SOCRADES ROADMAP
The Future of SOA-based Factory Automation

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Production plays a vital role in economy and society, remaining fundamental to creating stable employment. The relevance of manufacturing in European economy is clear and widely accepted from heterogeneous stakeholders: business, policy-makers, and academic communities. In order to boost performances of European manufacturing companies, product and process technology innovation is more and more needed. Indeed, in order to maintain competitiveness, manufacturing companies cannot avoid considering appropriately technological innovation, especially in those markets where demand is extremely variable and where stakeholders are very demanding in terms of product performances and price but also in terms of environmental and societal impacts. In November 2008, the European Commission adopted a specific action, “Factories of the Future”, in the “European Economic Recovery Plan”, thus positioning the improvement in the use of technology in manufacturing as one of the priorities to increase Europe’s competitiveness in the short and long term. Once again, this confirms the important role of technological innovation in European manufacturing.

In this context Information and Communication Technologies (ICT) play an important role to boost performances of European manufacturing companies. SOCRADES (Service-Oriented Cross-layer infRAstructure for Distributed smart Embedded devices) is a European research and advanced development project, funded by the Information Society Technologies (IST) initiative of the 6th Framework Programme, addressing ICT innovation for industrial automation applications. The primary objective of SOCRADES is to develop a design, execution and management platform for next-generation industrial automation systems, exploiting the Service Oriented Architecture paradigm both at the device (i.e. smart I/O, PLC, etc.) and at the business application level (i.e. MES/ERP, etc.). The basic aim of the project, therefore, is to develop tools and methods to achieve flexible, re-configurable, scalable and interoperable collaboration on a network of decentralised and distributed embedded devices and systems. Specifically, the project aims both at:

- Developing a comprehensive device-level SOA infrastructure – based on the Devices Profile for Web Services (DPWS) – for encapsulating intelligence and sensing or actuating skills as services, as well as to specify associated frameworks for management and orchestration of device- and system-level services.
Defining of a methodology for describing services with semantic mark-up that can be interpreted and processed by agents (Semantic Web Services), for the discovery, selection and composition of resources.

SOCRADES consortium is made up of 15 partners from 6 European countries, including the major European and global players in the industrial automation and IT-business sectors, as well as some of the most prestigious European universities.

SOCRADES shows how the convergence of solutions and products towards the SOA paradigm adopted for smart embedded automation devices contributes to the improvement of the reactivity and performance of many industrial processes, such as manufacturing, and logistics. SOCRADIES approach allows intelligent systems behaviour to be obtained by composing configurations of devices that introduce incremental fractions of the overall required intelligence. In this manner, the use of the SOA paradigm at the device level enables the adoption of a unifying technology for all levels of the enterprise, from sensors and actuators to enterprise business processes. This approach leads to information being available "on demand" and allow business-level applications to use high-level information for such purposes as diagnostics, traceability and performance indicators – resulting in increased overall equipment effectiveness and business agility. A SOCRADIES service is then a software component encapsulating automation device-specific functionalities. These functionalities are advertised/exposed to the outside world as “Services”, so to be located and invoked by other networked devices and/or applications without the latter being aware of how the functionality is implemented. Hence, one of the main benefits of this is that it allows adaptability and reconfigurability of automated processes on the factory and in real-time production control and management scales.

During its life, SOCRADIES developed models and methods for Factory Automation that were demonstrated through industrial prototypes and trials, showing the benefits of the adoption of SOA paradigm. Even if SOCRADIES has already taken several steps further, in order to go towards implementation and adoption of SOA-based Factory Automation still several challenges need to be tackled. These challenges are important to be addressed to ease future application and diffusion of SOA-based Factory Automation system in real environment. This roadmap intends to start addressing some of these challenges by identifying, both from business and technology perspective, the main research needs that have to
be addressed in order to facilitate the diffusion of SOA-based Factory Automation.

The aim of SOCRADES Roadmap is therefore to provide stakeholders (policy-makers, industry and academy) with a vision on business relevance of SOA paradigm for industrial automation and to identify the main building blocks of technology research that are needed in order to address industrial challenges coming from real applications.

This document addresses both managers and engineers by showing both business benefits and technological roadblocks in the adoption of SOA paradigm for industrial automation.

An introduction to SOA-based Factory Automation is provided in the second chapter. Main current trends in manufacturing are presented in the third chapter to provide insights on business needs that can be tackled through the adoption of SOA-based technologies. The fourth and fifth chapter address the analysis of benefits and barriers in the adoption of SOA-based Automation Systems. Finally research topics for future investigation are provided in the sixth chapter and concluding suggestions are proposed in the seventh chapter.

This document is the output of an extensive research activity that involved experts belonging both to SOCRADES consortium as well as to the international community involved in the SOA for industrial automation domain. In particular an International Roadmapping Workshop was held in Cardiff (within IEEE INDIN 2009, June 25th, 2009), in which experts coming from 11 countries gathered together to discuss about the future of SOA-based Factory Automation. We are really thankful to all the participants for their inputs and suggestions. Moreover, several anonymous contributors provided with their inputs and suggestions through an on-line survey that was available in the last 6 months through SOCRADES Website (www.socrates.eu).

We hope that this document can provide useful information and can stimulate discussion on the business opportunities that come from the exploitation of SOA paradigm in Automation of Future Factories.

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![Partner Logos](image-url)

**SOCRADES.EU**

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