Combining OSGi™ Technology and Web Services to realize the Plug-n-Play Dream in the Home Network

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Summary

• Application design in the home network
  • The technical challenges of the home network
  • Home Plug-n-Play technologies today

• The OSGi™ platform for plug-n-play services
  • A platform-centric vision
  • Handling distribution and heterogeneity: OSGi™ Device Access chapter

• Designing a DPWS Base Driver
  • Devices Profile for Web Services (DPWS)
  • Architecture and design patterns
  • Roadmap
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Application design in the Home Network
The home network
Home Plug-n-Play technologies today

- UPnP™: Multimedia and IP connectivity markets
- Apple Bonjour: Multimedia market (iPod, iTV, …)
- IGRS: Multimedia on the Chinese Market

- DPWS
  - Devices Profile for Web Services, initially meant to be UPnP™ v2
  - Pushed by Microsoft with Vista OS
  - Home and industrial automation markets
    - Legrand, Schneider Electric, etc.
    - Ricoh, Lexmark, Canon, etc. participation in the specification process
    - Printer and Scanner profiles delivered by Microsoft

- Has-beens: SLP, Jini, Salutation, etc.
The OSGi™ platform for plug-n-play services
A platform centric vision

Platform

Provided and required qualified features

Local and remote Discovery / Communication Middleware

Standard devices and sensors

Platform

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Service proxies populating the registry

Required service
Provided service
Reaction on service event

Generic Service
(e.g. UPnP Service)

Specific Service
(e.g. Media Server)

Discovery Base Driver

Refined Driver

Service Registry

Platform

Service Event Bus

Provided services
3

Designing a DPWS Base Driver
Devices Profile for Web Services (DPWS)

- Generic homogeneous specification
  - SOAP 1.2 as the base layer
  - WSDL description language
  - ws-* technologies (ws-discovery, etc.)

- Built upon UPnP™ experience
  - Lower network traffic
  - Richer types
  - Scalable discovery: Discovery Proxy
  - Fine-grained eventing mechanisms

<table>
<thead>
<tr>
<th>WS-Discovery</th>
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| SOAP 1.2              | HTTP 1.1                     |
| WSDL 1.1, XML Schema  | TCP                          |
| UDP                   | IPv4/IPv6                    |

Devices Profile for Web Services (DPWS) protocol stack
Requirements

• Main technical use cases
  • Generic network control points
    • WSDL parsing needed
    • No need for export mechanisms
  • Specific application clients
    • No need for WSDL parsing
    • Metadata retrieval optionality
  • Exportation of specific DPWS services
    • No need for WSDL online generation

• Deliver a modular API and reference implementation
  • Full implementation for smart devices
  • Limited implementation for constrained devices
  • Specification open to various Java™-Web Services mappings
Architecture and design patterns

- **Architecture**
  - Build upon OSGi R4 services
  - Small core targeting highly constrained environments.
  - Optional modules for easier export and service description management.

- **Technical choices**
  - OSGi™ device access model
  - OSGi™ whiteboard design pattern
  - Symmetric API for import/export
  - Factory facilitating service export
  - Immediate/lazy networking possibilities
  - Immediate/lazy loading possibilities
Roadmap

- **DPWS Java™ stack delivered by Schneider Electric**
  - Since January 2007 (C stack delivered in 2006)
  - Open Source Licence: LGPL

- **OSGi discovery, communication and eventing bundles delivered by France Telecom**
  - Since March 2006
  - Open Source Licence: LGPL
  - Link [http://amigo.gforge.inria.fr/obr/v2/repository.xml](http://amigo.gforge.inria.fr/obr/v2/repository.xml)

- **RFP 86 DPWS Discovery Base Driver**
  - Accessible in the OSGi™ Alliance repository since May 7th, 2007

- **DPWS Base Driver specification under work**
  - RFC-like specification to be published Q3 2007

- **2 reference implementations of the DPWS Base Driver under work**
  - France Telecom's RI and Schneider Electric's RI to be published Q3 2007
Conclusion
Conclusion

- OSGi™technology facilitates home application development

- DPWS: another plug-n-play protocol middleware, aligned with Web Services

- Ready to fill your house with plug-n-play devices?
  ⇒ Beta-testers wanted
  ⇒ Specification experts wanted
Thanks

• ITEA ANSO project
  • Autonomic Networks for SOHO users
  • Partially supported by the French Ministry of Industry under the European ITEA program.
  • [http://www.itea-office.org/public/project_leaflets/ANSO_profile_oct-05.pdf](http://www.itea-office.org/public/project_leaflets/ANSO_profile_oct-05.pdf)

• IST Amigo Project
  • Ambient intelligence for the networked home environment
  • Partially supported by the European Union under the IST program
Appendix
Challenges of Web Services integration

• Problems faced with Web Services specifications
  • Ambiguity brought by specification novelty
  • Complexity brought by specification genericity
  • Extensibility demanded by specification extensibility
Web Services Specifications

- **WS-Addressing**: a SOAP extension for handling message addressing and routing in a transport-independent way
- **WS-Discovery**: a Web Services-based discovery protocol in unmanaged networks
- **WS-MetadataExchange**
- **WS-Eventing**: a Web Services-based publish/subscribe protocol
- **WS-Security**: a SOAP extension for securing message exchanges
Technical references


- OSGi™ Alliance, RFP 86 DPWS Discovery Base Driver, May 2007. Authors: André Bottaro, Anne Gérodolle, Sylvain Marié, Stéphane Seyvoz, Eric Simon

- OSGi™ Alliance, RFP 72 Extended Mapping for UPnP Discovery Transparency, April 2006. Author: André Bottaro.
Links

- OSGi™ Users' Group France
  - [http://france.osgiusers.org](http://france.osgiusers.org)

- Apache Felix Project
  - [http://incubator.apache.org/felix](http://incubator.apache.org/felix)

- France Telecom Group
  - [http://www.francetelecom.com](http://www.francetelecom.com)

- Schneider Electric
  - [www.schneider-electric.com](http://www.schneider-electric.com)