



# eDIANA

*Embedded Systems for Energy Efficient Buildings*



## **EXECUTIVE** *summary*

eDIANA addresses the need to achieve energy efficiency in buildings through innovative solutions based on embedded systems. The eDIANA approach is to achieve greater efficiency in use of resources, prioritising energy as a scarce resource, more flexibility in the provision of resources and better situation awareness for the citizen and for service and infrastructure owners.

## **CONTRIBUTION** *to SRA*

eDIANA will address specific challenges in the three ARTEMIS Industrial Priorities:

- > Reference designs and architectures: focus on composability, by tackling the integration of a cross-sector solution, composing systems of systems from multiple domains and from various vendors and service providers. The composability challenge will search for meet-in-the middle and modularisation techniques for system and software components and concerted investigation of reuse and abstraction principles for the composition of embedded technologies at both cell and macro-cell levels.
- > Seamless connectivity and middleware: focus on cross domain connectivity and communication capabilities, working on the interoperability of highly distributed devices. With a very long life-time, measured in decades, with connectivity and communication capabilities to legacy systems and to future systems whose characteristics are not yet fully known. The cross-domain

challenges like efficient user interaction, ontologies, conflict resolution, robustness and support for diagnosis, are key to the envisioned eDIANA Platform.

- > System design methods and tools: focus on system level model-based tools and design processes, through the consideration of the growth and evolvability of the platform, providing model-based tools and development processes. Aim is to ease the conception, development, validation and integration of new devices and services. The model-based design and engineering challenge will work on the model-based design flow optimisation and model-based validation & verification flow optimisation while improving requirements engineering practices by applying product line methods.

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

The technology to be developed in eDIANA will improve energy efficiency and optimise buildings energy consumption of 25%, providing real-time measurement, integration and control. Moreover, comfort will be improved, making the user aware and enabling user-controlled policies for household devices (lighting, domestic electronics, etc.). Such progress beyond the state of the art will enable the building to become an 'active macroCell' in the energy network, connected to similar macroCells in a district or urban area.

## RELEVANCE & CONTRIBUTIONS to Call 2008 Objectives

eDIANA is located within the 'Private Spaces' application context within Sub-programme 7. 'Embedded technology for sustainable urban life':

- > To enable sustainable urban life through rationalisation in the use of resources while increasing comfort and security in urban environments by means of embedded intelligence and integration technology, improving energy efficiency and optimising overall energy consumption, production and storage in a building by measuring and controlling in real time, improving comfort, making user aware and enable user-controlled policies for household devices such as lighting, domestic electronics, etc.
- > To achieve greater efficiency in use of resources, more flexibility in the provision of resources and better situation awareness for the citizen and for service and infrastructure owners, through the deployment and inter-operation of embedded systems throughout the environment. eDIANA delivers tools and means to increase awareness for rational use of energy; interoperation and cross-functional interoperation of embedded control systems which will lead to higher energy efficiency.
- > To improve energy efficiency in residential and non-residential buildings as a first priority, while efficiency in the management of other resources in more extensive urban and sub-urban areas will be addressed in subsequent years. An eDIANA real-scale demonstrator will be implemented in four pilots covering residential and office buildings in different climate areas, focusing on the use and exploitation of embedded systems for energy efficiency.

## R&D INNOVATION and technical excellence

eDIANA's main goal is improved energy efficiency in buildings through the use of embedded devices. While such systems exist today, their effectiveness is often limited by a lack of interoperability, leading to fragmentation and limited overall impact. This project is a strongly application-oriented initiative. The focus is on the conceptualisation, design, development, demonstration and validation of new devices operating in a uniform platform called eDIANA. This platform is based on cells (living/working units), being part of MacroCells (buildings), that will be interconnected in a more complex network at district or urban area. The eDIANA Platform is an ambitious initiative that will integrate intelligent embedded devices, installed in buildings to improve energy efficiency and optimise overall energy consumption, production and storage.

The eDIANA Platform is a reference model-based architecture, implemented through an open middleware including specifications, design methods, tools, standards, and procedures for platform validation and verification. The eDIANA Platform will enable the interoperability of heterogeneous devices at the cell and MacroCell levels, and it will provide the hook to connect the building as a node in the producer/consumer electrical grid.

Thus, eDIANA will provide a reference architecture for a network of composable, interoperable and layered embedded systems that will be instantiated to several physical architectures. The eDIANA Platform realisations will then cope with a variable set of location and building specific constraints, related to parameters such as climate, Cell/MacroCell configuration (one to many, one to one, etc), energy regulations etc.

## PROJECT partners



[www.artemis.eu](http://www.artemis.eu)



### PROJECT COORDINATOR

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### START

February 2009

### DURATION

36 months

### TOTAL INVESTMENT

€17.3 M

### PARTICIPATING ORGANISATIONS

20

### NUMBER OF COUNTRIES

5