Framework for Service Composition Based on Ontologies for the Aggregation of Knowledge and Information for Intelligent Buildings (FCINT)

Sponsored by the European Fund for Regional Development and the Government of Romania

Project Highlights

The FCINT project, co-sponsored by the European Fund for Regional Development and Romania's Government (ID551, cod SMIS-CSNR 12038), is hosted by the Polytechnic University of Bucharest and directed by the U.S. Professor Wei-Tek Tsai from Arizona State University.

FCINT is in its fifth quarter of funded industrial research and experimental development. FCINT results to date have been reported quarterly to Romania's National Authority for Scientific Research and discussed in papers presented at the 18th International Conference on Control Systems and Computer Science (CSCS 18) held in Bucharest, Romania's capital city, between May 24th and 27th, 2011.

The CSCS 18 was co-sponsored by the Romanian Society of Control Engineering and Technical Informatics and was hosted by the Faculty of Automatic Control and Computers (FACC) at the Polytechnic University of Bucharest (PUB), which is the flagship of computer science education and academic research in Romania. The CSCS 18 organizing committee was co-chaired by PUB Professors Ioan Dumitrache, Dumitru Popescu, and Nicolae Tapus

The conference papers will be published in a volume by Elsevier.

Johnson Controls donated to the FCINT project the following devices: FX16 Master Controller, Temperature Sensor, CO_2 Sensor, and Humidity Sensor.

Abstracts of FCINT Papers

The CSCS 18 was attended by experts and university faculty from Europe and the United States.

Two of the FCINT-generated papers presented at the CSCS 18 received maximum scores. Revised versions have been submitted for publication.

Full-text copies of the FCINT papers may be requested directly from the authors.

A Service-Oriented Approach to Intelligent Building Management
By Wei-Tek Tsai, Serban Petrescu, Laurentiu Bucur, and Catalin Chera

The paper presents the design of an intelligent building management framework. The framework consists of a service-oriented device network, a simple controller that can interoperate with a variety of devices, platforms, and networks, and a server that allows users to design and compose control and policy services. Such a framework allows users to contribute information about policies, devices, and control services, and allows end users to compose control and policy services to be executed.

A Service-Oriented Controller for Intelligent Building Management
By Laurentiu Bucur, Wei-Tek Tsai, Serban Petrescu, Catalin Chera, and Florica Moldoveanu

The authors propose a controller that can work in a service-oriented device network to support intelligent building management. The controller is small, simple, and portable, and allows different software services and policies to be downloaded to perform different functions. Thus it achieves adaptive behavior in response to changing user requirements and/or environment. This design is unique as it can interoperate a variety of devices, platforms, and networks. The controller can be economically deployed to a variety of building environments with different policies and user preferences.

A Service Oriented Model for Building Control and Simulation
By Serban Petrescu and Catalin Chera

This paper features a service-oriented device network designed to support intelligent building management using DPWS and SODA. The network is compatible with existing standards for building control such as BACnet, LonWorks, and KNX. This design ensures a uniform and easy integration of devices in various applications. New devices, control services, and policy services can be published, discovered, composed, and executed in the proposed device network, and the information can be stored in an ontology system that is open for publishing and sharing. System security is ensured by sandboxing and simulation verification before service deployment in the network.

Software Architecture with Ontology for Intelligent Building Management
By Jay Elston, Wei-Tek Tsai, Wu Li, and Laurentiu Bucur

Ontology can be used as a part of software design to take the advantages of classification, semantic analysis and reasoning capabilities of an ontology tool. This paper proposes a service-oriented software architecture for intelligent building management where data are stored in an ontology tool. In this architecture, both software and ontology can evolve without affecting each other.

Modeling with Fluid Qualities

By Cristian Giumale, Lorina Negreanu, Alexandru Agache, Mihnea Muraru, Matei Popovici, and Ciprian Dobre

Current knowledge-based modelling languages have no acceptable mechanisms for working with time and the time-dependent properties of the described applications. Time-dependent aspects are usually represented using mechanisms for specifying static parameters of the described application, yielding complex models that are difficult to maintain, extend, and reason about. We argue that a modelling approach focused on the declarative and explicit specification of time dependencies is more suitable. We propose a modelling method based on fluid qualities, and a declarative language for building time-dependent models that can be efficiently processed. The language has similarities with CLIPS and Prolog, and has direct applications in areas centered on intelligent device control.

A Formal Approach to the Development of Service-Oriented Applications

By Lorina Negreanu, Cristian Giumale, Alexandru Agache, Mihnea Muraru, Matei Popovici, and Ciprian Dobre

The authors investigate the application of a formal approach for the development of trustworthy service-oriented applications. The approach consists of modelling the services using UML diagrams and then translating the diagrams into B specifications, suitable for proving the consistency of the model.

FCINT Info

FCINT project website: http://www.fcint.ro

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