# M E D E I A

## Model-Driven Embedded Systems Design Environment for the Industrial Automation Sector

***MEDEIA will methodically target, research and develop a formal framework supporting a new multi-domain modelling method to fulfil the increasing engineering needs in the industrial automation sector.***

### At A Glance: MEDEIA

***Model-Driven Embedded Systems Design Environment for the Industrial Automation Sector***

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University of Applied Sciences South Switzerland (Switzerland)
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Machining Centers Manufacturing S.p.A (Italy)
SCHUNK GmbH & Co. KG (Germany)
Electricité de France S.A (France)
O3NEIDA Europe (Belgium)

**Duration:** *36 months*

**Start:** 2008.01.01

**Total Cost:** € 2.84M

**EC Contribution:** € 2M

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**KEYWORDS: Automation components, behaviour and interface description, component based embedded systems design, model-driven architecture**

### Main Objectives

As the level of automation and system complexity in factories and plants increases steadily, system engineering becomes progressively more difficult and less-productive. A new approach to achieving high degrees of functionality through improved interoperability of subsystems is under way within MEDEIA.

***MEDEIA will focus on the development of a multi-domain model-driven embedded systems design approach for in the industrial automation sector.***

The focus of the MEDEIA project is on "automation objects" or "automation components" as the basis for developing a model-based embedded systems design environment. The MEDEIA project's objective is a radical improvement in productivity for the development of embedded control systems within the industrial automation sector.

The project goal of reducing system design time by 25% will be achieved through the systematic development of the following elements:

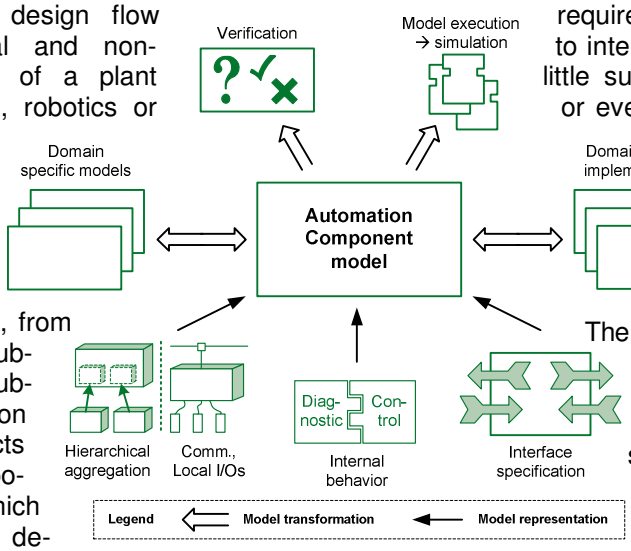
1. A formal framework for model-driven component-based development of embedded control
2. An easily – understandable modelling method designed for use by domain experts
3. An integrated modelling of diagnostics
4. The integrated simulation and verification of systems design
5. An automatic, embedded, and platform specific code-generation for the deployment of control software to heterogeneous automation hardware
6. A series of proof–of-concept demonstrations on real-world applications by project partners in the application domain of robotics, manufacturing, power generation and automatic packaging

The development of these elements will produce a pioneering methodology and a prototypical design and engineering framework for embedded system design, which will enable the industrial automation industry to reduce system design time and costs for the development of complex control systems.

## Technical Approach

The MEDEIA design methodology is based on the so-called Automation Components (ACs) which are in general a combination of embedded hard- & software. An AC contains the general model of its functionality and its interface for interacting with other components as depicted in the figure below.

The starting point of each engineering flow is the definition/specification of the system requirements. The MEDEIA design flow accepts the functional and non-functional specification of a plant (e.g. for manufacturing, robotics or power generation systems) as the initial starting point. The functional structure is realized through systems or components formed, in turn, from a combination of sub-systems and sub-sub-systems. This orientation to design reflects MEDEIA's strong compositional approach which greatly productivity in designing and building machines and plants from the mechanical/electrical point of view significantly.




In contrast to the functional structure of a plant, the state-of-the-art design process for the control system is usually not compliant with this point of view. Structures defined in embedded system disciplines like control hard- & software, as well as communication, are based rather on technical reasons as opposed to functional assignment.

The MEDEIA approach will close this gap between the mechanical/electrical engineering and the embedded control engineering approaches. The first step within the design flow is the specification of a rough plant architecture and ACs. Additionally, existing ACs or already available implementations of ACs can be included. By continuous refinement, adaptation to new requirements, splitting up to sub-problems/components and composition of ACs, the MEDEIA design flow becomes highly flexible and integrative at each level of the plant architecture. Independently of the current state of the specification of an AC, the AC model enables execution of the AC within a simulation framework. Therefore, simulation of AC models together with concrete implementations enables a new kind of hardware-in-the-loop execution: at any level of the plant architecture as well as for mixed up environments of existing and simulated ACs, the execution of parts of the system or the overall system will be possible. This feature results in much reduced development cycles, early testing and improved dependability of single components as well as of the overall plant.

## Key Issues

The current situation for the design of automation and control systems is characterized by a huge variety of different approaches in both, the specification and implementation of plants. When different end-users, each of whom has expressed their requirements in different forms, have to interact, there exists currently very little support in automated workflows or even in the interoperability of different software tools implementing the combined set of specifications defined in different forms.

The key issue of the MEDEIA approach for bridging the gap between the different users and their special way of specifying and implementing is to put a common element, the Automation Component, in between of the specification and implementation elements of a plant automation system implementation.

## Expected Impact

The MEDEIA method will support the automation industry to become more competitive by fostering new features that are seen by industry as vital for realisation and exploitation of innovative products within Europe. The proposed design method and formal framework allows a rapid design and engineering of advanced automation application solutions within a reasonable time and thus overcomes significant disadvantages of state-of-art approaches. This is crucial since pioneering high-tech products initially target premium-price sectors before reaching mass markets. Thus on a wider scope the project contributes strategically to innovations and leads to a more competitive industrial portfolio. In the 3-5 year range, the first products will appear that have been designed using the novel MEDEIA technology. First challenging fields of applications are likely to include:

- Manufacturing and production plants,
- Complex and advanced robotic systems,
- Power generation, distribution and supply systems, as well as
- Logistic systems.

MEDEIA technology from industrial partners will be developed for application in the fields above..