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Semantic Information Broker for Smart Spaces: Value Offering Deployment Options

Kick-off talk for FRUCT Smart Spaces & IoT WG meeting

18th FRUCT Conference

April 22, 2016, Saint-Petersburg, Russia

Smart-M3 Semantic Information Broker (SIB)

- The first official **Smart-M3 SIB** (Honkola, Laine, Brown, and Tyrkkö, IEEE Symp. on Computers and Communications, 2010)
- **RedSIB**: an optimized Smart-M3 SIB (Morandi, Roffia, D'Elia, Vergari, and Cinotti, FRUCT12 Conference, 2012)
- **CuteSIB**: a reengineered RedSIB to support extensibility, dependability, and portability (Galov, Lomov, and Korzun, FRUCT17 Conference, 2015)
- **pySIB**: a modular lightweight implementation for Python (Viola, D'Elia, Roffia, and Cinotti, FRUCT18 Conference, 2016), https://github.com/desmovalvo/pysib

- **RIBS** for resource limited devices (Suomalainen, Hyttinen, and Tarvainen, European Conf. on Software Architecture, 2010)
- **OSGi SIB** for Java-based systems (Manzaroli, Roffia, Cinotti, Ovaska, Azzoni, Nannini, and Mattarozzi, IEEE Symp. on Computers and Communications, 2010)

Is SIB a service-oriented product?

Technically: SIB is an advanced SPARQL / RDF triplestore endpoint for cooperative work of many knowledge processors (KP)

- join, leave the M3 space
- insert, update, remove RDF triples in the M3 space
- subscribe to a certain information in the M3 space
- some other persistent queries to the M3 space
- background reasoning over the shared information

SIB is a technological solution for application developers, not a service-valued packaged product for end-users

- **Impossible:** deploy a SIB and the users start consume services
- The straightforward case **a service = one KP** is too simple to create smart services

SIB Deployment: Value Offering Options

Question: How to create an M3 space for a given problem?

Restriction: no complicated infrastructure of KPs to install and run on many devices (manually)

- Configuration options in dependence on a hosting computing environment (SIB host machine)
    1. A local machine in the WLAN (local environment)
    2. WLAN router (network control point is extended)
    3. Personal mobile computer (M3 space accompanies the user)
    4. Internet server (extension of the Internet/Web service approach)

- Augmented software to be deployed together with SIB
    1. Additional modules are built in SIB (knowledge reasoners)
    2. Additional KPs are packaged with SIB (running on the same machine)

SIB Host Machine: Deployment Options

SIB host	Possible service-oriented applications
Local machine	Created smart space is used to implement a service-oriented information system accessed within the corporate network. Candidates for the local host machine are not limited with traditional servers: a desktop, laptop, or even single-board computer (e.g., Raspberry Pi) can be used.
WLAN router	A particular case of the local machine option. Created smart space is used to implement digital services for end-users located in the room or some indoor area. A similar option can be used for small-sized outdoor areas. Note that other non-traditional computers can host a SIB, e.g., a media-projector.
Personal mobile computer	Created smart space is used to implement mobile services that accompany the end-user, exploiting the capacity of her/his smartphone or tablet. The option advances the standalone mobile application style by making the mobile computer a small local server (which can access external resources from the global Internet).
Internet server	Created smart space is used to implement ubiquitously accesses services, advancing the web-server style of digital service provision. Although the option supports creating a smart space not associated with a physical spatial-restricted place, the localization is typically revealed due to the limited set of participants (end-users, devices, or external services).

Service-valued package includes:

1) SIB and 2) some infrastructural KPs

Client Knowledge Processors (c-KP)
Service delivery: informational and control

Domain-specific Knowledge Processors (d-KP)
Information for limited use cases

General-purpose Knowledge Processors (g-KP)
Information useful for many services

Semantic Information Broker (SIB)
Maintenance of shared knowledge corpus

Software Infrastructure

Package for deployment