X-by-Construction Design framework for Engineering Autonomous & Distributed Real-time Embedded Software Systems

Fact Sheet

Project Information

XANDAR
Grant agreement ID: 957210
DOI
10.3030/957210

Funded under
INDUSTRIAL LEADERSHIP - Leadership in enabling and industrial technologies - Information and Communication Technologies (ICT)

Total cost
€ 4 962 985
EU contribution
€ 4 962 985

Start date
1 January 2021
End date
31 December 2023

Coordinated by
KARLSRUHER INSTITUT FUER TECHNOLOGIE
Germany

Project description

Innovative design for embedded software systems

The next generation of networked embedded systems (ES) requires fast prototyping and high performance in addition to its key properties of reliability and safety. However, the dependence of the current autonomous systems trend on machine learning and artificial intelligence applications in combination with fail-operational requirements makes the verification and validation of ES a challenging endeavour. The EU-funded XANDAR project will address the goals defined within the ICT-50-
2020 Software Technologies call, delivering a mature software toolchain that fulfils the industrial requirements for rapid prototyping of interoperable and autonomous ES. A model-based system architecture to support novel automatic model synthesis and software parallelisation techniques will be used to achieve the objectives of a new real-time, safety- and security-by-construction paradigm.

Objective

The next generation of networked embedded systems (ES) necessitates rapid prototyping and high performance while maintaining key qualities like trustworthiness and safety. However, deployment of safety-critical ES suffers from complex software (SW) toolchains and engineering processes. Moreover, the current trend in autonomous systems relying on Machine Learning (ML) and AI applications in combination with fail-operational requirements renders the Verification and Validation (V&V) of these new systems a challenging endeavor. Prime examples are autonomous driving cars that are prone to various safety/security vulnerabilities. The XANDAR project is built to exactly match the goals defined within the ICT-50 Software Technologies.

XANDAR will deliver a mature SW toolchain (from requirements capture down to the actual code integration on target including V&V) fulfilling the needs of the industry for rapid prototyping of interoperable and autonomous ES. Starting from a model-based system architecture, XANDAR will leverage novel automatic model synthesis and software parallelization techniques to achieve specific non-functional requirements setting the foundation for a novel real-time, safety-, and security-by-Construction (X-by-Construction) paradigm. For the first time, XbC-guided code generation for non-deterministic ML/AI applications will be combined with novel runtime monitors to ensure fail-operation in the presence of runtime faults and security exploitations. The project provides a consortium covering the full spectrum of ES and software engineering. XANDAR will be validated by an automotive OEM (BMW) and the German Aerospace Center (DLR). Leading European SMEs and enterprises such as Vector, AVN, and fentISS as well as successful academic partners will contribute their diverse knowhow in Model-Driven Engineering, Software Systems and V&V, multicore architectures, code generation, and security enforcements from higher-level behavioral models to actual runnables.

Fields of science

natural sciences ∞ computer and information sciences ∞ software ∞ software applications ∞ system software
natural sciences ∞ computer and information sciences ∞ artificial intelligence ∞ machine learning
Programme(s)

H2020-EU.2.1.1. - INDUSTRIAL LEADERSHIP - Leadership in enabling and industrial technologies - Information and Communication Technologies (ICT)

Topic(s)

ICT-50-2020 - Software Technologies

Call for proposal

H2020-ICT-2018-20

See other projects for this call

Sub call

H2020-ICT-2020-1

Funding Scheme

RIA - Research and Innovation action

Coordinator

KARLSRUHER INSTITUT FUER TECHNOLOGIE

Net EU contribution

€ 695 685,00

Address

Kaiserstrasse 12
76131 Karlsruhe

Region

Baden-Württemberg > Karlsruhe > Karlsruhe, Stadtkreis

Activity type

Higher or Secondary Education Establishments

Links
UNIVERSITY OF PELOPONNESE

Greece

Net EU contribution

€ 477 145,00

Address

Stavrou 28 Kai Karyotaki 28
221 00 Tripolis

Region

Αργολίδα > Πελοπόννησος > Κεντρική Ελλάδα

Activity type

Higher or Secondary Education Establishments

DEUTSCHES ZENTRUM FUR LUFT - UND RAUMFAHRT EV

Germany

Net EU contribution

€ 480 750,00

Address

Linder Hohe
51147 Koln
AVN INNOVATIVE TECHNOLOGY SOLUTIONS LIMITED

Cyprus

Net EU contribution
€ 393 615,00

Address
133b Fraglin Roosevelt Ave
3011 Limassol

SME
Yes

Region
Κύπρος

Activity type
Private for-profit entities (excluding Higher or Secondary Education Establishments)

Non-EU contribution
€ 0,00

VECTOR INFORMATIK GMBH

Germany

Net EU contribution
€ 748 545,00
BAYERISCHE MOTOREN WERKE AKTIENGESELLSCHAFT

Germany

Net EU contribution
€ 1,026,915,00

Address
Petuelring 130
80809 München

Region
Bayern > Oberbayern > München, Kreisfreie Stadt

Activity type
Private for-profit entities (excluding Higher or Secondary Education Establishments)

Links
Contact the organisation
Participation in EU R&I programmes
H2020 collaboration network

Non-EU contribution
€ 0,00

THE QUEEN'S UNIVERSITY OF BELFAST

United Kingdom

Non-EU contribution
€ 0,00
Net EU contribution

€ 750 865,00

Address

University Road Lanyon Building
BT7 1NN Belfast

Region

Northern Ireland > Northern Ireland > Belfast

Activity type

Higher or Secondary Education Establishments

Links

Contact the organisation  Website
Participation in EU R&I programmes  H2020 collaboration network

Non-EU contribution

€ 0,00

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FENT INNOVATIVE SOFTWARE SOLUTIONS

Spain

Net EU contribution

€ 389 465,00

Address

Camino Vera Ciudad Politecnica De La Innovacion
46022 Valencia

SME

Yes

Region

Este > Comunitat Valenciana > Valencia/València

Activity type

Private for-profit entities (excluding Higher or Secondary Education Establishments)

Links

Contact the organisation  Website
Participation in EU R&I programmes  H2020 collaboration network

Non-EU contribution

€ 0,00