Deliverable 5.6
Communication/dissemination material (V3)

This project has received funding from the Electronic Component Systems for European Leadership Joint Undertaking under grant agreement No 737475. This Joint Undertaking receives support from the European Union's Horizon 2020 research and innovation programme and Spain, France, United Kingdom, Austria, Italy, Czech Republic, Germany.

The author is solely responsible for its content, it does not represent the opinion of the European Community and the Community is not responsible for any use that might be made of data appearing therein.

<table>
<thead>
<tr>
<th>DISSEMINATION LEVEL</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>PU</td>
</tr>
<tr>
<td>CO</td>
<td>Confidential, only for members of the consortium (including the Commission Services)</td>
</tr>
<tr>
<td>COVER AND CONTROL PAGE OF DOCUMENT</td>
<td></td>
</tr>
<tr>
<td>-------------------------------------</td>
<td></td>
</tr>
<tr>
<td><strong>Project Acronym:</strong></td>
<td>AQUAS</td>
</tr>
<tr>
<td><strong>Project Full Name:</strong></td>
<td>Aggregated Quality Assurance in Systems</td>
</tr>
<tr>
<td><strong>Grant Agreement No.:</strong></td>
<td>737475</td>
</tr>
<tr>
<td><strong>Programme</strong></td>
<td>ICT-1: Cyber-Physical-Systems</td>
</tr>
<tr>
<td><strong>Instrument:</strong></td>
<td>Research &amp; innovation action</td>
</tr>
<tr>
<td><strong>Start date of project:</strong></td>
<td>01-05-2017</td>
</tr>
<tr>
<td><strong>Duration:</strong></td>
<td>36 months + 2 months extension</td>
</tr>
<tr>
<td><strong>Deliverable No.:</strong></td>
<td>D5.6</td>
</tr>
<tr>
<td><strong>Document name:</strong></td>
<td>Communication/dissemination material (V3)</td>
</tr>
<tr>
<td><strong>Work Package</strong></td>
<td>WP5</td>
</tr>
<tr>
<td><strong>Associated Task</strong></td>
<td>Task(s) 5a.3</td>
</tr>
<tr>
<td><strong>Nature</strong></td>
<td>DEC</td>
</tr>
<tr>
<td><strong>Dissemination Level</strong></td>
<td>PU</td>
</tr>
<tr>
<td><strong>Version:</strong></td>
<td>1.0</td>
</tr>
<tr>
<td><strong>Actual Submission Date:</strong></td>
<td>28-02-2020</td>
</tr>
<tr>
<td><strong>Contractual Submission Date</strong></td>
<td>29-02-2020</td>
</tr>
</tbody>
</table>

**Editor:** Bohuslav Křena
**Institution:** BUT
**E-mail:** krena@fit.vut.cz

---

1. \( R = \text{Report, DEC} = \text{Websites, patents filling, etc., O} = \text{Other} \)
2. \( \text{PU} = \text{Public, CO} = \text{Confidential, only for members of the consortium (including the Commission Services)} \)
# Change Control

## Document History

<table>
<thead>
<tr>
<th>Version</th>
<th>Date</th>
<th>Change History</th>
<th>Author(s)</th>
<th>Organisation(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>24-02-2020</td>
<td>Call for inputs</td>
<td>Bohuslav Křena</td>
<td>BUT</td>
</tr>
<tr>
<td>0.1</td>
<td>26-02-2020</td>
<td>Dissemination material summarised</td>
<td>Bohuslav Křena</td>
<td>BUT</td>
</tr>
<tr>
<td>0.2</td>
<td>27-02-2020</td>
<td>Internal review</td>
<td>Adam Rogalewicz,</td>
<td>BUT</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>David Bařina</td>
<td></td>
</tr>
<tr>
<td>0.3</td>
<td>27-02-2020</td>
<td>Addressing internal reviews</td>
<td>Bohuslav Křena</td>
<td>BUT</td>
</tr>
<tr>
<td>1.0</td>
<td>28-02-2020</td>
<td>Final version</td>
<td>Filip Veljkovic</td>
<td>TASE</td>
</tr>
</tbody>
</table>

## Distribution List

<table>
<thead>
<tr>
<th>Date</th>
<th>Issue</th>
<th>Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>26-02-2020</td>
<td>Internal review</td>
<td>Adam Rogalewicz (BUT)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>David Bařina (BUT)</td>
</tr>
<tr>
<td>28-02-2020</td>
<td>Final version</td>
<td>EC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AQUAS.ALL</td>
</tr>
</tbody>
</table>
Table of Contents

Executive Summary ........................................................................................................... 5
1  Introduction .................................................................................................................. 6
2  Dissemination material ................................................................................................. 7
2.1 Project poster ............................................................................................................. 7
2.2 Project presentation ..................................................................................................... 13
2.3 Project leaflet ............................................................................................................. 26
2.4 Project video .............................................................................................................. 27
3  Conclusion ................................................................................................................... 28
Executive Summary

Dissemination material provides information about the AQUAS project, its progress, and achieved results. This deliverable describes updates of the dissemination material from the previous version of the deliverable, i.e. D5.3: Communication/dissemination material (V2) from January 2019 (M21), as well as prospects for the rest of the project.

This is the 3rd (and last) version of dissemination material report. It was originally planned under number D5.3 by January 2020 (M33), however, it has been postponed to February 2020 (M34) by 2nd Amendment (Reference No AMD-737475-31) with the new number D5.6 that allows its easier submission.

More about the dissemination activities that are supported by the dissemination material described in this deliverable can be found in deliverable D5.7: Reports on communication and dissemination activities (V2, M36), the release of which is planned within two months after this deliverable (i.e. April 2020).
1 Introduction

Dissemination and communication activities are a strong contributor to the project success. To support dissemination and exploitation, several kinds of dissemination material has been prepared in order to present the project and its results to the general public and stakeholders from the ECSEL focused areas: ‘Design Technology’, ‘Cyber-physical Systems’, and ‘European Asset Protection’. In particular, communication and dissemination activities should raise the public awareness of the challenges faced with the provision of safe, secure, and efficient cyber-physical systems.

As the project evolves, different information may be used for the dissemination—in the first stages, the existence and main ideas of the project have been communicated, while now, we report more about the project progress and the achieved results. The status of the dissemination material has been summarised and reported three times during the project:

- First (V1) in Month 9,
- Second (V2) in Month 21,
- Final (V3) in Month 34 (the current version).
2 Dissemination material

Different forms of dissemination material are needed to present the project at different events and using different channels. In the following, we report about the dissemination material that has been created or updated from the last version of this deliverable.

2.1 Project poster

The project poster is useful for booth presentations at fairs as well as for poster sessions at conferences and workshops. Within the last year, the poster has been used at the ECSEL JU Symposium in Bucharest (June 2019) and at the Alpine Verification Meeting 2019 in Brno (September 2019). Pictures of the posters are on the following pages.

As the poster at ECSEL JU Symposium has been displayed electronically, it consists (in contrast to traditional paper posters) of four pages that were displayed one by one on a screen. In addition, the big grey rectangle that can be seen in the middle of the first page represents a project video.

Additional version of a poster may be prepared for coming AQUAS booth at DATE conference in March 2020 taking place in Grenoble.
Project idea

Growing complexity of the systems we engineer in modern society creates increasing difficulty with providing assurance for factors including safety, security and performance. Particularly for safety critical systems such as the transportation, medical devices, aerospace or the industrial control domains.

Acknowledgment

This project has received funding from the Electronic Component Systems for European Leadership Joint Undertaking under grant agreement No 737475. This Joint Undertaking receives support from the European Union’s Horizon 2020 research and innovation programme and Spain, France, United Kingdom, Austria, Italy, Czech Republic, Germany.
The AQUAS project investigates the challenges arising from the interdependence of safety, security and performance of systems and aims at efficient solutions for the entire product life-cycle within three essential capabilities of the ECSEL JU MASRIA 2016: Design Technologies (DT), Cyber-Physical Systems (CPS), and European Asset Protection (EAP). The project builds on knowledge of partners gained in current or former EU projects and will demonstrate the newly conceived approaches across use cases spanning:

- Space
- Medicine
- Transport
- Industrial Control
• Modelling and analysis methods and tools to capture safety, security and performance requirements and threats holistically.
• Model-based-co-design for safety, security and performance, including modelling the effectiveness of intrusion detection, combining levels of defense, modelling of interdependence between subsystems and considering evolution of effectiveness of defense in view of evolving threats.
• Analysis of design decisions and their impact on safety, security and performance via design space exploration, quantitative modelling and sensitivity analysis.
• Assuring that the threats are effectively handled by state of the art certification strategies and automated HW/SW joint verification techniques.
Co-engineering into mainstream practices

We are investigating Co-Engineering techniques for safety, security and performance of critical and complex embedded systems

Partners Background

- 25% LE
- 37% SME
- 38% ACA

- 16 Saf-Sec
- 15 Saf-Perf
- 11 See-Perf
- 8 Product Lifecycle
Growing complexity of the systems we engineer in modern society creates increasing difficulty with providing assurance for factors including safety, security and performance, particularly for safety critical systems.

The AQUAS approach: Co-Engineering

- Model-based co-design for safety, security, and performance.
- Modelling and analysis methods and tools handling safety, security, and performance requirements holistically.
- Analysis of design decisions and their impact on safety, security, and performance.
- Effective use of state of the art certification strategies and combined automated verification techniques.

Safety/performance/security Co-Engineering goes beyond the V-model.

Interaction Points

- Design decisions must rely on a holistic view of the system (safety, security, and performance).
- Through the development cycle, initial decisions and allocation of goals and properties are refined.
- Each of the refinements may (or may not) serve as an interaction point.
- If a refinement results in significant deviation, an interaction point is triggered to get a new trade-off.

Application Domains

- Safety, Security, Performance, System modelling
- Space Multi-Input Architecture
- Rail Carriage Mechanisms
- Air Traffic Management
- Medical Devices
- Internal Domains
- Industrial Drive
2.2 Project presentation

For an oral presentation of the project, a presentation in the form of slides is very useful. In order to support partners, we have prepared a general presentation of the project. Based on that, partners can create their own presentations taking into account the particular aims of a talk, type of audience, and time restrictions. In the following, the current version of the general project presentation is shown only because we consider including all the presentations prepared by all the project partners as worthless.
Main Goals

- Co-engineering inside and across product lifecycle phases. Standards evolution. The three key goals: CE, PLC4E, SE4CE
- Achieved by establishing a global concept framework for safety, security, and performance co-engineering:
  - Based on the needs of industrial application domains
  - Efficient analysis of trade-offs between system quality attributes
  - Taking into account the complete product lifecycle
  - Tools and platforms upgraded to implement and test the co-engineering approaches
  - Effective support for design breakthroughs
  - Reducing engineering costs for building and maintaining systems
  - Influencing the evolution of standards

Project Structure
Driven by Use Cases

- Demonstrators are combined results of workpackages

Application Domains

- Safety, Security, Performance, System modelling
- Space Multicore Architectures
- Industrial Drive
- Medical Devices
- Rail Carriage Mechanisms
- Air Traffic Management
- External Domains
Air Traffic Management

(SEDAR 2015) - Need for novel ATM procedures to effectively integrate VLL UAV operations into air space

Unmanned Air Traffic Management – Environment & Scope

- Situation awareness is a key need for future ATM operations.
  - Facilitates coordination of flight operations → optimization
  - Ensures safety, situation awareness → early
- ICAO’s general scope is situation awareness for VLL UAVs
- Future situation awareness relies on ADS-B
- Aircraft broadcast in own position via radio
- Mandatory by 2020
- ADS-B is not that easy for UAV at very low level.
  - Too much power for batteries
  - Signs blended (buildings, hills, ...) → hidden aircraft
- Alternative means to share position information are needed (e.g., similar performance).
- Multiple standard DVB-T profiles available for ground-ground and air-ground interactions. Multiple networking technologies being explored for UAV communications.
- U-SAR: interest in ways to make each technology decisions that lead to valid combinations.

Air Traffic Management

Unmanned Air Traffic Management demonstrator based on the Taloa Aera platform

Unmanned Air Traffic Management - Objectives & Partners

- Novel security-performance co-engineering methods and tools will be applied to optimize communication throughput and reduce battery consumption while keeping the high security and safety levels demanded in these scenarios.
Medical Devices

Blood pressure (BP) and neuromuscular transmission (NMT) monitoring device for hospital operating room critical care

BP CONTROL SCHEMATIC

BP and NMT Device – Testing Environment
Rail Carriage Mechanism
Control system for platform screen doors

Platform Screen Doors

- Requirement: Open platform doors if and only if a passenger train is stopped on the platform at its correct position and train doors are opening

- Detection-based: redundant, diverse sensors to detect the arrival of the train

- Different possibilities:
  - Human drivers have different driving profiles
  - System that can interact with manual or automated metro trains
  - Digital communication with automated metros
  - ...
Industrial Drive

The heart of every automated industrial process are industrial drives.

**Industrial Drives and Motion Control**

- Industrial drives are usually integrated in an industrial network.
- They are located on the field level.
- There are several motor types such as synchronous and asynchronous motors, ranging from standard electric motor panels and servo motors for motion control applications (including linear and torque motors) over motors for use in hazardous explosion areas, to high voltage, etc. and customized electric motors.
- LCP stands for use servo motor modules.
- Motion control products cover a large variety of variable frequency inverters for electric motors.
- LCP contains a virtual prototype of a motion control platform and a connected electronic motor.
- The large variety of communication and sensor interfaces of such embedded systems add significant security challenges to the safety mechanisms already implemented in today’s commercial industrial products.

**Standards and Guidelines**

Most important standards and guidelines for the industrial domain are IEC 61508 for functional safety and IEC 62443 for industrial networks and system security.

**Industrial Drives Use Case – Relevant Standards and Guidelines**

- **IEC 61508** – Functional safety of electrical/electronic/programmable electronic safety-related systems
  - For the use case demonstrator only the phases until Realization are of interest.

- **IEC 61800** – Adjustable speed electrical power drive systems
  - Defines safety requirements for electric motor control such as Safety-Limited Speed
  - The use case intends to realize a subset of these (e.g. S6, S8, S10)

- **IEC 62443** – Industrial Network and System Security
  - Defines processes and security measures for networks and products
  - The use case falls into the role of a “Product supplier”;
  - Parts B3.4.4-4 and B3.4.4-2 are most relevant;
  - The use case control platform has to be category PLC;
  - The use case should be compatible to the standard.
Space Multicore Architecture

Space projects are composed of three main components, namely Payload, Operations Center and Ground Segment.

> UC3 will develop a demonstrator an architecture based on an integrated multicore, high-performance modules for the Payload. Safety, Security and Performance have to be articulated with the environmental constraints of an on-going piece of hardware/software.

Software is not extremely complex, as it is not easily updated/ upgraded and it must not fail.

Safety, Security and Performance standards for a Space Project are currently segregated in different ECSS standards.

> UC3 aims to study and improve the interdependency of Safety, Security and Performance throughout the life Cycle of a Space Project, which are currently defined in segregated ECSS standards and considered separately.

Studying the relationship could lead to unified standards and improving the consideration of these aspects along the whole product lifecycle.

Relevant Safety/Security/Performance Standards and Guidelines

- **Safety Standards**

  Safety and Dependability (SI) reliability, availability and maintainability) are defined in ECSS-Q-ST-40 and ECSS-Q-ST-50 standards. These documents contain the definition, but there is also a guideline on how to apply them which is ECSS-QM-50-08B. One of the fundamental methods of assessing the Dependability and Safety of a software product is a Software PDMCA (Failure Mode, Effects and Criticality Analysis).

- **Security Standards**

  The ECSS-SP-60A and ECSS-4080C require the identification and definition of security requirements in the software specification; however, as security can be a broad subject, they do not offer a guideline for specific cases, it depends on the field of application of the SW.

- **Performance Standards**

  For UC3, there are no performance control systems in the broad sense of the word; therefore, only SW execution, scheduling and parallel computation are to be considered. For on-board software, it is necessary to perform a schedulability analysis, that verifies that all tasks can meet their deadlines.

  In addition, it is necessary to ensure that shared resources are protected and that there are no parallel computing issues that might affect the correct functioning of the SW product, e.g. deadlocks, starvation, race conditions, etc.
Methodology – Co-engineering

Good synchronisation between safety/performance/security at each stage and along the stages.

Methodology – Interactions Points

- Design decisions must rely on an holistic view of the system (safety, security and performance)
- Through the development cycle, initial decisions and allocation of goals and properties are subject to refinements
- Each of the refinements may (or may not) serve as an interaction point
- If a refinement results in significant deviation, an interaction point is triggered in order to establish a new trade-off
Design Tooling

- New tools features to support co-engineering and interaction points.
- Improving tools interoperability through
  - standardised formats and interfaces.
- Subsets covering one or several use cases.
- Dynamic perimeters depending on lifecycle.

Examples of Involved Tools and Their Improvements

- CHESS (Intes)
  - Support for SysML/UM/MASTE-based model-driven, component-based development of high-integrity software systems for different domains.
  - To be done in AQUAS performance considerations in early stages, code generation improved by security features, MCFIT analysis, analysis of the impact of specific security measures on the overall performance.

- FramaC (CEA)
  - A tool suite for formal code analysis and verification of safety as well as security related aspects using various forms of static analysis.
  - To be done in AQUAS, analyzable assertions generated code to increase trust, static value analysis and to quickly discover safety/security code issues, modular formal verification applicable on (sub-)systems whose (re-)analysis turns out necessary.
Design Tooling

- **Art2kitekt – A2K (ITI)**
  - Tool-suite for modeling, simulation, and analysis of embedded critical systems.
  - *To be done in AQUAS:* new features for modelling and analysis of safety and performance of real-time systems, generating code skeletons for various operating systems, sensitivity analysis, relating analysis results to specifications.

- **Safety and Cyber Architects (ALL4TEC)**
  - Model-based tools for safety and security analysis based on fault trees and attack trees.
  - *To be done in AQUAS:* bridge with tools for system modeling (e.g., ChESS), support for integrated safety/security co-analysis.

- **SysML-Sec (MTPP)**
  - Environment to design safe and secure embedded systems with an extended version of the SysML language.
  - *To be done in AQUAS:* support for dealing with security in relation with safety and performance through improved modeling environments, updated model operators, improved/additional views, integration of new model transformations.

Design Tooling

- **ANaConDA (BUT)**
  - A framework for dynamic code analysis and noise-based testing targeting in particular concurrency-related issues.
  - *To be done in AQUAS:* improved checkers to allow for efficient re-analysis whenever a need be (interaction points), richer checkers to analyze more properties, focusing the analysis on sub-systems currently found problematic, collection of suitable metrics to steer analysis/testing.

- **AstréC/TimingProfiler (AblInt)**
  - Tools for static code analysis targeting safety, security, and performance.
  - *To be done in AQUAS:* enable safety/security analysis of embedded OSs (with stress on PikeOS) speeding up development of applications based on such systems, light-weight timing analysis applicable in early development stages.

- **OpenCert (Tecnalia)**
  - An Eclipse based tool and open platform for evolutionary certification of safety-critical systems.
  - *To be done in AQUAS:* strengthened and enhanced support for modelling safety, security, and performance aspects within assurance cases.
Dissemination & Exploitation

Exploitation tracks laid out for industry engagement, particularly via:

- an External Advisory Board
- significant involvement in standardisation meetings
- AQUAS projectopen workshops

AQUAS Partners

23 partners in 7 countries

Partner Backgrounds

- LE
- SME
- ACA
- 16 Saf-SEC
- 15 Saf-Perf
- 11 Sec-Perf
- 8 Product Lifecycle
Impact & Conclusions

- Generate momentum for industry to properly adopt co-engineering.
- Decisive competitive advantage for organisations following co-engineering recommendations and standards

- Unlocks a significant hurdle for innovative products on the market accelerating:
  - Digitalisation of Europe, IoT uptake by CPS, AgileEngineering, accessibility of new technology to large industry.

- Limiting risk in design whilst increasing efficiency of development
- Improved standards for dependability of complex systems

- Safety, security and performance co-engineering framework
- Partners selected for high motivation and good balance of expertise
- AQUAS rated 2nd out of 28 proposals
2.3 Project leaflet

The leaflet describes the project and its goals and provides basic contact information. It can be freely circulated to inform about the project and to promote it at workshops, trade shows, technical fairs, congresses, and other events. It has been updated, professionally printed in 2000 copies and distributed to all project partners within previous period for their needs. As there was no requirement on additional leaflets, we did not print new ones. Here is the original version of the leaflet for illustration:

---

This needs to be treated urgently by advancing (automated) co-engineering processes within industry. In particular, having focus within and across phases of the lifecycle and through standards evolution. The AQUAS project is a result of this bottleneck – with five industrial use cases and a balance of safety-performance-security expertise from 18 technology providers we are building initial momentum for industry to adopt co-engineering.

Help us to encourage wider migration of industry to using co-engineering processes by joining our public mailing list or particularly joining our Advisory Board to engage in discussions to improve strategy, technology and policy. Contact our Coordinator for further details.

http://aquas-project.eu/

Project coordinator:
Filip Veljkovic
filip.veljkovic@thalesalenia.space.com
Thales Alenia Space España
2.4 Project video

The first version of the project video created by professional creative studio FILMONDO (http://www.filmondo.cz/) was released in August 2018 to be used as a part of a booth presentation at Euromicro DSD conference. This version was also shown to project partners within the project plenary meeting in Vienna (September 2018). After that, several project partners provided valuable comments and suggestions that were not clear within the story line phase. We therefore raised several issues to FILMONDO and the second version of the video was released in January 2019. Based on the request of City, University of London, the third version of the project video has been released in September 2019.

Naturally, we do not include the video directly into this deliverable (except one screenshot above) because it can be found at the project web page (https://aquas-project.eu/).
3 Conclusion

In this deliverable, we have presented selected dissemination material that have been created or updated to support the AQUAS project dissemination activities during the last period, namely, project posters, the general project presentation, the project leaflet and the project video.

In addition, several documents like journal articles, conference papers, public deliverables, etc., that are publicly available at the project web page (https://aquas-project.eu/documents/) serve as dissemination material as well despite they are not included here. For instance, the journal article “The AQUAS ECSEL Project Aggregated Quality Assurance for Systems: Co-Engineering Inside and Across the Product Life Cycle” has been used several times as a project brochure.

Furthermore, we work on success stories that should present how co-engineering can contribute to particular use cases. Unfortunately, we cannot include these success stories into this deliverable yet because they require prior approval by representatives of involved partners as this deliverable is public. Honestly, we have assumed that creating success stories will be much easier. For instance, we have realized that people have different notion of success stories and thus, success stories originating from different areas require unification in several aspects.

However, as we have already indicated above, the most difficult issue is an official approval. Let us clarify that. If we want to show how methodology and tools developed within the AQUAS project contribute to solving some problems in industrial practice, we need first to expose these problems and explain their importance. But it is very delicate issue for companies to show that they have some problems, especially in the areas like safety and security that are (together with performance) crucial aspects of co-engineering targeted by this project. Publication of negative information may reduce confidence of business partners as well as public in such companies that cannot be appreciated by companies heads neither owners. But, on the other hand, without a clear definition of the initial problem, a success story cannot be convincing.

We hope that we will find right balance between these concerns and prepare understandable success stories. We plan to propagate them by our public mailing list, project web page, as well as social media in order to build strong community around the dependability co-engineering.