



PROJECT RESULTS

Collaborative engineering

Technologies for joint embedded-systems development



Companies now rarely work alone to develop embedded products due to tight requirements on time to market and increasing complexity of the systems. If market ambitions are to be achieved and the necessary expertise acquired, together with improvements to efficiency and lead time, embedded systems will need to be developed globally in collaboration with subcontractors, third-party developers and in-house resources. MERLIN addressed the increasing demand to find and discover efficient new ways to support collaborative embedded-systems development. The project developed a set of exploitable solutions for distributed co-partner development in combination with real-life experiences in applying these solutions.

To meet increasing market demand for faster, cheaper and feature-enhanced embedded systems, companies are now involved in many different forms of collaboration while developing such systems. For example, companies that act as product integrators combine products by integrating in-house developed parts with those from external sources. These different options require companies to analyse their development models, make decisions and use best existing systems and software-engineering technologies to build the complex distributed real-time embedded systems (DREs) of tomorrow.

Four project goals
MERLIN set itself a series of goals to:

1. Facilitate effective collaboration for development and evaluation of embedded systems – and work products – developed both in-house and by external partners;
2. Develop exploitable solutions for effective, high-quality, embedded-systems engineering in collaborative situations addressing: development infrastructures, product quality goals, and advanced coding and testing;
3. Ensure deployment of the exploitable solutions in industrial practice by validating the solutions in different types of embedded-software projects, and through the sharing and exchange of knowledge and experience; and
4. Propose new standards and de-facto working methods to deploy the identified and newly adapted technologies in a company's engineering processes.

Collaboration – the key to success
The current market situation and increasing complexity of embedded systems require the industry to engage in various types of collaboration. The trend clearly identified by MERLIN partners is a transition from traditional developer-subcontractor relationships to multi-partner developments, where suppliers have several – competing – integrators as their customers.

MERLIN enhanced and improved embedded-systems and software engineering technologies from a collaborative perspective. Crucial to the project was its approach to developing solutions.

MERLIN (ITEA 03010)



Partners
Delft University of Technology
Ericsson
Incode
LogicaCMG
Lund University
Nokia Siemens Networks
Philips
Solid
Sony Ericsson
University of Oulu
VTT – Technical Research Centre of Finland

Countries involved
Finland
The Netherlands
Sweden

Start of the project
July 2004

End of the project
June 2007



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Its philosophy was that industrial application should be the acceptance criterion for results. It means that industrial trials were at the centre of the project and also played a steering role in all inventory and development tasks. In principle, nothing was developed in MERLIN that would not be applied or tried out in a practical setting. Moreover, nothing has been declared as a solution if it has not proven its usability during a real-life industrial project.

Productivity hit by collaboration

The industrial partners in MERLIN found productivity is often impeded by communications barriers and cultural differences caused by collaborative development. For example:

- Philips experience in embedded-software development indicated productivity drops by a factor of two to three when the number of sites involved increases to two or more;
- Nokia Siemens Networks experience showed communications, transfer of documentation and results, distributed testing and testing environments – to mention just a few – were not yet at the level of sophistication that would increase productivity of collaborative product creation;
- Sony Ericsson experience

indicated productivity was heavily dependent on, for example, management alignment and mutual understanding of requirements. Experience also indicated that one-roof developments normally exhibit much higher productivity compared with multi-site, multi-partner developments.

However, collaboration is inevitable as companies can no longer make increasingly complex and large products alone. One of the project's main results, the MERLIN Handbook, gives practical advice on how to collaborate successfully, thus increasing the efficiency and effectiveness of collaborative networks and improving the quality of the end products.

The MERLIN ToolChain, another main result, addressed data integration directly, and provided a vendor-independent approach to tool integration. This gives companies the possibility to use best-in-class tools instead of a bundled set of same vendor's tools and thus improves the effectiveness of product development. The MERLIN ToolChain also gives more opportunities for small and medium-sized enterprise tool vendors, as their tools offer potentially more options when used together with the MERLIN ToolChain.

Major project outcomes (also available at: www.merlinproject.org)

Exploitation

- MERLIN ToolChain enabling transparency in collaborative embedded-systems development beyond partners' borders by integrating development tools – requirements, configuration management, project management, testing and integration tools – via Eclipse
- Electronic MERLIN Handbook with solutions for common problems in collaborative embedded-systems development
- Nine exploitable solutions validated by industrial case studies and launched with technical descriptions and flyers

Dissemination

- 60 publications and 9 MERLIN White papers presenting a complete overview of tools, methods and industrial practices in collaborative embedded-systems development
- Results of 23 industrial case studies incorporated in the MERLIN Handbook and published through international conference papers and journals
- Many dissemination initiatives such as industrial seminars, workshops, lectures and exhibition stands
- MERLIN Global Software Engineering Forum (www.merlinforum.org) launched to promote active co-operation between partners from industry and research organisations by arranging meetings and delivering newsletters also after the project

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