PROJECT RESULT

Automotive electronics

MEDEA+

A404: Silicon systems for automotive electronics (SSAE)

Cross-industry collaboration speeds development of safer, more reliable cars

Optimised interoperable bus systems for low-cost and high-speed communications between electronic control units in cars have been a key outcome of the MEDEA+ SSAE project. Generic application-specific standard products for the automotive market were also developed and demonstrated for multimedia and telematics applications in future vehicles. The results of this project that reflected continuing market developments during its course will ensure the European microelectronics industry will have an important influence on the definition of future worldwide standards for safer, more reliable cars.

Drivers are demanding ever higher levels of quality, safety, reliability and durability in vehicles. At the same time, car users want greater comfort, more real-time information to make journeys easier and a scale of in-vehicle entertainment not imagined even ten years ago. Electronics play a major role in meeting these needs with new components and architectures seen as essential building blocks for the global automotive industry.

Automotive electronics now account for over 20% of vehicle costs and this is projected to double to 40% by 2010. Applications include: power train and car safety – from engine management to drive by wire; comfort/convenience and vehicle controls; driver assistance – such as night vision, adaptive cruise control and collision warning; and infotainment and communications, including navigation and multimedia.

A major challenge is the different development cycles of the areas involved. The life of a car can be from 10 to 15 years, while the design cycle for new vehicle models is three to five years. This contrasts markedly with the typical 18-month development cycle of the electronics industry. The multiapplication/multidisciplinary nature of the automotive sector, together with these different development cycles, requires agreed architectures to protect the investments of all players. Therefore systems development depends on close vertical cross-industry collaboration.

New car architecture

The MEDEA+ A404 SSAE project set out to define, design and evaluate the core silicon components and services relevant to a new electrical/electronic architecture for cars. This architecture had to integrate new silicon, software and protocol communications technologies as they have developed during the period of the project itself.

SSAE started from the experience of major European car makers PSA Peugeot Citroën and Centro Ricerche Fiat, and the results of the earlier MEDEA Sysnet project. Apart from the two vehicle companies, the consortium included automotive electronic equipment suppliers, chipmakers, a connector producer and hardware/software services suppliers.

Key objectives included the definition and design of low cost components, equipment and associated services using widely shared communication protocol and software standards – particularly that developed in the ITEA EAST-EEA project. The intention was to generalise a series of new safety, comfort and communications functionalities at affordable prices based on multifunction chip modules that can easily be mass-produced for a number of car models.

Work was based on use of fault-tolerant buses

to link and control a variety of central units and multifunction modules such as intelligent switching units (ISUs) for body and comfort functions, telematics (T-box) and multimedia (M-box) as well as other electronic control units (ECUs) and electro-mechanical (mechatronics) modules.

Many achievements

Achievements included:

- Implementation and validation of ARM-oriented application-specific standard products (ASSP) for body and comfort functions in the main ISU;
- Development of several mechatronics modules, including door and seat control units;
- Evaluation of a low cost telematics ASSP and realisation of a T-box prototype, based on an ARM926 core;
- Design of a new modular M-box – full specification and hardware design, with hardware parts mounted and validated;
- Development of intellectual property (IP) and demonstration of interconnection technology based on the Local Interconnection Network (LIN), which is becoming the main standard worldwide; and
- Development and demonstration of a controller area network (CAN) controller and transceiver for high and medium speed networks.

Extensive work was carried out on high speed networks for telematics and multimedia. Such networks are a problem for low segment cars, due to limited availability of low cost devices – consumer electronics have mainly used USB as a wide purpose, low cost solution. Nevertheless, interesting volumes are forecast for multimedia networks in higher segment cars based on the media-oriented systems transport (MOST) and domestic digital bus (D2B) fibre optics standards.

Bluetooth wireless network functionality was demonstrated and validated in the SSAE T-box and M-box. This included ensuring compatibility with AUTOSAR standardisation work as, beside cost and performance, standardisation will be the main driving factor for market acceptance of future telematics products in cars.

Finally, a broad study was carried out on fail-safe networking. Various protocols were investigated but the release of FLEXRAY Version 2 – now seen as the future global solution – was too late for any implementation in an SSAE demonstrator. However, other time-triggered communications protocols that provide inherent fault tolerance were demonstrated. A new MEDEA+ project – A409 SAPECS – is continuing this activity.

Set for the future

SSAE produced concrete results in terms of ASSP components and IP to meet original equipment manufacturer (OEM) needs. A particularly advance was made in the optimisation of components for CAN/LIN solutions.

Overall, the MEDEA+ project met the challenges of optimising embedded electronics, paving the way to cost-effective new functional capabilities. SSAE demonstrated the automotive electronics business model can be streamlined efficiently by sharing business constraints and technical requirements across the value chain. The result is shorter time to market for ASSP products and an excellent match with end-user specifications in terms of cost as well as technical and functional demands.

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