Smart-M3 based applications

Petri Liuha - Nokia Research Center

10th FRUCT conference, Tampere Nov 11th, 2011
SOFIA Motivation and rationale

Main goal of the SOFIA project is to make "information" in the physical world available for smart services - connecting physical world with information world.

Full access to information present in the embedded computing devices has a potential for large impact on the daily lives of people living in this environment.
SOFIA Consortium

Industries and applications

• Mobile devices
• Automotive
• Home entertainment
• Wearable computers
• Building maintenance
• Large IT
• Video surveillance
• Lighting systems
• Emergency support systems
• WSNs
SOFIA - Sharing information locally

What if I know that he is answering the call? Should I turn the sound off? Automatically?

What if I know that he can not hear the incoming call? Should I flash lights? Automatically?

What if I know that music is loud in the room? Could I alarm louder? Use vibration? Automatically?

**SOFIA** platform makes it possible to mash-up and integrate information between all applications and domains spanning from embedded domains to the Web.
Smart-M3 functional architecture

Knowledge processor

Local information storage with RDF-store and information governance functionality

Semantic information broker

Device with embedded system

Application logic and interface supporting the use of common use case ontology and access to information broker

Knowledge processor

Access protocol (SSAP), with basic operations, e.g. join, leave, insert, remove, subscribe. Etc.

Common ontology models for use cases as information interoperability enabler

Smart-M3 is available as open source
Smart-M3 functional architecture

Semantic information broker

Legacy Application Platform

New Application Platform

Application

SIB - Local information storage with RDF-store and information governance functionality

KP - Application logic and interface supporting the use of common data and access to information broker

Device

System
4 European countries
All project domains represented
6 cross-domain pilots
Initial Dissemination plans for pilots defined

**SUM-SS - Oulu, Finland**
SUM-SS will demonstrate seamless usage of the smart spaces including a personal space, a smart home and a smart city. The last two will collaborate with the services provided in a cloud through the Cam4Home Open Platform.

**Smart Building Maintenance**
Bologna, Italy
A large office complex of three buildings will be equipped with multiple devices and technologies able to make the indoor spaces smart. A Facility company will “Smartify” relevant indoor spaces, building component and equipment.

**Smart Video-surveillance**
Bologna, Italy
The UMVS Monitoring Station will prompt subway operators of abandoned bags through the system, taking quick decisions on evacuation procedures & guiding the public through optimal exits, external security teams can interact with the system.

**Smart Home**
Eindhoven, Netherlands
In order to generate a Smart Space within a home environment different devices will seamlessly work with one another by exchanging relevant information through the semantic information broker.

**Virtual Wall**
Virtual Graffiti demonstrates user generated content and smart information services for users in various public environments. Have personal content and official information, get instant and up-to-date information, relevant on user’s locational context.

**Virtual Wall**
This service will allow transport users with a mobile device to visualize virtual notes published, download native information provided by the company or municipality and generate and publish virtual notes at the bus stop.

**Smart Maintenance on the move**
Bologna, Italy
End users will experience the improvement on the operative procedures and the overall business of a Global service in a smart indoor space with the use of multivendor mobile devices, wireless sensor networks and different Embedded Systems.

**Media Follows User**
Bologna, Italy
Mobile users will be able to seamlessly consume a particular media from different devices while moving around between different locations and use the most optimal resources of each personal environment.
Car-to-mobile: Media Follows User
<video>
Smart Building Maintenance

- Office tenants are alerted via SMS on their office status due to maintenance activities.
- The maintenance company monitors the building status and supervises maintenance activities.
- A mobile device is used to “smartify” the physical space.
- RFID tags are used to identify spaces, building elements, and sensors.
- Maintenance operators are notified for an intervention request and can accept to take it in charge.
- Maintenance operators are supported by wearable devices during on-site interventions.
- Smart Lights provide their status information and react to changes in the environment.
- LumenActive displays dynamic information for visitors.
- Wireless sensor networks (WSN) provide environment parameters, such as temperature, humidity, and water presence.
Mash-up: Smart Maintenance on the move
Virtual Wall, Virtual Graffiti
Smart home
<video>
Bling!

A great idea involving two programmable devices that need to share information!

Create a common ontology model for your use case (or preferably take an existing one)

Write Knowledge Processors using the same ontology

Use Smart-M3 for sharing the information and create “The Bling!”

SOFIA ADK or Native ADK for target device

Smart-M3 knowledge processor

M3-SIB Open Source

Smart-M3 knowledge processor
SOFIA ADK Approach

Hide ontology complexity to developers, transforming ontologies into model APIs.

Developers are only focus on the logic, not in communications, discovery, or semantics.

- Ontological representation
- SIB proxy
- TCP/IP, BT, etc. connector

<table>
<thead>
<tr>
<th>Logic</th>
<th>Knowledge Processor (KP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>Knowledge Processor Interface (KPI)</td>
</tr>
<tr>
<td>SSAP</td>
<td>TCP/IP, BT, etc. connector</td>
</tr>
<tr>
<td>Connectors</td>
<td>SIB proxy</td>
</tr>
</tbody>
</table>

Done by developers

Provided by the ADK
Community

Open Source
We do not want to wall up the technology. All the results coming from this community are open source. Collaborate, and help us improving our results.

Multi-Domain
The aim of the project is to be useful for any domain, so if your domain is not already included, propose new ones. The more the merrier results.

Multi-Platform
Are you programming for Windows, Linux, Android, iOS, TinyOS? Probably your platform is already targeted in the project. If not, please collaborate to include yours.

Multi-Language
We are developing in several programming languages: C, C++, C#, J2SE, J2ME for several platforms. We would like to have an implementation of SOFIA for each one.

Communication Agnostic
Whether your device communicates by Bluetooth, ZigBee, tcp/ip, etc, it is not an issue. The project is flexible to include new ones as plugins.

Smart Engineering/tooling
One of ours goals is to develop better and faster. We are developing a SDK with several tools which help you reduce the time-to-market dramatically.
Web Portal

1. Projects
2. Blog
3. Forum
4. Survey
5. Registry
6. Sofia applications catalog

www.sofia-community.org
www.sofia-project.eu

petri.liuha@nokia.com