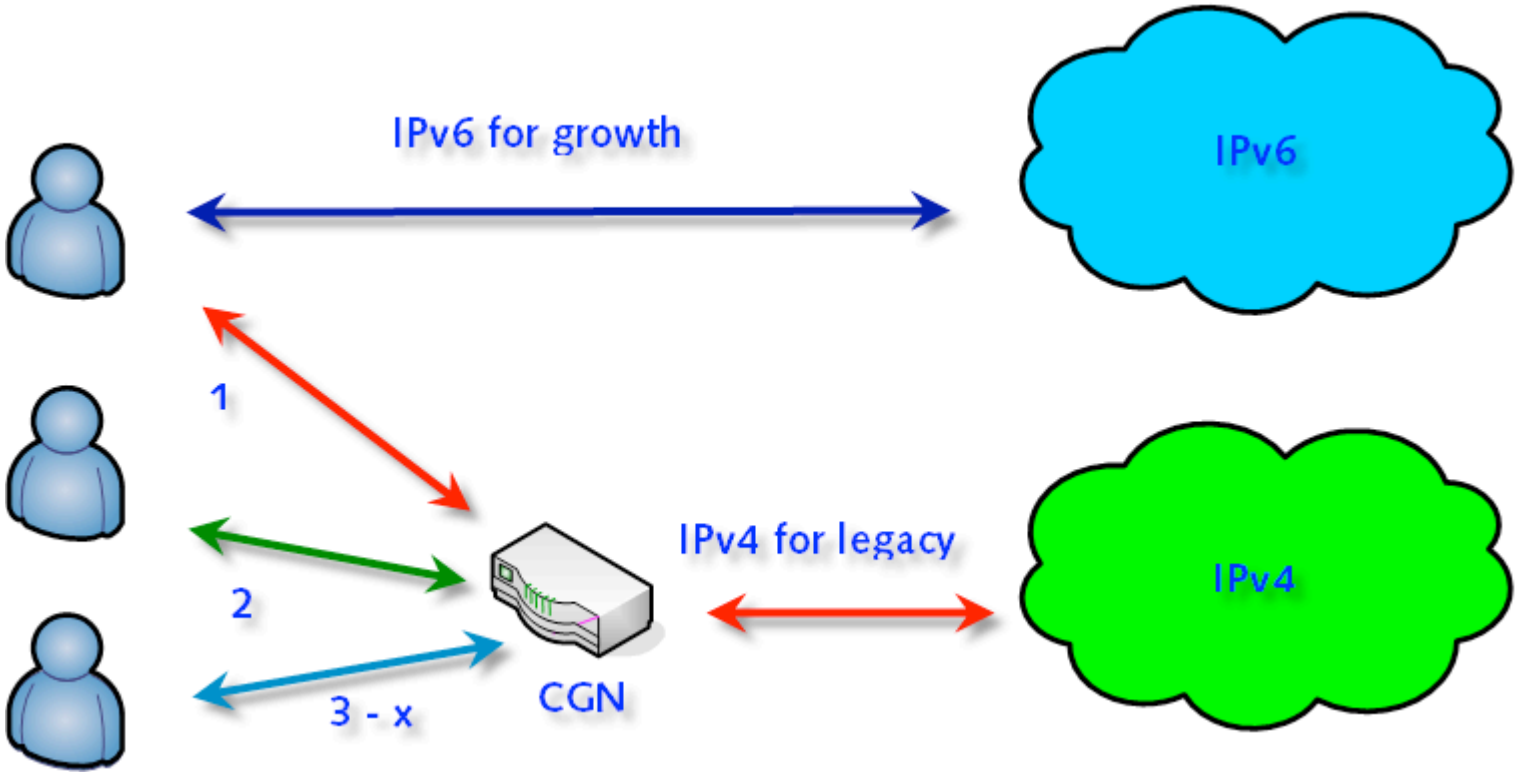
- Defined in RFC 6877
- Makes IPv4-only applications work on an IPv6-only device and over an IPv6 only network (Skype on Smart Phone)
- With the CLAT it supports applications that use literals and IPv4 addresses in the payload
- Combines stateless and stateful NAT64/NAT46
- Used by Mobile Providers (such as Verizon Wireless and T-Mobile USA among others)
- Tested on Android 4.3
  Implemented on Android 4.4

464XLAT Architecture



- CLAT is the customer side translator (XLAT). It complies with RFC 6145 on IP/ICMP Translation Algorithms. It translates 1:1 private IPv4 addresses to global IPv6 addresses and vice versa.
- PLAT is a provider side translator (XLAT) that complies with RFC 6164 on Stateful NAT64. It translates N:1 global IPv6 addresses to global IPv4 addresses and vice versa.

ISP Strategy and Business Case: Deploy IPv6



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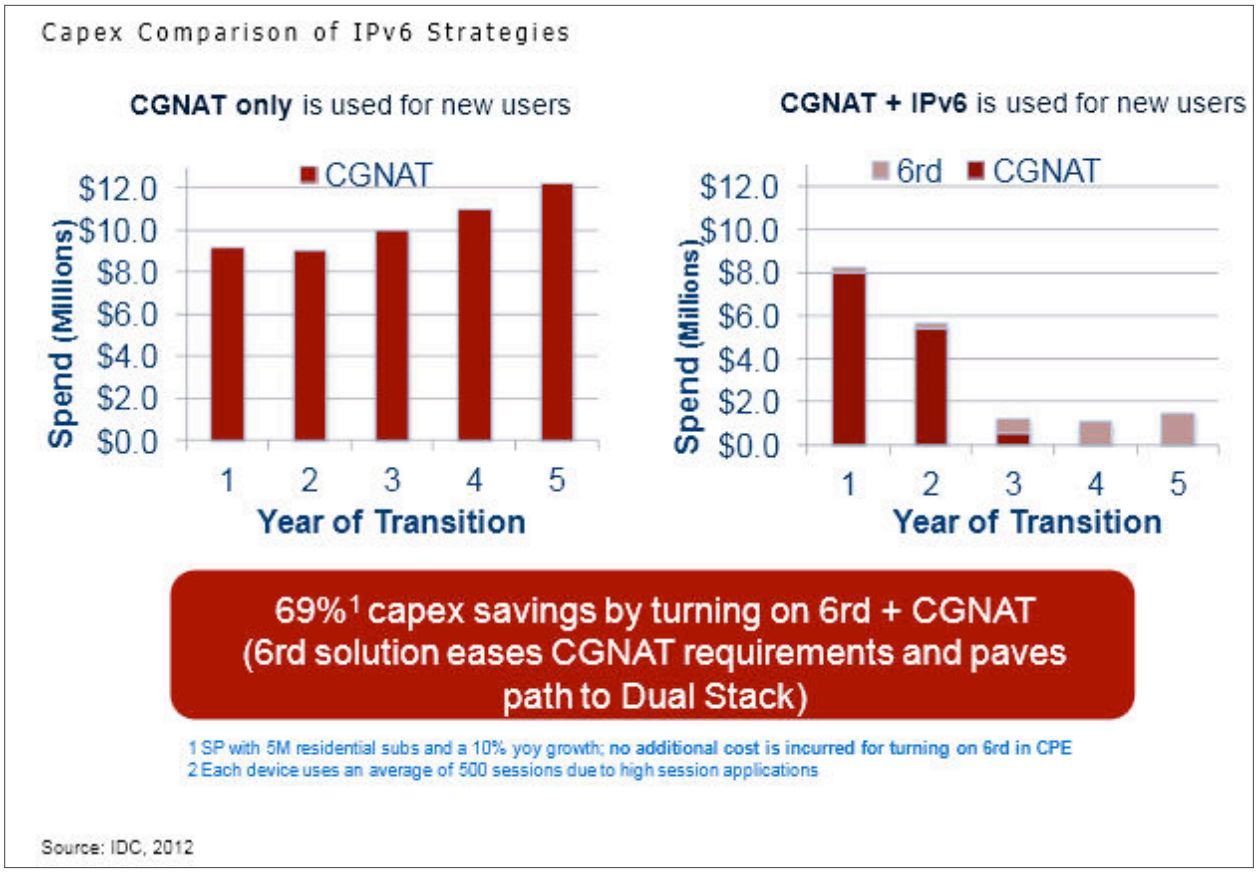
Business Case for delivering IPv6 now



SP with 5 Mio subscr.

Each home allocated 500 sessions

Annual subsc growth rate 10%

Content 25% in first year, going up to 95% in 5th year

Cost for maintaining CGN in IPv4-only scenario growing

Cost for 6rd mainly initial capital cost

http://www.cisco.com/en/US/solutions/collateral/ns341/ns525/ns1017/idc_ipv6_economics.pdf

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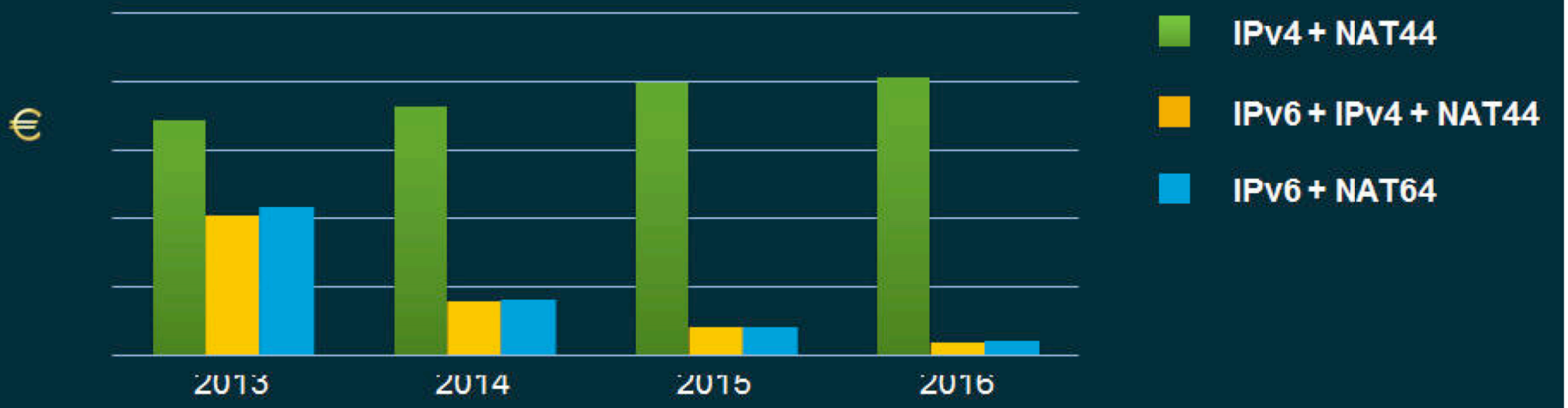
Business Case (2)

Business Case #2:
Mobile CGN Bypass



March 2013, IDC Study - "The Business Case for IPv6 in Mobile Networks"

http://goo.gl/J9IZF

Conclusions

- The Internet consists of users, transit providers and content/application providers
- The faster each and everyone does his part of the job to support IPv6 as soon as possible (at least towards the public Internet) he helps the whole community to avoid pain and unhappy users
- That means
  - ISP deploy IPv6 to your Internet customers
  - ISPs provide IPv6 transit
  - Content providers provide dual-stack content

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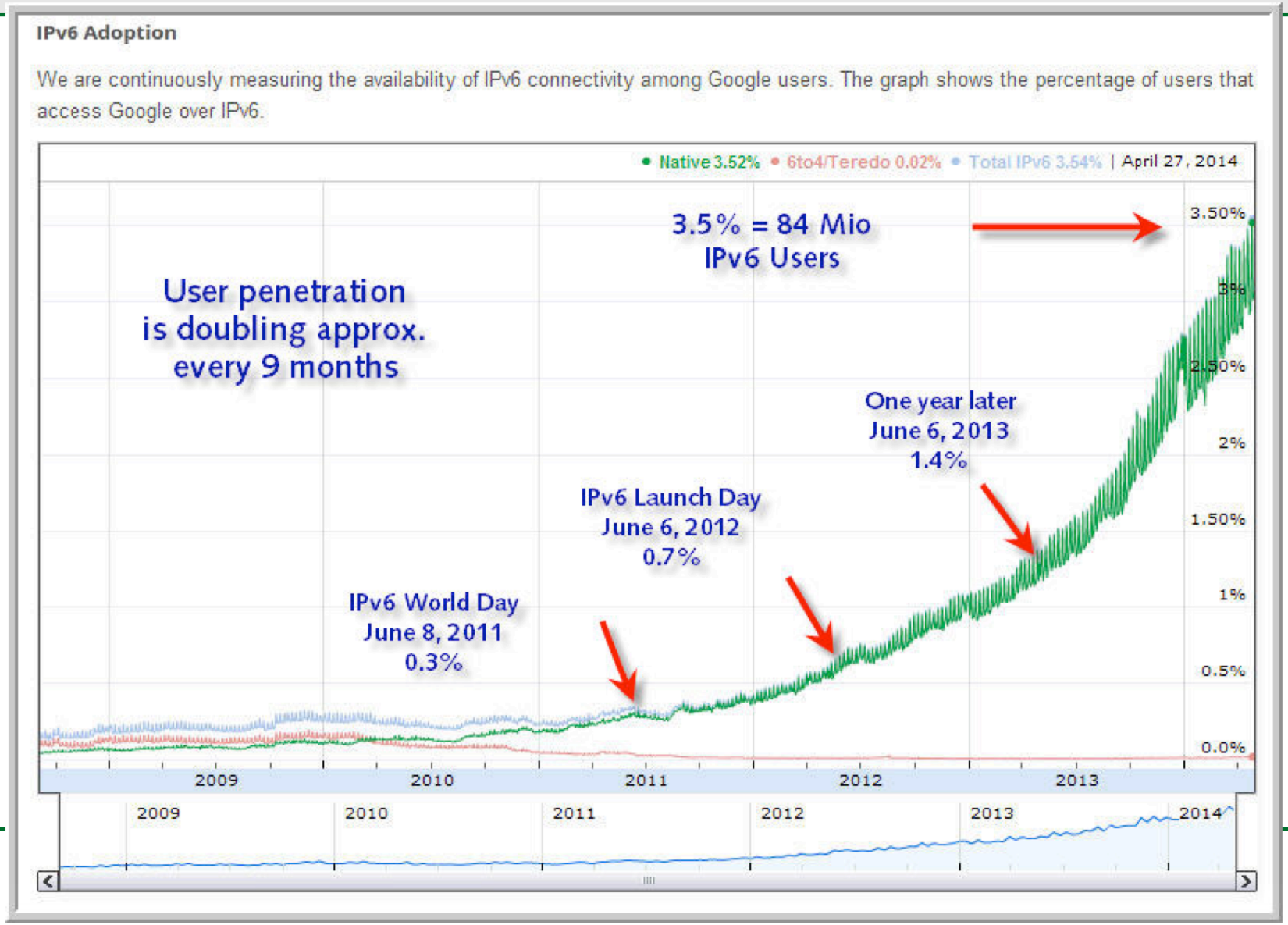
IPv6 in the World – Google Stats



Upcoming – Swiss IPv6 Business Conference

- June 17, Zürich, Arena Sihlcity
- **www.ipv6conference.ch**
- Many international speakers you don't wanna miss!

VIP Ticket including Dinner with the Speakers available

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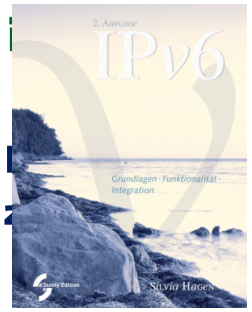
Thank You For Your Attention!

IPv6 Grundlagen, Funkti t, Integration

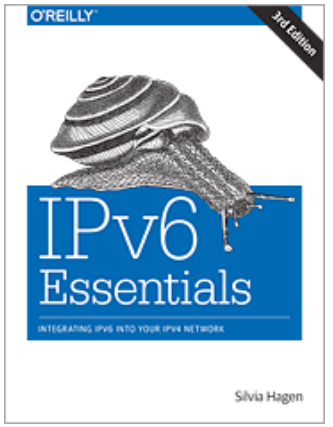
von Silvia Hagen, Deutsc
2. Auflage, Sunny Edition, 2
ISBN 978-3-9522942-2-2



NEW

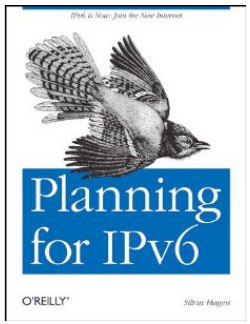
IPv6 Essentials

by Silvia Hagen, English
3rd Edition, O'Reilly, June 2014
ISBN 978-1-4493-1921-2



Planning for IPv6

by Silvia Hagen, Engli
O'Reilly, July 2011
ISBN 978-1-4493-0539-0
eBook 978-1-4493-0538-3



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