

DEMANES

Design, Monitoring and Operation of Adaptive Networked Embedded Systems



EXECUTIVE *summary*

The goal of **DEMANES** (Design, Monitoring and Operation of Adaptive Networked Embedded Systems) is to provide a framework as well as component-based methods and tools for the development of run-time adaptive systems, enabling them to react to changes in themselves, in their environment, in user needs and in contexts.

CONTRIBUTION *to SRA*

DEMANES is fully aligned with the ARTEMIS SRA addressing the need to maximise the commonalities between various applications of networked embedded systems. The DEMANES technology will have sufficient flexibility to adapt to the demands of different application domain such as aerospace, automotive, industrial automatisisation.

- > Shorter time to market
- > 10% reduction in the cost of the system design (2016 compared with 2008)
- > 10% reduction of development cycles (2016 compared with 2008)
- > Higher cross-sectoral reusability of DEMANES devices by 15% (2016 compared with 2008)
- > 10% less effort to manage a complexity increase of 25% (2016 compared with 2008)
- > 5% reduction of effort and time for re-validation and re-certification (2016 compared with 2008)

MARKET INNOVATION & *impact*

Application Contexts where DEMANES will provide market innovation and generate an impact are:

- > **Industrial Systems** (Industry for airports, urban transport, city logistics, urban safety and security)
- > **Nomadic Environments** (PDAs, smart phones, body sensors, public transportation)
- > **Private Spaces** (home, smart TVs and sensors)
- > **Public Infrastructure** (public urban spaces, transport stations and vehicles, airports)

Therefore DEMANES will help to boost European industry's potential to create major market opportunities and establish leadership by:

- > **reducing** the current European dependence on US industry and technology, with regard to the networked embedded systems applications;
- > **increasing** the competitiveness of EU industry in a set of crucial industrial fields.

The proposed project aims to develop technologies that increase human capabilities in strategic fields such as aerospace, automotive and emergency systems.

RELEVANCE & CONTRIBUTIONS *to Call Objectives*

DEMANES will deliver results related to the following ARTEMIS targets:

- > **Reduce the cost of system design (from 10% to 35%).** By using 'modular-architecture' using all the relevant modules such as Energy Harvesting, Communications, Sensors, Actuators. Standard descriptions and definitions will specify the steps and rules for designing each kind of modules, including Maximum Power Consumption, In-Circuit Communications Interface and Data Protocol and Component Performance dataset.
- > **Reduce development cycles (from 10% to 35%).** For any new requirement, the only necessary step is to exchange one type of module with the most appropriate module, for example a Temperature Sensor Module with a Humidity Sensor Module instead of developing a new module.
- > Achieve cross-sectoral reusability of embedded systems (from 15% to 50%)
Simply by exchanging/removing/adding one of the modules already designed and firmware, a current embedded application can be reused in another sector.
- > **Reduce effort and time for re-validation and re-certification (from 5% to 20%).** The family of modules will be designed via a standard procedure, where, for example, power consumption, in-circuit communications, data protocols and format, and enumeration will be defined, so that each new embedded system can be implemented by existing validated and certificated modules.
- > **Manage a complexity increase with less effort (from 25% to 60%)** Novel technology elements will be developed to cover the special needs of the DEMANES project (i.e. very large-scale, networked embedded systems, distributed management of runtime reconfiguration, etc.). These technologies will be refined to design and develop/integrate tools for designing, implementing, deploying and testing large-scale network embedded applications.

R&D INNOVATION *and technical excellence*

The primary objective of DEMANES is to develop novel technologies to support the cost-effective and timely realisation of large-scale networked systems embedded in the physical world, which are capable of a high level of evolution to follow internal and external changes, and manifest a high level of dependability. DEMANES aims to develop a smart integrated tool chain, reusable components and a framework for the design, implementation, testing, validation and operation of adaptive networked embedded systems. The tool chain will consist of tools:

- > to model the architecture and the operation of adaptive systems to guide the design process and to enable the use of design patterns and reuse of software components
- > to support the design process of such systems by providing simulation and evaluation environments and testbeds for verification and testing along the different stages of the development process
- > to support the implementation of such systems by providing services for self-organisation, reconfiguration and self-optimisation as parts of the execution environment
- > to monitor the internal and external operational conditions and manage adaptation at run time.

In addition to the tool chain, DEMANES will further deliver a model-driven design methodology, reference designs for dependable, real-time distributed systems and a pilot implementation of a runtime platform for applications designed according to the methodology developed. The platform will provide for system self-awareness by means of performance monitoring, runtime functional contract checking, monitoring of real-time properties and reconfiguration.

PROJECT partners



www.artemis.eu



PROJECT COORDINATOR

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WEBSITE

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START

May 2012

DURATION

36 months

TOTAL INVESTMENT

€20.5 M

PARTICIPATING ORGANISATIONS

24

NUMBER OF COUNTRIES

5