ITEA
INFORMATION TECHNOLOGY FOR EUROPEAN ADVANCEMENT

PROJECT RESULTS

Robust and Open

Component-based software architecture for configurable devices

As the complexity of technology grows and the demand for interoperability increases, there's an ever greater need for fully open middle-ware solutions that can replace the traditional proprietary software that's commonly used in embedded systems today.

Open platform solutions for embedded systems

In order to guarantee reliability, robustness, security, and at an acceptable price, most embedded systems are based on proprietary software. This has slowed down the introduction of new services and caused problems with inter-operability. It has become clear that this way of working can't compete with the network economy model, where each participant can focus on a specific role within a supporting framework. ROBOCOP managed to make a significant step towards opening the market for embedded software in consumer and industrial devices by enabling independent system integrators and third parties to develop system-level components for that market.

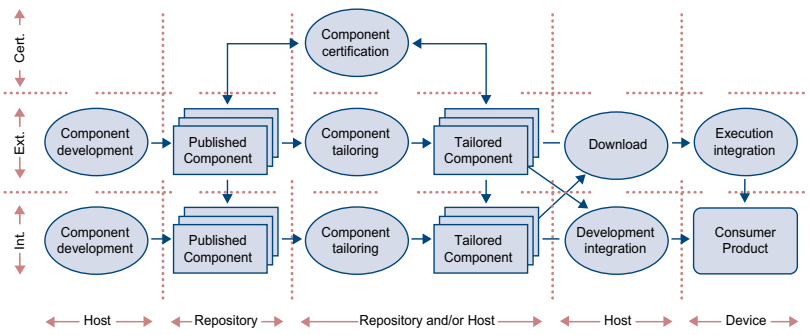
Middleware for high volume embedded appliances

ROBOCOP defined a component-based software architecture for the middleware layer of high-volume embedded appliances. Such appliances include mobile phones, personal digital assistants (PDAs), internet and broadcast terminals (set top boxes), network gateways, digital televisions and programmable logic controllers. The middleware layer is the part of the software stack that sits between the (downloaded) application software on one side, and the operating system and device drivers on the other. ROBOCOP focused on this middleware layer only and didn't address the specifics of the application and/or operating system/services layers.

With this new architecture the project team has solved a number of critical problems, such as enabling software IP exchange and the support of (distributed) development of resource-constrained, robust, reliable and manageable components. The approach followed has its roots in the IC industry's design of Systems-On-Silicon, where it has proved to be quite successful. The intention is to enable the (vendor independent) interchange of software components for the embedded application domain. Different abstraction levels will enable the interchange of components at multiple levels of the system integration process, each with different associated business models.

An open framework

The demands for interoperability and exchangeability of the components within this system required a well-defined framework architecture with open (published and standardised)



Component development and integration

ROBOCOP (ITEA 00001)

Partners
CSEM
Eindhoven University of Technology
ESI
FAGOR Electrodomésticos
IKERLAN-Electrónica
Nokia
Philips
SAIA-Burgess Electronics
Technical University of Madrid
Visual Tools

Countries involved
Finland
The Netherlands
Spain
Switzerland

Start of the project
July 2001

End of the project
June 2003

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interfaces. And as well as having functional characteristics, it also needed to support the management of the extra-functional characteristics of the software components in the hosting framework.

Such a component-based model supports different abstraction levels for the components defined for different purposes. For example, a high abstraction level is made available without charge to enable a product manager to carry out a functional level simulation where only footprint and processor or power demands are utilised within the model. In the case of a system architect, a model that also provides details on real time behaviour or resource usage might be more appropriate and is available under certain conditions (basic fee, non-disclosure agreements, memory of understanding, and the like). The component framework also allows the use of heterogeneous components (coming from different frameworks) and supports robust and reliable operation. Robust relates to the fact that the system will always be able to fulfil a (predefined) minimal set of services even under unexpected/ unpredictable conditions. In this context robustness has two essential aspects: one in respect to operation of the system in relation to its inputs, and the other a consideration of its lifetime, where the ability to carry out remote upgrade and extension is important. Robustness with respect to the input signals requires well-defined resource management with control and monitoring of the components in the system. Robustness during upgrade and or extension requires very well designed components with explicit dependencies. Testability both at module level, and of the integrated system, is of crucial importance if the goal is to be achieved. Being able to test and master the complexity of the system is an essential ingredient for performance in the application domain. Other essentials of a component framework that have been taken into account are the independence from specific implementations, design for reuse, design for debugging at the application level and support for the application of re-configurable computing.

Vendor independent trading of software components

The ROBOCOP approach enables vendor-independent trading of the software components (and associated IPR) used in embedded applications. Different abstraction levels enables the interchange of components at many levels of the system integration process. The project results will give a powerful boost to the global competitiveness of Europe's electronics industry, to system integrators and independent embedded software suppliers.

As early adopters of the technology, the project partners will be able to improve time to market, extend the functionality of their products by using third-party components, and become IP component traders. The project results will also radically improve the market position of software houses – who can concentrate on providing system level components – and open up new business opportunities for small and medium enterprises. The ROBOCOP framework will give them an easy entrance into this market as it de-couples application domain knowledge from the specifics of individual systems.

Major project results:

These can be summarised as follows:

- component framework with well defined interfaces (APIs);
- means to support for the framework operation like component download support and component management support;
- templates for components compliant with the component framework.
- the definition of a number of component views to support the concept of component IP trading;
- a prototype simulation of the component framework and a number of components that can be hosted in the framework that make use of its services.

Major project outcomes

Dissemination

- Several internal papers
- 2 presentations/demos at events

Exploitation

- 4 new products for internal use

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ITEA - Information Technology for European Advancement - is an eight-year strategic pan-European programme for pre-competitive research and development in embedded and distributed software. Our work has major impact on government, academia and business.

ITEA was established in 1999 as a EUREKA strategic cluster programme. We support coordinated national funding submissions, providing the link between those who provide finance, technology and software engineering. We issue annual Calls for Projects, evaluate projects, and help bring research partners together. We are a prominent player in European software development with some 8,000 person-years of R&D invested in the programme so far.

ITEA-labelled projects build crucial middleware and prepare standards, laying the foundations for the next generation of products, systems, appliances and services. Our projects are industry-driven initiatives, involving complementary R&D from at least two companies in two countries. Our programme is open to partners from large industrial companies, small and medium-sized enterprises (SMEs) as well as public research institutes and universities.

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