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.

DISSEMINATION LEVEL		
X	PU	Public
	CO	Confidential, only for members of the consortium (including the Commission Services)

COVER AND CONTROL PAGE OF DOCUMENT	
Project Acronym:	AQUAS
Project Full Name:	Aggregated Quality Assurance in Systems
Grant Agreement No.:	737475
Programme	ICT-1: Cyber-Physical-Systems
Instrument:	Research & innovation action
Start date of project:	01-05-2017
Duration:	36 months + 2 months extension
Deliverable No.:	D5.6
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Version:	1.0
Actual Submission Date:	28-02-2020
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Editor: Institution: E-mail:	Bohuslav Křena BUT krena@fit.vut.cz

[1] **R**=Report, **DEC**= Websites, patents filling, etc., **O**=Other
[2] **PU**=Public, **CO**=Confidential, only for members of the consortium (including the Commission Services)

Change Control

Document History

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

Distribution List

Date	Issue	Group
26-02-2020	Internal review	Adam Rogalewicz (BUT) David Bařina (BUT)
28-02-2020	Final version	EC AQUAS.ALL

Table of Contents

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.

ECSEL Joint Undertaking

Aggregated Quality Assurance for Systems (AQUAS)

AQUAS SAFETY SECURITY PERFORMANCE

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.

Start date:	May 1st, 2017
Duration:	36 months
Total costs:	€M 15,5
Number of participants:	23
Number of countries:	7
Project coordinator:	Filip Veljković THALES ALENIA SPACE ESPANA,SA filip.veljkovic@thalesaleniaspace.com

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.

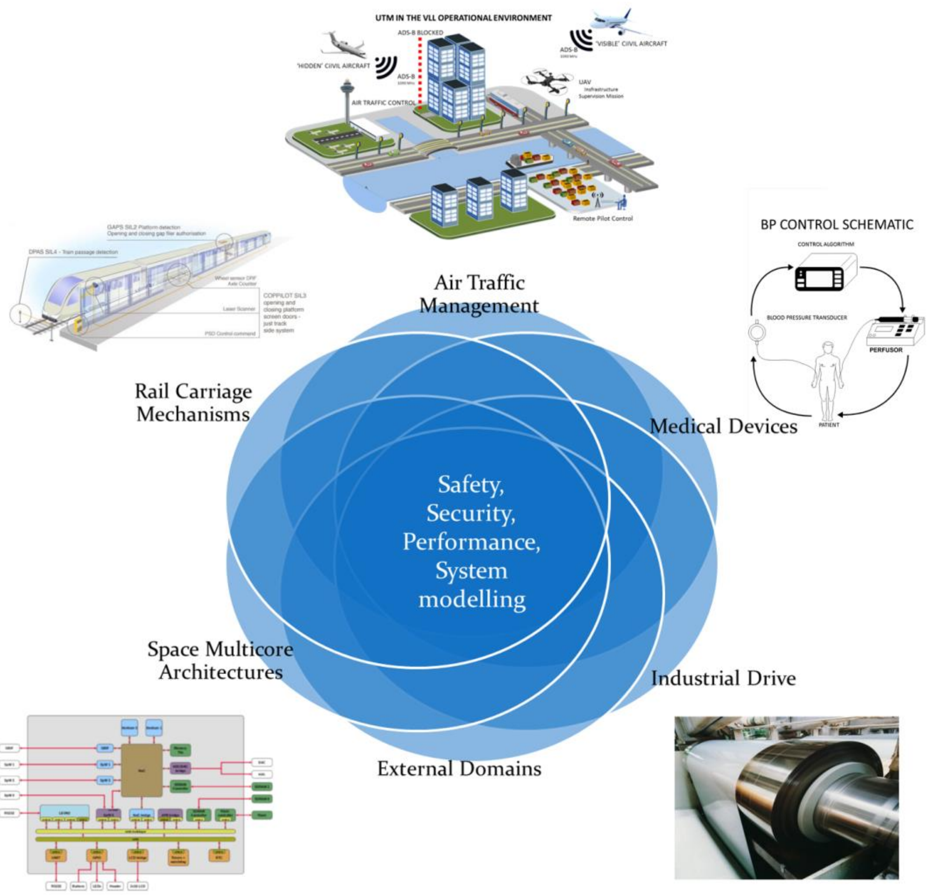
SHAPING DIGITAL INNOVATION

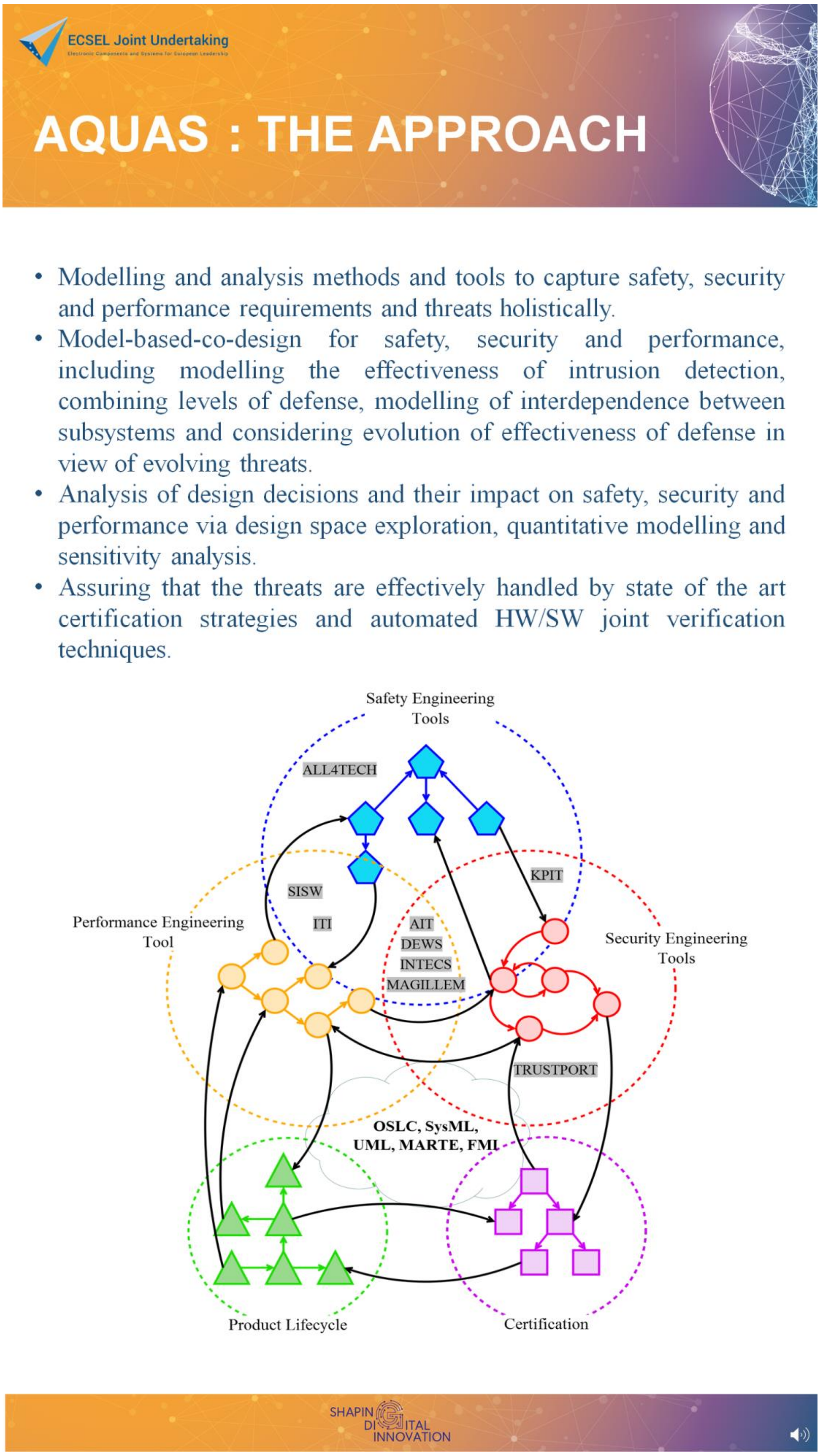
ECSEL Joint Undertaking

APPLICATION DOMAINS

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**

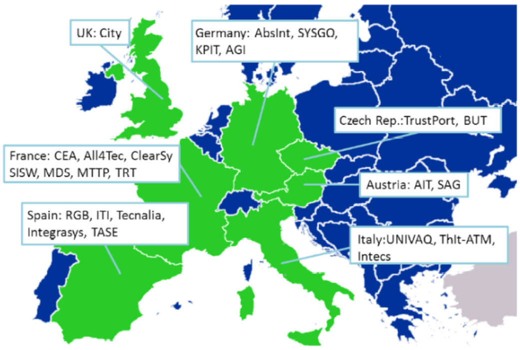



ECSEL Joint Undertaking
AQUAS : THE APPROACH
• Modelling and analysis methods and tools to capture safety, security and performance requirements and threats holistically.
• Model-based-co-design for safety, security and performance, including modelling the effectiveness of intrusion detection, combining 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.
Safety Engineering Tools
ALL4TECH
KPIT
SISW
ITI
AIT
DEWS
INTECS
MAGILLEM
Performance Engineering Tool
Security Engineering Tools
TRUSTPORT
OSLC, SysML, UML, MARTE, FMI
Product Lifecycle
Certification
SHAPING DIGITAL INNOVATION


ECSEL Joint Undertaking
AQUAS : 23 PARTNERS IN 7 COUNTRIES
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%
37%
38%
LE
SME
ACA
•16 Saf-Sec
•15 Saf-Perf
•11 Sec-Perf
•8 Product Lifecycle
SHAPING DIGITAL INNOVATION

Coordinator: Filip Veljković
Thales Alenia Space
Czech coordinator: Tomáš Vojnar
Brno University of Technology

safety – security – performance trade-offs • co-engineering

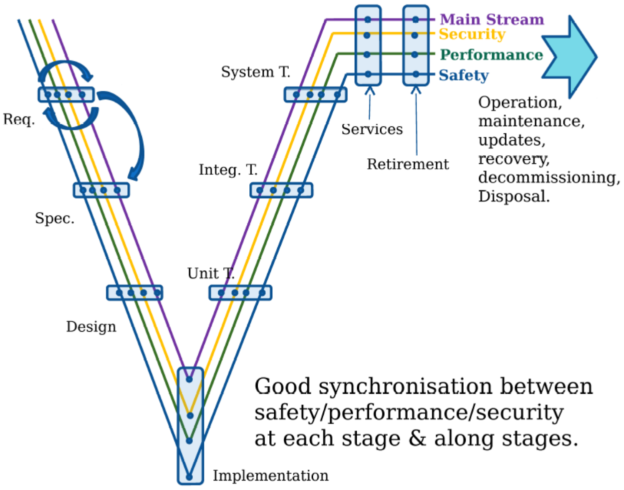


Growing complexity of the systems we engineer in modern society creates increasing difficulty with providing assurance for factors including safety, security and performance, particularly for safety critical systems.

The AQUAS approach: Co-Engineering

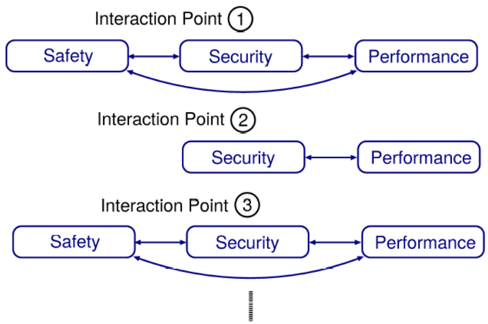
- Model-based co-design for safety, security, and performance.
- Modelling and analysis methods and tools handling safety, security, and performance requirements holistically.
- Analysis of design decisions and their impact on safety, security, and performance.
- Effective use of state of the art certification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

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

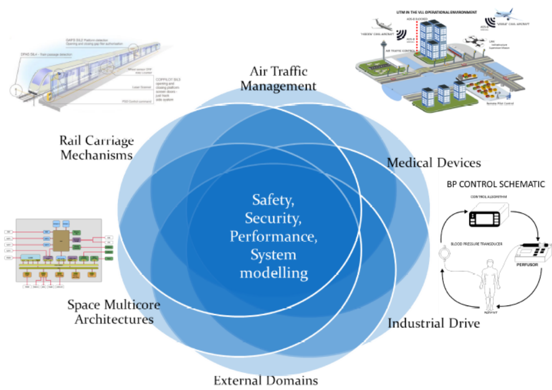


Interaction Points

- 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.

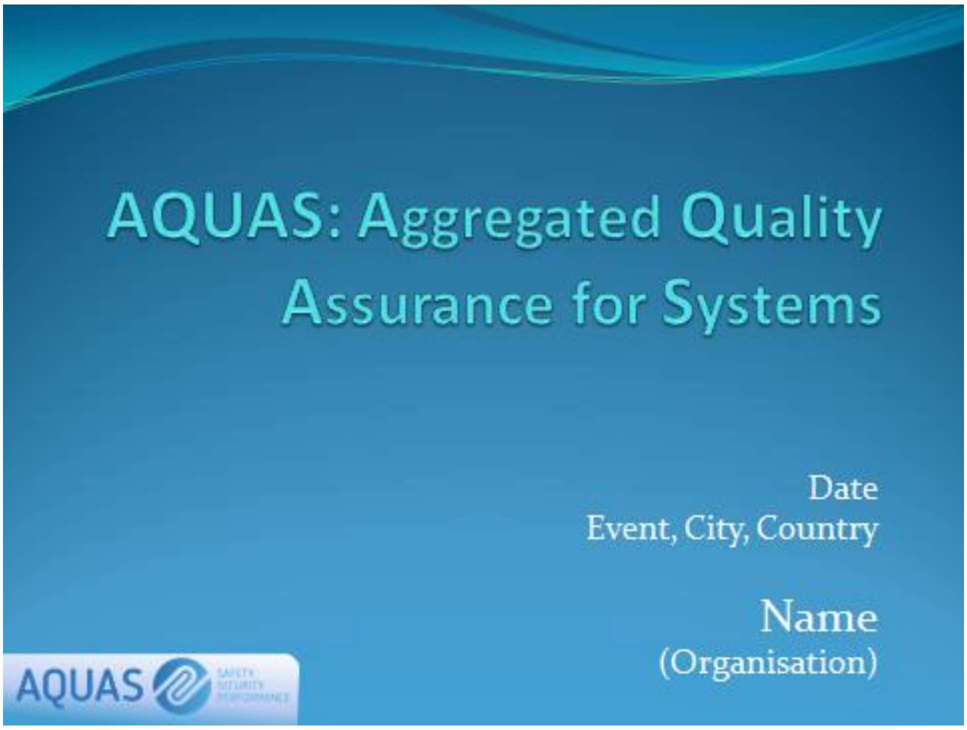


Application Domains



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, PLC4CE, 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
AQUAS
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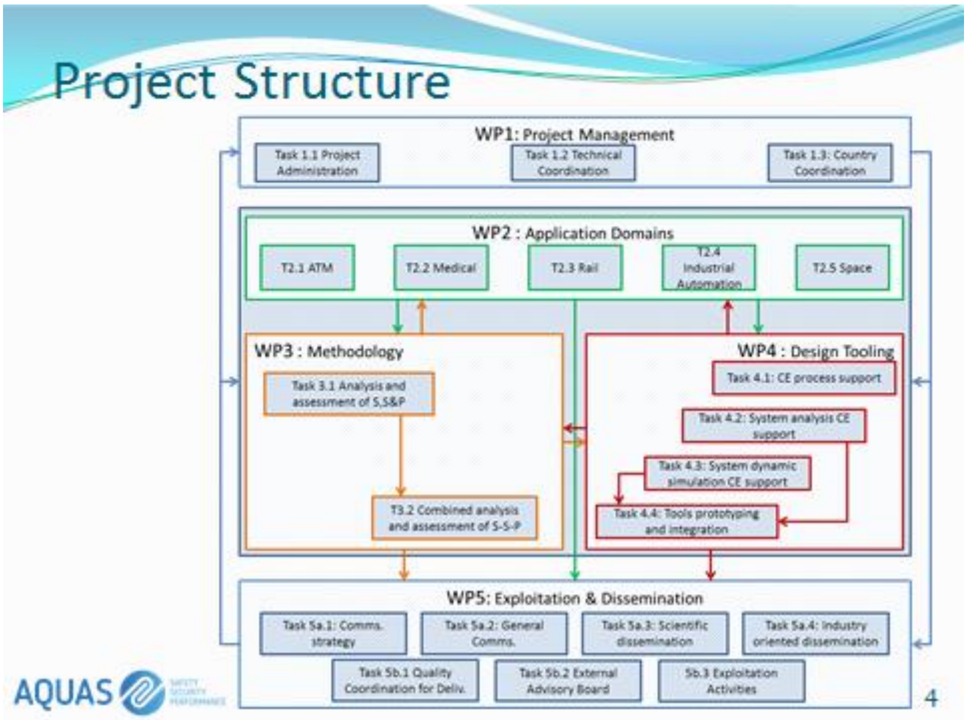
Project Structure
WP1: Project Management
Task 1.1 Project Administration
Task 1.2 Technical Coordination
Task 1.3: Country Coordination
WP2 : Application Domains
T2.1 ATM
T2.2 Medical
T2.3 Rail
T2.4 Industrial Automation
T2.5 Space
WP3 : Methodology
Task 3.1 Analysis and assessment of S,S&P
T3.2 Combined analysis and assessment of S-S-P
WP4 : Design Tooling
Task 4.1: CE process support
Task 4.2: System analysis CE support
Task 4.3: System dynamic simulation CE support
Task 4.4: Tools prototyping and integration
WP5: Exploitation & Dissemination
Task 5a.1: Comms. strategy
Task 5a.2: General Comms.
Task 5a.3: Scientific dissemination
Task 5a.4: Industry oriented dissemination
Task 5b.1 Quality Coordination for Deliv.
Task 5b.2 External Advisory Board
5b.3 Exploitation Activities
AQUAS
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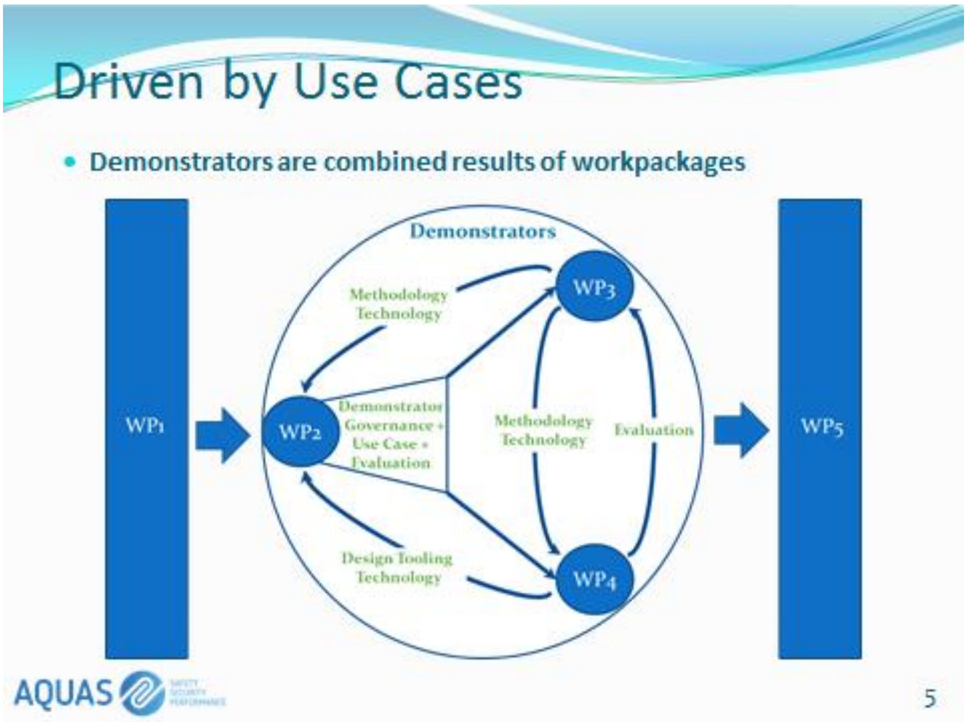
Driven by Use Cases
Demonstrators are combined results of workpackages
Demonstrators
WP1
WP2
WP3
WP4
WP5
Methodology Technology
Demonstrator Governance + Use Case + Evaluation
Methodology Technology
Evaluation
Design Tooling Technology
AQUAS
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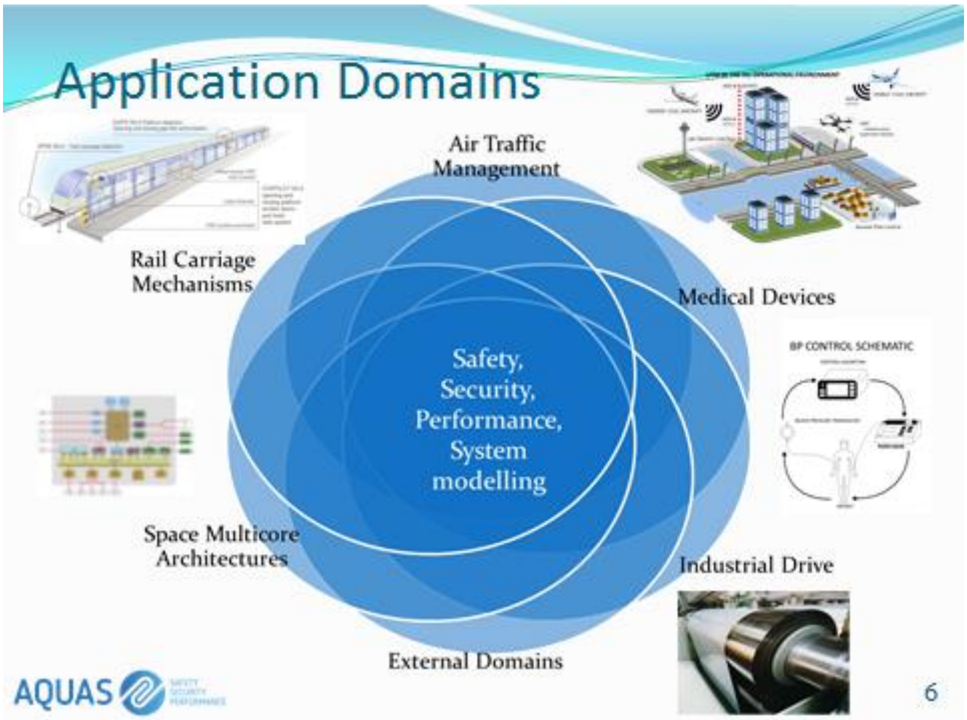
Application Domains
Air Traffic Management
Rail Carriage Mechanisms
Medical Devices
BP CONTROL SCHEMATIC
Safety, Security, Performance, System modelling
Space Multicore Architectures
Industrial Drive
External Domains
AQUAS
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Air Traffic Management
(SESAR 2016) - 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 → optimisation
Enables conflict detection → safety
> UC1 general scope is situation awareness for VLL UAVs.
Future situation awareness relies on ADS-B.
Aircrafts broadcast its own position via radio
Mandatory by 2020
... but ADS-B is not that easy for UAV at very low level.
Too much power for batteries
Signals blocked (buildings, hills, ...) → hidden aircrafts
> alternative means to share position information are needed (with similar performance).
Multiple standard SWIM profiles available for ground-ground and air-ground interactions. Multiple networking technologies being explored for UAV communications.
> UC1b interested in ways to make early technology decisions that lead to valid combinations.
UTM IN THE VLL OPERATIONAL ENVIRONMENT
AQUAS
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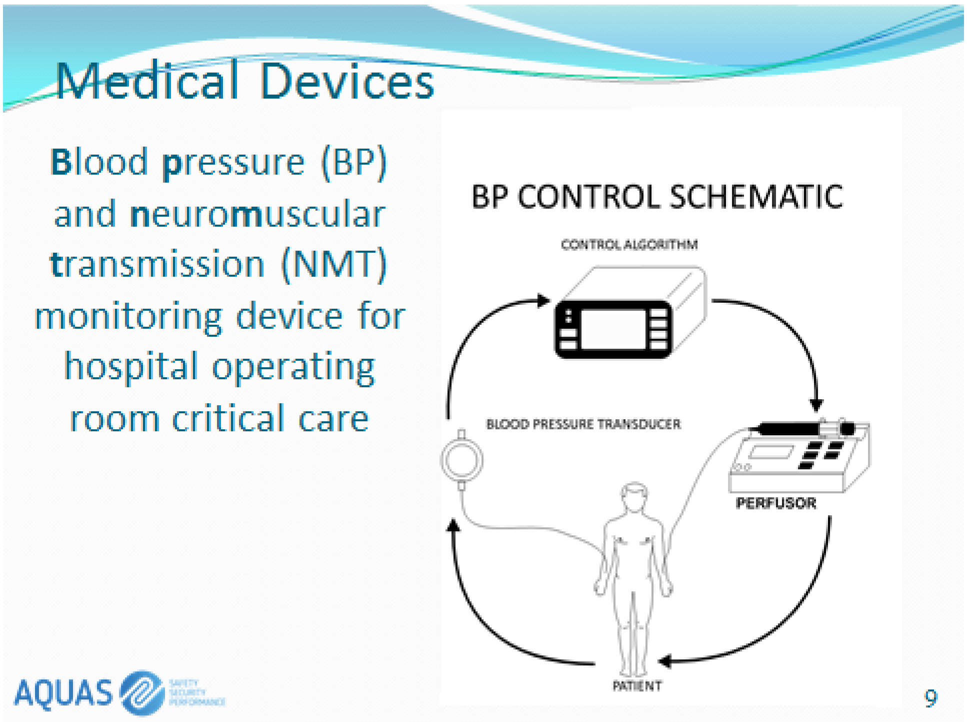
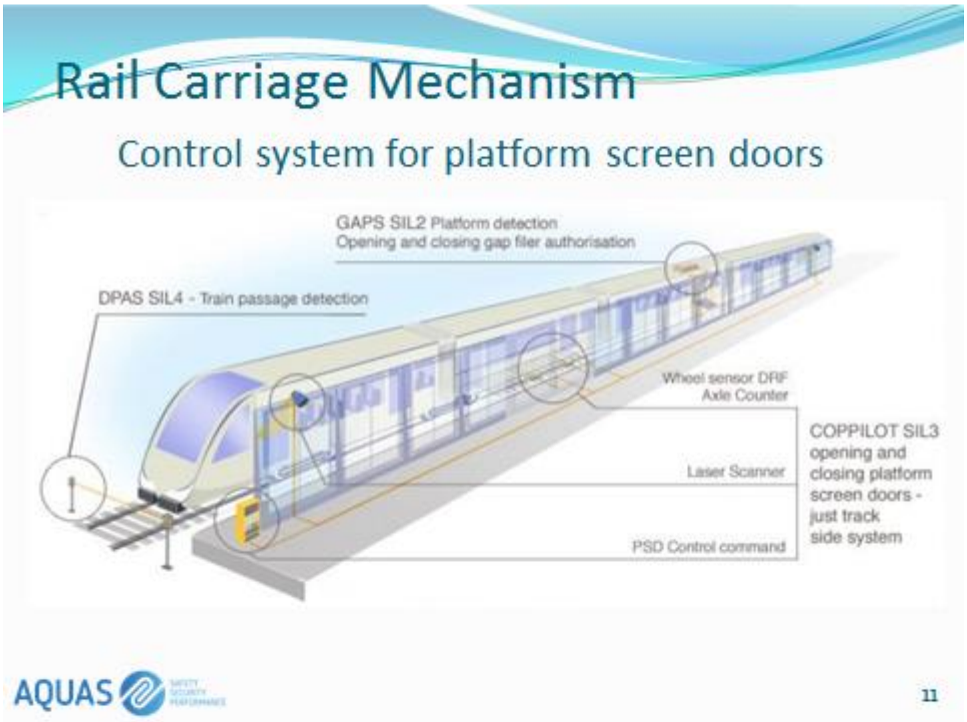
Air Traffic Management
Unmanned Air Traffic Management demonstrator based on the Intel Aero platform
Unmanned Air Traffic Management - Objectives & Partners
Novel security-performance co-engineering methods and tools will be applied to optimise communication throughput and reduce battery consumption while keeping the high security and safety levels demanded in these scenarios.
AbsInt
AIT
BRNO UNIVERSITY OF TECHNOLOGY
CITY UNIVERSITY LONDON
intecs
INTEGRASYS
ikv++ technologies ag
Hochschule RheinMain
SYSGO
TrustPort
AQUAS
8


Medical Devices
Blood pressure (BP) and neuromuscular transmission (NMT) monitoring device for hospital operating room critical care
BP CONTROL SCHEMATIC
CONTROL ALGORITHM
BLOOD PRESSURE TRANSDUCER
PERFUSOR
PATIENT
AQUAS
9


Medical Devices
BP and NMT Device – Testing Environment
AQUAS


Rail Carriage Mechanism
Control system for platform screen doors
GAPS SIL2 Platform detection
Opening and closing gap filer authorisation
DPAS SIL4 - Train passage detection
Wheel sensor DRF
Axle Counter
Laser Scanner
PSD Control command
COPPILOT SIL3 opening and closing platform screen doors - just track side system
AQUAS
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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
...
Stop signal sensor
Wheel sensor
AQUAS


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.
> UC4 is located on the field level
There are several e-motor types such as synchronous and asynchronous motors, ranging from standard electric motor systems and servomotors for motion control applications (including linear and torque motors) over motors for use in hazardous explosion areas, to high voltage, DC and customized electric motors.
> UC4 intends to use servo motor models
Motion Control products cover a large variety of variable frequency inverters for electric motors.
> UC4 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 adds significant security challenges to the safety mechanisms already implemented in today's commercial industrial products.
Virtual Prototype
AQUAS
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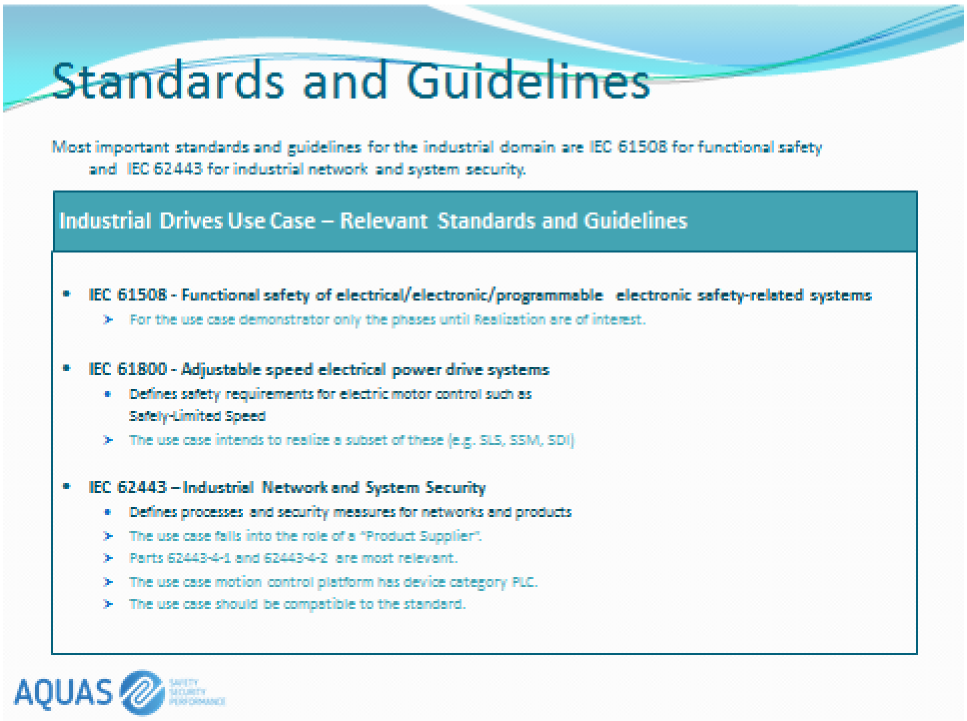
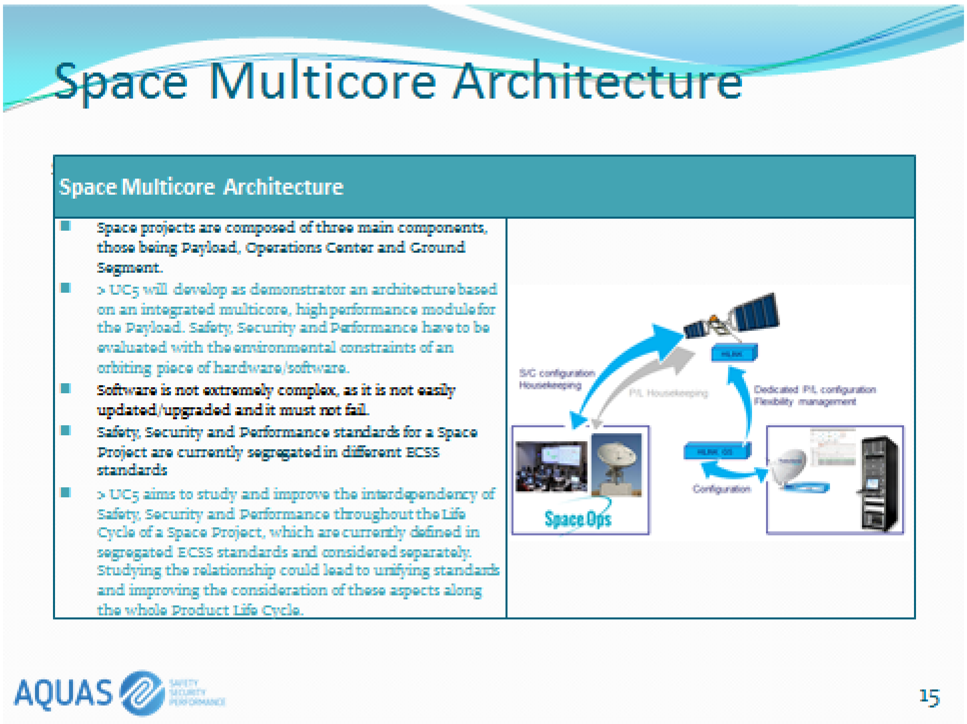

Standards and Guidelines
Most important standards and guidelines for the industrial domain are IEC 61508 for functional safety and IEC 62443 for industrial network and system security.
Industrial Drives Use Case – Relevant Standards and Guidelines
IEC 61508 - Functional safety of electrical/electronic/programmable 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 Safely-Limited Speed
The use case intends to realize a subset of these (e.g. SLS, SSM, SDI)
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 62443-4-1 and 62443-4-2 are most relevant.
The use case motion control platform has device category PLC.
The use case should be compatible to the standard.
AQUAS


Space Multicore Architecture
Space Multicore Architecture
Space projects are composed of three main components, those being Payload, Operations Center and Ground Segment.
> UC5 will develop as demonstrator an architecture based on an integrated multicore, high performance module for the Payload. Safety, Security and Performance have to be evaluated with the environmental constraints of an orbiting 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
> UC5 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 unifying standards and improving the consideration of these aspects along the whole Product Life Cycle.
S/C configuration
Housekeeping
P/L Housekeeping
Dedicated P/L configuration
Flexibility management
Configuration
Space Ops
AQUAS
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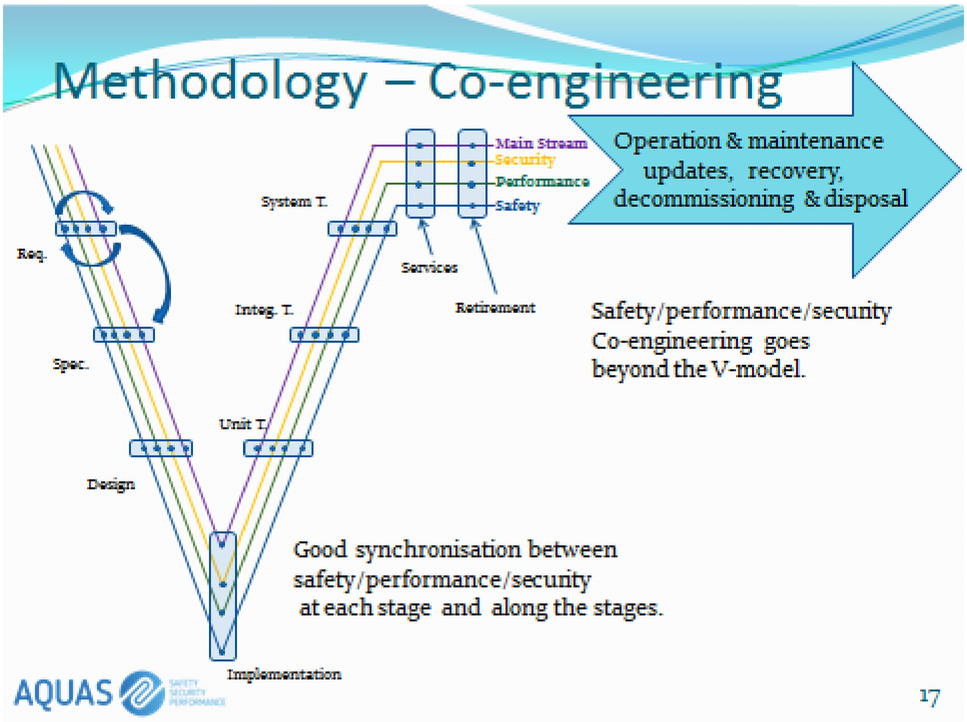
Space Multicore Architecture
Relevant Safety/Security/Performance Standards and Guidelines
Safety Standards
Safety and Dependability (SW reliability, availability and maintainability) are defined in ECSS-Q-ST-40 and ECSS-Q-ST-30 standards. These documents contain the definition, but there is also a guideline on how to apply them which is ECSS-Q-HB-80-03. One of the fundamental methods of assessing the Dependability and Safety of a software product is a Software FMECA (Failure Mode, Effects and Criticality Analysis).
Security Standards
The ECSS-E-ST-40C and ECSS-Q-ST-80C 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 UC5, 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 real-time 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...
AQUAS


Methodology – Co-engineering
Main Stream
Security
Performance
Safety
Operation & maintenance
updates, recovery,
decommissioning & disposal
System T.
Req.
Services
Retirement
Integ. T.
Spec.
Unit T.
Design
Implementation
Safety/performance/security
Co-engineering goes
beyond the V-model.
Good synchronisation between
safety/performance/security
at each stage and along the stages.
AQUAS
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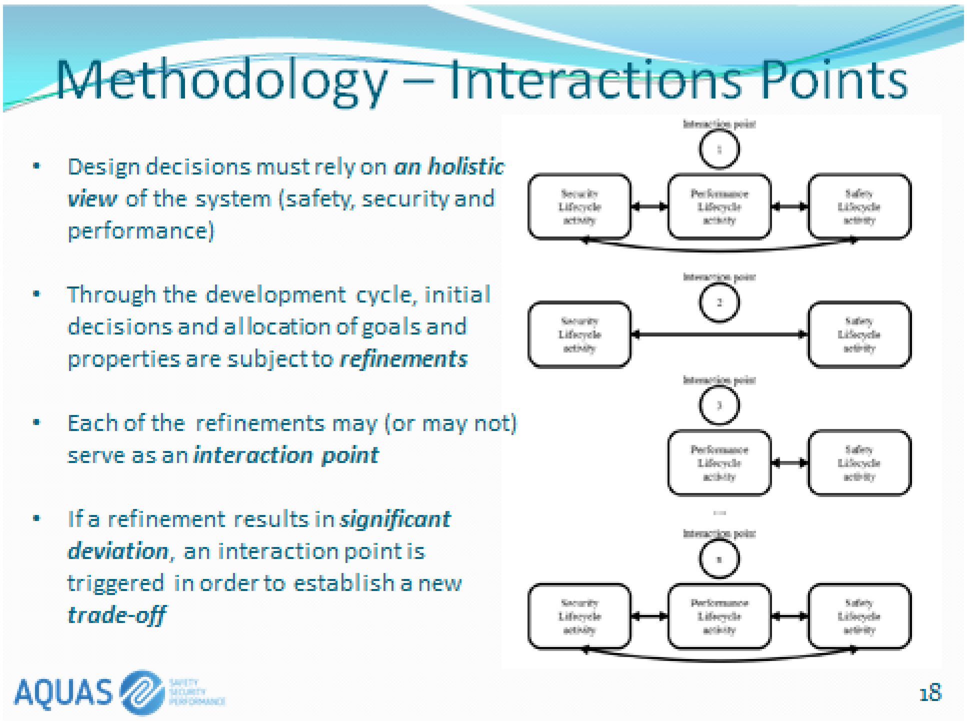
Methodology – Interactions Points
Design decisions must rely on an holistic view of the system (safety, security and performance)
Through the development cycle, initial decisions and allocation of goals and properties are subject to refinements
Each of the refinements may (or may not) serve as an interaction point
If a refinement results in significant deviation, an interaction point is triggered in order to establish a new trade-off
AQUAS
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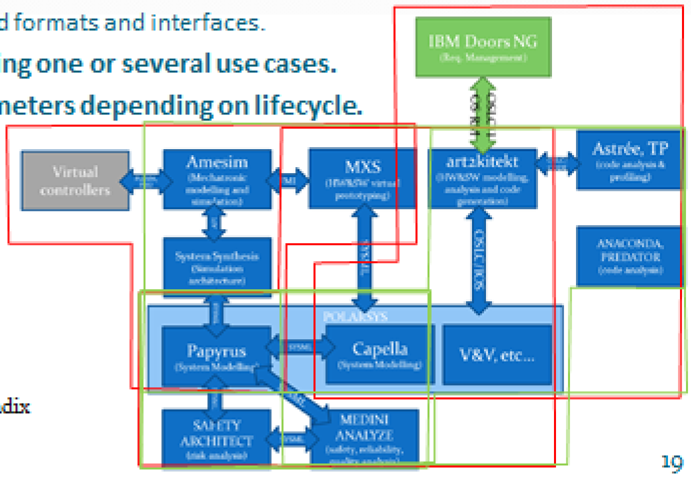
Design Tooling

- 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.



N.B. More details in appendix

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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 (Intecs)
  - Support for SysML/UML/MARTE-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 , WCET 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 in generated code to increase trust, static value analysis to quickly discover safety/security code issues, modular formal verification applicable on (sub-)systems whose (re-)analysis turns out necessary.

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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 (MTTP)
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/added views, integration of new model transformations.
AQUAS
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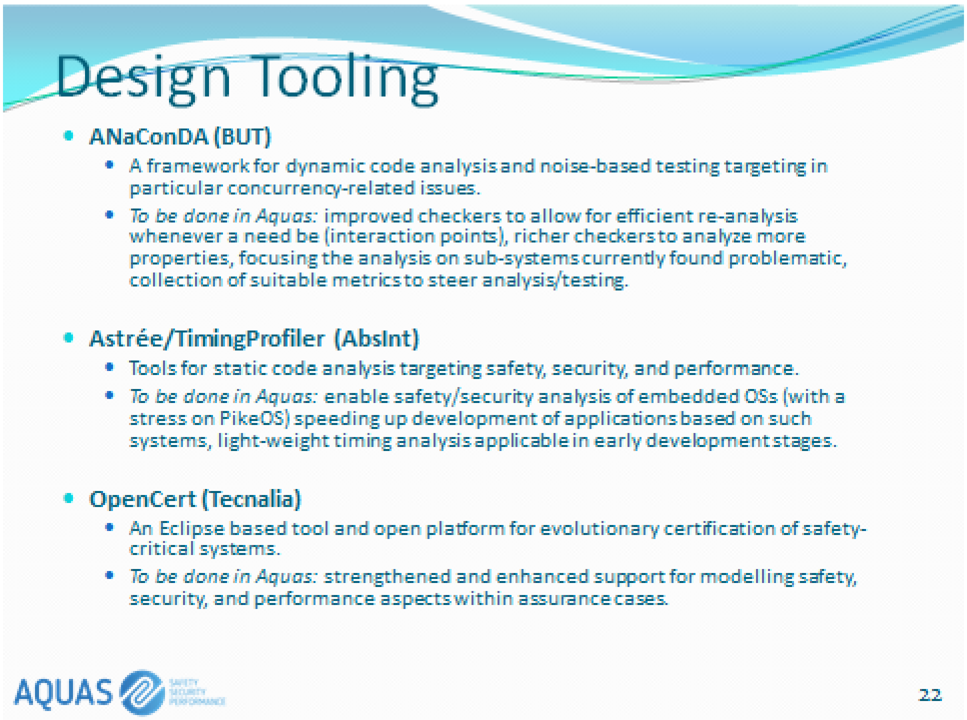
Design Tooling
ANaConDA (BUT)
A framework for dynamic code analysis and noise-based testing targeting in particular concurrency-related issues.
To be done in Aquas: improved checkers to allow for efficient re-analysis whenever a need be (interaction points), richer checkers to analyze more properties, focusing the analysis on sub-systems currently found problematic, collection of suitable metrics to steer analysis/testing.
Astrée/TimingProfiler (AbsInt)
Tools for static code analysis targeting safety, security, and performance.
To be done in Aquas: enable safety/security analysis of embedded OSs (with a 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.
AQUAS
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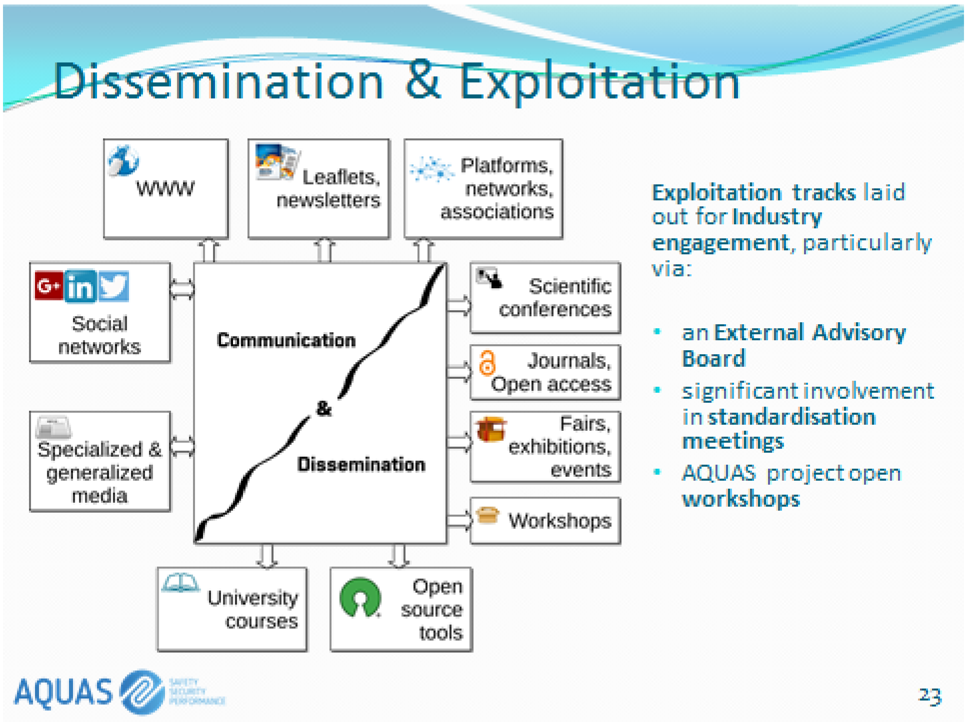
Dissemination & Exploitation
WWW
Leaflets, newsletters
Platforms, networks, associations
Social networks
Communication
&
Dissemination
Scientific conferences
Journals, Open access
Specialized & generalized media
Fairs, exhibitions, events
Workshops
University courses
Open source tools
Exploitation tracks laid out for Industry engagement, particularly via:
an External Advisory Board
significant involvement in standardisation meetings
AQUAS project open workshops
AQUAS
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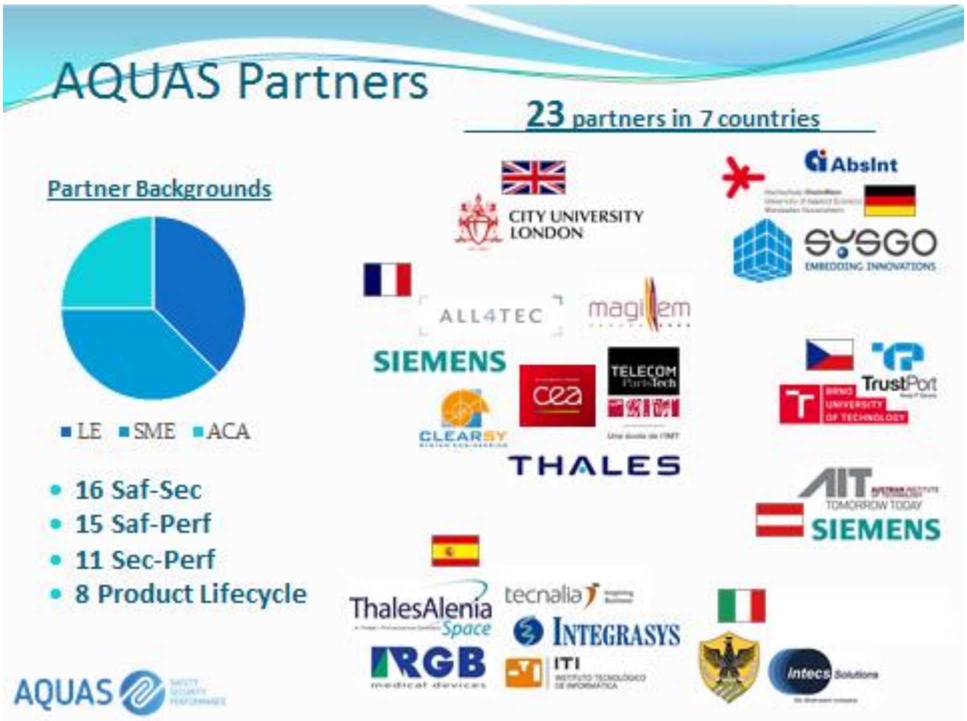
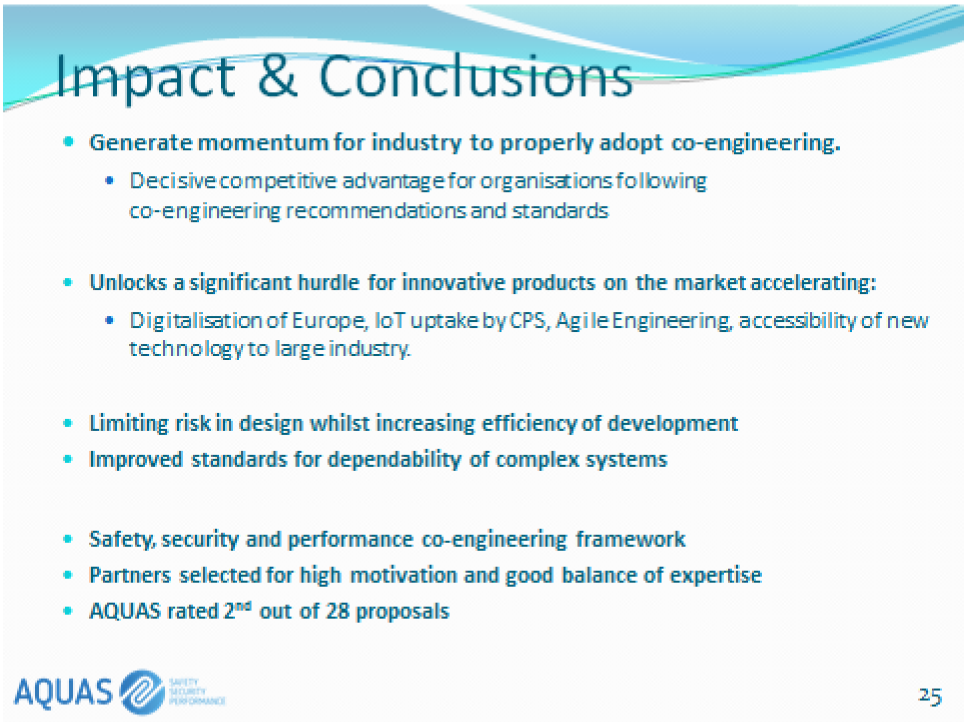
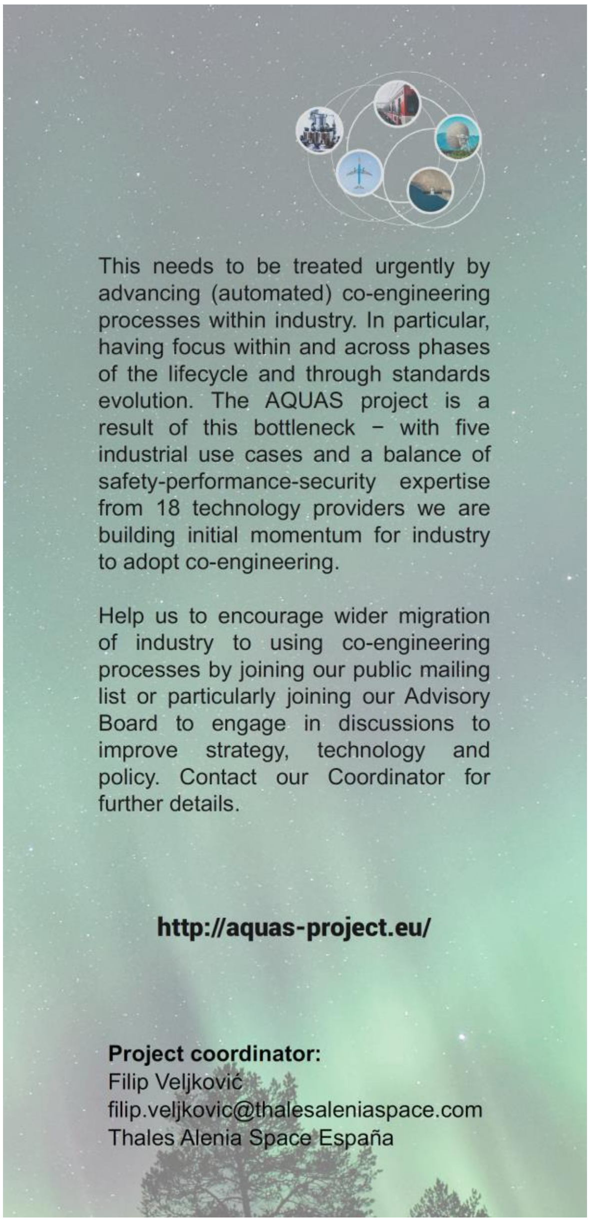

AQUAS Partners
23 partners in 7 countries
Partner Backgrounds
LE
SME
ACA
16 Saf-Sec
15 Saf-Perf
11 Sec-Perf
8 Product Lifecycle
AQUAS


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, Agile Engineering, 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
AQUAS
25


AQUAS
THANK YOU
ECSEL JU

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 2 000 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:



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.