ARTEMIS Call 2009 Project
100205

POLLUX

Process oriented electronic control units for electric vehicles developed on a multi-system real-time embedded platform

EXECUTIVE *summary*

POLLUX aims to reduce the development time and cost of the complex, high-reliability mechatronic systems needed for the mass deployment of electric vehicles through the creation of common reference architecture for distributed embedded systems, including real-time middleware and multi-core hardware. This enables the flexible, evolvable and networked interoperation of systems (sensors, actuators, batteries, converters, ECUs) plus the deployment of advanced electric vehicle (EV) and powertrain management algorithms and strategies.

CONTRIBUTION *to SRA*

The primary research objective of POLLUX is to contribute in the development of technical solutions that address the new E/E architecture and extreme complexity of the automotive platform where the electrification is expected to bring in new challenges and opportunities. It will directly address the application scenario 'frugal, safe car', envisioned by the ARTEMIS SRA whose main objectives are contained in reducing power consumption and fatalities, and in improving driver awareness by novel Human Machine Interface (HMI) and Advanced Driver Assistance Systems (ADAS). The value-added-chain benefits from the considerable potential for product differentiation among vehicle manufacturers and, subsequently, a competitive boost to the whole European supply chain (Semiconductors and Embedded Systems, Automotive Tier 2 and 1, OEMs).

MARKET INNOVATION *& impact*

The electrified mobility market (e-bikes, electric scooters, Light EVs, HEVs, and PHEVs) is showing around 40% annual growth worldwide; conservative outlooks estimate that some 10 million EVs will be on EU roads by 2020. The next generation of EVs offers the chance to implement a radical new concept for the control architecture based on the distributed propulsion and the pure electrical power supply and distribution. Based on this paradigm change the European industry is in a position to drive the innovative mobility solutions with the related markets. The impact of POLLUX is seen on the changed supply chains in the automotive industry, in new market entrances and value creation among the production lines. POLLUX contributes to the development of a European standard reference technology platform for electric vehicle design, which contains architectures, models, methods, and tools for real time embedded system development, verification, validation and testing. In this direction, POLLUX addresses the most relevant automotive industry bottlenecks related with the cost of complexity of the electronic architectures.

RELEVANCE & CONTRIBUTIONS *to Call 2009 Objectives*

POLLUX addresses the industrial priority area of reference designs and architectures in order to offer common architectural approaches (standardised and interoperable) for EVs, reducing computational effort, and targeting high levels of reusability, reliability and dependability of systems, thus reducing development time and costs.

In particular the project contributes to the following 2009 call areas:

- Establishment of a common architecture for advanced multi-core hardware and middleware solutions
- Establishment of a multi-domain architecture for integrate able and interoperable sub-systems, with reference design to achieve high energy efficiency

- Development of networked embedded systems addressing safety-critical and harsh environments that require different safety and security schemes
- New approaches to certification and qualification
- Assessment of technologies for intelligent multi-model interactive systems especially in the area of emerging driver assistance systems

The project also contributes to the overarching ARTEMIS targets through:

- Automotive platform simplification thus reducing system design cost and development time by more than 15% with respect to actual costs/time-to-market levels
- Management of electronic system complexity increase by smart system partitioning thus allowing up to 25% less computational effort with enhanced performance
- The reusability of embedded systems by exploiting the experience of a multi-sectorial partnership and the synergies with the ENIAC E3CAR and ARTEMIS IoE projects.

R&D INNOVATION *and technical excellence*

Future vehicle architectures will be based on distributed energy and propulsion systems adopting radically new control concepts (i.e. multi-power, smart differential, e-ABS). Sensing, actuation, signal processing and computing devices will be embedded in the e-motor, power converter, energy storage and grid connection devices as well as the on-board PV panels and the range extender. These architectures will be based on distributed embedded computing and electronics system allowing significant energy saving, with enhanced fun-to-drive, safety and comfort. They will contribute to a radical overall reduction of the complexity of the vehicle in that they will be characterised by a reduced number of control units through the relocation of functionalities into a distributed embedded system network.

The key technological innovations are:

- Development of a platform concept for EV architecture, electronics, communication and embedded systems modelling and simulation.
- Layered EV architecture (electronics, communication, energy management, software) based on ICT models.
- AUTOSAR® compliant parallel computing real-time and secure platform.
- Specify, design, and develop two multicore microcontroller platforms validated for motor controller and battery management modules.
- Implementation of novel circuits for in-vehicle network links (Ethernet validation in EVs, CAN Partial Networking and FlexRay networks).
- X-by-Wire concept for semi-automatic parking assistance for urban EVs.
- Novel HMI concepts and customizable haptic feedback system for electric vehicle steer-by-wire interfaces.

PROJECT *partners*

ON Semiconductor, SINTEF, QinetiQ, City Motion, ZEM, TTTech, UAB Universitat Autònoma de Barcelona, The University Of Sheffield, ceaLeti, AVL, AKKA Technologies, Infineon, Continental, NXP founded by Philips, amu, PSA PEUGEOT CITROËN, FH JOANNEUM Elektronik & Technologiemanagement, GreenPower tech, CNM Centro Nacional de Microelectrónica IMB, AVL, CRF Centro Ricerche Fiat, AIT Austrian Institute of Technology, triphase, aicia, ST, Politecnico di Torino, NXP founded by Philips, FICOSA, virtual vehicle, Infineon, CISC semiconductor

ARTEMIS

www.artemis.eu

POLLUX

PROJECT COORDINATOR
Ovidiu Vermesan

INSTITUTION
SINTEF

EMAIL
info@artemis-pollux.eu

WEBSITE
www.artemis-pollux.eu

START
March 2010

DURATION
43 months

TOTAL INVESTMENT
€33 M

PARTICIPATING ORGANISATIONS
35

NUMBER OF COUNTRIES
10