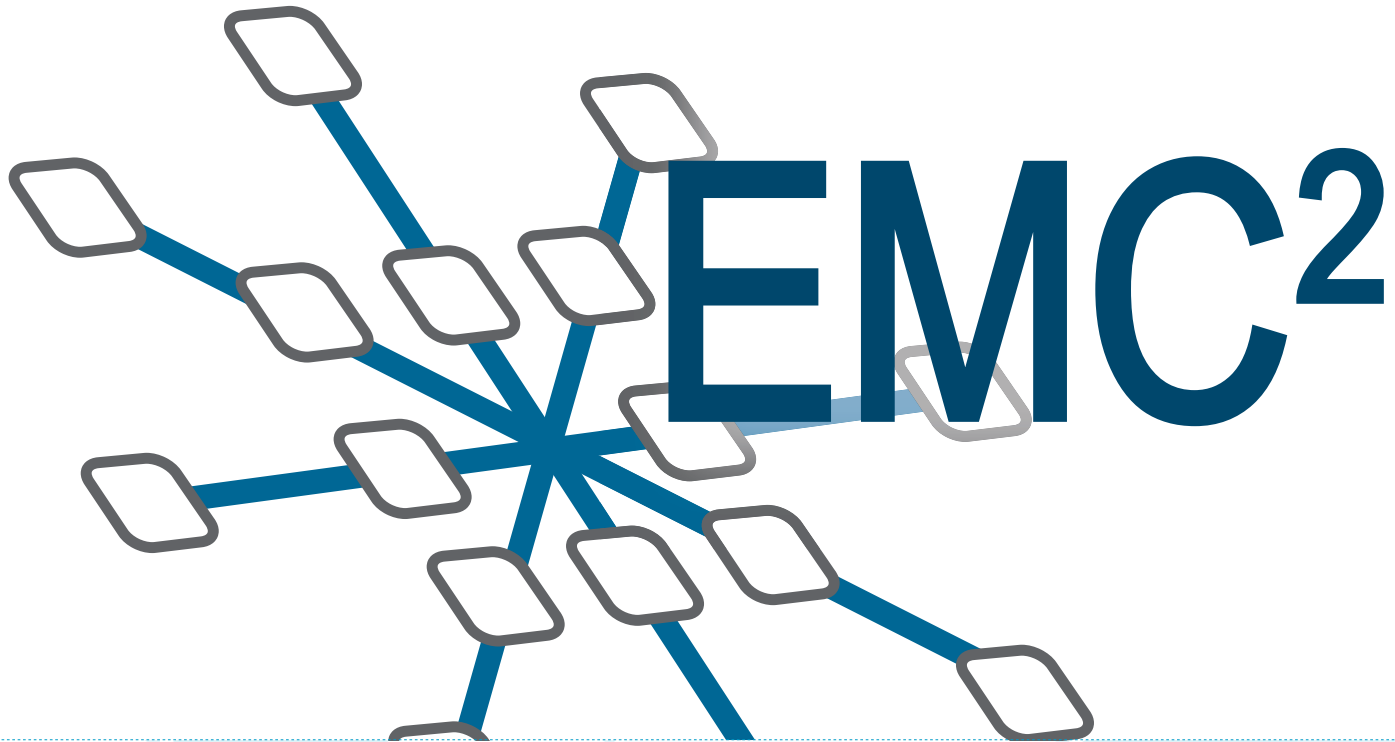# EMC²

Embedded Multi-Core systems for Mixed Criticality applications in dynamic and changeable real-time environments

EXECUTIVE *summary*

EMC² finds solutions for dynamic adaptability in open systems. It provides handling of mixed criticality multi-core applications in real-time conditions, with scalability and utmost flexibility, full-scale deployment and management of integrated tool chains, through the entire lifecycle.

CONTRIBUTION *to SRA*

The EMC² project focuses on the industrialisation of European research outcomes and builds on the results of several previous ARTEMIS, European and national projects. It provides the paradigm shift to a new and sustainable system architecture that is capable of handling open dynamic systems.

EMC² is part of the European Embedded Systems industry strategy to maintain its leading edge position by providing solutions for:

> Dynamic Adaptability in Open Systems,
> utilising expensive system features only as Service-on-Demand, in order to reduce the overall system cost,
> handling mixed criticality applications in real-time conditions,
> scalability and utmost flexibility,

> full-scale deployment and management of integrated tool chains through the entire lifecycle,
> power supply challenges from dynamic operational changes in MCMC real-time systems.

MARKET INNOVATION *& impact*

EMC² expects to facilitate the EU's ability to deploy and use Embedded Systems across important European market sectors:

> Automotive: Embedded Systems are the key innovation driver, enabling the majority of innovations.
> Avionics: main challenges are related to the acceleration of technology cycles and cost of software development.
> Space: main challenges are related to the increase of performance/weight ratio, high reliability and long lifetime.
> Industrial control and factory automation: the key areas will be energy efficiency and sustainability.
> Healthcare: challenges are related to work flow efficiency, integration of diagnosis and treatment, quality assurance.
> Internet of Things: the increased amount of data available, as well as safety and security issues, will need to be processed.

RELEVANCE & CONTRIBUTIONS *to Call 2013*
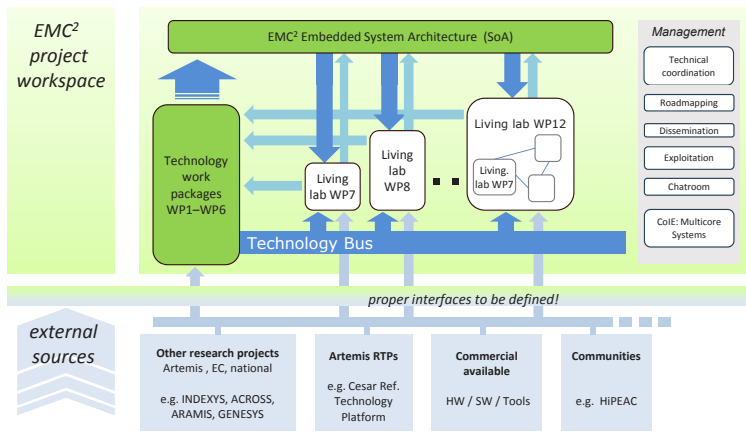
EMC^2 addresses the topic of industrial-strength tools, contributing to the ARTEMIS tool Repository. As a joint effort of technology work packages and application innovation work packages, EMC^2 provides a flexible Multi Processor System on Chip (MPSoC) architecture that can be tailored by middleware to the needs of a particular application domain. This will substantially reduce the non-recurring development costs and the time-to-market of new Embedded System applications and significantly cut the recurring cost of the respective products.

This project covers the full range of open research issues stated in the 2013 Annual Work Program: security and active diagnosis in MPSoCs, integrated resource management, internet integration of MPSoCs and appropriate tool environment. Driven by the application needs, EMC^2 has a strong focus on re-configurability and adaptability. The infrastructure's applicability is demonstrated by six dedicated living labs from various application domains, including automotive, aerospace and communication, representing European major industry sectors.

The project is therefore also in line with the promotion by ARTEMIS of the reference designs and architectures concept that provides solutions to key technical challenges – such as networking, security, robustness, diagnosis, maintenance, integrated resource management, self-organisation and, most notably, dynamic adjustments in changing systems. EMC^2 strongly supports the quantitative ARTEMIS targets by focusing on measurable contributions and thus improving the competitiveness of the European Embedded Systems industry.

R&D INNOVATION *and technical excellence*

Due to the size of the EMC^2 project, each work package was designed with its own unique objectives, task descriptions, deliverables, milestones, schedule, etc., fitting seamlessly into the overall EMC^2 plan. This Embedded System approach will force the breakthrough and deployment of multi-core technology in almost all application domains – Avionics, Space, Automotive, Railway, Shipping, Medical, Energy and Industrial Factory Automation – where real-time and mixed-criticality are issues, and therefore strengthen the competitiveness of the European Embedded Systems industry. The project is organised in a project structure with horizontal and vertical activities closely linked to each other:
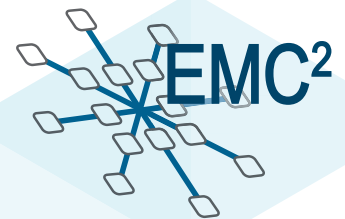
> Horizontal activities: technological work packages (WP1-WP6), to develop dedicated technologies required by industrial use cases for the implementation of Embedded, mixed-criticality multi-core Systems.

> Vertical activities: living labs (WP7-WP12), which include several demonstrators for mixed-criticality multi-core Embedded Systems. Each of WP7-WP11 is focused on a specific application domain, while WP12 is cross-domain. Each task in a living lab represents a use case. Technologies required by the use cases will be developed by WP1-WP6 and evaluated by application in the use cases.

PROJECT *partners*

The EMC^2 project partners can be found at http://www.artemis-emc2.eu/partners_authorities

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