DECOS

Dependable Embedded CComponents and Systems

**KEYWORDS:** Embedded system, time-triggered, integrated architecture, fault-tolerance, dependability, composability, validation, certification, automotive, avionics, structural control

**Introduction**

Over the past decades, the development of computing systems to support safety-critical real-time computer applications (nuclear, aerospace, railway, etc.) has often followed a customised-solution design approach. The reinvention of system design concepts, middleware and limited reuse of code across diverse application domains are exacerbated by the extensive costs of verifying and validating such complex single-of-a-kind safety-critical systems. With the expected deployment of safety-critical systems in many more application domains (automotive, medical, process control, etc.) the availability of a component-based methodology for the cost-effective design, implementation, validation, and certification of integrated dependable embedded systems becomes instrumental for the competitiveness of the European economy.

**Objectives**

DECOS methodically targets, investigates, and develops approaches to significantly alleviate - elimination would be an idealised goal - the identified five key obstacles - Electronic Hardware Cost, Diagnosis and Maintenance, Dependability, Development Cost, Intellectual Property (IP) Protection - to the deployment of advanced electronic functions in embedded systems. The intent is to provide an integrated distributed execution platform and a set of pre-validated hardware components and software modules and tools for the design of dependable embedded systems. Generic design solutions for integrated dependable systems will be developed such that the invariance of the design strategies and technology neutral interfaces are considered upfront as a design objective. System design approaches that are applicable to diverse application domains will be considered. We target automotive, aerospace, railway, control and medical applications.

**Expected Results**

DECOS will provide the basic enabling technology to move from a federated distributed architecture to an integrated distributed architecture, i.e. an execution platform that allows tight integration of software-modules from different sources (vendors) and with different criticality levels. This will be supported by methods and tools for system design, a diagnostics infrastructure and software and hardware components (FPGAs).

In order to be able to thoroughly test dependable embedded systems, a test-bench comprising methods and tools for validation and modular certification will be created.

Concepts and methodologies to visualise and navigate complex real-world systems during design and validation will be delivered in order to support design comprehension.

Application development will be simplified by the provision of basic software building blocks easing the generation of safe software modules.

The applicability of the developed technologies will be shown via demonstrator systems out of three application domains – automotive, aerospace and industrial control. It can be expected that the application of the DECOS methodology will result in cost reductions in the design and deployment of embedded systems as well as in system hardware cost, maintenance and system development.
Partners and their Role

Leading experts in the field of hard real time systems and dependability at the Technical Universities of Vienna and of Darmstadt, and at the Budapest University of Technology and Economics treat research issues on architecture, composability and validation.

The European flagship companies Audi, represented by Audi Electronics Venture, Fiat represented by CRF, Airbus Deutschland also representing Airbus France and Airbus UK and EADS prepare the proof of concept demonstrators with the goal to improve their products, and benefit from cost saving and reduced time-to-market. These companies are assisted by their research partners and suppliers Liebherr-Lindenberg, Thales Avionics, and Hella which will contribute to the demonstrators and exploit DECOS results.

The University of Kassel works on a HIL system for the automotive demonstrator. The Technical University of Hamburg-Harburg and the University of Kiel prepare the flap system and the design of the aerospace demonstrator.

The middleware provider Esterel works on tools for system design, and the core technology provider TTTech is involved in component design and implementation.

The Swedish National Testing and Research Institute treats validation and certification issues.

Infineon Technologies develops the necessary hardware infrastructure (prerequisites for future SoC (Systems-on-Chip) for mass deployment of DECOS technology).

Profactor Produktionsforschung GmbH focuses on the development of new methods for integrated production technologies.

ARC Seibersdorf research acts as co-ordinator and participates in research activities in the architecture, validation and certification areas.

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**CONTRACT NUMBER**

IST – 511764

**TYPE OF PROJECT**

Integrated Project

**PROJECT PARTICIPANTS**

ARC Seibersdorf research GmbH, Austria
AIRBUS Deutschland GmbH, Germany
Audi Electronics Venture GmbH, Germany
Budapest University of Technology and Economics, Hungary
C.R.F. Società Consortile per Azioni (Centro Ricerche Fiat), Italy
EADS Deutschland GmbH, Germany
Estere1 Technologies S.A., France
Hella KG Hueck & Co, Germany
Infineon Technologies AG, Germany
Liebherr-Aerospace Lindenberg GmbH, Germany
Profactor Produktionsforschung GmbH, Austria
SP Swedish National Testing and Research Institute, Sweden
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**PROJECT WEBSITE**

www.decos.at

**BUDGET**

Total cost: 14.3 M€
Funding: 9 M€

**TIMETABLE**

Starting date: 1. July 2004
Duration: 36 months