



# CRAFTERS

*"ConstRaint and Application driven Framework for Tailoring Embedded Real-time Systems"*

## **EXECUTIVE** *summary*

CRAFTERS will produce a holistically designed ecosystem from application to silicon. This ecosystem will provide a tightly integrated multi-vendor solution and tool chain that complements existing standards. The goal is to reduce NRE costs of software development by 30% between 2009 and 2013.

## **CONTRIBUTION** *to SRA*

CRAFTERS is especially relevant to ARTEMIS sub-programme (ASP) 5, Computing environments for embedded systems, while contributing notably to ASPs 1 and 6. The focus of the project spans the different domains of real-time applications for heterogeneous, networked, embedded multicore systems. These applications suffer from the lack of trusted pathways to system realisation and application deployment. Given the considerable effort and uncertainty associated with service and product development, industry becomes discouraged from engaging in such ventures, leaving market opportunity unexploited. CRAFTERS proposes a computing environment for multicore systems derived from vertical domains (represented with selected use cases) that

will enable the evolution to horizontal domains by providing common methods, tools and reference platforms for embedded multicore applications.

## **MARKET INNOVATION** *& impact*

CRAFTERS integrates an innovation ecosystem spanning application to silicon and is thus relevant to all ARTEMIS Industrial Priorities. The project results centre around **reference designs and architectures** that are firmly supported by **design methods and tools** developed specifically for these reference architectures. CRAFTERS directly addresses **seamless connectivity and middleware** by realising a common middleware layer that is designed to support new wireless communication standards while being portable across different platforms.

## **RELEVANCE & CONTRIBUTIONS** *to Call Objectives*

CRAFTERS will develop design tools and associated runtime support to enable the composability, predictability, parallelisation, aggregation and management of systems according to a service-

driven or data-centric approach that entails performance and energy modelling and analysis, verification and scalability while preserving system-level predictability. The project will also:

- > provide a common multi-domain architecture, APIs and design tool platform for advanced multicore hardware and middleware solutions.
- > define new programming model & new types of API to support platform-independent composition for mixed criticality systems.
- > define definition of performance & resource management models, meta-data and system layers in order to achieve global performance as well as resource optimisation and management.

The project results include the market introduction of platform device families for robust compositional design and design revision. Compositionality is guaranteed through well specified IP interfaces, focusing especially on network connectivity and a modular system management infrastructure. At the device level we will work on a hardware interface layer for standardised device management and efficient hardware constructs for the specified management functions. These flexible management functions make the platform flexible enough to meet very different non-functional requirements and hence target different application domains (horizontalisation). The platform even allows the integration of applications with highly contrasting non-functional requirements (mixed-critical systems). To demonstrate the feasibility of this approach, CRAFTERS includes use cases (which will result in demonstrators) from three different application contexts, each combining two closely related domains (image and video processing, industrial control and transportation, positioning and communication).

### R&D INNOVATION *and technical excellence*

CRAFTERS will bring added value and advances beyond the state-of-the-art products and techniques within the following areas:

- > Compiler-generated parallelism and high application portability
- > Holistically optimised system services through technology aware HW/SW co-design
- > System-wide real-time support and timing exposure through abstraction levels
- > HW/SW implementations for real-time communication and computation
- > Combined on/off-line real-time scheduling for many-core architectures
- > HW/SW implementation for energy management with scalable performance
- > Communication-centric computation platform analysis and integration
- > Technology aware techniques accelerating disruptive migration, e.g., to 3D-SIC
- > Tool-based adaptation of technology and platform independent middleware
- > NoC-centric integration framework for many-core platform composition
- > Homogeneous and heterogeneous (open-source) many-core reference platforms

CRAFTERS expands previous design approaches with a holistically designed ecosystem from application to silicon that could cover a wide application range. For multicore platforms, one innovation is to provide a complete development environment that allows the best implementation strategy to be selected for a particular application. In order to reach this goal, extension and improvements for multicore architectures of state-of-the-art model-based specification standards (such as MARTE), early-estimation techniques, performance estimators, verification frameworks and parallelising compilers have to be developed. These efforts complement innovations in middleware for multicore platforms that include run-time environment, scheduling and hardware management. The project also addresses the development of a multicore platform that includes hardware profilers and support for the run-time environment.

### PROJECT *partners*



[www.artemis.eu](http://www.artemis.eu)



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#### START

June 2012

#### DURATION

36 months

#### TOTAL INVESTMENT

€17.6 M

#### PARTICIPATING ORGANISATIONS

24

#### NUMBER OF COUNTRIES

10