



## PROJECT RESULTS

# Trustworthy software secures key applications

### Dependable embedded software will meet future needs

***Trust4All has developed a model to represent trust attributes supported by a middleware software architecture. This approach is specifically targeted at embedded systems that require a (pre-)defined level of trust, due to the nature of the services they provide. The project focuses on the trustworthiness-related aspects of the middleware software architecture in domains such as navigation, monitoring, mobile information, healthcare and office automation, for which dependability is particularly important.***

The amount and importance of software in embedded systems is growing at a very rapid pace, for instance in the automotive, domestic healthcare and domotics or home automation domains amongst others. It is also known

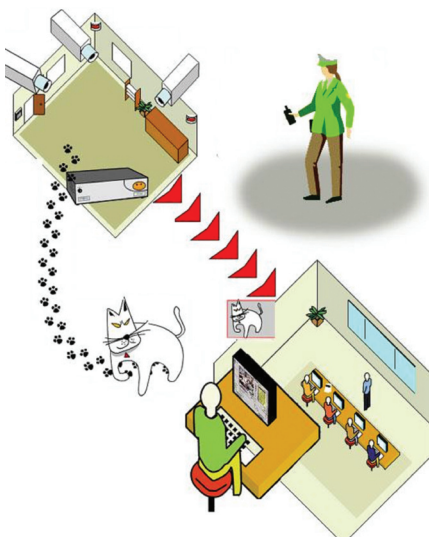
from many cases that embedded software is the main reason for failure of the complete system. The economic value of the related products and/or function and the fact that individuals and societies depend more and more on the correct functioning of these embedded systems are the major reasons behind the Trust4All initiative.

Trust4All is the third project of the Robocop, Space4U and Trust4All trilogy and makes full use of the results of Robocop and Space4U. Robocop introduced a component-based framework for high volume embedded devices with a focus on robust and reliable operation, upgrading and component trading, while Space4U's focus was on the validation, maturity and extension of the Robocop architecture by introducing fault, power and terminal management.

#### Opportunities and threats

Embedded systems are changing from closed and static stand-alone systems to open, dynamic and interconnected systems. This offers great opportunities to enhance usability, but also gives rise to growing threats with respect to the trustworthiness of the software behaviour. Aiming at improved manageability of embedded software poses ever-growing challenges in both technical and logistical areas.

When analysing the envisaged needs of future application domains from the user viewpoint, there is clearly an expectation that such systems should be able to provide



## Trust4All (ITEA 04003)

#### Partners

- Centrum voor Wiskunde en Informatica
- ESI
- Fagor
- Ikerlan
- Leiden University
- Nokia Corporation
- OCE – Technologies
- Philips Applied Technologies
- Philips Research Laboratories
- Robotiker
- Solid Information Technology
- Technische Universiteit Eindhoven
- Telematica Instituut
- Visual Tools
- VTT Electronics

#### Countries involved

- Finland
- The Netherlands
- Spain

#### Start of the project

July 2005

#### End of the project

June 2007



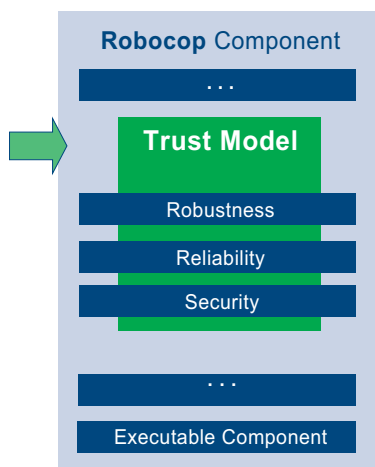
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higher levels of dependability. Meeting this demand will require the establishment of defined levels of trustworthiness – ranging from medium to high – in several respects:

- Security during critical actions to guarantee the promised behaviour;
- Reliability throughout a reasonable lifetime to deliver the expected benefits; and
- Robustness during operation to guarantee functionality

### Driving standards

The major result of the project is a model to represent trust attributes, supported by an architecture that makes it possible at any time to verify and reason about the level of trust offered by a composed



system. It provides associated metrics and a methodology for dynamic monitoring of system status with respect to the model after requested or unrequested updates, upgrades or extensions. On the basis of this validation process, systems will be allowed to, or prevented from, executing applications or services that require a defined level of confidence. The ISO/IEC 23004 standard on middleware is a major result of the project. Seven of the eight parts of the standard are the result of the Trust4All project: architecture, component model, resource and quality management, component download, fault management, system integrity management and reference software.

### Validated in range of domains

The results of Trust4All have been validated in a wide variety of application domains: navigation, monitoring, mobile information, healthcare and office automation. This has been achieved through the development of the following demonstrators: mobile navigation, document-management system, monitoring for elderly people, taxi-driver assistant and home healthcare.

In addition to these demonstrators, a wide range of validation tools has been developed and used for the development of the applications.

### Major project outcomes

#### Dissemination

- 74 publications
- Six presentations at conferences/fairs

#### Exploitation

- Two new product concepts
- Four new services intended for internal use
- Five real demonstrators showing the benefits of the developments in five different application domains: navigation, monitoring, mobile information, healthcare and office automation
- Seven tools for the analysis and validation of trust-related attributes of composed embedded software for development and run-time use

#### Standardisation

- Almost all of the contributions for the ISO/IEC MPEG standardisation body, resulting in a complete new standard for middleware named ISO/IEC 23004 consisting of eight parts including the reference software, have been contributed by the Trust4All project

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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 10,000 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.

