

ReCaM

Rapid reconfiguration of flexible Production Systems

Welcome to the first ReCaM newsletter!

In this first issue you will find a general introduction of the ReCaM project, the latest news about recent events, the interview with Robert Bosch GmbH, and short descriptions about three partners of the consortium.

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- Objectives
- Concepts

Interview with Robert Bosch GmbH

- ReCaM and Industrie 4.0

Partners Profiles

- Bosch
- nxtControl
- TUT

What is the ReCaM Project?

The ReCaM project is a three year innovation action project funded by the European Commission in the Horizon 2020 program, under the call "Factories of the Future (FoF-11-2015)" with the grant agreement No. 680759.



The main goal is to develop and demonstrate the next generation of flexible production systems leaning on the reconfigurable modular production resources, associated engineering tools and control systems. The ReCaM tools aim to support the capability-based reconfiguration and auto-programming of the resources to a set of given product requirements. The project developments support the design and operation of future production systems that allow quick, cost-efficient set-up and the fast integration of new product variants.

Do you know?

ReCaM is the acronym for "Rapid reconfiguration of flexible production systems through capability-based adaptation, auto-configuration and integrated tools for production planning"

The Consortium Partners

The ReCaM Consortium is composed of nine partners from industrial end users, technology providers and research institutions.



Latest news and upcoming events

Face to face meeting in Tampere, Finland



This year, the semi-annual face-to-face meeting of the ReCaM partners took place at Tampere University of Technology in Finland, 21-22nd June, 2016.

The consortium met and discussed the IT-infrastructure forming the foundation of the future ReCaM-system. Therefore, not only the current state was discussed but also evaluated in an interactive session where different scenarios were used to proof the consistency of each building block's inputs and outputs. The results will be used for the next steps towards refining the system architecture as well as for the first steps towards the partial prototypical implementation.

Upcoming!

Face to face meeting in Vienna, Austria

In the next ReCaM meeting the consortium will outline the main steps leading to the implementation of the ReCaM architecture. The meeting will focus on the definition of data model interfaces between the main functions of ReCaM building blocks. This meeting is being organized by nxtControl and will be held in Austria, Vienna, from 29th to 30th November, 2016.



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ReCaM Project in a Nutshell

Section Focus:

How ReCaM contributes to manufacturing Industry?

- Expected impact and goals
- The ReCaM approach
- The innovative aspects

What are the impacts and the potential benefits of the ReCaM project?

- ✓ Producing smaller lot sizes and higher product variants in existing production systems;
- ✓ Reduction of the set-up, changeover times and costs for existing production systems;
- ✓ Reduction of average energy consumption through an optimised use of production capacity;
- ✓ Strong support for standardisation of communication protocols, data structures and tool connectivity.

What is the ReCaM Approach?

A novel capability-based system configuration method will be used to design production systems from mechatronic objects and to adapt the capabilities based on the workpiece requirements. This method facilitates the automatic matching between workpiece requirements and resource capabilities, and provides the basis for the auto-programming of the mechatronic objects for required tasks.

Rapid reconfiguration and easy reconfiguration of the network of mechatronic objects will be supported by a Runtime System for mechatronic objects network. Furthermore, candidate reconfigurations are evaluated using engineering methods for integrated reconfiguration and production planning. These tools will support two important phases: new production system designs (green-field design phase)

and online reconfiguration management of operational systems (i.e., production and reconfiguration planning).

This will be done concurrently with the production planning and scheduling, and optimisation of the plan to minimize the changeover times and costs.

Which are the innovative aspects of ReCaM?

In order to achieve the required level of flexibility and responsiveness, the following elements are needed: intelligent methodologies, data models and tools to facilitate the reconfiguration planning, and integrated production scheduling and control of the production systems.

New innovative developments and integrations will be made during the project in the following areas:

- ✓ Common system and module architecture;
- ✓ Standardized formal description of the Mechatronic Objects' capabilities and features;
- ✓ Automatic layout and structure recognition tool;
- ✓ Methodology and tool for an integrated, intelligent reconfiguration and production planning;
- ✓ Method and tool for automatic energy consumption optimization;
- ✓ Standardised control and communication solutions and protocols.

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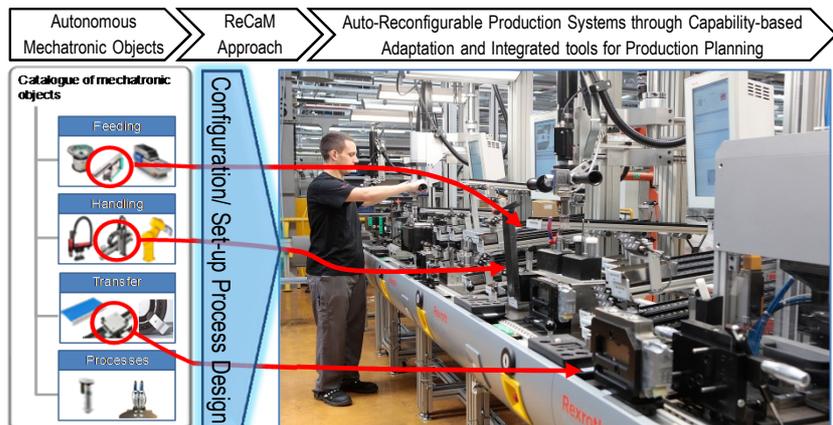
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The ReCaM approach towards the design and the development of versatile production systems

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Section Focus:

Interview with experts at Robert Bosch GmbH:

Experts at Bosch present you the insight about the prospects of the ReCaM project, its impacts on manufacturers and its synergies with industrie 4.0

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Spotlight on ReCaM and Industrie 4.0

Interview with Robert Bosch GmbH

- Frank Hess, Vice President Manufacturing Mobile Controls, Drives and Control Technology Division
- Joachim Frangen, Program Director „Industrie 4.0 – Connected Industry“, Corporate Sector Research and Advance Engineering
- Sebastian Schröck, Project Coordinator ReCaM, Corporate Sector Research and Advance Engineering

What are the key concepts behind ReCaM and its impacts for manufacturers like Bosch?

The demand for customization of products requires new approaches towards highly flexible production. To address this challenge, the project ReCaM focuses on reconfigurable production systems by use of capability-based description and optimization for production planning and execution. This topic is relevant for many sectors of European industry, as the broad spectrum of partners in the ReCaM-consortium proofs. Flexible production has a double impact: on the one hand, it will enable manufacturers like Bosch to fulfil customer demands for individual products and services with short time to market and at a cost level of mass production. On the other hand, providers of industrial technology can serve customers with innovative solutions for their production. Bosch hereby represents two roles: as a leading manufacturer, innovative solutions can be applied in over 250 plants; as a leading provider, Bosch offers well-proven solutions for smart factories.

How can the ReCaM project improve the competitiveness of EU manufacturers?

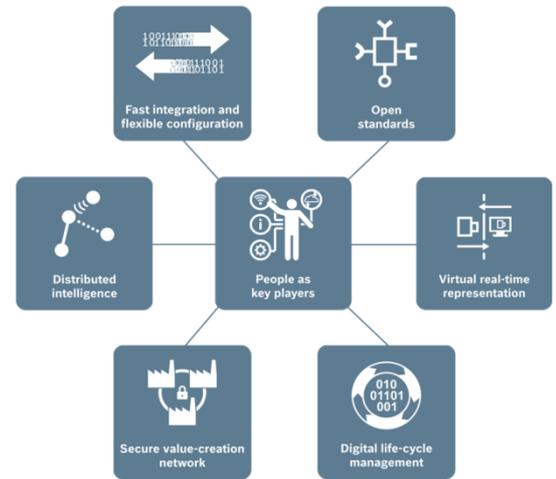
ReCaM focuses on increasing versatility of production equipment and acceleration of engineering and planning processes. Re-use of adaptive equipment will decrease time to market and drastically reduce down time due to changeover for products and variants.

Interview with Robert Bosch GmbH

Furthermore, re-use enabled by flexible equipment protects production investment and supports the efficient use of resources like material, energy and time. By increasing the versatility of European production sites, the customer orientation and competitiveness will be strengthened and thereby also the economic future of our sites.

What are the synergies between ReCaM and Industrie 4.0 initiatives?

ReCaM is perfectly in line with the German initiative of Industrie 4.0. Both initiatives are aiming at smart factories employing new methods and technologies to increase flexibility, resource efficiency and human-centred production. Where Industrie 4.0 focuses more on connectivity and data driven services, ReCaM puts emphasis on versatile production equipment. Both approaches are going hand in hand. ReCaM addresses many aspects of the seven features of Industrie 4.0 defined at Bosch.



Seven Features of Industrie 4.0 defined at Bosch

“Where Industrie 4.0 focuses more on connectivity and data driven services, ReCaM puts emphasis on versatile production equipment. Both approaches are going hand in hand.”

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People as key players: Individual support of humans in engineering and production as well as reduction of non-value adding tasks leads to more attractive and motivating work processes. People are more focussed on their strengths and increasing their decisive role.

Fast integration and flexible configuration: Product- and variant-flexible production equipment can be reconfigured rapidly in a free arrangement. Each module provides a defined capability and can be re-used for the production of different products.

Distributed intelligence: The system is designed to use highly adaptable control concepts, services and skills supporting Plug & Produce as well as seamless integration into existing software-systems (e.g. ERP and MES).

Open standards: Production resources of different implementations (e.g. Controllers of NXT control and Bosch Rexroth) are designed to enable the simple integration of machines and components in heterogeneous system environments.

Virtual real-time representation: Capability based modelling of work plans and skills of the resources enables transparency even for less-trained workers. Visualisation along the value chain, reliable processes and fast decisions are enabled by virtual planning and consideration of production scenarios.

Digital life-cycle management: Integrated tool-chain for digital planning, engineering and management of production resources supporting the value creation chain. The solutions being developed within ReCaM will be visible for the Industrie 4.0 initiatives in Germany and therefore might affect future standardisation efforts.

How can ReCaM create new business opportunities for technology providers?

ReCaM will provide methods and technologies that can be exploited by European providers of production technology on a level of products and services.

Based on ReCaM results, suppliers can provide components, modules and systems on field-level or tools and services for engineering, planning and execution of versatile production lines. Furthermore, suppliers can focus on control platforms with production services covering all enterprise levels.

What are the expected challenges implementing ReCaM solutions?

The main challenge is to achieve an effective transfer of the project results. This implies several aspects: the remaining gap between ReCaM results and application to real production scenarios should be kept small, in order to prepare the exploitation. This is addressed by production demonstrators proving feasibility and benefit in specific applications. Furthermore, implementation success is influenced by user acceptance on all levels, e.g. workers, planners and management. This challenge can be addressed by considering user acceptance throughout the design phase and to test user acceptance in demonstrator applications. Also, a broad use of ReCaM results will be supported by preparation of standardisation activities by ReCaM.

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Consortium's Partners Description

Section Focus:

A brief description of three of our consortium partners

- Robert Bosch GmbH
- nxtControl GmbH
- Tampere University of Technology

In our next newsletter we will introduce you with other three consortium partners



nxtControl GmbH has developed one of the first automation software products based on the new IEC61499 standard for distributed systems. Several technologies and techniques have been integrated to answer customer request for more flexibility and modularity of automation systems. By improving the vertical and horizontal integration, system integrators, machine builders and good manufactures take profit of more flexible, more independent and much more efficient automation engineering. nxtControl integrates the engineering of control logic, visualization, I/O connection and documentation in one single engineering tool. The company has been founded in 2007 by a team of technicians and two system integrator companies. They were involved in the development of the products, to make sure that nxtControl software is customer orientated and coming up to industrial requirements. Since then a public and a private venture capital investor have taken shares in nxtControl. Today nxtControl GmbH consists of 18 employees including university graduates in mathematics, machine engineering, control engineering, software and hardware engineering as well as application engineers.



The Bosch Group is a leading global supplier of technology and services. It employs roughly 375,000 associates worldwide (as of December 31, 2015). The company generated sales of 70.6 billion euros in 2015. Its operations are divided into four business sectors: Mobility Solutions, Industrial Technology, Consumer Goods, and Energy and Building Technology. The Bosch Group comprises Robert Bosch GmbH and its roughly 440 subsidiaries and regional companies in some 60 countries. Including sales and service partners, Bosch's global manufacturing and sales network covers some 150 countries. The basis for the company's future growth is its innovative strength. At roughly 118 locations across the globe, Bosch employs 55,800 associates in research and development. The Bosch Group's strategic objective is to deliver innovations for a connected life. Bosch improves quality of life worldwide with products and services that are innovative and spark enthusiasm. In short, Bosch creates technology that is "Invented for life."



Tampere University of Technology (TUT) conducts scientific research in technology and architecture and provides higher education within these fields. TUT started operating in the form of a foundation in the beginning of 2010. TUT has about 10 000 students and 2000 employees. The thematic research areas of TUT are: Digital operating environment, Energy and ecoefficiency, Industrial competitiveness, and Health technology. The department that will take part in the proposed project is Department of Mechanical Engineering and Industrial Systems (MEI). MEI was established in January 2014 by combining former departments of Production engineering and Engineering design added with fluid power and mechatronics research groups. The research and teaching activities of MEI covers the whole product life-cycle processes in mechanical engineering and industrial systems area. Both fundamental and applied research types are carried out. There are 4 vertical research areas: Applied Mechanics, Design and Development, Manufacturing and Automation, Life-cycle Management and in addition 2 cross-sectional research areas: Engineering Intelligence and Sustainable Machine Systems. Department has modern laboratories as tools for education and research.

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