ARTEMIS BOOK OF PROJECTS
VOLUME TWO

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Preface

It is with great pleasure and appropriate timing that we present the second ARTEMIS book of projects, Volume 2.
In addition to Volume 1 – in which we highlighted Calls 2008 and 2009 – this book brings you an overview of what has been started and achieved in the calls of 2010 and 2011. The book gives you an update on the progress that has been made by the ARTEMIS Joint Undertaking, the first initiative of its kind in Europe: a public private partnership between the Commission, the ARTEMIS Member States and the ARTEMIS Industry Association on embedded systems.

The idea of the funded projects of the ARTEMIS Joint Undertaking is to avoid further fragmentation of research in the field of embedded systems and, therefore, the projects are based on an overall Strategic Research Agenda and contribute to the general goals of the ARTEMIS community. Ultimately, these projects are intended to have a larger footprint, size and potential impact than other funded projects in Europe.

However, as most projects – showcased in Volume 2 – are still in their start-up phase and as the impact of projects can often only be measured some years after completion, it is too early to fully predict their success. Nevertheless, I hope that this information gives you an early indication of the potential of the approaches and that it inspires you to submit, along with your (new) consortium partners, similar project ideas that fit the Research Agenda of the ARTEMIS Joint Undertaking and its strategic goals in the forthcoming calls.

Klaus Grimm
President of the ARTEMIS Industry Association
Chair of the Governing Board of the ARTEMIS Joint Undertaking

Introduction

The first "Book of Projects" described the 25 projects from the first two ARTEMIS calls: those projects were pioneers and stars at the same time! They were indeed pioneering this new R&D instrument called ARTEMIS. But they were also stars, having been selected through a rigorous, competitive and selective process.

It's now time to look at the second generation of ARTEMIS projects. Both 2010 and 2011 calls generated together a family of 19 projects, bringing the total of ARTEMIS projects to a significant number of 44.

What has changed with this new group of projects? Well, the first big difference is that these projects from the 2010 and 2011 calls have been able to capitalise on the previous ones, using their results on which to base their developments. Another difference comes from the increased maturity of the ARTEMIS community: some sub-programmes, addressing new domains like health, were addressed much more in this second group of calls.

Reading this book, you'll discover that, after 4 ARTEMIS calls, we see the emergence of clusters of projects: new projects are based on the results of previous ones, while a core of partners continues to collaborate one project after the other.

This emergence of clusters of projects is actually the seed for the goal that we all share: the creation of ARTEMIS Centres of Innovation Excellence.

Eric Schutz
Executive Director, ARTEMIS Joint Undertaking

ARTEMISCALI2010

Introduction: Call 2010

Call 2010 was the first call to be fully executed – from start to finish - under the management of the wholly autonomous ARTEMIS-JU Office. Sadly, we had to observe that the growing financial crisis has finally taken its toll and indeed, the National funding committed to this call has dropped to roughly what it had been in the first call, in 2008.

Notwithstanding, the ARTEMIS community still enthusiastically submitted proposals – 72 Project Outlines, which yielded 47 Full Proposals representing an industry willingness to invest some 589 million euros. The ARTEMIS project evaluation and selection procedure filters out only the very best proposals and, taking the available budgets into account, 11 projects were earmarked for negotiations. Sadly, one accident de parcours resulted on one of these excellent projects having to be discontinued due a major change of strategy by a leading world player, finally yielding 10 projects from this call, all of which started their work well on time.

Among these projects we again find some typical ARTEMIS characteristics: some very large projects complemented by smaller targeted initiatives. The average number of countries participating in these is still around 6.8, with an average of about 20 partners per project: some considerable mass is being put behind these projects! The centre of gravity of this mass is again around the difficult problems of making highly reliable embedded computing systems – a problem that industry worldwide struggles with and where European companies obviously want to keep investing to maintain their traditionally leading position on the quality/reliability front. Refreshingly, we also see some more proposals on other topics getting through, such as support for medical systems, advanced user interfaces and, in particular, a large initiative with a unique concept for substantial, societal-scale energy distribution and management.

What is not immediately apparent from the bare facts and figures is the growing number of cross-links between projects. Now with 35 projects running, some "clusters" can already be observed to be forming. These clusters are the hoped-for precursors to larger, longer-lived groups of players that ARTEMIS calls "Self-sustaining Innovation Ecosystems" which, when formalised, can become accredited "Centres of Innovation Excellence". The continuation of the ARTEMIS Technology Conferences has been particularly fruitful in exposing projects' public results and initiating discussions between projects for various collaborations, including the sharing of results.

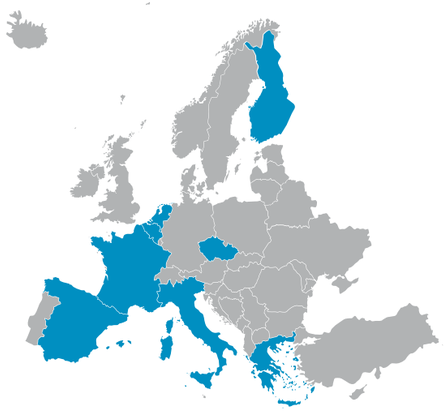
We present here 10 more project abstracts and some articles that we hope will be interesting and giving even more background to the "ARTEMIS Way".

Alun Foster
Programme Manager ARTEMIS Joint Undertaking

ASTUTE

269334

Start date:	March 2011
Project duration (months):	36
Total investment:	€13.2 m
Number of participating organisations:	23
Number of countries:	6



ASTUTE aims to define reference architecture for the development of human-machine interfaces (HMIs) by targeting proactive information retrieval and delivery based on situational context and user state information. In essence, to support the user's decision-making process in a complex environment. The project develops, tests and evaluates platform demonstrators in the domains of automotive, aeronautics and emergency management.

MARKET IMPACT AND INNOVATION

The key to developing a system using context and user-state information to provide users with pro-active decision support via multi-modal interfaces lies in enabling proactive information flow/push to be used via a proactive decision engine that puts the user in control; the load is optimised for the user through the appropriate dosage of information. Models of the user state and the situational context needed to interpret the data captured enable a sort of 'user personal profile' to be created that incorporates user- and context-awareness. Intelligent information management techniques provide aggregation, storage and retrieval of information about situation and context, user state and intention, prediction models, data and information models.

The project results are applicable to a wide range of sectors such as automotive, aerospace and emergency management. Several societal needs are addressed in this context. For instance, in the case of road transport, improving driver comfort and safety is of major importance in today's European society. In addition, new applications, tools and embedded platforms have to be developed for the user to gain access to and profit from new information and services that correspond to evolving social demands. In the same way, increasing flight safety, decreasing the workload of pilots and enhancing usability contribute to public safety. Refinement of the existing essential monitoring tools leads to a greater security in daily life activities.

D3COS

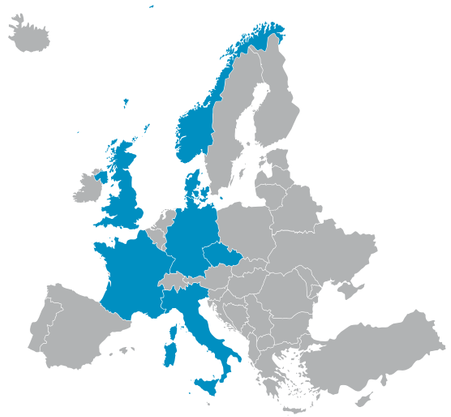
269336

Start date:	March 2011
Project duration (months):	36
Total investment:	€14.5 m
Number of participating organisations:	21
Number of countries:	7

D3CoS aims to develop new and affordable methods, techniques and tools (MTTs) to support the different steps in the industrial development process of Dynamic Distributed Cooperative Human-Machine Systems.

MARKET INNOVATION AND IMPACT

Steady, fast increasing demand for transportation, a key factor of modern human societies, obviously leads to increased traffic density and congestion in the air, on land and at sea. Combined with a system philosophy based mainly on a master (human)-slave (machine) relationship inherent in most current assistance systems, this has an adverse effect on efficiency, safety and the environment. D3CoS goes beyond traditional assistance systems and consequently addresses the whole cooperative systems development process from a multi-agent perspective, where humans and machines inherently cooperate to achieve common, subordinate goals or tasks in order to tackle the challenges posed by future cooperative traffic environments. The D3CoS project seeks technical excellence through open experimental simulation platform-interfacing models of cooperative human and machine agents and support for the reusability of successful designs and design patterns for intelligent multi-modal human-machine interfaces as well as for (human) state inference and state adaptation. Furthermore, this excellence is evident in architectures for cooperative systems with embedded systems and a common methodology to integrate the D3CoS methods, techniques and tools into an easy-to-use, reliable, valid tool chain for industrial application.



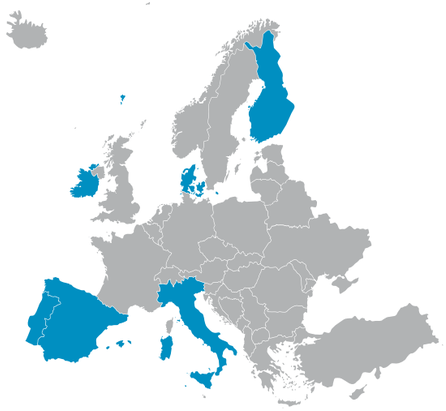
D3CoS results will reduce the effort and time to market of innovative and ambitious distributed cooperative human-machine systems. By improving the quality of system design, development and evaluation through methods, techniques and tools as well as enhance support through model-based development and testing, the cost of system design, development and evaluation will be reduced and thus boost productivity and competitiveness for European manufacturers. Safety improvement for cooperative human-machine systems will be achieved by including a human-centred system design perspective and applying agent modelling techniques in the early phases of the embedded system development process. Furthermore, the developed toolset will support early product design evaluations.

ENCOURAGE

269354

Project duration:	36 months
Start date:	June 2011
Total investment:	€6.3 m
Number of participating organisations:	11
Number of countries:	5

The ENCOURAGE project aims to develop embedded intelligence and integration technologies that will directly optimise energy use in buildings and enable active participation in the future smart grid environment.



MARKET INNOVATION AND IMPACT

The ENCOURAGE project aims to develop technologies that will enable energy optimisation in buildings at different levels: device, building and district. These energy optimisation objectives will be achieved in three complementary ways. Firstly, the development of supervisory control strategies will enable larger sub-systems (heating, ventilation, air conditioning, lighting, renewable energy generation, thermal storage, etc.) to be coordinated and the operation of the numerous devices in such systems to be orchestrated. Secondly, the development of an intelligent gateway with embedded logic supporting inter-building energy exchange will facilitate direct communication with other buildings and local producers so that the potential use of the electricity produced locally on their premises can be negotiated. Finally, the development of novel virtual sub-metering technologies and event-based middleware applications will support advanced monitoring and diagnostics concepts. Systematic performance monitoring will ensure that the resulting savings can be sustained over a long period of time without being adversely affected by any deterioration of performance that may occur in either the mechanical equipment or the monitoring and control system itself.

The appliance-level monitoring and control developed within the ENCOURAGE project contributes to ICT enabled solutions for energy efficiency and supports Europe's objective of a 20% energy reduction by 2020. ENCOURAGE enables this monitoring on standard and non-compliant devices, with the possibility of energy consumption capabilities for neighbouring buildings and entities. The spin-off of this will be seen in the development of the market for intelligent ICT-based appliances as well as the introduction of a completely new market for energy trade based on forecasts, metering and the range of energy supply options.

ENCO URAGE

Embedded iNtelligent COntrols for bUildings with Renewable generAtion and storaGE

Our society relies on energy for most of its activities. One application domain that is putting the energy budget under significant pressure is energy consumption in residential and non-residential buildings. The ever increasing needs for energy, resulting from the industrialisation of developing countries and the limited scalability of the traditional technologies for energy production, raises both problems and opportunities. The problems are related to the devastating greenhouse gas effects produced by the burning of oil and gas for energy production and the dependence of whole countries on companies supplying gas and oil. The opportunities are mostly technological, since novel markets are opening for both energy production via renewable sources, and for innovations that can rationalise energy usage. An appealing research effort combining these two aspects would leveraging on ICT technologies to rationalise energy production, acquisition and consumption.

Our society relies on energy for most of its activities. One application domain that is putting the energy budget under significant pressure is energy consumption in residential and non-residential buildings. The ever increasing needs for energy, resulting from the industrialisation of developing countries and the limited scalability of the traditional technologies for energy production, raises both problems and opportunities. The problems are related to the devastating greenhouse gas effects produced by the burning of oil and gas for energy production and the dependence of whole countries on companies supplying gas and oil. The opportunities are mostly technological, since novel markets are opening for both energy production via renewable sources, and for innovations that can rationalise energy usage. An appealing research effort combining these two aspects would leveraging on ICT technologies to rationalise energy production, acquisition and consumption.

RATIONALISING ENERGY PRODUCTION AND CONSUMPTION

The ENCOURAGE project aims to develop embedded intelligence and integration technologies that will directly optimise energy use (20% savings) in buildings and enable active participation in the future smart grid environment. This will be achieved by developing supervisory control strategies and orchestrating device operation, supporting inter-building energy exchange and through novel virtual sub-metering technologies and event-based middleware application supporting advanced monitoring and diagnostics concepts.

The desired energy savings will be achieved in three complementary ways. Firstly, by developing supervisory control strategies that will be able to coordinate larger subsystems (HVAC, lighting, renewable energy generation, thermal storage, etc) and orchestrating the operation of the numerous devices in such systems. Secondly, through an intelligent gateway with embedded logic supporting inter-building energy exchange that will communicate directly with other buildings and local producers to negotiate possible use of the electricity produced locally in their premises. Thirdly, by developing novel virtual sub-metering technologies and event-based middleware applications that will support advanced monitoring and diagnostics concepts. Systematic performance monitoring will ensure that the savings are sustained over a long period of time. The primary application domains are non-residential buildings and campuses, but the project is also relevant to residential buildings and neighbourhoods. Demonstrators will comprise public and private office buildings, campus buildings and private homes.

ENCOURAGE ARCHITECTURE: SUPPORT FOR HETEROGENEOUS SMART GRIDS

The ENCOURAGE project aims to develop embedded intelligence and integration technologies that will directly optimise energy use in buildings and enable active participation in the future smart grid environment. The primary application domains targeted by the ENCOURAGE project are non-residential buildings (e.g., campuses) and residential buildings (e.g, neighbourhoods). The goal of the project is to achieve 20% of energy savings through the improved interoperability between various types of energy generation, consumption and storage devices, through inter-building energy exchange and through systematic performance monitoring. To achieve this an architecture has been designed comprising four chief components: supervisory control, energy brokerage and business intelligence, the ENCOURAGE Building Network (EncBN) and middleware.

Supervisory Control implements strategies to orchestrate the operations of different subsystems like heating, ventilation and air conditioning (HVAC) systems, lighting, renewable energy generation and thermal storage, taking into account that each subsystem potentially comprises a large number of embedded devices. Supervisory Control will be focused either on the supply side (local generation control), demand side (load management), or a combination of both (energy management). Energy Brokerage and Business Intelligence integrates the system with intelligent gateways whose embedded logic supports inter-building energy exchange to enable direct communication with other buildings and local producers to negotiate possible use of the electricity produced locally in their premises. The component will provide services that will take advantage of the collected historical data on previous consumption patterns as well as load and generation forecasts to make decisions in short-term about the participation in the energy brokerage or in the long-term about possible retrofits, equipment replacements and other capital investment actions.

The ENCOURAGE Building Network (EncBN) provides management for the devices that either reside inside the building or, like the local generation and storage equipment, are located in the exterior spaces. A Middleware implements an event-processing system that takes the data from the EncBN and processes it as a stream of events. The middleware can be seen as being composed of multiple event-processing agents that exchange information between event producers, event consumers and other agents. This approach will not only handle uncomplicated events but will also allow for inference of complex events by combining simple ones. The middleware will be able to host various applications, such as the device diagnostics.

At EncBN level, the project aims to combat the complexity that arises with large systems. The ENCOURAGE architecture further develops the results of ARTEMIS project eDIANA by articulating the smart grid into cells (living/working units) and macro-cells (residential and non-residential buildings) to reach a new level of optimisation.

HOME AREA NETWORKS

The EncBN is identified with a set of Home Area Networks (HANs), each one composed by devices in the user's house and one or more smart gateways that control the devices and connect the HAN to the ENCOURAGE Middleware. Current practice considers the gateways as non-interactive, a HAN divided into secluded and non-communicating segments. The ENCOURAGE architecture assumes that the gateways aggregate themselves with the Middleware, causing the cell to appear as a single entity.

To provide a semantically meaningful division of the EncBN into units that can be easily mapped to final users, we communicate with the HANs via Logical Aggregators, which are the entry points to the single entities into which the network is divided. This entity can be identified with the cell, and corresponds to one living/working unit. Each logical aggregator brings together a number of legacy embedded devices (gateways, sensors, actuators, ...) and rationalises their integration into the smart grid. With the goal of easing the integration of new vendors and boosting the versatility of the platform, ENCOURAGE will adhere to the standards used both to describe the internal data and, whenever possible, to enable communication between the gateways and the logical aggregators.

This article was based on the following information:

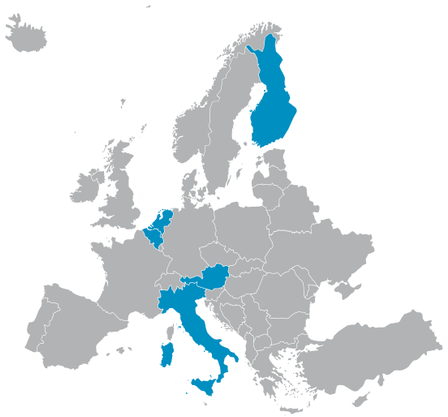
Article:
'ENCOURAGE architecture: support for heterogeneous smart grids.' (2012)

Website:
www.mbat-artemis.eu/home

High Profile

269356

Start date:	April 2011
Project duration (months):	36 months
Total investment:	€7.9 m
Number of participating organisations:	17
Number of countries:	5



HIGH PROFILE aims to establish an overall system approach for healthcare based on an integrated system concept of seamless integration of interoperable components, explicitly in the field of Advanced Imaging Systems.

MARKET INNOVATION AND IMPACT

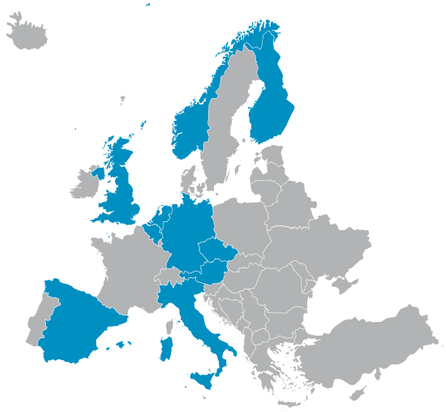
When a patient with a neurological problem goes to see his physician, the latter needs access to the best possible information on the brain. In order to enable the physician to get what he needs, and therefore to facilitate better treatment of neurological diseases, HIGH PROFILE aims to deliver software systems that integrate information from multiple sources, such as MRI, EEG and NiRS, and thus provide insight into 3D and 4D brain activity. HIGH PROFILE deploys software-based image processing on commodity hardware systems that are increasingly becoming multicore. The project will elevate the state of the art by integrating imaging equipment for neurological diagnostics to support improved diagnosis and develop a standards-based interoperable solution architecture to support clinical workflows associated with the use of advanced medical technology. This includes support to combine images from different medical equipment modalities and for comparing/merging images with physiological models of the central nervous system.

HIGH PROFILE addresses the global market for medical imaging, a market that is showing continuous and sustainable growth and is becoming increasingly demanding. This market will see greater use of digitised, higher resolution images and a shift towards multi-modality and functional imaging as well as minimal invasive intervention. HIGH PROFILE will deliver a significant contribution to the diagnosis and therapy of illnesses of the central nervous system and brain, exploiting high-performance digital signal processors and computing along with content management platforms, making the data available when and where required. In turn, visits to physicians and hospitals will become shorter and less frequent, and periods of hospitalisation will be shorter. Ultimately, this will lead to greater longevity and improved quality of life throughout.

IoE
269374

Start date:	May 2011
Project duration:	36 months
Total investment:	€45.5 m
Number of participating organisations:	42
Number of countries:	10

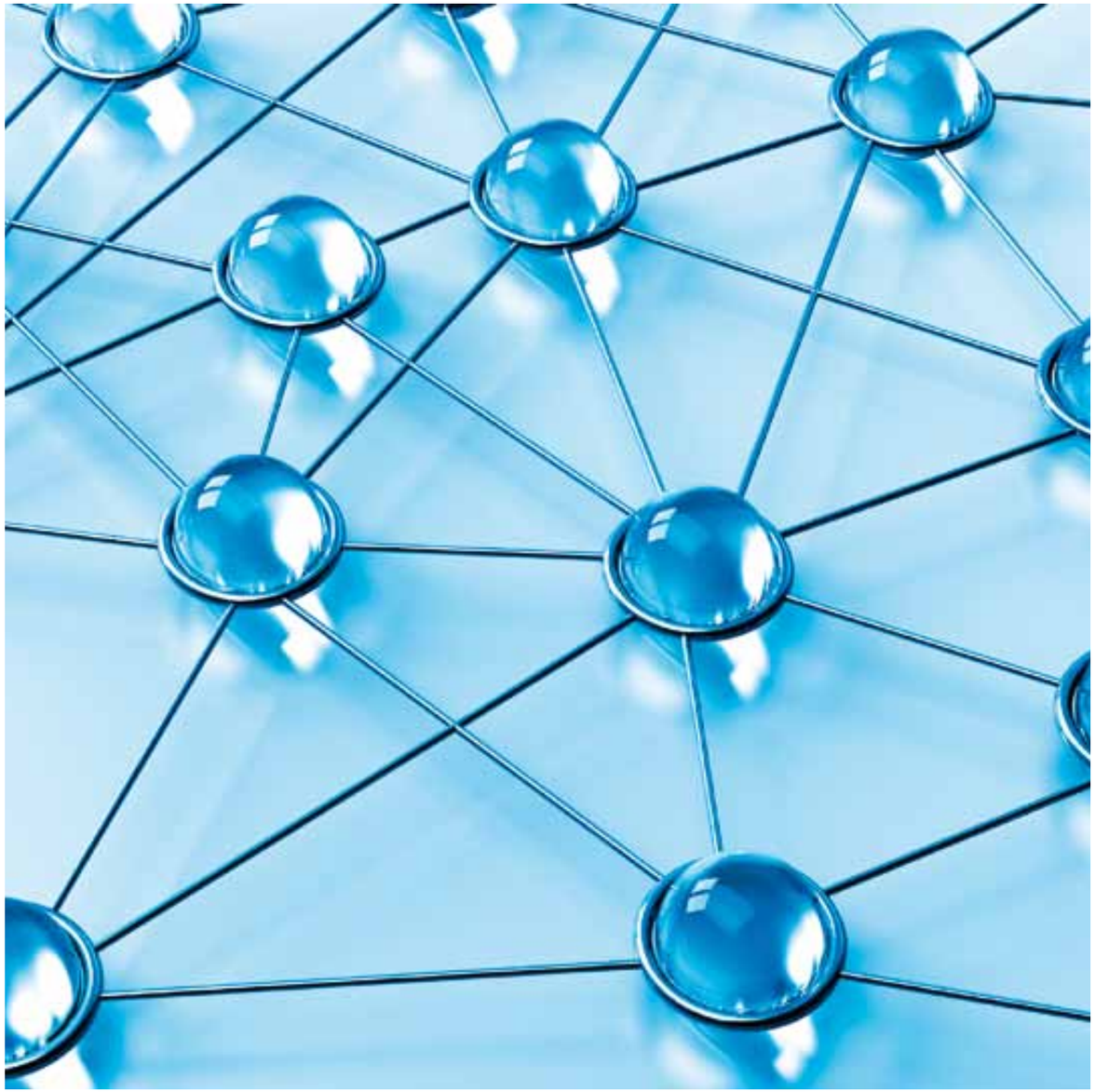
The aim of the IoE project objective is to develop hardware, software and middleware for seamless, secure connectivity and interoperability achieved by connecting the Internet with the energy grids, with a specific focus on applying the IoE for the electric mobility infrastructure.



MARKET INNOVATION AND IMPACT

The underlying architecture of distributed embedded systems combines power electronics, integrated circuits, sensors, processing units, storage technologies, algorithms and software. Smart grid power network modelling, emulation and simulation for Internet of Energy integration will increase the number of participants for whom precise and detailed information and accurate state estimation and prediction are available. A novel smart meter system with multiple interfaces will enable advanced demand response and load shedding. The project will also provide guidelines for the implementation of security, privacy and dependability in IoE, validated in selected cases using models and simulations. Power storage architectures and communication modules will target integration on the Internet of Energy electric mobility applications. Furthermore, renewable energy integration and infrastructure for Internet of Energy electric mobility applications will be geared to combining controlled multiple systems and monitoring new data as well as integrating remote monitoring with navigation systems for novel green mobility services.

The IoE will impact the future electricity grid by using data communication to transport electricity more efficiently, reliably and affordably as well as future Internet by using the electricity grid to facilitate and accelerate communication amongst the various energy nodes and domains. Overall, the grid will shift from a centralised, producer controlled network to a distributed, consumer interactive, environmentally responsive model, enabling bi-directional power/energy transport and greater consumer participation thanks to a capillary of information distribution and economic benefits for energy production. It will incorporate significant levels of energy storage and generation that will remedy disparities between peak supply and demand.



IoE

Internet of Energy for Electric Mobility

The objective of the Internet of Energy (IoE) is to develop hardware, software and middleware for seamless, secure connectivity and interoperability by connecting the Internet with the energy grids and so create the infrastructure for electric mobility. The underlying architecture of distributed embedded systems combines power electronics, integrated circuits, sensors, processing units, storage technologies, algorithms and software with a real-time interface between the power network/grid and the Internet. The grid will increasingly rely on smaller, locally distributed electricity generators and storage systems based on plug & play principles whereby power network devices and loads can be charged from or be connected to any energy source (solar, wind, hydroelectric).

UNDERLYING ARCHITECTURE

The project will examine vertical integration and horizontal cooperation among energy utilities, OEMs and hardware/software/silicon providers. It will address reference designs and embedded systems architectures for highly efficient, innovative smart network systems with regard to requirements of compatibility, networking, security, robustness, diagnosis, maintenance, integrated resource management, and self-organisation. Value added services will be created using both wired and wireless devices with access to the Internet by managing key topics: demand response, modelling/simulation, energy efficiency and conservation, usage monitoring, real-time energy balance and billing.

The IoE project will propose an architecture and distributed embedded systems to implement the real-time interface between the smart energy grid (infrastructure) and a cloud of devices/loads at the edge (users). For example, electric vehicles, residential and commercial buildings, offices, electric devices and domestic appliances can be plugged into and charged by a variety of electric energy sources such as solar panels, wind turbines, hydroelectric, etc. With an underlying architecture of distributed embedded systems, combining power electronics, microprocessors, sensors, storage technologies, algorithms and software, the Internet of Energy will provide an intelligent and efficient network that seamlessly links energy utilities to operators and energy consumers.

The IoE project consortium brings together 40 partners from 10 European countries - mobilising Europe's best industrial and research capabilities in the area of embedded systems, energy, semiconductors, end users and vehicle OEMs.

INNOVATION AND EXCELLENCE

The project targets a number of key areas of innovation and excellence. Among these is smart grid power network modelling, emulation and simulation for Internet of Energy integration whereby load estimation response prediction will become more precise the more detailed information becomes available. The IoE's step beyond the state of the art will be the integration of ICT features with hardware control functions (µC's, FPGAs). Interwoven functions that currently use separate sets of chips will enable a cost-effective, reliable data information exchange between ICT and the electric energy domain. Furthermore, the development of a cost-effective and energy-efficient bi-directional power flow controller capable of rapid charging and intelligent control of the exchange of energy between distributed storage, renewable energy sources and the grid will be addressed.

In terms of storage the IoE examines a range of power storage modules with a selection of geometries to suit various expected operational locations (in vehicle, roadside, at service areas, at home, in the workplace) using different chemistry and super capacitor technologies, optimised for effective operation across the range of usage and charging scenarios. An overall architecture is proposed to ensure that correct operation safeguards the system against system failure or misuse and guidelines will be provided for the implementation of security, privacy and dependability.

ELECTRIC MOBILITY

The focal point of the three-year project is on the opportunities from smart-grid developments to enable and support the large-scale uptake of electric mobility in Europe. The Internet will be connected with the energy grids to enable intelligent control of energy production, storage and distribution; these are all key infrastructure enablers for the widespread use of electric vehicles.

This project is developing hardware, software and middleware for seamless, secure connectivity and interoperability by connecting the Internet with energy grids to create an electric mobility infrastructure. The project is addressing

reference designs and embedded systems architectures for highly efficient, innovative smart network systems regarding requirements of compatibility, networking, security, robustness, diagnosis, maintenance, integrated resource management and self-organisation.

The IoE proposes innovative solutions for interfacing the Internet with the power grid with applications for electric mobility, helping to make transport more sustainable, efficient, clean, safe and seamless. IoE is supporting both the development of the future electric grid by using data communication to move electricity more efficiently, reliably and affordably and the development of the future Internet by using the electric grid to facilitate and speed-up the communication amongst the various energy nodes and domains.

MARKET INNOVATION AND IMPACT

The IoE will impact the future electricity grid by using data communication to transport electricity more efficiently, reliably and affordably as well as future Internet by using the electricity grid to facilitate and accelerate communication amongst the various energy nodes and domains. Overall, the grid will shift from a centralised, producer-controlled network to a distributed, consumer interactive, environmentally responsive model. It will enable bi-directional power/energy transport on the power transmission lines provided by a new smart electricity grid relying on data/information transferred across both power lines and data links (wired and/or wireless).

A capillary pattern of information distribution and economic benefits for energy production, use, storage and transportation will promote greater consumer participation (and therefore motivation and incentives for energy and environmentally friendly user patterns). It will incorporate significant levels of energy storage capabilities and generation that will greatly help balance the disparities between peak supply and demand.

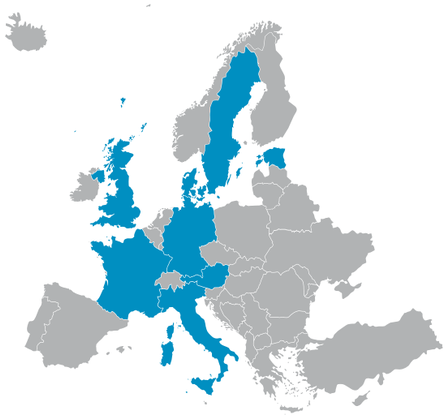
This article was based on the information of the IoE website.

Source: www.artemis-ioe.eu

MBAT

269335

Start date:	November 2011
Project duration:	36 months
Total investment:	€34.5 m
Number of participating organisations:	38
Number of countries:	8

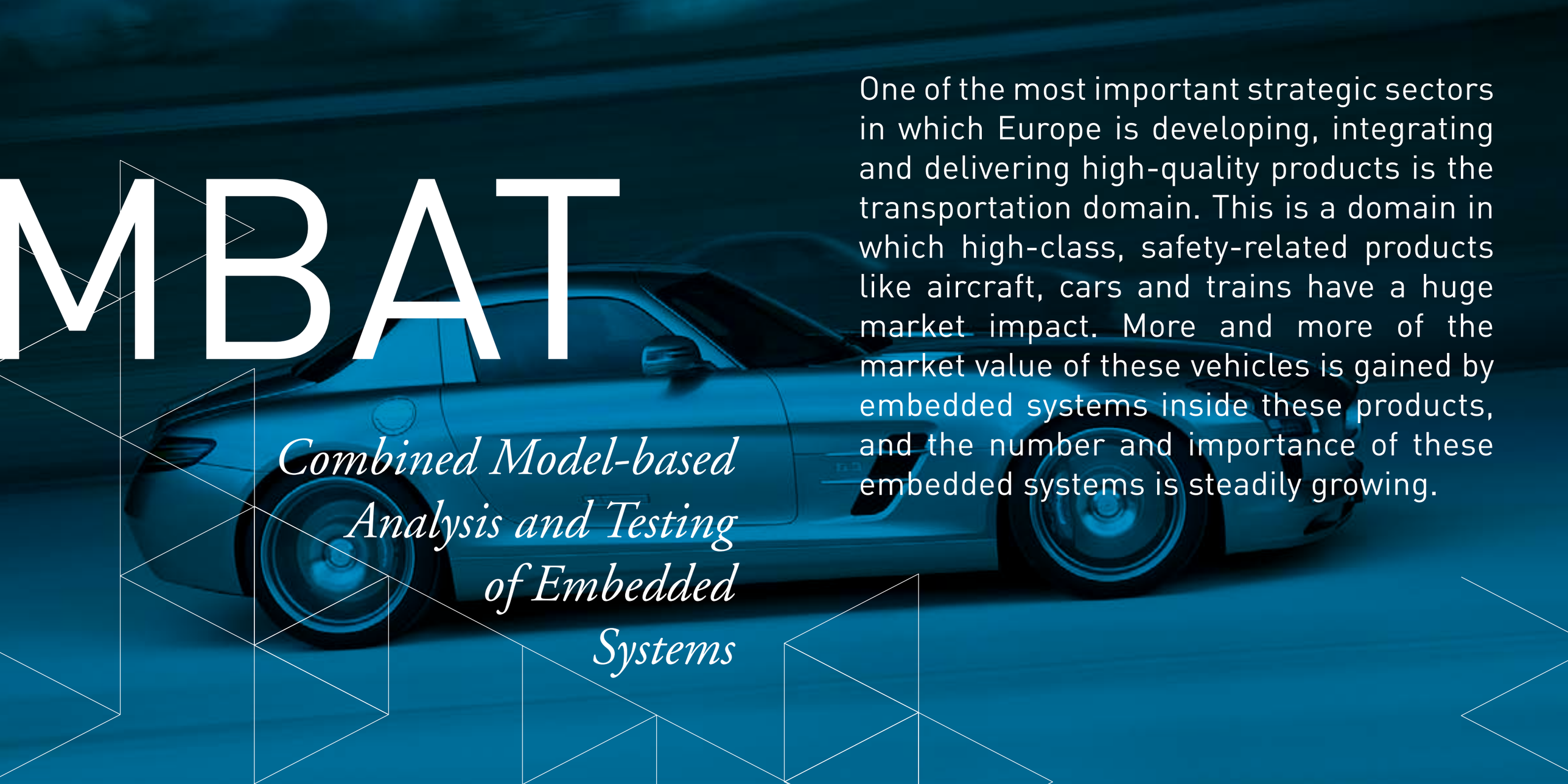


MBAT will provide Europe with a new leading-edge Reference Technology Platform (RTP) for the effective and cost-reducing validation and verification (V&V) of embedded systems in the transportation domain.

MARKET INNOVATION AND IMPACT

The V&V technologies already in industrial use are still too expensive while at the same time often ineffective or even insufficient.
MBAT will provide European industry with a new leading-edge V&V technology in form of a Reference Technology Platform (the MBAT RTP) that will enable the production of high-quality and safe embedded systems at reduced cost in terms of time and money.
This will be made possible by a new and very promising approach in which the most advanced model-based testing technologies will be combined with static analysis techniques. Besides this combination, a further new approach will employ (and re-use) test & analysis models as the basis for model-based V&V and lead to a more effective and, at the same time, cost-reducing approach.
In addition, the MBAT RTP will be connected with other ARTEMIS reference technology platforms, such as the CESAR, iFEST and pSafeCer RTPs, to extend these platforms in order to pursue the ARTEMIS goal to provide a European RTP for the development of embedded systems.

MBAT will increase the competitiveness of European key players in the transportation domain by reducing V&V costs for embedded systems by at least 20% and shortening time-to-market by at least the same percentage while increasing the coverage of the embedded system under V&V by at least 30%. The error detection rate will be significantly improved and this, in turn, will enable higher quality embedded systems. MBAT will also contribute to and implement the common ARTEMIS interoperability standard and make new (research and commercial) tools available for integration as part of industrial processes and tool chains.



MBAT

Combined Model-based Analysis and Testing of Embedded Systems

One of the most important strategic sectors in which Europe is developing, integrating and delivering high-quality products is the transportation domain. This is a domain in which high-class, safety-related products like aircraft, cars and trains have a huge market impact. More and more of the market value of these vehicles is gained by embedded systems inside these products, and the number and importance of these embedded systems is steadily growing.

One of the key enablers in assuring the quality of embedded systems is the application of powerful validation and verification (V&V) technologies during the embedded systems development process. Unfortunately, the V&V technologies that tend to be prevalent in industrial use today are still too expensive and are often not effective enough. The MBAT project will provide European industry with a new leading-edge V&V technology in the form of a Reference Technology Platform (MBAT RTP) that will enable high-quality and safe embedded systems to be produced more quickly and less expensively.

NEW APPROACH

This quicker, cheaper production of embedded systems will be made possible by a new and very promising approach in which model-based testing technologies will be combined with static analysis techniques. A further new approach is to use (and re-use) specially designed test and analysis models as the basis for model-based V&V, ultimately creating a technology that will lead to a more effective and at the same time cost-reducing approach compared to its traditional counterparts. In addition, the MBAT RTP will be connected to other ARTEMIS reference technology platforms, which will also serve to extend the existing platforms.

Since the focus of this project is on transportation domains that have the common need to deliver safety-critical products of the highest quality, the MBAT consortium is composed of key players that develop such products, including their embedded systems. The industrial partners will ensure that the resulting MBAT RTP will be approved by the industry and thus its use within the European industry will have a very high degree of relevance. Developed by such key industrial players (both large companies and SMEs) in the domain and supported by leading research partners, the MBAT RTP will provide very effective means for the industry to assure the very best quality embedded systems at very competitive, reduced costs.

QUALITY IS KEY

Europe enjoys a very good reputation for the high quality of its products, services and system engineering capabilities. Maturity and sophisticated innovation have enabled products developed in Europe to be sold all over the world. One of the most important industrial strategic sectors in which Europe is developing, integrating and delivering high-quality products is the transportation domain.

More and more of the market value of these transport products is gained by the embedded systems that are incorporated within these products. Such embedded systems are responsible for safety, fuel/power consumption or driving assistance in cars, trains and airplanes, and the number and importance of these embedded systems is steadily growing. This means that it is essential for European system developers and integrators to master embedded systems technology.

Effective and efficient technologies for developing and validating embedded systems are of utmost importance if this leading position that Europe holds is to be bolstered and extended. It is especially important in times in which Europe has to compete with services and products provided by low-wage countries that a high level of quality is maintained. Europe indeed has a large body of knowledge, experience and technologies in the area of embedded systems development but these assets need to be combined and aggregated in order to strengthen the ability of European manufacturers and system integrators to produce supreme-quality embedded systems. Quality flaws in transportation systems can ruin a reputation and consequently see market share decline, as evidenced by recent stories of some non-European car manufacturers. At its most extreme, a lack of quality can put human beings in danger and threaten the natural environment. This has to be avoided at all costs.

This article was based on the information of the MBAT website.

Source:
www.mbat-artemis.eu/home

RESULTS IN A NUTSHELL

MBAT will reduce the costs of validation and verification significantly by at least 20% through the combination and extensive automation of model-based analysis and testing techniques as well as cut the costs of certification and qualification and accelerate time to market for embedded systems products by the same percentage. The detection of errors will be enhanced by effectively combining of analysis and testing so that such errors can be identified and weeded out early in the development phase, thereby safeguarding quality. Effective transfer from research domain to industrial practice will be achieved by integrating model-based V&V technologies into industrial practice, and MBAT will measure the impact of this transfer. Cross-domain fertilisation will be facilitated and supported, starting within the transportation domain, and the MBAT reference technology platform will be prepared in the conviction that with some degree of adaptation the resulting MBAT RTP can also be used in other application domains like telecom and manufacturing. Ultimately, an eco-system of technical expertise will be built around the MBAT RTP.
Solutions for real challenges

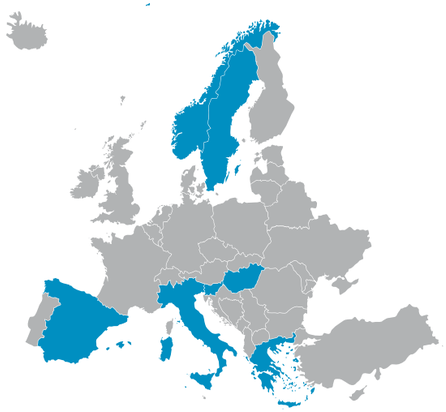
To summarise, MBAT will provide Europe with a new leading-edge Reference Technology Platform for effective and cost-reducing validation and verification, focusing primarily on the transportation domain, but also applicable in other domains. Developed by European industrial key players (large companies and SMEs) in this domain and supported by leading research partners, this MBAT RTP will be of high value for the European industry, providing very effective means to assure very highest quality embedded systems at reduced costs. With this, MBAT will also strongly support the EU vision of zero traffic fatalities by 2020. As this project is clearly industrially driven, this provides an assurance that the MBAT RTP will provide solutions for the real development challenges that exist in the European industry, a goal that is commensurate with ARTEMIS project objectives.

nSHIELD

269317

Start date:	November 2011
Project duration (months):	36 months
Total investment:	€13.4 m
Number of participating organisations:	24
Number of countries:	7

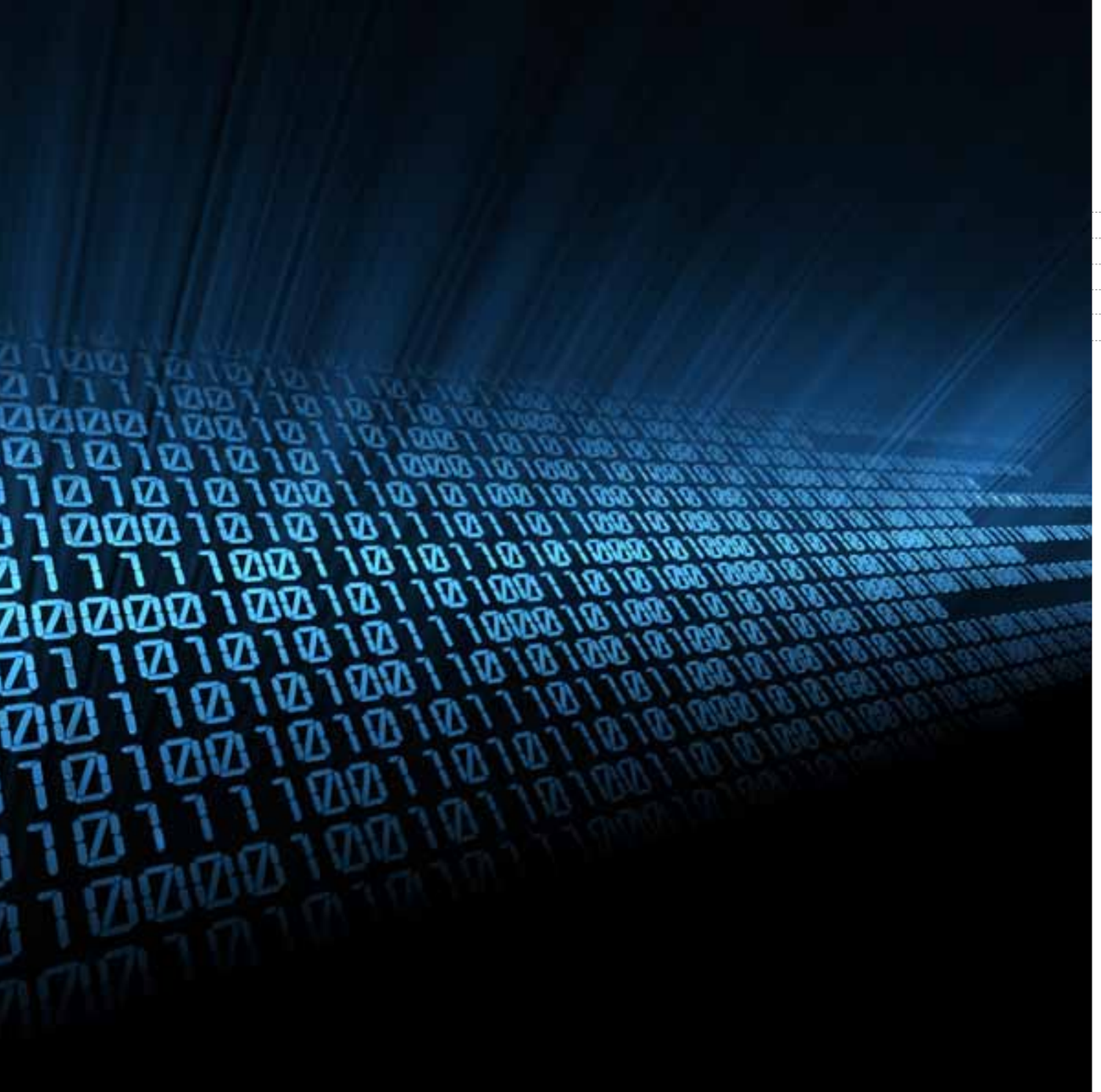
nSHIELD is the architectural framework project for security, privacy and dependability (SPD) in embedded systems. The project aims to develop new built-in SPD functionalities and demonstrate the modularity and the composability of them in four different strategic scenarios: Railways Security, Voice/Face Recognition, Dependable Avionic Systems and Social Mobility and Networking.



MARKET INNOVATION AND IMPACT

Approaching SPD at four different levels – node, network, middleware and overlay – nSHIELD will examine the state of the art in SPD of individual technologies and improve and integrate solutions at each level. The SPD technologies will be then enhanced with the composability functionality. At the same time, the integrated use of SPD metrics in the framework will have an impact on the development cycles of SPD in embedded systems because the qualification, (re) certification and (re)validation process of a SHIELD framework will be faster, easier and widely accepted. With the creation of this innovative, modular, composable, expandable and highly dependable architectural framework, and with the use of common SPD metrics, nSHIELD will be capable of improving the overall SPD level in any specific application domain with minimum engineering effort. In addition, the whole embedded systems lifecycle will be supported to provide the highest cross-layer and cross-domain levels of SPD, guaranteeing their maintenance and evolution in time.

Applied to systems for monitoring and protection (railway and urban transport infrastructure, voice and facial recognition, social mobility and avionic system surveillance), the results obtained with nSHIELD are expected to reduce costs and development time as well as improve compliance with SPD requirements and the level of integration between heterogeneous elements. In addition, the project will probably boost system reliability and reduce time to market compared with rival products, with a consequent increase in sales. Finally, nSHIELD will define a standard to result in a generic embedded system with a potential "SHIELD compliant" certification.



PRESTO

269362

Start date:	April 2011
Project duration:	36 months
Total investment:	€8.6 m
Number of participating organisations:	13
Number of countries:	5

PRESTO aims to improve test-based embedded systems development and validation in the context of the constraints of the industrial development process. The project is based on the integration of test trace exploitation, platform models and design space exploration techniques. The expected result of the project is to establish functional and performance analysis and platform optimisation at an early stage of the design development.

MARKET INNOVATION AND IMPACT

The overall concept developed in the PRESTO project is validation capacity at an early stage of non-functional properties, such as performance, to enable better alignment of the software components on the execution platform (hardware and middleware). PRESTO aims to improve the software part of the design flow by specifying the software application as a set of interconnected components and their interfaces using the MARTE profile or domain-specific language supporting software/hardware allocation. PRESTO's innovation and technical excellence stems from software and hardware modelling, using modelling notations and transformations to facilitate software/hardware allocation, as well as the formal modelling of properties, including timing constraints, and a comparison between timing analyses and simulation results with the real platform execution to assess the overall PRESTO workflow.

Embedded system development is undergoing radical change due to the increase of complexities on all fronts. To manage this, PRESTO is introducing the design space exploration of different software/hardware allocations and the associated performance analyses at early stages of the system development using the performance exploration/configuration generation tools. Current software and hardware development are normally separate processes, which causes validation problems and leads to over-dimensioned platforms that increase cost and power consumption. As major players in the embedded systems market, the industrial partners of the project (THALES, TELETEL, MILTECH) will use and evaluate the new methods/tools to adapt new software applications to different execution platforms. The PRESTO project will thereby stimulate the growth and emergence of the solution and tool vendors involved in the project, in particular SMEs (RapitaSystems, Softeam, MetaCase, Prismtech, PragmaDev, Sarokal).


PRESTO
Fostering analysis on industrial
embedded systems
development process

PRESTO (development process improvements of industrial real-time embedded systems) is an ARTEMIS JU project of the 2010 call involving 13 organisations from five European member states and representing industry (large companies and SMEs) as well as the research and academic communities. Having started in April 2011, it has a duration of 36 months and a budget of 8.6 million euros.

PRESTO AT A GLANCE

The PRESTO project aims to improve the development and validation of test-based embedded systems within the constraints of industrial development processes. One the one hand, the main information recovery of the software development flow is the description of the software application as a set of interconnected components and their interfaces, specified using the MARTE profile or domain-specific language supporting software/hardware allocation. On the other hand, test traces are generated from "classical" software test integration of functional behaviours. Presto is based on the integration of:

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

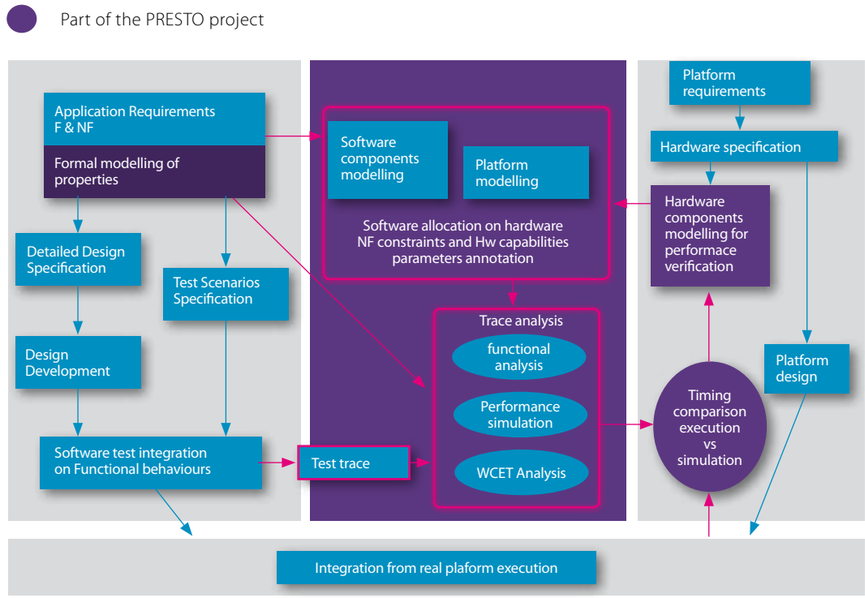
The general idea of the PRESTO project is to provide a toolset, using inputs from the current Industrial Design processes, in particular: system requirements allocated to the software and hardware with test execution traces from the software integration.

AS EARLY AS POSSIBLE

By nature, Embedded Systems are constrained by the limited amount of resources available (time, power, size). These constraints need to be taken into account in the engineering process. The allocation of application functions on execution platforms and the related consequences of using resources must be carefully addressed, as early as possible, during the design stages. Evolutions in the industrial process developments of real-time and embedded systems are faced by new challenges in their design process. During embedded software design hardware platform parameters should be adjustable and the embedded software design should allow new hardware component parameters to be modified so that software developments benefit and the impact of these functionalities can be evaluated, in term of timings, during the early stages of the design.

EXPECTED RESULT

The expected result of the project is to establish functional and performance analysis and platform optimisation at an early stage of design development. Particular attention is given to industrial development constraints, which means: 1) the least possible cost in terms of extra specification time and need for expertise, 2) simple use of the tools, 3) smooth integration in the current design process, 4) a tool framework flexible enough to be adapted to different process methodologies, design languages and integration test frameworks, 5) analysis results validated by comparison with real platform results, and subsequently improved platform modelling for fast prototyping.



THE PRESTO CONCEPT

The following project synopsis presents the formerly separated software (i.e. the application part of the system) and hardware (i.e. the HW, OS and middleware part of the system) design flow parts. PRESTO enriches these flows by adding extra specifications of the software/hardware deployment modelling and captures the deployment information needed to interpret trace generation from host platform to estimate the performance of the modelled targeted platform. Functional analysis from properties is also verified on the traces. The overall concept developed in the PRESTO project is the validation of non-functional properties, such as performance, at an early stage to result in a better fit of the software components on the execution platform (hardware and middleware).

The PRESTO flow extensions, related to software and hardware modelling, are explained below.

A - IMPROVEMENT OF THE SOFTWARE DESIGN FLOW

> **Software modelling,** *by any language extension, supporting software and hardware allocation (with the MARTE UML profile, AADL or AUTOSAR standards as potential candidates)*

The software component modelling specification will be done at the same time as the software design specification (Software Requirements Specification, Interface Requirements Specification). The definition of the components and their interface should be sufficient for performance modelling.

> **Formal modelling of properties**

Requirements specified in system specification documents are described in natural language (requirements for functional or timing constraints) and validated only in platform execution. We propose to formally specify the functional and timing constraints to be used by the timing analysis tools in addition to the software/hardware allocation model and an application model. The format and expression of these timing properties are defined jointly by the industrial partners and timing tools analysis providers in the project.

> **Test trace generation and exploitation**

The sequences of actions in traces are expressed as the behavioural representation of the system. The objective of this project is to use these sequences of actions as the entry point for performance analysis tools. As these traces contain a huge quantity of functional information, we propose using them in the project for both functional and non-functional property verification. An information set will be defined in respect of ascertaining the type of property, and the capabilities of the analysis tools. Code instrumentation will be applied on the wrapper code generated in the software modelling specification.

B - IMPROVEMENT OF THE HARDWARE DESIGN FLOW

The main information recovery of the process hardware development flow similarly includes:

> **Hardware modelling**

The description of the hardware platform and its modelling using the dedicated MARTE profile. This modelling should be smoothly integrated into the hardware design flow. At this stage several architectures may be specified and modelled by the prototyping tool and compared with software components and architecture.

> **Comparison between timings analysis and execution**

To validate the timing analysis results, they have to be verified against real platform execution analysis by comparing timing results with the execution (or simulation) of the application on the platform at different gradations (e.g., single function, full trace,…).

C - IMPROVEMENT OF THE ANALYSIS CAPABILITIES

The results will allow the adaptation of the parameters needed for predicting performance using timing analysis. The transition between functional simulation and execution tends to be gradual; it should be possible to quickly verify those parts where the design has proceeded further. Therefore, mixed situations have to be taken into account.

> **Fast platform prototyping tool definition**

Here we propose to quickly define a platform prototyping tool, based on the MARTE UML profile for embedded systems, or to use existing hardware and software architecture modelling languages to describe the allocation of the software components on the annotated platform. This will provide performance verification, such as WCET analysis in respect of specific software/hardware allocation, scheduling analysis, performance dependence on hardware parameters, best proportion of the hardware components in terms of the performance constraints.

> **Use of the test traces as point of entry for designing the property and performance analysis environment**

The sequences of actions in traces are expressed as the behavioural representation of the system. The objective of this project is to benefit from these sequences of actions and to use them as the point of entry for performance analysis tools. The test framework may generate more accurate information, such as message conveyance between components, function calls, host execution timing information and variables assignments. This information is generally used to help debug the system. As these traces contain a huge quantity of functional information, we propose using them in the project for both functional and non-functional property verification, by specifying explicit properties, as available from the formal modelling of requirements, and by inferring properties or sequence patterns from traces.

> **Simulation results compared with the real platform execution**

As the modelling of the platform is not supposed to be designed by a hardware expert, and should be as fast as possible, key to the top-down analysis from the application to the platform execution is confidence in the fast prototyping tool performance predictions. The solution to validate this modelling is to compare the predicted performance with the real execution on the platform for different classes of systems used as benchmarks, in order to identify the dominant parameters for suitable platform modelling.

Michel Bourdellès acts as the interface between the collaborative project activities and the Software Radio Protocol department, product design, at Thales Communications & Security. Michel Bourdellès is involved particularly in projects related to the improvement of the RTES design process as in the ARTEMIS PRESTO project, protocols intrusion detection security extension, and protocol resource optimisation. Michel Bourdellès gained his PhD degree in Computer Science from the "Ecole des Mines de Paris" in 1999 and joined THALES Communications & Security, Colombes in 2000.

Article written by Michel Bourdellès.

Acknowledgement: the author acknowledges the PRESTO partners for the careful reading and comments of the PRESTO project presentation: TELETEL (project coordinator), INRIA, University of Aquila, Sarokal Solutions, VTT, Miltech, RapitaSystems, Prismtech, MetaCase and PragmaDev.

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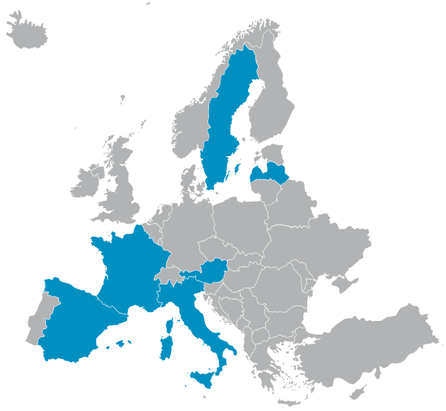
May 2012 NO.12

Article written by Michel Bourdellès

pSafeCer
269265

Start date:	April 2011
Project duration (months):	36 months
Total investment:	€10.4 m
Number of participating organisations:	23
Number of countries:	6

pSafeCer is an international research collaboration targeting increased efficiency and reduced time-to-market by the composable certification of safety-relevant embedded systems. The main pSafeCer challenges are to reduce the cost of qualification, certification and verification and to provide a framework for compositional development and certification of systems.



MARKET INNOVATION AND IMPACT

The concept of contract comparison has been used to determine compatibility during system composition, with the majority of this work concentring on the functional properties of systems and timing properties. However, much less work has considered how CBD can be applied to other non-functional properties like dependability, which must be captured in the contract for effective CBD of safety-relevant, software-intensive embedded systems. Our aim is to enhance existing CBD frameworks by extending them to include dependability aspects so that the design and the certification of systems can be addressed together with a manageable amount of work. This would allow reasoning about the design and safety aspects of parts of the systems in relative isolation as well as facilitate a more automated (and hence quicker) modular safety argument approach.

pSafeCer creates innovations for process, component models, safety arguments and verification/validation, applicable to multiple domains, targeting cost-efficient reuse. The result is lighter, cheaper and faster certification of safety-related, software-intensive, embedded real-time systems. Instantiating methods and tools for automotive, avionics, construction equipment and rail domains along with the creation of an integrated certification and development framework will provide direction for methodology, reference architecture and the prototype tool environment. European industry, especially SMEs and technology providers, will benefit from these developments as they will enable markets for niche components to open up substantially and cost-effectiveness to be boosted by allowing product lines/variants across multiple domains. An indirect effect will be the adoption and dissemination of pSafeCer results in other projects and activities, including increased attention in academic education and research.

WSN DPCM

269389

Start date:	October 2011
Project duration:	36 months
Total investment:	€3.3 M
Number of participating organisations:	11
Number of countries:	4

WSN-DPCM develops a full platform to address the main Wireless Sensor Network (WSN) challenges for smart environments. These include the middleware for heterogeneous wireless technologies and an integrated engineering toolset for development, planning, commissioning and maintenance activities for expert and non-expert users.

MARKET INNOVATION AND IMPACT

The WSN DPCM toolset will contribute to the WSN community by providing solutions that include a complete set of development, planning, commissioning and maintenance tools. It will offer a real end-to-end integrated tool-chain solution to promote a true model-driven architecture in all design and operational views of a system. The integrated toolset extends beyond the graphical user interface level to seamlessly handle the information flow between the tools, supporting model-based functionality composition as well as easy propagation and back-annotation of changes among the various tool views. The integrated environment will be supported by the middleware, which will act as the backbone of the software infrastructure. This middleware, in contrast to existing solutions, will provide a multi-level framework including functionality composition and adaptation. It will also allow the definition of a vertical software infrastructure to couple the different engineering views.

WSN-DPCM will have a significant impact on the WSN tool market since it delivers a novel, integrated toolset targeting several vertical application domains. Leveraging on the middleware, the toolset will provide the value needed to allow the WSN application developers to raise the focus of their efforts from hardware, platforms, tool details and implementation towards higher added-value aspects, such as the creative use of the WSNs for effective solutions to customer problems and application quality improvements. The platform will reduce the cost of WSN system design by lowering the barriers to entry and delays in the field, the skills required of developers and the level of detail for the project implementations. Moreover, the open character of several parts of the platform will also reduce the cost of hardware migration for WSN applications.

ARTEMISCALL2011

Introduction: Call 2011

With the ARTEMIS-JU Office machine now fully oiled and running, the Call of 2011 came and went quite swiftly – though not unnoticed. The knock-on effects of the continuing financial crisis had bitten even deeper into the available funding budgets, both on the public and on the private side. The Call yielded 41 Project Outlines which culminated in 9 successfully negotiated projects representing a total investment (private and public contributions) of about 144 million euros.

Within these 9 projects we see a continuation and expansion of the work being done to support high-reliability design, with projects looking at specific aspects, such as certification or the problems of great variability in the design process. We also see projects that are explicit continuations and extensions of the work started in previous Calls' projects. These projects have firmly established ARTEMIS as an incubator for continued collaborative activities between key players in Europe. And, next to these "Hi-Reliability" projects, we also see contributions to what we can loosely call the "Internet of Things" – after all, embedded systems are in many ways becoming the "Things of the Internet" – as well as applications of embedded systems for "smart-grid" approach to energy supply (again, another nicely-growing cluster in the ARTEMIS portfolio). Of course, not every project can be about an application – some underlying technology concerning low-power multicore processing technology and how it can be put to practical use is also needed, and here too we find two projects that complement the portfolio nicely.

Wishing once again an interesting read.

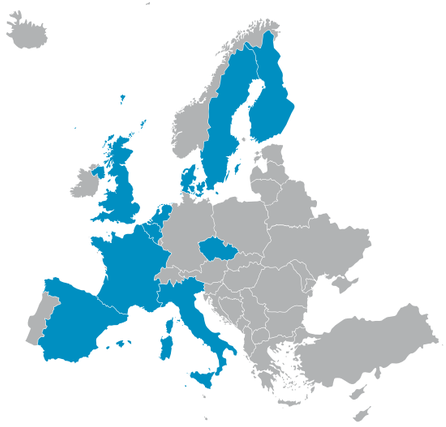
Alun Foster
Programme Manager ARTEMIS Joint Undertaking

CRAFTERS

295371

Start date:	June 2012
Project duration:	36 months
Total investment:	€17.6 m
Number of participating organisations:	26
Number of countries:	10

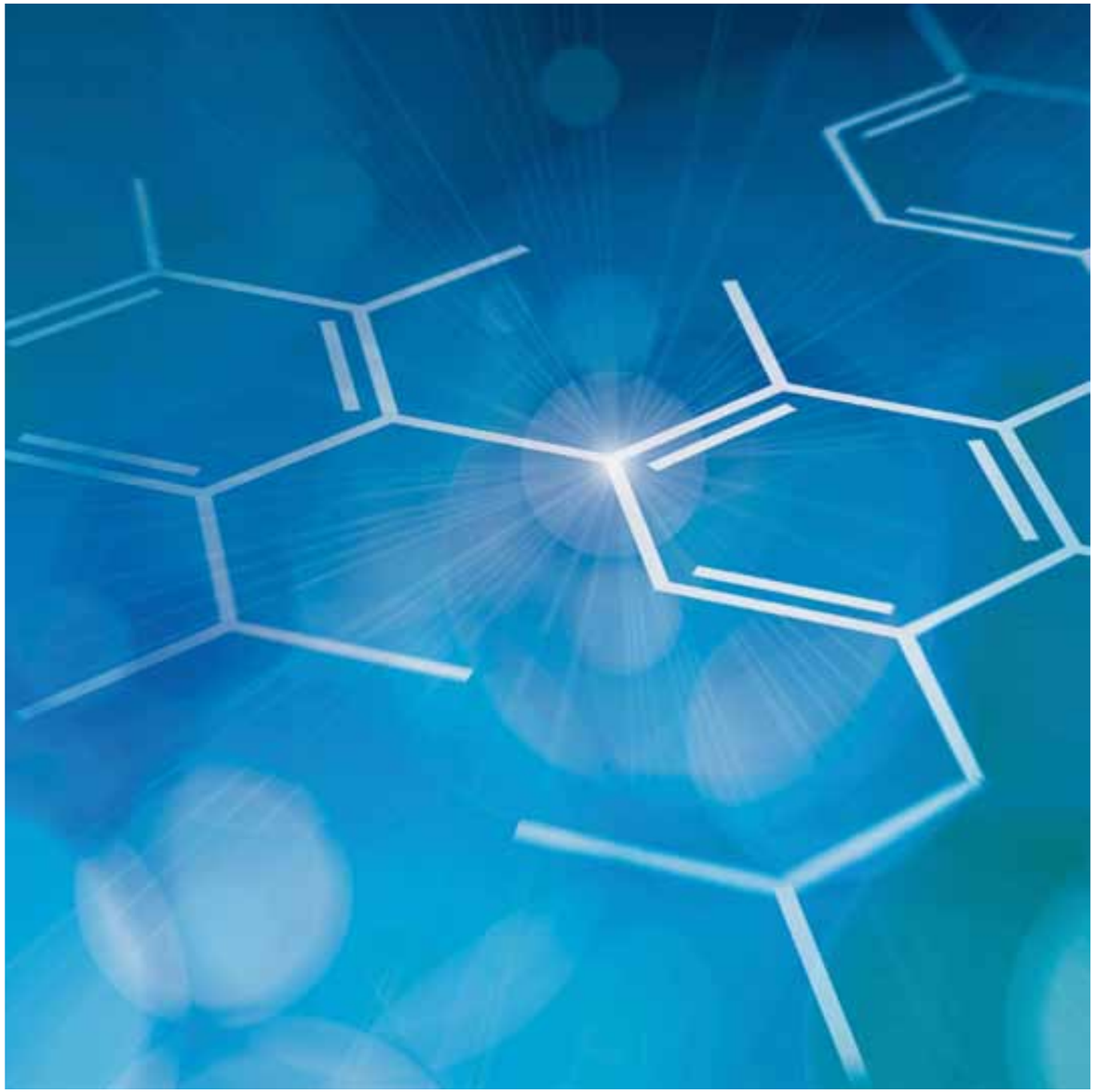
CRAFTERS will produce a holistically designed ecosystem from application to silicon. This ecosystem will provide a tightly integrated multi-vendor solution along with a tool chain that complements existing standards. The goal is to reduce NRE software development by 30% between 2009 and 2013.



MARKET INNOVATION AND IMPACT

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. To achieve this requires extension and improvements for multicore architectures of state-of-the-art model-based specification standards (such as MARTE) and the development of early-estimation techniques, performance estimators, verification frameworks and parallelising compilers. 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. CRAFTERS will bring added value and advances beyond the state-of-the-art products and techniques within a number of areas, such as compiler-generated parallelism and high application portability, holistically optimised system services through technology aware hardware/software co-design, and system-wide real-time support and timing exposure through abstraction levels. In addition, real-time communication and computation as well as scalable energy management will be implemented in both hardware and software while combined on/off-line real-time scheduling will be enabled for multicore architectures.

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. Seamless connectivity and middleware are directly addressed by realising a common middleware layer designed to support new wireless communication standards while being portable across different platforms

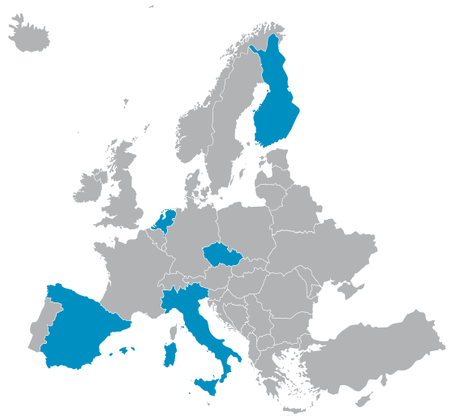


DEMANES

295372

Start date:	May 2012
Project duration:	36 months
Total investment:	€20.5 m
Number of participating organisations:	25
Number of countries:	5

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.



MARKET INNOVATION AND IMPACT

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. 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

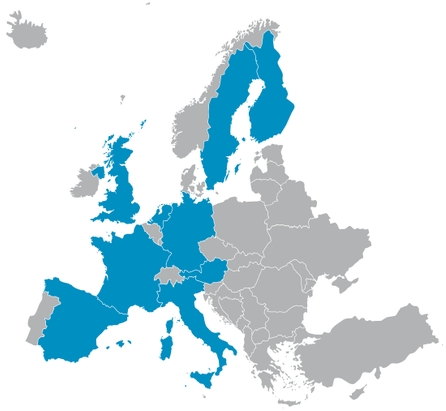
Application contexts where DEMANES will provide market innovation and generate an impact are Industrial Systems (for airports, urban transport, city logistics, urban safety and security), Nomadic Environments (PDAs, smart phones, body sensors, public transportation), Private Spaces (home, smart TVs and sensors) and 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 current European dependence on US industry and technology, with regard to the networked embedded systems applications, and boosting the competitiveness of EU industry in a set of crucial industrial fields. The technologies that will be developed will increase human capabilities in strategic fields such as aerospace, automotive and emergency systems.

DESERVE

295364

Start date:	September 2012
Project duration:	36 months
Total investment:	€35.3 m
Number of participating organisations:	26
Number of countries:	9

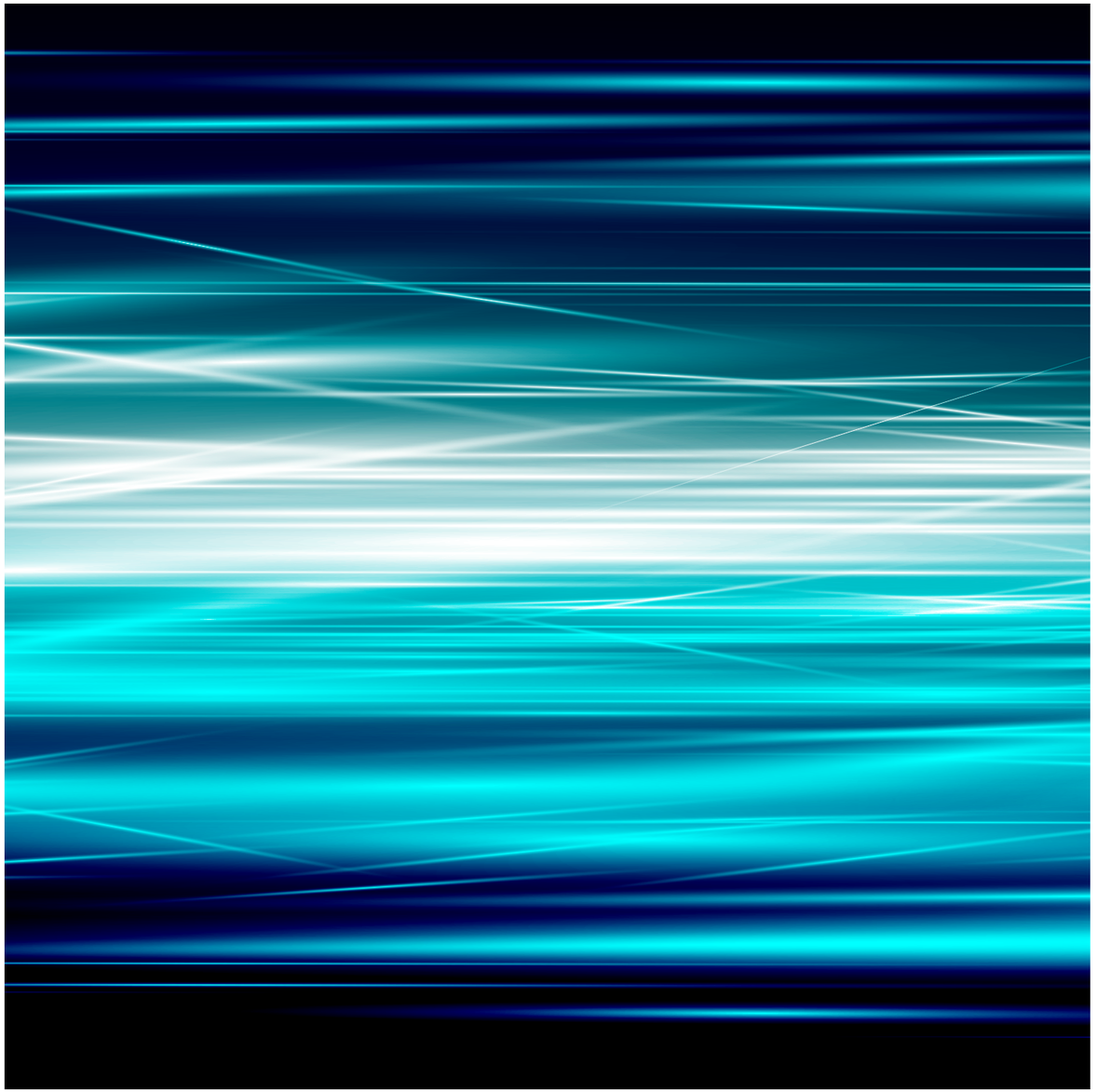
DESERVE aims to design and develop a tool platform for embedded Advanced Driver Assistance Systems (ADAS) to exploit the benefits of cross-domain software reuse, standardised interfaces, and easy and safety-compliant integration of heterogeneous modules to cope with the expected increase of function complexity and the urgent need to reduce costs.



MARKET INNOVATION AND IMPACT

Most cars today contain heterogeneous ADAS that support safe and clean driving. However, the increasing costs and complexity are prompting the need to merge different functions to share software and hardware resources (such as sensors). DESERVE aims to apply an holistic approach, which foresees the easy integration of different software and hardware solutions as well as the validation of each function as a module and as a part of the entire system, to guarantee the safety of the introduction of any new element. The design and development validation environment will be based on consolidated methodologies (such as the V-model) to test and develop new embedded components. The DESERVE platform will provide methods and tools to implement a dynamic adaptation of sensor fusion modules and HMI systems. This will allow the design, implementation and integration of brand-new components and embedded modules for the consistent interpretation of the vehicle's surroundings and the driver's behaviour. These modules will constitute the abstraction layers for the development of new ADAS functions working only at systems level and using pre-validated software components

The introduction of new safety regulations has acted as a catalyst for the growing ADAS market. However, such systems are still expensive, mainly because their development is time-consuming in terms of integration and validation. Moreover, the inclusion of ADAS is not always affordable for low-cost car customers. Therefore, by reducing time and costs, the DESERVE project will promote the ADAS market, and it will spread the use of safety functions without a proportional increase in the price of the modules and the vehicle. Fast and significant market penetration will boost Europe's position as a key player in the ADAS market.



e-GOTHAM

295378

Start date:	April 2012
Project duration:	36 months
Total investment:	€6.84 m
Number of participating organisations:	17
Number of countries:	5

e-GOTHAM aims to implement a new aggregated energy demand model, by increasing management efficiency, raising energy consumption awareness and stimulating the development of a leading-edge market for energy-efficient technologies with new business models. It will also define a complete solution for microgrids in the residential, services and industrial sectors that includes different configurations of loads, distributed generators and energy storage components.

MARKET INNOVATION AND IMPACT

The motivation for e-GOTHAM lies in the envisioned modernisation of the power grid to meet increasing energy demand and minimise its environmental impact. To handle the problem of the power grid modernisation, the e-GOTHAM underlying concept is to divide the overall power grid into localised power grids (microgrids), with increased communication capability between producers and consumers that allows action to be taken on the elements within the microgrid and operation in cooperation with the overall power grid. To achieve this, e-GOTHAM will design an open reference architecture and develop a middleware with seamless connectivity that provides the communications and decision support tools needed to optimise and manage microgrids in the residential, services and industrial sectors. This will facilitate the integration and management of microgrid elements through a large-scale network of embedded systems that use real-time measurements of energy related parameters to actuate dynamically and autonomously over the microgrid and so match power demand and supply. The project will implement the middleware along with other project outcomes in an incremental and iterative manner to verify and demonstrate the e-GOTHAM concept and objectives.

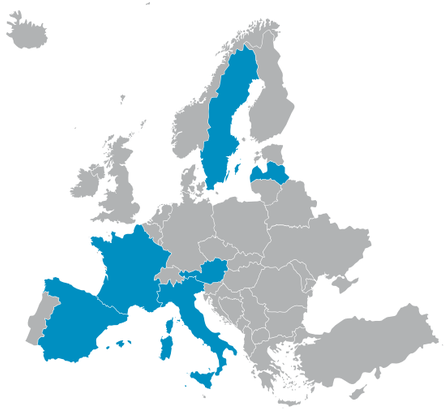
e-GOTHAM intends to make respond to the societal challenge of Smart Buildings and Communities of the Future through an open microgrid solution that contributes to sustainability and energy efficiency. This is expected to have an impact in terms of eco-efficiency, eco-sufficiency, comfort and security. e-GOTHAM will also help to defragment embedded systems in the microgrid market by creating an eco-system around the e-GOTHAM open reference architecture and beyond. This innovation environment will help to boost European industry competitiveness and leadership in the microgrid and smart energy market.

nSafeCer

295373

Start date:	April 2012
Project duration:	36 months
Total investment:	€15.3 m
Number of participating organisations:	29
Number of countries:	6

European industry has great potential to achieve a leading position in the growing global market of safety-relevant embedded systems, provided it can devise efficient and industrial-strength methods and processes for their development and certification. nSafeCer targets increased efficiency and reduced time-to-market through the composable safety certification of safety-relevant embedded systems.



MARKET INNOVATION AND IMPACT

In nSafeCer there is extra focus on evaluating the suitability and effectiveness of the processes, methods and tools developed. To demonstrate the applicability of these outcomes for particular domains and across multiple domains, use cases have been chosen that cover automotive and construction equipment, avionics, rail as well as cross-domain aspects. These use cases are representative of the challenges industry currently faces and relate to qualification, certification or verification. The aim is to achieve a 15% reduction in development cycles requiring certification and in the effort and time needed for revalidation and recertification as well as in system design costs, despite a higher level of complexity. Assuming that efficient processes are in place to define, develop and maintain reusable components, the savings potential in component development activities in a system development project can be as high as 85%.

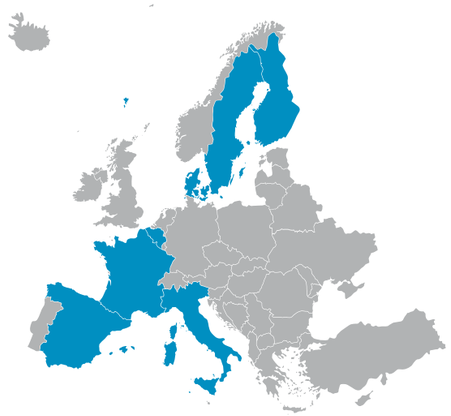
nSafeCer brings about market innovation and impact in several respects, including innovation for processes, component models, safety arguments and verification/validation, applicable to multiple domains, targeting cost-efficient reuse leading to lighter, cheaper and faster certification of safety-related, software-intensive embedded real-time systems. Instantiation of methods and tools covers the automotive, avionics, construction equipment and rail domains and the development, verification and certification of tools provide direction for methodology, reference architecture and prototype tool environment. The open framework created will benefit new (other) domains and certification for cross-domain use of components. European industry, especially SMEs and technology providers, will see markets for niche components open up and cost-effectiveness increase while nSafeCer results will be adopted and disseminated in other projects and activities, including academic education and research.

PaPP

295440

Start date:	September 2012
Project duration:	36 months
Total investment:	€ 10.2 m
Number of participating organisations:	16
Number of countries:	8

PaPP aims to deliver solutions facilitating the development of software for the future parallel and heterogeneous embedded systems. Any software will need to cope with varying degrees of parallelism and heterogeneity, so PaPP considers the whole system stack from architecture to application in order to deliver future-proof software.



MARKET INNOVATION AND IMPACT

Task-centric run-time systems for homogeneous multicores have been shown to have attractive predictive properties, which we believe can also carry over to heterogeneous platforms. As opposed to data parallelism or explicit threading, this approach is structured as a graph of dynamically created tasks whereby temporarily coexisting tasks can be executed in parallel by a number of native threads usually called workers. This model allows application developers to focus on application functionality determined by the task graph structure and individual task behaviour, while the run-time system can optimise execution on a particular platform. Furthermore, task graphs of application sub-components can be naturally composed for parallel execution. By taking a task-centric approach and, in particular, contributing to run-time systems and operating systems, dynamic software adaptation is enabled to optimise performance and use of resources as well as offer support for heterogeneous multicore hardware and different inter-core communication schemes. Separating platform-independent applications and platform-optimised run-time systems will reduce development efforts and time to market, improve product quality and, ultimately, improve European industry competitiveness.

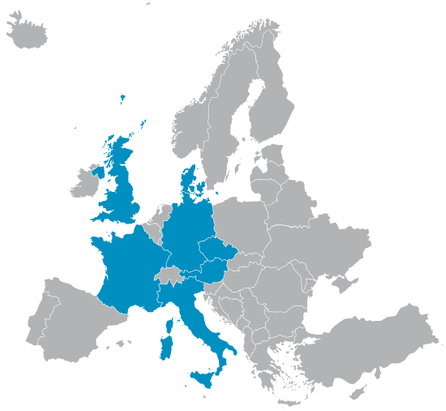
Ensuring portable and predictable performance will significantly reduce cost of design and development for application providers that today have to deal with numerous hardware and OS platforms. Software developers will also gain flexibility by not being bound to a particular hardware platform, thereby increasing the business flexibility, interoperability and competitiveness in an open market. For the Space application domain, the results will be demonstrated on the commonly used satellite platforms to verify a number of features already evident through the European Space Agency. In the multimedia domain, the performance portability results will stimulate the reuse of important media processing IP on wider set of heterogeneous media processing chips, like future generations of GPUs or FPGAs.

SESAMO

295354

Start date:	May 2012
Project duration:	36 months
Total investment:	€12 m
Number of participating organisations:	20
Number of countries:	8

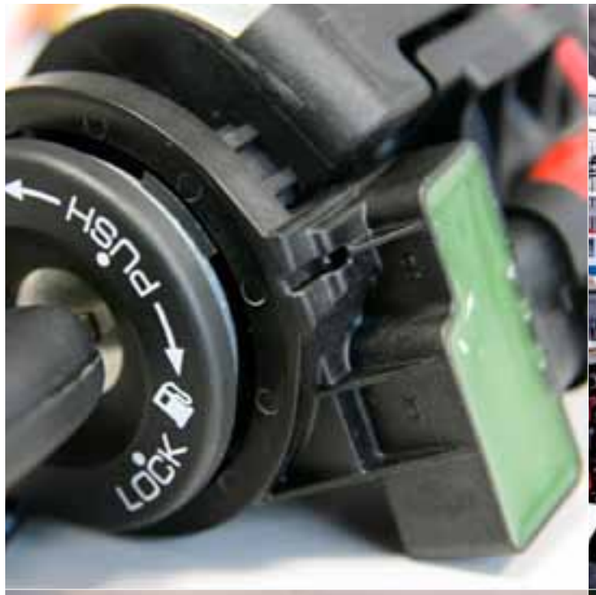
The SESAMO project addresses the root causes of problems arising with the convergence of safety and security in embedded systems at architectural level. A component-oriented design methodology based upon model-driven technology will address the safety and security aspects of networked embedded systems in multiple domains (e.g., avionics, transportation, industry control, mobile medical).



MARKET INNOVATION AND IMPACT

The core research of the SESAMO project is to develop a rigorous framework that enables joint reasoning about the required safety and security properties and the resolution of any conflicting constraints. The building blocks will be contained in the identification, characterisation, development or adaptation of enabling mechanisms for safety and security while essential methodological solutions will be developed for the safety and security-oriented design and analysis process, including modelling and qualitative as well as quantitative analysis techniques. A model-based methodology and solutions for addressing safety and security aspects within an integrated process will be supported by an effective tool chain and decision support strategies will allow critical situations to be resolved during system operations according to the safety and security requirements of the system. The SESAMO results will be assessed from a multiple-domain industrial perspective (such as aerospace, energy management, automotive, metropolitan rail and mobile medical), and the quantification of their performance through the elaboration of use cases.

All the technological results are embedded in a process-related, methodological context, accompanied by guidelines for using them within the SESAMO design process. The introduction of SESAMO is expected to considerably reduce safety and security related damage to products that rely on embedded IT systems. SESAMO is expected to produce a 15% reduction in development cycles and the re-validation and recertification of systems after changes. The building blocks developed in SESAMO are intended to be reusable across domains and, if reused within a methodology-driven process supported by SESAMO tools, less effort will be required to obtain systems with verifiable safety and security related characteristics.



SESAMO

SEcurity and SAfety MOdelling

The SESAMO project addresses the root causes of problems arising with convergence of safety and security in embedded systems at architectural level, where subtle and poorly understood interactions between functional safety and security mechanisms impede system definition, development, certification, and accreditation procedures and standards. Intense market innovation is being held back by this root cause: the absence of a rigorous theoretical and practical understanding of safety and security feature interaction. The proposed solution is to develop a component-oriented design methodology based upon model-driven technology, jointly addressing safety and security aspects and their interrelation for networked embedded systems in multiple domains (e.g., avionics, transportation, industry control).

KEY ELEMENTS OF THE SESAMO APPROACH ARE:

- a methodology to reduce interdependencies between safety and security mechanisms and to jointly ensure their properties
- constructive elements for the implementation of safe and secure systems
- procedures for integrated analysis of safety and security
- an overall design methodology and tool-chain utilising the constructive elements
  and integrated analysis procedures to ensure that safety and security are intrinsic characteristics of the system.

The relevance of the SESAMO results is guaranteed by the involvement of large partners with significant economic interests in safety and security critical systems in the use case domains: automotive, aerospace, energy, mobile medical, and metropolitan rail transport; a sound group of technology providers (including SMEs); and prestigious research entities (academia and institutes) with deep and complementary multi-domain expertise. SESAMO will enable cost-efficient and systematic design, analysis, development, and assessment of distributed safety and security critical embedded systems. The results will have broad, cross-domain applicability in numerous strategic sectors of European industry.

TARGET DOMAINS

Aerospace

The aerospace industry is characterised by embedded systems that have challenging resource (size, weight, power) constraints and demanding hard and soft real-time response requirements even in fault conditions. Furthermore, specialised input/output hardware is the norm rather than the exception. All systems must be certified to high levels of assurance to ensure correct functionality and implementation.

Development

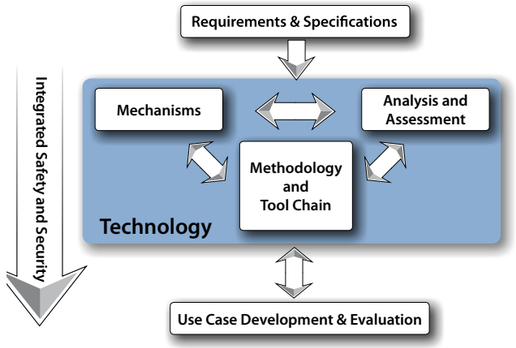
Methods for safety-critical embedded systems have a long history and much experience has been gained. In spite of their maturity and widespread deployment, however, existing standards for developing safety-critical systems are not immune to the need to adapt to new technological scenarios and changing architectures.

Automotive

The automotive industry is introducing communication everywhere together with associated security hazards. The list of embedded automotive applications exhibiting both safety and security-critical characteristics is growing quickly. Some examples are: eCall (emergency call), remote diagnostics, ADAS (advanced driver assistance systems) or steer-by-wire. SESAMO will pursue automotive use cases related to this current trend of introducing computer control into formerly mechanical automotive embedded systems.

Energy management

Energy management facilities are important examples of critical infrastructures. SESAMO will implement use cases in two important areas of energy management infrastructure: oil refineries and smart grids.



Metropolitan underground railway transport

The IT systems managing metropolitan underground railway transport have evolved along with the rapid technological advances of the last decades. Complex traffic control and management systems now communicate with sophisticated embedded systems onboard the trains in order not only to regulate traffic (with all its implications for safety criticality) but to deal with passenger management issues. The realities of terrorism and network intrusion today have thrust a new dimension of security into this sector, characterised by confined spaces and limited time to reaction to dangerous events, whether they be micro (embedded systems) or macro (passenger safety and security management).

Mobile Ambient Assisted Living Systems

In the medical field, the safety of medical equipment and security of patient data are of utmost concern. Recent advances in mobile technologies have accelerated the development of wireless networks and researchers in Europe are now able to build medical equipment for home applications known as Mobile Ambient Assisted Living (AAL) Systems. These embedded systems are intended for remote patient supervision using multi-parameter biosensors and secure communication networks in order to enable therapy at home. The concrete use case in the area of mobile ambient assisted living systems will therefore concentrate on safe and secure mobile communications technology for AAL systems.

This article was published in:
http://sesamo-project.eu

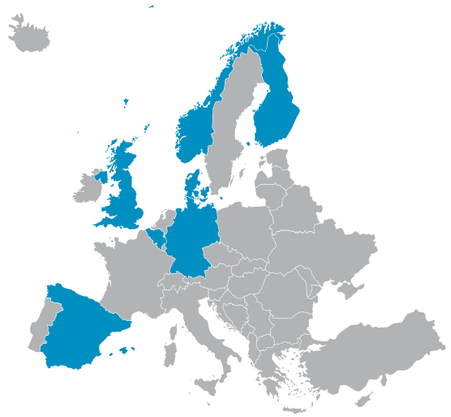
August 2012
Publication type: Newsletter

VARIES

295397

Start date:	May 2012
Project duration:	36 months
Total investment:	€13.2 m
Number of participating organisations:	23
Number of countries:	7

VARIES helps embedded systems builders to unleash the full potential of variability in safety-critical embedded systems by enabling companies to make informed decisions on variability use, providing effective variability architectures and approaches, and offering consistent, integrated and continuous variability management over the entire product life cycle.



MARKET INNOVATION AND IMPACT

Embedded systems builders must deliver new products with speed, diversity, high quality and at acceptable cost. Product variability is crucial in the development safety-critical embedded systems. Few generic solutions can be found that fit all; instead there is a multitude of very specific variability solutions for very specific variability needs (long tail market). To unleash the full potential of product variability in safety-critical embedded systems, VARIES has defined three key objectives: to enable companies to make an informed decision on variability use, to provide effective variability architectures and approaches, and to ensure consistent, integrated and continuous variability management over the entire product life cycle. To reach this ambitious goal, VARIES will create a reference framework for managing variability in safety-critical embedded systems, comprising methods, tools, models, reference architectures and relevant knowledge. Validating the results across industry domains will ensure broad applicability of the results. In addition, VARIES will establish a Centre of Innovation Excellence (CoIE) to help the European industry address its specific variability challenges by creating sustainable access to the long tail market of variability services.

VARIES aims to boost the competitiveness of the European Embedded Systems industry through a better understanding of what drives variability decisions, by creating ways to describe and exchange variability information in objects and by providing and extending variability management in safety-critical embedded systems across the entire lifecycle. VARIES aims to boost reusability by combining product line engineering and variability management concepts, make time to market more predictable and shorter, improve productivity through reuse, reduce product engineering effort while delivering the functionality required and guaranteeing reliability and quality levels, and facilitate a smooth transition to a product line approach. The VARIES consortium will actively drive standardisation of the Common Variability Language (CVL) to enable variability information exchange.

VARIES is an industry-driven research project geared towards the subject of variability in safety critical embedded systems. Embedded systems are rarely entirely conceived from scratch and companies developing embedded systems constantly face decisions about whether to use and adapt existing products or product assets or whether to develop new assets. Determining the long-term risk and benefits of such decisions is very challenging. So VARIES addresses the following question: How can the benefits offered by introducing variability into embedded systems outweigh the increased product complexity caused by variability?

VARIES

Managing variability in safety-critical embedded systems

The project aims to enable companies to make informed decisions on variability use in safety-critical embedded systems as well as provide effective variability architectures and approaches for these same systems, and offer consistent, integrated and continuous variability management over the entire product life cycle. In addition, VARIES will create a Centre of Innovation Excellence (CoIE) for managing variability in embedded systems. VARIES, which started in May 2012, involves 23 partners from seven countries and has a duration of three years.

DECISIONS BASED ON HARD FACTS

The VARIES project aims to enable companies to make variability decisions in their embedded systems based on hard, tangible evidence rather than 'gut feeling' as well as assess the impact of their variability decisions across the entire product life cycle and better define the product variants that are of most value to the market segments they serve.

One of the huge challenges faced today is how to manage the variability of safety-critical embedded systems without negatively impacting the safety characteristics of an embedded system at (reusable) component level. By definition, safety concerns the entire system; it is a far from straightforward task to determine the system level on the basis of the specific characteristics of the individual elements that composing the system. Assurance concerning the adequate management of hazards and risks is a regulatory requirement and a prerequisite for the deployment of a safety-critical system. A safety case, through its arguments and evidence, provides the assurance that the system is acceptably safe to operate within its intended environment. From the perspective of a product line, the safety case should be systematically developed and maintained so that the impact of variation on safety assurance can be managed and supported by the traceability between the product-line artefacts and the safety case concepts.

VARIES will enable the integration of safety assessment into the product-line processes along with concrete guidance on reference architectures and approaches to realise variability without compromising the safety characteristics of the embedded systems. Special attention will focus on the composition of reliable and unreliable components and on how this composition impacts safety. Moreover, VARIES will also enable companies to determine the optimum balance between safety and variability.

Special attention will be given to the multi-disciplinary aspects in complex embedded systems engineering, including safety and certification aspects. This will enable consistent, continuous and integrated variability management over the whole product life cycle for not only individual companies but also in partnerships.

WORK PACKAGE STRUCTURE

There are seven work packages that range from the management and administration of the project (WP1) through a number of interacting steps (WP2 to WP6) aimed at creating the VARIES Reference Technology Platform (RTP) to the dissemination and exploitation phase (WP7).

The first of the interacting steps (WP2) will gather together all the requirements by the partners and for the industrial demonstrators (which are the core of WP6). Then the next step (WP3) will be to identify the variability drivers and their impact on the product portfolio. Understanding these drivers and how they interact with the product portfolio will "enable companies to make an informed decision on variability use in safety-critical embedded systems" (Objective 1).

The third step (WP4) is concerned with the variability vehicles – in other words, the instruments (methods, tools, services, etc.) that will help companies to manage their variability challenges identified in previous two steps. These variability vehicles will support organisations by "providing effective variability architectures and approaches for safety-critical embedded systems" (Objective 2).

Ensuring that the outcomes of the project can converge and be integrated is the main task of the fourth step (WP5). The VARIES Reference Technology Platform, the main outcome of WP5, uses the input from work packages 2-4 to realise support for "consistent, integrated and continuous variability management over the entire product life cycle" (Objective 3).

The last of these steps (WP6) takes all of the results of the previous four steps, especially the VARIES reference technology, preparing them for incorporation into the final work package (WP7) where they will be disseminated and exploited through the establishment of the VARIES Centre of Innovation Excellence (CoIE).

RESULTS AND INNOVATIONS

VARIES will develop a reference framework made of new models, tools and design methods for lean innovation and the VARIES Platform will provide a complete, cross-domain, multi-concern, state-of-the-art reference platform for managing variability in safety critical embedded systems. Special attention will focus on aspects specific to safety critical embedded systems, in particular the impact of reuse and composition on certification. This platform will enable different tools to be instantiated and linked to support the process flow of development for embedded systems product variants over the whole product lifecycle, tailored to the specific context of a given company. Finally, a Centre of Innovation Excellence will be established to focus on optimised product variability that can be used for a range of markets.

The project aims to deliver a complete reference platform for managing variability in safety-critical embedded systems with special attention being given to the creation of safety-critical systems through a product-line approach whereby better interoperability and industrial impact will be achieved by building on standardisation efforts that exist in the area of product lines. In order to succeed or even to survive, manufacturers and system integrators must be able to deliver new products with speed, diversity, high quality and at an acceptable cost. The VARIES project envisions managing product and processes at a higher level of complexity with less effort while also coping with uncertainty and maintaining independent hardware and software upgradability all along the life cycle.

This article was based on the information of the Varies website.

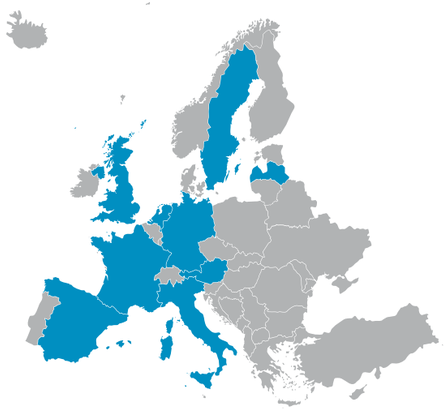
Source: www.varies.eu

VeTeSS

295372

Start date:	May 2012
Project duration:	36 months
Total investment:	€19.2 m
Number of participating organisations:	24
Number of countries:	8

VeTeSS will develop standardised tools and methods to verify the safety of automotive embedded systems. By providing objective data for safety qualification and certification, reliance on manual processes and expert opinion will be reduced as will development costs and time to market, even with the increasing complexity of embedded systems and software.



MARKET INNOVATION AND IMPACT

The VeTeSS project will investigate the verification methods and coverage metrics used to test the response of safety-critical embedded systems to common-cause errors, including both simulation-based and formal methods. We will also investigate the correlation of fault coverage in hardware against different levels of simulation, using data from physical testing and experience in the field. One of the key areas of research will be the verification of the mechanisms used to ensure robustness against common-cause failures. The project will define a seamless, automated design flow from requirements to validation, integrating formal analysis, simulation and physical test. Based on this, a set of consistent tools and methods for safety analysis and testing across hardware and software, and analogue and digital domains will be provided. This will include methods and tools to automatically derive test procedures and test vectors to validate an architecture against the safety goals. The development of quantitative methods and the use of objective data will be used to support verification, certification and qualification. It will enable the communication and integration of the safety case at every level of the supply chain. Characterising and isolating the effect of faults in each part of the system will lead to improved predictability and reusability. This should result in both enhanced safety and increased availability thereby improving the user's perception of the reliability and quality of the system.

The output from the project will have both commercial and practical benefits for companies throughout the automotive supply chain, the European automotive industry as a whole, and other safety-related industries. It will provide opportunities for companies, especially SMEs and start-ups, to develop new products and services, including tools, training and consultancy for implementing safety standards.

VETESS

Verifying the robustness of safety-relevant systems

The often ad-hoc and manual safety verification today presents a challenge for companies producing safety-relevant embedded systems. The VeTeSS project will develop standardised tools and methods to verify the robustness of safety-relevant systems, particularly against transient common-cause faults. The automated, quantitative processes developed by VeTeSS will be usable at all stages of development, reducing costs and time to market, even with the increasing complexity of embedded systems and software.

PROJECT STRUCTURE

The project encompasses the entire V-model design cycle, including several different areas of technology and related approaches to verification and testing. The matrix structure sees Work Packages that correspond to the parts of the system to be tested, as defined by ISO 26262, and orthogonal Technical Streams to coordinate the development of verification and testing methodologies for each of these.

Work Packages

The work packages responsible for actually carrying out the research and development of appropriate tools and techniques – WP4 System Integration, WP5 Hardware Components and WP6 Software Components – are preceded by the Requirements Definition Work Package (WP3) that will examine the tools currently available, where and how they are applied, and identify gaps or shortcomings so that a complete automated verification environment can be built. The Case Studies and Demonstrators Work Package (WP7) will provide vital feedback to the three technology work packages, 4 to 6, highlighting any problems or shortcomings with the tools and processes, allowing these to be addressed before final release. All of these work packages will provide input to the Dissemination, Exploitation and Standardisation Work Package (WP2) aimed at promoting the project in the press, at conferences, among standards bodies, to industrial partners and so on.

Technical Streams

The Information Management stream (TS1) will define processes relating to information management, including guidelines for writing requirements that are useful for automated verification/certification (atomic, consistent, quantitative, testable, etc.); how to identify safety requirements (as opposed to non-safety relevant functional requirements); how requirements should be documented and traced throughout the verification process; how test cases and verification results should be documented and communicated; etc.

Simulation and Modelling (TS2) is a stream that will manage the tools and techniques used to create and simulate hardware models of different abstraction levels (system level, RTL, gate-level) as well as the software simulation, all with a view to being able to easily link safety verification to the simulation.

The third technical stream, Formal Methods (TS3), provides provable results of correctness and safety through well-defined models and formal safety requirements. Recommendations for future amendments of ISO 26262 with respect to formal methods will also be developed. The results for hardware and software will be integrated at system level and complementary to the bottom-up integration. The stream will coordinate top-down processes such as mapping requirements to hardware and software elements.

Tools and tool chains increasingly support development activities to automate certain tasks, thus decreasing development time, improving system quality and minimising the risk of human error. However, confidence and trust in the tools and tool chain used to achieve the required level of safety are essential. Tool planning, evaluation and qualification are required for the development of safety-relevant products in the context of ISO 26262. To enable this, the Tool Qualification stream (TS4) will develop guidelines and templates for tool planning, evaluation and qualification.

Testing physical hardware by exposure to external disturbances will determine the effects of transient faults caused by EMI and alpha radiation. By examining the methods and tools for physical testing and the correlation of results from these tests with those results from modelling and simulation, the Physical Test stream (TS5) will gain information on the efficiency of safety measures, the validity of diversity metrics, and the validity of the fault models developed for simulation. These results will also be compared with the results of field testing and failures.

RESEARCH AREAS

The main aim within VeTeSS of developing tools and methods to improve safety verification, composability and reuse in order to reduce costs, development effort and time to market will be supported by a number of other research activities.

Common Cause Failures

One of the key areas of research will be the verification of mechanisms used to ensure robustness against common-cause failures (random events such as electromagnetic interference or alpha particles). It will also look at the silicon design and software techniques currently used to mitigate common-cause failures to verify that these techniques are effective, suggesting improvements as appropriate. The project will seek to exploit existing fault models, already used in other parts of the design process, to improve safety system modelling and analyse the correlation between simulation, the results of software-based hardware tests and physical effects seen in real hardware. This will verify the sensitivity of safety monitoring code to transient faults and extend the range of fault types covered.

Software

In investigating improved methods for the development and verification of software for safety-critical systems, the project will look at fault injection, formal methods and coverage metrics for software. ASIL-D qualification for software development is not practical today; this needs to change and this project should contribute to that goal. It is worth noting that software, unlike hardware, has no random failure modes or fatigue mechanisms. All software defects are introduced by mistakes in requirements capture, communication or development. The probability of failure is related to the probability of inputs and internal states occurring to trigger the failure. For this reason, the verification methods used for hardware and software are somewhat different and this is reflected in the relevant parts of the work plan.

Fault Coverage Models

Fault coverage is one of the keys to assessing functional safety. A significant part of the project is concerned with checking the verification methodologies used to ensure they provide the high level of detection expected. One important approach is to derive a statistical model for the required failure density in order to fulfil ASIL-D requirement for >99% coverage and so give confidence in fault simulations performed at a higher level of abstraction (RTL rather than circuit level) and thus allow much faster simulation, also making it easier to ignore those parts of the design that are not safety-relevant. The formal analysis of the fault coverage metrics used for verification will improve confidence in the test results by demonstrating they are relevant and provide a high probability of detecting safety failures.

Automated Methodologies

The project aims to replace the current manual processes with a more consistent and automated set of tools and interfaces (a Tool Platform) that can be shared by all. An automated and seamless safety flow will be developed building on existing approaches, including those from areas outside safety testing. This will increase the efficiency of safety verification, both in terms of the effort required and confidence in the results.

Improved Reliability

The results from the project will facilitate the design of embedded systems in which high levels of availability are maintained even as safety requirements increase. One approach is to ensure that only those faults that could affect a safety-related function will cause the function to be disabled. This can only be done if we can verify that faults elsewhere cannot interfere with the safety goal. The project will investigate encapsulation mechanisms, error injection and propagation tools, error containment and structured fault tree analysis that could be employed to perform this verification.

Executable Safety Case

One of the goals is to move beyond an executable specification (model) of the system and towards the construction of an "executable safety case". This would include a meta-description of the different elements to describe the way a particular safety goal is fulfilled by the engineering flow from requirements, implementation, integration and validation. This should also be able to generate the metrics for diagnostic coverage for single and multiple faults, and the probability of failure to meet the safety goal per hour (failure in time – FIT). Although this may not be fully realised in this project, we hope to put the necessary infrastructure and standards in place to enable the implementation and use of executable safety cases in future.

Making ISO 26262 Usable

The project will encourage the establishment of an eco-system around the project results including the development of tools and services by SMEs, and centres of excellence to provide training and support for implementing the standards in practice. This will enable the industry to move beyond the Siemens (or equivalent) standard, as referenced by ISO 26262, resulting in better predictability and improved consistency between manufacturers.

BENEFITS ALL ROUND

European industry will benefit from vendors being able to supply standard components for multiple applications: as a standardised, evidence-based verification processes enable the reuse of components in different applications. The focus of VeTeSS is the strategically important automotive market but active engagement with other markets will see knowledge shared and results disseminated. The safety of electric/hybrid vehicles in particular needs to be proven to allow wider adoption, and this will in turn be a major contributor to carbon emissions reduction. A more competitive the European embedded hardware and software industry will improve the safety, quality and reliability of products and enable innovative technologies to increase road user safety. Society will also benefit from fewer accidents and lower costs.

This article was based on the information of the Vetess website.

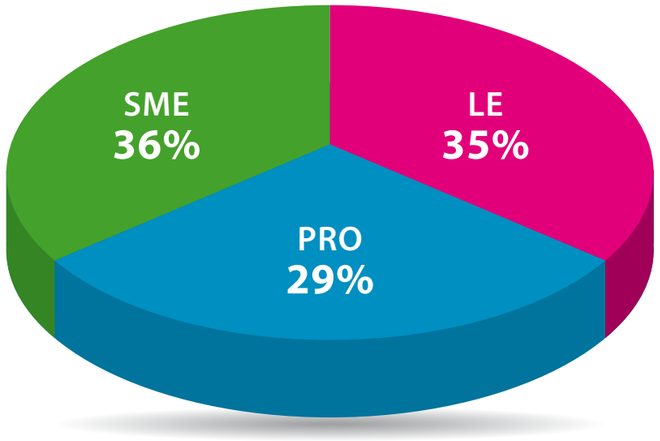
Source: http://vetess.eu

Conclusions

With now a total of four Calls behind us, and 44 projects actively running, some evaluation of the programme becomes statistically relevant: here is an overview of what the programme has so far accumulated.

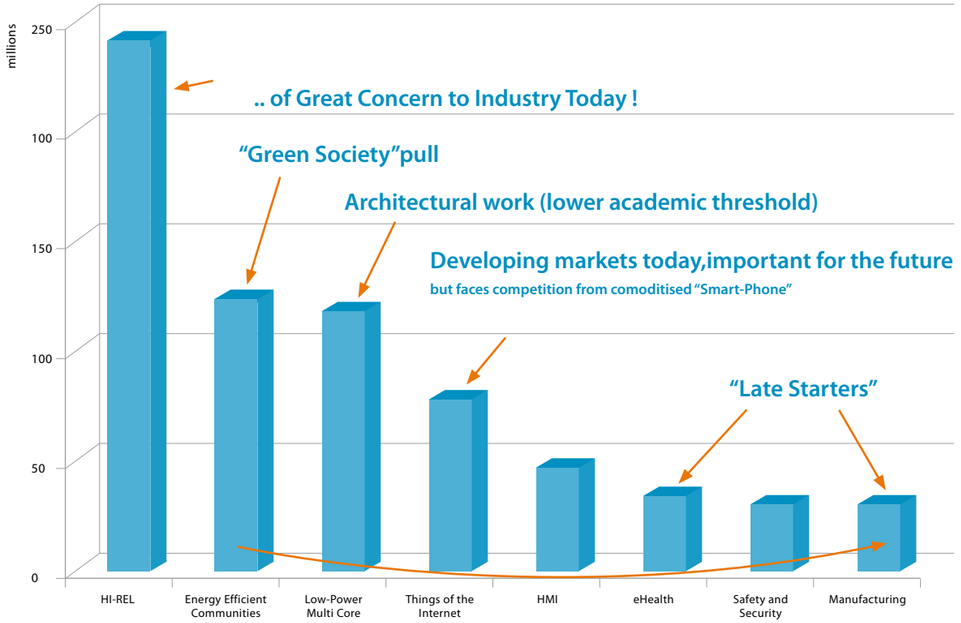
Starting at the 'typical project' level, we see that ARTEMIS projects have a Total Budget ranging from 2.5 M€ to 59 M€, and a number of partners ranging from 8 to 56. This quite wide spread is indicative of two things. Firstly, as would be implied by a correct interpretation of the "Think Big" paradigm, the actual size of the project is not a measure of excellence on its own: large or small projects can be selected by the JU's evaluation and selection procedures. Secondly, it is important to note that even the smallest projects have links – for the most part very explicit – to the larger projects. The "Think Pan-European" adage is exemplified by there being from 4 to 11 countries involved in these ARTEMIS projects – the average is around 7 countries per project. The combination of these factors can result in a significant multiplication of the utility of the individually obtained results, which itself is a precursor to achieving "Innovation".

Participation by partner types, as UNIQUE participations



From a technical content standpoint, the vast majority of projects work towards a "platform" of some sort, albeit a middleware platform Out of a total of 585 Unique Participations (i.e. each participant counted only once), 29% are Public Research Organisations, 35% are Large Enterprises and 36% are SMEs. That roughly 70% of the participants in the ARTEMIS programme are industrial clearly shows the industry-driven nature of the programme, while the balance between large and small enterprises shows that the programme is indeed "SME-friendly", or at the very least attractive for SMEs to participate in. On that note, it is interesting to observe that 3 projects have no large-enterprise partners at all (where SMEs lead the project), 9 SMEs are participating in more than one ARTEMIS project (as much as five in one case), and 12 SMEs have decided that their project is of such strategic value to them, they participate in projects where there is in fact no national funding available to support them: they receive only the 16.7% of their costs as a contribution from the EU.

An important outcome of the programme so far is the emergence of clusters of projects around key themes, partly by natural processes and partly by active stimulation, through the ARTEMIS Technology Conferences and specific actions of the Industry Association. By grouping project's activities into these loosely defined clusters, the picture here merges.



This chart groups the total R&D investment into the various clusters that have already formed. By far the largest cluster concentrates around "High Reliability", which is the most important aspect of Embedded Systems design and possibly the most important "Innovation Enabler". By grouping the rather smaller "Manufacturing" cluster with the work on Energy Efficient Communities, the second largest cluster around possibly the most visible Societal Concern today emerges. Viewed in this way, the ARTEMIS programme is already making major contributions to solving some high-visibility problems. Which does not belie in any way the work delivered by projects in the other clusters listed!

The formation of clusters is important: it assures a much better take-up and re-use of project results and assures continuity for the future establishment of communities of high expertise. ARTEMIS formulates these communities as "Self-sustaining Innovation Eco-systems". Within this rather informal phrase lies the formal recognition of "Centres of Innovation Excellence", with a labelling scheme operated by the ARTEMIS Industry Association. The encouragement of the formation of such centres is one of the main goals of the ARTEMIS programme, and to that end, a special type of project has been added to the Call 2012 – the "ARTEMIS Innovation Platform Projects" (AIPPs) as an essential stepping-stone. But more about that in the next Book of Projects!

Editorial Information

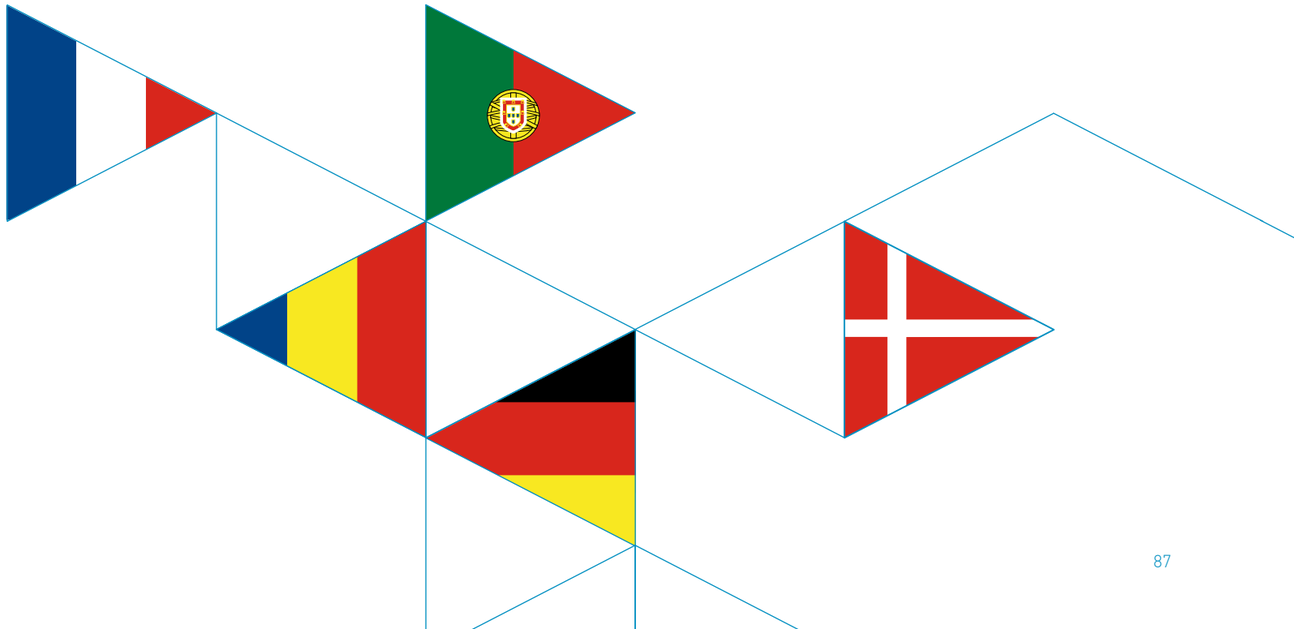
ABOUT ARTEMIS

Advanced Research & Technology for Embedded Intelligence and Systems

Innovations made possible by embedded systems make our lives healthier and more interesting, our transport safer, and our energy use more sustainable. They are at the heart of industrial innovation and competitiveness, creating and sustaining jobs and economic well-being. Over 4 billion embedded processors were sold in 2006 and the global market is worth €60 billion with annual growth rates of 14%. The economic impact in terms of jobs and growth is expected to exceed €100 billion over ten years.

Computing technology is facing many threats and challenges from fragmentation, globalisation and fierce competition.
In recognition of the strategic importance of embedded computing systems the European Union launched the ARTEMIS Joint Technology Initiative (JTI) as a Joint Undertaking (JU), or public-private partnership, between:

- The European Commission
- Member States (23 countries)
- ARTEMIS Industry Association (a non-profit association with 200+ members)

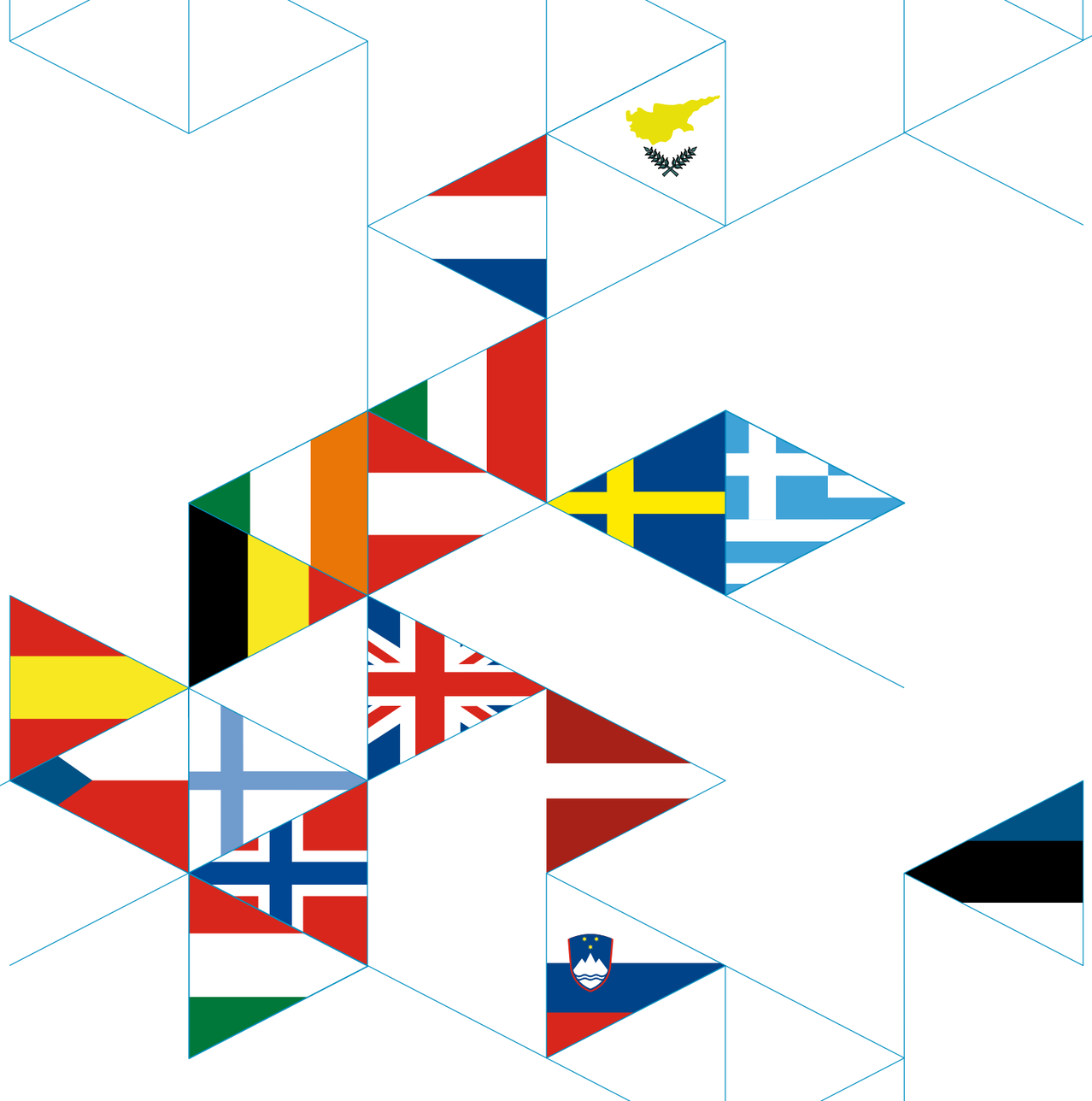


ARTEMIS aims to tackle the research and structural challenges faced by European industry by defining and implementing a coherent research agenda for embedded computing systems. Its ambition is to help European industry consolidate and reinforce its world leadership in embedded computing technologies.

The ARTEMIS Industry Association represents the research community including industry (large, small and medium sized companies), universities and research institutes. It continues the work of the European Technology Platform and is therefore responsible for the ARTEMIS-ETP Strategic Research Agenda set up by the European Technology Platform in March 2006.

The ARTEMIS Joint Undertaking is a Brussels based organisation legally established in February 2008 and gaining autonomy in October 2009. It is managed by an Executive Director. The ARTEMIS Joint Undertaking adopts a commonly agreed research agenda closely following the recommendations of the Strategic Research Agenda developed by the ARTEMIS Technology Platform.

Visit us at: www.artemis.eu



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ARTEMIS