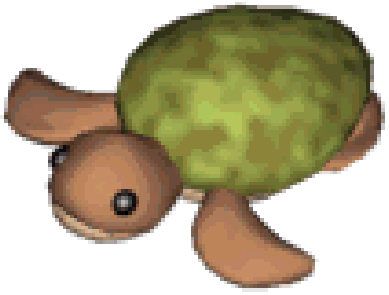
Welcome to

IPv6 Current Status Denmark

Henrik Lund Kramshøj hlk@zencurity.dk

Slides are available as PDF kramshoej@Github

Goal

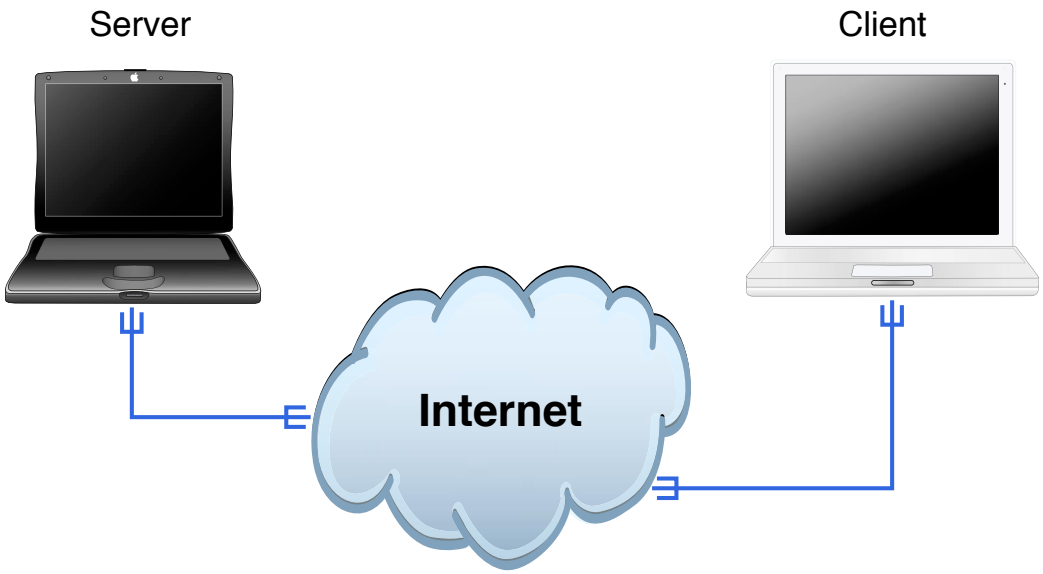


IPv6 Status Denmark

Enabled providers and sites

How to get your site on IPv6

Internet today



Clients and servers

Rooted in academic networks

Protocols which are more than 20 years old, moved to TCP/IP in 1981

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

1988 About 60.000 systems on the internet - The Morris Worm hits about 10%

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 15 APNIC ran into their last /8 and started a more restrictive policy

How to use IPv6

www.zencurity.com

hlk@zencurity.com

Really how to use IPv6?

Get IPv6 address and routing

Add AAAA (quad A) records to your DNS - Done

```
www       IN A        185.129.60.130
          IN AAAA     2a06:d380:0:3065::80
mail      IN AAAA     2a02:9d0:10::216
```

```
www.zencurity.com has address 185.129.60.130
www.zencurity.com has IPv6 address 2a06:d380:0:3065::80
mail.zencurity.com has IPv6 address 2a02:9d0:10::216
```

IPv6 Status Denmark

~~IT- og Telestyrelsen are becoming more active~~
They are killed, nobody in government does much with IPv6 anymore

Unofficial IPv6 task force at `http://www.ipv6tf.dk/`
Service Temporarily Unavailable, my web site - had almost no content

Major providers are ready on back bones

Internet Providers are increasingly becoming ready, **slowly**

Other initiatives `http://world-ipv6-day.dk/`

Sites previously on IPv6 are not anymore, like Version2.dk and Computerworld :-(

TL;DR We are getting IPv6, but find a tunnelbroker unless you are on Altibox, Fullrate, Gigabit or Bolig:net - `https://tunnelbroker.net/`

Enabled IPv6 ISPs in Denmark

IPv6 hos danske internetudbyderne

Det går desværre ret langsomt med IPv6 i Danmark, det er kun et par udbydere, der tilbyder det til privatkunder. Resten tilbyder det slet ikke, eller kun til erhvervskunder.

Her er overblik over IPv6 idanske internetudbyderne, der tilbyder deres kunder IPv6. Du kan sorterere ved at klikke på kolonneoverskrifterne.

Din udbyder: Bolignet A/S (IP:2a02:2190:f000:cf0f:15

Internetudbydere på listen: 34
Internetudbydere med IPv6: 17
Internetudbydere med fuld IPv6: 3
Procentdel der understøtter IPv6: 50%
Procentdel med fuld IPv6: 9%

Fuld IPv6 = IPv6 til alle privat- og erhvervskunder.

Source: `https://ipv6-adresse.dk/` Emil Stahls excellent web site

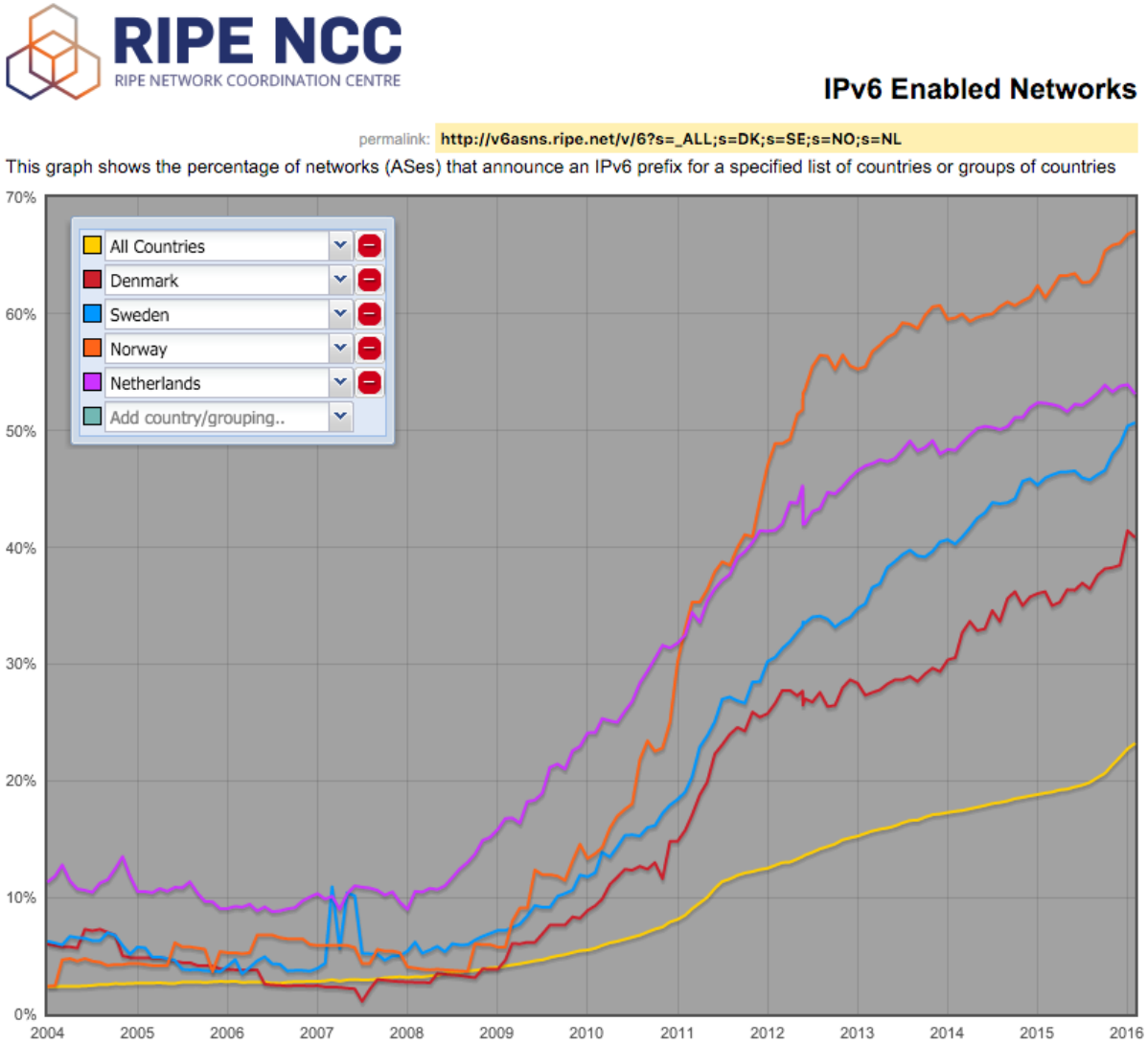
Enabled IPv6 ISPs in Denmark

Altibox	Ja	Vi understøtter IPv6rd.	ISP	25. Jan. 16
Solido Networks	Ja	Understøtter og promoverer også aktivt IPv6. Kun til erhverv.	Tweet	29. Sep. 13
Zen Systems	Ja	Vi er fuldt IPv6 klar og har allerede nogle kunder som kører dual stack. Leverer kun til erhvervskunder.	ISP	30. Sep. 13
Nianet	Ja	Vi understøtter IPv6 (ikke på SE/Stofa's net). Leverer kun til erhvervskunder.	ISP	04. Oct. 13
Jay.net	Ja	Vi tilbyder IPv6 til kunder der har specifikke trafikpakker.	ISP	14. Feb. 16
Energi Fyn	Ja	Understøtter IPv6 i vores Erhverv Pro-produkt.	PDF	10. Mar. 15
bolig:net	Ja	Vi leverer allerede i dag fuld IPv6 til både vores private kunder og erhvervskunder.	ISP	18. Jan. 14
Gigabit	Ja	Fuldt ud understøttet. Dual stack til alle, både privat og erhverv. /48 prefix deligation	ISP	22. Mar. 14

Source: `https://ipv6-adresse.dk/`

Also check `http://ripeness.ripe.net/5star/DK.html`

IPv6 in the Nordic region



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

footnote, I bought two dirt cheap TP-Link managed switches recently, but supposedly has IPv6 routing and even ACLs! T2600G-28TS 1300kr eks moms

`http://www.tp-link.com/en/products/details/cat-39_T2600G-28TS-(TL-SG3424).html`

No excuses that your hardware in your enterprise does not support IPv6!

BTW IPv6 is already in your network

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.

Source: From 2010!

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

Allocating IPv6 addresses

You have plenty!

Providers and LIRs will typically get /32

Providers will typically give organisations /48 or /56

Your /48 can be used for:

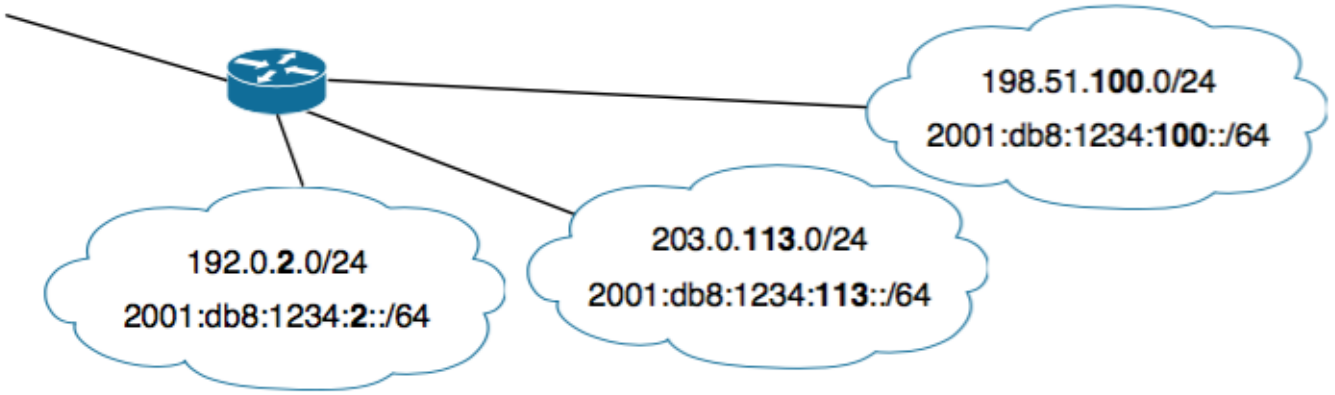
- 65536 subnets - all host subnets are /64
- Each subnet has 2^{64} addresses

Preparing an IPv6 Addressing Plan

3.1. Direct Link Between IPv4 and IPv6 Subnets

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 ☺

Source: `https://www.ripe.net/support/training/material/IPv6-for-LIRs-Training-Course/Preparin`
`pdf`

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

Conclusion

IPv6 is here already - use it

`http://www.ipv6actnow.org/`

`http://www.ipv6tf.dk` - anyone want to reboot it?

Use ping/ping6 and traceroute to test connectivity

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

Done ☺