IPv6
Status – Planning - Incentives

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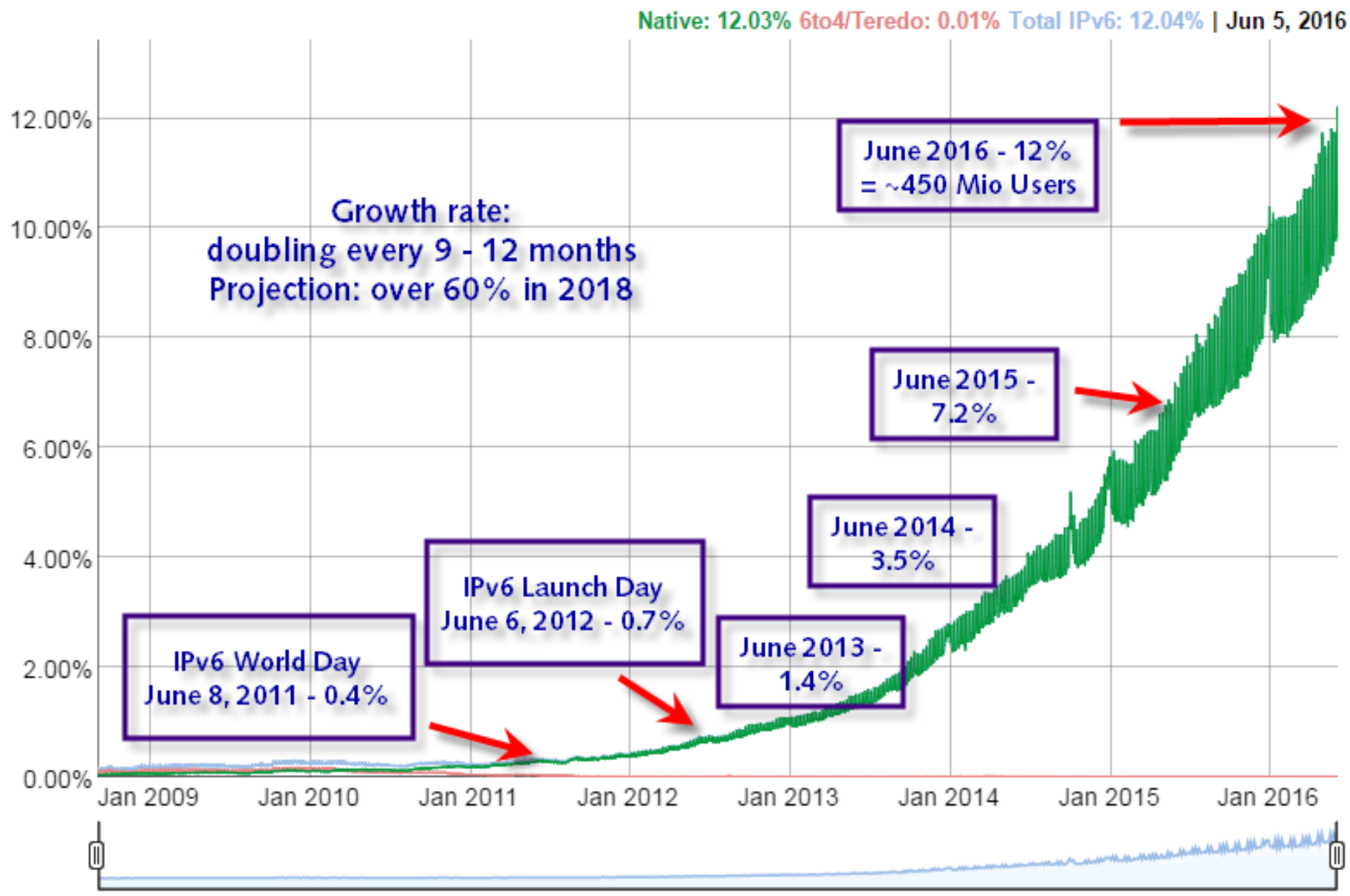
Walk the Talk

Taking Off

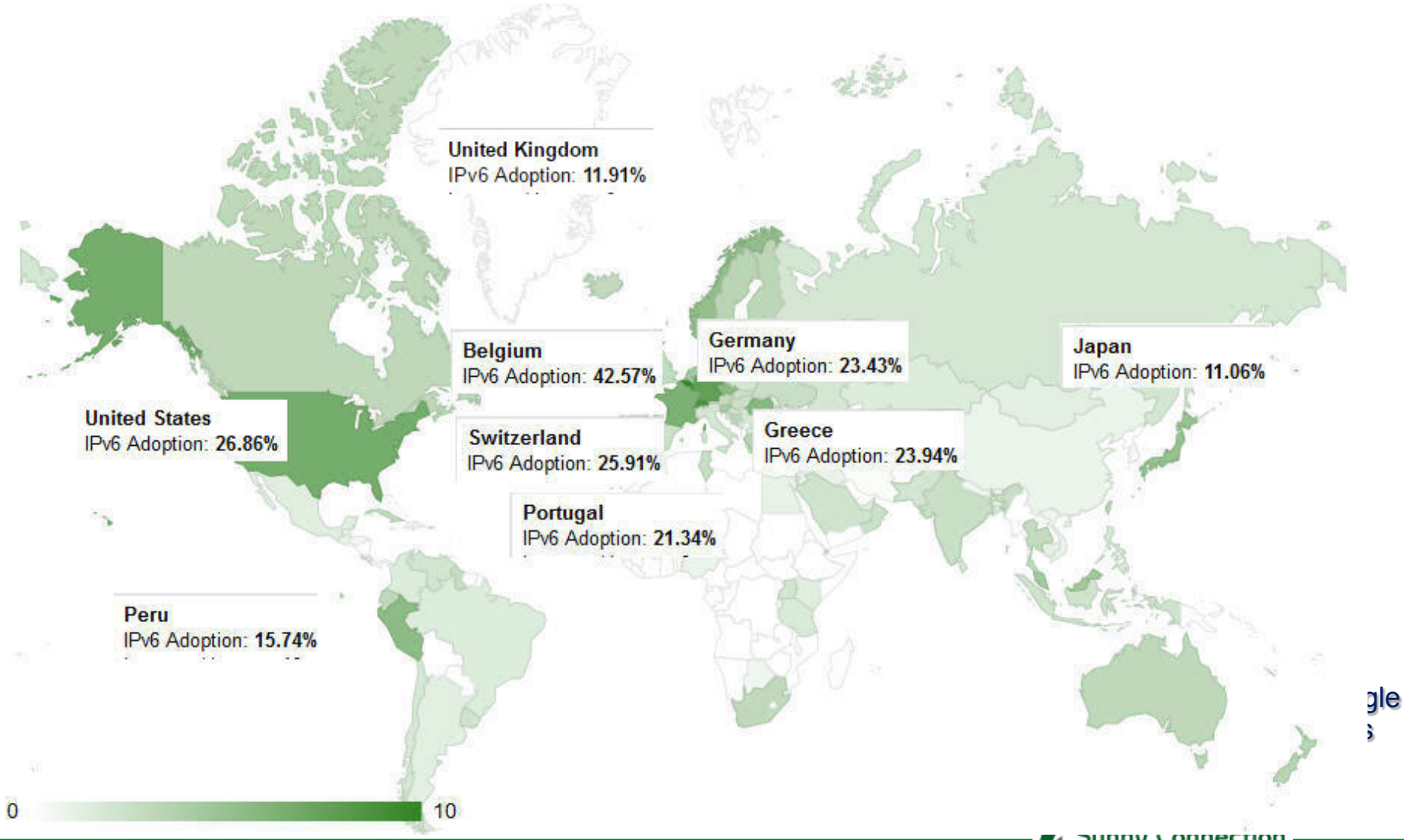
World IPv6 Day
June 8, 2011

IPv6 Adoption

We are continuously measuring the availability of IPv6 connectivity among Google users. The graph shows the percentage of users that access Google over IPv6.

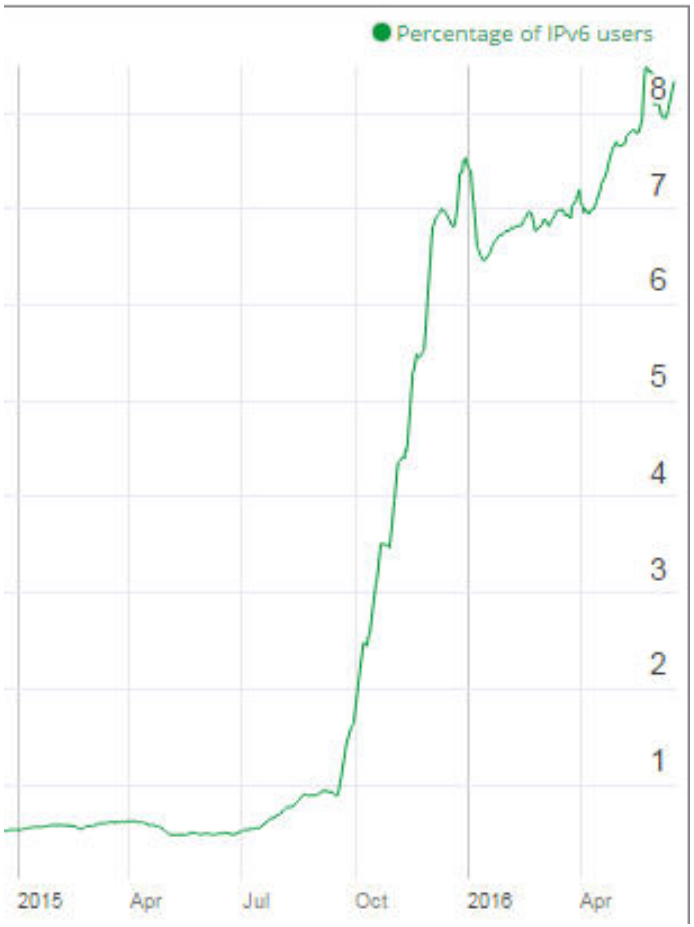


World Picture with some countries

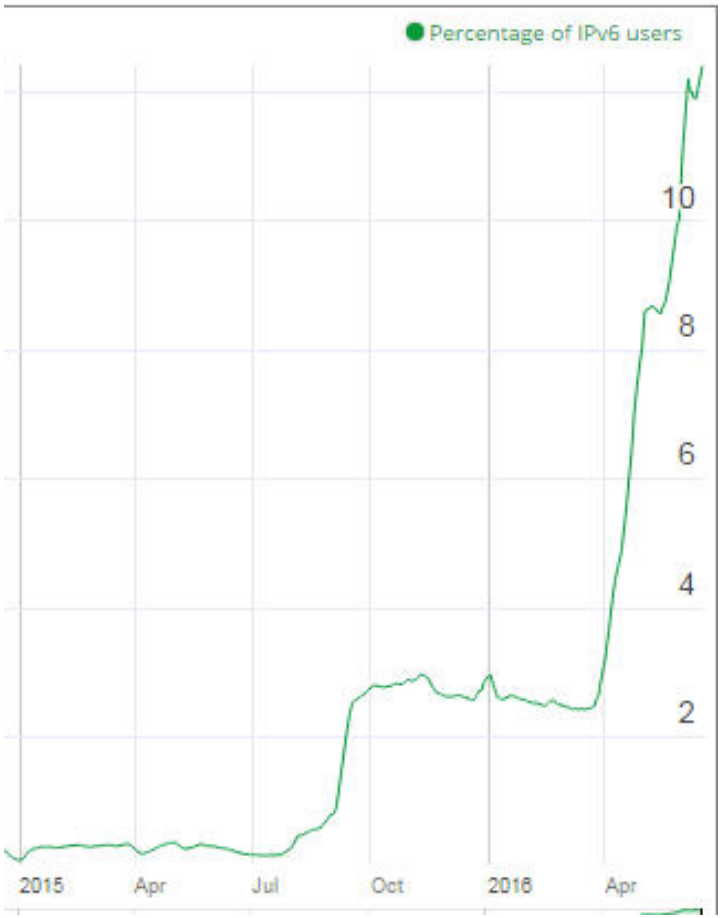


It can go fast… some recent examples

Canada



United Kingdom



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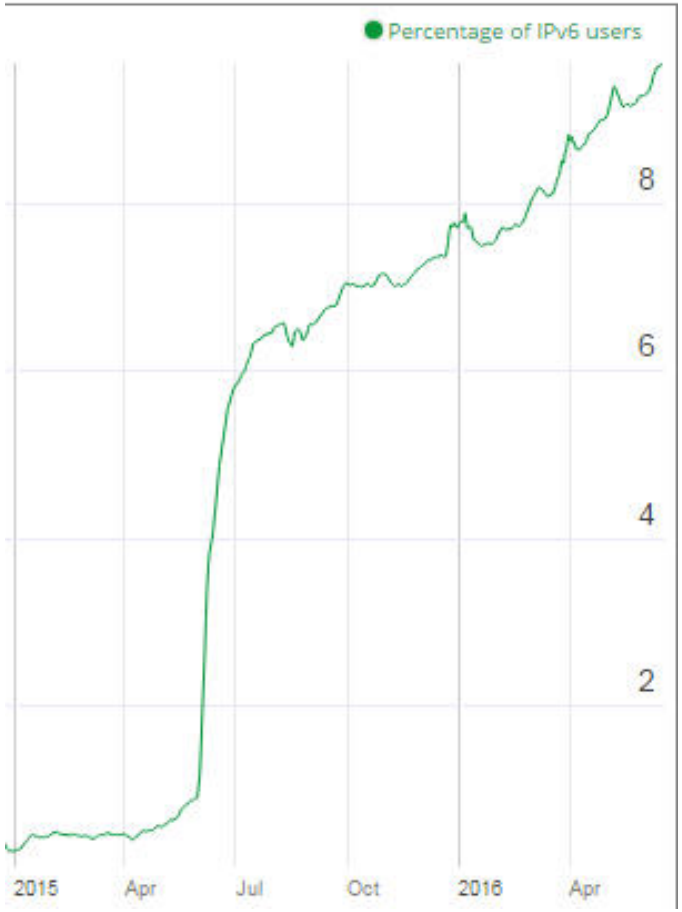
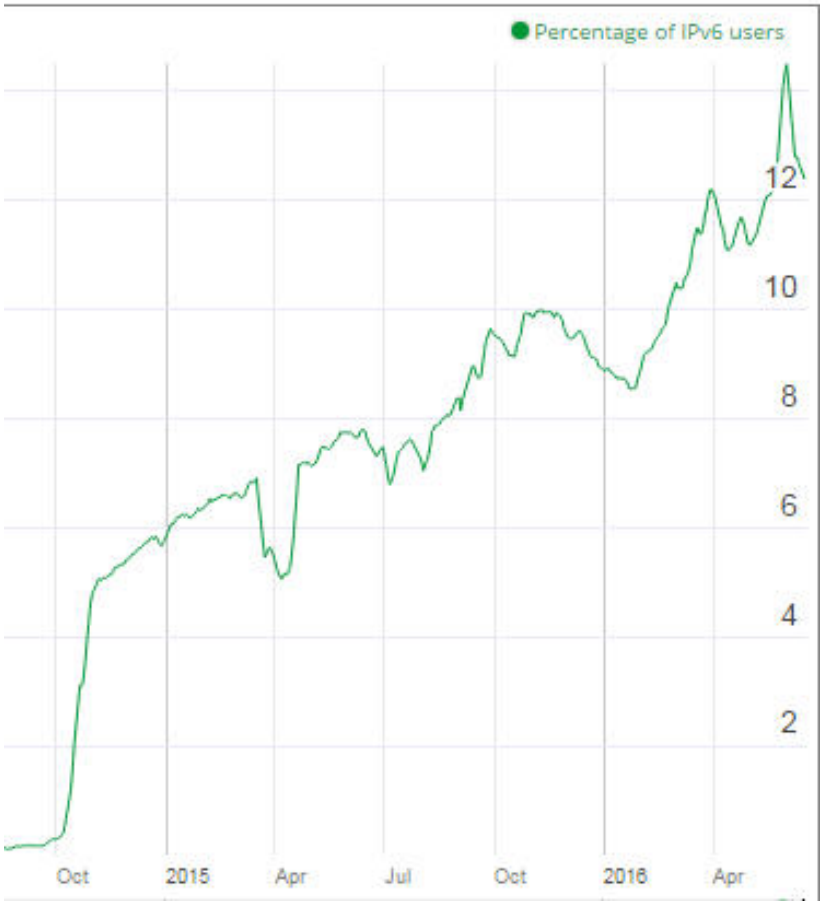
More examples

Finland



Estonia



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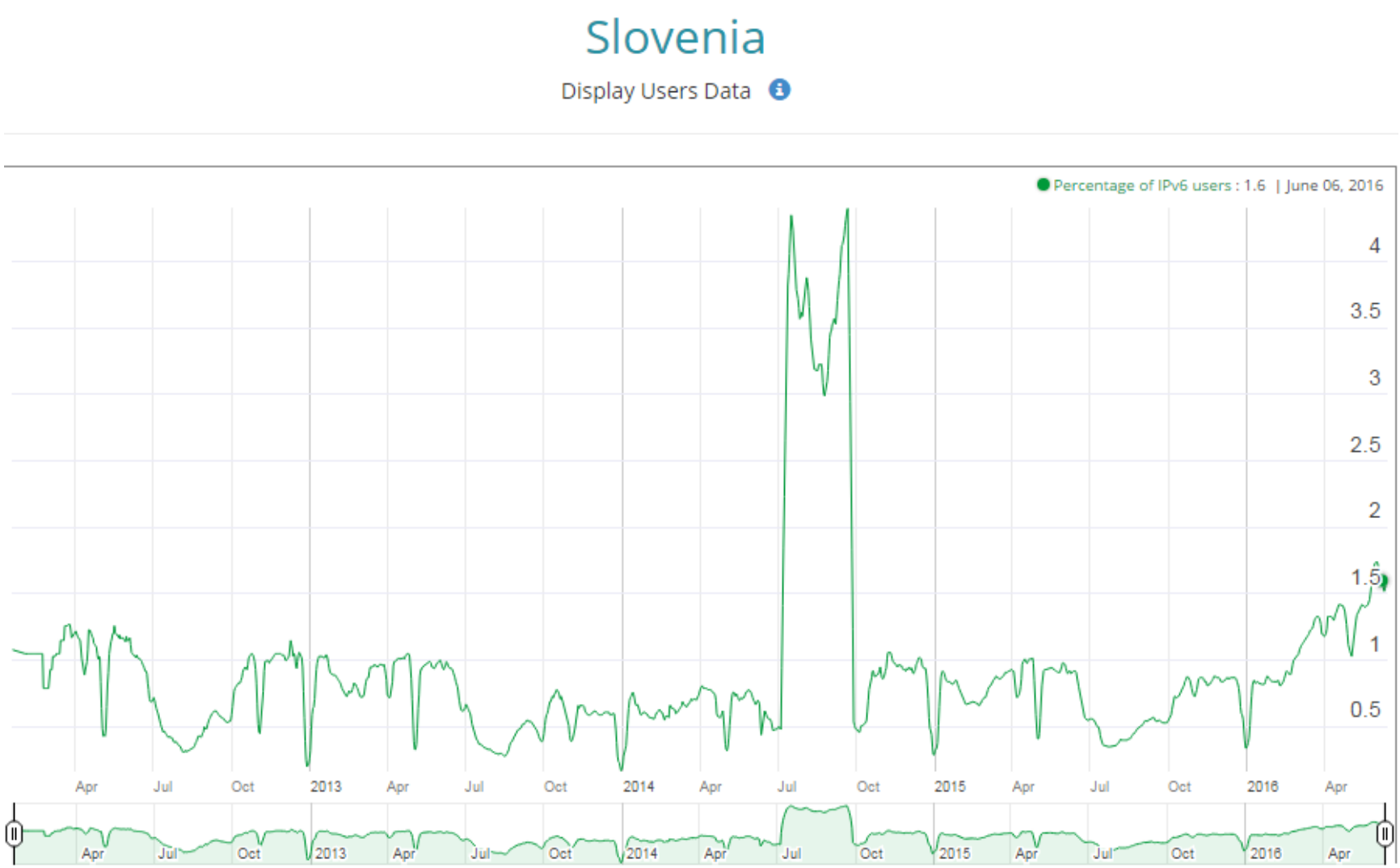
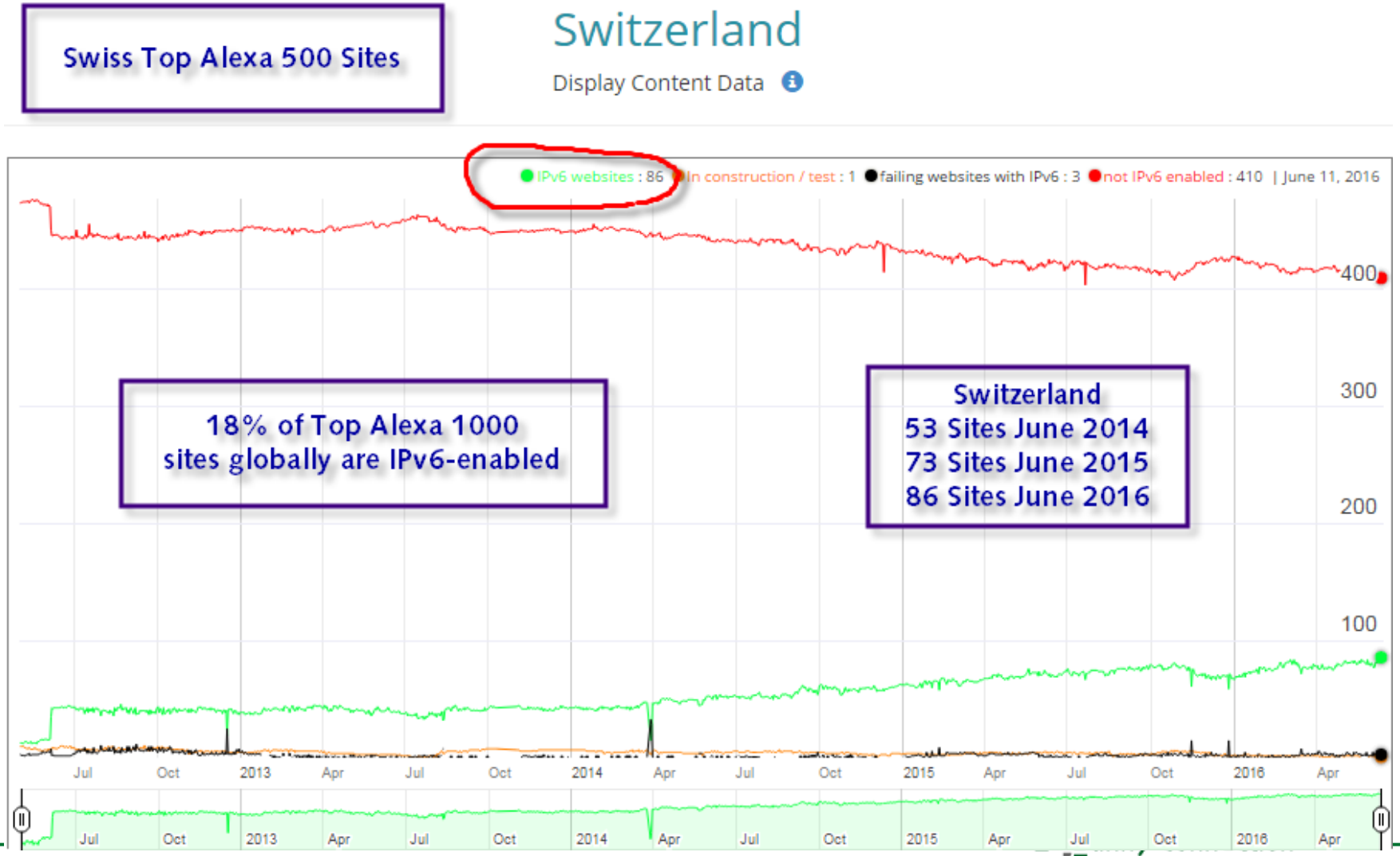
Slovenia – IPv6 Internet Users



Switzerland Content

Swiss Top Alexa 500 Sites



www.worldipv6launch.org/measurements and 6lab.cisco.com

Dashboard Swiss Sites – here they come!

- Top Alexa – http://dashboard.swissipv6council.ch/#alexa

22	**Portal der Schweizer Regierung** (www.admin.ch)	FAIL	FAIL	OK
26	**Swisscom Directories AG** (local.ch)	OK	FAIL	OK
27	**Tagesanzeiger** (tagesanzeiger.ch)	FAIL	OK	OK
28	**Swisscom** (www.swisscom.ch)	OK	FAIL	OK
33	**Blogspot** (www.blogspot.ch)	OK	UNKNOWN	FAIL
39	**Apple** (www.apple.com)	OK	FAIL	FAIL
46	**Blogger.com**	OK	OK	FAIL
51	**Microsoft** (www.microsoft.com)	OK	FAIL	OK
61	**Post CH AG** (post.ch)	OK	OK	OK
78	**Comparis** (comparis.ch)	OK	OK	OK
115	**Swisslos** (swisslos.ch)	OK	FAIL	OK
130	**Infomaniak** (infomaniak.ch)	OK	OK	OK
139	**TIO – Portale del Ticino** (tio.ch)	OK	OK	OK

Postfinance following in a few weeks!

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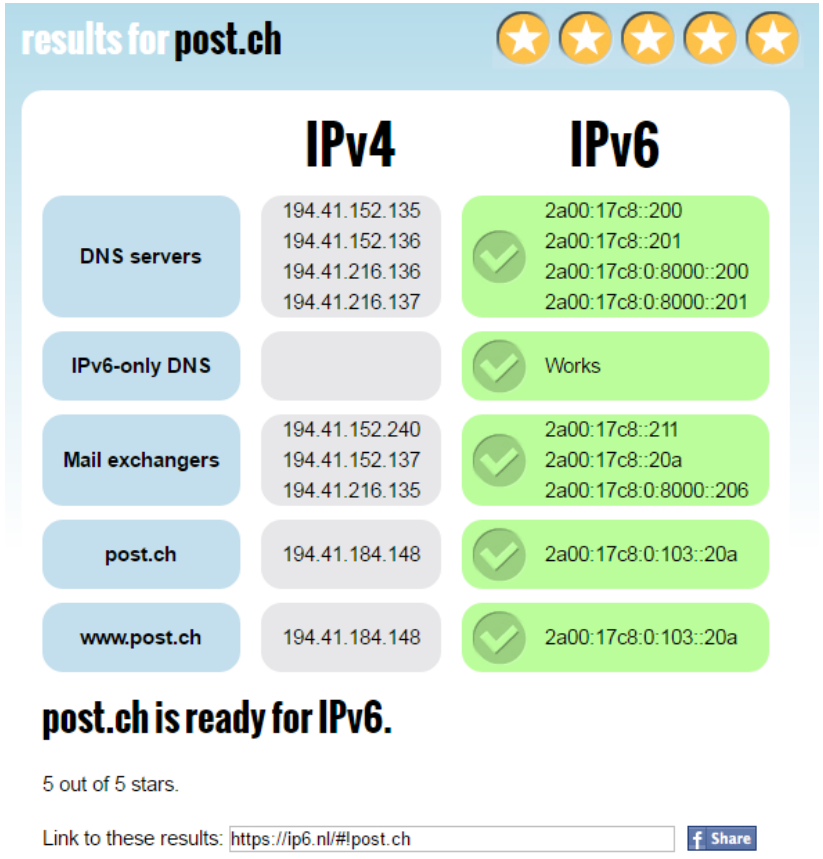
ip6.nl – 5 Stars for post.ch and comparis.ch



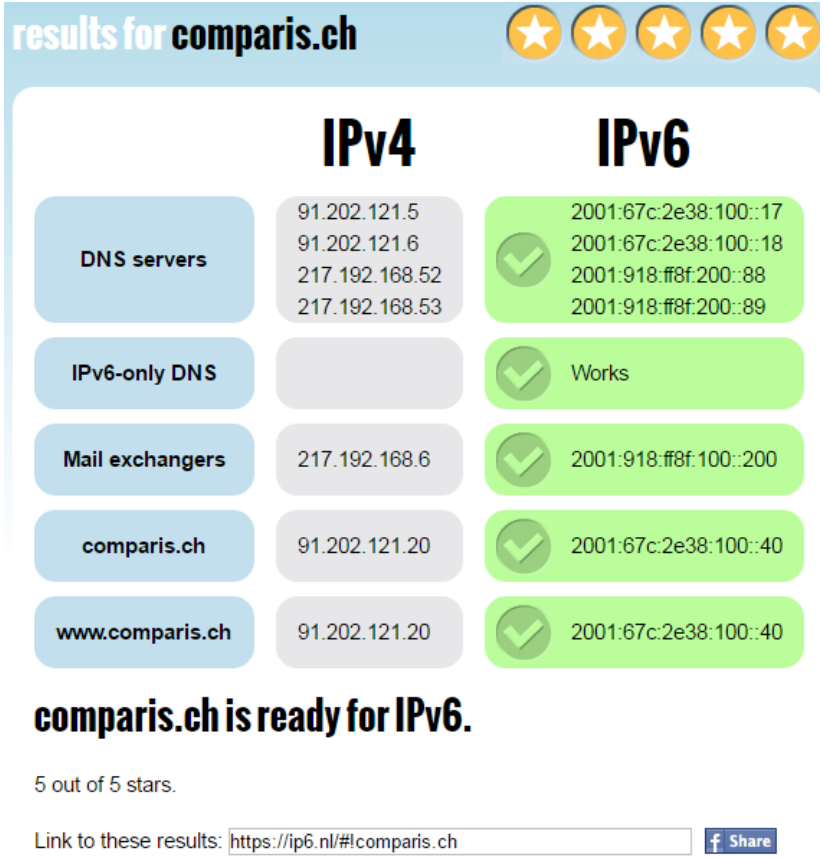
results for post.ch

	IPv4	IPv6
DNS servers	194.41.152.135 194.41.152.136 194.41.216.136 194.41.216.137	2a00:17c8::200 2a00:17c8::201 2a00:17c8:0:8000::200 2a00:17c8:0:8000::201
IPv6-only DNS		Works
Mail exchangers	194.41.152.240 194.41.152.137 194.41.216.135	2a00:17c8::211 2a00:17c8::20a 2a00:17c8:0:8000::206
post.ch	194.41.184.148	2a00:17c8:0:103::20a
www.post.ch	194.41.184.148	2a00:17c8:0:103::20a

post.ch is ready for IPv6.

5 out of 5 stars.

Link to these results: https://ip6.nl/#!post.ch Share



results for comparis.ch

	IPv4	IPv6
DNS servers	91.202.121.5 91.202.121.6 217.192.168.52 217.192.168.53	2001:67c:2e38:100::17 2001:67c:2e38:100::18 2001:918:ff8f:200::88 2001:918:ff8f:200::89
IPv6-only DNS		Works
Mail exchangers	217.192.168.6	2001:918:ff8f:100::200
comparis.ch	91.202.121.20	2001:67c:2e38:100::40
www.comparis.ch	91.202.121.20	2001:67c:2e38:100::40

comparis.ch is ready for IPv6.

5 out of 5 stars.

Link to these results: https://ip6.nl/#!comparis.ch Share

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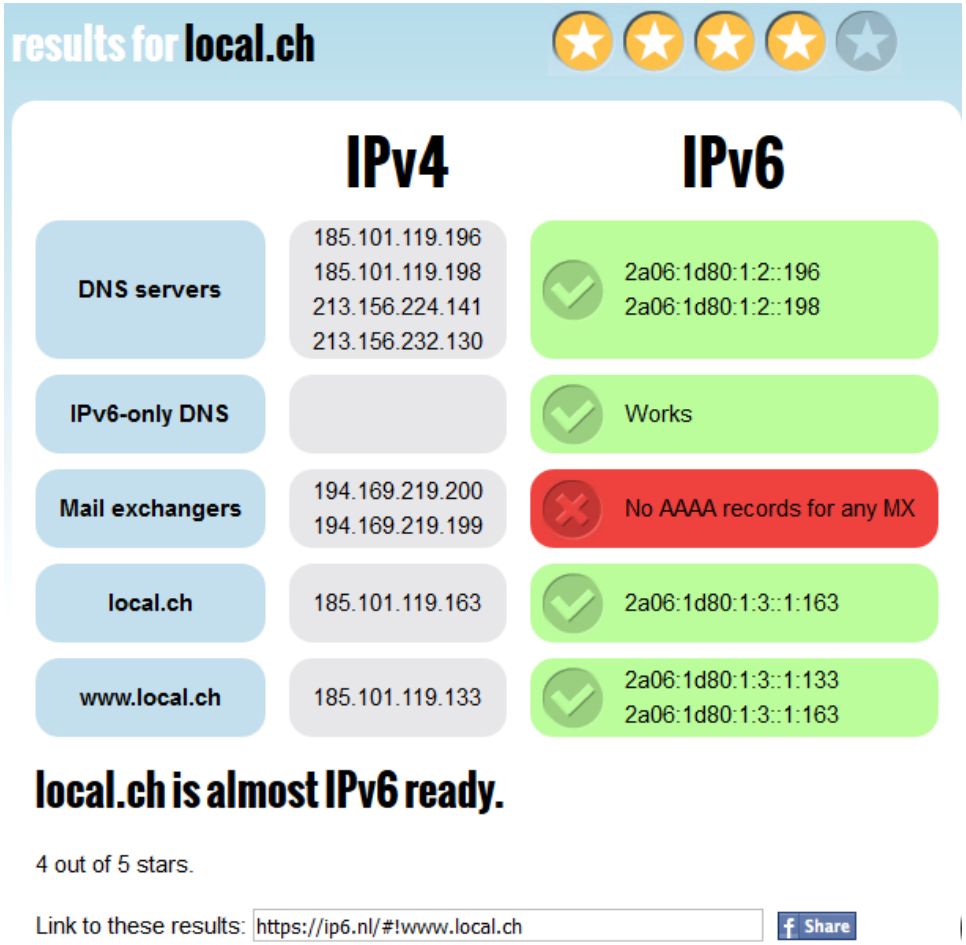
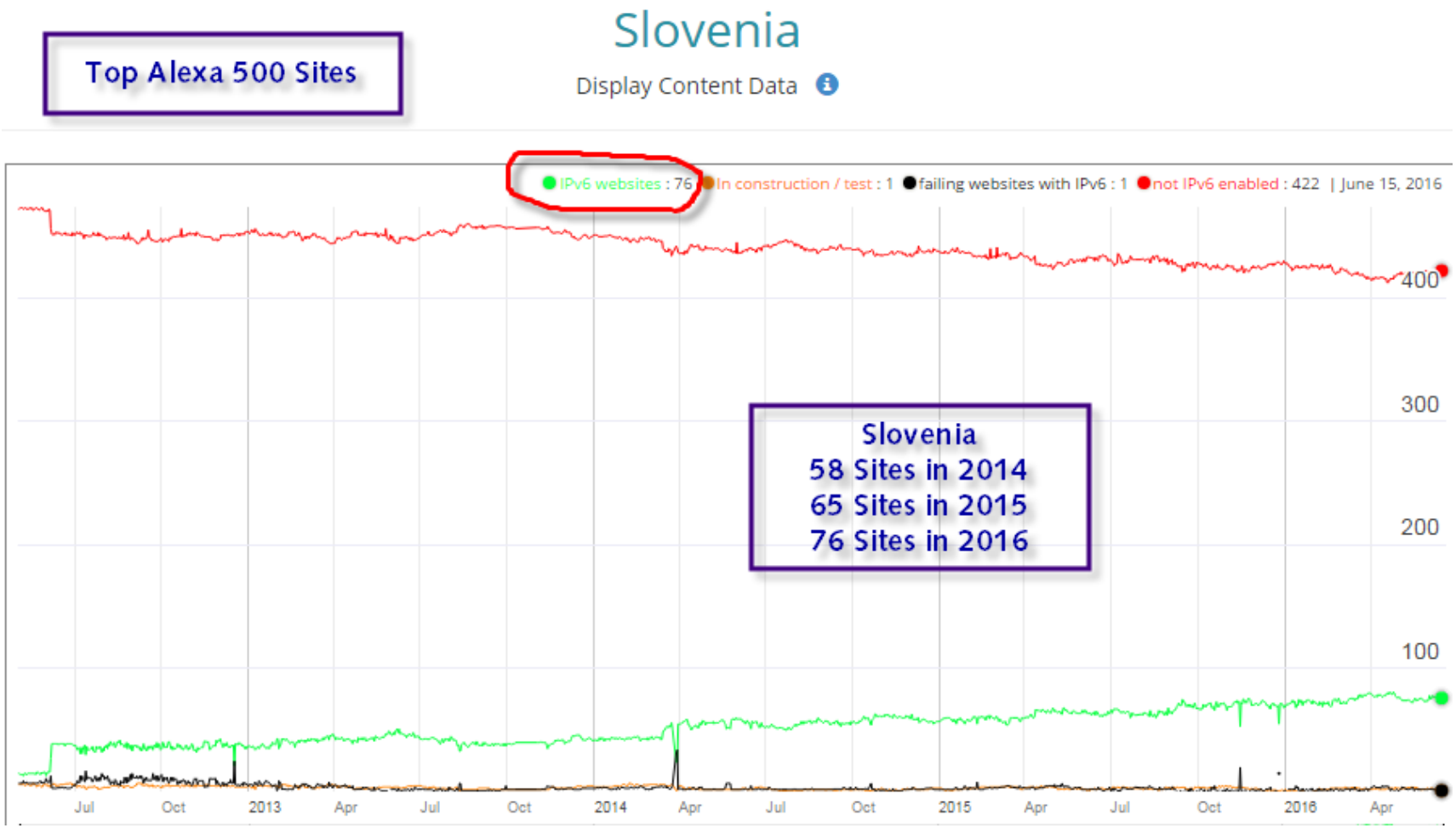
ip6.nl – 4 stars for local.ch – since June 11!



You did it!

Slovenia – how is your website doing?

Top Alexa 500 Sites



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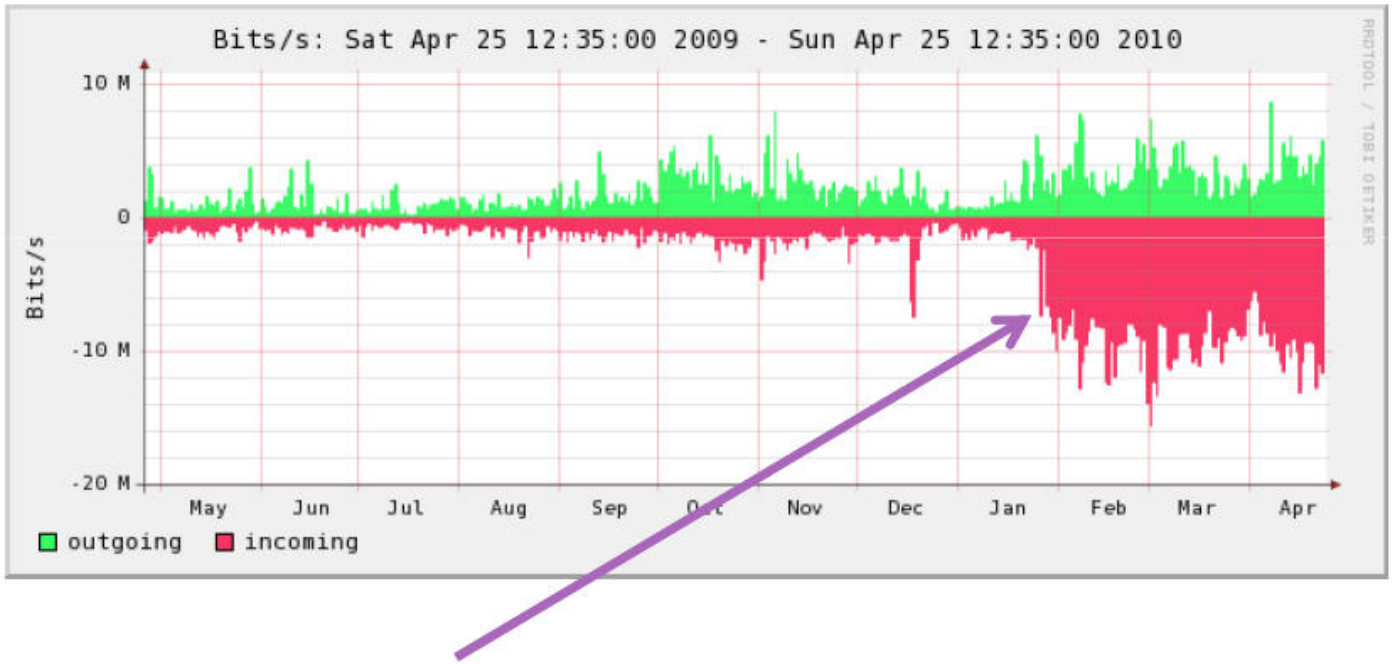
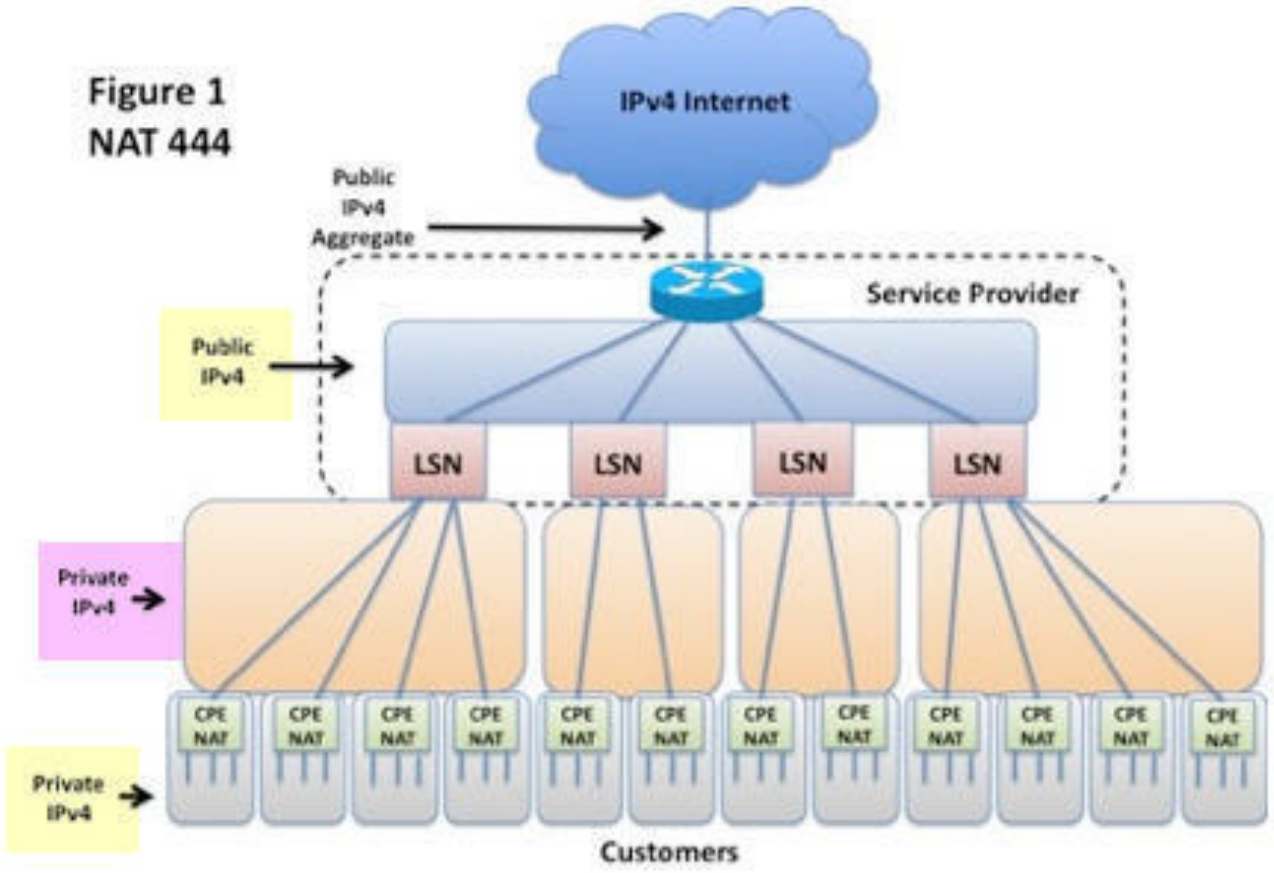
The Youtube Effect - UTC

Redefining UTC - Users – Transit - Content



Google added AAAA records for YouTube

NAT444



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

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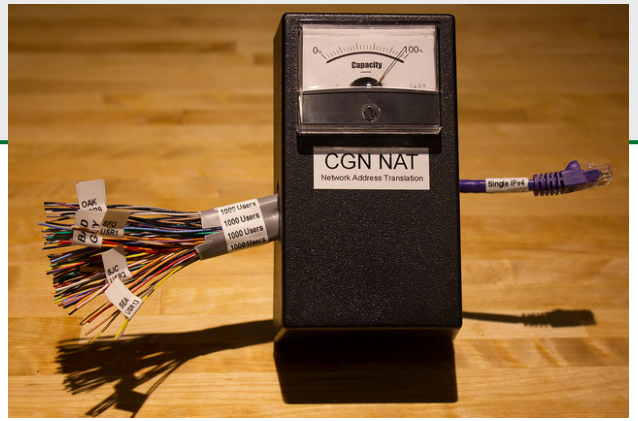
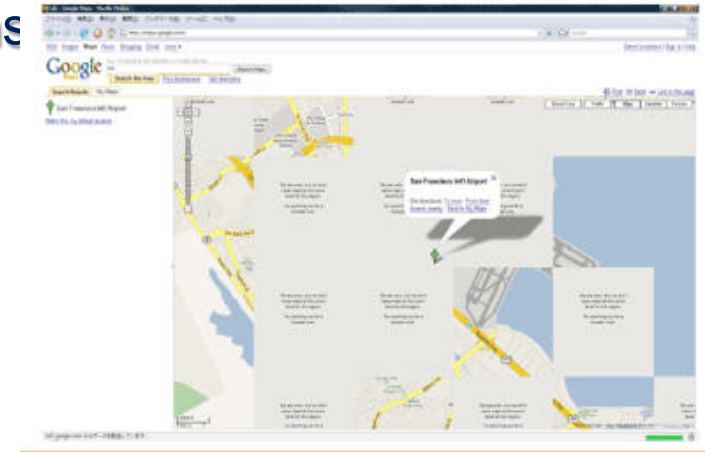
CGN – your bottleneck



- 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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New Internet Users

- Will have:
  - NATed IPv4 Internet Access (possibly multiple NATs with CGN) – to extend IPv4 address space and running 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? ;-)

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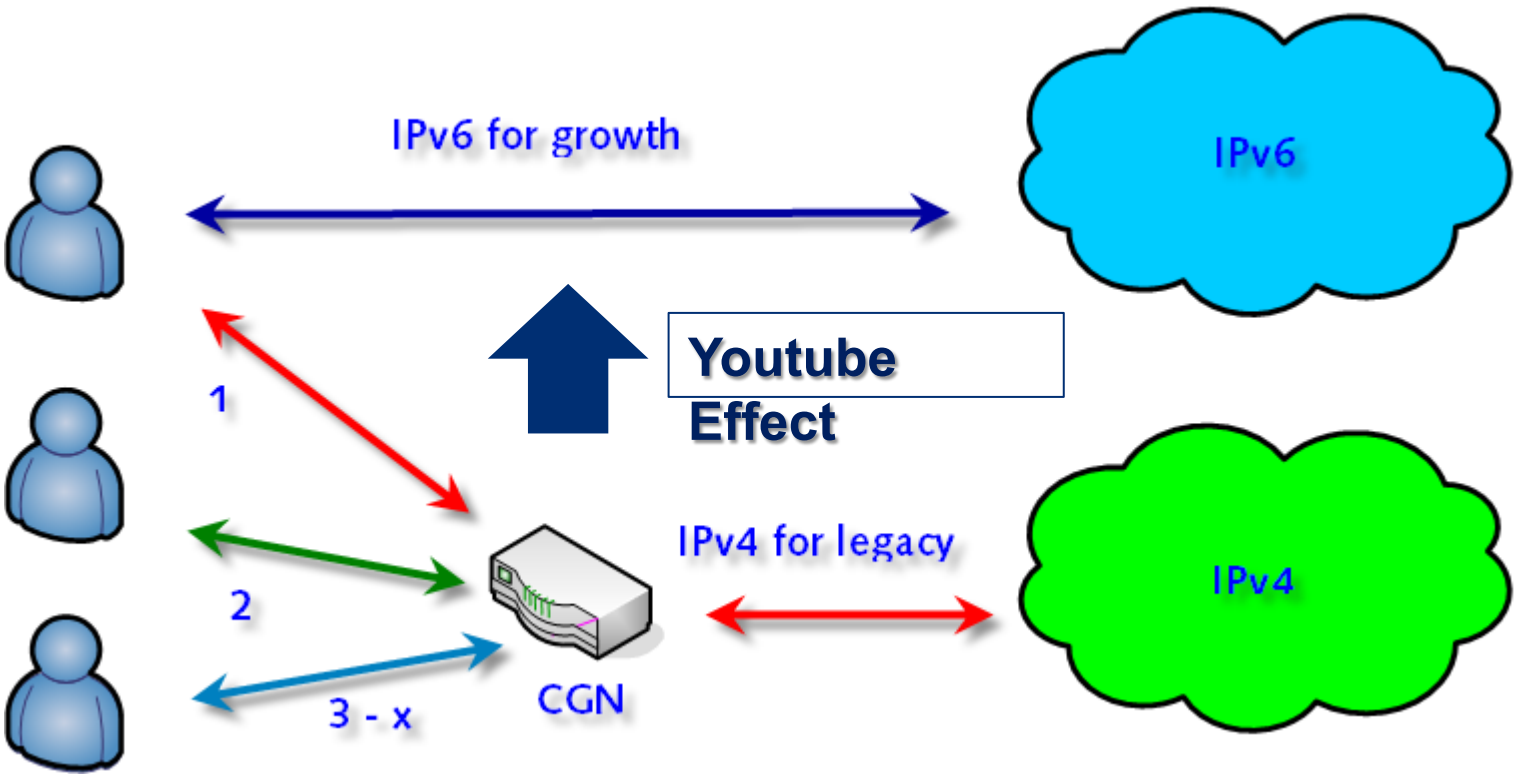
ISP Strategy and Business Case: Deploy IPv6



Why should you dual-stack your Website?

- Business Continuity (number one reason for enterprises)
- To be reachable for all Internet users with good performance
- To show you are using current standards (IPv4 is a legacy protocol from the last century)
- To support the Internet community in building an IPv6 Internet as soon as possible (ISP incentive)

ISP incentive:
for an ISP in the long term (5 years) the deployment of native IPv6 in parallel to supporting IPv4 can reduce the cost by as much as 40%*

*Cisco study,
http://www.cisco.com/en/US/solutions/collateral/ns341/ns525/ns1017/idc_ipv6_economics.pdf).

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The Business Case for ISPs

- It is important for everyone to deploy as many dual-stack sites as possible. It shifts traffic to the IPv6 Internet.
- For an ISP, providing CGN-IPv4 access can be four times more expensive than to provide IPv6-native access.
  - Numbers by Swisscom, presented by Martin Gysi at his presentation in October 2015

Cost for 1 Gb/s throughput:	
6rd:	**CHF 1'650.00**
CG-NAT:	**CHF 8'000.00 (without cost for logging)**

Is this a business case or not?

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Customer Responsibility

- **Make clear IPv6 requirements for all new projects and services!**
- **If you don't take your responsibility now, it may hit you in a couple of years**
- **Your vendors will not move if you don't require IPv6!**
- **Many vendors have Pseudo Implementations to make their marketing brochures look good, but the code is not usable in production. This obviously doesn't apply to our**

Most underestimated areas:

- **Applications (3rd party and self-developed)**
- **Cloud services**
- **IoT**
- **Ecommerce and Egovernment**

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Executive Summary - Enterprise

IPv6 is on its way. It will take you 3 to 5 years for a smooth and cost efficient migration. So you have to start today with the planning and testing.

Every component in your network is affected. If you don't use the natural life cycles of your products and align the integration with other IT initiatives, costs will be excessive

- **Why now?**
  - Business Continuity
  - Reachability
  - Life Cycle Management
  - Investment protection
  - Time for education and to build experience

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Plan early

- I know you have more v4 addresses...

Common Excuses

- We don't need IPv6, we have enough IPv4 addresses
- We have outsourced our network / our services, we don't care – oh really?
- Our applications won't support IPv6 for many years, so why care?
- We have many other projects on the table, no priority for IPv6.
- We are currently busy planning our next generation datacenter.

- So why should you plan early?

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Early planning

- Early planning allows for:
  - Make use of product life cycles, refresh cycles, other IT projects
  - Investment protection by having clear IPv6 requirements for purchasing, outsourcing contracts and SLA's (!!!)
  - Integrating IPv6 will take up to 3 or even more years. If you don't plan early, you won't be ready when you need it.
  - You need time to educate all IPv6 team members and IT personel
  - You want to use all the opportunities IPv6 offers!
  - You need sufficient time for labs, testing and pilots

Is a unique opportunity to clean out and redesign your IT and to implement standardization

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Spread Costs – make them digestable

- By planning early and starting with small steps, one at a time, you can spread costs for planning and deployment over two or three years
- If you don't, the moment will come when you have an urgency to deploy, you will not have enough time for careful planning and you will have to spend all the cost in one year.
- If you don't plan carefully, your operational cost in the long term may increase substantially. (some managers think in very short cycles….)

- Gartner says, the integration of IPv6 costs 6% of an annual IT budget, spread over the number of years for deployment.

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IPv6 Strategy

- Get an overall perspective
- Involve all teams
- Include Business Vision, Business Strategy, IT-Strategy and base the IPv6 Strategy on this foundation to make it sustainable
- Your IPv6 strategy is supposed to support the business

- ✘ Don’t base your strategy on the results of a generic assessment!
- ✘ Don’t base your strategy on current bugs and lack of standard-compliant implementation.

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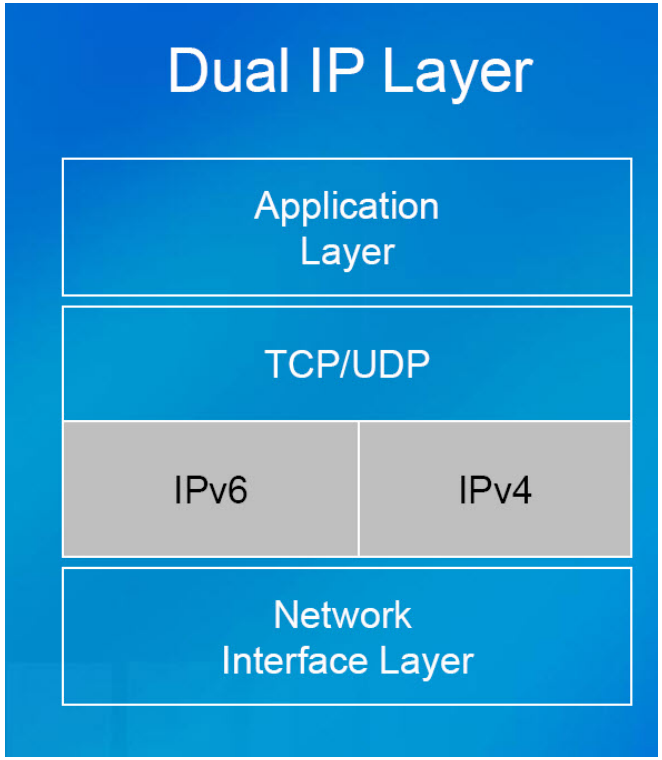
Dual IP Layer



- Many applications that follow the OSI model have no issues in IPv6 networks.
- If you develop your own applications for yourself or for your customers, make sure your developers understand the implications.
- State of the Art applications have to perform in an IPv4-only network, in a dual-stack network and also in an IPv6-only network.
- Apple requires all iOS9 apps submitted to its App Store to support IPv6-only.

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Manage your vendors

- Assess your vendor strategy
- Your vendors face the same challenges you do, only they should be ahead of the game. But don’t assume they are. Check!
- If they had the greatest services or products for IPv4, don’t assume they also have the best for IPv6.
- Don't expect your vendors know what you need!
- In the early stage write letters of intent
- Don’t forget SLA’s, Outsourcing contracts, ISPs….

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Checklist for vendors

- Use IPv6 Requirements specification
- Test features, functionality and performance (under load)
- A checkbox "supports IPv6" isn't sufficient, be specific
- Feature parity with IPv4 isn't sufficient

- When evaluating vendors check the following:
  - Technical features (according to your RFC requirements)
  - Staff (do they have sufficient knowledge, certifications?)
  - All channels need to be educated, sales, engineering, support
  - Ask for their processes (upgrades, incident management)
  - **Don’t trust brochures, test in your lab**

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Do they walk the talk?

Example: June 2014, Ron Broersma, DoD: "US DoD's DREN Will Only Buy Products With An IPv6 Website"

Quoted: Our #1 rule:

If we can't get to the company or product website via IPv6, we won't consider such products.

- we learned the hard way that without strong corporate commitment to IPv6 support, it will take forever to get IPv6 bugs fixed or features added.
- we learned that the corporate website being IPv6Y-enabled was a good indicator of corporate commitment to IPv6.
- this has been tested many times, and it works.
- in the process, we encourage industry to IPv6-enable their public facing services

Read full article: http://www.internetsociety.org/deploy360/blog/2014/09/us-dods-dren-will-only-buy-products-with-an-ipv6-website/

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The 7 most important steps (+1)

1. Get management on board, appoint an IPv6 program manager
2. Education for all team members (focused and specific to groups)
3. Define Strategy, High Level Plan and Roadmap
4. Perform assessments (everything, HW, SW, OS, Services, Apps)
5. Refine strategy and roadmap, define detail projects, create budget for investments and work
6. Define addressplan and network design
7. Define security- and management concept

8. Test, test, test and deploy – (cycles)

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The most common stumbling blocks

- Lack of management support
- Heads in the sand politics
- Processes (get in your own way)
- Shortterm thinking
- Lack of authority (across departments)
- Too many projects, not enough people, no time for carefulness
- Too much pressure, doing it quick and dirty
- Treat IPv6 as a network and infrastructure project (mind the apps)

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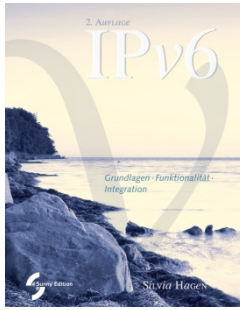
Thank You For Your Attention!

IPv6 Grundlagen, Funktionalität, Integration



von Silvia Hagen, Deutsch
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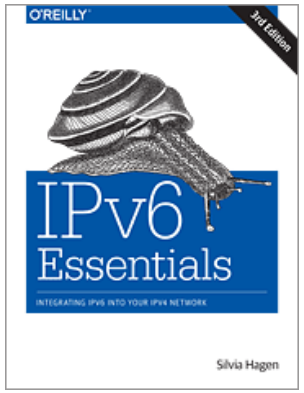
IPv6 Essentials



by Silvia Hagen, English
3rd Edition, O'Reilly, June 2014
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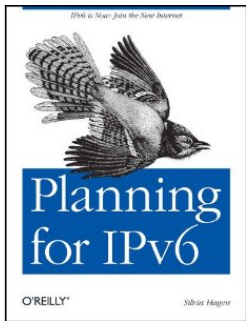
Planning for IPv6



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