ARTEMIS BOOK OF PROJECTS
VOLUMEONE

ARTEMIS BOOK OF PROJECTS VOLUMEONE

Content

ARTEMIS CALL 2008

ARTEMIS CALL 2009

Preface

It is with great pleasure and appropriate timing that we present the ARTEMIS book of projects, Volume 1, that brings you an overview of what has been started and achieved in the calls of 2008 and 2009. In so doing, the book brings you up to date 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 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 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 in the Research Agenda of the ARTEMIS Joint Undertaking in the forthcoming calls, and, wherever possible, complement projects that are currently running in the direction of the strategic goals of the whole programme.

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

Introduction

Since 2004, when the 'ARTEMIS European Technology Platform' published its 'Building ARTEMIS' report, a lot has been achieved. Six years on, this first 'Book of Projects' is a tribute to all the hard work and dedication of everyone involved in turning some futuristic and ambitious dreams into a concrete and working reality.

Embedded Systems technology is a specialist branch of ICT that, in addition to its specific technical challenges, has two major characteristics of great importance to European citizens. Firstly, it is a domain where Europe enjoys high esteem in the world and, as such, has a strong voice in the world-wide arena. Secondly, because of their ubiquity in daily life and their key ability to drive innovation, European citizens can benefit greatly from their direct application and enjoy significant economic benefits from their positive impact on businesses in many domains. Embedded Systems are therefore more than a specific domain of technical study – they are a pillar of social well-being, and one which ARTEMIS is dedicated to reinforcing.

The ARTEMIS Joint Undertaking was set up to manage a new financing scheme for R&D, integrating contributions from the European Commission and from participating Member States – something unique that was never achieved before. This funding scheme is now up and running – witness the projects in this book. But ARTEMIS is more than another R&D funding instrument. In order for the results of this R&D work to genuinely make a difference in our lives, the outcome of the programme must have impact. This impact can be achieved by creating an environment where the individual know-how of specific players can be brought together for the mutual benefit of all participants – and therefore of our society at large. Putting all these 'complementary assets' together in a structured way to form 'Innovation Ecosystems' is one of the main goals of ARTEMIS. Now that the funding part has been set up and the results are starting to appear, we will see a lot more activity around these ecosystems in the near future.

So, here you have them, the 25 projects from the first two ARTEMIS calls: pioneers and stars, every one. Pioneers, as they are the first to fully exercise this new instrument in real-life, and stars, like all ARTEMIS projects, as they have been selected via a rigorous and competitive evaluation process. I hope you enjoy discovering what they are all about.

Eric Schutz
Executive Director, ARTEMIS Joint Undertaking


ARTEMIS

CALI2008

Introduction: Call 2008

The ARTEMIS Call of 2008 was unique in many ways. It was the very first call for proposals issued by the brand new 'ARTEMIS Joint Undertaking', which at that time was run by staff members of the European Commission (DG-INFSO) in anticipation of the ARTEMIS Joint Undertaking Office. The fact that a call could be issued at all is in itself wonderful, made possible by remarkable dedication of the Commission staff, and the ARTEMIS community is truly indebted to them.

In order to get off to a running start, the first call used a single-step evaluation process. Here, proposers only had one 'bite at the cherry' – their proposals had to be extensive and as good as perfect from the outset. Quite a challenge, which the ARTEMIS community responded to with great vigour; 27 proposals were submitted, where some 290 organisations planned to invest 320 M€ in support of the ARTEMIS vision.

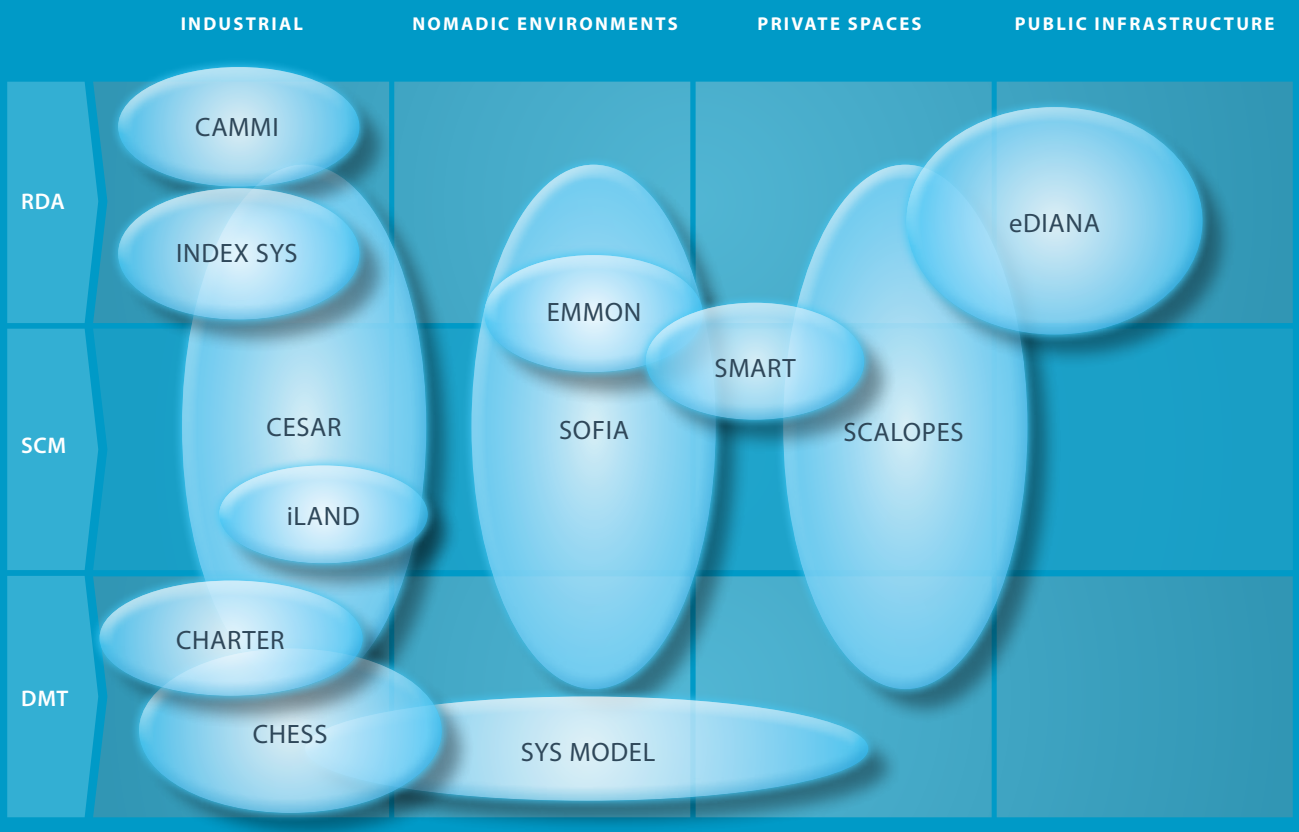
These proposals were evaluated using the well tried and tested procedures common in the EC's Framework Programmes. Though felt by some to be a little 'heavy', they do give very good confidence in the quality and capability of the projects to deliver what they promise. The evaluation criteria, too, were similar to those of the FP7, with uniform weight on all criteria. In these early days, it was not yet possible to put any of the new 'ARTEMIS Culture' into the proceedings.

Still, as an outcome, a set of 12 ARTEMIS projects emerged. With some very large projects, with as many as 55 partners from 12 countries, to smaller, more targeted ones, the stage has been set for the fulfilment of one of the main ARTEMIS objectives: set up funded R&D projects that can seed larger, pan-European collaborations. Indeed, the projects are being encouraged to publicise their work widely, to attract interest in their results and assure a follow-on of their work after the project itself ends. I.e. to focus on Impact! This seems now to be taking form, with one project (SCALOPES) already organising an 'ARTEMIS Technology Conference' – one of the first such initiatives to come out the project community itself, and one which we hope will trigger other such activities in the future.

So, here they are. I hope you find these projects both interesting and enlightening.

Alun Foster
Programme Manager ARTEMIS Joint Undertaking

ARTEMIS PROJECTS 2008 MAPPING SRA



RDA= Reference Designs and Architectures Methods and Tools

SCM= Seamless Connectivity and Middleware

DMT= Design

CAMMI

100008

Start date:	June 2009
Project duration (months):	36
Total investment:	€7.3 m
Number of participating organisations:	12
Number of countries:	6

When the human being in the control loop of a complex system is exposed to physiological, psychological and time stresses, human cognitive deterioration may result and thus diminish the performance and safety of the overall system. Adaptive cognitive man-machine interfaces and human-centered communication can be exploited to improve the level of operational performance and safety. This applies to domains like next generation flight-management systems for aircraft, UAV for civil and security applications, infrastructure management systems and high-speed driver assistance systems in the rail domain or in large and complex industrial plants. CAMMI is focused on ergonomics, the usability of computing artifacts and on practices surrounding the collection, manipulation, and use of information.

INNOVATION AND MARKET IMPACT

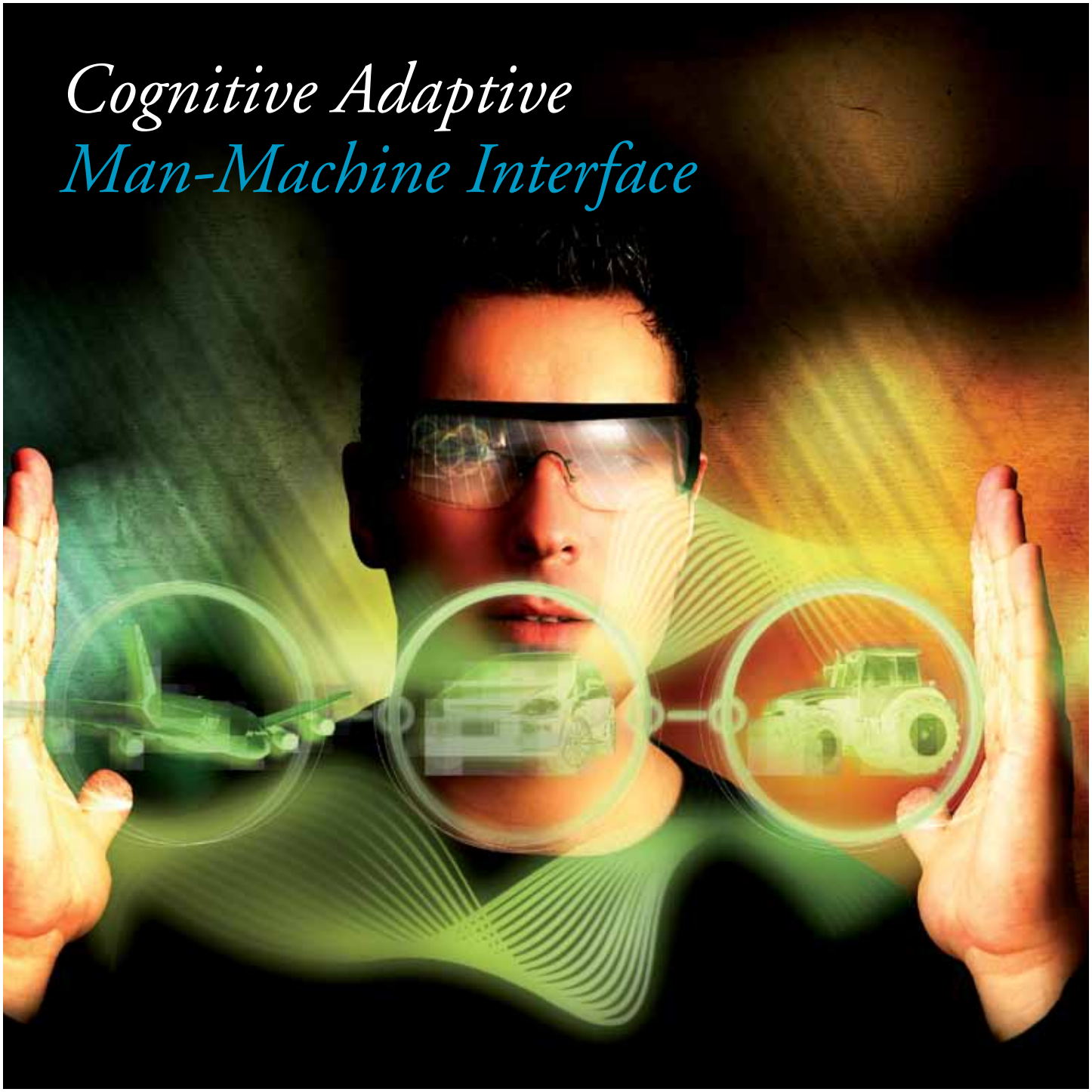
CAMMI aims to introduce a joint cognitive approach into operator console control so that any workload that exceeds the operator's capability should be reflected in offloading, or automating, non-critical, time-consuming tasks. This will enable control to be shared between operator and system, allowing the operator to focus specifically on critical tasks. The potential benefits of this to industry and society are tremendous and the gains can be expressed at both macro (industrial, economic and societal) and micro (individual well-being) level.

Human-centered computing is closely related to interdisciplinary fields such as human-computer interaction and information science; CAMMI has identified a core of cooperative work among different domains such as: workload mitigation strategies, common architectures, articulation works.

The CAMMI project develops technologies for intelligent multimodal interactive systems that address user interaction with adaptive context-aware systems. Relevant on-board embedded MMI applications of CAMMI are focused on flight management systems for manned and unmanned aircrafts, although a broader range of applications are envisaged for complex process of civil protection and for modern automotive and agricultural machines.

CAMMI research field is focused on understanding characteristics of operators' workload, with the objective of designing adequate computer-based technology to support the cooperative work and proposes a functional demonstrator consisting of a synthetic environment that simulates an MMI mock-up that is able to emulate operations that are related to several scenarios. In order to realise adaptive control systems, the CAMMI demonstrator provides a cognitive supervisor agent that selects MMI operating modes from those available and balances the induced workload with pilot's cognitive capability. These concepts have largely been derived through studies of existing systems in the different domains.

Cognitive Adaptive Man-Machine Interface

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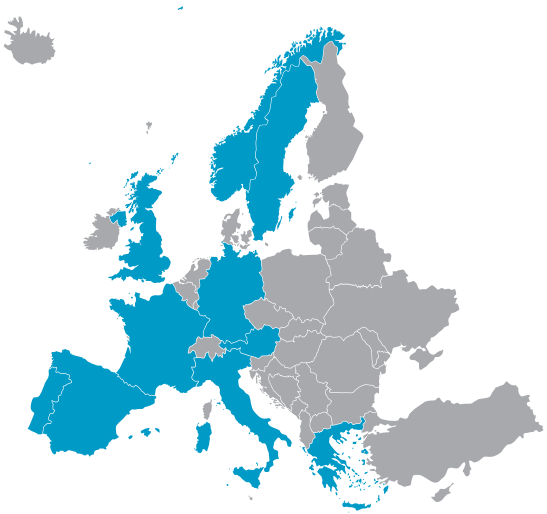
CESAR

100016

Start date:	March 2009
Project duration (months):	36
Total investment:	€16.1 m
Number of participating organisations:	55
Number of countries:	10

To maintain the competitive edge that Europe holds over the USA and Far East in the transportation and automation markets, CESAR aims to substantially boost the cost efficiency of embedded systems development, especially for safety critical systems. Therefore the project addresses industrial needs to enhance the development of embedded systems for safety relevant applications.

One major CESAR objective is the significant reduction of costs by up to 50% for the development of safety critical systems while ensuring the quality and safety properties. CESAR is expecting this cost reduction in providing methods and processes via concurrently establishing an interoperability platform in kind of a seamless tool chain (integrated in the Reference Technology Platform – RTP). Therefore CESAR follows the following approach, taking into account the entire System Engineering Process:



1. Bringing innovations in tool and methods of the RE (Requirements Engineering) discipline
2. Bringing innovations in tool and methods of the CBD (Component Based Development) and extend CBD with multi views and multi criteria
3. Combine improved Requirements Engineering (RE) and Design System Engineering because a close collaboration between RE and CBD is necessary to achieve the ambitious CESAR goals

Only an integration of these disciplines accompanied with an adequate tool support into a seamless tool chain (CESAR Reference Technology Platform - RTP) can unleash the full potential of the CESAR approach

A further objective is given by duplication of the number of European technology providers and SMEs joining the CESAR ecosystem which shall be pushed forward by an orientation towards an open standard of interoperability and methods.

INNOVATION AND MARKET IMPACT

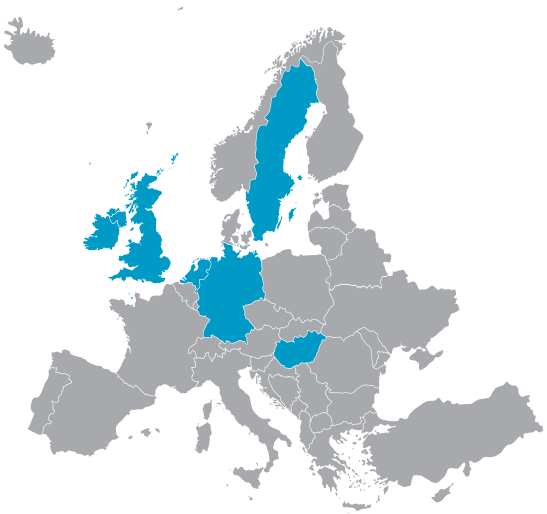
CESAR will contribute to safe functional mobility in the transport sector, for which embedded systems are key enabling solutions, while maintaining strong European competitiveness by improving the cost efficiency of processes. The project will also increase the productivity and profitability of industrial products while keeping the risk of failure below acceptable limits.

Through its strong commitment of a wide community of major end-users, tool vendors and technical experts from academia and industry, CESAR is ideally positioned to create sustainability impact around the CESAR Reference Technology Platform.

CHARTER

100039

Project duration:	36 months
Start date:	April 2009
Total investment:	€2,55 m
Number of participating organisations:	12
Number of countries:	6



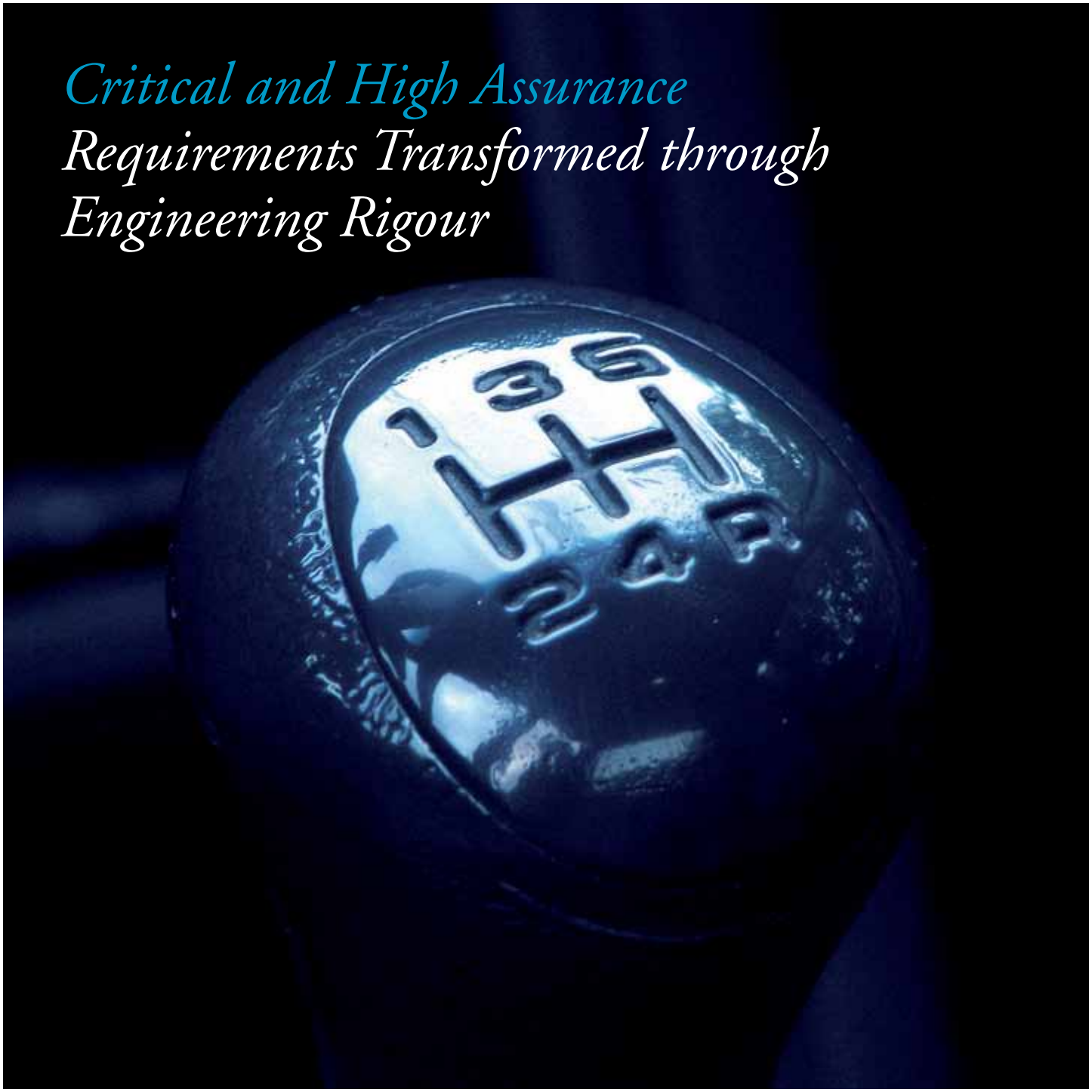
CHARTER will develop concepts, methods and tools for embedded system design and deployment that master the complexity and substantially improve the development, verification and certification of critical embedded systems. Since human life will come to depend on embedded software, it is vital that this software is increasingly subjected to governmental regulations and verification in order to protect society from any resulting severe risks. CHARTER will therefore help to safeguard the security of future society.

INNOVATION AND MARKET IMPACT

Critical embedded software systems assist, accelerate and control various aspects of European society and are commonly found in cars, aircraft, medical instruments and major industrial and utility plants. Future generations will experience software pervasiveness that can hardly be imagined today. Embedded systems will literally be found everywhere and will control many devices and infrastructures we rely upon every day. Since they are critical to human life, they must comply with the highest standards of performance through formal certification procedures.

CHARTER will contribute significantly to safety and security in an embedded software society by accelerating and reducing the cost of certifying critical embedded systems. Using a Quality-Embedded Development (QED) approach, real-time Java, Model Driven Development, rule-based compilation and formal verification will be merged to drive software certification to a new level. This will be essential since the costly and time-consuming procedures employed today to verify new software, for example in the aviation industry, will not be capable of meeting formal verification demands of this scale.

Critical and High Assurance Requirements Transformed through Engineering Rigour

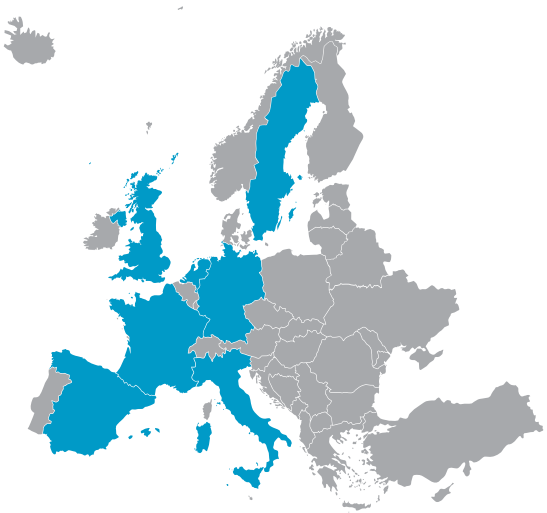


Composition with Guarantees for High-integrity Embedded Software Components Assembly

CHESS

100022

Start date:	February 2009
Project duration (months):	36 months
Total investment:	€16.1 m
Number of participating organisations:	18
Number of countries:	6



CHESS will develop model-driven solutions, integrating them in component-based execution frameworks, assessing their applicability from the perspective of the telecommunications, space, railways and automotive domains, and verify their performance through the elaboration of representative use cases from industry. By adapting component infrastructures for the integration of real-time and dependable patterns, and validating the approach through multi-domain case studies, CHESS aims to boost the mastery of complexity, reuse, robustness and quality as well as ease maintenance. Building languages to model and tools to evaluate extra-functional properties will reduce the costs and risks of development and deployment.

INNOVATION AND MARKET IMPACT

Combining component-based development and model-driven engineering approaches creates unique challenges for the development of high-integrity software. Two such challenges immediately stand out: developing components that can be certified or qualified individually for guaranteed delivery of the required level of service in operation, and preserving those guarantees in an assembly of heterogeneous software components on a given target execution platform. Current component-based software development infrastructures and their associated runtime environments do not satisfactorily address extra-functional characteristics (i.e. safety, reliability, performance).

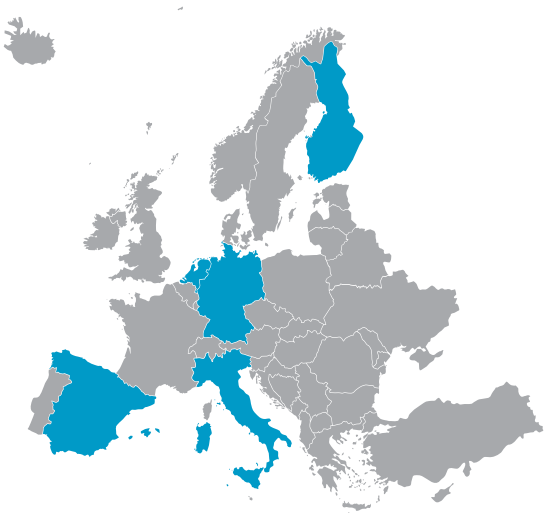
The CHESS project aims to capture those extra-functional concerns and extend model-driven engineering industrial practices and technology to specifically address the architectural structure, the interactions and the behaviour of system components while guaranteeing their correctness and the level of service at run time. CHESS will seek mature industrial quality research solutions to the problems of property-preserving component assembly in real-time and dependable embedded systems, and support the description, verification and preservation of extra-functional properties of software components at the abstract level of component design as well as at run time.

eDIANA

100012

Start date:	January 2009
Project duration:	36 months
Total investment:	€17 m
Number of participating organisations:	21
Number of countries:	5

eDIANA will create a multi -faceted, multi -purpose framework for the building sector to assess, handle and optimise energy consumption in Cells (living/working units) and MacroCells (residential and non-residential buildings). The development of a real-time power consumption sensor and embedded energy controller for urban and domestic environments will not only reduce energy demand but also allow utility companies to more effectively manage energy load and allow consumers to adjust consumption and to make real data-based decisions.



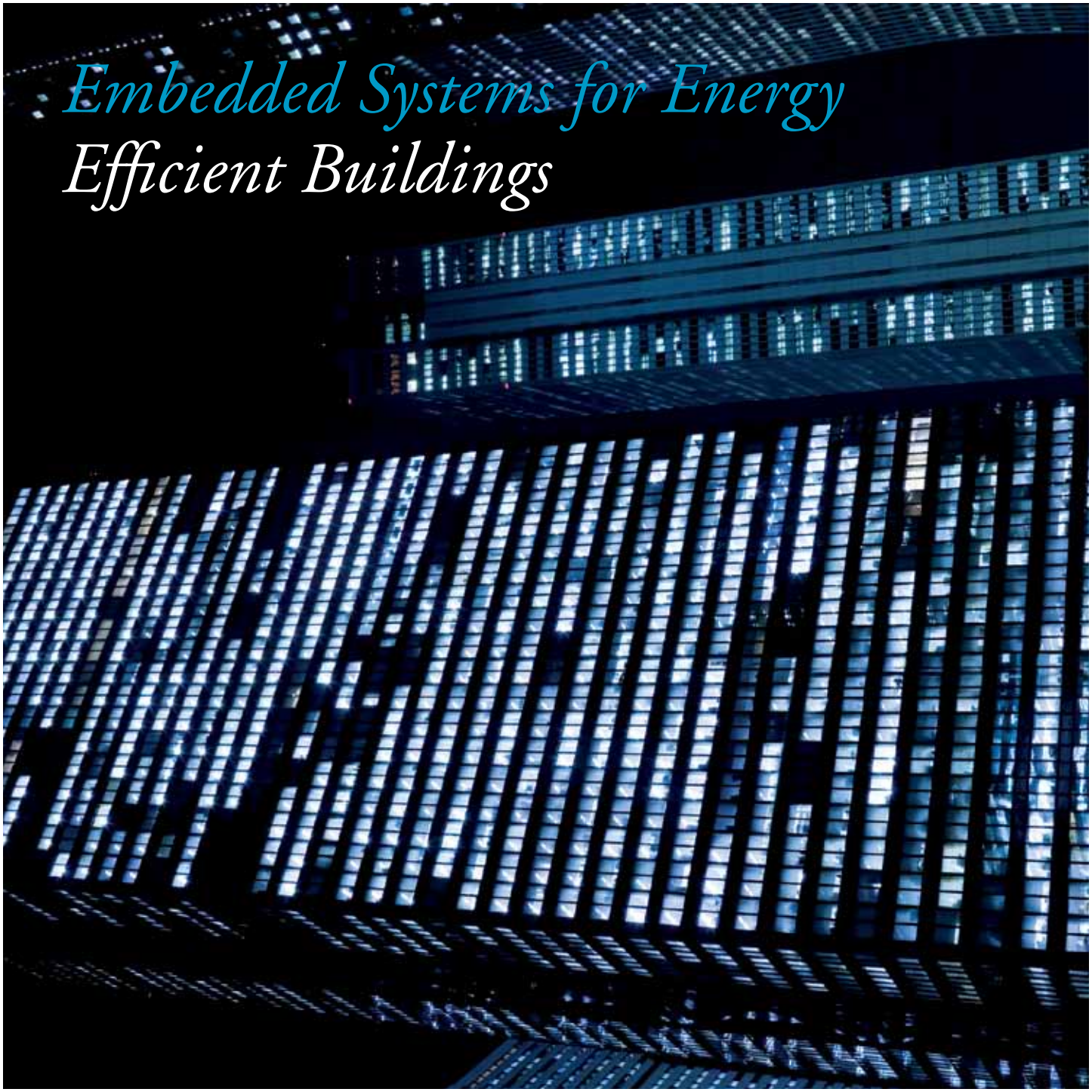
INNOVATION AND MARKET IMPACT

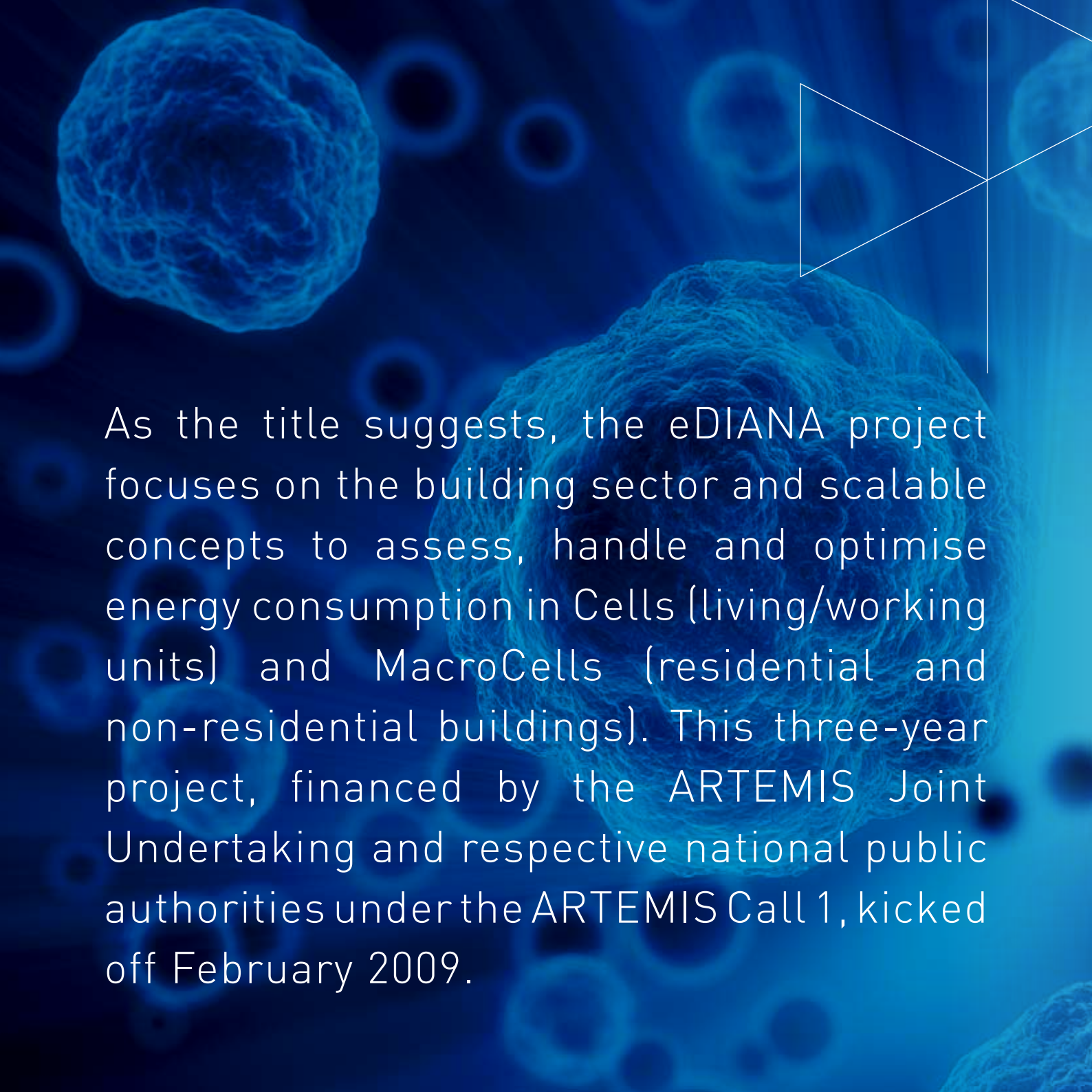
The application of model-driven engineering for embedded systems, in the context of eDIANA, provides a systematic approach to the specification, design, development and delivery of complex systems that will allow architecture and device-level software and hardware-specific design to evolve more or less independently. Moreover, eDIANA middleware infrastructure will introduce novel algorithms, protocols and software tools that enable interaction among heterogeneous devices, satisfying the required energy management functions and operations through collaborative and context-aware devices at different levels of the architecture.

The model-based design approach can raise the level of abstraction from the realisation domain to the problem specification domain, which provides the means to address challenges such as robustness, diagnosis and maintenance from a trade-off analysis perspective. So, given appropriate methodologies and tools, such models can be synthesised into efficient, reliable software and hardware realisations with the potential to radically improve design productivity and the quality of the whole set of embedded elements to be developed under the eDIANA project.

The picture that emerges will be an urban or residential world where electricity can be accessed, read, profiled, curtailed and managed for various devices, with an increasingly precise response to changes in weather, user comfort, security criteria, demand and price. The delivery of these innovations in the home, office and building domains, based in a coherent system platform as the proposed by eDIANA and aligned with the proposed reference architecture and derived examples, will be key to delivering effective energy management functions across the European urban landscape.

Embedded Systems for Energy Efficient Buildings





As the title suggests, the eDIANA project focuses on the building sector and scalable concepts to assess, handle and optimise energy consumption in Cells (living/working units) and MacroCells (residential and non-residential buildings). This three-year project, financed by the ARTEMIS Joint Undertaking and respective national public authorities under the ARTEMIS Call 1, kicked off February 2009.


eDIANA

MULTI-FACETED, MULTI-PURPOSE FRAMEWORK

The aim of eDIANA is to prepare a novel framework to support system analysis and engineering with component models and tools that enable the interoperable exchange of information leveraged by new energy management algorithms. The development of a real-time power consumption sensor and embedded energy controller for urban and domestic environments will not only reduce energy demand but also allow utility companies to more effectively manage energy load and allow consumer to adjust consumption and to make real data-based decisions. The picture that emerges will be an urban or residential world where electricity can be accessed, read, profiled, curtailed and managed for various devices, with an increasingly precise response to changes in weather, user comfort, security criteria, demand and price.

Moreover, eDIANA middleware infrastructure will introduce novel algorithms, protocols and software tools that enable interaction among heterogeneous devices, satisfying the required energy management functions and operations through collaborative and context-aware devices at different levels of the architecture. The delivery of these innovations in the home, office and building domains, based in a coherent system platform as the proposed by eDIANA and aligned with the proposed reference architecture and derived examples, will be key to delivering effective energy management functions across the European urban landscape. As a result, the whole value chain (users, producers, operators, building-related companies and embedded technology providers) benefits from the envisioned interoperable middleware infrastructure.

MODEL-BASED DESIGN

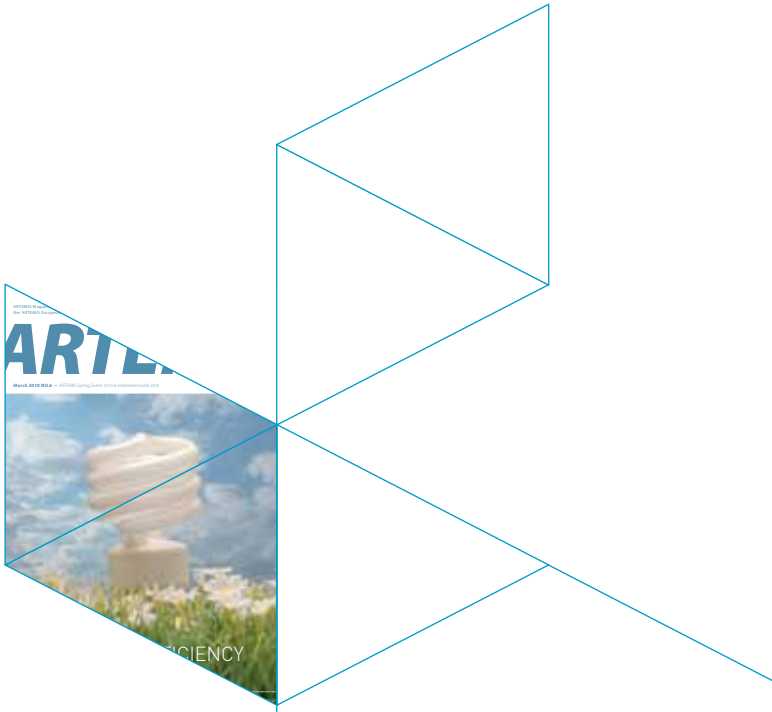
As already mentioned, the application of model-driven engineering for embedded systems, in the context of eDIANA, provides a systematic approach to the specification, design, development and delivery of complex systems that attempt to separate system architecture views from design and realisation technologies. This allows architecture and device-level software and hardware-specific design to evolve more or less independently. Model-based design can raise the level of abstraction from the realisation domain to the problem specification domain, which means we can reason about the general properties of the design rather than a specific implementation under a given (fixed) software/hardware partitioning. This is key to eDIANA as it provides the means to address challenges such as robustness, diagnosis and maintenance from a trade-off analysis perspective. So, given appropriate methodologies and tools, such models can be synthesised into efficient, reliable software and hardware realisations with the potential to radically improve design productivity and the quality of the whole set of embedded elements to be developed under the eDIANA project.

ROBUSTNESS

In order to produce and assess robust elements for the eDIANA Platform, product development, support and after-market engineers require a framework to distil physical parameters from the environment and compare them to a model-based view. While the effect of a single failure in the proposed eDIANA Platform is not critical, the large-scale deployment of energy-efficiency management embedded systems in urban areas could mean that single failures, repeated across a large number of installations, have a significant impact on the whole energy management system. Therefore, the eDIANA model-based simulation framework must assess the capability of an energy-efficiency management component to deliver an acceptable level of service within the overall architecture despite the occurrence of transient and permanent software and/or hardware faults, design faults, imprecise specifications and accidental operational faults.

A few previous projects have addressed the design of solutions that integrate legacy systems and smart environments, sensors nodes, electrical appliances and home appliance to improve energy efficiency and optimise overall energy consumption, production and storage in a building, exploiting real-time measurement and control. However, no projects have dealt with the study of architectures, topologies and communication protocols in scenarios where heterogeneous networks are present. eDIANA addresses the design of all relevant embedded technologies, and the implementation and testing of all the complete systems needed from sensor devices to information gathering and exchange.

Last but not least, eDIANA is geared to three standardisation areas that focus on future relevance: building-relevant standards regarding energy and home automation, communication (e.g. between system components and Cells) and safety. Furthermore, eDIANA is examining emerging interdependencies and coherences between these different areas that are currently being considered separately. By systematically identifying and presenting the relevant state-of-the-art standardisation and impact on future work in standardisation and research, eDIANA aims to develop a future-oriented product that will have the support of all stakeholders.



Article was published in:
ARTEMIS Magazine
March 2010 NO.6

Written by:
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ACCIONIA INFRAESTRUCTURAS
Research & Development, Spain


EMbedded MONitoring

EMMON

100036

Start date:	March 2009
Project duration:	36 months
Total investment:	€ 2,57 m
Number of participating organisations:	9
Number of countries:	6

The aim of EMMON (EMbedded MONitoring) is to create technologies that allow effective monitoring with 10,000 to 100,000 devices, in an area of 50 square km in a real world scenario. EMMON will research, develop and test a functional prototype for large-scale wireless sensor networks with the aim of increasing tenfold the number of devices possible today and developing simulation tools for networks a hundred times greater than at present.

INNOVATION AND MARKET IMPACT

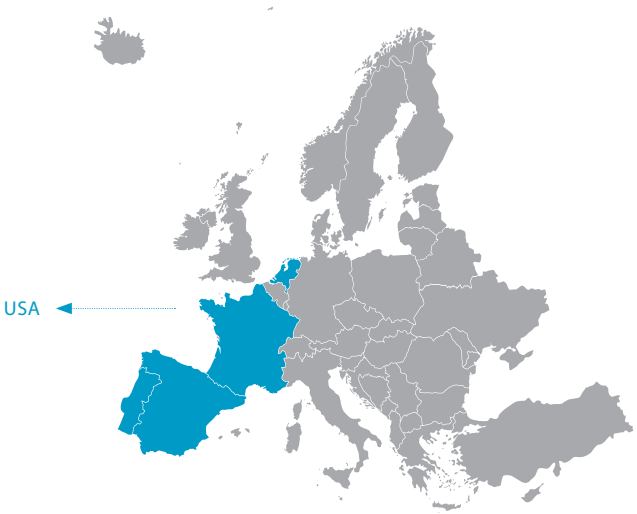
The vision of smart locations and ambient intelligent environments is of significant societal interest today (smart cities, smart homes, smart public spaces, smart forests) but this vision requires huge geographical tracts to be monitored in real time. EMMON will tackle the challenge of using thousands of embedded networking devices in large-scale distributed application scenarios by covering the technology chain from OS to middleware and from protocols to system integration in a large geographical area.

The potential market impact will be to enable several robust, scalable, energy-efficient and reliable environmental monitoring applications at lower cost and higher performance, providing unprecedented situation analysis and awareness, to better help decision makers, organisations and authorities reduce and optimise costs and provide better services to citizens.

iLAND

100026

Start date:	March 2009
Project duration:	36 months
Total investment:	€3,9 m
Number of participating organisations:	9
Number of countries:	5

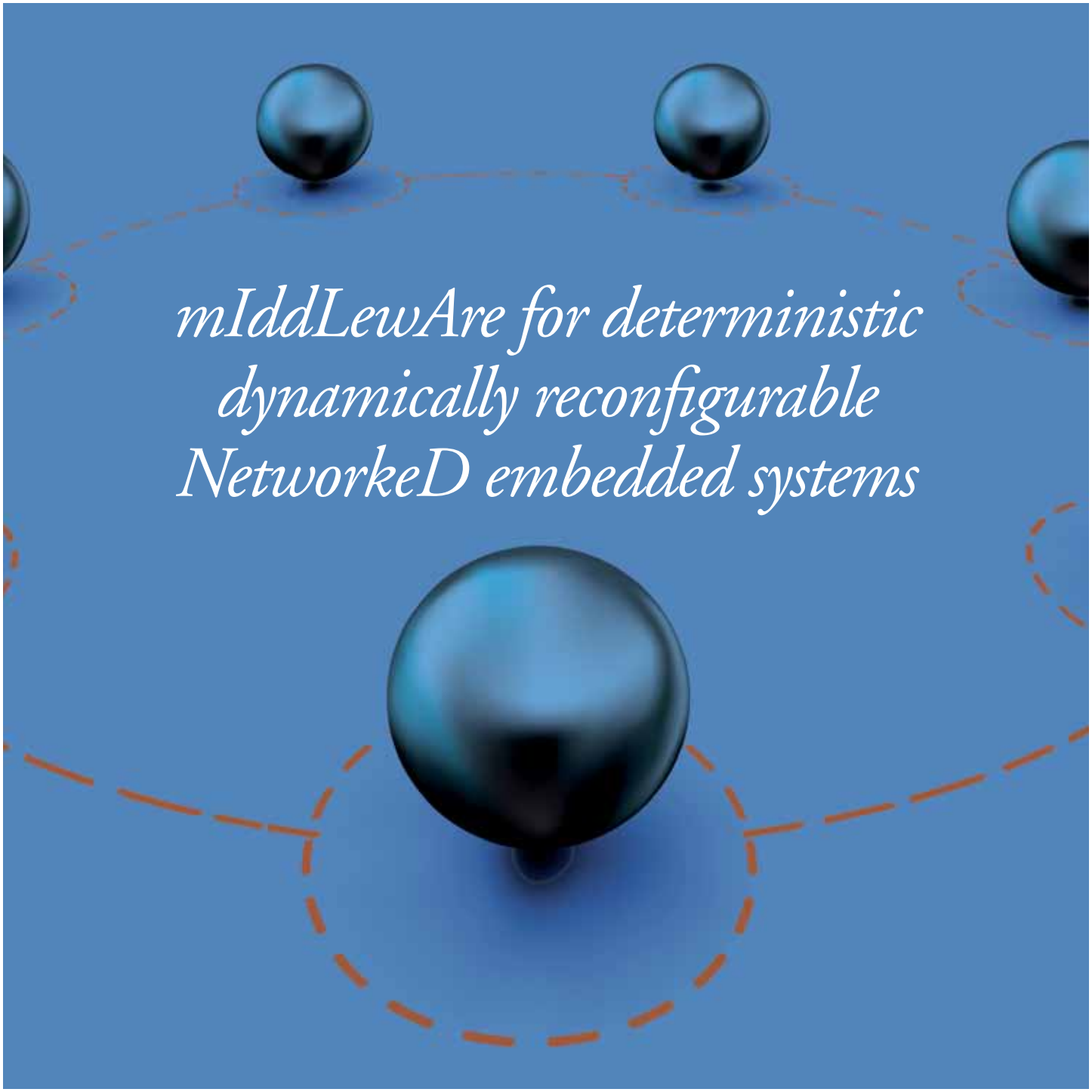


ILAND will offer deterministic services and QoS-based resource management by developing enabling technologies for modular, component-based middleware for networked systems that demand deterministic, dynamic functional composition and reconfiguration. Its results embrace a lightweight middleware architecture, with validation through three application demonstrators. The technologies developed in ILAND will have an immediate impact in the embedded products that could reach the market in the near future.

INNOVATION AND MARKET IMPACT

The project will address two types of networked embedded systems: ad-hoc and infrastructured networked embedded systems. The first concerns embedded systems with a highly dynamic structure featuring an open architecture with devices that might appear and disappear spontaneously, as represented by wireless transport and home care applications. Infrastructured networked embedded systems composed of heterogeneous devices with an appropriate degree of functional flexibility and nodes in active or passive state are represented by video monitoring and surveillance applications.

Examples of new products and systems enabled by ILAND include a commonly available distributed digital video recorder for security installations or an intelligent in-store video system capable of distinguishing customer gender. ILAND will also facilitate highly dynamic systems in various domains, such as remote monitoring in areas with no communication infrastructure, infrastructure-less email service for poor regions, highly efficient remote meter reading for water or gas meters. New products and applications based on wireless sensor networks, such as an ambient assisted living monitoring system at home or a system for environmental monitoring, can benefit from ILAND.


mIddLewAre for deterministic
dynamically reconfigurable
NetworkeD embedded systems

INDustrial EXploitation of the genesYS cross-domain architecture

INDEXYS

100021

Start date:	April 2009
Project duration:	30 months
Total investment:	€7,3 m
Number of participating organisations:	10
Number of countries:	4

The objective of INDEXYS is to tangibly realise industrial implementations of cross-domain architectural concepts developed in the EC FP7 project GENESYS (GENeric Embedded SYStem Platform) in three domains: automotive, aerospace and railway, thereby relating to ARTEMIS Industrial Priority: 'Reference designs and architectures'.

INNOVATION AND MARKET IMPACT

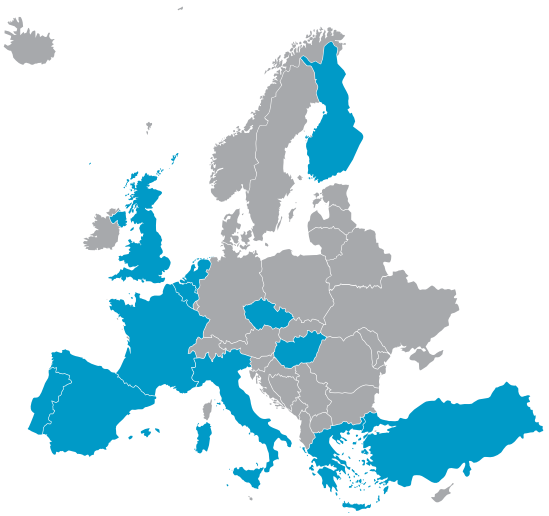
Research and development carried out in INDEXYS will deliver significantly advanced technology for strengthening European excellence in computing architectures of the automotive, aerospace, and railway domains. INDEXYS contributes to mastering new computing architectures and enables European industries across different application domains to maintain and even improve their technological leadership. A positive impact for both OEMs and the European supplier industry is expected.

INDEXYS' instantiations of selected architectural services of the GENESYS generic reference architecture template contribute to the 'establishment of a common multi-domain architecture, APIs, and design tool platform for advanced multi-core hardware and middleware solutions' (ARTEMIS Joint Undertaking work programme) and thereby support the European supplier industry to target larger markets. OEMs will benefit from mature cross-domain technology at lower cost, as well as from decreased development cost and time-to-market.

SCALOPES

100029

Start date:	January 2009
Project duration:	27 months
Total investment:	€36,6 m
Number of participating organisations:	39
Number of countries:	12



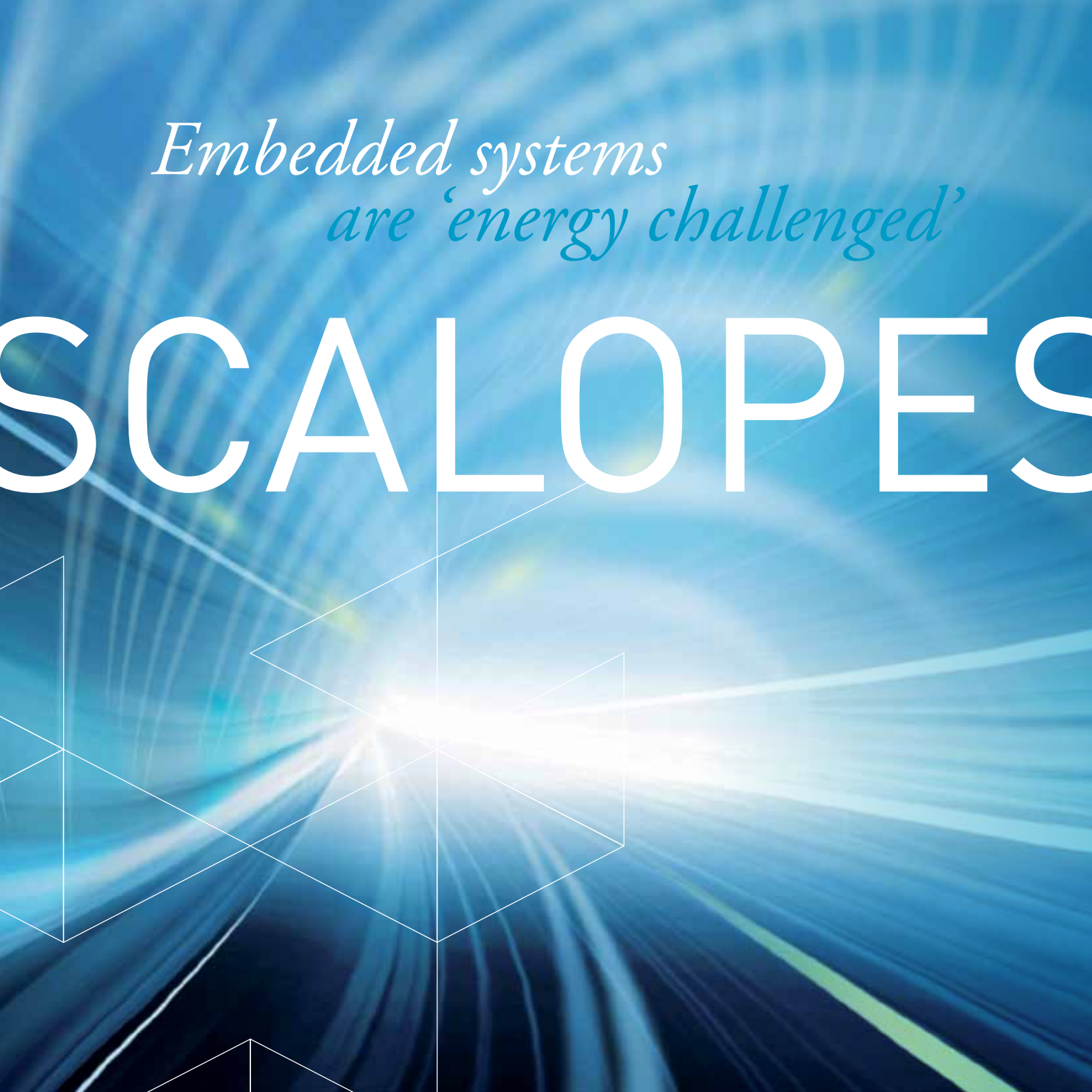
The main objective of SCALOPES is to enable an industrially sustainable path for the evolution of low-power, multi-core computing platforms for four application domains with strategic value for European competitiveness. The main technology focus in SCALOPES lies on generating solutions for energy and resource management, low-energy design methods and associated runtime methods as well as standard interfaces (API) between hardware and low-level software. The benefits will be demonstrated by working on platforms that provide real-time data processing capabilities (image, video, audio, packet processing) combined with high energy efficiency.

INNOVATION AND MARKET IMPACT

The development of these technologies is consistent with existing and emerging standards and is based on existing state-of-the-art tools available in industry and among the key research institutes in Europe involved in this area, all of whom are partners in SCALOPES. The project focuses on cross-domain technology and tool developments for multi-core architectures. These developments are driven by and proven for four different application domains: communication infrastructure, surveillance systems, smart mobile terminals and stationary video & entertainment systems.

The objectives of the SCALOPES project will be considered as successfully reached when the power consumption is reduced by 30% while the performance is increased by 20% for multi-core embedded systems in all four application domains covered. For instance, compared to reference home TVs from 2008, power savings of >35% can be achieved by 2010, and >50% at the end of the project. The resource management framework for the display controller should allow resource utilisation to be boosted by 50% and the form factor to be reduced by 50%. Moreover, improvements in design tools will allow the design time to be reduced by 20% for the typical embedded system architecture design in the application domains covered.


SCalable LOw
Power Embedded
platformS


Embedded systems
are 'energy challenged'
SCALOPES

The goal of SCALOPES is to enable an industrially sustainable path for the evolution of low-power multi-core computing platforms for application domains with strategic value for European competitiveness. The technical innovations are driven by and proven for four different application domains: communication infrastructure, surveillance systems, smart mobile terminals and stationary video systems. The project is financed by the ARTEMIS Joint Undertaking and respective national public authorities under the ARTEMIS Call 1. It started in January 2009 and runs till March 2011

HIGH PERFORMANCE, LOW POWER

The design of modern embedded systems is often beset by conflicting requirements, like the simultaneous need to be low power while providing high performance, so power optimisation is one of the driving themes in the SCALOPES project. Examples include battery operated (wearable) portable devices suited for the display of streaming video and non-portable, power-rich platforms as in television sets, where the packaging and reliability costs associated with high power and high performance systems also force designers to look for ways to reduce power consumption. In fact, embedded systems are 'energy-challenged' at all levels.

The application behaviour of modern, typically software-centric, MPSoC-based embedded systems is becoming more and more dynamic, with two distinctive types of dynamic behaviour: intra-application and inter-application. Intra-application dynamic behaviour relates to the different behaviours, or operation modes, of a single application. For example, a video application could dynamically lower its resolution (and thus its QoS) to decrease its computational demands in order to save battery life. Inter-application dynamic behaviour, on the other hand, refers to the fact that modern embedded systems often require to support an increasing number of applications and standards. In order to cope with the dynamic behaviour, system-level design is used to raise the abstraction level of design. This approach allows the capture of multiple applications during system design.

The increased complexity of MPSoC design has led to a way of designing SoCs that takes account of composability, predictability and dependability. Composability enables the development of stable software for very large SoCs by ensuring that parts of the SoC software can be developed and verified separately. Predictability ensures that the tools that calculate the timing behaviour enable the correct design and scaling of systems to ensure that the real-time conditions are met. Last but not least, dependability relates to the behaviour of the system in the event of errors or problems during operation.

SEAMLESS ADAPTABILITY

The challenge in designing a Resource Manager (RM) for multi-core platforms is to adapt seamlessly, during run-time, to the power consumption and the overall performance of the architecture according to the application needs and its surrounding environment. A common RM is structured around two entities: the Local Resource Manager (LRM) and the Global Resource Manager (GRM). The LRM encapsulates the local policies and mechanisms used to initiate, monitor and control computation on the corresponding domain while the GRM manages jobs (a group of communicating tasks allocated on a domain). In other words, the RM supports both platform scalability and application scalability.

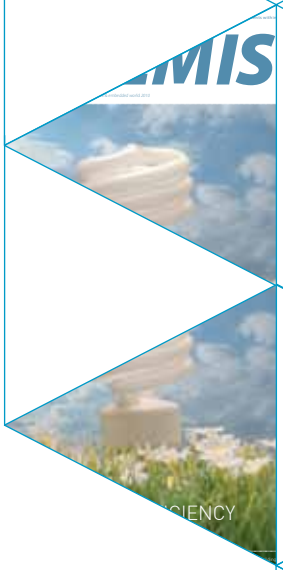
Ongoing RM design is characterised by two approaches. The first shares a common application between two platforms – a symmetric multiprocessor running SMP Linux versus an asymmetric multiprocessor platform. The second approach makes use of a single platform running Linux providing support for System Control State Machine (SCSM) and Dynamic Frequency Scaling (DFS). Power aware design technologies and methods will create a unified framework supporting the design of complex, heterogeneous, reconfigurable, multi-core systems optimising the use of the available resources in terms of power consumption, performance and reliability. A multipurpose board is being developed for high-speed network monitoring, routing and application support by searching for the optimum in high performance, low power consumption, composability, predictability, dependability and other general development requirements considered within SCALOPES. The purpose is to process protocol and/or payload data of NGN networks as a monitoring and data-processing unit.

The SCALOPES project will also answer the main issue in the

design of a mobile terminal which is: 'How can several types of user-oriented features be incorporated with seamless operation and evolution (including runtime adaptability), using minimum power resources for the required performance in dynamic SMT set-ups?'

VIDEO APPLICATION DOMAIN

In video surveillance applications, the aim is substantial improvement on actual commercial systems in three main areas: multi-standard image processing, independent of resolution, with high throughput and hard reliability requirements, image comprehension, like smart scene segmentation, behavioural tracking and complex measurements, and energy and cost-saving techniques, like triggering from external alerting sources and efficient communication handling. The stationary video application domain focuses on digital TV components and devices, on the one hand, and display controllers for multi-viewers, on the other. These display controllers for multi-viewers, i.e. large display walls, are part of complex networked visualisation systems, dealing with a huge amount of encoded video data complemented by metadata and monitoring information. These systems are traditionally resource and power-hungry, bulky equipment, statistically over-dimensioned to guarantee at run-time the necessary quality of service irrespective of the amount of data to be displayed. Solutions to make such systems embeddable are being investigated and are focusing on ways to reduce the amount of computing resources required locally by using the resources available through the network.



Article was published in:
ARTEMIS Magazine
March 2010 NO.6

Written by:
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A new low-power
video-capable wireless
sensor network infrastructure

SMART

100032

Start date:	March 2009
Project duration:	36 months
Total investment:	€4,5 m
Number of participating organisations:	11
Number of countries:	5

The SMART (Secure, Mobile visual sensor networks ARchiTecture) project aims to provide an infrastructure that will support certain features that are specific to and very important for numerous application domains of Wireless Sensor Networks, such as high-security levels, low power consumption, video-capabilities, auto-configuration and self-organisation. These are not currently efficiently catered for by existing solutions. SMART will address all those features efficiently and inexpensively by creating an innovative low-power wireless video-capable sensor network infrastructure, thereby enabling developers will be able to build and customise new WSN applications in new areas with very low research and development costs.

INNOVATION AND MARKET IMPACT

The SMART project will achieve world leadership in the emerging field of Wireless Sensor Networks by bridging the gap between off-the-shelf reconfigurable devices, low cost and a novel Reconfigurable Application Specific Instruction Set Processor (RASIP) with a high degree of adaptability and low power. This know-how will give the project's corporate partners and the European Union excellent advantages to in the emerging markets of globally networked, interoperable embedded systems.

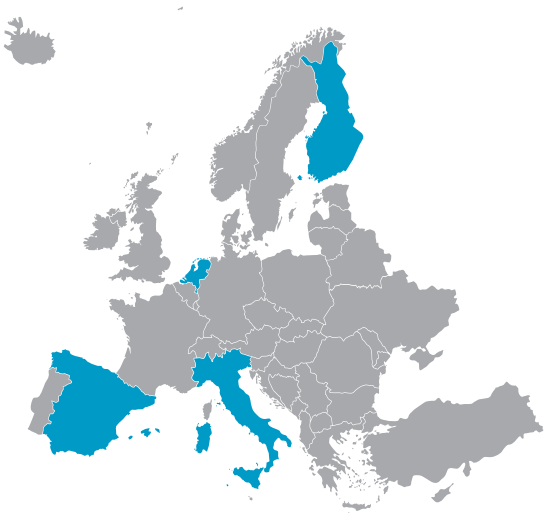
The SMART system will also take advantage of the partial real-time reconfiguration feature of the reconfigurable devices and will be able to alter their processing tasks according to the environment the sensor network operates in. SMART will have significant impact in the areas of sensors, smart systems integration, middleware development and wireless networking by specifying and implementing miniaturised, very powerful and ultra low-power pioneering wireless sensor nodes.

SOFIA

100039

Start date:	January 2009
Project duration:	36 months
Total investment:	€36,5 m
Number of participating organisations:	19
Number of countries:	5

The SOFIA project makes 'information' in the physical world available for smart services in embedded and ubiquitous systems. The SOFIA Open Innovation Platform (OIP) architecture and Application Development Kit (ADK) make it easy to develop devices and services that can interact across vendor and industry domain boundaries. This complements and enhances the inherent functionality and value of the stand-alone device, service or system, while letting the individual vendors and owners determine the degree of openness and sharing according to their business needs.



INNOVATION AND MARKET IMPACT

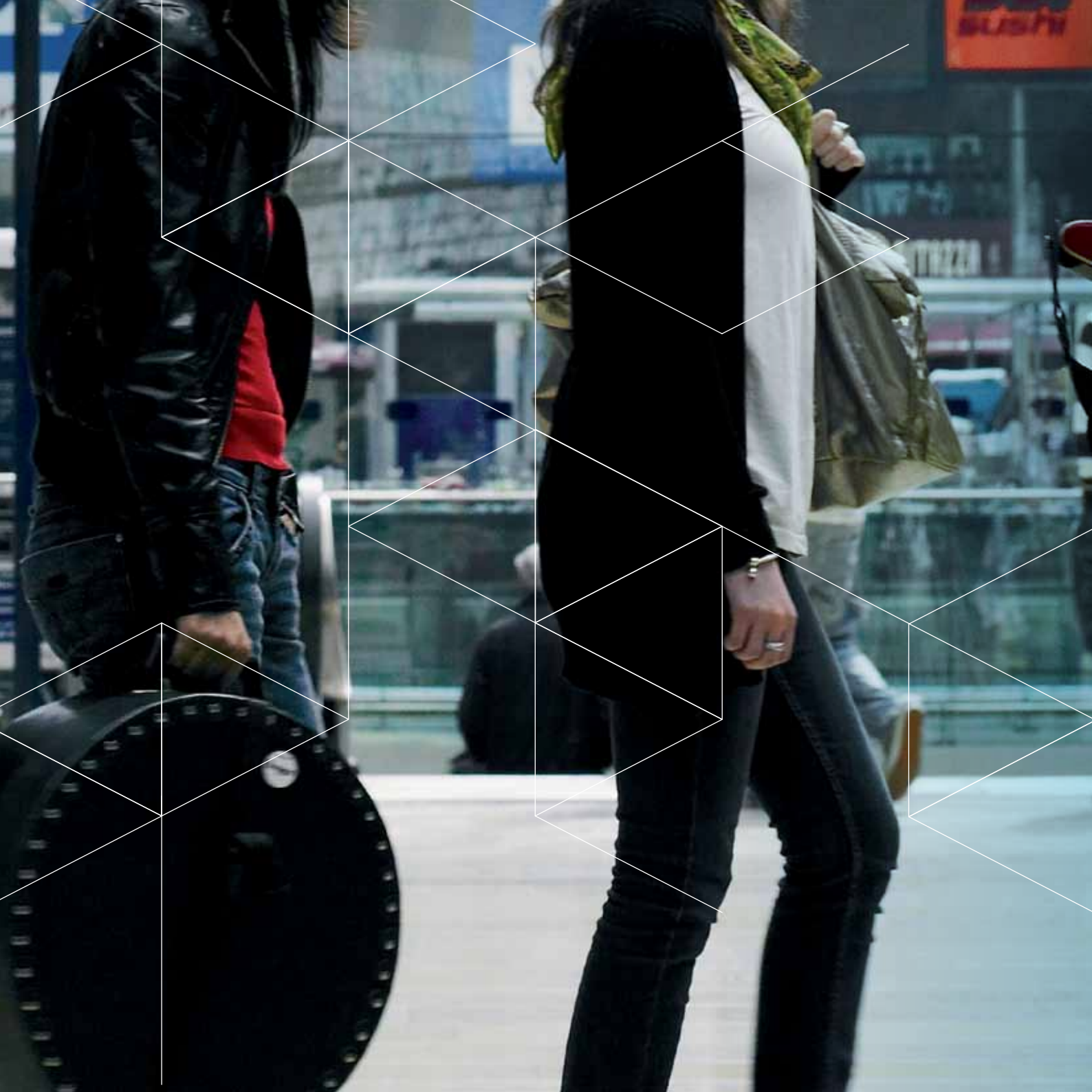
SOFIA will have a fundamental role in creating applications for smart environment by defining a common way to share and access local data. The common and open solutions will enable the introduction of new digital applications, extension of functionality in existing systems and development of cross-domain services for consumer services in cities, houses and private spaces like the car, and for professional users in different areas like in building maintenance or in monitoring of spaces or assets. It is possible to foster innovation while maintaining value of existing legacy systems and investments.

The common SOFIA technologies developed by the horizontal WPs are being applied to industry and domain specific technologies by the vertical WPs, and envisioned smart environments include e.g. the car, the office and the railway station.

A car's purpose-built interfaces can be used to conveniently and safely access the content, services and information available in personal mobile devices as well as present information via mobile devices or help them to adapt to the proper context. New interoperable devices and their services can improve the car's features throughout its lifetime. In an office, equipment that performs access control, lighting, heating and ventilation will provide information to a shared repository without being developed as an integrated system.

Augmented by individuals carrying personal devices, developers can use the rich information to quickly tune the operation of any facilities according to the current usage. In a railway station environment, where surveillance and sensor equipment will provide current status information to operations management and public safety related systems, personal devices can access derivative information such as navigating past slowly moving crowds. In an emergency, both public and personal devices can relay instructions adapted to the rolling situation.


Smart Objects For Intelligent Applications


SUSHI

SOFIA

Smart Objects: For Intelligent Applications - first results made open

The SOFIA project directly addresses the challenge of ARTEMIS Sub-programme 3 on Smart Environments. The main mission of the project is to make 'information' in the physical world available for smart services in embedded and ubiquitous systems. As concrete results, the project targets the development of an Open Innovation Platform (OIP) architecture and an Application Development Kit (ADK). Initial results, during the first year of the project, have already been made known by putting the core component of the interoperability solution – called Smart-M3 – to open source.

WHAT SOFIA IS ABOUT?

SOFIA aims to define and open a completely new domain for technology and service innovation on a global scale, with the theme the opening of embedded information for all kinds of applications. The key challenge is the interoperability between devices and embedded systems originating from different domains.

The enabling technologies for both computing and communication have matured to a level where cost-efficient use of embedded, ubiquitous technologies makes sense. Thus, it is feasible to start realising the concept of smart spaces that has been widely studied in ubiquitous computing, ambient intelligence and future internet research.

From the user aspect, continually evolving information and communication technologies (ICT) touch nearly every aspect of our contemporary life. The introduction of new applications or services must address the human dimension of technology. In the ambient services that use ubiquitous technologies, this human-technology interaction will in the very near future extend to much more complex fields of everyday life that it has so far.

WHAT ARE THE APPLICATION AREAS OF SOFIA?

The interoperability solution can be applied in many areas. However, the project will test its real use in three different application contexts: personal spaces, smart indoor spaces and smart city. While each of these addresses specific requirements and constraints arising from their environments, all face similar challenges in sharing information.

In personal environments, the use cases are typically dynamic and the area limited. Devices and their services can be developed throughout their lifetime, independent of each other. In smart indoor spaces like smart office, embedded infrastructure equipment as well as appliances and personal devices can share information without being part of an integrated system. The smart city is a very large application context, where typically public areas include different embedded systems, some of them critical or closed. Personal devices can access some of this information and the embedded systems further benefit from aggregated data provided to users in the space.

The project covers the various areas with partners that represent different domains (including mobile and CE devices, public infrastructure and the construction industry), regions (Finland, Italy, the Netherlands, Spain and Switzerland) and organisation types (25% SMEs, 30% universities and research institutes). The project is headed by Nokia in Finland. The ARTEMIS programme offers a good opportunity to involve such a multidisciplinary set of partners in a strategic project.

WHAT IS THE OPEN SOURCED SMART-M3?

Open sourced implementation is a core component of the SOFIA Open Innovation Platform. It provides the baseline for the solution to cross-domain and cross-platform interoperability platform and information exchange, and, moreover, the project develops further enhancements and adaptation technologies. The solution is called Smart-M3, where the M3 originally stands for Multi-device, Multi-vendor, Multi-domain. Smart-M3 makes it possible to mash up and integrate information among all applications and domains ranging from different embedded domains to the Web.

Fragmentation of technical solutions in different domains and standardisations that are specific to the use case hinder cross-domain application development. Smart-M3 enables the evolution of applications without compromising existing investments.

The Smart-M3 interoperability layers are shown in Figure 1. On the lowest layer, Device World, we have devices connected with device networks and gateways. On the middle layer, Service World, we have applications, clients and services. Services are directly available only within a single domain. The information exchange between service domains happens via service ontology interpreters.

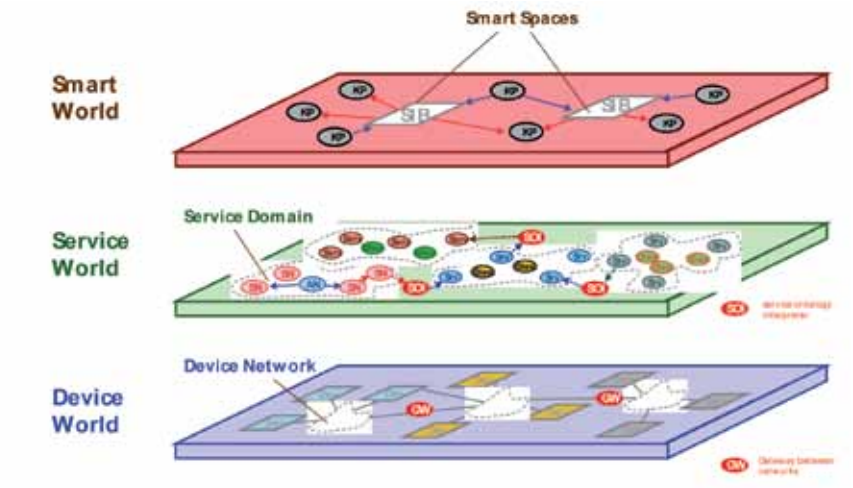


Figure 1 Smart-M3 view on layered interoperability

The highest layer of interoperability is Smart World where interoperability is based on semantic information. Smart World unifies the lower layers with information level interoperability. Smart-M3 includes software modules to create all required functions of Smart World.

Smart-M3 applies blackboard software architecture to provide a cross-domain search extent. Implementation of Smart-M3 provides a uniform, use case independent service API for sharing information in a Smart Space. The possibility to expose Smart Space service APIs concurrently through multiple domains and transport technologies makes the information currently isolated in multiple heterogeneous embedded domains available by using web programming tools and methods without compromising power, safety and performance requirements of the embedded domains. As an example this would allow an application programmer who programs for a mobile platform to access contextual information in a car, home, office, football stadium, etc, in a uniform way and improve the user experience, without compromising the real-time requirements of the embedded system.

The impact on existing system investment is minimised. The domain-specific technology choices are not compromised and the applications in different domains are not coupled together.

For more detailed and technical information, please refer to the SOFIA web site and the Smart-M3 wiki pages.

Smart-M3 Wikipedia article:
http://en.wikipedia.org/wiki/Smart-M3

Sofia web pages:
www.sofia-project.eu

The open source project is located in SourceForge:
http://sourceforge.net/projects/smart-m3

Article was published in:
ARTEMIS Magazine
October 2009 NO.5

Written by:
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Juha-Pekka Soininen, VTT Finland

WHY HAVE THE PROJECT RESULTS BEEN MADE OPEN SO EARLY?

There are at least three advantages in being open in the early phase in the project.

1. By opening up some of the results, more developers and contributors are expected to contribute new technical innovations and uses for the SOFIA solutions, and get feedback and help in focusing on the most critical technical issues as well as the most relevant applications. This is expected especially from the ARTEMIS community, but also from other early adopters. In the case of smart environments, which present implicitly multi-vendor contexts, openness is a key enabler and facilitator for faster progress towards project objectives.

2. The Smart-M3 is one of the core elements in the SOFIA project. The work done in the project specific to applications contains many domain-specific and, to some extent, proprietary solutions, which cannot and do not need to be open. The advantage here is a clear distinction of shared and non-shared ground. The project work can be focused on those parts that are essential for each partner and that benefit from opening to interoperability.

3. By going open early we define an ARTEMIS route to collaborative innovation research in Europe. Now all project partners are given a channel to contribute parts of their results for peer review. Consequently, all partners can enjoy the results of others in a very meaningful way.

The openness principle should be applied only to issues that benefit from being open. The basic prerequisites are the need for common solutions, where no control point is up for grabs as such, and the potential to share results across different domains, platforms and even products.

The risk of fragmentation of open solutions always remains a challenge. A large project with set objectives can act as a supervisor of the development. After all, this is always an issue in large initiatives.

WILL THERE BE IMPACT BEYOND THE SOFIA PROJECT?

The partners involved in the project have various use scenarios for the SOFIA solutions in many application fields. We see this as the opening of a new development for embedded systems in general.

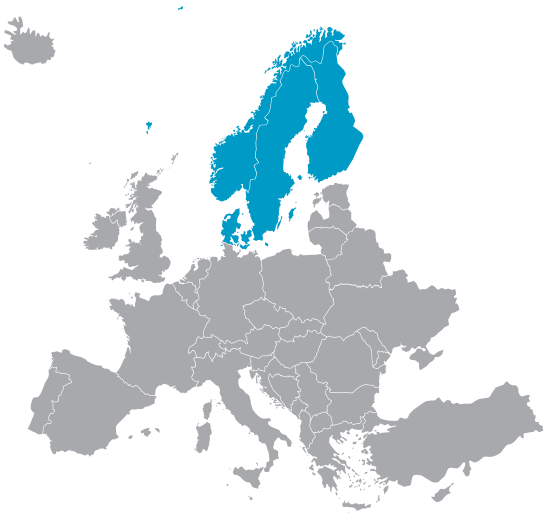
We hope that already during the project lifetime, many other ARTEMIS projects could benefit by utilising the results we have made available. We see the Smart-M3 as a particularly convenient solution for SP3 smart environments. At the same time, we believe that somebody might find the ideas useful in other application contexts as well. We look forward to a lively community of players in the embedded systems area who will try out the SOFIA technology and hopefully adopt it as a novel way of enriching their solutions.

System Level Modeling Environment for SMEs

SYSMODEL

100035

Start date:	January 2009
Project duration:	36 months
Total investment:	€5,4 m
Number of participating organisations:	11
Number of countries:	4



Only a small improvement in the methodology SMEs use for embedded systems design can result in considerably more competitive strength and effectiveness. This is the vision behind SYSMODEL whose aim is to give SMEs the confidence to build cost-efficient ambient intelligence systems with optimum performance, accelerated time-to-market and faster deployment.

INNOVATION AND MARKET IMPACT

SYSMODEL will develop supportive modelling tools for the design and implementation of heterogeneous systems where time and power are critical factors. The focus of SYSMODEL is to reuse existing models and integrate them into a heterogeneous system. The SystemC-based modelling framework employed will define rules for expressing four different Models of Computation (MoC) and rules for composing these MoCs into a system with well defined behaviour.

The SYSMODEL deliverables offered to SMEs include a modelling methodology described in a 'How to do system level performance modelling' manual, open-source point tool prototypes for use in performance modelling and analysis, a number of SME verification case studies that illustrate this methodology and a comprehensive training programme taking the SMEs from awareness level through in-depth training to online tutorials. The potential impact of this project is huge.


ARTEMIS

CAL2009

Introduction: Call 2009

The ARTEMIS Call of 2009 was, if that is possible, even more unique than that for Call 2008. The call itself was launched while still under the auspices of the EC, but the newly established ARTEMIS Joint Undertaking Office took up the baton between the Project Outline and Full Project Proposal evaluation steps (this was the first two-step ARTEMIS Call, as was originally conceived). In addition, some more ARTEMIS-specific flavour had been added by using evaluation criteria that favoured proposals with a strong market impact potential.

The two-step evaluation process proved itself very well, with the technical experts remarking that the general quality of the full project proposals was very high, in particular of those where the feedback from the project outline phase had been carefully considered. From an original 56 project outlines, 44 full proposals were submitted: 20 of these were technically above threshold, and 14 were felt to be within range of the available funding budgets. Ultimately, through the merger of 2 projects with a close application link, 13 projects were funded.

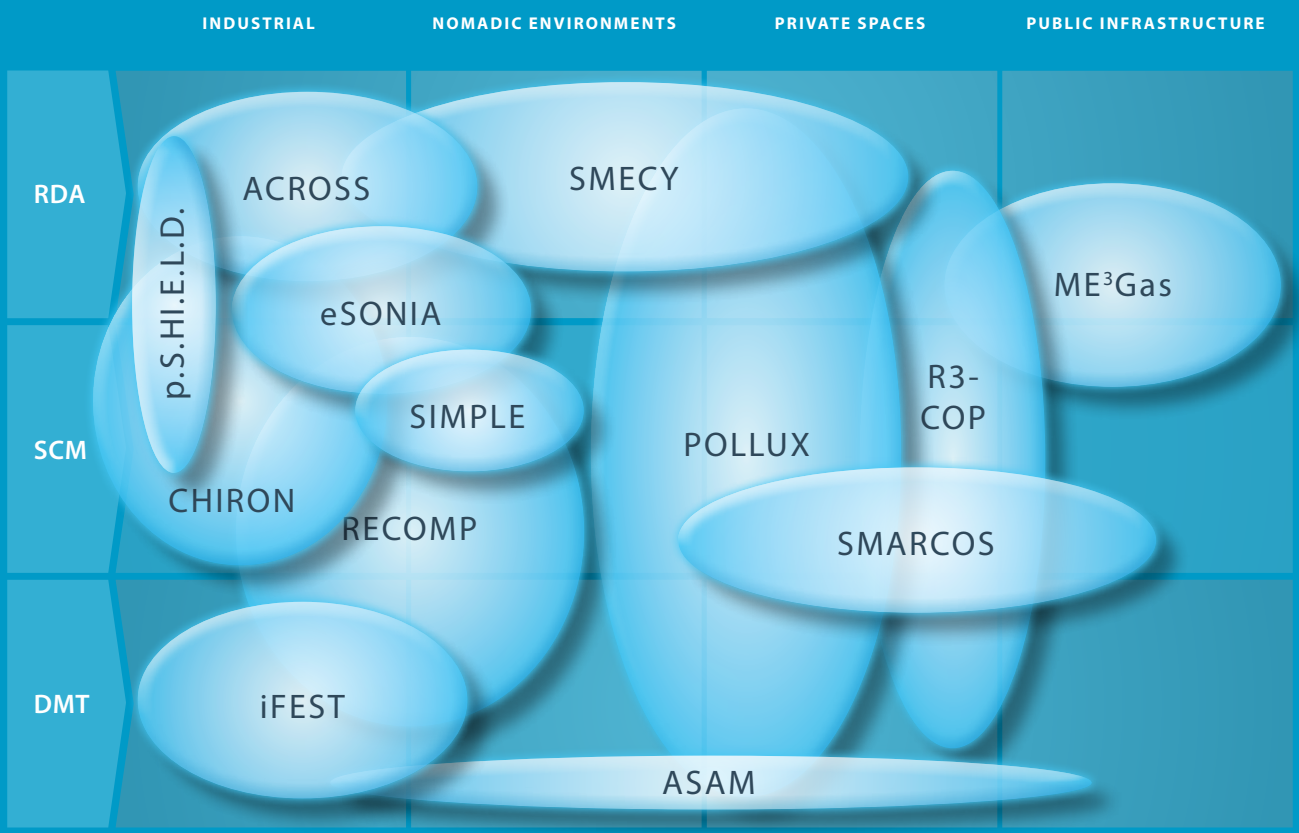
As for Call 2008, the ARTEMIS programme has attracted a nice balance of some very large projects with large impact potential across many European countries, backed up by some smaller, more targeted ones that can yield valuable results for later inclusion into larger initiatives.

With more projects now running, the coverage of all the technical items of the programme – grouped into 'ARTEMIS Sub-Programmes' (ASPs) is growing nicely.

At the time of writing, with the projects from Call 2008 and Call 2009 all up and running and the evaluation process for Call 2010 well under way, we can say that the ARTEMIS cycle of Calls is now definitely up and working and the R&D part of the programme itself is running well. See for yourself, in the following project descriptions.

Alun Foster
Programme Manager ARTEMIS Joint Undertaking

ARTEMIS PROJECTS 2009 MAPPING SRA



RDA= Reference Designs and Architectures
Methods and Tools

SCM= Seamless Connectivity and Middleware

DMT= Design

ACROSS

100208

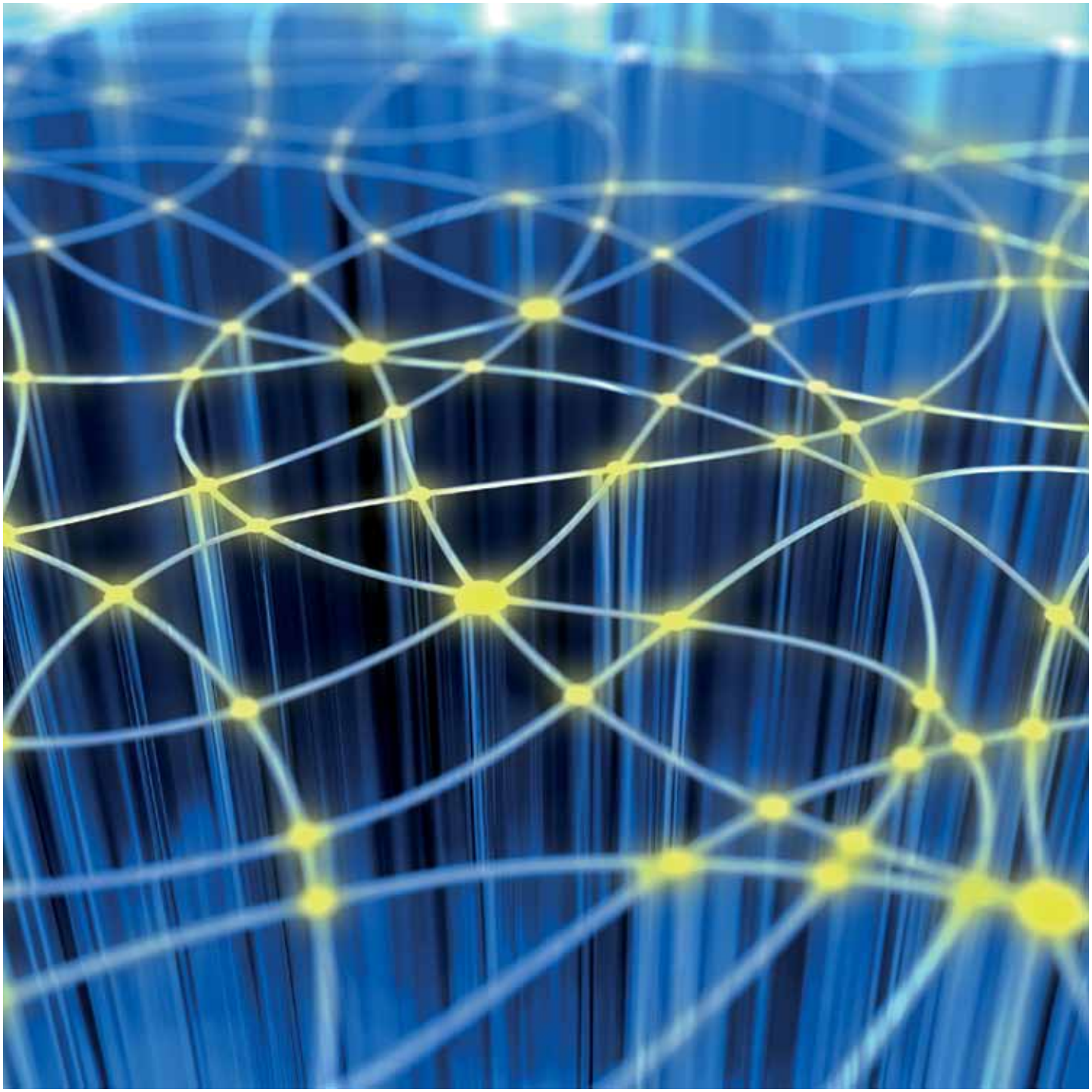
Start date:	April 2010
Project duration:	36 months
Total investment:	€16,1 m
Number of participating organisations:	19
Number of countries:	4

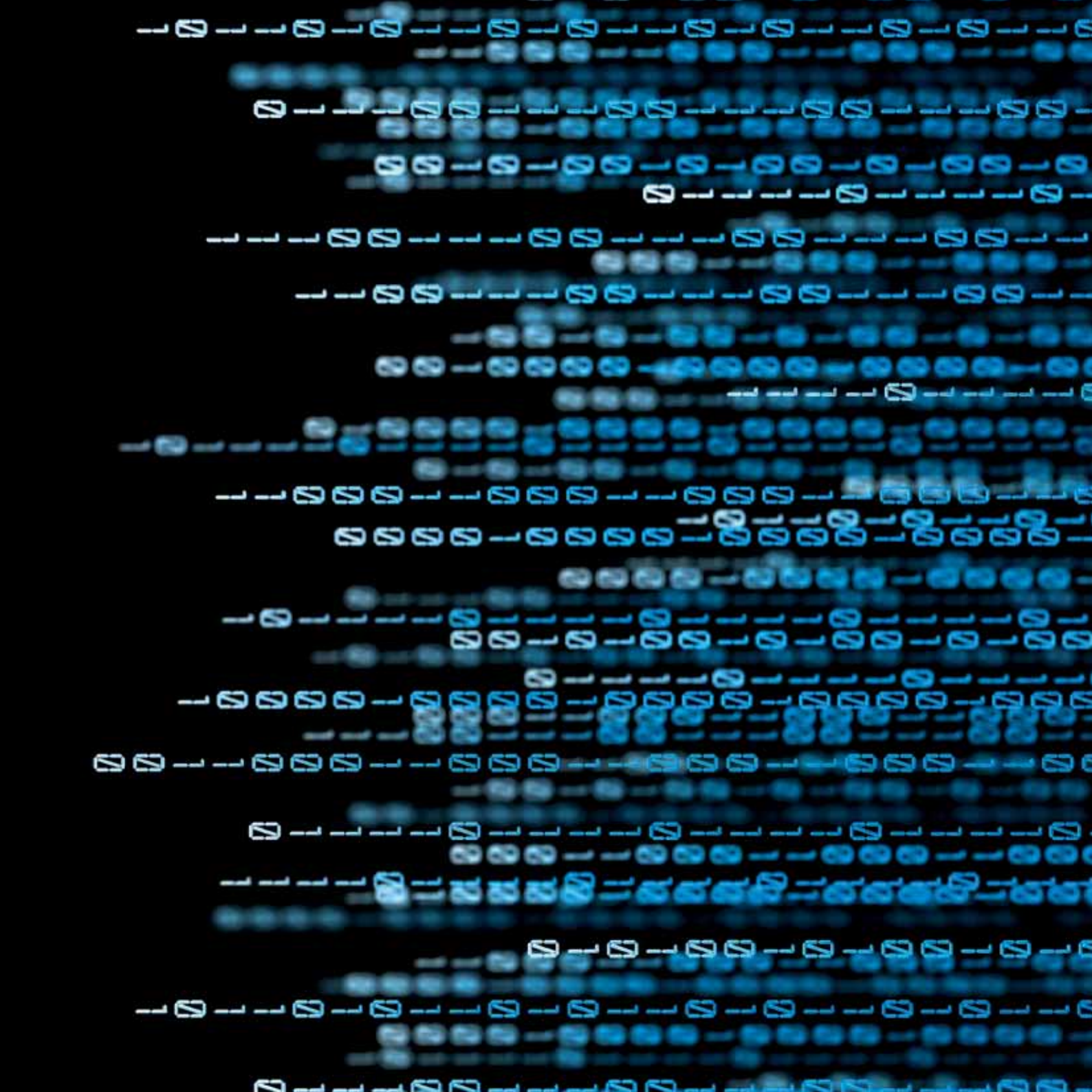
ACROSS will significantly reduce the development cost through a component-based architecture with support for composability as well as increased robustness and the capacity to fully exploit the economies of scale in the semiconductor industry. It will do so by offering domain-independent architectural solutions for the automotive, aerospace and industrial control domains, addressing common technological challenges such as complexity management and robustness

INNOVATION AND MARKET IMPACT

In the automotive, avionics and industrial application domains no MPSoC-based framework for the component-based development of safety-related embedded systems is currently available today to support composability, robustness, integrated resource management, diagnosis and model-based development. ACROSS will enable such component-based development, thereby reducing design, integration and validation efforts. The ACROSS MPSoC will offer a predictable on-chip interconnect that is free of interference, thus simplifying the integration and interoperation of independently developed components, and will support robustness by establishing a framework for fault isolation, the selective restart of components after a transient fault, and the masking of transient and permanent errors by component replication.

As a platform architecture that provides a minimal set of core services and a plurality of optional services predominantly implemented as self-contained system components, ACROSS will offer a domain-independent technology (middleware, tools and IP cores) to enable the European supplier industry to increase its market share, provide OEMs with a mature cross-domain technology at lower cost, reduce development cost and accelerate time to market, ease the introduction of new cross-domain applications, enable the exploitation of the economies of scale in the semiconductor industry and give the end user more robust products.



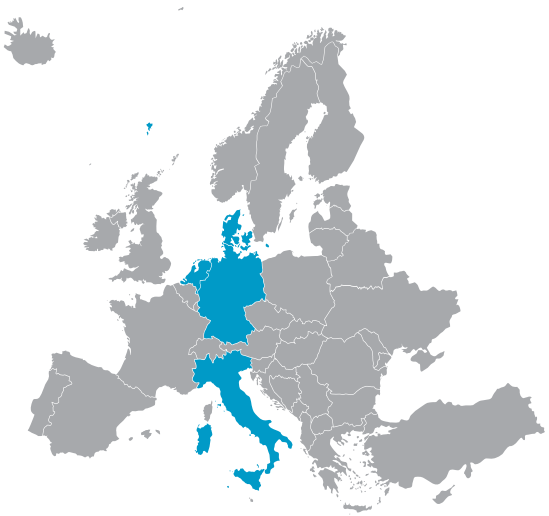


ASAM

100265

Start date:	April 2010
Project duration:	36 months
Total investment:	€5,83 m
Number of participating organisations:	8
Number of countries:	4

ASAM targets a uniform process of automatic architecture synthesis and application mapping for heterogeneous multi-processor embedded systems based on adaptable and extendable ASIPs. It aims to define a new unified design methodology, as well as, related automated synthesis and prototyping tool-chains. The new design environment will allow rapid exploration of the high-level algorithm and architecture design spaces, as well as, an efficient automation of the final system synthesis, and in consequence, quick development of high-quality designs.



INNOVATION AND MARKET IMPACT

The ASAM project will deliver new capabilities to automate the construction of the SoC and processor designs through an advanced design-space exploration. The design-space exploration will involve the combined macro- and micro-architecture exploration necessary for SoCs based on adaptable ASIPs, and will account for the actual constraints of modern SoC design (power, performance and area). Further innovative features are the automatic architecture instantiation or customisation of particular application-tailored processors, as well as, communication and memory structures. The project will also advance the state-of-the-art in application parallelisation, partitioning, scheduling and mapping, needed to facilitate the design-space exploration and to deliver applications running efficiently on the constructed heterogeneous multi-processor platforms.

The new embedded system design technology is relevant for a very broad range of applications (in consumer electronics, multimedia, entertainment, telecom, medical imaging and instrumentation, advanced machinery, military, etc.), and is applicable to several implementation technologies (e.g. SOC or ASIC, structured ASIC, and FPGA). It fulfills the needs of multi-domain and cross-domain applications, and addresses fundamental development challenges for electronic systems of the future. In all these markets application-specific systems play major role. The rapid changes in these markets' requirements and demands of high performance and low energy consumption dictate that solutions need to be programmable, but highly efficient at the same time. The project aims to facilitate this.

CHIRON

100228

Start date:	March 2010
Project duration:	36 months
Total investment:	€ 18,1 m
Number of participating organisations:	26
Number of countries:	8

CHIRON intends to combine state-of-the art technologies and innovative solutions into an integrated framework for effective and person-centric health management throughout the complete (health)care cycle thus responding to the present-day demographic and socio-economic challenges facing healthcare: from an ever ageing population suffering from chronic and cardiovascular diseases and various handicaps to the need for affordable 'global' healthcare provided by fewer and fewer professionals and medical infrastructures for critical, often mobile, patients.

INNOVATION AND MARKET IMPACT

An effective response to these challenges requires a shift from 'health care' (how to treat patients) to 'health management' (how to keep people healthy). This project will exploit the enormous potential of ICT to realise radical change in healthcare by developing an overall, integrated system architecture to produce a 'continuum of care' i.e. or an integrated health management approach in which health is patient-centric both in the home, the hospital and nomadic environments.

The reference architecture will ensure interoperability between heterogeneous devices and services, reliable and secure patient data management and a seamless integration with the clinical workflow. This person-centric approach puts the needs of the citizens, the medical professionals and the whole community at the core of the design while a knowledge-based system integrates patient and community related data in a large, distributed repository that is secure, easily interpretable and accessible by authorised persons. Proactive computing will see embedded systems that anticipate the needs of people and are self-adapting, thereby enriching the quality of life and fostering patient empowerment.

Personalised solutions for an evolving patient profile will include all the relevant health aspects of the user and a constantly updated personalised risk assessment model based on the patient's medical history. Personalisation will also feature in a coaching system to help the patient to reduce immediate risk and improve long-term recovery. Finally the project will develop new advanced tools to facilitate real-time processing, computer-aided analysis and accurate visualisation of medical images.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Present day healthcare is under pressure: demographic and socio-economic challenges from a ageing population and a constant rise in the numbers of people suffering from chronic and cardiovascular diseases and various handicaps to the need for affordable 'global' healthcare provided by fewer and fewer professionals and medical infrastructures that can respond to the demands of critical, often mobile, patients.

CHIRON, an ARTEMIS Joint Undertaking project, intends to combine state-of-the art technologies and innovative solutions into an integrated framework for effective and person-centric health management throughout the complete (health)care cycle.

FROM TREATMENT TO PREVENTION

An effective response to these challenges requires major changes in the delivery and management of care, with a shift from 'health care' to 'health management'. In other words, from 'how to treat patients' to 'how to keep people healthy'. The CHIRON project involves 26 partners (large corporates, SMEs, universities, research centres and two hospitals) from eight different countries. Its aim is to exploit the enormous potential of ICT to realise radical change in healthcare by developing an overall, integrated system architecture to produce a 'continuum of care' or an integrated health management approach in which health is patient-centric both in the home, the hospital and nomadic environments.

The reference architecture will ensure interoperability between heterogeneous devices and services, reliable and secure patient data management and a seamless integration with the clinical workflow. This person-centric approach puts the needs of the citizens, the medical professionals and the whole community at the core of the design while a knowledge-based system that integrates past and current patient data and community related statistical data in a large, distributed repository that is secure, easily interpretable and accessible by authorised persons. Finally, proactive computing will see embedded systems that anticipate the needs of people and are self-adapting, thereby enriching the quality of life and fostering patient empowerment.

PERSONALISATION

In line with its objectives CHIRON intends to develop a number of personalised solutions such as the continuous multi-parametric monitoring of physiological and psycho-emotional state, environmental parameters, patient activity and lifestyle related factors. Furthermore, an evolving patient profile will include all the relevant health aspects of the user and a personalised risk assessment model based on the medical history of the patient will be constantly updated. Personalisation will also be contained in a coaching system to help the patient to reduce immediate risk and improve long-term recovery. New, advanced tools will facilitate real-time processing, computer-aided analysis and accurate visualisation of medical images.

IMPLEMENTATION

The CHIRON project will specify these new solutions, implement them with a focus on issues such as data security, privacy, trust and information, validation of the research results along with the technical and clinical assessment of the proposed solutions as well as the socio-economic impact.

Article was published in:
ARTEMIS Magazine
August 2010 NO.7

Written by:
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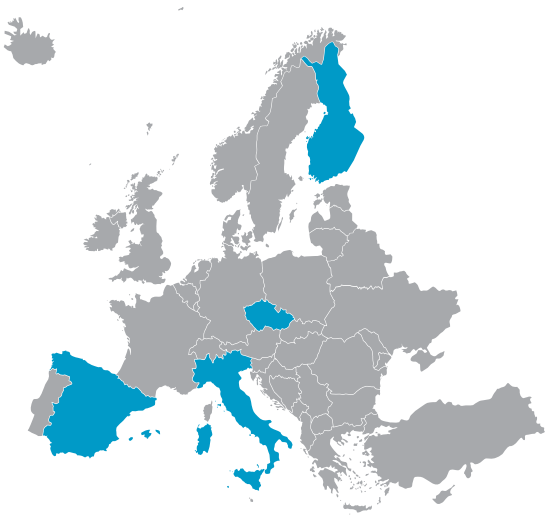
eSONIA

100223

Start date:	January 2010
Project duration:	36 months
Total investment:	€12,1 m
Number of participating organisations:	15
Number of countries:	4



eSONIA aims to enable greater predictability of plant behaviour and visibility, reduced safety risks, enhanced security and improved cost efficiency by realising the asset-aware and self-recovering plant. This will be achieved through pervasive, heterogeneous (wireline and wireless) IPv6-based embedded devices with on-board specialised services, glued together by middleware and capitalising on the service oriented approach.

INNOVATION AND MARKET IMPACT

In Europe, manufacturing represents approximately 22% of GDP while some 75% of GDP and 70% of employment are related to manufacturing. Maintenance costs can represent between 15% and 60% of production cost. However, today, plant operating conditions cannot be comprehensively monitored, since there is no infrastructure for holistic and continuous measurement and visualisation of relevant information. This lack of insight prevents efficient decision-making in real time, reducing efficiency and increasing maintenance costs and safety risks.

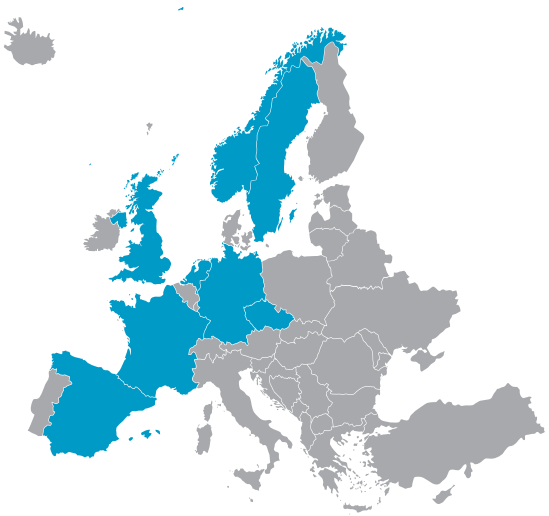
eSONIA aims to develop tools for the 3D visualisation of operations on the factory floor with an In-plant (indoor and outdoor) geo-location system for real-time asset management and a service management system for enhanced manufacturing control along with reference models and tools to implement a services oriented architecture in a factory environment. These will be complemented by a set of processes running on embedded devices and offered to the outside world as Web Services to support (asset) health assessment, prognostics, maintenance scheduling (i.e. the best mix of cyclic, condition-based and predictive maintenance).

All of this will give industry support for the continuous monitoring, diagnostics, prognostics and control of assets, regardless of their physical location. The data gathered allow efficient automatic maintenance schedules and improved operator dispatch and repair performance.

iFEST

100203

Start date:	April 2010
Project duration:	36 months
Total investment:	€15,8 m
Number of participating organisations:	20
Number of countries:	8



iFEST will specify and develop an integration framework for establishing and maintaining tool chains for the engineering of complex industrial embedded systems with specific emphasis on open tool chains for HW/SW co-design of heterogeneous and multi-core solutions, and life cycle support for an expected operational life time of several decades. iFEST will promote the standardisation of project results to encourage industrial uptake, aligned with the ARTEMISIA Working Groups on standardisation and tool platforms.

INNOVATION AND MARKET IMPACT

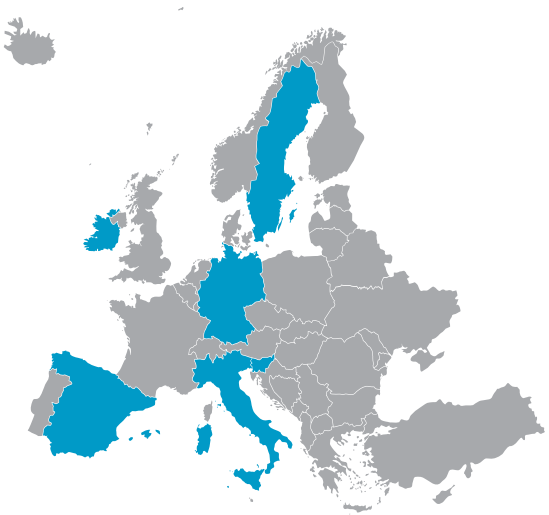
iFEST results will demonstrate a potential reduction by 20% of both time-to-market and engineering lifecycle costs, including the cost of poor quality. It will enable engineers to explore the architectural design space at a high level of abstraction, select a cost-effective design, and from the abstract models produce, semi-automatically, the hardware and software implementations in a cost effective balance. A major innovation in this respect is the targeted integration of tools from the world of model-driven engineering with traditional HW/SW co-design tools.

Several iFEST industrial case studies will validate the integration framework and two tool chains, for control and streaming applications will be created. The integration framework will permit tools to be readily replaced within the tool chain, thereby dealing with issues such as tool obsolescence and tool lock-in. It will effect a shift in the industry from a low efficiency of tool usage to innovative products and services that can be designed much more efficiently due to well-functioning tool chains. Having a greatly improved design capacity will create new markets and redefine existing ones for industrial embedded systems.

ME³Gas

100266

Start date:	April 2010
Project duration:	12 months
Total investment:	€ 15,7 m
Number of participating organisations:	17
Number of countries:	6



The goal of ME³Gas is to address reduction in energy usage and the CO2 footprint in domestic and commercial buildings by enabling consumers to gain control of their appliances and effortlessly optimise energy-efficient usage without compromising on either comfort or convenience.

INNOVATION AND MARKET IMPACT

The use of embedded intelligence is what makes energy smart, and is the heart of energy-efficient technologies. ME³Gas will make use of the service-oriented middleware for embedded systems being developed in the Hydra project and use its huge potential to create services and applications across heterogeneous devices, to develop an energy-aware middleware platform. In order to have commercial and residential relevance, ME³Gas must be used to save energy in real-world applications.

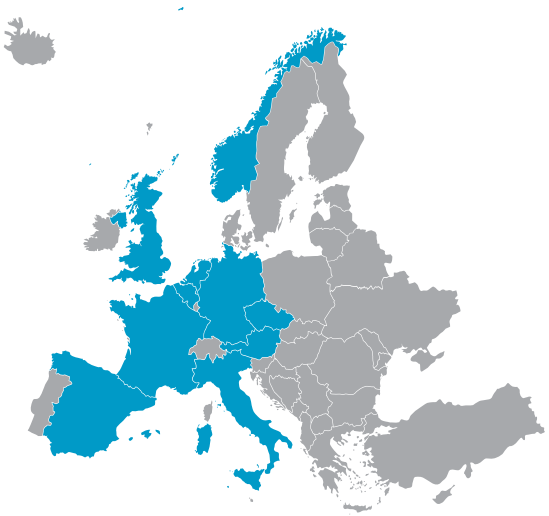
To demonstrate this, ME³Gas includes the critical step of retrofit installation of the developed hardware and GUI platforms into real applications. In this context, ME³Gas will develop a new generation of smart gas meters, based on embedded electronics, communications and the remote management of a shut-off valve, which will offer a whole range of intelligent features: management of multiple tariffs and payment modalities, remote gas cut off, security alarms, etc.

ME³Gas will also contribute to the standardisation work being carried out currently in Europe in the smart metering field (under the M/441 mandate of the EC mainly). The work will propose a standard for a European Gas Metering Infrastructure, which can be a part of a multi-utility platform to be made within the project.

POLLUX

100205

Start date:	March 2010
Project duration:	36 months
Total investment:	€33,3 m
Number of participating organisations:	35
Number of countries:	10



POLLUX is a unique platform to develop a distributed real-time embedded systems platform for next generation electric vehicles (EVs). The benefits of clustering knowledge and innovation through vertical integration and horizontal cooperation between OEMs and suppliers will be evident in significant energy savings and enhanced drive experience combined with more safety and comfort as well as less vehicle complexity.

INNOVATION AND MARKET IMPACT

The multidisciplinarity of the POLLUX consortium will enable the flexible and evolvable interoperation of systems and the deployment of advanced vehicle and powertrain management algorithms and strategies. Architectures for embedded systems networking will be tailored for specific EV issues and needs and for enhanced features in terms of reliability, dependability, maintainability, security and durability. Safety-critical and harsh environment domains requiring novel safety and security schemes will be addressed as a first priority while new approaches to standardisation, certification and qualification will be fostered to accommodate the new embedded system technologies for EVs.

Next generation EVs will become mechatronic systems comprising a multitude of plug-and-play and self-configurable peripherals (i.e., multifunctional embedded systems). Sensing, actuation, signal processing and computing devices will be embedded in the e-motors, power converters, energy storage and grid connection devices, on-board PV panels/range extenders. The chassis and powertrain control systems will form the 'basal brain' and 'autonomic nervous system' of the car automating lower-level tasks during vehicle use and enabling future 'cortex' functionalities (e.g. auto pilot) through novel human-machine interfaces.

The spin-offs for society include primary energy saving, lower cost and, in view of the growing shortage of strategic raw materials (i.e. lightweight metals, copper, rare earths), more sustainable production.

POLLUX

POLLUX is a consortium of 35 partners from 10 different European countries. Each partner has developed state-of-art embedded systems technology in automotive and other sectors and eleven partners are part of the ENIAC E3Car project. The multidisciplinarity of the consortium with its clustering of knowledge and innovation gives POLLUX a unique platform to develop a distributed real-time embedded systems platform for next generation electric vehicles (EVs).

Article was published in:
ARTEMIS Magazine
August 2010 NO.7

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The vertical integration and horizontal cooperation between OEMs and suppliers (of hardware, software and silicon) is a focal area in building a solid, embedded-systems European industry and establishing standard designs and distributed real-time embedded-systems platforms for EVs.

KEY AIMS

POLLUX addresses the reference designs and embedded systems architectures for high efficiency, innovative mechatronic systems for electric vehicles, aiming at the creation of a common architecture and design platform for advanced multi-core hardware and middleware solutions. This will enable the flexible and evolvable interoperation of systems (including sensors, actuators, energy storage and conversion devices, information systems and control systems across multiple domains) plus the deployment of advanced vehicle and powertrain management algorithms and strategies.

Architectures for embedded systems networking will be tailored for specific EV issues and needs (i.e electromagnetic compatibility, protection from low-frequency magnetic fields) and for enhanced features in terms of reliability, dependability, maintainability, security and durability. Safety critical and harsh environment domains requiring novel safety and security schemes will be addressed as a first priority. Finally, new approaches to standardisation, certification and qualification will be fostered to accommodate the new embedded system technologies for EVs.

NEXT GENERATION EVS: THE CAR BRAIN

Next generation EVs will show a first level of convergence between computer and automotive architectures: future cars will be mechatronic systems comprising a multitude of plug-and-play and self-configurable peripherals (i.e. multifunctional embedded systems). Future car architectures will be based on distributed energy and propulsion systems adopting radically new control concepts (multi-power, smart differential, e-ABS). Sensing, actuation, signal processing and computing devices will be embedded in the e-motors, power converters, energy storage and grid connection devices, on-board PV panels/ range extenders. The chassis and powertrain control systems will form the 'basal brain' and 'autonomic nervous system' of the car that automating lower-level tasks during vehicle use (driver assistance, terrain evaluation, proactive energy management) thus enabling future 'cortex' functionalities (e.g. auto pilot) by means of novel human-machine interfaces.

POLLUX makes use of synergy with the ENIAC E3Car project that focuses on developing power nanoelectronics technologies, devices, circuits and modules for EVs in preparation for the launch of a massive European EV market by 2015-2020.

The new electric vehicle architectures based on distributed embedded computing and electronics system will allow significant energy saving and enhanced drive experience combined with more safety and comfort as well as less overall vehicle complexity. The spin-offs for society include primary energy saving, lower cost and, in view of the growing shortage of strategic raw materials (i.e. lightweight metals, copper, rare earths), more sustainable production.

p.S.HI.E.L.D.

100204

Start date:	March 2010
Project duration:	12 months
Total investment:	€5,4 m
Number of participating organisations:	18
Number of countries:	6

p.S.HI.E.L.D. (embedded Systems arcHItecturE for multi-Layer Dependable solutions) approaches embedded system Security, Privacy and Dependability (SPD) in the pervasive computing environment to protect people, data and infrastructures against threats. This project is a pilot version that will be a pioneering investigation to be enhanced with R&D activities proposed in the future ARTEMIS Calls.

INNOVATION AND MARKET IMPACT

p.S.HI.E.L.D. aims to address SPD in the context of embedded systems (ESs) as 'built in' rather than as 'add-on' functionalities, proposing and perceiving the first step toward SPD certification for future ES. It will ultimately provide built-in SPD via a reference architecture that allows flexibility and composability of enhanced SPD technologies acting at every level. Driven by ad-hoc new metrics, defined and harmonised within the project, a significant advantage can be achieved for the SPD certification of the embedded systems. By integrating SPD solutions at node, network and overlay level, it will be possible to create a layered and composable reference infrastructure based on a set of innovative security concepts, technologies and specific metrics.

The leading concept is to demonstrate composability of SPD technologies. Starting from current SPD solutions in ESs, the project will develop new technologies and consolidate the available ones in a solid foundation that will become the reference for a new generation of 'SPDready' ESs. The composability of the p.S.HI.E.L.D. architectural framework will have great impact on system design cost and time-to-market of new SPD solutions. At the same time, the integrated use of SPD metrics will have an impact on the qualification, (re-) certification and (re-)validation process, making them faster, easier and more widely accepted. Selected scenarios, such as railway transportation and health service provision, will be used to drive requirements and to validate the provided framework, keeping in account the requirements and solution in the SPD fields emanating from other ARTEMIS funded projects.


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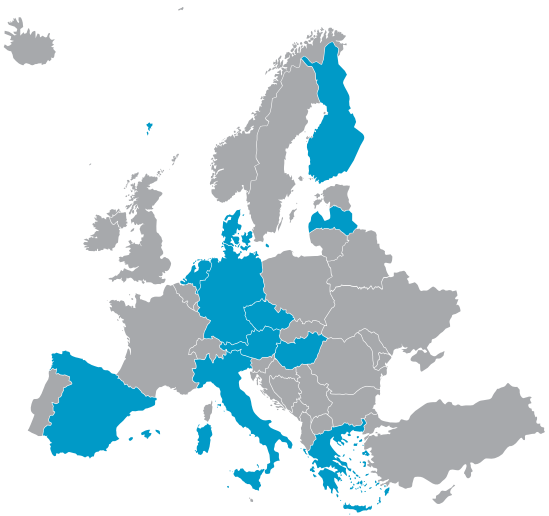
R3-COP

100233

Start date:	March 2010
Project duration:	36 months
Total investment:	€18,3 m
Number of participating organisations:	30
Number of countries:	11

R3-COP, or Resilient Reasoning Robotic Cooperative Systems, will provide European industry with new leading-edge methodology and technologies that will enable the production of advanced robust and safe cognitive, reasoning autonomous and co-operative robotic systems at reduced cost in terms of time and money. It will not only establish an environment for the design and development of such systems, but also include techniques for assessing and validating their safety and robustness, as well as develop a high-performance and fault-tolerant processing platform. These systems will be able to reason, learn and cooperate in different application domains such as surveillance (indoor, land, air, sea) and rescue, agriculture (field and greenhouse), people care, home environments and transport.

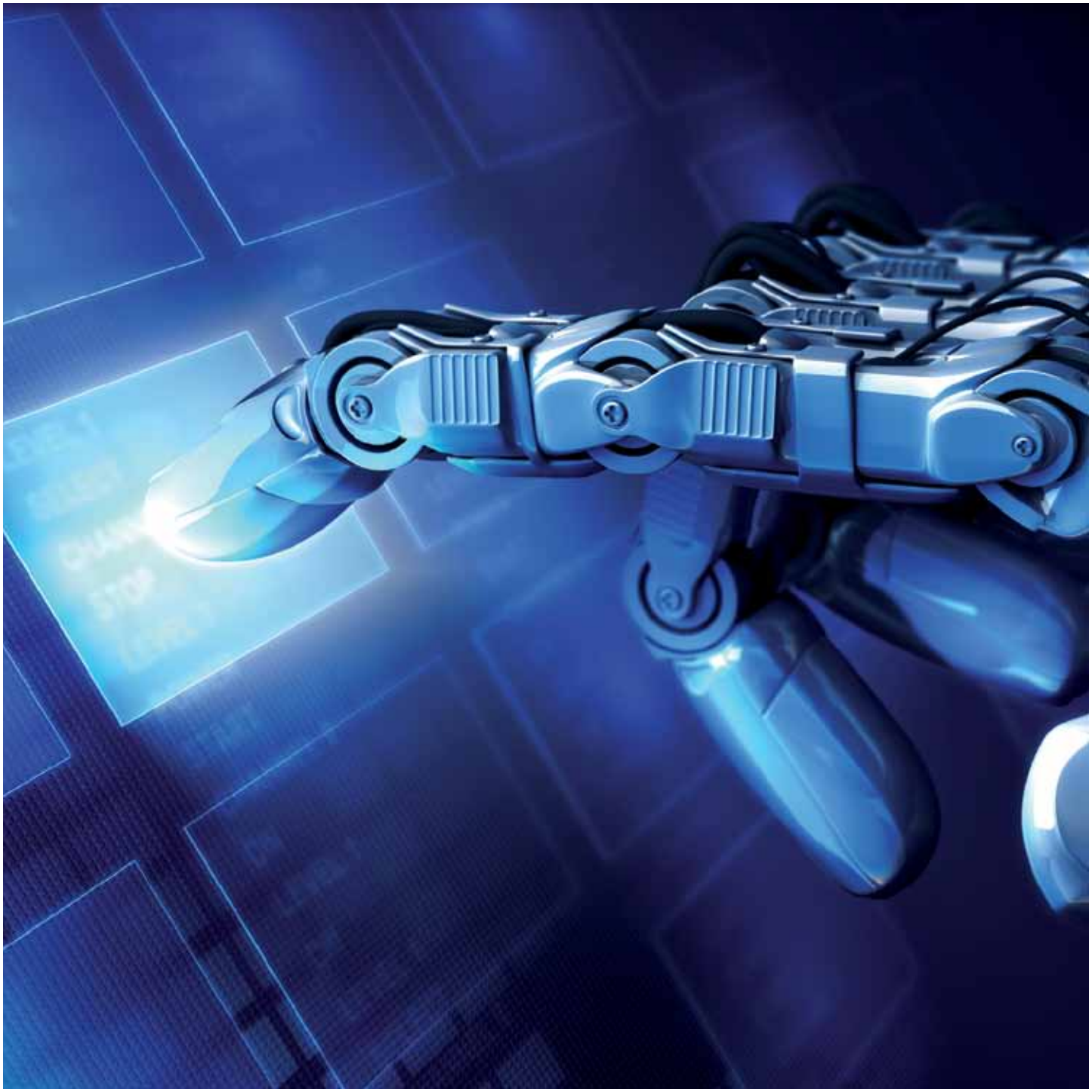


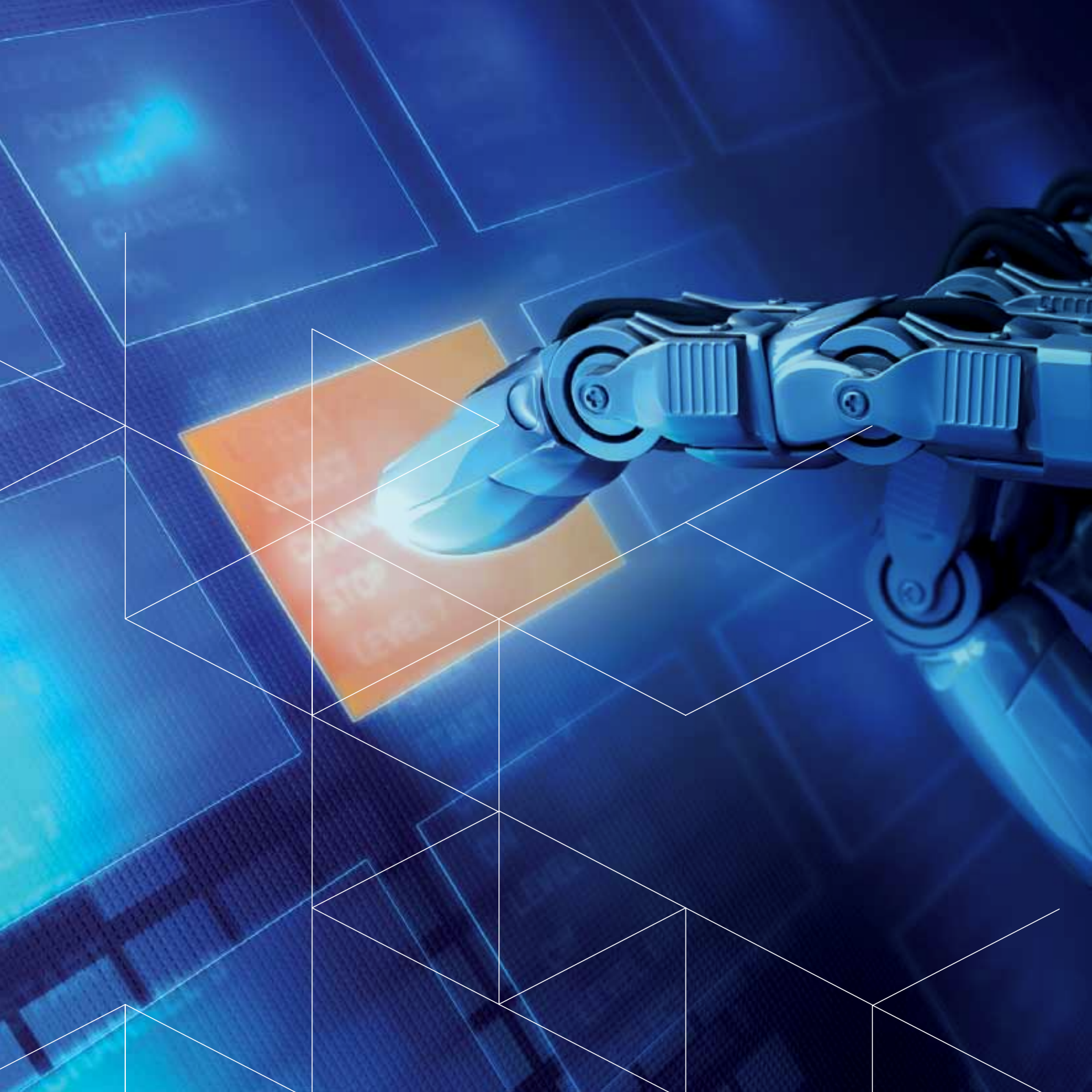
INNOVATION AND MARKET IMPACT

Safe and robust autonomous systems will be one of the key tangible manifestations of embedded systems simply because the application domains are so diverse, from rescue to entertainment. However, while current diversity make it unrealistic to expect such systems to be economically feasible (except in manufacturing, where robots are used already on an industrial scale), such systems increasingly share space, and even cooperate closely, with humans, so an urgent need exists to assert and guarantee their dependability, especially in terms of safety and robustness.

To develop a methodology-based framework for the efficient and economic development of safe, robust, sustainable (mobile, cooperating) autonomous systems, a reference architecture will be developed along with means for tailoring it for specific applications. This architecture will be substantiated in a number of domain-specific platforms and demonstrators. The development of new methods to thoroughly test cooperative, learning, autonomous systems with complex sensors such as vision will serve as a foundation for future certification.

R3-COPwill advance the technology of autonomous systems by developing a fault-tolerant high-performance processing platform, based on a multi-core architecture, as well as innovative system components for the robust perception of the environment including sensor fusion, and for reasoning and reliable action control. The expected outcome is an industry-level computing environment and platform for resilient autonomous systems targeting various application domains, including highly safety-critical such as aerospace and automotive.






R3-COP

R3-COP, or Resilient Reasoning Robotic Cooperative Systems, will establish an environment for design and development of resilient autonomous co-operating systems with the goal to facilitate faster, more cost-effective development of new safe robotic and autonomous systems applications.

Essentially the project, which involves 30 partners from eleven countries, aims to overcome fragmentation of the robotic sector by creating a cross-domain platform of methods and tools for the design, development and validation of resilient and usable real world autonomous systems. These systems will be able to reason, learn and cooperate in different application domains such as surveillance (indoor, land, air, sea) and rescue, agriculture (field and greenhouse), people care, home environments and transport.

DEPENDABILITY

Safe and robust autonomous systems will be one of the key tangible manifestations of embedded systems in mid-term future, simply because the application domains are so diverse, from rescue to entertainment. However, with the variety of approaches and platforms that exist today, it is unrealistic to expect such systems to be economically feasible (except in the manufacturing domain, where robots are used already on an industrial scale). At the same time, as such systems increasingly

share space, and even closely cooperate, with humans, there is an urgent need to provide every possible means and measures to assert and guarantee their dependability, especially in terms of safety and robustness.

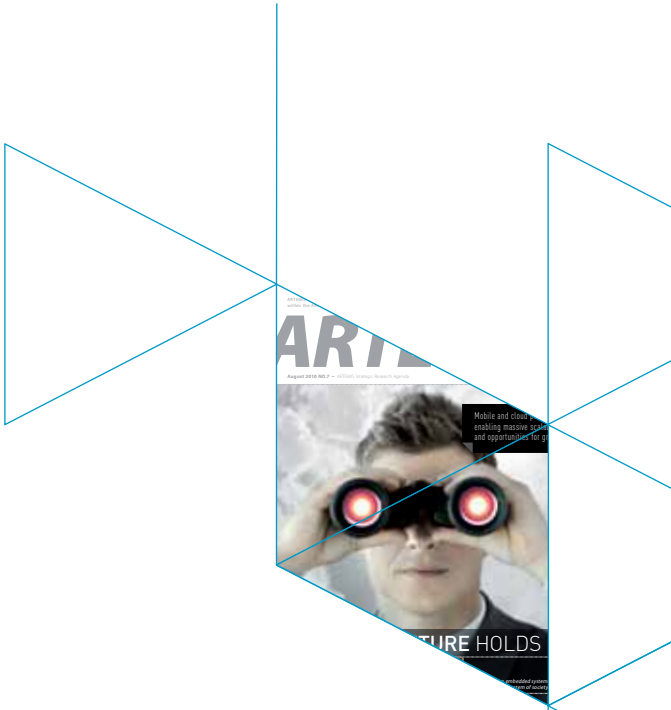
To develop a methodology-based framework for the efficient and economic development of safe, robust, sustainable (mobile, cooperating) autonomous systems, a reference architecture will be developed along with means for tailoring it for specific applications. This architecture will be substantiated in a number of domain-specific platforms and demonstrators.

The development of new methods to thoroughly test cooperative, learning, autonomous systems with complex sensors such as vision will serve as a foundation for future certification of such systems. Research will target resilient cooperation models and protocols, robust computer navigation and vision algorithms, semantic reasoning methods, methods and tools for efficient testing and validating of dependable adaptive autonomous systems with learning and reasoning abilities.

TWIN FOCUS

R3-COP will advance autonomous systems in two directions: technology and methodology. In terms of technology, R3-COP will develop a fault-tolerant high-performance processing platform, based on a multi-core architecture, as well as innovative system components for robust perception of the environment including sensor fusion, and for reasoning and reliable action control. In addition, a methodology-based design and development framework will enable the economic realisation of dedicated solutions while a tool platform will allow for cautious application of the design methodology, including new test strategies and tools. The outcomes will be applied in a series of demonstrators from ground-based (industrial and domestic), airborne and underwater domains.

The expected outcome is an industry-level computing environment and platform for resilient autonomous systems targeting various application domains. Within ARTEMIS, R3-COP is the first project addressing robotic autonomous systems.



Article was published in:
ARTEMIS Magazine
August 2010 NO.7

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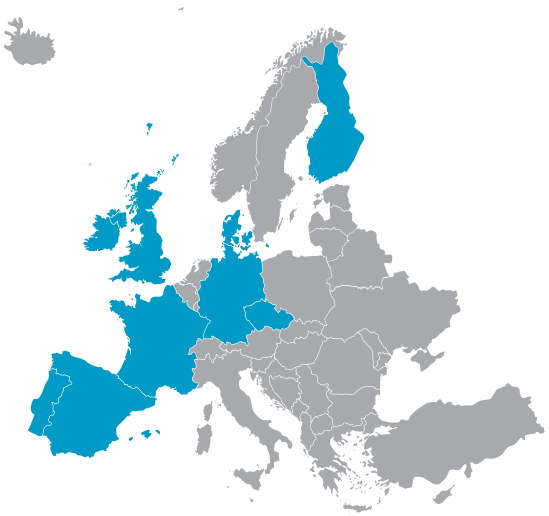
RECOMP

100202

Start date:	April 2010
Project duration:	36 months
Total investment:	€25,8 m
Number of participating organisations:	41
Number of countries:	9



The aim of RECOMP (Reduced Certification Costs for Trusted Multi-core Platforms) is to define a European standard reference technology, supported by the European tool vendors participating in RECOMP. It will establish methods, tools and platforms for enabling cost-efficient (re-)certification of safety-critical and mixed-criticality systems in the application domains automotive, aerospace and industrial control systems as well as elevators and transportation systems.

INNOVATION AND MARKET IMPACT

The increasing demand for processing power poses new challenges for the design of modern embedded systems. The adoption of multi-core processors seems to be a promising approach to tackle these challenges and to achieve further performance improvements combined with a reduction of energy consumption. Multi-core architectures are well known from the domain of desktop computing but using these architectures in safety-critical applications requires them to be certified according to domain specific safety-standards. Corresponding certification processes have been developed and established for the area of single-cores only, without taking the issue of multi-cores into account until now.

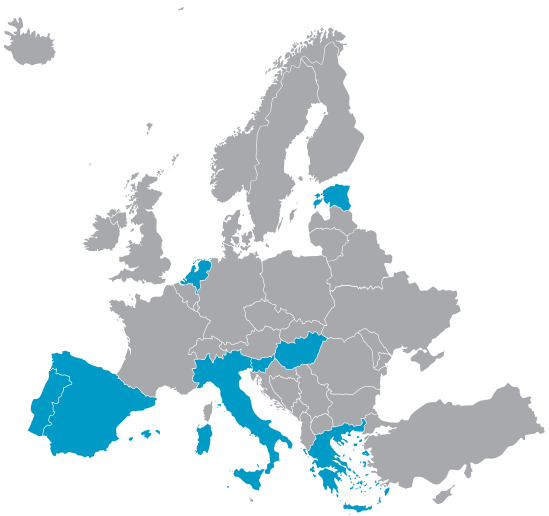
An optimal solution for the field of multi-cores would be provided by a modular certification process, which would save both costs and time due to the reuse of previously certified components. RECOMP addresses the need for flexibility and upgradability of both the non-safety and safety-critical critical part by developing reference designs and exemplary platform architectures for a large variety of domains. Another focus is tool support for achieving cost-effective certification and re-certification. In this context mathematical principles will be developed to enable the formal analysis of multi-core system with virtualisation support. In cooperation with tool vendors and certification authorities these methods will be integrated into tools chains and certification processes. Formal certification will guarantee the safety and dependability of systems.

SIMPLE

100261

Start date:	September 2010
Project duration:	36 months
Total investment:	€ 7,43 m
Number of participating organisations:	13
Number of countries:	8

The main goal of SIMPLE is to research and deliver an intelligent, self-organising embedded middleware platform, designed for the integration of manufacturing and logistics. SIMPLE will address the self-organisation and cooperation of wireless sensors and smart tags for federated, open and trusted use in the manufacturing, logistics applications and domestic use. SIMPLE will prototype, test and validate the technologies using three test-beds under normal operation; a complete manufacturing plant solution, a complete logistics supply chain and a domestic case.



INNOVATION AND MARKET IMPACT

The deployment of Wireless Sensor Networks (WSN) in 'smart factories', logistics and domestic applications is already a fact and has attracted the interest of the research community and the electronics development giants worldwide. Before their wide exploitation however, WSNs have to solve some significant problems, including simple installation, simple adaptation, simple integration, simple maintenance and simple utilization.

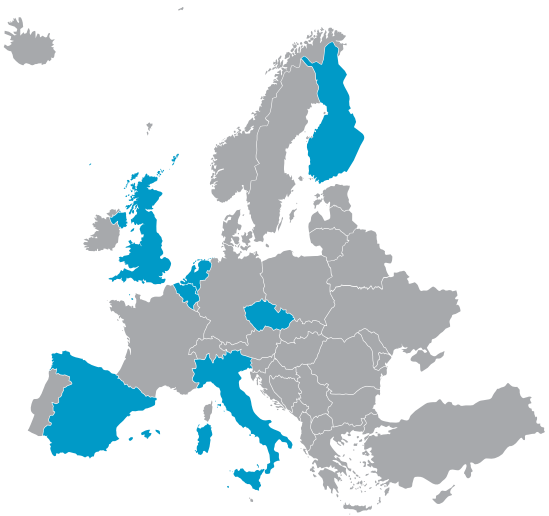
The primary idea is to enable the dynamic inter-working of ultra heterogeneous sensors and tags, which should autonomously be organised in hierarchies, thus leveraging the development of a new class of secure, scalable, cost-effective, and easy-to-deploy 'smart factory' logistics and domestic applications. The SIMPLE outcomes aim at compensating the current lack of solutions capable of monitoring the state of shipments at different grouping levels and, more generally, of tracing goods along the whole supply chain (manufacturing, logistics, consumption).

Wireless Sensor Networks (WSNs) have been identified as one of the most important technologies for the 21st century and, according to current market projections, more than half a billion nodes will have been shipped for wireless sensor applications by 2010. On the other hand, the evolving 'Internet of Things', considered as the global network infrastructure, linking physical and virtual objects through the exploitation of data capture and communication capabilities, raises the already high hopes of WSN even more.

SMARCOS

100249

Start date:	January 2010
Project duration:	36 months
Total investment:	€13,5 m
Number of participating organisations:	17
Number of countries:	7



SMARCOS helps users of interconnected embedded systems by enabling devices and services to communicate in UI level terms and symbols, exchange context information, user actions, and semantic data. It allows applications to follow the user's actions, predict needs and react appropriately to unexpected actions.

INNOVATION AND MARKET IMPACT

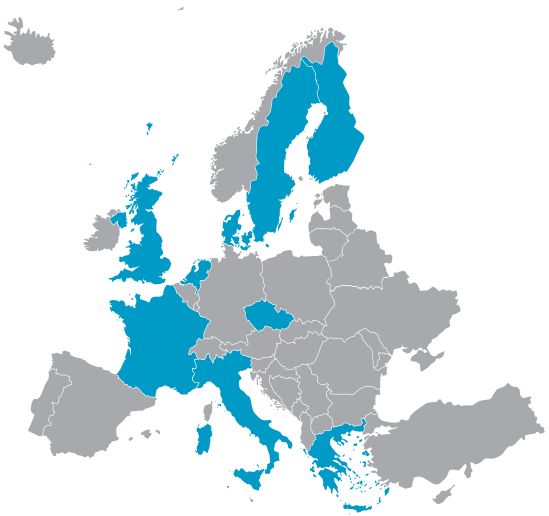
With many products today connecting with web services (media players, refrigerators, e-books, even cars), distributed computing is becoming the norm in embedded systems. However, connection problems, firmware incompatibilities, incomprehensible dialogue boxes and just plain bugs plague much of the present crop of commercially available solutions. New challenges are also emerging for user interaction. Existing efforts towards interoperability (e.g. ARTEMIS project SOFIA) have largely focused on architectures. SMARCOS extends these efforts at user level..

The main objective of SMARCOS is to attain such an inter-usability via interconnected embedded systems in response to user interaction requirements in respect of multiple platforms, multi-user applications, internet synchronisation, and application and service adaptation to changing situational contexts. Personal embedded devices, which expose a number of services, can be combined to form interoperable device ecosystems that offer joint services. SMARCOS will facilitate the interusability of such jointly created services. This will be demonstrated through several pilots that implement the use cases, including one large trial at a major public event (2012 London Olympics) and several smaller prototypes during the term of the project.

SMECY

100230

Start date:	February 2010
Project duration:	36 months
Total investment:	€ 20,5 m
Number of participating organisations:	30
Number of countries:	9



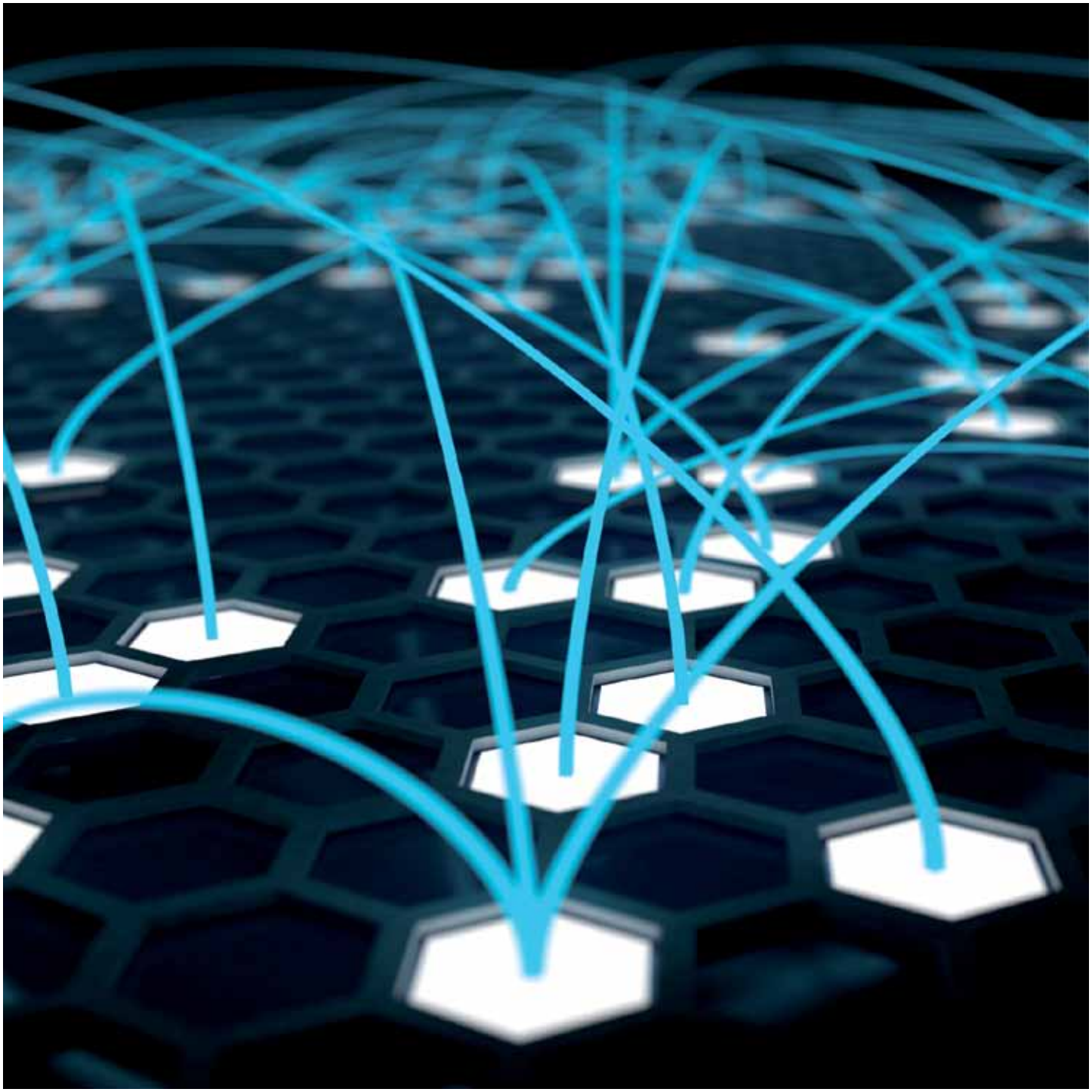
SMECY aims to launch an ambitious European initiative to match those initiatives in Asia (e.g. teams funded by JST/CREST programmes) and the USA (e.g. PARLAB in Berkeley, Parallel@ illinois and Pervasive Parallelism Laboratory in Stanford) and so enable Europe to become the leader in multi-core technology by developing new programming technologies enabling the exploitation of many (hundreds of) core architectures.
The conceptual approach of the SMECY project is based on the statement that to be efficient the front-end / back-end should take into account the application requirements as well as the platform specificities of various embedded systems in different industries.

INNOVATION AND MARKET IMPACT

The recent emergence of multi-core technologies will rapidly develop to massively parallel computing environments whose improved performance, energy and cost characteristics will extensively penetrate the embedded system industry within a few years. This will affect and shape the whole business landscape in which semiconductor vendors, for instance, will need to be capable of offering advanced multi-core platforms to diverse application sectors,

Intellectual Property (IP) providers need to re-target existing and develop new solutions to be compatible with evolving multi-core platforms and the need of embedded system houses, in addition to product architecture adaptations and renewing their system, architecture, software and hardware development processes.

Multicore technologies are of strategic value in winning market share in all areas of embedded systems. Given the need to extend coverage of embedded systems, SMECY lays the focus on targeting programming multicore architecture for consumer electronics with efficient resources management, with the ultimate aim of enabling Europe to catch up with, and even overtake, Asia and the USA in this field.



Conclusions

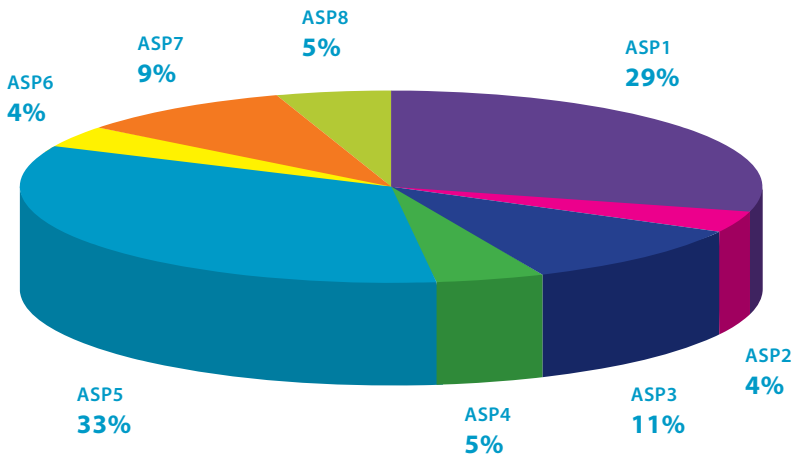
So there you have them. 25 projects working on the ARTEMIS technical programme, funded by the unique ARTEMIS funding model. This is the first time that such coordination between the private sector – itself comprising large enterprises, SMEs, universities and research institutes – the funding authorities of some 22 participating countries and the European Commission has been achieved. It will be a while yet before the impact of these projects will become visible, but – as you can see – the potential contribution to European competitiveness and innovation capability is certainly there.

It is interesting to take a 'helicopter view' of what these projects are contributing to the ARTEMIS programme as a whole. The following charts give a snapshot view of the total ARTEMIS programme, after its first two Calls.

COVERAGE ARTEMIS SUB PROGRAMMES (ASP)

Using the 'Eligible Cost' of each project is a good item to use as a measure – it represents the investment that the ARTEMIS community (which includes all participating countries and the European Commission) is putting into the programme.

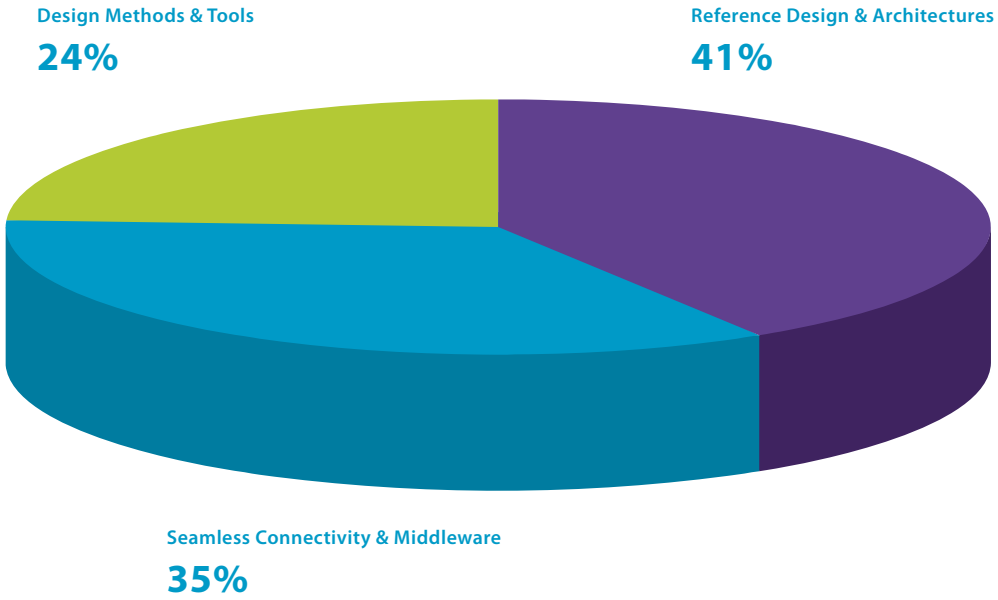
Coverage of Industrial Research Priorities, by Eligible Costs



ASP1: *Methods and processes for safety-relevant embedded systems*
ASP2: *Healthcare systems*
ASP3: *Smart environments*
ASP4: *Efficient manufacturing and logistics*
ASP5: *Computing environments for embedded systems*
ASP6: *Inter-networked ES for Security and Critical Infrastructures Protection*
ASP7: *Embedded technology for sustainable urban life*
ASP8: *Human-centred design of embedded systems*

That the ARTEMIS community is investing heavily in the safety critical aspects of embedded systems is natural. After all, they are increasingly used in areas that can directly impact the safety of the users (all of us). Also, the investment in the underlying architectures and the development tools needed to use them (ASP5) is a natural consequence. The remaining ASPs have a stronger application focus, and it is the goal of the ARTEMIS programme management group to encourage a higher participation in these areas in the future, to bring the balance from 60:40 more towards 50:50.

Coverage of transversal Research Domains
(representing industrial priorities)



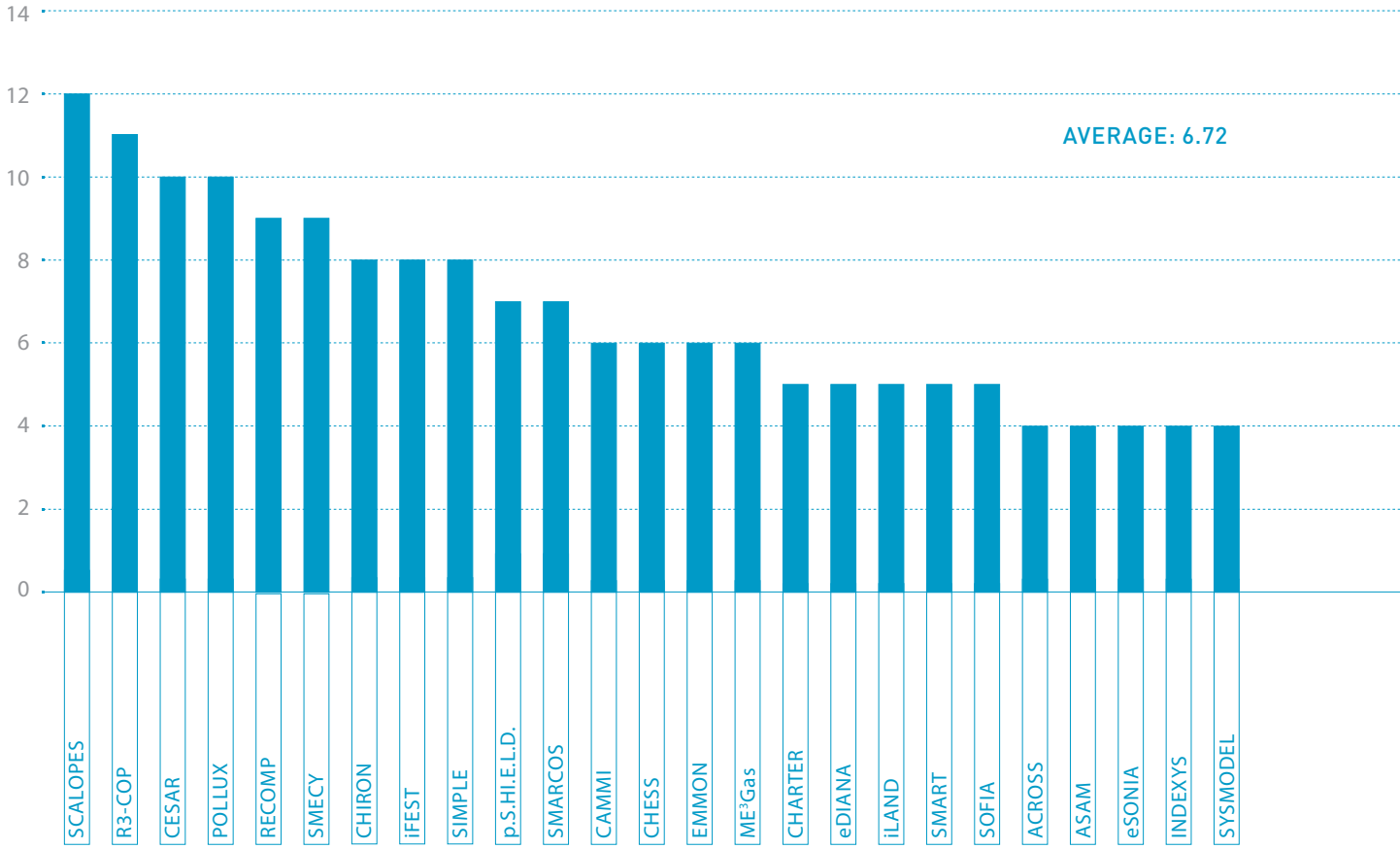
COUNTRIES PER PROJECT

With an average of close to 7 countries involved in each ARTEMIS project, the programme is successfully broadening the European perspective of embedded systems research (other funding instruments typically average around 3, though this is the strict minimum for an ARTEMIS project). This minimum has not yet been used – the smallest coverage is 4 countries.

The following chart simply give an idea of the scale of the ARTEMIS projects. With an average of 21 partners investing 16 M€ per project, the programme is certainly moving towards larger, high impact projects.

Alun Foster
Programme Manager ARTEMIS Joint Undertaking

Number of Countries per project



Editorial Information

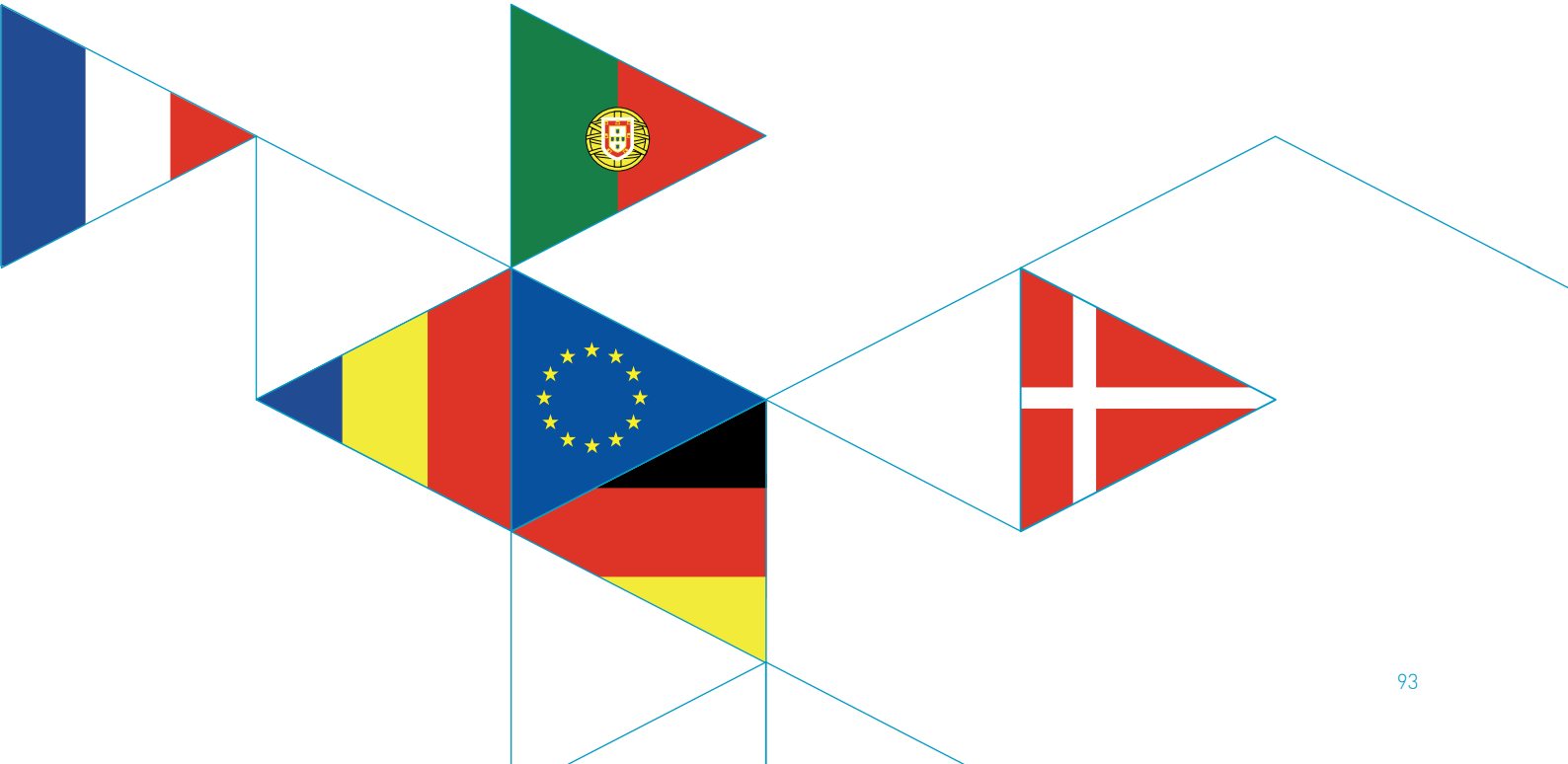
ABOUT ARTEMIS

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 (22 countries)
> ARTEMIS Industry Association (a non-profit association with 200+ members)

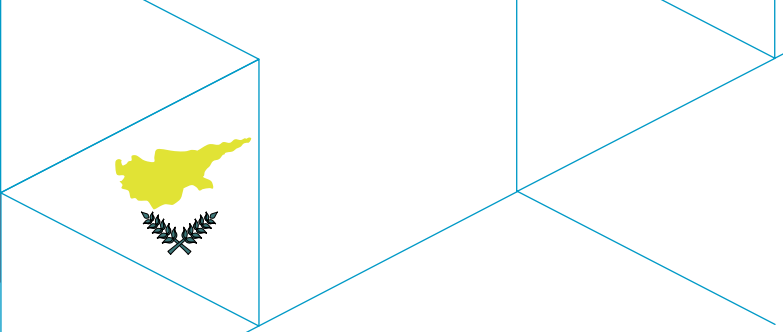


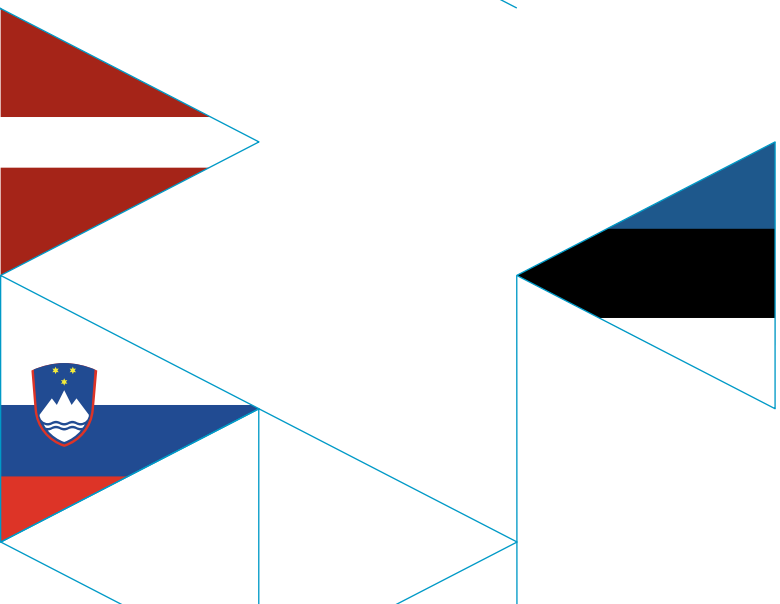
ARTEMIS aims to tackle the research and structural challenges faced by European industry by defining and implementing a coherent research agenda for embedded computing systems. Its ambition is to help European industry consolidate and reinforce its world leadership in embedded computing technologies.

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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With special thanks to Eric Schutz and Klaus Grimm for their enthusiastic support.

Graphic design and layout
Studio Kraft – Veldhoven, the Netherlands

Editing
CPLS – Goirle, the Netherlands

Printed and bound in the Netherlands by:
Verhagen Grafische Media – Veldhoven, the Netherlands

First edition, September 2010
www.artemis.eu

Projects are made possible by funding from the ARTEMIS Joint Undertaking


ARTEMIS