CALL 2009

Project profile

END

Models, solutions, methods and tools for energy-aware design

Energy efficiency is one of the most critical aspects of today's information society. Reducing the energy consumption of electronic devices, circuits and systems as well as improving energy generation, conversion, storage and management capabilities are the main challenges that engineers and scientists have to face in the next decade. The ENIAC JU project END targets the development of innovative energy-aware design solutions and electronic design automation technologies for the next generation of nanoelectronics circuits and systems, and related energy generation, conversion and management systems.

Sub Programme

- Design Methods and Tools for Nanoelectronics

Advances in electronics have made it possible to increase the intelligence of energy generation, conversion and distribution. The result is a new era of smart power grids, smart energy consumption metering and monitoring, and smart energy conversion.

'Smart' in these contexts implies awareness of environmental conditions, coupled with the capability to adapt system behaviour without direct and continuous human intervention. As an example, photovoltaic (PV) solar energy conversion can benefit greatly from adaptation of panel-operating points to solar irradiation. This ensures maximum energy transfer from the solar panels to the electric plants under a wide variety of environmental conditions.

Clearly, the cost of intelligence must be much lower than the advantages it brings in terms of increased efficiency, responsiveness and robustness. This implies non-trivial design choices and tradeoffs, which can be explored only with adequate design automation.

For instance, maximum power point tracking (MPPT) solutions are justified only when they result in an increase in energy collected by a PV panel exceeding significantly the energy consumed in monitoring solar irradiation and computing the optimal operating point. Quantitatively determining if an MPPT solution has a positive energy balance requires accurate modelling not only of the PV panel but also of the energy-conversion and mixed-signal circuits that monitor power transfer and compute the optimal panel operating point.

Going green

The ultimate intention of END is to bring innovative energy-aware design solutions and electronic design automation (EDA) technologies into the product-development processes of the industrial partners of the consortium. This will enable the design and manufacture of the electronic circuits that will be at the basis of the green information society of the future.

However, minimising the energy consumption of electronic devices and circuits themselves is only a partial objective which might not coincide with the ultimate goal of increasing the energy efficiency of systems in which electronics play the role of critical enabler.

These complex systems generally include energy conversion and storage subsystems where a marginal increase in efficiency may be more than sufficient to justify a power budget to operate the electronic devices that make it possible. In the past, these subsystems were designed in isolation and interfaced as commercial-off-the-shelf components.

Pursuing energy efficiency

The ENIAC JU project will pursue the energy-efficiency objective by combining research in modelling, design and EDA technologies with strategic application drivers which will serve both for requirement setting and concept demonstration.

A distinguishing feature of the technology research and development approach followed within END is that, under a common design platform, it unifies the development of modelling, simulation, design and EDA techniques for devices and systems of different nature and purpose – such as digital blocks, analogue/radio frequency blocks and discrete components – as well as the conception and experimentation of new power supply systems, with particular emphasis on energy-management aspects.

A synergistic approach

This encourages a synergistic approach to energy-aware design, offering a comprehensive set of solutions covering the many different facets of the complex problem of accounting for energy effects during the design of heterogeneous circuits and systems, such as those that will be used to implement future electronic products.

The strategic application drivers will address domains in which energy efficiency is essential, such as solar-energy and wireless systems. Each of the application drivers will provide the specifications for the modelling and design activities, the requirements for the design methods and tools, the test cases for validation of models, design solutions and, where applicable, EDA tools and system and/or silicon demonstrators.

Full exploitability

The development of new design tools and methodologies is necessary for European industry to be able to deliver the value-added devices using both the 'more Moore' sector involving the continued miniaturisation of traditional digital circuitry and the 'more than Moore' sector with the addition of new and non-digital functions.

END will make a substantial contribution to the development of new modelling, design and EDA capabilities to ensure full exploitability of future generations of nanoelectronics technologies with ultra-low-energy operation.

Design Methods and Tools for Nanoelectronics

Partners:

- Acondicionamiento Terrassense
- Centre Suisse d'Electronique et de Microtechnique
- Centro Nacional de Microelectrónica-CSIC
- Centro Ricerche Fiat
- ETH Lab, Eurotech Group
- inAccess Networks
- INTRACOM TELECOM
- Italian University NanoElectronics Team
- Numonyx
- NXP Semiconductors
- ON Semiconductor Belgium
- ON Semiconductor Slovakia
- Politecnico di Torino
- Slovak University of Technology in Bratislava
- STMicroelectronics
- University of Bologna, Alma Mater Studiorum
- University of Catania
- University of Patras
- University of Salerno

Project co-ordinator:

- Salvatore Rinaudo, STMicroelectronics

Key project dates:

- Start: April 2010
- Finish: March 2013

Countries involved:

- Belgium
- Germany
- Greece
- Italy
- Slovak Republic
- Spain
- Switzerland

Total budget:

- €13.1 million

The ENIAC Joint Undertaking, set up in February 2008, co-ordinates European nanoelectronics research activities through competitive calls for proposals. It takes public-private partnerships to the next level, bringing together the ENIAC member states, the European Commission and AENEAS, the association of R&D actors in this field, to foster growth and reinforce sustainable European competitiveness.

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