Welcome to

IPv6 status in Denmark get moving!

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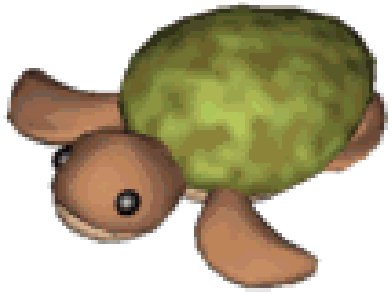
http://www.solidonetworks.com

Slides are available as PDF

Goal



Introduce IPv6 - facts and features

IPv6 Status Denmark

Enabled providers and sites

How to get your site on IPv6

Why I think we should prioritize IPv6

Internetworking: history

1960s L. Kleinrock, MIT packet-switching theory, J. C. R. Licklider, MIT - notes Paul Baran: On Distributed Communications

1969 ARPANET 4 nodes

1971 14 nodes

1974 TCP/IP: Cerf/Kahn: A protocol for Packet Network Interconnection

1983 **Switching from NCP to IP/TCP**

1983 EUUG $\rightarrow$ DKUUG/DIKU forbindelse

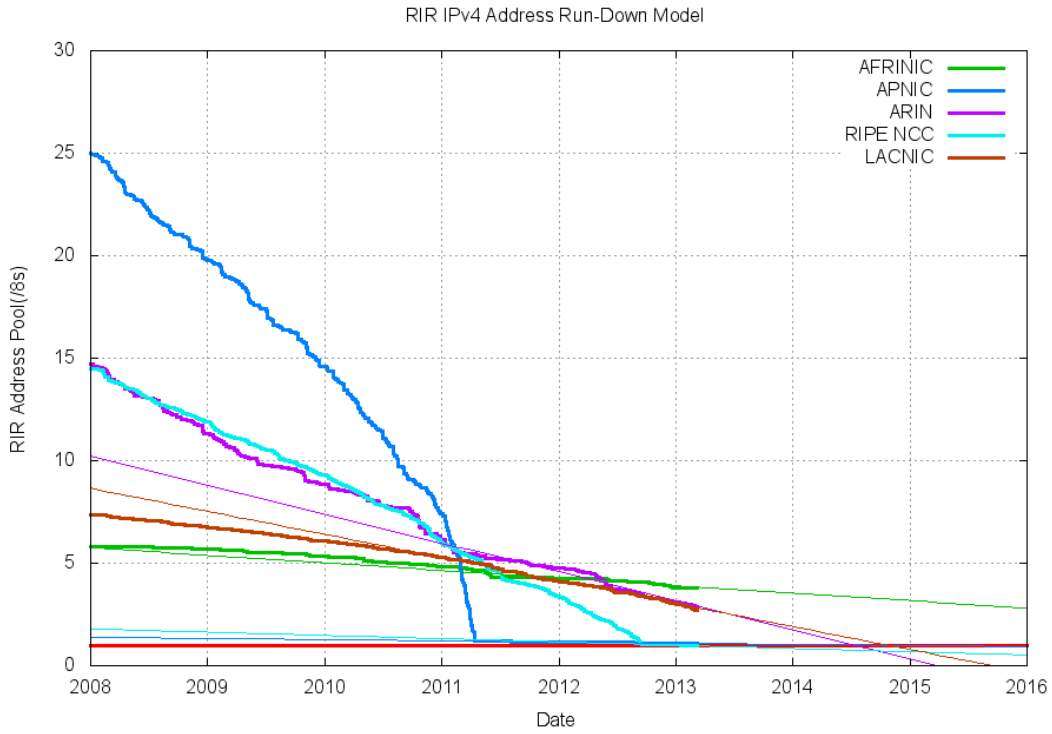
2010 IANA reserved blocks 7% (Maj 2010) - `http://www.potaroo.net/tools/ipv4/`

2011 February 3 IANA pool ran out - last 5 /8 allocated to RIRs

2011 April 19 APNIC ran into their last /8 and started a more restrictive policy

2012 Sept 14 RIPE NCC ran into their last /8 and started a more restrictive policy

Internetworking: future of IPv4



- Projected Exhaustion Date

2014 June ARIN - September LACNIC

2020 AFRINIC - has about 3.8 /8s Source `http://www.potaroo.net/tools/ipv4/`

www.solidonetworks.com

hlk@kramse.org

(hlk@solido.net is not IPv6 enabled - ooops!)

Really how to use IPv6?

Get IPv6 address and routing

Add AAAA (quad A) records to your DNS

Done

www.solidonetworks.com

```
www         IN A          91.102.95.20
            IN AAAA       2a02:9d0:10::9
```

IPv6 Status Denmark

Unofficial IPv6 task force at `http://www.ipv6tf.dk/`

Major ISPs are ready in core networks

Major ISP deliver IPv6 to business customers

No major providers deliver IPv6 to consumers

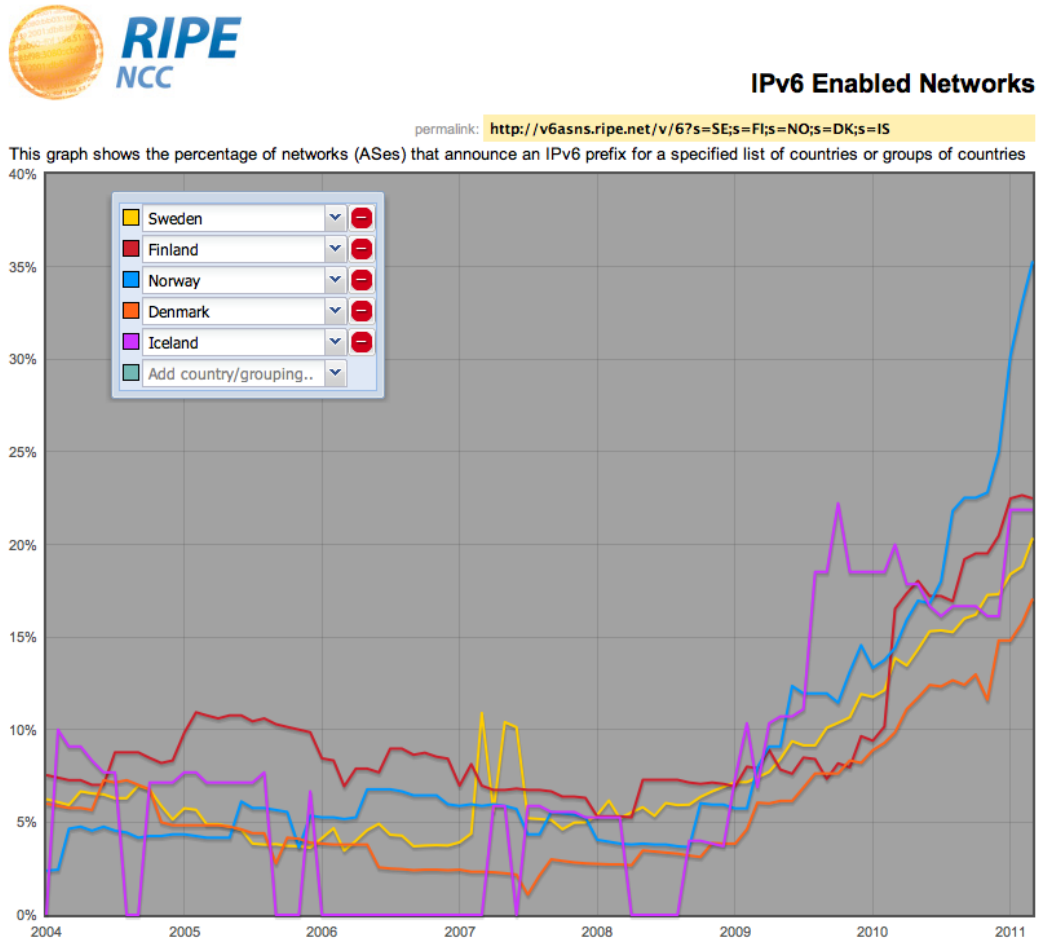
Some smaller internet Providers are working on IPv6 to homes

A large percentage of the LIRs servicing Denmark has IPv6!

Many hosting and content providers are ready in core networks

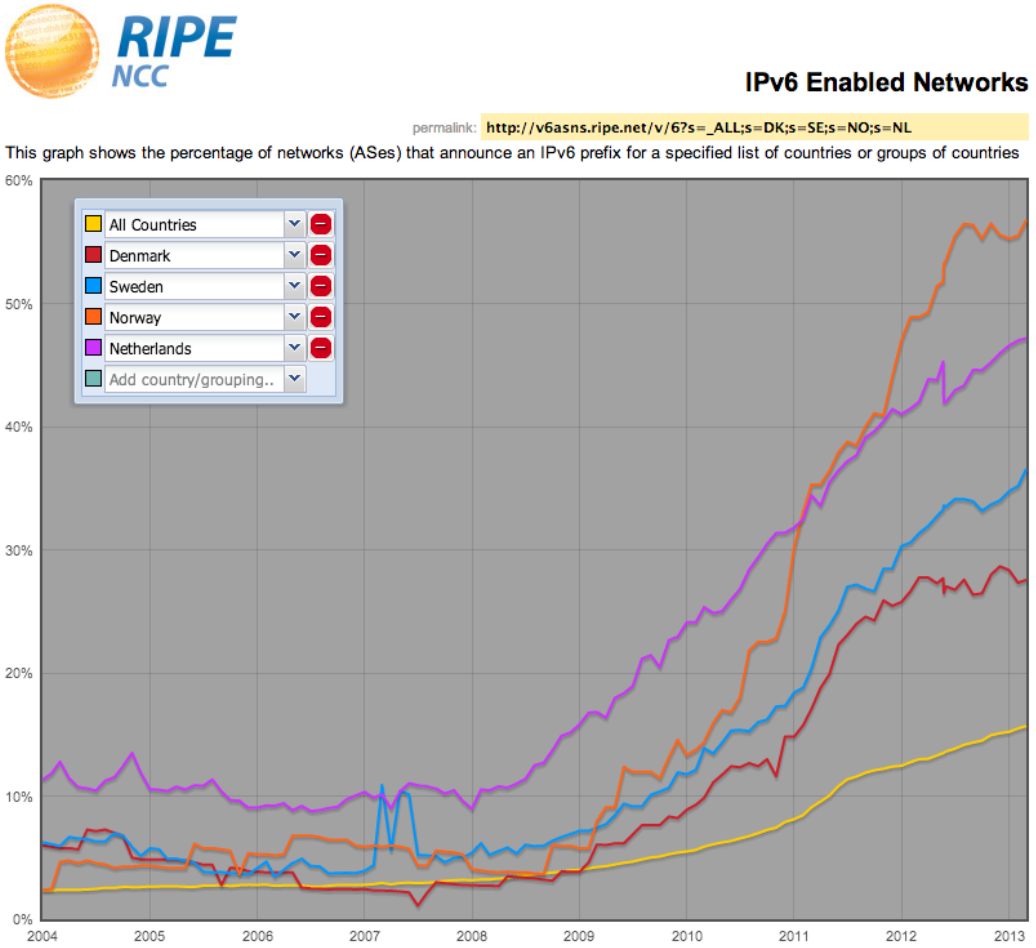
Many hosting and content providers can deliver IPv6 to business customers

IPv6 in the Nordic region - 2011



http://v6asns.ripe.net/v/6?s=_ALL;s=DK;s=SE;s=NO;s=NL

IPv6 in the Nordic region - 2013



http://v6asns.ripe.net/v/6?s=_ALL;s=DK;s=SE;s=NO;s=NL
https://www.ripe.net/membership/indices/DK.html

RIPE NCC getting IPv4 in Europe

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On 14th September 2012, the RIPE NCC distributed the final IPv4 address space before reaching the last /8. This means that section 5.6 of IPv4 Address Allocation and Assignment Policies for the RIPE NCC Service Region is now in effect.

This section states that, once the RIPE NCC begins to allocate address space from the last /8, **an LIR may receive only a /22 (1,024 IPv4 addresses)**, even if they can justify a larger allocation. This /22 allocation will only be made to LIRs **if they have already received an IPv6 allocation** from an upstream LIR or the RIPE NCC.

<blink>No new IPv4 Provider Independent (PI) space will be assigned.</blink>

IPv6 or GTFO

The price of IPv4

Hi,

thank you for the interesting, sorry for the late reply, but I have got 20-30 interests/ day. I have got two unused ip range 91.135.112.0/21 and 91.135.120.0/22 I'm waiting for offers and the highest offer will become it. I can give it to rent or I can sell it. The best offer for rent is 3,5 eur / month / ip and for buy is 30 eur / ip.

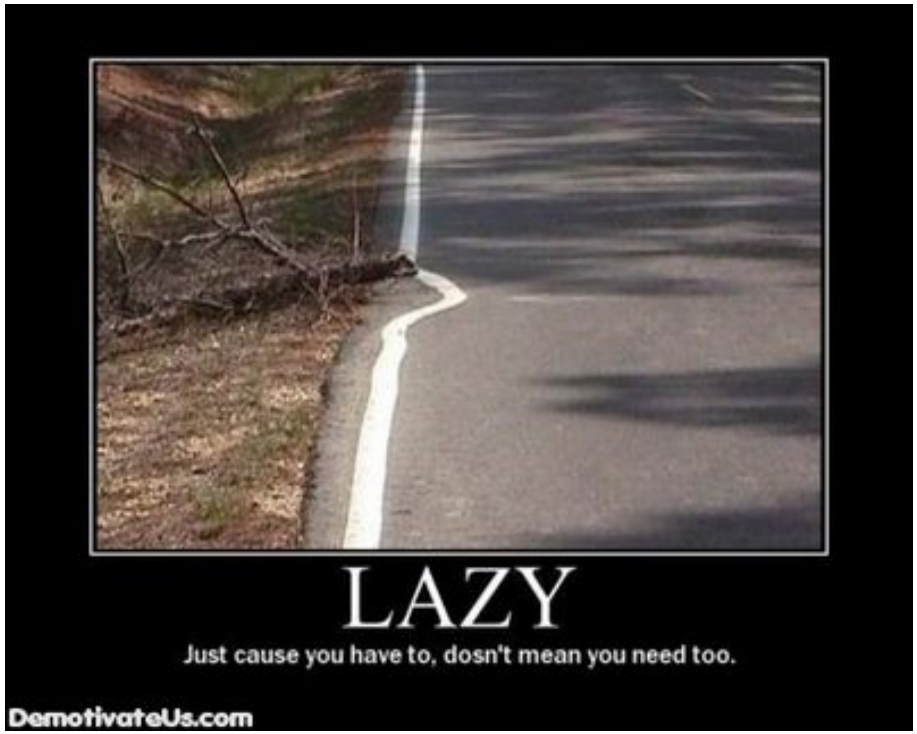
Best regards, Zoltan

Let me calculate that for you **/22 is 1,024 IPs each 30 EUR = 30,720 EUR**

How many do you want?

Source: private email communication asking about an IPv4 listing on RIPE portal

Current status Denmark

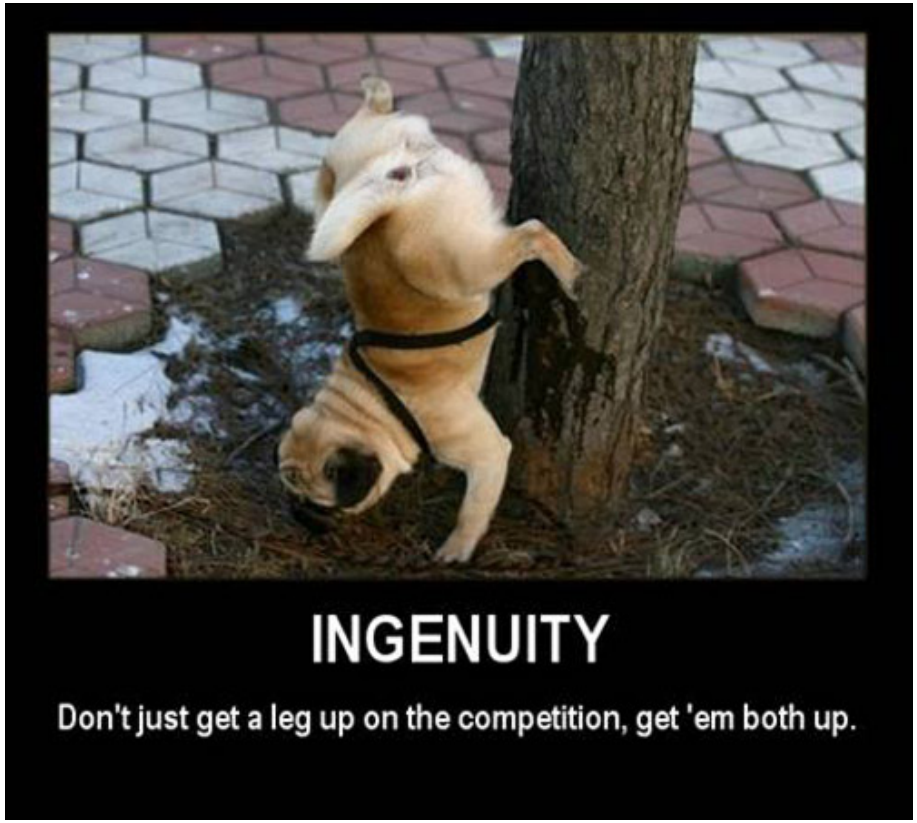


Too little interest (upgraded from ”no interest” in earlier presentations)

Some providers are doing testing, Thanks Bolig:net for the native IPv6 in my home!

Perceived NO NEEED - this is a problem - **WTF people, get real!**

Carrier Grade NAT - an IPv4 solution



CGN sucks and RFC6598 IANA-Reserved IPv4 Prefix for Shared Address Space extends the life - double NAT whammy - no problems *jediwave*

Join me everyone - **NAT IS BAD**

Every day is IPv6 day

Free, a major French ISP rolled-out IPv6 at end of year 2007

XS4All As of August 2010 native IPv6 DSL connections became available to almost all their customers.

Denmark are frontrunners in IT, *sigh*

Source: `http://en.wikipedia.org/wiki/IPv6_deployment`

Danish ISPs and infrastructure

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`http://www.tdc.dk` Large ISP

`http://globalconnect.dk` Fiber and internet provider

`http://netgroup.dk` Internet provider

`http://nianet.dk` Internet provider

`http://bolignet.dk/` Internet provider

`http://zensystems.dk` Internet provider

`http://fiberby.dk/` Internet provider

`http://siminn.dk` Internet provider (IPv6 RSN ☺)

`http://www.dk-hostmaster.dk`

IPv6 enabled sites

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http://www.lynero.dk www.feriebolig-spanien.dk

http://mirrors.dotsrc.org **http://www.herning.dk**

http://www.computerworld.dk http://www.version2.dk

http://www.information.dk http://kiaklub.dk/

http://xstream.dk http://ssl.isecurity.dk

https://bitbureauet.dk/ http://Ugenr.dk

http://bingo.wenneberg.net/ http://mirror.dk.freebsd.org

http://Pixolink.com http://coolsms.com

Personal and other web sites

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`http://flemmingriis.com`

`http://graffen.dk`

`http://iboserup.dk`

`http://blog.andersen.nu/`

`http://iptv-analyzer.org`

`http://web.gratisdns.dk` Larsen Data
+ approx 51313 hosts via URL forwarder service!

Quick conclusion - there is danish content on IPv6

See more at: `http://world-ipv6-day.dk/danske-ipv6-sites`

Kommunikation Telenor 5. mar. 2013 14.42
To: Henrik Kramshøj
Re: IPv6 status for Telenor

Hej Henrik,

Telenor er i gang med at klargøre understøttelsen af IPV6 og forventer at kunne tilbyde denne funktionalitet for Mobil og faste kredsløb senere i 2013.

Vh Peter

Peter Glüsing
Pressechef I Telenor Danmark

TDC Yousee

aha, de har ellers tidligere meldt mere aggressivt ud.

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Ny standard for IP-adresser

23-01-2012
IP-adresser er nummerserier, som anvendes som adresser for trafik på internettet. Hver gang du kobler op mod internettet, får du automatisk tildelt en IP-adresse.

IPv4 og IPv6
I dag anvendes IP-adresser af den type, som kaldes IPv4, men i takt med, at antallet af opkoblede enheder rundt om i verden stiger, øges behovet for flere IP-adresser. Antallet af mulige adresser i standarden IPv4 er begrænset, og derfor er en ny standard, IPv6, blevet udviklet.
IPv6 anvender såkaldt128 bit lange adresser, hvilket gør, at der findes en meget stor mængde unikke adresser.

IPv6 hos 3
Vi forbereder os på at understøtte IPv6 og vil indenfor kort tid begynde at tilbyde denne valgmulighed for kunder, som ønsker det.
IPv6 og IPv4 vil eksistere side om side i lang tid endnu, og du kan derfor fortsat anvende den hardware, du i dag har, selvom den kun understøtter IPv4.

Hvordan skal jeg forholde mig som kunde?
Som kunde behøver du ikke at foretage dig noget eller sætte dig ind i, hvilken type IP-adresse du anvender. Du behøver ikke bekymre dig om, hvorvidt mængden af IPv4-adresser slipper op, eller om hvorvidt vi understøtter IPv6.
Vi sikrer, at du altid kan koble op mod Internettet, uanset hvilken type IP-adresse, der anvendes.

Mkay, kort tid ...

Non-IPv6 sites in Denmark

but no DR.dk, folketinget.dk, ministerier, offentlige myndigheder, no KMD, no web sites with CSC, IBM, ...?

it’s not hard - get moving

How to get your site on IPv6

Practical information for your network

Strategy and actions points

- Collect information about IPv6
- Collect information about your network
- Collect information about your hosts and services
- Ask your providers for IPv6 plans
- Experiment with IPv6 - today
- Implement small proof of concept, in production!
- Expand coverage

Process for LIRs: apply for IPv6 space, announce with BGP - 2 days work!

Ripeness

First star: IPv6 address space

One more star: route6 object

Another star: reverse DNS

Yet another star: prefix visible in RIS

`http://ipv6ripeness.ripe.net/4star/DK.html`

Security Implications - take control

For an IPv4 enterprise network, the existence of an IPv6 overlay network has several of implications:

- The IPv4 firewalls can be bypassed by the IPv6 traffic, and leave the security door wide open.
- Intrusion detection mechanisms not expecting IPv6 traffic may be confused and allow intrusion
- In some cases (for example, with the IPv6 transition technology known as 6to4), an internal PC can communicate directly with another internal PC and evade all intrusion protection and detection systems (IPS/IDS). Botnet command and control channels are known to use these kind of tunnels.

Kilde:

`http://www.cisco.com/en/US/prod/collateral/iosswrel/ps6537/ps6553/white_paper_c11-629391.html`

Collect information about IPv6

Guidelines for the Secure Deployment of IPv6, SP800-119, NIST
`http://csrc.nist.gov/publications/nistpubs/800-119/sp800-119.pdf`

The Second Internet: Reinventing Computer Networks with IPv6, Lawrence E. Hughes, October 2010,
`http://www.secondinternet.org/`

IPv6 Network Administration af David Malone og Niall Richard Murphy

`http://www.ripe.net`

This presentation ☺

Allocating IPv6 addresses

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You have plenty!

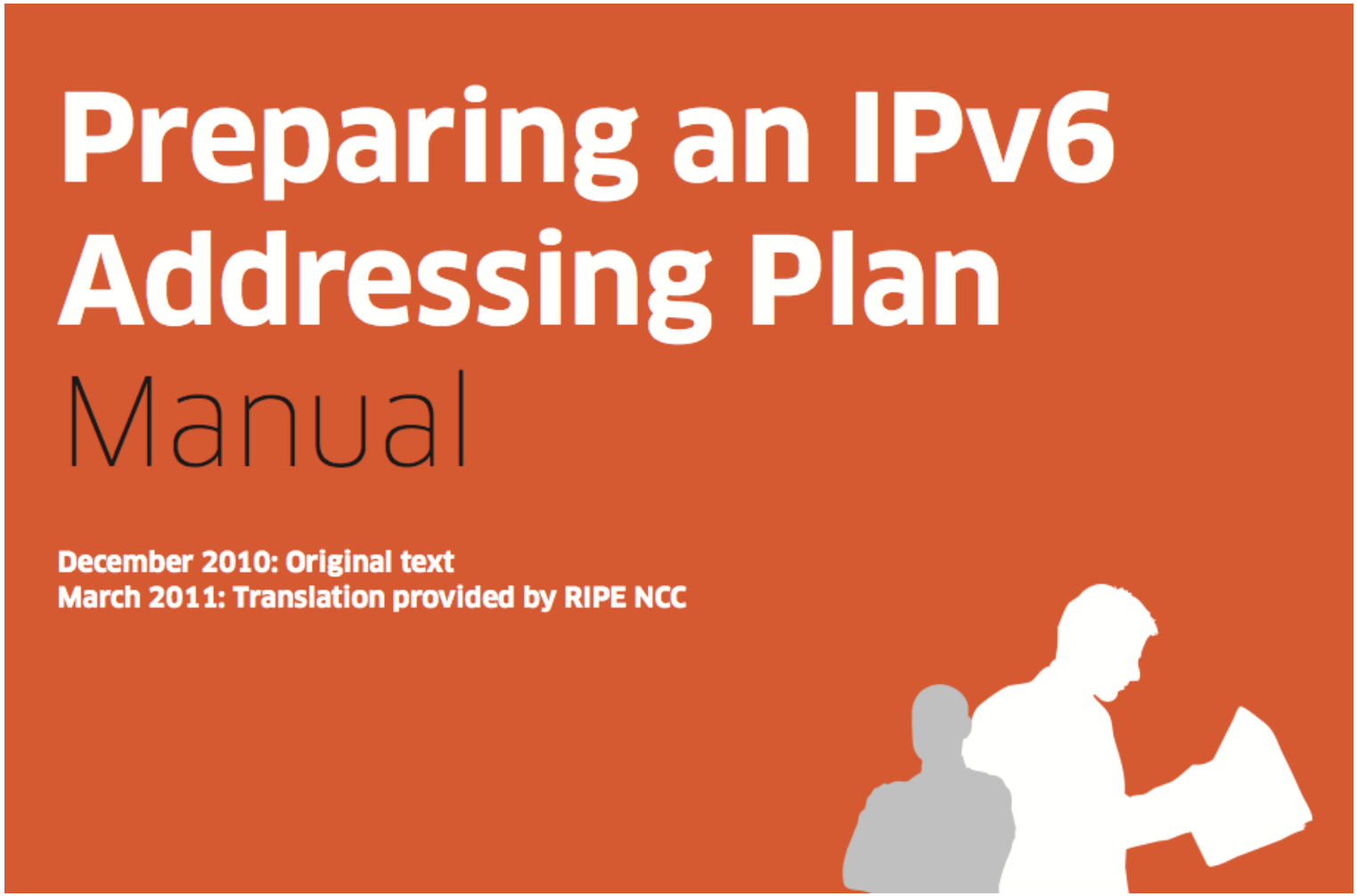
Providers and LIRs will typically get /32

Providers will typically give organisations /48 or /56

Your /48 can be used for:

- 65536 subnets - all host subnets are /64
- Each subnet has 2^{64} addresses

Preparing an IPv6 Addressing Plan



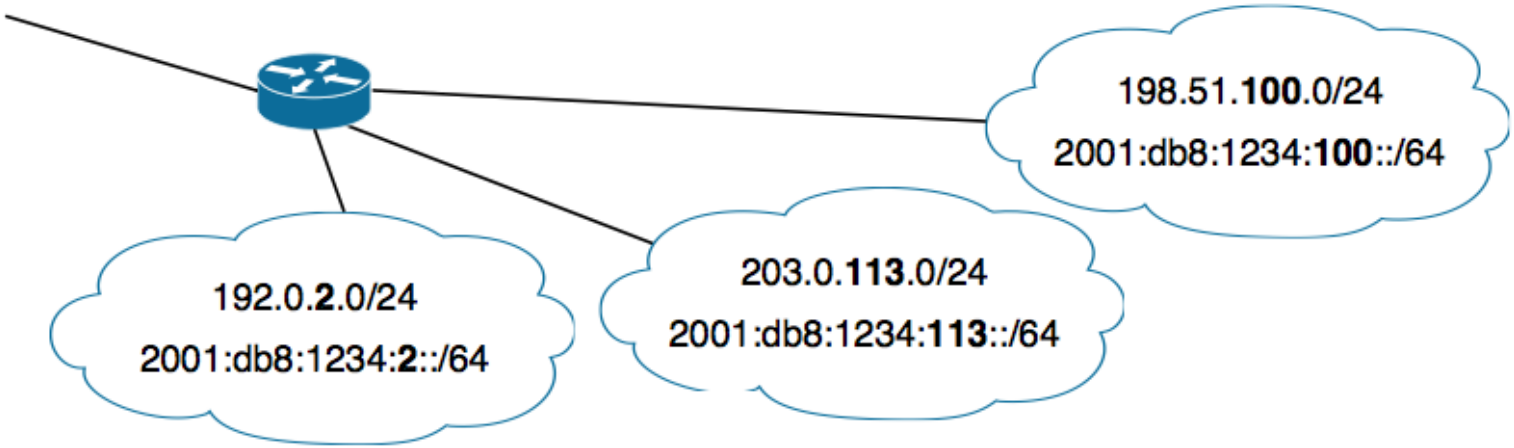
http://www.ripe.net/training/material/IPv6-for-LIRs-Training-Course/IPv6_addr_plan4.pdf

Example adress plan input

3.2 Direct Link Between IPv4 and IPv6 Addresses

If the existing IPv4 networks use only /24 subnets (for example, from 203.0.113.0 to 203.0.113.255), a direct link can be established between IPv4 addresses and the new IPv6 addresses. In this case, you can include the penultimate number of the IPv4 address (113 in 203.0.113.0/24, for example) in the IPv6 subnet. The IPv6 address will then be 2001:db8:1234:113::/64.

Such an IPv4-to-IPv6 transition could appear as follows:



Easy and coupled with VLAN IDs it will work ☺

Run IPv6 in production

Make sure you establish IPv6 in **production**

Enabling service on IPv6 without production - bad experience for users

Start by enabling your DNS servers for IPv6 - and DNSSEC - and DNS over TCP
Remember that your firewall might have problems with large DNS packets

Add a production IPv6 router - hardware device or generic server

Tunnels are OK, and SixXS consider their service production

Up and running with IPv6

`https://www.sixxs.net/` Apply for IPv6 tunnel

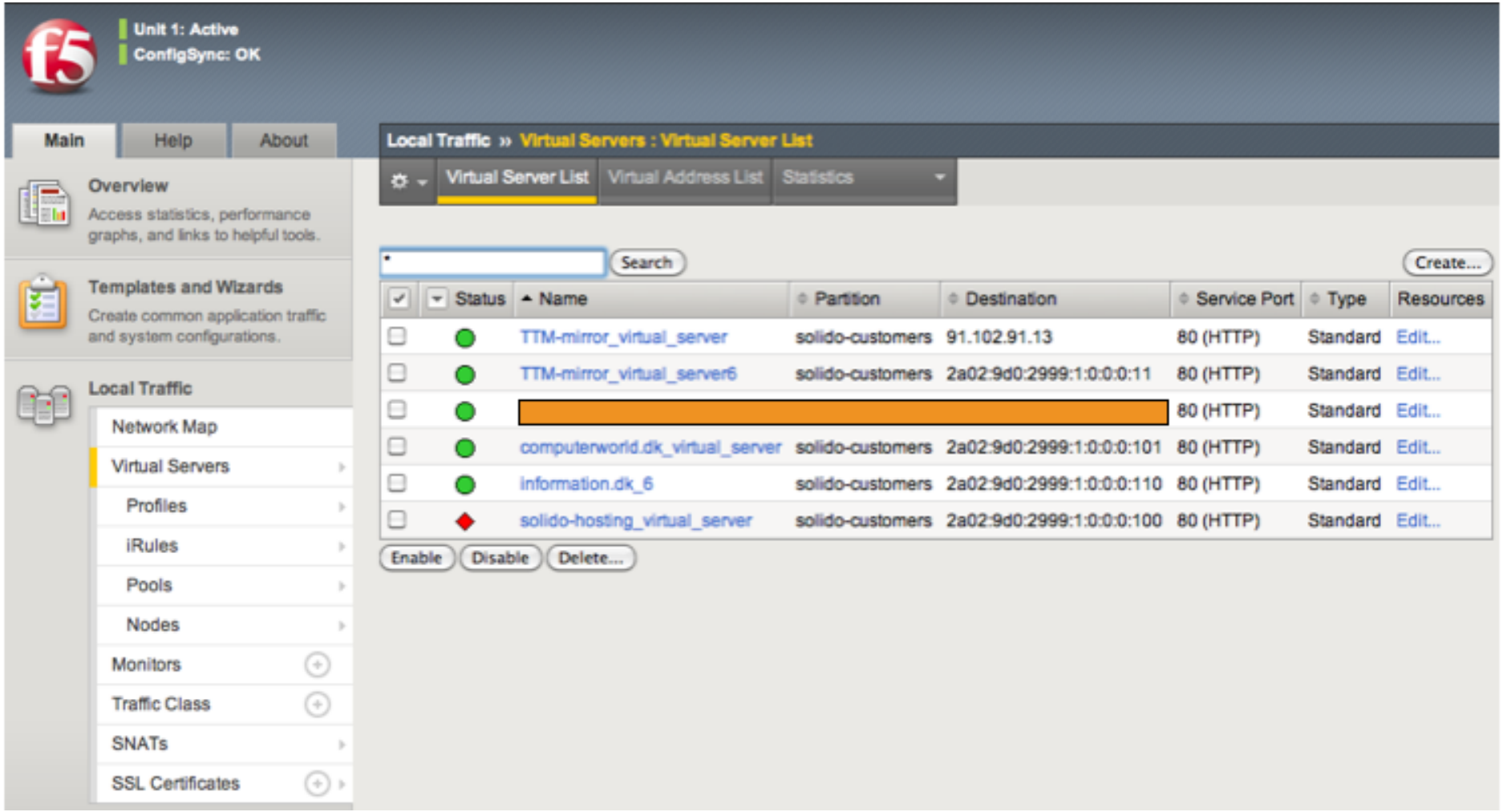
`http://www.tunnelbroker.net/` Apply for IPv6 tunnel

Use ping/ping6 and traceroute to test connectivity - Done enjoy ☺

Try in your browser:

- `http://www.kame.net` Dancing turtle
- `http://www.ripe.net` RIPE, look for address up right corner
- `http://loopsofzen.co.uk/` Play a game
- `https://www.sixxs.net/` Apply for IPv6 tunnel
- `http://ipv6.he.net/certification/` Join the Hurricane Electric IPv6 Certification Project

F5 load balancer example



Why prioritize IPv6 IPv6 - the business case

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- An almost unlimited scalability with a very large IPv6 address space (2^{128} addresses), enabling IP addresses to each and every device.
- Address self-configuration mechanisms, easing the deployment. Router advertisements are simple
- Improved security and authentication features, such as mandatory IPSec capacities and direct connections
- Peer-to-peer connectivity, solving the NAT barrier with specific and permanent IP addresses for any device and/or user of the Internet.
- Mobility features, enabling a seamless connexion when moving from one access point to another access point on the Internet.
- Multi cast and any cast functionalities.
- IPv6 will provide an easier remote interaction with each and every device with a **direct integration to the Internet.** In other words, IPv6 will make possible to move from a network of servers, to a network of things.

Business case for IPv6 is **continuity**

Partially inspired by `http://www.smartipv6building.org/index.php/en/ipv6-potential`

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IPv6 is here already - use it

http://www.ipv6tf.dk

Danish IPv6 task force - unofficial - not very active

Questions?

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http://www.solidonetworks.com

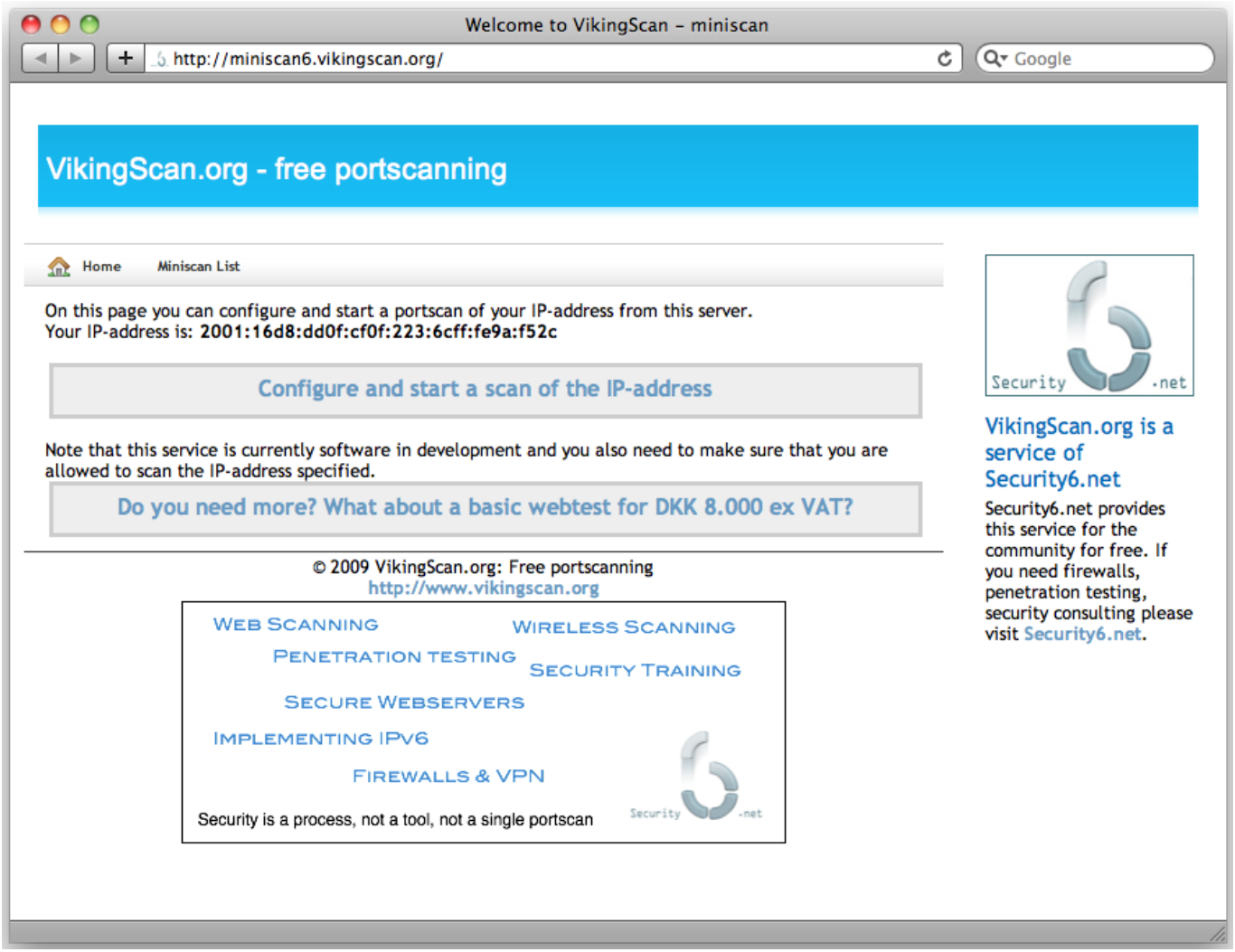
You are always welcome to send me questions later via email

Ressources

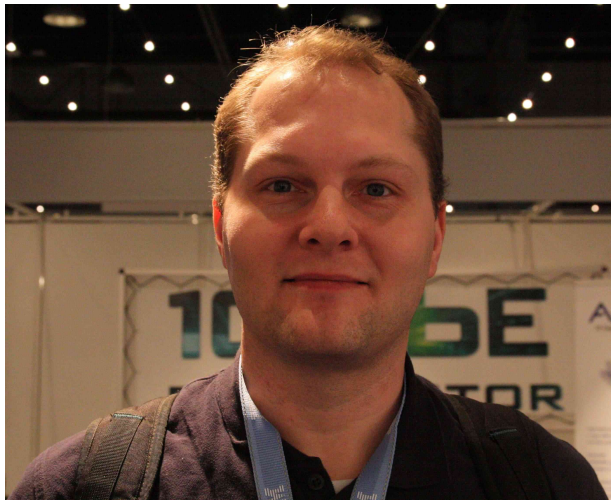
Guidelines for the Secure Deployment of IPv6, SP800-119, NIST
`http://csrc.nist.gov/publications/nistpubs/800-119/sp800-119.pdf`

The Second Internet: Reinventing Computer Networks with IPv6, Lawrence E. Hughes, October 2010,
`http://www.secondinternet.org/`

VikingScan.org - free portscanning



Contact information



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- CISSP certified
- 2003 - 2010 Independent security consultant
- 2010 - owner and partner in Solido Networks ApS