

**Tutor: Jari Kleimola**

## **Topic 1: Zeroconf (Bonjour)**

Zeroconf is a collection of open IETF standards providing automatic IP networking configuration and service discovery. It is especially well suited for (small) home networks connecting domestic devices. Bonjour is Apple's implementation of Zeroconf, and there are versions also for Windows and Linux, which makes it an important cross-platform middleware architecture. In the paper, one might consider items such as:

- What are the key parts of Zeroconf, and how does it work?
- What kind of implementations are available for Mac, Windows and Linux?
- What kind of networked home appliances/applications are there employing Bonjour connectivity?
- Choose and examine one DNS SRV service type relating to home networking scenario. For example, you might investigate how iTunes employs Bonjour (DAAP/DACP) to distribute AV content around the house.
- Compare Bonjour to UPnP in terms of addressing and discovery. It is also possible to make an in-depth comparison, which is enough for the paper (no need to include items above).

Some links:

<http://www.zeroconf.org> (IETF WG)

<http://developer.apple.com/networking/bonjour/index.html>

<http://www.oreillynet.com/pub/a/wireless/2002/12/20/zeroconf.html>

<http://www.upnp.org>

## **Topic 2: Middlewares for home monitoring and control**

Increasing number of homes have networked monitoring and (automated) control of appliances for heating, ventilation and air conditioning, water, electricity and lighting, white goods and security. Currently, there are a lot of competing solutions resulting incompatibility problems that can be addressed using protocol converters or bridges. For example, the OSGi framework has been utilized in solving the incompatibility issues.

- What are the most important protocols and their underlying networking technologies? The focus should naturally be on IP-based systems, but non-IP solutions should be briefly discussed as well.
- What kind of protocol converters and bridges are available?
- Is there converging middleware to fuse out incompatibilities?
- OSGi bundles for home automation

Some links:

[http://www.oasis-open.org/committees/tc\\_home.php?wg\\_abbrev=obix](http://www.oasis-open.org/committees/tc_home.php?wg_abbrev=obix)

<http://www.caba.org/index.html>

<http://www.osgi.org/>

### **Topic 3: Remote User Interfaces for Home Devices**

Current home appliances (like AV equipment) are already full of features, and their capabilities are likely to be further expanded when technologies develop and converge. The downside of this trend is that the devices are difficult to operate using tiny front panel controls and few lines of alphanumeric display space. Networking makes it possible to tear off native device user interfaces, and remote them in a device that is more suitable for interaction (e.g., computers, PDAs or mobile phones). Compare available remote UI protocols and technologies.

Some links:

<http://www.ietf.org/html.charters/widex-charter.html>

<http://www.upnp.org/standardizeddcp/remoteui.asp>

remoting protocols : HTTP/XHTML, Web4CE, Microsoft RDP, AT&T VNC, Nokia LRDP, Samsung XHT, Siemens SGXML, Philips UIF

### **Topic 4: CE Platforms for Running Distributed Software Components (survey)**

Home networks do not necessarily have a PC to serve as the application platform. However, some connected devices are quite capable of running distributed system components, even those developed by third party suppliers or educated user communities. Depending on the role of the host device and its revealed API, different kinds of functionality can be achieved. Observe device families in home network which are capable of acting as hosts (like STBs, Digital Media Adapters, NAS, router/gateways, media centers, gaming systems, etc.), and try to find what special possibilities they offer for extensions (for example, media streamers might allow content adaptation, STBs may allow OSD on top of video). What kind of programming languages bind the APIs? Where to get the SDKs? Is there an operating system embedded in the host (e.g., Linux, WinCE), is the system completely open source or semi-open with restricted API set, etc.

Some links:

[http://wiki.neurostechnology.com/index.php/Neuros\\_OSD](http://wiki.neurostechnology.com/index.php/Neuros_OSD)

<http://developer.motorola.com/products/settops/>

[http://www.hauppauge.com/pages/products/data\\_mediamvp.html](http://www.hauppauge.com/pages/products/data_mediamvp.html)

<http://support.fujitsu-siemens.com/com/support/downloads.html> (ACTIVY Media Center/Server/Player source code)

<http://msdn.microsoft.com/library/default.asp?url=/library/en-us/wceintro5/html/wce50oriWelcomeToWindowsCE.asp>

<http://blog.mediacentersandbox.com/PermaLink,guid,817c2b05-2a9e-47ac-80c9-1c4db5b26c18.aspx>