

Effects on standard security mechanisms of going from IPv4 to IPv6

Henrik Dalbakk

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We are running out of IPv4 addresses, and we are doing it fast:

...ARIN will for the very first time, sometime between the middle and end of next year, receive a request for IPv4 address space that is justified and meets the policy. However, ARIN won't have the address space. So we'll have to say no for the very first time.

ARIN CIO Richard Jimmerson, April 2010

NAT - Network address translation

The network's job is to transmit datagrams as efficiently and flexibly as possible. Everything else should be done at the fringes.

RFC3439 - Architectural Principles of the Internet

Security aspects of IPv4

- An old protocol, first version is RFC791 from 1981
- Intended usage in trusted networks
- Lacking built in security features like authentication, confidentiality or non-repudiation

The solution - IPv6

- First specified in RFC1883 from 1995
- Vast address space, 2^{128}
- Mitigates the need for NAT
- IPsec mandatory in the specification
- Not compatible with IPv4
- Availability

Main scenario

How can IPv6 be added to a small, medium sized IPv4 network while not sacrificing security, availability and functionality in the process?

Methodology

- 1 Analysing transition techniques
 - Selecting three techniques
- 2 Building a baseline network
- 3 Planning the implementation of the chosen techniques
- 4 Executing the planned implementation
- 5 Analysing the alterations in the network

Selecting three techniques:

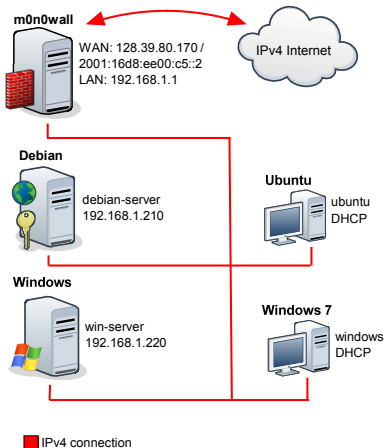
- Implementation difficulty
- Support
- Scope of the technique

Selecting three techniques:

- Implementation difficulty
- Support
- Scope of the technique

We ended up with 6to4, ISATAP and Teredo.

Baseline network



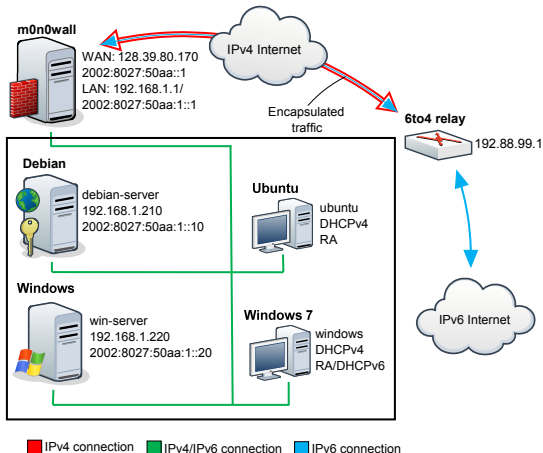
Planning and execution

- Planning - divide and conquer:
 - Firewall/border equipment
 - Servers
 - Clients
 - Testing
- Execution - doing as planned

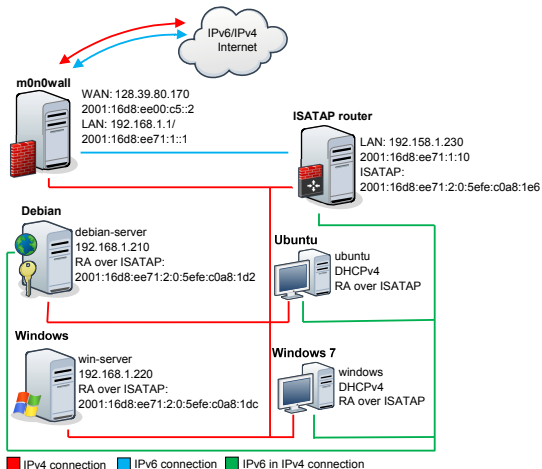
Analysis

- How is the internal/external functionality affected?
- How is the network security affected?
- How is the offered services affected?

6to4



ISATAP



Teredo

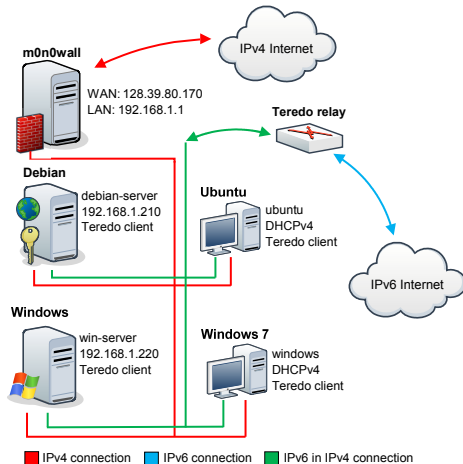


Table: Summary table

	6to4	ISATAP	Teredo
NAT Traversal	No	No	Yes
IPv4 requirement	Global unicast	No	No
IPv4 dependency	Yes and No	Yes	Yes
IPv6 prefix	2002::/16	N/A	2001::/32
Available IPv6 space	/48 pr IPv4	N/A	/128
Transition native IPv6	Medium	Easy	Hard
Implementation	Hard	Medium	Easy
OS support	Good	Good	Good
Usage	WAN/LAN	LAN	Single host
Recommended	Yes	Yes	No

Conclusions

- Implementing IPv6 is feasible with limited resources
- 6to4 and ISATAP can be used by themselves or together with good results
- Teredo is not suitable

Thank you for your attention

Questions?