

Artemis JU and Eniac JU Projects with Czech Participation

The ARTEMIS Joint Undertaking is a funding scheme for international industry-oriented projects with the involvement of EU, ARTEMIS member states represented by the national funding authorities (NFAs) and industry. Industry (Small and Large companies, research labs and universities) is represented in the ARTEMIS JU by its industrial association ARTEMIS-IA. ARTEMIS projects cover areas such as: Critical Systems Engineering Factories, Health Care Systems, Seamless Communications & Interoperability-Smart Environment (the neural system of society); Production and Energy System Automation; computing platforms for embedded systems; „Intelligent-Built“ environment and urban infrastructure for sustainable and „friendly“ cities.

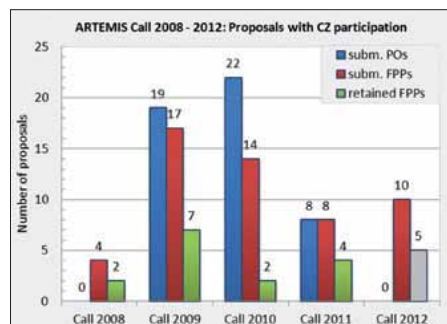
The ENIAC Joint Undertaking coordinates European nano-electronics research activities through competitive calls for proposals. It takes public-private partnerships to the next level, bringing together the ENIAC member states, the European Commission and AENEAS, the association of R&D actors in this field,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

ARTEMIS-IA and AENEAS are two industrial associations representing industry in the Artemis JU and Eniac JU. These associations define annual work programmes with the content of the call for each year. All National Funding Authorities (NFAs) involved in the Artemis and Eniac programs declare indicative budgets for their participants and there is the corresponding funding coming from the EU. The EU funding covers 16,7 % (Artemis) and 15 % (Eniac) of the total eligible cost of projects selected for funding. The national conditions and funding rates are different in each country, but defined and known before each call. The technical selection of projects is managed by the Artemis JU and the Eniac JU office in Brussels. Both offices contract independent experts like in the FP7. The Czech NFA signs national contracts with Czech partners in selected projects and provides national public funding. The EU funding mirrors the certificates for national pre-financing and the national certificates for total eligible and accepted costs of each participant from CZ.

The Czech NFA provides support to Czech participation in both programs. We have participated in the ARTEMIS JU since the start of the program. Funding comes from the part of the budget dedicated to internation-

al cooperation in research and development and especially FP7 cooperation. The Czech NFA funds Czech companies, universities and non-profit research institutes in ARTEMIS and the EUREKA cluster ITEA2. Universities or research institutes get up to 83,3 % funding from the NFA in selected Artemis projects but they must be present in the projects together with industry from the Czech Republic.

The main Czech partners come from Honeywell, the SME companies CAMEA (Brno) and IMA (Prague), the Brno University of Technology (BUT), the Czech technical University in Prague (CTU) and from the Institute of Information Theory and Automation of the Academy of Sciences of the Czech Republic (UTIA).



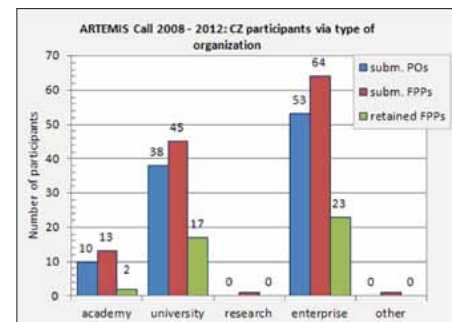
Pic. 1. Artemis Call 2008 - 2012, Proposals with CZ participations

The direct involvement of the Czech NFA in the Artemis JU and Eniac JU has been a success. It has created reasonably stable conditions for Czech participants. It helped them to enter the consortia preparing the project proposals at an early stage. The Czech NFA has been providing national support including the pre-financing for the participants since the start of the program. It is reflected in the substantial presence of Czech partners in the Artemis and Eniac projects.

The number of submitted project outlines, final submitted proposals with Czech presence and the number of funded projects are depicted in Pic. 1. (Artemis JU) and in Pic. 3. (Eniac JU). The presence of Czech companies, universities and the academy institutes is presented in Pic. 2. (Artemis JU) and in Pic. 4. (Eniac JU).

Naturally, there are challenges for the NFA and for the Czech participants as well. The current Artemis and Eniac funding schemes link the Czech NFA, both JU offices and the other NFAs. This creates dependencies which are sometimes not trivial to track and to resolve.

In general, the majority of Czech participants benefit from their presence in the Artemis JU and Eniac JU projects. These participants are often invited to participate also in the FP7 ICT project proposals.



Pic. 2. Artemis Call 2008 - 2012, CZ participants, type of organizations

Contracted Artemis JU Projects with Czech Partners

CAMMI – Cognitive Adaptive Man-Machine Interface (2009-2011)

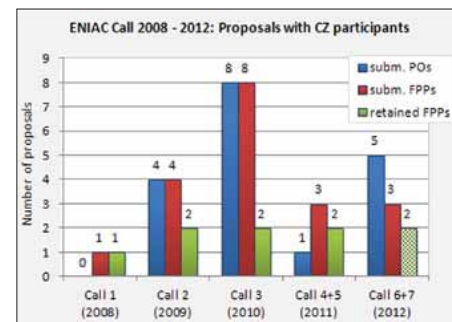
– Honeywell International s. r. o.

A human being in the control loop of a complex system is exposed to physiological, psychological and time stresses that lead to human cognitive decrement, thus diminishing the performance and safety of the overall system. Adaptive cognitive man-machine interfaces and human-centred communication can be taken advantage of to raise operational levels.

SCALOPES – SCALable LOW Power Embedded platformS (2009-2010)

– ASICentrum spol. s r. o.

– Institute of Information Theory and Automation of the ASCR, v. v. i.



Pic. 3. Eniac Call 2008 - 2012, Proposals with CZ participations

The main objective of SCALOPES was to enable an industrially sustainable path for the evolution of low-power, multi-core comput-

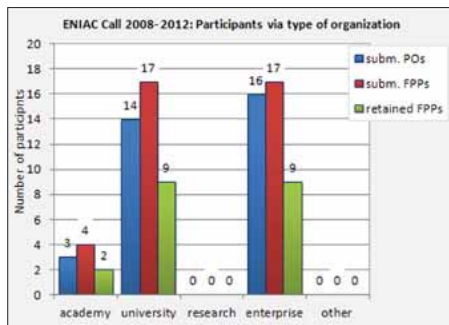
ing platforms for application domains with strategic value for European competitiveness.

eSONIA – Embedded Service Oriented Monitoring, Diagnostics and Control: Towards the Asset-aware and Self-Recovery Factory (2010-2012)

- UNIS, a. s.
 - Brno University of Technology, Faculty of Information Technology
- ESONIA aimed to enable greater predictability of plant behaviour and visibility, reduced safety risks, enhanced security and improved cost efficiency by creating an asset-aware and self-recovering plant. This was achieved through pervasive, heterogeneous (wire-line and wireless) IPv6-based embedded devices with on-board specialised services, glued together by middleware and capitalising on a service oriented approach.

iFEST – industrial Framework for Embedded Systems Tools (2010-2013)

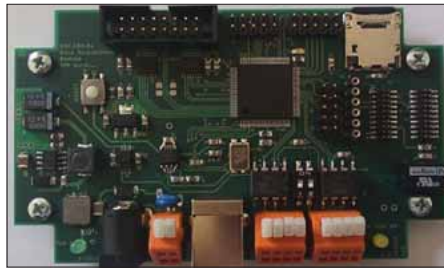
- Masaryk University, Faculty of Informatics
 - Honeywell International s. r. o.
- IFEST specifies and develops an integration framework for establishing and maintaining tool chains for the engineering of complex industrial embedded systems. Specific emphasis is placed on open tool chains for HW/SW co-design of heterogeneous and multi-core solutions, and life cycle support for an expected operational life time of several decades.



Pic. 4. Eniac Call 2008 – 2012, CZ participants, Type of organizations

POLLUX – Process Oriented Electrical Control Units for Electrical Vehicles Developed on a multi-system real-time embedded platform (2010-2013)

- Brno University of Technology, Faculty of Electrical Engineering and Communication
 - Institute of Microelectronic Applications
- POLLUX develops a distributed real time embedded systems platform for next generation electric vehicles, by using a component and programming-based design methodology. The focus will be on composability, networking, security, robustness, diagnosis, maintenance, integrated resource management, evolvability and self-organisation.



Pic. 5. Process Oriented Electrical Control Units for Electrical Vehicles

R3-COP – Resilient Reasoning Robotic Cooperative Systems (2010-2013)

- Brno University of Technology, Faculty of Information Technology
 - CAMEA, spol. s r. o.
- R3-COP, or Resilient Reasoning Robotic Cooperative Systems, addresses robotic autonomous systems to establish an environment to design and develop resilient autonomous cooperating systems aimed at facilitating the faster, more cost-effective development of new, safe robotic and autonomous systems applications in domains such as surveillance and rescue, agriculture, people care, home environments and transport.

RECOMP – Reduced Certification Costs for Trusted Multi-core Platforms (2010-2012)

- SYSGO s. r. o.
- Honeywell International s. r. o.
- Brno University of Technology, Faculty of Information Technology
- CAMEA, spol. s r. o.

RECOMP has established methods, tools and platforms for enabling cost-efficient certification of safety-critical and mixed-criticality systems. Applications addressed are automotive, aerospace, industrial control systems, and lifts and transportation systems.

SMARCOS – Smart Composite Human - Computer Interfaces (2010-2012)

- Honeywell International s. r. o.
- 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.

SMECY – Smart Multicore Embedded Systems (2010-2013)

- Institute of Information Theory and Automation of the ASCR, v. v. i.
- ČIP plus, s. r. o.
- Brno University of Technology, Faculty of Information Technology

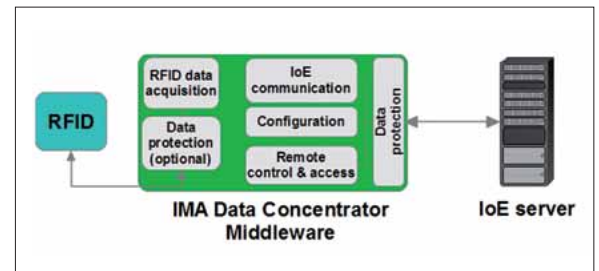
SMECY aims to launch an ambitious European initiative to match those initiatives in Asia and the USA and so enable Europe to become the leader in multi-core technology by developing new programming technologies that enable the exploitation of many (hundreds of) core architectures.

D3CoS – Designing Dynamic Distributed Cooperative Human-Machine Systems (2011-2013)

- Honeywell International s. r. o.
 - Czech Technical University in Prague, Faculty of Electrical Engineering
- Complex human-machine interplay in advanced automated assistance systems for transport modes requires adequate human-machine cooperation with shared authority. The Distributed Cooperative Human-Machine Systems (DCoS) project develops affordable methods, techniques and tools that address the specification, development and evaluation of cooperative systems from a multi-agent perspective, with human and machine agents in charge of common system tasks.

IoE – Internet of Energy for Electric Mobility (2011-2014)

- Brno University of Technology, Faculty of Electrical Engineering and Communication
 - Institute of Microelectronic Applications
- Internet of Energy aims to develop hardware, software and middleware for seamless, secure connectivity and interoperability by connecting the Internet with energy grids to create an electric mobility infrastructure. The project will address reference designs and ES architectures for highly efficient, innovative



Pic. 6. The data concentrator

smart network systems regarding requirements of compatibility, networking, security, robustness diagnosis, maintenance, integrated resource management and self-organization.

CRAFTERS – ConstRAINT and Application driven Framework for Tailoring Embedded Real-time Systems (2012-2015)

- Brno University of Technology, Faculty of Information Technology
 - CAMEA, spol. s r. o.
- CRAFTERS aims to significantly reduce total cost of ownership, time-to-market and the number of development assets by in-

roducing a holistically designed ecosystem through a tightly integrated multi-vendor solution and tool chain that complements existing standards. Feature-limited releases of reference tools will be released and platforms will become available to support the evaluation and adoption of the results.

DEMANES – Design, Monitoring and Operation of Adaptive Networked Embedded Systems (2012-2015)

- Czech Technical University in Prague, Faculty of Electrical Engineering
- Merica s. r. o.

DEMANES aims to provide component-based methods, framework and tools for the development of runtime adaptive systems, enabling them to react to changes in themselves, in their environment and in user needs. The concept, methodology and tools developed in DEMANES will be validated and demonstrated in three application cases: smart urban transport, smart airport and smart home.

SESAMO – Security and Safety Modelling (2012-2015)

- Czech Technical University in Prague, Faculty of Electrical Engineering
- SYSGO s. r. o.
- UniControls a. s.

SESAMO aims to significantly reduce total cost of ownership, time-to-market and the number of development assets by introducing a holistically designed ecosystem through a tightly integrated multi-vendor solution and tool chain that complements existing standards. Feature-limited releases of reference tools will be released and platforms will become available to support the evaluation and adoption of the results.

Contracted Eniac JU Projects with Czech Partners

E3Car – Nanoelectronics for an Energy Efficient Electrical Car (2009-2012)

- Brno University of Technology, Faculty of Electrical Engineering and Communication
 - Institute of Microelectronic Applications
- The current goal of most EU car manufacturers is to produce an entirely electric



Pic. 7. The prototypes of convertors

vehicle that protects the environment from emissions and noise. Power will be derived from batteries that are recharged by connection to the mains, with an alternative on-board solar energy source. The E3Car project addresses the development of highly-efficient electric vehicles, battery control, high-voltage components, architectures and subsystems for electronic control through the development of nanoelectronics circuits and modules for electric cars/vehicles and the demonstration of these modules in a final system.

CSSL – Consumerising Solid State Lighting (2010-2012)

- Czech Technical University in Prague, Faculty of Electrical Engineering
- STMicroelectronics Design and Application s. r. o.



Pic. 8. Set of environmental sensors

Light-emitting diode (LED) lamps are a rapidly-emerging technology for the replacement of incandescent light bulbs that is gaining acceptance as an alternative to the compact fluorescent lamp. Commercial versions are already available, although there is frequently no single LED retrofit product that meets all consumer requirements. The ENIAC JU project CSSL aimed to develop and demonstrate inexpensive smart solid-state light sources through advances in technology and application opportunities. The project also worked vertically across the entire European value chain to achieve substantial cost reductions.

MAS – Nanoelectronics for Mobile Ambient Assisted Living (AAL) Systems (2010-2013)

- Institute of Microelectronic Applications
- Brno University of Technology, Faculty of Electrical Engineering and communication

The ENIAC JU project MAS is developing nanoelectronics components for applica-

tions in the field of health and wellness, and creating a development platform for the design of complete flexible, robust and safe mobile ambient-assisted-living systems. The project covers remote patient supervision using multi-parameter biosensors and telecommunications networks to improve the quality of the clinical environment as well as to encourage home-based therapy. Implementation will require novel nanoelectronics technologies, interfaces, component designs and architectures for a common architectural approach.

Artemos – Agile RF Transceivers and Front-Ends for Future Smart Multi-Standard Communications Applications (2011-2014)

- TESLA, a. s.
- Brno University of Technology, Faculty of Electrical Engineering and Communication

To provide mobile users with multiple services, today’s cell phones simply include additional radio frequency (RF) circuitry for each band. Signal variability and the limitations of current technologies and conventional architectures make an integrated solution impossible. An RF front-end which covers all bands and meets all specifications requires homogeneous or heterogeneous integration of a set of tuneable architectures enabled by innovative technologies. The ENIAC JU project ARTEMOS aims to develop new techniques in simulation and modelling to create a new generation of multi-standard cell phones.



Pic. 9. AirQ concept tested as cloud service

MOTORBRAIN – Nanoelectronics for Electric Vehicle Intelligent Failsafe Power Train (2011-2014)

- Brno University of Technology, Faculty of Electrical Engineering and Communication
 - Institute of Microelectronic Applications
- The design and manufacture of a truly viable electric vehicle has represented a major

challenge for the past several decades. Obtaining a reasonable distance per charge combined with performance to match that of a vehicle with an internal combustion engine has continued to elude the brightest minds in the automotive industry. The ENIAC JU project MotorBrain brings together the skills and experience of European leaders in the automotive component chain with the aim of making a breakthrough in this field. The consortium is made up of specialists in every facet of electric vehicle technology.

DCC+G – DC Components and Grid (2012-2015)

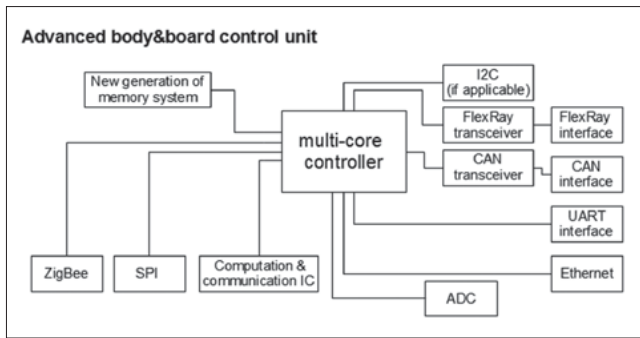
- Brno University of Technology, Faculty of Mechanical Engineering
- Emerson Climate Technologies, s. r. o.

Buildings consume 40 % of Europe’s energy. Over 50 % of consumption in commercial buildings is used for heating, ventilation, air conditioning and lighting. The European Commission has decided that, from 2020, all new construction must consume net-zero-energy. This will only be possible using integrated renewable energy sources. Direct current (DC) grids in buildings can increase efficiency of electricity distribution and equipment by 5 % and boost solar power system efficiency by 7 %. The ENIAC JU project DCC+G is developing energy-efficient, integrated DC energy dis-

tribution based on advanced semiconductor power technologies.

IDEAS – Interactive Power Devices for Efficiency in Automotive with Increased Reliability and Safety (2012-2015)

- Brno University of Technology, Central European Institute of Technology
- Institute of Information Theory and Automation of the ASCR, v. v. i.
- Institute of Microelectronic Applications



Pic. 10. Body&Board Control Unit in modern vehicles

In both conventional and electric vehicles, power supply reliability is a major challenge. Electronic packaging has a substantial impact not only on overall complexity and efficiency but also on safety in the event of a crash and/or fire. The main objective of the ENIAC JU project IDEAS is, therefore, to develop advanced packaging for power-supply components and new generation memory systems for applications in electric and/or internal combustion engine vehicles. The project also covers aspects that have not been

addressed in other ENIAC and ARTEMIS automotive-electronics projects.

Conclusions

We would like to acknowledge that the support work as a contact point for the Artemis, Eniac and FP7 ICT programs is supported by the Ministry of Education and Sports within the framework of the EUROPRO project OKO-ICT and by the FP7 ICT project Idealist2014.

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An Innovative Way to Custom Processor Design

Custom processors such as Application-Specific Instruction-set Processors (ASIPs) and programmable accelerators are the key building blocks of the Systems on Chip (SoCs) that power today’s electronic systems. Custom processors deliver greater computational efficiency than general purpose processors and more flexibility than fixed-function RTL designs. They are the ideal technology to consider for performance and power sensitive design elements in the next-generation of SoCs.

Codasip® Framework

The Codasip® Framework provides an integrated development environment that helps designers create the most suitable ASIP for multiprocessor SoCs for the target application or application domain as quickly as possible. Time savings are accomplished by the automation of tasks that would otherwise be performed manually, e.g. the creation of the to-

olchain or the hardware description and verification.

CodAL Language

For the ASIP description, the architecture description language called CodAL is used. The CodAL language is a hierarchical and highly structured architecture description language that is used to represent processor cores at

a higher level of abstraction. High level of abstraction is the key element for a fast and accurate prototyping of the architecture. The processor core can be described on the instruction-accurate abstraction level in the early design stage. When the instruction-set is stable, the cycle-accurate model of the microarchitecture can be created. In the CodAL architecture description language, the instruction accurate models of x86, ARM, MIPS, VEX and of other processors were created in the past. Many cycle-accurate models were also created.

CodAL’s key feature is the ability to have a golden model of the design in the form of an instruction-accurate model and ensure equivalency with a more complex cycle-accurate model.