Extreme IPv6 Networking at Home

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Background

This talk is about IPv6, but

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

- But it IS about IPv6 networks at home
- And about the cool things you can do with IPv6
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
How a User Might See This

All the familiar tools
Same view, no matter where you are
Devices and networks are invisible
Proof That EVERYTHING Can Be Connected

Ari Keränen
Is the igloo melting?
En tykkääään · Kommentoi · Näytä kaverisivu · 19 tuntia sitten lähellä paikkaa Grindelwald, Bern
👍 Sinä tykkääät täästä.
House Arkko Snow
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...
The Dream – It Just 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
  [Especially by my mother!]
Zero-Configuration
Implementing and Using HOMENET
Zero-Configuring Homes per IETF HOMENET 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
OSPFv3-Based Home Networking

ISP interface
- IPv6 forwarding
- DHCPv6 PD

Guest segment

Private segment

DNS discovery for
- Finding servers (or starting)
- Informing hosts

Home GW

OSPF extensions for
- Defaults
- Router ID autoconfig
- Prefix assignment

WLAN segment

Home automation segment

R
A HOMENET Network

Router ID
Prefix
NAT64 config
RA & PIO
DNS discovery
Some Early Experiences from Zero-Configuration

- The technology seems to work as intended
- Also enables many new things
- Our understanding of the problems developed as the work continued
- Relatively easy to implement
  (If you are not crazy enough to implement OSPFv3 from scratch)
- Interfaces to other systems
Connecting Everything

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

Benefits
- Cost efficient devices
- Large developer community
- New roles in the value network

Transformation
- Multi-purpose devices
- Web paradigm
- Apps migrate to cloud
The Right Way to Deploy the Internet of Things

- The key is general-purpose technology
- We need more general-purpose link-layers, more web technology, more standard switches, routers, and servers
- My cat6 network has been tremendously flexible resource
- Now we will see the same with my Ethernet & IPv6 networks and various web tools in the cloud
Recommended Technologies

- WLAN, 2G/3G/4G, Ethernet, BT – easy to deploy, widely supported, coverage
- REST over HTTP or COAP – universal connectivity with REST-based interfaces
- JSON, SenML, XML – easily processed formats
- General-purpose tiny computers and OSes; CPUs instead of logic
The Power of Web Tools – Example
Connecting my sensors to tools in the Internet, with IPv6 and CoAP
Also using OSPFv3, HOMENET, resource directories, and 1-Wire
1-Wire Sensors on the IPv6 Internet

Feel free to try COAP to these addresses, e.g., kitchen.objez.net
Avoiding Legacy Using NAT64
IPv6-Only Networking

Without IPv4 for 2.5 years now – happy
We did this for testing our (then) early product, eating our own dogfood, and to prepare the way for others

Three sites were involved:
› ER NomadicLab, my home, mobile
Experiences (RFC 6586)

The bottom line:

› IPv6-only was possible; I did not have to go back
› Some pain was involved
› Some things do break
   – Lack of IPv6 support and previously unseen bugs
   – Some users went back to dual stack due to Skype
   – Key is is true IPv6 support, not so much NAT64

Plenty of effort in the world in last two years to improve the situation
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