



PROJECT RESULTS

# Engineering of Software Diversity

## Engineering Software Architectures, Processes and Platforms for System-Families

**Systems are becoming more and more software-intensive. So far, software-engineering technology has focused on creating one system at a time. Now processes, methods, platforms, components and tools need to be significantly improved to support the demand for fully-fledged system families.**

### Domain-specific product architectures

The structuring of systems into families creates strategic business assets that spread development costs and counter the impact of ever-growing complexity, making it possible to sustain a rapid rate of product innovation, while guaranteeing overall system performance and quality. The fundamental concept is a domain-specific product architecture based on a layered set of platforms, supported by software engineering with a focus on pervasive re-use.

viability of this enhanced approach in healthcare, Air Command & Control systems, communication, public utility management, automotive and office equipment support. ESAPS has thus delivered both an enhanced system family approach and a number of domain-specific platforms.

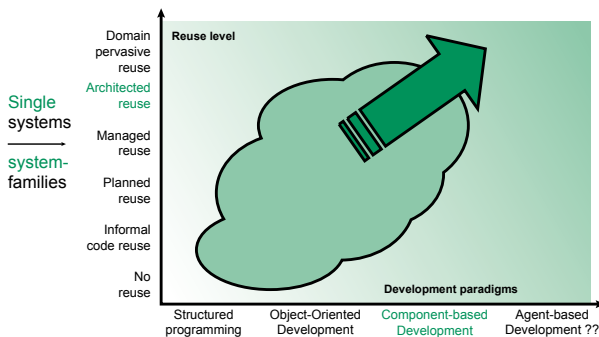
ESAPS solutions make possible a major paradigm shift in existing processes, methods, platforms and tools by moving:

- from state-of-the-art object technology to component technology for complex embedded systems
- from engineering single systems to multiple systems or system families, and by
- making the transition to a higher level of re-use.

### Main results

Companies offering software-intensive systems have to demonstrate clear technology improvements, e.g. with regard to component technology, configurability and standardisation. In addition, time to market has to be reduced and - often - the variety of products has to be increased, in response to rapidly changing requirements. This results in the need to produce numerous variants of software in system families in a relatively short time. In short, we have to plan, design, market, develop and sell diversity. ESAPS has achieved the following in this area:

1. Identification of the essential tasks of system family engineering processes
2. System family methods and tool prototypes for variability management



Moving from single systems to multiple system families

The ESAPS project developed an enhanced system family approach by combining the most promising technologies of the partner companies in analysing, defining and evolving system families. The partners have also validated the

## ESAPS (ITEA 99005)

### Partners

- Alcatel
- Combitech
- ESI
- EESI
- Ericsson
- Fraunhofer IESE
- Helsinki University of Technology
- INRIA
- Ivoriun
- Market Maker
- Nokia
- Philips
- Robert Bosch
- Sainco
- SERC
- Siemens
- Thales
- Unión Fenosa
- University of Essen
- University Karlskrona/Ronneby
- University Politecnica Madrid

### Countries involved

- Finland
- France
- Germany
- The Netherlands
- Spain
- Sweden

### Start of the project

July 1999

### End of the project

June 2001



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3. System family methods for requirements traceability and change management
4. Enhanced component-based domain-specific platforms for system families
5. Requirements for software engineering tool support within family development.

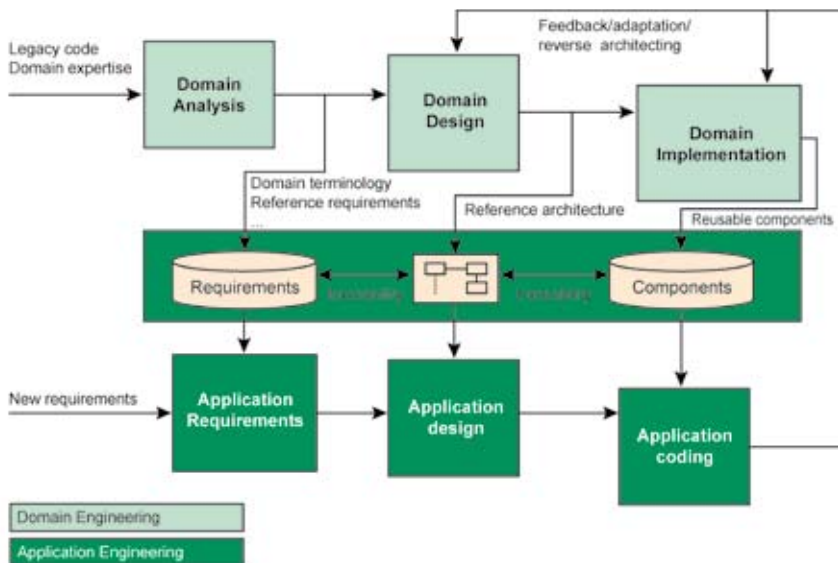
### System families for specific markets

The new approach will create demand for tools and methods, significantly increasing markets for component and middleware providers (mostly SMEs). However, the main impact of ESAPS solutions will be on quality improvement and lead-time reduction. Manufacturers of information-intensive products will be able to bring more high-quality products onto the market in a shorter time.

and intelligent offices.

- **Air Command & Control:** The new technology will facilitate interoperability between both in-house and COTS (commercial off-the-shelf) components, improve quality and simplify maintenance, enabling the development of complex air security systems.
- **Healthcare:** ESAPS results will lead to the development of a wide range of medical imaging equipment. By using standard, reusable components and customised interfaces, this equipment will be interoperable in diverse healthcare infrastructures, enabling the development of fully digital hospitals.
- **Utilities:** Recent studies reveal that current practice for developing control, supervision and management systems for utilities needs to improve (with

more automation, maintainability and customisation for different domain segments and early evaluation of products). System family technology will enable the development of a new generation of systems with high quality, shorter life cycles, a market orientation, customisation of user and control interfaces, and interoperability with third-party subsystems.



The Praise reference process

The markets that will benefit first from system family technology are:

- **Communications:** more affordable reliability and faster rollout of broadband technology will enable the launch of products simultaneously on mobile phones and Personal Digital Assistants (PDAs). By using standard components and interfaces, these devices will be able to interconnect, creating the potential for intelligent homes, virtual homes

ESAPS results are currently being used by project partners such as Nokia (in their supply chains for making mobile phones), Thales (air traffic control), Alcatel (network management), Philips and Siemens (medical systems), Telvent (utilities network management). Effective dissemination to industries across Europe has also been a key focus.

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