



# Experiences from an IPv6-Only World at Ericsson

**draft-arkko-ipv6-only-experience**

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# Moving to an IPv6-Only Network

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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

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## 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

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## 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

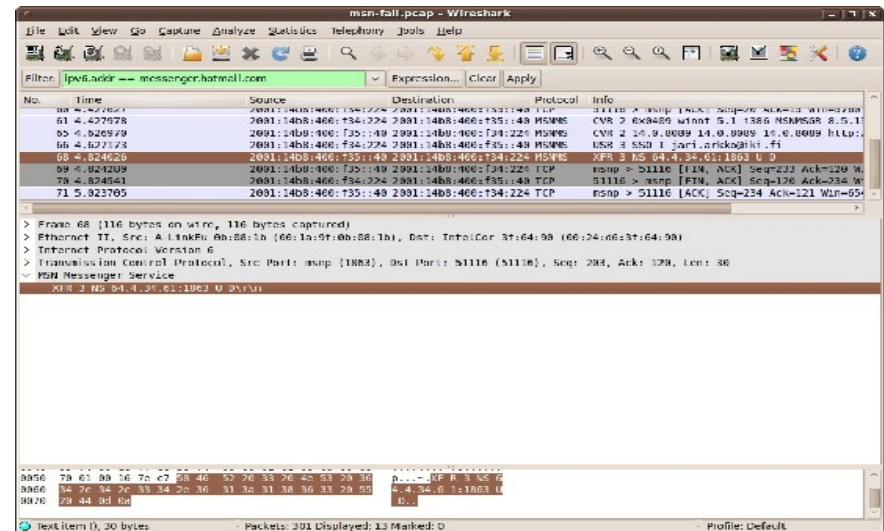
- › Old RA info not removed after network change (Linux)
- › Network manager needs to be told to not expect IPv4 (Apple, Ubuntu)
- › DNS discovery problems (Ubuntu, Windows)

# 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](http://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

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## 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

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## GAME

## Works in LAN/NW mode?

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



# NAT64-Based Connectivity

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- › 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

<b>Mode</b>	<b>Failure rate</b>	<b>Notes</b>
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

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## 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!

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Questions? Comments?