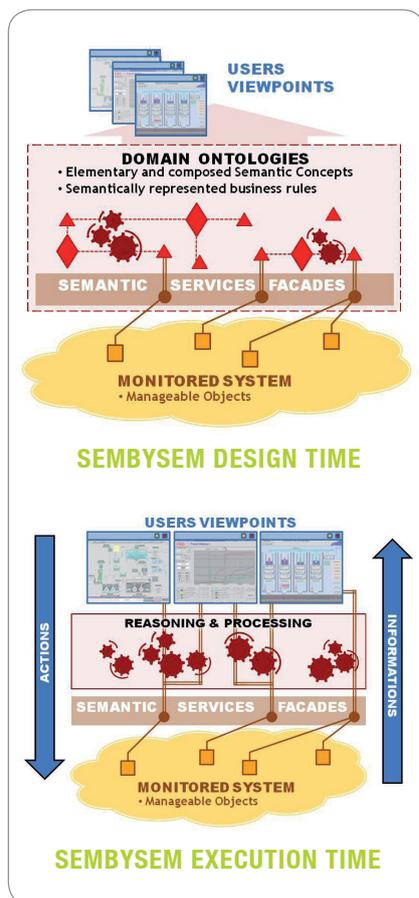


Project Results

Semantic approach to services management

Developing an effective method of systems monitoring and management in the Internet of Things

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With ever more objects able to provide information in the 'Internet of things', services management will be crucial. The ITEA 2 SEMbySEM project has developed a semantic approach providing dynamic representations of systems as semantically described synchronised views, offering simple and effective control. The core will be available as open-source software to promote domain-specific semantics for management of large systems. Commercial applications are developing in transport control, virtual manufacture and hypervision for building management systems.

There is a strong trend toward a world of sensors with everyday objects equipped with embedded data and communications capabilities in the Internet of things. In such a world, a semantic web offers a practical framework to provide ways to process the huge amount of data produced. From an end-user point of view, the information provided is only meaningful within the scope of some end-user activity, targeting a defined goal achievable through a dedicated scenario.

The goal of SEMbySEM was the development of generic software allowing aggregation of information from communicating objects – such as radio-frequency identification tags, industrial sensors, servers, simulated objects and devices – and applications such as video acquisition, supervision and computer-system monitoring in an ergonomic form enabling actions by the end-user on these objects and applications.

COHERENT OBJECTS

SEMBYSEM defined tools and standards for systems management as a coherent set of objects grounded in a semantic representation. This abstract view isolates the technical issues related to communications with the various sensors in a 'façade' layer and works directly on a semantic model of the system.

As the systems to be managed are intrinsically dynamic, a new semantic representation was needed to define the ontology and the business rules. The system needs not only to find out what information is available but also to decide on priorities. And the mechanism needs to be generic to address the situation where lots of objects can communicate and have to be controlled.

SEMBYSEM started with the management of computer systems with a summary of

SEMbySEM (ITEA 2 ~ 07021)

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Partners

AGMLab
ARC Informatique
CBT
CityPassenger
Datapixel
Identoi
Innovalia Association
LIG, University of Grenoble
LISSI, University Paris XII
LORIA/INRIA Lorraine
Oliotalo
Software Quality Systems (SQS)
Thales Communications
Thales Services
Trimek
VTT Technical Research Centre of Finland

Countries involved

Finland
France
Spain
Turkey

Project start

July 2008

Project end

December 2010

Contact

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Project website :

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Project Results

operations in terms of human goals. The resulting system can then manage the human need directly, not the technical issues.

ONTOLOGICAL APPROACH

To be certain that it was always possible to compute, SEMbySEM limited the capacity of the language being used to try and address all the possible problems. This resulted in a specific internal approach called Micro Concept using semantics to describe the systems in terms of an ontology so that it is not necessarily to change the vocabulary continuously.

This vocabulary is used to design a living model of the system which is fed at run time with events such as 'train started' and 'train stopped' in rail transport and all other activities that modify these properties. This live model of the system can then be queried before carrying out an action. The living dynamic reference of the system being managed is analogous with how the brain sees the body and controls its actions. SEMbySEM demonstrated that the semantic approach is the most appropriate and versatile way to describe concepts and rules, with the largest consensus on the terms and their meaning.

It lets different users define their business model in terms of concepts and rules and define their own representation. These concepts are then linked with their real counterpart to manage them by obtaining information from them and acting on them.

OPEN-SOURCE TOOL

SEMbySEM proved the efficiency of its approach in a series of demonstrators, including:

- Real-time localisation and tracking of locomotives and goods wagons in rail transport;
- Management of virtual metrology for metal car-panel production; and
- Centralised control of multiple building management systems in a single coherent supervisory control and data acquisition (SCADA) hypervision system.

The software will be published as open-source and the results are already being applied. Thales has demonstrated a systems application for a Spanish metro network. ARC Informatique will use the results in more dynamic generations of its SCADA systems. And Spanish partners will develop virtual metrology systems for the car industry.

Major project outcomes

DISSEMINATION

- 15 publications were provided by the different universities (INRIA Loria, LISSI, LIG Grenoble) and by THALES Services
- 9 presentations were made at conferences, in particular ESWC 2009, KEOD 2009, SCC2010, SEAMS 2011, RTSOAA 2011

EXPLOITATION

- THALES will use parts of these results in future Hypervision Tools
- ARC Informatique will use parts of these results in its SCADA product
- CityPassenger is using semantics results in some of its network appliances
- ICBT will incorporate results in its metrology systems

STANDARDISATION

- The project has been a real effective use case for multilingual standardisation within ISO's TC37 "Terminology and other language and content resources" / SC4 "Language Resources Management".
- Based on work done in SEMbySEM, the MLIF standard (ISO MLIF FDIS 24616 should become an International Standard in July 2011.

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■ ITEA 2 – Information Technology for European Advancement – is Europe's premier co-operative R&D programme driving pre-competitive research on embedded and distributed software-intensive systems and services. As a EUREKA strategic Cluster, we support co-ordinated national funding submissions and provide the link between those who provide finance, technology and software engineering. Our aim is to mobilise a total of 20,000 person-years over the full eight-year period of our programme from 2006 to 2013.

■ ITEA 2-labelled projects are industry-driven initiatives building vital middleware and preparing standards to lay the foundations for the next generation of products, systems, appliances and services. Our programme results in real product innovation that boosts European competitiveness in a wide range of industries. Specifically, we play a key role in crucial application domains where software dominates, such as aerospace, automotive, consumer electronics, healthcare/medical systems and telecommunications.

■ ITEA 2 projects involve complementary R&D from at least two companies in two countries. We issue annual Calls for Projects, evaluate projects and help bring research partners together. Our projects are open to partners from large industrial companies and small and medium-sized enterprises (SMEs) as well as public research institutes and universities.

