



# PRESTO

*ImProvements of industrial Real Time Embedded Systems develOpment process*



## **EXECUTIVE** *summary*

PRESTO improves test-based embedded systems development and validation, while considering the constraints of industrial development process. The project is based on the integration of:

- a) Test trace exploitation
- b) Platform models and
- c) Design space exploration techniques.

The expected result of the project is to establish functional analysis, performance analysis and platform optimization at early stage of the systems development.

## **CONTRIBUTION** *to SRA*

PRESTO contributes to:

- > An integrated chain of European-sourced tools supporting development of real-time embedded systems. PRESTO will enrich the current embedded design process with a set of new modelling and analysis tools. These new tools help to validate larger sets of requirements, from the user requirements through the system design and to the execution on target platform.
- > Reduction of the cost of the systems and their design by managing the software and hardware allocation with respect to non-functional properties, such as performance, timing and power consumption.
- > Reduction of the effort and time needed for re-validation and re-certification after changes, in particular improving validation of non-

functional properties on different software and hardware allocations.

- > Independent hardware and software upgradeability along the life cycle.

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

The embedded system development is undergoing thorough changes due to increase of complexities on all fronts, such as number of applications and their functionality, and number of components in modern multi-core platforms. To manage this, PRESTO introduces the design space exploration of different software and hardware allocations, and the associated performance analyses at early stages of the system development using the performance exploration and configuration generation tools.

Currently, the software and the hardware development parts are typically separated causing validation problems and leading to over-dimensioned platforms that increase cost and power consumption. The industrial partners of the project (THALES, TELETEL, MILTECH) use and evaluate the new methods and tools for the purpose of adaptation of new software applications to different execution platforms. The PRESTO project will leverage state-of-the-art research results from the academic and research partners (U. L'Aquila, INRIA, VTT) to stimulate the growth and emergence of the solution and tool vendors involved in the project, in particular the SMEs (RapitaSystems, Softeam, MetaCase, Prismtech, PragmaDev, Sarokal).

## RELEVANCE & CONTRIBUTIONS *to Call 2010 Objectives*

PRESTO addresses the ARTEMIS industrial priorities as follows. The main objective of the project is to enrich the current industrial development framework to address the following challenges:

- > Better system requirements formalisation and verification on the system design level.
- > Full analysis of the execution traces of the software integration to validate behavioural and timing properties.
- > Validation on platform modelling and hardware software allocation using UML MARTE and domain-specific modelling languages (DSLs).
- > Verification of non-functional properties from software and hardware allocation.
- > Smooth design methods and tools extension on the current industrial process. Evaluation of the impact on expertise, time and cost of using the new modelling and analysis approach.

The project addresses the evaluation of the level of accuracy needed on the platform description for pertinent non-functional property (NFP) analysis.

- > Modelling of the platform, and NFP properties analysis.
- > Evaluation of the constraints on timing estimation by the use of software tuning capabilities. Mix of software components with different level of abstraction, in order to validate global timing properties on different parts of the product.
- > Exhaustive design space exploration.
- > Software driven energy optimisation, such as impact on the latencies by the use of Dynamic Voltage and Frequency Scaling tuning capabilities.
- > Validation of an application on different platforms. Impacts of software components allocation on global timing properties. Comparison with evaluation on target platforms.

## R&D INNOVATION *and technical excellence*

An industrial project of embedded system development comes within a global context including quality requirements and configuration management requirements. PRESTO aims to address these along with communication and reporting support for the system team, other participants and customers. The PRESTO approach is driven by early-level tests and it is based on validation of system requirements.

The overall concept developed in the PRESTO project is the capacity of validation at early stage of non-functional properties, such as performance. A better fit of the software components on the execution platform (hardware and middleware) is expected.

PRESTO project aims at improvement of the software part of the design flow. The description of the software application is made as a set of interconnected components and their interfaces. These are specified using MARTE profile and DSLs supporting software and hardware allocation. Test traces are generated from "classical" software test integration on functional behaviours.

PRESTO innovation and technical excellence stems from:

- > Software and hardware modelling, using modelling notations and transformations to facilitate software and hardware allocation.
- > Formal modelling of properties, including timing constraints, based on test trace generation and use of the test traces as entry point for the property and performance analysis.
- > Comparison between timings analysis and simulation results confrontation with the real platform execution to assess the global PRESTO workflow.

## PROJECT *partners*



*Inria*  
informatics mathematics

MetaCase

Sarokal Solutions



PRAGMADEV  
real time development tools

PRISMTECH  
Productivity Tools & Middleware

THALES  
COMMUNICATIONS - FRANCE

SOFTEAM  
Think Object

VTT

*teletel*

THALES  
ITALY

RAPITA  
SYSTEMS LTD



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### START

April 2011

### DURATION

36 months

### TOTAL INVESTMENT

8,6 M€

### PARTICIPATING ORGANISATIONS

13

### NUMBER OF COUNTRIES

5