



Experiences from an IPv6-Only World at Ericsson

draft-arkko-ipv6-only-experience

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Moving to an IPv6-Only Network

Our sites had been in dual stack for years

It all worked very well, so clearly we had to try something else

- › At some point someone will move to this type of a network – some interest for this with mobile operators, for instance

We had several goals:

- › Find out what breaks with IPv6-only networking and feed the results back to various vendors, IETF, ...
- › Test an early version of our NAT64 device
- › Build an understanding to recommend dual stack and IPv6-only for the appropriate situations

Our IPv6-Only Network



Two sites were involved:

- › ER NomadicLab and my home
- › A small group of opt-in users

An alternate network with

- › No IPv4 at all (no DHCP, no routing)
- › Separate prefixes/VLANs/wireless
- › NAT64 for access to the IPv4 Internet
- › IPv6 servers, IPv6 Internet access, whitelists, etc already in place



Experiences

The bottom line

- › IPv6-only is possible today
- › I do not have to go back any more
- › Some pain involved; not for everyone yet
 - But a big difference between mobile and general environments

In more detail:

- › Many things **do** break
- › Lack of IPv6 support and previously unseen bugs
- › Some users went back to dual stack because of this
- › Key issue is true IPv6 support, not so much NAT64

IPv6-Only

Plenty of things work well:

- › Browsing generally not an issue at all (I saw 2 IPv4 literals in 2 months)
- › E-mail, software updates, many chat systems, streaming

On some handsets you can reach 100% functionality

But there are some issues in general environments:

- › Host operating system testing issues
- › Some applications fail
- › Many appliances do not support IPv6
- › Firewall support (particularly for fragments)



Example issues with operating systems

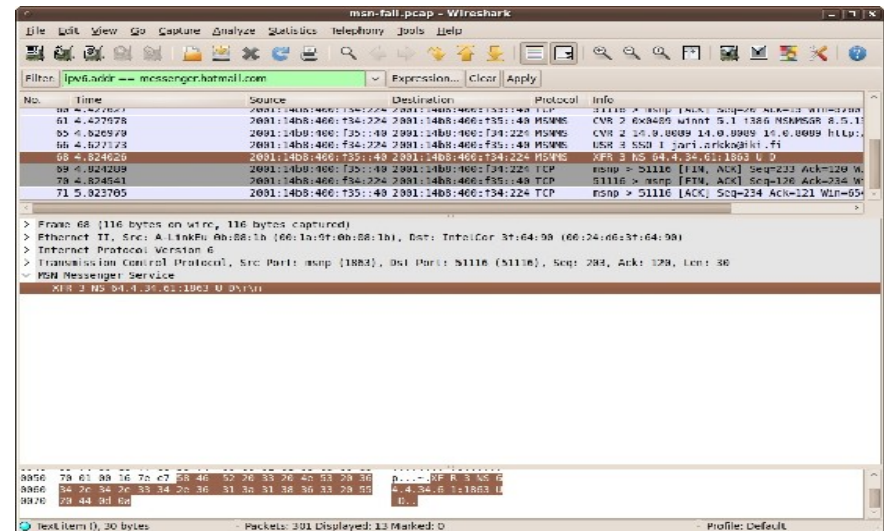
- › Old RA info not removed after network change (Linux)
- › Network manager needs to be told to not expect IPv4 (Apple, Ubuntu)
- › DNS discovery problems (Ubuntu, Windows)

Examples of Problems with Applications

- › By far the biggest complaint was about Skype
- › Secondlife clients do not work
- › Issues with some chat systems and with most games

Unable to connect to Second Life.
DNS could not resolve the host name.
Please verify that you can connect to the www.secondlife.com
web site. If you can, but continue to receive this error,
please go to the support section and report this problem.

Close



IPv6-Only Messaging

System

Works?

Facebook on the web (http)

Yes

Facebook via a client (xmpp)

Yes

Jabber.org chat service (xmpp)

Yes

Gmail chat on the web (http)

Yes

Gmail chat via a client (xmpp)

Yes

Gtalk client

No

AIM (AOL)

No

ICQ (AOL)

No

Skype

No

MSN

No

Webex

(tests in progress)

Sametime

(tests in progress)

IPv6-Only Gaming

GAME

Works in LAN/NW mode?

Web-based (e.g. armorgames)	Yes
Runescape (on the web)	No
Flat out 2	No
Battlefield	No
Secondlife	No
Guild Wars	No
Age of Empires	No
Star Wars: Empire at War	No
Crysis	No
Lord of the Rings: Conquest	No
Rome Total War	No
Lord of the Rings: Battle for Middle Earth 2	No

NAT64-Based Connectivity

- › Generally works very well, when the application is IPv6-capable
- › Measurements based on Alexa top 1000 web sites provide some additional information
 - But YMMV: temporary glitches, your location in the routing infrastructure, client software (browser vs. wget) may affect the results

Mode	Failure rate	Notes
IPv4-only	1.9%	
IPv6-only	96%	Exceptions include google, ...
IPv6-only & NAT64	2.1%	Mostly due to IPv4-literals

With 1 000 top sites, 0.2% needed an IPv4 literal to render all components on top the page (2% for 10 000 top sites)

Conclusions and Recommendations

Recommendations:

- › Dual stack should still be our preferred mode of operation
- › IPv6-only can be recommended today for controlled environments
 - Early adopters, mobile networks that have control of terminals, ...
- › We are not that far from making IPv6-only work for everyone, either, but some work is needed:
 - › DNS discovery, fixing bugs, cleaning the Internet of IPv4 literals
 - › IPv6 support for Skype, messaging and gaming
 - › Measurements on failures and delays, analysis of reasons
 - › Much of this is a one-time effort!

Questions? Comments?