



Services in Wireless IPv6 Networks

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Introduction

- A new Internet Protocol (IPv6) has been proposed. It is supposed to fix limitations that are present in currently used IPv4
- The new protocol has faced criticism. Some think that the problems can be worked out more cost effectively by patching old IPv4 and some do not see new features beneficial
- 6WINIT project intends to validate IPv6 concepts and technologies in real wireless networks
- 6WINIT hypothesis is that IPv6 is beneficial

Why IPv6?

- IPv4 was designed in the late 1970's. So far all of the critical problems have been worked out. In the 21st century new challenges emerge:
 - new Internet users
 - wireless and mobile users
 - less developed world
 - autonomous and intelligent devices
 - new ways of using Internet
 - peer-to-peer communication
 - always-on connections (mobile devices, home networks)

⇒ more addresses and easier maintenance is needed
- IPv6 ⁽¹⁾ is evolution - not revolution - because it helps Internet to scale to new users and new services. It changes implementation details but the basic concepts remain the same.

1) IPv5 name was reserved for a protocol that does not belong to IP family.

IPv6 Benefits

- Enough global addresses for every device
 - no need for address translations that create additional complexity, make connections to local networks difficult and break some protocols
 - addresses can be configured automatically, without specific infrastructure
- New, cleaner design
 - routing hierarchy
 - mobility (Mobile IPv6 has simpler and more effective architecture than Mobile IPv4)
 - security (IPSec mandatory - in theory)
 - redesigned protocol header

6WINIT Project (IPv6 Wireless Internet Initiative)



- EU project validating the new mobile wireless Internet
 - GPRS ¹⁾, UMTS, WLAN, Bluetooth networks
 - more bandwidth
 - IP Protocol version 6 (IPv6)
 - address space, automatic configuration, mobility, quality of service, end-to-end security
- In practice, existing applications are ported to wireless Internet
 - Clinical health care applications
 - Generic applications
- Contributing development of relevant IPv6 components (software, routers, ...) and standards
- 17 partners from Europe and Asia: universities, research institutes, manufacturers (e.g. Ericsson) and operators (BTexact, T Nova and NTT)
- Two years (2001-2002), total budget 5,9 m€, 550 personmonths

¹⁾ GPRS = General Packet Radio Service

VTT's IPv6 Enabled Applications in 6WINIT

- Weather Station
 - embedded IPv6 server
- Positioning/navigation application
 - helps people to navigate (a map service)
 - WLAN-positioning indoors and GPS satellite positioning outdoors
- Home environment
 - all equipment at home can be controlled with one "remote control" (e.g. handheld computer or speech recognition)

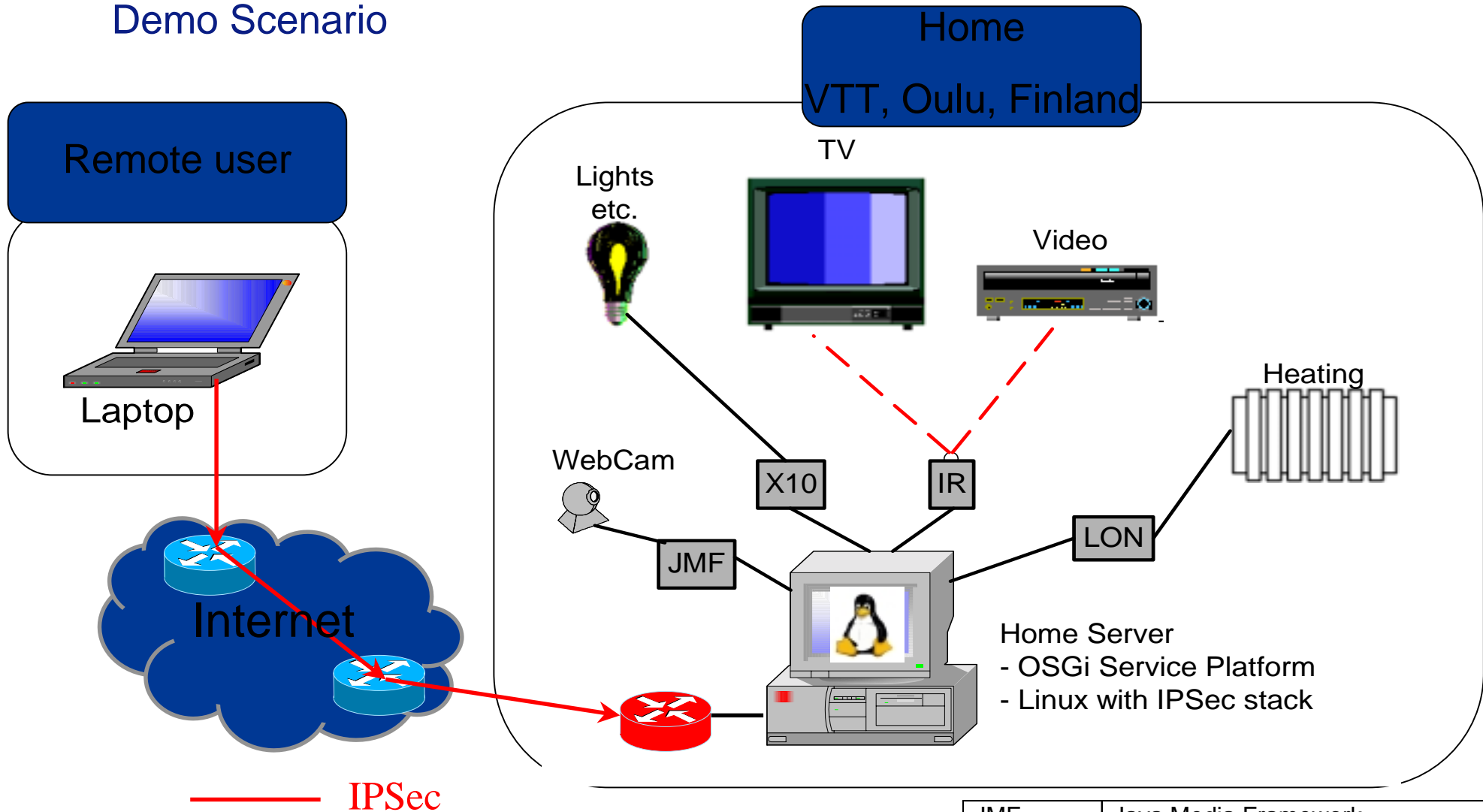


Applications have been presented at IST 2001 ja INET 2002 conferences.
The weather station is available on-line at <http://weather.willab.fi/>.

Home Environment Demo

- Control home devices (originally made in Interactive Intelligent Electronics (IIE) strategic research programme)
- Various possible controllable devices:
 - TV, video, lighting, heating, coffee maker, sauna, etc.
- All devices can be controlled using the same device and user interface
 - handheld computer, laptop, speech control, PC, etc.
- Remote access: control home devices wherever you are
- Location awareness: control those devices which are close to you
- Shows some real IPv6 benefits
 - Extensive address space: more devices to internet
 - Remote access needs at least one public IP address for every home

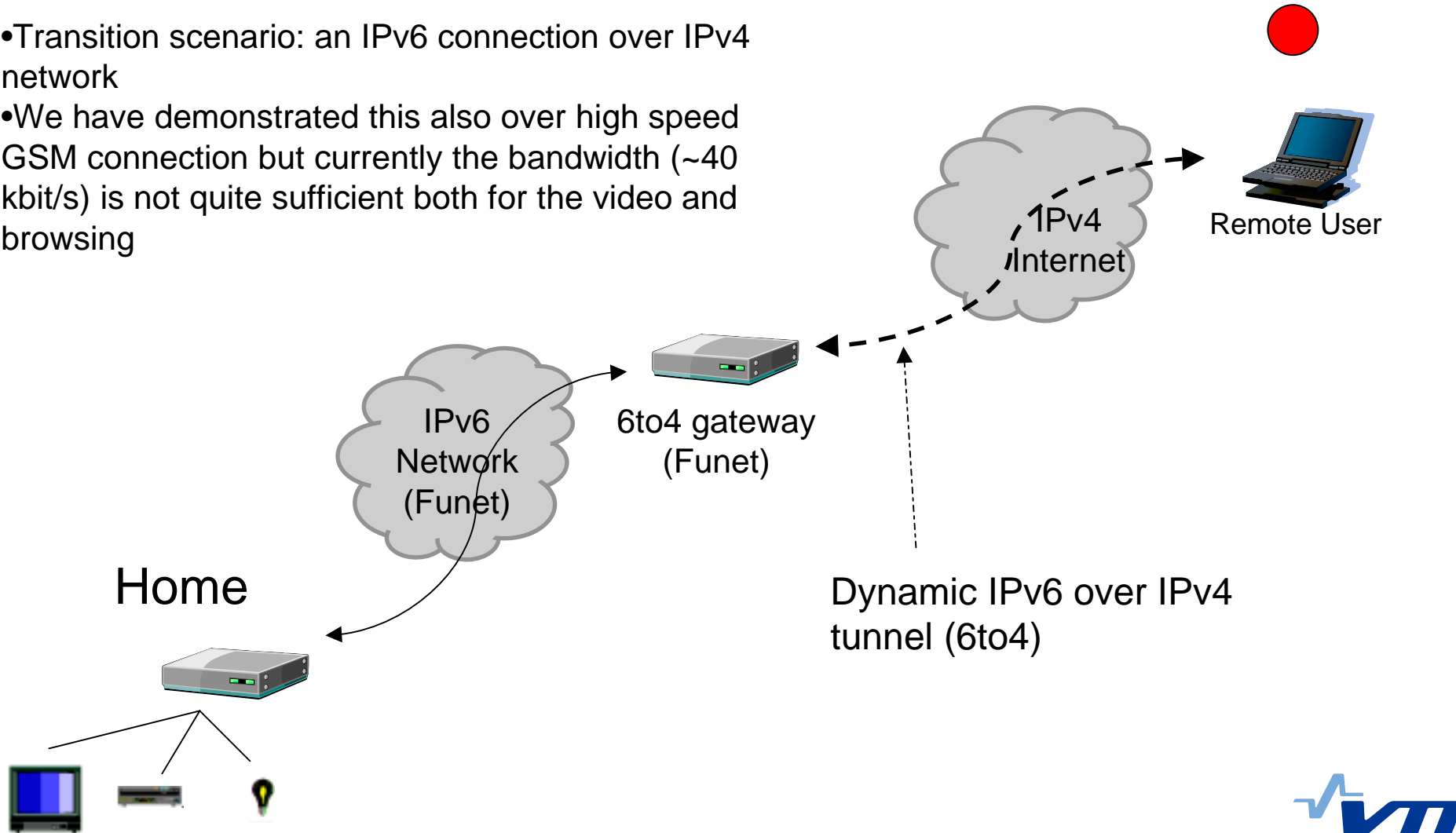
Demo Scenario



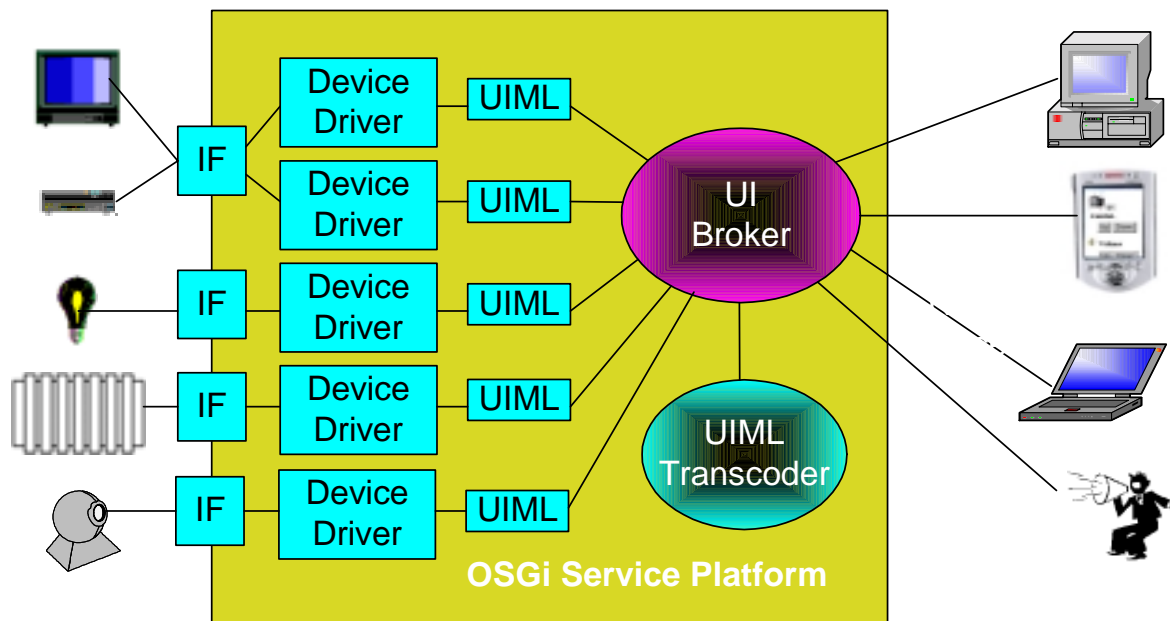
JMF	Java Media Framework
IR	Infrared
LON	Local Operating Network
OSGi	Open Services Gateway Initiative
X10	Powerline carrier protocol

Demo Network

- Transition scenario: an IPv6 connection over IPv4 network
- We have demonstrated this also over high speed GSM connection but currently the bandwidth (~40 kbit/s) is not quite sufficient both for the video and browsing



Home Server Architecture



IF	Interface
OSGi	Open Services Gateway Initiative
UI	User Interface
UIML	User Interface Markup Language

IPv6 Status

- IPv6 protocol was standardised in the 1990's. Some parts (e.g. Mobile IPv6) are still open.
- The state of IPv6 implementations is quite good as far as network equipment (e.g. routers) and open source software are concerned. Windows has support, but it is not comprehensive.
 - we have noticed that lots of porting and testing is still needed
- Transition phase is needed
 - users will not notice the change (in the short term), but it puts network maintenance and software developers to work (migration policy needs to be developed, routers and operating systems need to be upgraded and software applications may need modifications)
 - two protocols need to be supported simultaneously during the transition phase (cf. Euro and Y2K cases)

Who Will Deploy IPv6?

- Research world
 - IPv6 is a good tool for networking research (e.g. mobility and new services): the protocol is extensible and there is no need to work around address translators, for example
- Controlled, commercial deployment
 - wireless manufactures and operators will use it in UMTS and GPRS?
 - countries that run out of IPv4 addresses (Asia, Africa, Europe)?
- Anarchistic deployment
 - enthusiastic hackers will deploy it at home?

Conclusions

- 6WINIT project validates the the new mobile wireless Internet
 - ⇒ In general, the progress has been slower than expected. Especially the operators have not been able to provide the required facilities.
- GPRS, UMTS, WLAN, Bluetooth
 - ⇒ the project expects to test UMTS access later this year (2002)
 - ⇒ IPv6 access from GPRS is difficult due to address translators
- IP Protocol version 6 (IPv6)
 - ⇒ IPv6 has some real benefits mainly due to addressing issues
 - ⇒ there is still implementation work to be done before IPv6 is ready for large scale deployment in production environments

More Information

- Huitema, C. (1998). IPv6 - The New Internet Protocol. Prentice Hall.
- Waddington, D.G. & Chang F. (2002). Realizing the transition to IPv6. IEEE Communications Magazine, Vol. 40 Issue 6, June 2002.
- Leiner, B., Cerf, V., Clark, D., Kahn, R., Kleinrock, L., Lynch, D., Postel, J., Roberts, L. & Wolff, S. (2000). A Brief History of the Internet. Version 3.31, <http://www.isoc.org/internet/history/brief.shtml>
- 6WINIT homepages, <http://www.6winit.org/>
- 6WINIT at VTT homepages, <http://www.vtt.fi/ele/research/els/projects/6winit.html>