

# MADES

## *Model-based Methods and Tools for Avionics and Surveillance Embedded Systems*



### OVERVIEW

MADES is developing new model-driven technologies to improve current practices in the development of embedded systems for the Aerospace and Defence industries. The project is applying a holistic approach in researching new tools and technologies that support design, validation, simulation, and code generation, while providing better support for component reuse. New annotation and verification methods are being developed that ensure overall system consistency and advanced code generation technologies will address both conventional programming languages and hardware description languages providing compile-time virtualisation techniques that are able to cope with the increasing complexity of modern hardware architectures.

### OBJECTIVES

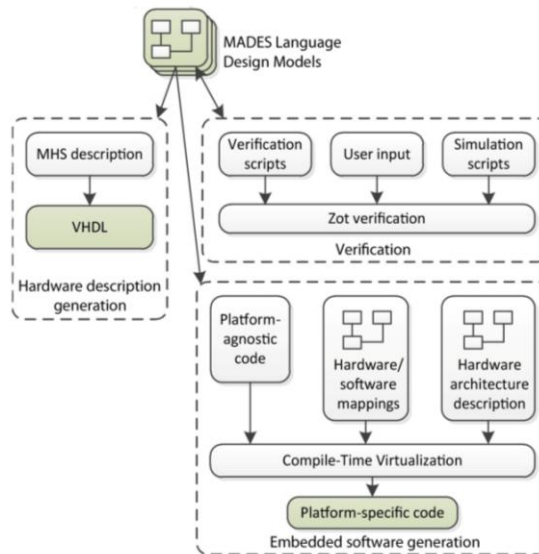
The project will extend existing modelling languages and profiles to develop languages and dedicated tools that are focused on real-time systems for avionic and surveillance applications. Project research and development will lead to new model-based verification and simulation methods, along with new model-based code generation methods and tools that will address both conventional programming languages and hardware description languages. The MADES tools will provide developers with the ability to more easily reuse existing software components, ensure consistency of complex systems, and exploit advanced hardware platforms. The MADES tools and technologies will be integrated into a single framework providing a seamless environment for modelling, validation, and code generation of avionic and surveillance solutions.

### MARKET IMPACT

MADES technologies will reduce development costs of complex embedded systems for the Aerospace, Defence and other key European industries, while enabling a next generation of highly complex embedded systems to be developed that are more reliable, yet costing less to maintain and evolve as industry needs change and hardware capabilities increase. New market opportunities for European industries, including SME size companies, will emerge as companies relying on design and integration of embedded systems in their products are more competitive in global markets through lower costs and improved abilities to deliver new or enhanced products faster to market.

## R & D INNOVATION

MADES advances in Model Driven Engineering for embedded systems development will be based on extensions to the MARTE Profile that will support improved verification, simulation and code generation. An industry leading modelling tool *Modelio* from Softeam will be updated to provide specific support for new MADES modelling annotations allowing more advanced simulations and new transformations for improved analysis. A components repository enabling greater component reuse will contain the full knowledge gathered about components during each development phase, including information about component constraints for assembly. Automated formal verification techniques will be developed to efficiently check system properties, including temporal ones, by exploiting domain knowledge that will accelerate the verification process. A formal framework to combine models of both the system being developed and its physical environment will be defined to create a simulation environment through which valuable insight into system behaviour can be gained before deployment. New transformations and code generators will enable developers to virtualise complex hardware platforms while providing rich traceability support linked to the MADES verification and simulation technologies.



## INDUSTRIAL RELEVANCE

The tools and technologies developed within MADES are driven by requirements from industrial users in the Avionics and Defence domains and will undergo extensive validation through use in the development of commercial applications for avionics and radar surveillance. Key criteria that will be measured during the industrial evaluations include:

- **Retargeting effort** – effort required to migrate an application from one processor architecture to another
- **Reusability** – number of software components that can be taken from one application development project to another
- **Verification** – number of errors corrected earlier in the development process through new model verification methods

The project expects to deliver improvements in each of these areas, which will benefit industrial organisations throughout Europe by providing increased productivity, lower development costs, shorter development cycles and more reliable embedded system applications.

## PROJECT PARTNERS



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30 months

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3.6 M€