Deploying IPv6

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Short about us

- Operates Internet Exchanges in five Swedish cities

- Operates i.root-servers.net

- Operate anycast and unicast services for a number of TLDs from around the world

- Active in various Internet forums related to standardization (IETF) and operations (RIPE, Nanog, APRICOT, MENOG, SANOG) as well as industry (Euro-IX)

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Why?

- Given the RIR data - we need to deal with the depletion of IPv4 addresses, and that quite soon

- Options for dealing with this are

  1. IPv4+NAT

  2. IPv6 in co-existence with IPv4

  3. Something else

- 1) will come with increased cost, 3) doesn't exist. Leaves us with 2)

The IPv6 value proposition

- Deploying IPv6 today will not give your customers/users something they can't do today

    - There is no magic here

    - But IPv6 will eventually help us with address shortage

- But the DNS is a crucial part in IPv6 readiness and early adoption and TLDs have an important role to play

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A highly simplified view
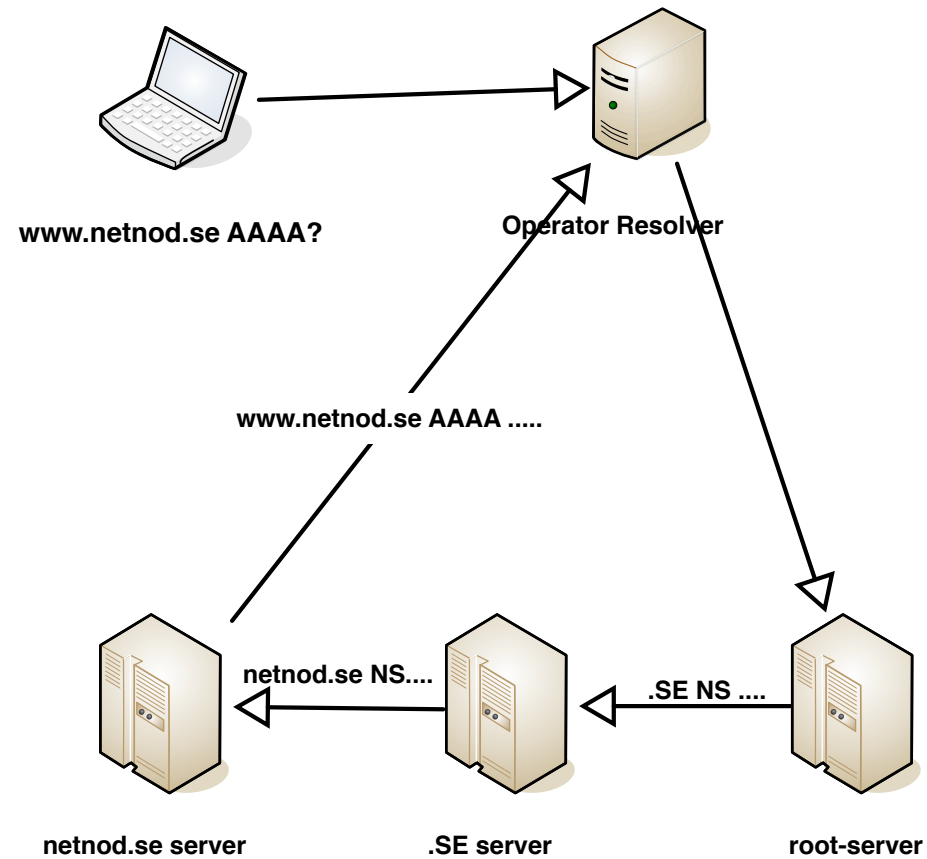
IP transport

- Each transaction exchange represented by a line on the previous slide can user either of IPv4 or IPV6 transport

  - The more of the transactions that are IPv6 capable the better prepared for an IPv6 roll out we are

  - The transactions are orthogonal to the transport used by the user for actually accessing www.netnod.se

Why TLDs?

- Having an "unbroken" DNS lookup exchange over IPv6 is quite fundamental for IPv6 readiness

- Not having a TLD support IPv6 will mean users in that TLD are less likely to be prepared (if not even unprepared) for IPv6 adoption

  - It's true it will work over IPv4, but operational experience is what counts for readiness

Impact on TLD operations?

- Registry systems (i.e back-end database) needs to support entry of AAAA glue

- Interface to customers/registrars needs to support AAAA records

- At least one slave server needs to have IPv6 transit

  - Preferably more than one and preferably also TLD monitoring system

  - And you need to ask IANA to add the AAAA glue

Operational risks?

- So are there any operational risks for a TLD?

- Adding new functionality is always a risk

- IPv6 capability might mean upgrades of slave-server DNS-server software, operating system, router code etc

  - Might introduce new bugs

- But IPv6 code is starting to be so old that if support is lacking you probably have other operational worries

Operational risk?

- Adding IPv6 glue for TLD NS records might cause some unexpected behavior for clients that have IPv6 connectivity and do not realize it or for clients that have an IPv6 address but broken IPv6 access

  - But finding these and fixing them helps with IPv6 readiness

  - TLDs can help make a difference in IPv6 readiness among their customer/user base

Our experiences?

- We have deployed IPv6 for all services (IXP and unicast DNS slave service) except anycast DNS (in progress

- We decided to make this production grade from day one

  - And to make it behave exactly like IPv4

  - Monitoring and uptime requirements the same

Our experiences?

- As for DNS we have had little if no problems or reports from customers

- Issues

  - We have had some issues with global routing

  - We have had some issues with router code

  - But we have those for IPv4 too

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What if you don't do it?

- Most likely nothing will break (yet)

  - Customers/users will continue to use IPv4 transport for lookups

- You will loose valuable operational experience in running IPv6

- You will possibly act as a barrier for adoption for your customers/users

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Financials

- Adding IPv6 comes with marginal costs and should not lead to extra charges for customers/users

- Investments are limited to adjustments to registry system and customer / registrar interface

- "One-time off" costs for staff training

- Costs for IPv6 access to one or more slave-servers should be marginal

Regulation?

- Various countries and governmental bodies have adopted various forms of policy / regulation with regard to IPv6

- While I am sure that looks like important action, it won't help with end-user adoption or creation of a value proposition

  - But one example is http://ec.europa.eu/ information_society/policy/ipv6/docs/european_day/ communication_final_27052008_en.pdf

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