Developing Smart Home Systems by using OSGi and Plug Computers

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Introduction ProSyst

- ProSyst is a leading company for end-to-end embedded software and OSGi solutions
- Founded 1997 in Cologne, Germany
- OSGi member since its foundation in 1999
- 120+ engineers employed
ProSyst E2E Products

Device A
- ProSyst OSGi
- Java VM
- OS

Device B
- ProSyst OSGi
- Java VM
- OS

Backend
- Other Backend Systems (CRM, OSS, BSS, etc.)
  - ProSyst Remote Manager
  - SW Rep
  - Portal Server
  - J2EE App Server

Server & Storage Infrastructure

Developer PC
- ProSyst OSGi SDKs
- ProSyst Profiler

ProSyst OSGi Available for:
- Android
- Windows Mobile
- S60
- brew
- VxWorks
- CNX

Software
- SW Rep
- Portal Server
- J2EE App Server

Other Backend Systems
- CRM, OSS, BSS, etc.
Agenda

- Introduction OSGi
- Introduction Plug Computers
- OSGi Smart Home Architecture
- OSGi Smart Home SDK
- Live Demo with UPnP
- Conclusions
The OSGi Alliance is an independent non-profit corporation founded in 1999.

OSGi is a module system and service platform for the Java.

It defines also the life-cycle management of applications and components.

OSGi specification is currently used in various vertical areas such as residential, mobile, automotive, enterprise, etc.

More information at http://www.osgi.org
Technical Benefits of OSGi

- Portability of applications & services (Java)
- Dynamic discovery of services & APIs
- Modularization of the platform and apps
- Higher degree of code re-use
- Lots of off-the-shelf components available
- Platform, applications and services are remotely manageable: deployment, monitoring, diagnostics, lifecycle, configuration, etc.
Concept: Platform Openness

- **Traditional Concept**
  - Applications are limited to locked down set of APIs
  - No platform innovation possible

- **New Concept**
  - “Soft Platform”: New Features & APIs loadable at any time
  - Open for Operators and 3rd parties
  - Caters for rapid platform Innovation

[Diagram showing traditional and new concept with Preload/Postload Apps and APIs]
Manageable Units

Traditional Concept
- Postload Apps
  - Created by 3rd party
  - Managed by User
- OS + APIs + Preload Apps
  - Created by OEM
  - Firmware Updates
- Hardware

New Concept
- Postload Apps
  - Created by OEM, Operators or 3rd party
  - Managed by OEM, Operators, 3rd party or user
- Preload Apps
- APIs
- OS + Core APIs
- Hardware

- Coarse grained management model
- No platform innovation possible

- Fine grained management model
- Innovation possible on all levels
- Open for Operators and 3rd parties
Residential OSGi

- The residential area is currently one of the most promising application fields of OSGi because of:
  - There are several well synchronized specification efforts based on OSGi
  - Many useful services/protocols needed in residential boxes are well specified and implemented
  - SDKs and other convenient tools widely available
Plug Computers

- A plug computer is a small form factor network-attached server for use in the home. In effect, a plug computer is a network appliance that is fully enclosed in an AC power plug or AC adapter.
- Plug computers are equipped with hardware interfaces like USB 2.0, SD, Gigabit Network, JTAG mini USB, Bluetooth, Wi-Fi
- Software includes Linux, JVM and even OSGi
Plug Computers by Example
SheevaPlug

- **Manufacturer**: Marvell
- **Release date**: March 2009
- **Operating system**: Ubuntu
- **Power**: 2.3w idle no attached devices, 7.0w running at 100% CPU utilization
- **CPU**: 1.2 GHz ARM Marvell Kirkwood 88F6281
- **Storage capacity**: External hard drive/SDIO card/flash disk
- **Memory**: 512 MB SDRAM, 512 MB Flash
- **Connectivity**: USB 2.0, SD, Gigabit Network, JTAG mini USB
Plug Computers by Example
GuruPlug Server Plus

- Successor of SheevaPlug
- Add 2x Gb Ethernet, 2 x USB 2.0, 1x eSATA @ 3Gb/s SATAII, 1x MicroSD Slot
- Wi-Fi and Bluetooth support (using external dongle)
Benefits of Plug Computers

- Power consumption. - drawing under 5 Watts of power, this powerhouse can handle all your biggest tasks while still saving about 96% on energy costs when compared to the average 175 Watt desktop computer.
- Customization - you can customize your Plug to work in almost any industry - Home Automation, Security/Surveillance, Medical Monitoring, Industrial Automation, Smart Grid Electrical, Mesh and Grid Computing.
- Connectivity.
OSGi Smart Home Architecture
The E2E Management Picture

- Broadband Forum
  - Management Server (ACS)
    - TR-069
    - TR-098 (IGD)
    - PD-194
  - Portal(s)
- OSGi and HGI
  - Home Gateway (CPE)
- UPnP
Using OSGi as EE in Home Gateways

Execution Environment

- Home Monitoring
- Home Control
- Multimedia Apps
- Energy Management
- Standard OSGi Services
- Management Agent
- Multimedia Services (DLNA)
- HG Admin
- Home Control and Automation

Applications not running in the EE

System Services

EE Integration

Java VM

OS (Linux)
mBS SH SDK is a collection of convenient tools for deployment and management of OSGi-compliant bundles on OSGi Runtimes straight from within the Eclipse Workbench.

Developers can use a set of Eclipse plug-ins to perform the following tasks:

- Model and build OSGi Runtime images that best fit the requirements of the target device platform.
- Debug or profile a remote OSGi Runtime in order to test its performance or the behavior of specific bundles being developed.
package my.osgi.bundle;

import org.osgi.framework.BundleActivator;

public class Activator implements BundleActivator {

  /*
   * (non-Javadoc)
   * @see org.osgi.framework.BundleActivator#start(org.osgi.framework.BundleContext)
   */
  public void start(BundleContext context) throws Exception {
    System.out.println("Hello World!!!");
  }

  /*
   * (non-Javadoc)
   * @see org.osgi.framework.BundleActivator#stop(org.osgi.framework.BundleContext)
   */
  public void stop(BundleContext context) throws Exception {
  }
}
mBProfiler assists developers in improving the efficiency of applications. It is focused on testing and exploring different aspects of the performance of a Java program, associated with JVM’s consumption of the available platform resources (CPU, memory and threads).
mBS SH SDK Specific Plug-ins

- **J9 JRE Plug-in** – Installs in Eclipse a J9 2.4 JVM fully compliant with the J2ME CDC Personal Profile 1.1
- **Target Platforms Store** - Adds to the Eclipse PDE a bunch of target platforms holding the APIs and services available in the OSGi Runtime.
- **Target Image Descriptors** – Represent a set of pre-defined OSGi Runtime images containing the functional components for the most typical production use cases. Developers can use the image descriptors to generate a ready runtime and deploy it on devices or to design own images.
Live Demo with UPnP

- Demonstrate a simple OSGi service registered in UPnP network
- The service can be personalized
- Demo can be debugged and profiled directly on the device
The Add-on contains everything that is needed to get an OSGi-based setup started.

It includes:
- OSGi Framework
- JVM
- Development tools
- Useful demo applications running on top of the OSGi layer.

The Add-on is supplied on a SD-card (fits into card slot of SheevaPlug)

Source: http://www.globalscaletechnologies.com
Conclusions

OSGi and Plug Computers fits perfectly for use in Smart Home solutions

The existing OSGi based COTS products can accelerate and facilitate the development of residential products enormously

ProSyst offers ready OSGi runtimes for many hardware platforms including Plug Computers

ProSyst provides SDKs for box manufactures, system integrators, operators and application developers

For more info visit: http://www.prosyst.com
Thanks!

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