INDEXYS

INDustrial EXploitation of the genesYS cross-domain architecture

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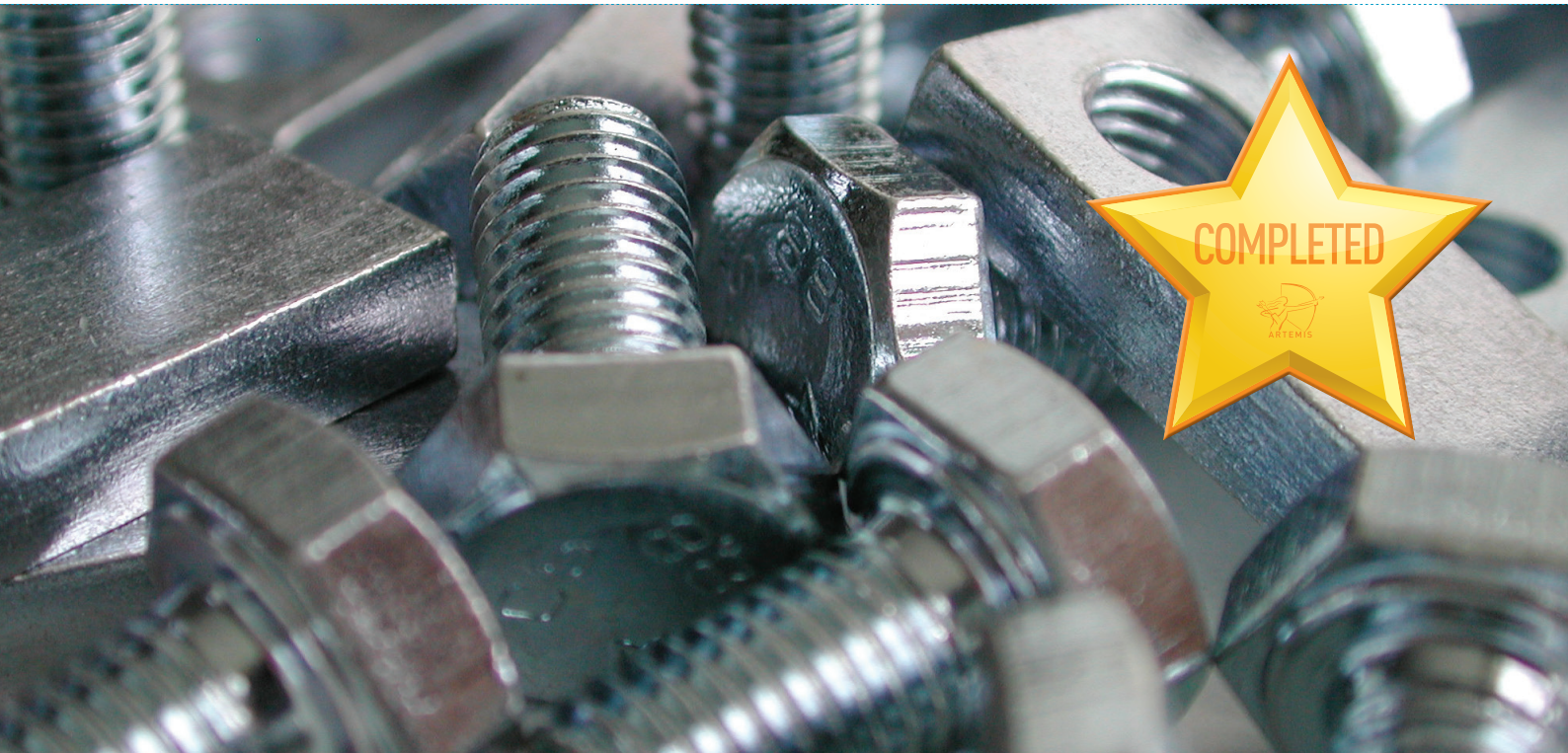
EXECUTIVE *summary*

The objective of INDEXYS is to tangibly realise the industrial implementations of cross-domain architectural concepts developed in the EC FP7 project GENESYS (GENeric Embedded SYStem Platform) in three domains: automotive, aerospace and railway, thereby relating to ARTEMIS-JU Industrial Priority: 'Reference designs and architectures'.

CONTRIBUTION *to SRA*

As outlined in the ARTEMIS SRA, part 1, 'Reference Designs and Architectures', the 'main ambition of Artemis is to overcome fragmentation, cutting barriers between application sectors so as to 'de-verticalise' the industry, sharing across sectors tools and technology that are today quite separate [...]'.

Based on the SRA, the GENESYS project which led to a cross-domain architectural style for the construction of dependable embedded systems, encompassing structuring rules and fundamental architectural principles. The aim of INDEXYS is to follow up on the GENESYS' results by implementing selected industrial-grade services of GENESYS' architectural concepts in the automotive, aerospace and railway domains, and by evaluating the cross-domain exploitability of these services.

MARKET INNOVATION *& impact*

Research and development carried out in INDEXYS will deliver significantly advanced technology to strengthen European excellence in computing architectures of the automotive, aerospace, and railway domains. INDEXYS contributes to mastering new computing architectures and enables European industries across different application domains to maintain and even improve their technological leadership. A positive impact for both OEMs and the European supplier industry is expected.

INDEXYS' instantiations of selected architectural services of the GENESYS generic reference architecture template contribute to the 'establishment of a common multi-domain architecture, APIs, and design tool platform for advanced multi-core hardware and middleware solutions' (ARTEMIS-JU work programme) and thereby support the European supplier industry to target larger markets. OEMs will benefit from mature cross-domain technology at lower cost, as well as from decreased development cost and faster time-to-market.

RELEVANCE & CONTRIBUTIONS *to Call 2008 Objectives*

INDEXYS relates to ARTEMIS 'Industrial Priority: 'Reference designs and architectures' by targeting constructible component integration

across different integration levels of the automotive, aerospace and railway domains. Thus, the 'ability to derive instantiations of architecture from a generic platform that support the constructive composition of large systems from components and sub-systems without uncontrolled emergent behaviour or side effects', as mentioned in the ARTEMIS-JU work programme, is considered to be a major objective.

The automotive, aerospace and railway industries require safety-critical systems. Consequently, INDEXYS targets dependability services at architectural level by INDEXYS' architectural service instantiations in order to guarantee 'reliable and timely system services despite accidental failure of system components'. Core concepts behind these dependability services are the availability of a synchronised global time, message-based sub-system interaction across a state-message based interface (i.e., temporal firewall), error containment at node level and on network level by strict definition of error containment regions, as well as diversity concepts in order to increase robustness at an architectural level. The instantiation of generic architectural services from GENESYS will be done on the basis of existing platform solutions enhanced by new architectural services (including dependability services).

By realising instantiations of the GENESYS cross-domain reference architecture template, INDEXYS contributes to higher cross-domain reuse of generic architectural services across automotive, aerospace and railway platforms. INDEXYS therefore addresses Sub-Programme (SP) 5, 'Computing environments for embedded systems', with a particular focus on the first goal of SP 5, i.e., the 'transition from separate sectoral, vertically structured markets to a horizontally structured market'.

R&D INNOVATION *and technical excellence*

Increasing the computational capabilities of embedded computing systems and their falling costs have enabled, new functionality – such as driver assistance systems in the automotive domain - and cost savings have become possible, for example, the replacement of mechanical components by embedded computers.

However, each application domain traditionally tends to develop customised solutions, thereby often re-inventing concepts that are already applied in other domains. It is therefore expedient to invest into a generic embedded system architecture that supports the development of dependable embedded applications in many different application domains, using the same hardware devices and software modules.

The realisation of a cross-domain architecture with generic architectural services enables considerable cost savings: The development of the basic services, tools, and design+verification processes is a major cost factor that is otherwise burdened to each domain separately.

Contrary to the approach of many present platform solutions that are tailored to a specific domain, INDEXYS aims to develop of reusable architectural services for exploitation across platforms of different domains. While INDEXYS is not expected to instantly replace existing architectural solutions, its architectural service implementations will support a gradual shift towards higher reusability of services across different domains (particularly across automotive, aerospace and railway domains) lowering costs by using the availability of existing solutions and existing experience with these solutions in the engineering community.

PROJECT *partners*