Extreme IPv6 Networking at Home

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Background

This talk is about IPv6 & the Internet of Things, but

- NOT about home gateways
- NOT about ISP IPv6 service
- And NOT about new transition tools

- But it IS about IPv6 at home & elsewhere
- And about the cool things you can do with it
The Dream – No Limitations

Networking as it should be
Everything at your fingertips

- EVERYTHING is connected
- Simple end-to-end connectivity to all devices
- One web to rule them all
- No burden of legacy
EVERYTHING Is Connected

How users might see this:

- Same view, no matter where you are
  Global reachability for your devices
  For some applications, this is really important

- Devices and networks are invisible

- The same user interface for everything

- Tomorrow’s Internet is not the same as today’s
Proof That EVERYTHING Can Be Connected

Smart Igloos

Ari Keränen
Is the igloo melting?
En tykkääkään · Kommentoi · Näytä kaverisivu · 19 tuntia sitten lähellä paikkaa Grindelwald, Bern

👍 Sinä tykkääät tästä.

House Arkko Snow No.
19 tuntia sitten · Tykkää · 2

House Arkko Snow
Whopping +25 C in the sleeping bag. Are you having a party?
Tykkää · Kommentoi · Jaa · 17 tuntia sitten via House Arkko App

House Arkko Snow
Igloo is really warming up inside, +5 wow
Tykkää · Kommentoi · Älä seuraa julkaisua · Jaa · 4 tuntia sitten via House Arkko App

Ari Keränen Full igloo info, please
2 tuntia sitten · Tykkää

House Arkko Snow
Outside temperature is 1.19 C, inside high 3.56 C and low 3.56 C. Wall temperature in the middle and low is 0.94 C and 0.62 C higher up. Outer part of the wall is at 0.62 C, inner part is at 0.62 C. Sleeping bag is at 0.62 C.
2 tuntia sitten · Tykkää

Kirjoita kommentti...
Smart Energy

Smart energy is about energy conservation with better appliances, more information, and coordination.

Countless organisations work on this around the world.
And They Got It All Wrong
THIS Is Smart Energy

Heater that pays your electricity bill?

Heating device - a resistor that converts electricity into heat

Computing device – does some useful work *and* converts electricity into heat

Bitcoin mining, etc
Simple End-to-End Connectivity

The dream: it just all works

No matter how many boxes you have
And how you connect them

- Networks shall have address space
- Routers shall know where to send packets
- Names resolve to addresses
- Human touch is NOT required
Zero-Configuring Homes
IETF HOMETNET WG

- Use existing tools (DHCP PD, RAs, OSPF)
- “Route where you had NAT44” architecture
- Add small enhancements where needed to ensure automatic self-configuration
  - Automatically turning routing on
  - Prefix discovery and assignment
  - DNS discovery and MDNS across the home
# A HOMENET Network

- **Prefix**
- **Router ID**
- **NAT64 config**
- **DNS discovery**
- **RA & PIO**

```bash
core@newrouter:/tmp# cat /etc/hord/events
Selected own router ID: 16.101.110.86
Automatically assigned a prefix to an interface on interface eth1: 2001:db8:beef:ddd6::/64
Added a new neighbor on interface eth1: 49.66.233.220
Received a valid DD message from neighbor with sequence number on interface eth1: 49.66.233.220
Neighbor moves to EXSTART state on interface eth1: 49.66.233.220
DD sequence number to a neighbor initialized on interface eth1: 1008170920
Tentatively selecting ourselves as the master for the neighbor on interface eth1: 49.66.233.220
New DD message sent with sequence number, in response to a sequence number on interface eth1: 1008170920
This router becomes a slave to the following peer on interface eth1: 49.66.233.220
Negotiation done, moving to state EXCHANGE with neighbor on interface eth1: 49.66.233.220
```

```bash
root@nat64:/tmp# host -t aaaa www.slashdot.org
Address: 2001:14b8:400::f3c:21a:9fff:fe0b:011
www.slashdot.org has IPv6 address 2001:14b8:400::f3c:21a:9fff:fe0b:011
```

```bash
root@nat64:/tmp# cat /etc/nat64.conf

```
Some Early Experiences

- First implementation one year ago
- Now there are multiple implementations, open source, interop tests, IETF demos, …
- Future? A bright future would be to have this become part of usual home router software
One Web to Rule Them All

Experiences from Implementing and Using the Internet of Things
Some Experiences

- Legacy devices are moving to an all-IP model
- It is important to reach interoperability at all layers; formats and web interfaces are very important too, not just IP
- The key is general purpose technology (3G, WLAN, web)
- Web tools is the way the market is going

**Benefits**
- cost efficient devices
- large developer community
- new roles in the value network

**Transformation**
- multi-purpose devices
- web paradigm
- apps migrate to cloud
No Burden of Legacy
Integrating and Ignoring Legacy
Power of web tools, IPv6, and CoAP:
Make it look like a resource
Instant interoperability
Instant global access
Case IPv4 Legacy

Without IPv4 for 3 years

I was able to do all my work and entertainment

We did this for testing an early NAT64 device, eating our own dogfood, and to prepare the way for others

Considerable progress in 3 years; but still some pain points today
Summary

- You can connect everything
- The network can configure itself completely
- If there is legacy, don't keep it around – isolate it somewhere, and build your new network right
  - Do not build everything to the IPv4 blueprint
- Make everything speak the web and you can build wonderful things easily