

IPv6 Enterprise Adoption Planning Opportunities and Challenges

Silvia Hagen
Sunny Connection AG
www.sunny.ch



CSCS

Centro Svizzero di Calcolo Scientifico
Swiss National Supercomputing Centre

Swiss IPv6 Council
www.swissipv6council.ch



Topics

- The Evolution of the Internet and what we learn from it
- IPv6 101
- Why should you introduce IPv6 now?
- Is there an IPv6 Killer App?
- Planning and Methodology
- The 7 most important steps
- The biggest stumbling blocks – Theory and Practice

Evolution of the Internet

- IPv4 was developed in the 70-ies and introduced in the Internet on the Flagday in January 1983.
- 1991 the WWW was developed at CERN.
- The Internet was mainly created by us all using it, strong expansion in the late 90-ies.
- The Internet grows exponentially and cannot continue to grow without IPv6.
- The consumption of IPv4 addresses has more than doubled in 2010. The global IANA pool, and the APNIC and RIPE pools are empty.
- Vint Cerf is standardizing and testing the Interplanetary Communicationprotocol with the NASA – Business Case?
- 2012 - June: World IPv6 Launch Day
- December: End of the Mayan Calendar
- With IPv6 we are actually launching the 2nd generation Internet

Evolution has no Business Plan



Dieser Upgrade löste das Pferdemit-
problem



Trend Analysten sagten voraus, dass die
Menschheit im Pferdemit erstickten würde.

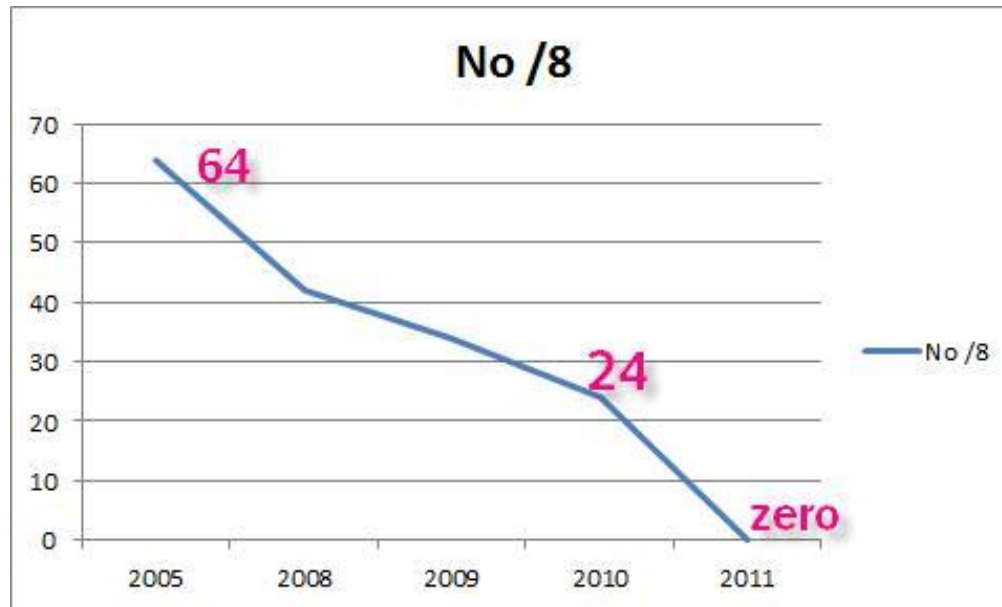


The Human Capacity for Predictions

- And our capability to identify a Business Case:
 - Personal Computers in the 80s
 - Handys and SMS
 - Google, Facebook, Twitter.....
 - Internet!

Has anyone foreseen these business cases? Would we have created the Internet if we had done a business case analysis?

Depletion of the IANA IPv4 Pool



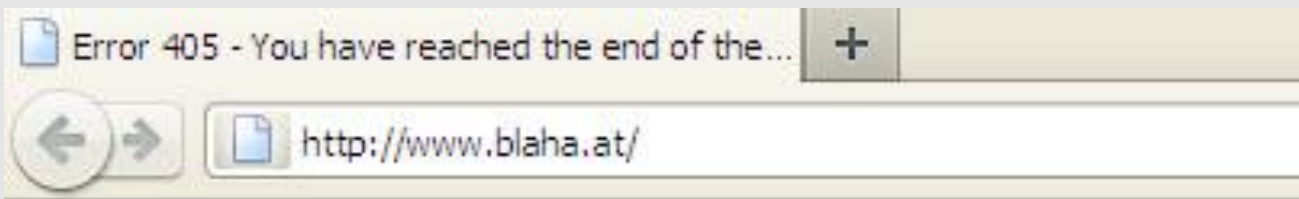
Average
consumption rate
was approx.
10 /8 per year
until 2010


2010 consumption rate was more than doubled
(Asian Broadband providers)

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 1.9 Bio 28% " **99.9% IPv4 users**
 - 2012 2.3 Bio End of IPv4 - go figure
 - **2015** **5 Bio?** Percentage of IPv6-only users?



 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!

New Internet Users

- Will have:
 - NAT-ed IPv4 Internet Access (possibly multiple NATs with LSN)
 - IPv6-only Internet Access with translation for IPv4 Internet (NAT64/DNS64)
- Internet Access to IPv6 sites will for many users 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!**
(Why do you think is Google so interested in IPv6?) ;-)

IPv6 is inevitable

- We have no choice because
 - The global IPv4 pool is empty, so is the APNIC and RIPE pool
 - Internet growth is only possible with IPv6 (or across multiple IPv4 NATs)
 - There are no alternatives to IPv6

Where is the business case?

- Business Continuity
- Lean and costefficient integration.
- Use opportunities – create your next generation network!

This is only possible if we plan early and take the time to understand IPv6, its implications and dependencies.

Opportunities

- For vendors and service providers this means:
 - Opportunity to position yourself as a leader
 - Open up new markets and new customers
 - Stay on the ball
 - Soon it will simply be a requirement to be competitive
- Requires to analyze your product portfolio early enough to identify what it takes to make it IPv6 ready
- Use the opportunity to design new state of the art products based on the advanced features of IPv6

Lean Integration?

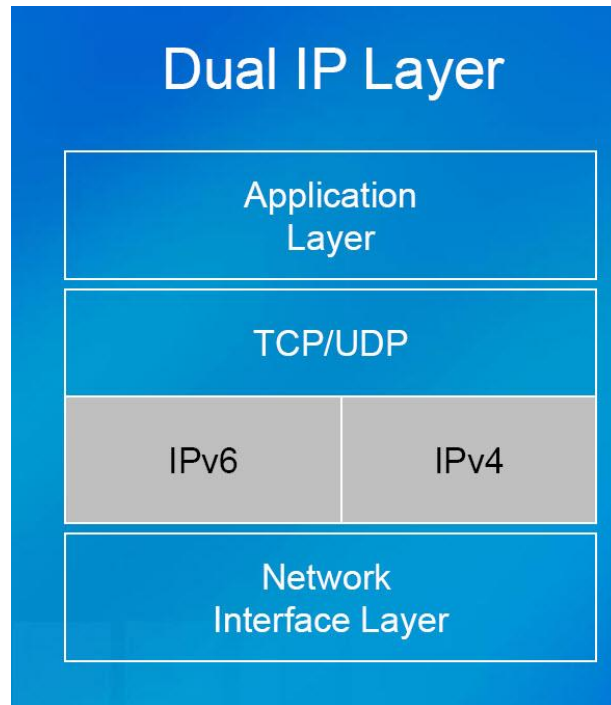
- Early planning allows for:
 - Make use of product life cycles and refresh cycles
 - Investment protection by having clear IPv6 requirements for purchasing, outsourcing contracts and SLA's
 - Introduction of new services IPv6-only

- Risk mitigation by:
 - Secure unwanted IPv6 traffic in an IPv4 network
 - Careful deployment of an IPv6 infrastructure with minimal risk
 - Education of all IPv6 team members and IT personel
 - Sufficient time for labs, testing and pilots
 - Time for bugfixing with vendors (early stacks)

Main Changes from IPv4 to IPv6

- Expanded addressing capability (128 bits)
- Expanded address architecture
- Expanded autoconfiguration mechanisms
- Simplification of the header format
(fixed length: 40 bytes)
- Improved support for extensions and options (Extension Headers)
- Extensions for authentication and privacy (security)
- Flow labelling capability (QoS – Quality of Service)

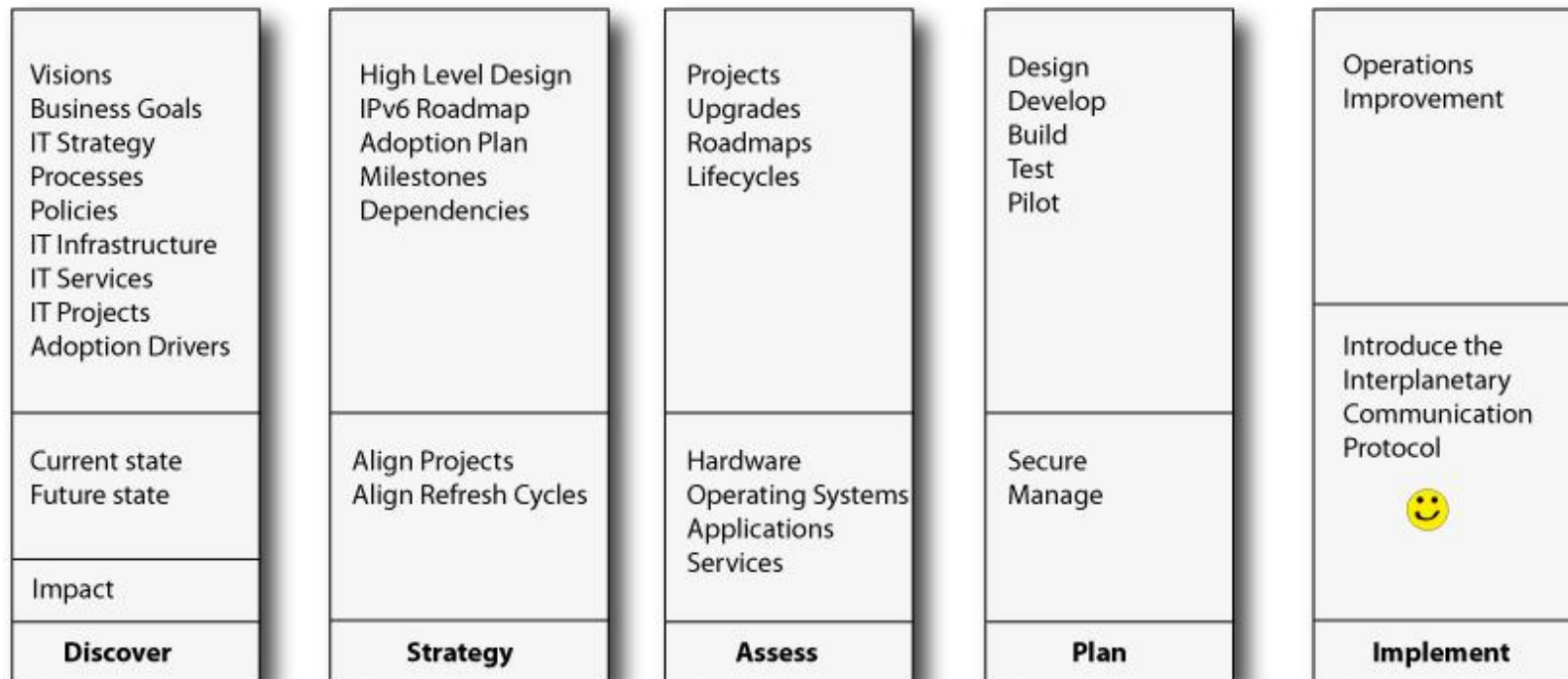
Dual IP Layer



- 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.

Methodology

Education



Things to note

The biggest risk is to not take full advantage of the IPv6 transition

- The success of an IPv6 project highly depends on a complete view
- Is an effort across teams and projects
- Requires project members to have indepth training before working on concepts
- Is a unique opportunity to clean out and redesign your IT and to implement standardization

Gartner Perspective

- Gartner estimates the cost of migrating an enterprise to Internet Protocol version 6 (IPv6) could be as high as 6% of the entire annual IT budget.
- Once migration is complete, the ongoing costs will fall to about 1% of the IT budget.
- Gartner analyst, Neil Rickard, says organizations should be aiming to have an IPv6 capability on the internet within the 2012 to 2015 timeframe

General Design Rules

- Native IPv6 where ever possible, dual-stack as long as necessary
- New services IPv6-only whenever possible (internally)
- Tunneling only if necessary and only as a temporary solution
- No NAT, no translation (only with a gun to your head)
- Future networks are end-to-end
- The expanded address architecture allows for new security concepts
(embed service information in address, adapt security concept)
- Consider new services (monitoring, sensors, health care, Car2Car ... depending on industry) – many new services have a much higher demand for addresses and mobility requirements

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

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
- Treat IPv6 as a network and infrastructure project (mind the apps)



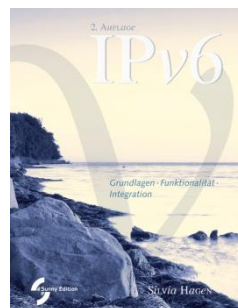
Executive Summary

- 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, costs will be excessive.
- Why now?
 - Business Continuity
 - Reachability
 - Life Cycle Management
 - Investment protection
 - Time for education and to build experience

Thank You For Your Attention!

IPv6 Grundlagen, Funktionalität, Integration

von Silvia Hagen, Deutsch
2. Auflage, Sunny Edition, 2009
ISBN 978-3-9522942-2-2



IPv6 Essentials

by Silvia Hagen, English
2nd Edition, O'Reilly, May 2006
ISBN 978-0-596-10058-2



Planning for IPv6

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

