

**ECSEL Research and Innovation actions (RIA)**



# AMASS

## **Architecture-driven, Multi-concern and Seamless Assurance and Certification of Cyber-Physical Systems**

### **Exploitation Plans and Initial Market Megatrends Analysis (a)**

#### **D8.2**

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<b>Responsible partner:</b>	R. Bi and I. Broster (RPT)
<b>Contact information:</b>	rbi@rapitasystems.com
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## Contributors

Names	Organisation
Ran Bi, Ian Broster	Rapita Systems Limited
Jose Luis de la Vara, Jose Maria Alvarez	Universidad Carlos III de Madrid
Luis Maria Alonso, Jose Miguel Fuentes	The REUSE Company
Thomas Gruber	AIT Austrian Institute of Technology GmbH
Detlef Scholle	ALTEN SVERIGE AKTIEBOLAG
Philippe Krief, Gaël, Blondelle	Eclipse Foundation Europe
Stefano Tonetta	Fondazione Bruno Kessler
Frank Badstuebner	Infineon
Silvia Mazzini	Intecs
Norbert Bartsch	Lange Aviation
Benito Caracuel	Telvent
Jiří Barnat	Masaryk University
H. Espinoza, M. Alvarez	TECNALIA Research & Innovation

## Reviewers

Names	Organisation
Jose Luis de la Vara (Peer Reviewer)	UC3
Silvia Mazzini (Peer Reviewer)	Intecs
Cristina Martínez	TECNALIA Research & Innovation



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## Executive Summary

This document, deliverable D8.2 of the AMASS project, describes (a) a review of trends and market needs that the project intends to address and (b) the exploitation strategy and plans of individual partners.

The market trend report in section 2 has been prepared by collecting and harmonizing a survey of the project partners' understanding and market information across various domains, of the trends and changes in technology and market needs. Key challenges, coming from increased complexity and functionality of Cyber-Physical Systems (CPS) and the need of efficiently reusing certification evidence, are discussed.

The AMASS initial exploitation strategy was heavily focused on the industrial partners' exploitation of their own technologies, through their introduction into commercial products or service offerings. As the project involves a number of different industry sectors and different parts of the supply chain of these industries, individual partners have then accordingly adjusted those initial exploitation plans, which are presented separately in this document.

This deliverable will be updated throughout the project in deliverables D8.3 and D8.4.



# 1. Introduction

AMASS will create and consolidate a de-facto European-wide assurance and certification open tool platform, ecosystem and self-sustainable community spanning the largest CPS vertical markets. The ultimate aim is to lower certification costs in face of rapidly changing product features and market needs. This will be achieved by establishing a novel holistic and reuse-oriented approach for architecture-driven assurance (fully compatible with standards such as AUTOSAR and IMA), multi-concern assurance (compliance demonstration, impact analyses, and compositional assurance of security and safety aspects), and for seamless interoperability between assurance/certification and engineering activities along with third-party activities (external assessments, supplier assurance).

This document is deliverable D8.2 (Exploitation Plans and Initial Market Megatrends Analysis), released by the AMASS WP8 (Exploitation, Dissemination and Standardization). This deliverable provides first draft of overall market analysis and exploitation plans. The Plan should be seen as a “living document” which needs to be updated according to the current status of the dissemination activities (T8.2) of the consortium and also the progress of technical development.

The information is collected from the consortium of AMASS and includes the understanding of the market needs and trends from each contributed partner in their domain, in section 2. The trends indicate that the project direction is valuable and that there are market opportunities for the improvement of certification and assurance activities.

The overall and individual exploitation plans in sections 3 and 4, including contributions per partner (adapted as needed for industrial vs academic needs) are explained. Each partner has defined their initial plans, and these are expected to change throughout the project as the technologies develop.

Section 5 provides a brief summary of the IPR management structure and policy.

## 2. Market Alignment and Megatrends

It is important that the research work is focused on market opportunities; this will maximize the project Return on Investment (ROI). With a strong industrial drive to the project, and supported by the scientific advice of the academic partners, each partner will contribute with its own background knowledge and ideas about where they see the market is moving and, accordingly, which the most suitable and arising opportunities for AMASS will be.

Part of the purpose of WP8 is to ensure a strong cooperation and collaboration between partners in the project, to respond to the global technological challenges. AMASS partners should contribute with their specific expertise and know-how to the joint research and development activities, and thus drive improvement of scientific and technological cooperation towards market needs.

To capture the market needs and trends, a survey has been conducted amongst all partners to determine the market needs in each relevant sector. The results of this are reported in this section. The survey shows similarities in market understanding between the project partners. These similarities are used to determine the direction of the project.

### 2.1 Market size and share

A 2013 report from a workshop on Cyber-Physical Systems<sup>1</sup> estimated the global Embedded Systems at \$850 billion. The global Aerospace, Automotive, and Medical domains were estimated at \$472 billion. Europe was estimated to produce 30% of the embedded systems, with the European share of the global Aerospace, Automotive, and Medical domains at \$141 billion. The European markets have created many employment opportunities, the auto/aero/medical/embedded domains is a current growth area with a reported increase of 50,000 jobs every year globally. Figure 1, from the report, shows the market share of the European Embedded systems markets.

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<sup>1</sup> "Cyber-Physical Systems: Uplifting Europe's Innovation Capacity", K. Rouhana; <http://ec.europa.eu/digital-agenda/en/news/report-workshop-cyber-physical-systems-uplifting-europe%E2%80%99s-innovation-capacity>



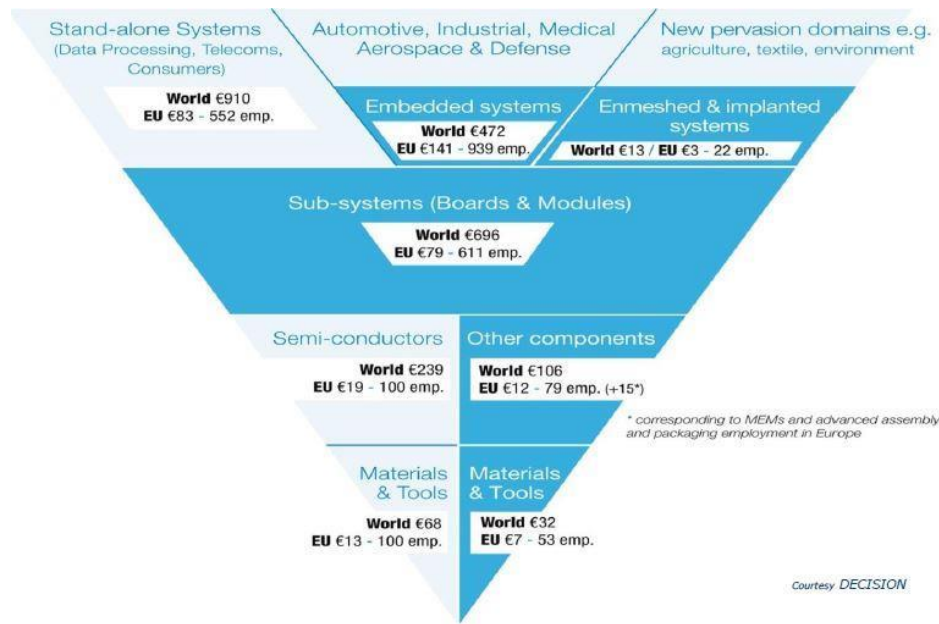


Figure 1. Embedded systems market size and European share

A summary of market research data is provided in Table 1. This data was collected from several market reports, predictions, and AMASS partners. The raw data shown in this table is available in the footnote references<sup>2</sup>.

Table 1. Trends and expectations of the industrial markets addressed by AMASS

Market	Figures	Current trends	Expectations
Industrial Automation	<ul style="list-style-type: none"> <li>• ~\$200B revenue market</li> <li>• European share ~38% of the market</li> <li>• 28.4% EU GDP</li> </ul>	<ul style="list-style-type: none"> <li>• Smart factory concept deployed</li> <li>• Growing use of computers and Industrial Internet</li> <li>• Market led by USA, but with European countries (e.g., Germany) and companies (e.g. ABB, Siemens) among the main players</li> </ul>	<ul style="list-style-type: none"> <li>• Industry 4.0</li> <li>• ~ \$250B revenues by 2018</li> <li>• Significant growth of market for sub-systems (e.g. PLC) and applications (e.g. for automotive)</li> </ul>

<sup>2</sup> Gartner: Application Development Software, 2012  
 ECSEL: Multiannual Strategic Plan, 2015  
 "Cyber-Physical Systems: Uplifting Europe's Innovation Capacity", K. Rouhana  
 ERCIM news: Trustworthy Systems of Systems: Safety & Security Co-engineering, 2015  
 Gartner: Hype Cycle for Application Development, 2015  
 Data Science Central: That's Data Science: Airbus Puts 10,000 Sensors in Every Single Wing!, 2015  
 RnR Market Research: Smart Factory Market, 2014  
 CyPhERS project: Integrated CPS Research Agenda and Recommendations for Action, 2015  
 Processit project: European Roadmap for Industrial Process Automation, 2013  
 EC: Cyber-Physical Systems: Uplifting Europe's Innovation Capacity, 2013  
 Automotive Megatrends: Automotive Cyber-Physical systems: the next computing revolution, 2014  
 ARTEMIS: Press Release Cyber-Physical Systems, 2015  
 Acatech: Living in a networked world Integrated research agenda Cyber-Physical Systems, 2015  
 CPSoS project: Core Research and Innovation Areas in Cyber-Physical Systems of Systems, 2014  
 Shea & Company: Software Development Tools Competitive Landscape and Market Trends May, 2015  
 Gov2020: Cyber-physical systems, 2014  
 Cyber Physical Systems Public Working Group: Preliminary Discussion Draft Framework for Cyber-Physical Systems, 201



<p>Automotive</p>	<ul style="list-style-type: none"> <li>• Europe: total turnover of €839B (6.9% EU GDP), 23% of worldwide car production; &gt; 20M vehicles/year</li> <li>• Automobiles: 10 million SLOC (source lines of code) and 1-10 networks</li> <li>• 75-80% functions embedded</li> </ul>	<ul style="list-style-type: none"> <li>• ISO 26262 as the functional safety standard</li> <li>• Recent issues with assurance including safety, security, reliability</li> <li>• Smart Connected Cars: intelligent sensing to include functions to increase safety</li> <li>• Connected vehicles: V2V, V2I</li> <li>• AUTOSAR as the standard architecture for new vehicles</li> </ul>	<ul style="list-style-type: none"> <li>• From 800M to 1.6B vehicles worldwide</li> <li>• Increasing complexity: hundreds of millions of SLOC and tens of internal and external networks</li> <li>• Almost every passenger vehicle sold in 2020 will have V2V systems, ultimately leading to autonomous driving</li> </ul>
<p>Railway</p>	<ul style="list-style-type: none"> <li>• In many countries, ERTMS investments have brought considerable benefits, in terms of increased capacity, maintenance costs savings, multi-supplier opportunities, reliability or speed. As demonstrated by its worldwide success, ERTMS has emerged as “the” global signalling standard.</li> <li>• Continuous communication-based signalling system, such as ERTMS, reduces the headway between trains, enabling up to 40% more capacity on currently existing infrastructure.</li> </ul>	<ul style="list-style-type: none"> <li>• ERTMS deployment. ERTMS is becoming the reference signalling system in Europe with a “Corridor approach” – whereby investments are coordinated amongst different countries.</li> <li>• Together with railway stakeholders, the European Commission has established a list of six priority Corridors for the deployment of ERTMS.</li> <li>• A European ERTMS Deployment Plan has been defined, creating a legal obligation to equip ERTMS Corridors since July 2009.</li> </ul>	<ul style="list-style-type: none"> <li>• Whilst one of the key objectives of ERTMS is to achieve interoperability on the European railway network, the standard has also been designed and is fit for use by the railways worldwide.</li> <li>• One of the key advantages of ERTMS is that it “opens” the supply market (the product may be delivered by different suppliers) and that the ERTMS suppliers represent the largest part of the global signalling market. It is expected that ERTMS will gradually become the standard of choice for an ever-growing number of railway companies worldwide.</li> </ul>
<p>Aerospace</p>	<ul style="list-style-type: none"> <li>• Thousands of sensors per aircraft.</li> <li>• 7-12% of aircraft costs are related to CPS.</li> <li>• 60-70% of avionics development costs are related to verification.</li> <li>• 75-80% functions embedded.</li> </ul>	<ul style="list-style-type: none"> <li>• Introduction of new systems and features (e.g., unmanned aerial vehicles) has increased the need for new assurance approaches.</li> <li>• Compositional development and certification (IMA) as a standardised practice.</li> <li>• Use of large and complex networks.</li> </ul>	<ul style="list-style-type: none"> <li>• Tens of thousands of sensors.</li> <li>• Air traffic will double in the next 15 years.</li> <li>• Expected demand for over 30,000 new aircraft in the next 20 years.</li> </ul>
<p>Space</p>	<ul style="list-style-type: none"> <li>• More than \$26B revenue during the next 10 years.</li> <li>• Minimum presence of CPS architectures in flight solutions.</li> <li>• New constellations market started with constellations over 600 satellites foreseen.</li> </ul>	<ul style="list-style-type: none"> <li>• Main challenges are related to the increase of performance / weight ratio, high reliability and product long life in challenging environments.</li> <li>• Certification and in-flight validation of reconfigurable HW.</li> <li>• Increase of the usage of non-Space COTS solutions.</li> <li>• Increase in the autonomous missions for science.</li> </ul>	<ul style="list-style-type: none"> <li>• In-flight reconfiguration to be extended for all domains.</li> <li>• Cost reduction of over 40% requested to maintain reliability figures for constellations.</li> <li>• Upgraded COTS to be used as main components for space solutions.</li> <li>• 2 orders of magnitude increase in data processing and data transmission needs</li> </ul>



			by 2020.
Application Development Software	<ul style="list-style-type: none"> <li>• \$10B value worldwide</li> <li>• 25% development time reduction and 40% time-to-market reduction thanks to information sharing.</li> </ul>	<ul style="list-style-type: none"> <li>• Wide variety of tools used.</li> <li>• Tool qualification as a basic need.</li> <li>• Emergence of new tools for supporting system assurance and certification activities.</li> <li>• Creation of open-source communities for building such tools.</li> <li>• Eclipse as the market leader.</li> </ul>	<ul style="list-style-type: none"> <li>• OSLC as standard tool interoperability mechanism, and development of further OSLC specifications.</li> <li>• Wider use of open-source tools.</li> <li>• Market growth because of the increasing use of software and the need to deal with increasing system complexity.</li> </ul>

Europe is a market leader for high complexity and mixed-criticality systems and controls in the Embedded automotive, industrial, medical, aerospace and health industries. These industries face a common need to produce higher reliability, dependability, mixed-criticality and production complexity in their products to maintain this competitive advantage. The main competitors to the European Embedded market are the USA and Asia.

## 2.2 Partner Survey

A survey was conducted amongst all project partners, to establish their view of the market. Partners were asked to explain the trends in the market and how they see their alignment with the trend. The AMASS consortium is a mix of industrial partners from the aerospace, rail, automotive, and industrial automation sectors, as well as leading academic partners. The consortium represents a broad group across the critical systems markets, and is composed of leading European players, combining business know-how with technical insight.

In addition, important drivers for the European embedded market have been explored, these include the need to improve time to market, improve competitiveness, and manage the trend of rising complexity in embedded software and CPS in general.

The results are collated in the following, extracting out commonalities where possible.

## 2.3 Market “Megatrends” and Needs: Survey results

### 2.3.1 Time to market & competitiveness

In an increasingly competitive market, with an ever-increasing speed of innovation, partners must pursue easier, faster, and more efficient ways to build and assure safety and security of critical systems to remain competitive. A key part of this relies on *fast and reusable certification*.

*Cost (price of product) pressures are increasing*, with new products expected to exceed current ones in both features and quality, yet without price increase. The customer expectation is that new products are incrementally built based on prior product development, despite advances in modular and off-the-shelf components. Thus, the certification/safety process of systems still struggles with the “incremental certification” issues.

### 2.3.2 Reuse challenges

The trend and need is *to increase reuse-gear development* and certification process as a major means to reduce costs. As noted above, the challenge with reuse is not necessarily with the reuse itself but with *reuse of certification and safety artefacts*, especially where artefacts are cross-domain. A safety artefact for



aerospace might not be able to be applied directly “as is” in the railway or automotive domains for example.

### 2.3.3 Open solutions & reuse

There is a trend to move from closed, proprietary systems to *more open CPS*. Open here includes: open source, open interfaces/API, and collaborative solutions from multiple partners integrated together.

Open solutions can help to provide incremental and off-the-shelf components for incremental developments. For many new technologies (cloud, big data, mapping software, Internet of Things (IoT), automotive, etc.) large actors and small start-up companies are choosing to collaborate, to share the cost of creating new platforms, in open source format, and thus to develop their products and solutions using these open source platforms.

### 2.3.4 Security

Open solutions, and particularly IoT, have created *enhanced security concerns*, stimulated by the increased communication in open networks with its associated risks of hacking, availability, and reliance on 3<sup>rd</sup> parties to support the infrastructure.

Combined safety and security engineering methods are needed and being developed. One challenge is when *safety and security are in conflict*. Safety is often achieved by simplicity, whereas security is often achieved by layers of complexity.

### 2.3.5 Rising complexity

Systems are becoming ever more complex, due to *increased customer demand for functionality, new capabilities, the expectation of increased automation, and the opportunities to introduce expert systems/intelligence within systems*.

The impact of that trend on safety-critical systems development makes it harder to ensure that software and systems are adequately tested, certified, and safe.

There is an increased *recognition of risks due to the increasing complexity*: larger code bases, more cooperating systems, and distributed/multi-core systems are simply harder to get right, and to justify their safety too.

In the aerospace industry, as a way to understand when testing is sufficient, there is an increased emphasis on coverage, especially at the integration-level. Data/control coupling coverage analysis is becoming more important, in addition to normal structural code coverage. This is due in part to complexity and in part to the increased operational testing emphasis, as required by ARP-4754A, which is now mandatory. This may propagate to other industrial domains.

Other examples where this complexity trend is having a big impact include collaborative and autonomous vehicles and distributed control systems in “Industry 4.0”, where both the level of control over testing and the number of ways for reaching a failure are growing dramatically.

### 2.3.6 New development practices

The software development process and practices are developing. New methodologies like Agile (common in many industries) are gradually making their own way into safety-critical software development. *Model-based development techniques, formal methods, object-orientation, and new simulation techniques are also increasing* and are having an impact on the way we deal with reliable software in safety-critical systems.



In the aerospace industry, there has been a *progressive reduction of the emphasis on product-specific certification, in favour of process-specific certification*. The number of experts in favour of goal-based assurance and certification in contrast to other schemes is increasing.

### **2.3.7 Automation of labour intensive activities**

Many *labour-intensive tasks are being progressively minimized through automation*. Manual activities, which may have been previously off-shored to lower labour cost countries are now increasingly being performed with tools.

The increased automation of testing processes, for example, is a major trend. Companies are investing in automation solutions so that the second and subsequent times that testing activities are performed there is a very low cost to achieve results because of the lower manual effort required. This allows re-use of testing and automatic generation of some safety/certification artefacts.

### **2.3.8 Automation of intelligent control**

New technology *applications with autonomous vehicles and intelligent functionality* in aircraft, drones, etc., interactive robotics, autonomous transport systems, IoT, massive automation, connected vehicles, aircraft navigation/planning, displays, are all leading to a stronger interplay of safety and security engineering.

One challenge that this brings is the testing and certification of autonomous behaviours. This requires new ideas, tools, methods and engineering solutions, to efficiently tackle both safety- and security-related risks within systems.

### **2.3.9 Increasing product lifespans**

In many industries, such as aerospace and railway, *the lifespan of products is long and increasing*: 30 years is typical and 30 to 50 years expected.

Given the rate at which technology is developing, tools, methods and documentation that are used for the original product need to be available throughout the product lifespan. This is so that incremental development and bug-fixes, for example, can be performed cost effectively.

### **2.3.10 Cross-domain and cross-country standardization**

To handle increased product complexity, with no extra effort, there are moves by the aerospace certification authorities, including the FAA, under "overarching properties" to further streamline the certification, and ideally to better *harmonise practices between different airworthiness authorities* - especially as there's now more commercial aviation development in Russia, China, and Japan.

### **2.3.11 Other changes in certification and safety in aerospace**

There is an *increased focus on system-level safety risk management*, allowing for reduction in regulatory oversight when data exist showing that risks are low (but see the findings of the Haddon-Cave report<sup>3</sup> into the NIMROD loss, which may be at odds with this view). Meanwhile, civil standards are increasingly being applied to military systems too. More and more projects are starting under DO-178C rather than DO-178B, and thus starting to use the associated Object-Oriented (OO) and model-based supplements.

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<sup>3</sup> [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/229037/1025.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/229037/1025.pdf)

### 3. Overall Strategy for Exploitation

The AMASS project is industrially focused so we place emphasis on the ability to take the new technologies, developed through this project, and bring them to use by the project industrial partners, supplying their respective supply chains.

The AMASS initial exploitation strategy is split into three areas:

**Industrial** exploitation:

- Mainly driven by industry partners, who have both short-term and long-term technology exploitation needs, the AMASS project will use its results, as soon as possible, in product development projects within industry partners, in order to improve existing and new products in their capability of better and more efficiently developing and certifying secure/safe large and complex composed CPS.
- Interaction between partners needs to be encouraged and facilitated, in order to exchange experience and knowledge in different business environments through complementary case studies conducted using the AMASS integrated framework.
- In the longer-term, some companies may form partnerships, and influence their customers and/or suppliers to use the AMASS Safety/Security Assurance Methodology.

Exploitation via **Community** (driven by partners active in the Eclipse Community):

- The project shall establish cooperation with other (non-project) organizations in the community, to further develop AMASS technology.
- The project shall build new technology and tools inside the community-driven framework and provide added-value and services around that core.

**Academic** exploitation (mainly driven by academic partners):

- Preparation of high quality journal and conference papers, to support own reputation and to be further used by themselves and other parties.
- Preparation of course materials, based on the project experiences and prepared textbooks (primarily the universities).
- Introduce some of the methods and tools, available for public usage, in lectures at universities, in a form of practical usage.
- Provision of consulting services (by universities) to increase their societal and economic value.



## 4. Individual Partner Exploitation Plan

This section contains an exploitation plan from each partner. Although this was written at an early stage of the project, each partner identified the way they plan to exploit the results of the project. Each partner's exploitation plan is a living document that will be maintained and updated by each partner throughout the project every 6 months.

Updating the plan is important as the technologies developed throughout the project lead to new ways and opportunities to exploit the results of the project.

### 4.1 TecNALIA Research & Innovation (TEC)

#### 4.1.1 Business Idea/Product & Services

*What does your organization expect to achieve with AMASS? How will this benefit your organization? Examples might include: new products, new services, joint/partnerships, strengthening position in market.*

TECNALIA is an applied research technological centre whose main goal has been clear from the outset: to transform knowledge into Gross Domestic Product (GDP), to improve people's quality of life, by generating business opportunities for companies.

TECNALIA aims at changing radically the ways of transforming knowledge into results. Our claim "Inspiring Business" means identifying and developing business opportunities through applied research. This is based on the four different types of activities we develop:

- Privately Funded Projects: TECNALIA is a strategic partner for the development of new products or processes, or for the improvement of existing ones. Flexible R&D&I projects that adapt to the needs of each organisation, with a clear focus towards the generation of value and the market, promoting the competitive future of businesses and society at large.
- Technology Transfer: TECNALIA VENTURES is responsible for the comprehensive commercialization of the most relevant and state-of-the-art technology developed by TECNALIA itself, in the form of intellectual property, know-how or participation in technology-based companies. An essential bridge between R&D&I and a competitive business position.
- Technological Services: Over 50 years of experience providing technological services for the evaluation and diagnosis of materials, processes, and products. We have a highly-qualified technical staff with access to extensive laboratory facilities.
- Strategic Consultancy in Technology and Innovation: Consultancy in technology-based innovation strategies, pursuing business growth and diversification. Our technological know-how allows us helping our clients in order to identify and undertake new business ideas, detecting opportunities, and transforming them into successful results.

In this sense, the exploitation of the results coming from AMASS project is oriented to the two first types of activities in list above: Privately funded projects and Technology Transfer.

By participating in AMASS, TECNALIA extends its competence in applied software service engineering. More concretely, the AMASS results will be applied in the following ways to improve our business:

- Use and adjust project results (methods and tools) to improve existing products by TECNALIA and generate new ones, to be capable of developing safety-critical systems, especially for the automotive and aeronautics sectors.
- Improve some of the products by TECNALIA in relation to the safety-assurance and certification of



embedded systems. In this sense, results from AMASS will improve OpenCert, the modular & harmonized assurance tool platform hosted at Eclipse/Polarsys. The primary goal of this tool is to provide a set of methods and tools to certify the “conformance” of development activities/artefacts to standards (with special focus on safety standards such as IEC 61508, ISO 26262, or DO-178B) or to internal company rules, without worrying about the confidence of the evidence. These methods and tools aim at reducing certification and re-certification efforts and times.

- AMASS will help the creation of new systems based on the AMASS assurance/certification concepts. These systems can be tested internally with the modelling tools and quickly validated and verified to be ready for production of small-scale products for OEM’s in the Basque Country, such as Irizar (Bus OEM) or Mercedes Benz (Vito EV model, developed in the Basque Country). Moreover, the technology behind the reconfigurable platforms will be very valuable to foster TecNALIA position in the field of software platforms, e.g. the OpenCert tool platform, improving the current solutions with input directly coming from industry.
- TECNALIA already runs a significant business in both Product and Process certification, supported by the ESI@net and ESICenter networks. TECNALIA is a world reference in Software Process Evaluation based on models such as CMMI, ISO 15504-SPICE and ITmark in all continents. The results of AMASS, in coordination with OpenCert, will help our technology transfer activities in this domain by means of improved and new services/products regarding consultancy on assurance/certification concepts for E/E products.

#### 4.1.2 Markets/Customers

*Please list the markets or customers where you intend to exploit the results from AMASS.*

Technology transfer: AMASS results could be linked to the safety-critical community to provide a mature approach for safety/security assurance, to be applied in industrial projects for avionics and automotive electronics. In Spain, this will be done in particular across TECNALIA clients, from the green car community to the aerospace pole in Seville.

Industry cooperation: participation in seminars/workgroups (LSIS, EADS workgroups, INCOSE, Certification Together community) will be a channel for a broad communication of AMASS results, and thus as a mean for sharing experience and data. TECNALIA will use this advantage on quick design and development of safety-critical systems, and the inclusion of security assurance as a proof for applying similar solutions in the context of the Automotive cluster located in the Basque Country.

The previous aspects refer to exploitation of the project results at an external level, that is, making business with other companies and entities coming from different sectors. But additionally we have the opportunity to get an internal exploitation, that is, applying the results related to methodologies and tools to improve the internal organisation development facilities for model-based development of embedded systems, and related validation & verification activities, which we are currently being performed in the Transport Business Unit.

We also plan to reinforce our “cybersecurity and safety by design” offer, by working with Schneider Electric – Spain (AMASS partner) in particular in relation to the compliance with standards of their RTU as well as in their safety-security co-assessment tool support.

#### 4.1.3 Participant Exploitation Plan

*How can you turn your ideas into reality? What steps do you need to take? How will the technologies and partnerships develop during and after the project?*





Regarding the exploitation channels, TECNALIA will use the following ones to spread the AMASS project results at an international level:

- Publication of AMASS results in prestigious international conferences and journals (such as IEEE ones).
- Use of the following Training and Consultancy Department of TECNALIA International Commercial Networks and Exploitation Channels:
  - TECNALIA delegations: Basque Country, Madrid, Barcelona, Sevilla. At the moment, TECNALIA delegations exist in Nuevo León (Mexico), Montpellier (France), Pontedera/Pisa (Italy), and Belgrade (Serbia).
  - Associated Innovation Centers: At the moment, Associated Innovation Centers exist in Cairo (Egypt), Bogota (Colombia), Sofia (Bulgaria), and Anglet (France).
  - Commercial alliances: TECNALIA is engaging in commercial alliances with locally active companies, in order to get quick access to market knowledge, increase sales of own products and services in the respective country through its partners, and start connected R&D projects with local clients, sometimes including the partner as well. The ESI@net in the area of ICT exists since 2001 and is composed of 35 partners from 20 different countries.
  - Participation in international networks: The valorisation methodologies TECNALIA uses to introduce its technological assets in international markets differ very little from the ones it is applying in its home market. The Cyber Security & Safety research group is active in several relevant international organizations.
  - Inspiring Business Forum: for the early distribution of high added-value technologies and associated business opportunities, TECNALIA has created an exclusive forum for interested companies where they get priority access to business opportunities, either detected by TECNALIA or coming from a network of international partners. The Inspiring Business Forum is in the process of being opened to companies from overseas, and TECNALIA is thinking of replicating the model with local partners in other regions of the world.
  - TECNALIA Ventures: TECNALIA can count on its own Technology Transfer Office (TECNALIA Ventures) that supports the business units in all technology transfer issues, from licensing out to the creation of spin-off companies.
  - Out-licensing of technological assets (IP): The IP produced by TECNALIA business units is licensed-out internationally to interested companies, either directly through the business units themselves or using TECNALIA's internationally active Technology Transfer Office.

#### 4.1.4 Commercial value

*Please give estimated commercial values or estimated growth in 1-2 years and 3-5 years.*

The main outcome of the AMASS project will enhance the current safety-critical systems R&D by safety assurance and certification capabilities to our offering. The return is expected to be materialised onto new co-operations and collaborations and new areas where the evolutionary and compositional certification approach, proposed in AMASS, can be adopted.

It is expected to increase our consultancy services in 1 to 2 years. We expect to increase this number thanks to the results of AMASS up to 3 consultancy services, summing up to 100.000€. This represents an increase of 50% per year over 2015. This will enable TECNALIA to recover the investment in the Project in 2019, after AMASS project termination.



The events, results and dissemination strategy, proposed in the project definition, will provide an increment in the social and networking activities of TECNALIA. This will provide an excellent value over the company research lines, towards the definition of new services for new customers, enhancing the offer in model-based development of safety-critical systems, safety assurance, and certification.

#### **4.1.5 The means by which IPR will be protected**

*How would you intend to protect IPR generated by AMASS? I.e., patent, collaboration agreement or else.*

None yet.



## 4.2 Honeywell (HON)

### 4.2.1 Business Idea/Product & Services

*What does your organization expect to achieve with AMASS? How will this benefit your organization? Examples might include: new products, new services, joint/partnerships, strengthening position in market.*

Honeywell expectation is to lower the development costs as well as the costs of poor quality by deploying AMASS results in its projects, and via a formal verification integrated tool chain.

### 4.2.2 Markets/Customers

*Please list the markets or customers where you intend to exploit the results from AMASS.*

Aerospace market in general.

### 4.2.3 Participant Exploitation Plan

*How can you turn your ideas into reality? What steps do you need to take? How will the technologies, partnerships develop during and after the project?*

The exploitation is planned as follows:

- Pilot evaluation of AMASS methods and tools in the development process of selected Honeywell projects (Control Systems, Display and Graphics, etc.).
- Pilot deployment of AMASS methods and tools, in the development process of selected Honeywell projects (Control Systems, Display and Graphics, etc.).

### 4.2.4 Commercial value

*Please give estimated commercial values or estimated growth in 1-2 years and 3-5 years.*

Short term (1-2 years): formal verification integrated tool chain should reach TRL 6 in 2016 and new low-maturity features will be added afterwards. The tools will be deployed in selected own pilot projects (Control Systems, Display and Graphics, etc.). Return on investment value is estimated to be about 2.02 just for one project in Control Systems.

Midterm (3-5 years): formal verification integrated tool chain and other AMASS results will be deployed in multiple Honeywell projects, and the savings will then be computed more precisely.

### 4.2.5 The means by which IPR will be protected

*How would you intend to protect IPR generated by AMASS? I.e., patent, collaboration agreement or else.*

The IPR is protected by consortium agreement. Non-Disclosure Agreements will be signed in case that we need to share confidential information with AMASS partners we cooperate with closely. In case of a new technology invention, a patent would be considered.



## 4.3 Schneider Electric (TLV)

### 4.3.1 Business Idea/Product & Services

*What does your organization expect to achieve with AMASS? How will this benefit your organization? Examples might include: new products, new services, joint/partnerships, strengthening position in market.*

Schneider Electric expects to integrate new safety and security methodologies and tools to its Remote Terminal Units (RTU) devices, based on the standards, such as IEC 61508 and IEC 62351. The new AMASS tool would be integrated in the design and development RTU processes, including safety and security requirements in the workflow, improving the related verification and validation, and enabling the certification in these two aspects.

### 4.3.2 Markets/Customers

*Please list the markets or customers where you intend to exploit the results from AMASS.*

Schneider Electric's exploitation plan for the project will be part of the global Smart Grid Strategy of the Company. The project results will have a direct impact in control devices (RTU) for the Smart Grid, providing solutions with new safety and security features to customers in the energy sector (Utilities).

Schneider Electric intends to exploit the project results with an international vision. The important presence of Schneider Electric in the global market will represent an excellent opportunity for exploiting the results of the project and to promote it.

### 4.3.3 Participant Exploitation Plan

*How can you turn your ideas into reality? What steps do you need to take? How will the technologies, partnerships develop during and after the project?*

Firstly, Schneider Electric will use the AMASS platform in the case study (CS1) to check its functionality for the RTU design and development process. Tecnalía, as safety expert, will participate in this case study.

After the project, the future use of AMASS platform in the internal procedures will be considered, based on the evaluation and case study results.

### 4.3.4 Commercial value

*Please give estimated commercial values or estimated growth in 1-2 years and 3-5 years.*

(1-2 years): methods and tools that are evaluated in RTU non-production environment.

(3-5 years): methods and tools that could be applied to RTU production environment.

### 4.3.5 The means by which IPR will be protected

*How would you intend to protect IPR generated by AMASS? I.e., patent, collaboration agreement or else.*

If needed, NDA could be signed to share confidential information.



## 4.4 KPIT medini Technologies AG (KMT)

### 4.4.1 Business Idea/Product & Services

*What does your organization expect to achieve with AMASS? How will this benefit your organization? Examples might include: new products, new services, joint/partnerships, strengthening position in market.*

The main business idea of KMT is to strengthen its position in the market for functional safety tool support. It is planned to extend the existing tool suite *medini analyze* with new features or new components that will be based on AMASS ideas. Focus here is on new seamless collaboration approaches, re-use of safety related information/components, and architectural patterns.

Besides the main focus on the product offerings, KMT seeks partnerships and collaborations that allow to broaden its scope towards other domains. The current focus of KMT is on the Automotive domain.

### 4.4.2 Markets/Customers

*Please list the markets or customers where you intend to exploit the results from AMASS.*

First step: Automotive OEM's, Tier suppliers and Semiconductors that deliver safety-related products.

Second step: OEM's, Tier Suppliers and Semiconductors in other domains (Industrial, Aerospace).

### 4.4.3 Participant Exploitation Plan

*How can you turn your ideas into reality? What steps do you need to take? How will the technologies, partnerships develop during and after the project?*

Results of AMASS will be further developed to achieve the appropriate maturity level and then offered to the market. Either new tools will be added to the *medini* product line, or new components will be added to existing products. The business model for the tool will be a license model with the additional charge of yearly maintenance and service fees or a subscription model. Especially with the help of seamless integration, KMT will open its target market and will significantly extend its market share. Furthermore, the large participation of industrial partners with appropriate case studies and new target domains will strengthen KMT's potential to extend its current business.

Besides the above described tool business, the consulting branch of KMT will be strengthened by new topics especially in the area of certification. This topic is becoming more and more important in the Automotive domain and, with the expertise gained in the AMASS project, KMT will be able to further extend its current business in such domain.

### 4.4.4 Commercial value

*Please give estimated commercial values or estimated growth in 1-2 years and 3-5 years.*

Commercialization will happen via tool licenses or subscription models.

Quantification is not yet possible; we need to have more detailed understanding of the product capabilities to come up with a sound price model for the licensing.



#### 4.4.5 The means by which IPR will be protected

*How would you intend to protect IPR generated by AMASS? I.e., patent, collaboration agreement or else.*

Software patents are not considered useful in Europe. Consortium agreement should be sufficient to protect knowledge.

Source Code Copyright will be protected by giving source code to notary.



## 4.5 Mälardalen University (MDH)

### 4.5.1 Business Idea/Product & Services

*What does your organization expect to achieve with AMASS? How will this benefit your organization? Examples might include: new products, new services, joint/partnerships, strengthening position in market.*

Academic achievements are counted in publications, recruitments and development of new courses. But in the long run also new project grants and industrial collaborations are inevitable prerequisites for successful academic research, thus the achievements of a good project are within all these areas.

MDH will primarily further develop its competence in the area. It is envisaged at least one promotion to associate professor, and a set of strategic recruitments of senior researchers and PhD-students to establish the knowledge field at the university. Through all of them a set of journal and conference contributions are expected.

The consortium itself represents also a base for future research activities in the area, and the partnership is expected to lead to future collaborations. The project is foreseen to support the partaking organisations, so the growth and development of the partner organisations, based on successful project efforts, is also a part of the benefit for the university, since also the collaboration opportunities will grow.

AMASS is also probably the largest European initiative in the area of Assurance and Certification of Cyber-Physical Systems, so the MDH active participation in AMASS is also expected to promote its reputation, and the contributions from MDH will promote its authority in the area.

### 4.5.2 Markets/Customers

*Please list the markets or customers where you intend to exploit the results from AMASS.*

New research collaborations, for instance with automotive and other industry in different research programs, both nationally (SSF, KKS) and internationally (ECSEL, ITEA, Horizon).

### 4.5.3 Participant Exploitation Plan

*How can you turn your ideas into reality? What steps do you need to take? How will the technologies, partnerships develop during and after the project?*

The main outcome is a result of intense academic research work. To let it take place a strong project management is needed, which includes and emphasizes the efforts of the individual project workers. Models and methods could be patentable, partnership could be strengthened and mentorship of individuals could be an efficient tool for this.

There are support structures and experience of this kind of processes at MDH. There is also other public support available, as specific public funds and agencies for innovation (Västmanlands Forskings och Utvecklingsråd, ALMI företagspartner, VINNOVA). Patenting, covering both Sweden and a European market or worldwide as well, might cost about 20,000 €.

The main research issue that MDH would like to exploit would **be the connection of the three dimensions and the model-transformation for Cross-Domain and Intra-Domain Reuse**, which in the end will allow collaborating with commercial companies to benefit from the research. The methods may be patentable and might represent a base for a new spin-off company.



#### 4.5.4 Commercial value

*Please give estimated commercial values or estimated growth in 1-2 years and 3-5 years.*

The academic value of the results would be the promotion of the individuals, and the possibility to propose new projects. The commercial value is harder for us to estimate.

#### 4.5.5 The means by which IPR will be protected

*How would you intend to protect IPR generated by AMASS? I.e., patent, collaboration agreement or else.*

For a commercialisation of the models, identification of ownership has to be done in the frame of the consortium agreement. Potential way of doing this is through establishing a spin-off company, consisting of the inventors. Another way of doing it is to let the existing business partners exploit the ideas.

For academic purposes, the most important way to protect IPR is to publish the new results. In that case collaboration agreements with specific business partners would be enough to secure the freedom to publish.

But patenting new methods could also be a way, and in the Swedish context the permanently employed researcher has the right to own the results privately, which makes the creation of a spin-off company easier.





## 4.6 Eclipse Foundation Europe (ECL)

### 4.6.1 Business Idea/Product & Services

*What does your organization expect to achieve with AMASS? How will this benefit your organization? Examples might include: new products, new services, joint/partnerships, strengthening position in market.*

By supporting the AMASS partners to publish their results in open source, the Eclipse Foundation GmbH plans to achieve the following important goals:

- Improving its Open Source technology portfolio
- Growing the ecosystem, around open source tools for Embedded Systems, in PolarSys.

The benefit for Eclipse Foundation is to recruit new members, and to provide more value to existing members thanks to a larger community.

### 4.6.2 Markets/Customers

*Please list the markets or customers where you intend to exploit the results from AMASS.*

Generally speaking, we target companies that design and develop embedded systems.

More specifically, we envision that large organizations will adopt the AMASS open platform, and leverage upon it in order to integrate assurance and certification features in their tool chains.

We also target small enterprises that assign more and more importance in the value chain and are now asked by their customers to cover more and more activities in the product lifecycle, including assurance and safety activities.

### 4.6.3 Participant Exploitation Plan

*How can you turn your ideas into reality? What steps do you need to take? How will the technologies, partnerships develop during and after the project?*

Recruiting new members for the Eclipse Foundation starts with building a community about useful and innovative open source technologies.

Concretely, the first step is to help the project partners publish their open source results, as soon as possible, in PolarSys. The first AMASS prototype will be published in the context of the CHES and OpenCert PolarSys projects.

It means that once this first prototype is available, we have two years to develop the community, and to make sure that the commitment to this community is important enough, for both project partners and adopters of AMASS, so that they will likely become members of the Eclipse Foundation in order to influence the project itself.

### 4.6.4 Commercial value

*Please give estimated commercial values or estimated growth in 1-2 years and 3-5 years.*

In terms of estimated value, the project helps retaining Eclipse Foundation members like CEA, Tecnia, Infineon, Thales, ...



It also helps us attract new members from the consortium. We expect to have at least 3 or 4 partners joining the Eclipse Foundation, as new members by the end of the project.

#### **4.6.5 The means by which IPR will be protected**

*How would you intend to protect IPR generated by AMASS? I.e., patent, collaboration agreement or else.*

Assets created or published by the Eclipse Foundation are published under the Eclipse Public License v1.0, or possibly the Creative Commons by-sa 4.0 license for documentation.



## 4.7 Infineon (IFX)

### 4.7.1 Business Idea/Product & Services

*What does your organization expect to achieve with AMASS? How will this benefit your organization? Examples might include: new products, new services, joint/partnerships, strengthening position in market.*

- Strengthen the position in Advanced Driver Assistance Systems (ADAS), towards semi and fully autonomous driving.
- Key factor is the step from fail safe to fail operational systems.

### 4.7.2 Markets/Customers

*Please list the markets or customers which you intend to exploit the results from AMASS.*

- Focus on automotive

### 4.7.3 Participant Exploitation Plan

*How can you turn your ideas into reality? What steps do you need to take? How will the technologies, partnerships develop during and after the project?*

- Project results will become integral part of future design flow.

### 4.7.4 Commercial value

*Please give estimated commercial values or estimated growth in 1-2 years and 3-5 years.*

- Primary goal is to act as door opener for new applications (towards autonomous driving).

### 4.7.5 The means by which IPR will be protected

*How would you intend to protect IPR generated by AMASS? I.e., patent, collaboration agreement or else.*

- AMASS results itself will probably be published
- Results integrated into our in-house design flow will only be available at company internal level
- No patents planned so far



## 4.8 AIT Austrian Institute of Technology GmbH (AIT)

### 4.8.1 Business Idea/Product & Services

*What does your organization expect to achieve with AMASS? How will this benefit your organization? Examples might include: new products, new services, joint/partnerships, strengthening position in market.*

AIT expects to strengthen its position in the development of safety and security related engineering methods and tools, specifically, a workflow and tool automation platform for the engineering process for safety and security assurance of critical systems. The tools and the resulting expertise will be offered to partners outside of the project, in cooperative or contracted research. Additionally, AIT will exploit the knowledge and experience gained in AMASS in the context of ISO and IEC Standardization for functional safety and cybersecurity, thus promoting recommended use of co-engineering methodologies and tools.

### 4.8.2 Markets/Customers

*Please list the markets or customers which you intend to exploit the results from AMASS.*

OEMs and suppliers for connected and safety-critical systems, in domains like automotive, railway, and industrial automation and control.

### 4.8.3 Participant Exploitation Plan

*How can you turn your ideas into reality? What steps do you need to take? How will the technologies, partnerships develop during and after the project?*

AIT thinks that, while the publically available AMASS platform is a good basis for further exploitation, all parts developed should be suitable as standalone applications, and able to cooperate with tools outside of AMASS, in order to restrict dependencies. To support the ongoing the development of tools after AMASS, open interfaces are considered valuable.

### 4.8.4 Commercial value

*Please give estimated commercial values or estimated growth in 1-2 years and 3-5 years.*

Short term (1-2 years): tools with TRL 6-7, that are evaluated in non-production environment.

Midterm (3-5 years): methods and tools that can be applied to production environment.

### 4.8.5 The means by which IPR will be protected

*How would you intend to protect IPR generated by AMASS? I.e., patent, collaboration agreement or else.*

Combination of open and closed code, with clearly defined interfaces.



## 4.9 Fondazione Bruno Kessler (FBK)

### 4.9.1 Business Idea/Product & Services

*What does your organization expect to achieve with AMASS? How will this benefit your organization? Examples might include: new products, new services, joint/partnerships, strengthening position in market.*

FBK expects: 1) to strengthen the applicability of FBK's tools in the process of development and certification of embedded systems; 2) to increase the adoption of FBK's tools by industrial partners; 3) to identify industrial needs and develop novel methods to address them. FBK would benefit in terms of visibility and new partnerships based on the AMASS results.

### 4.9.2 Markets/Customers

*Please list the markets or customers where you intend to exploit the results from AMASS.*

FBK develops analysis tools that are domain independent, but used in domains such as space, avionics, railways, automotive, health, automation control, and smart systems.

### 4.9.3 Participant Exploitation Plan

*How can you turn your ideas into reality? What steps do you need to take? How will the technologies, partnerships develop during and after the project?*

The concrete exploitation plan of FBK comprises the following steps:

- enhancement of FBK tools with new functionalities related to the architecture-driven approach
- integration of FBK tools in the architecture-driven approach of AMASS
- publications about the research results obtained in AMASS
- industrial adoption of the assurance-driven approach using FBK tools
- increase the maturity level of the FBK tools

### 4.9.4 Commercial value

*Please give estimated commercial values or estimated growth in 1-2 years and 3-5 years.*

FBK is a non-profit research organization and currently no commercial benefit is expected from the participation in AMASS.

### 4.9.5 The means by which IPR will be protected

*How would you intend to protect IPR generated by AMASS? I.e., patent, collaboration agreement or else.*

Not yet planned actions for IPR protection. Research results will be published on open access publications; contributions to the AMASS platform will be released as open source; FBK tools will be released with specific licenses.



## 4.10 Intecs (INT)

### 4.10.1 Business Idea/Product & Services

*What does your organization expect to achieve with AMASS? How will this benefit your organization? Examples might include: new products, new services, joint/partnerships, strengthening position in market.*

Intecs will use the methodological results and the acquired knowledge for increasing its technical lead and competitive edge in the AMASS core domains, and for opening up domains where architecture-driven, multi-concern, and seamless assurance and certification are essential for the development of trusted and reliable CPS and systems of systems. Intecs will therefore expand and integrate its development and consultancy portfolio in relation with best practices and standards as improved within AMASS.

Intecs has already delivered the CHES toolset as open source under the Eclipse Polarsys working group (see the CHES Project at <https://www.polarsys.org/ches/>). The Polarsys group is a new open source industry collaboration created at the Eclipse Foundation, to focus on tools for safety critical and embedded system development.

The extensions developed for CHES in AMASS will be delivered under Polarsys, as extensions to the existing CHES Project. The open source distribution of the AMASS products, specifically addressing markets of interest to Intecs, is expected to increase the company visibility, competitiveness, and returns in terms of support, training, consultancy, and customization services.

Intecs is also interested to influence the evolution of the OMG SysML<sup>®</sup> and MARTE modelling standards, according to the AMASS results.

### 4.10.2 Markets/Customers

*Please list the markets or customers where you intend to exploit the results from AMASS.*

Intecs designs and develops applications, tools, software, hardware components and products for Aerospace, Defense, Transportation, Telecommunication, and Smart Systems markets.

Intecs intends to promote the use of AMASS for the development, assurance and certification of critical systems in all these domains.

### 4.10.3 Participant Exploitation Plan

*How can you turn your ideas into reality? What steps do you need to take? How will the technologies, partnerships develop during and after the project?*

Participation in AMASS will feed directly the Intecs core competency and leadership position in embedded model-based development in the European embedded systems sector. We have a direct commercial interest in several areas, including development capability (projects with major clients including Finmeccanica in Italy), consultancy (we provide modelling consultancy to large clients in Italy), and tool offerings (we are a member of the Polarsys tool initiative).

Concrete exploitation plans for Intecs would be:

- (a) Enhancement of the CHES toolset offer with the AMASS architecture-driven, multi-concern assurance, and certification-related functions and methodology.
- (b) Industrial adoption of CHES by the end users of AMASS.



(c) Adoption of CHES and AMASS results by the Intecs internal industrial divisions, in order to increase the respective capability in systems development.

(d) Enhancement of the maturity level of CHES toolset from currently TRL 5, that is a technology validated in industrially-relevant environment, to TRL 7-8, possibly as a complete technology as successfully experimented in some operational environments.

#### **4.10.4 Commercial value**

*Please give estimated commercial values or estimated growth in 1-2 years and 3-5 years.*

Short term (1-2 years): open source availability of the integrated toolset, with improved maturity, and visibility, no direct commercial value.

Midterm (3-5 years): methods and tools to be offered for adoption by industry, we estimate the growth related to the provision of training and consultancy services.

#### **4.10.5 The means by which IPR will be protected**

*How would you intend to protect IPR generated by AMASS? I.e., patent, collaboration agreement or else.*

IPR generated by AMASS will be offered as open source, protected by the Eclipse Public License (EPL).



## 4.11 Berner & Mattner (B&M)

### 4.11.1 Business Idea/Product & Services

*What does your organization expect to achieve from AMASS? How will this benefit your organization? Examples might include: new products, new services, joint/partnerships, strengthening position in market.*

Main business idea of B&M is to strengthen its position in the market for software test and functional safety design tool support. It is planned to extend the existing tool TESTONA with new features or new components that will be based on AMASS ideas. Focus here is on new seamless collaboration approaches, re-use of safety related information/components and architectural patterns.

Besides the main focus on the product offerings, B&M seeks partnerships and collaborations that allow broadening its scope towards other domains. The current focus of B&M is on the Automotive domain.

### 4.11.2 Markets/Customers

*Please list the markets or customers which you intend to exploit the results from AMASS.*

First step: Automotive OEMs, Tier suppliers and Semiconductors that deliver safety related products.

Second step: OEMs, Tier Suppliers and Semiconductors in other domains (Industrial, Aerospace).

### 4.11.3 Participant Exploitation Plan

*How can you turn your ideas into reality? What steps do you need to take? How will the technologies, partnerships develop during and after the project?*

Results of AMASS will be further developed to achieve the appropriate maturity level and then offered to the market. Either new tools will be added to the B&M product portfolio or new components will be added to the existing products (TESTONA, MERAN, MODICA ...). The business model for the tools will be a license model with the additional charge of yearly maintenance and service fees or a subscription model. Especially with the help of seamless integration B&M will open its target market and will significantly extend its market share. Furthermore, the highly participation of industrial partners with appropriate case studies and new target domains will strengthen B&M's potential to extend its current business.

Besides the above described tool business, the consulting branch of B&M will be strengthened by new topics especially in the area of certification. This topic becomes more and more important in the Automotive domain and with the expertise gained in the AMASS project, B&M will be able to extend its current business here.

### 4.11.4 Commercial value

*Please give estimated commercial values or estimated growth in 1-2 years and 3-5 years.*

Commercialization will happen via tool licenses or subscription models. Quantification not yet possible – need to have more detailed understanding of the product capabilities to come up with a sound price model for the licensing.





#### 4.11.5 The means by which IPR will be protected

*How would you intend to protect IPR generated by AMASS? I.e., patent, collaboration agreement or else.*

Software patents are not considered useful in Europe. Consortium agreement should be sufficient to protect the knowledge.

Source Code Copyright will be protected by giving source code to notary.



## 4.12 GMV Aerospace and Defence, S.A.U. (GMV)

### 4.12.1 Business Idea/Product & Services

*What does your organization expect to achieve with AMASS? How will this benefit your organization? Examples might include: new products, new services, joint/partnerships, strengthening position in market.*

By using the AMASS methodology and tools, GMV aims at reducing the development life-cycle key parameters (i.e., time and effort) and, at the same time, improving safety and qualification processes of space operational projects.

### 4.12.2 Markets/Customers

*Please list the markets or customers where you intend to exploit the results from AMASS.*

Space domain (embedded critical software) / mainly for the European Space Agency (ESA).

### 4.12.3 Participant Exploitation Plan

*How can you turn your ideas into reality? What steps do you need to take? How will the technologies, partnerships develop during and after the project?*

Firstly, GMV will apply the AMASS methods and tools in R&D studies to check its applicability in the space domain. Subsequently, it is foreseen to use the AMASS framework in small operational projects.

### 4.12.4 Commercial value

*Please give estimated commercial values or estimated growth in 1-2 years and 3-5 years.*

1-2 years: GMV will assess the AMASS results in R&D studies in the space domain.

3-5 years: GMV will apply the AMASS framework in small operational projects.

### 4.12.5 The means by which IPR will be protected

*How would you intend to protect IPR generated by AMASS? I.e., patent, collaboration agreement or else.*

If needed, NDA could be signed to share confidential information.

GMV does not develop any product. No patents will be generated.

## 4.13 RINA (RIN)

### 4.13.1 Business Idea/Product & Services

*What does your organization expect to achieve with AMASS? How will this benefit your organization? Examples might include: new products, new services, joint/partnerships, strengthening position in market.*

RINA Services, as Notified Body no. 0474, expects to widen its experience in assessment of safety and compliance to various European standards in the railway domain, and in other sectors. Furthermore, RINA Services main activity in the project aims at developing a model of specific functions, as defined in the System Requirements Specification of European Rail Traffic Management Systems (ERTMS/ETCS), UNISIG SUBSET-026, for use in the laboratory test activities and the certification processes.

### 4.13.2 Markets/Customers

*Please list the markets or customers where you intend to exploit the results from AMASS.*

Railway domain in general, especially in the field of ERTMS/ETCS laboratory tests and certification processes.

### 4.13.3 Participant Exploitation Plan

*How can you turn your ideas into reality? What steps do you need to take? How will the technologies, partnerships develop during and after the project?*

RINA Services aims at applying the methods and tools that are going to be created in AMASS, in particular in WP3, in the System Requirements Specification of ERTMS/ETCS, UNISIG SUBSET-026, as an example that could show the implementation in the railway ERTMS/ETCS domain of the architecture-driven approach developed in AMASS itself.

### 4.13.4 Commercial value

*Please give estimated commercial values or estimated growth in 1-2 years and 3-5 years.*

1-2 years: RINA will assess the AMASS results.

3-5 years: RINA will apply the AMASS results in the laboratory tests, and in the definition and reviewing of the ETCS on-board subsystem tests specifications.

### 4.13.5 The means by which IPR will be protected

*How would you intend to protect IPR generated by AMASS? I.e., patent, collaboration agreement or else.*

Not yet planned actions for IPR protection.



## 4.14 Thales Alenia Space (TAS)

### 4.14.1 Business Idea/Product & Services

*What does your organization expect to achieve with AMASS? How will this benefit your organization? Examples might include: new products, new services, joint/partnerships, strengthening position in market.*

The main objective is to reduce the time of certification and re-certification of code and architectures, without repeating the whole process every time.

One of the most relevant improvements will be the on-board re-validation and re-certification of configurable FPGAs.

### 4.14.2 Markets/Customers

*Please list the markets or customers where you intend to exploit the results from AMASS.*

The main customer will be other parts of Thales, including TAS-E (España), and the advantage that this will cause in the offers TAS-E presents.

### 4.14.3 Participant Exploitation Plan

*How can you turn your ideas into reality? What steps do you need to take? How will the technologies, partnerships develop during and after the project?*

Plans depend on that are proved and accepted by the space industry and the space government divisions. Clear stating our requirements, constraints and our problems to the AMASS tool developers to support their development of tooling is the best approach.

### 4.14.4 Commercial value

*Please give estimated commercial values or estimated growth in 1-2 years and 3-5 years.*

With the AMASS tool developed and validated the number of acquired contracts will likely increase, with the consequent growth of the company, and with best profiting of the human resources, due to the longer time available in favour of other activities, instead of being involved in repetitive tasks, such as re-certification and re-validation.

### 4.14.5 The means by which IPR will be protected

*How would you intend to protect IPR generated by AMASS? I.e., patent, collaboration agreement or else.*

Patent or collaboration agreement.



## 4.15 Universidad Carlos III de Madrid (UC3)

### 4.15.1 Business Idea/Product & Services

*What does your organization expect to achieve with AMASS? How will this benefit your organization? Examples might include: new products, new services, joint/partnerships, strengthening position in market.*

As an academic partner, UC3 will exploit its participation in AMASS for improving and extending its current activities on education, research, and technology transfer. In more specific terms, UC3 exploitation will focus on the following aspects:

- Education of a PhD student and a Postdoctoral Fellow
- Education of Bachelor's and Master's students through theses on AMASS-related topics
- Presentation of AMASS ideas and results in UC3 courses
- Use of AMASS methods and tools in the laboratory sessions of some UC3 course
- Publication of high-quality scientific papers from AMASS results
- Contribution to the AMASS results targeted at being released as open-source technologies (e.g., in Polarsys)
- Establishment of a community of AMASS results' potential users in UC3 industry network (Airbus, Chrysler, Daimler...)
- Participation in the activities related to AMASS Advisory Board
- Preparation of at least 2 scientific publications with researchers that are not part of the AMASS consortium
- Standardization of AMASS results through UC3 activity at INCOSE, OMG, and OSLC
- Acquisition of new knowledge and expertise in assurance and certification of CPS that could lead to the participation in new project proposals at European or national level
- Possibility of providing AMASS-based products and services based to local companies, via technology transfer contracts

Dealing with this set of aspects will ultimately allow UC3 to extend its competence on assurance and certification of critical systems, to establish new links with other organizations on this topic (which can lead to further collaboration in the future), and to gain recognition as a top academic institution in the area.

### 4.15.2 Markets/Customers

*Please list the markets or customers where you intend to exploit the results from AMASS.*

Since UC3 is an academic institution, its main market and customers correspond to:

- Students, who can acquire AMASS-related knowledge through the presentation of project information and results to them, and through the work on thesis (PhD, MSc, and BSc) on topics related to the project.
- Research community, which can gain new knowledge and identify new research gaps to fill as a result of the publication of the AMASS results that UC3 produces and (1) reports on scientific papers and (2) presents at conferences and workshops. Members of the research community could further collaborate with UC3 in the future. This could result in a mutual benefit, via e.g. the exchange of knowledge and expertise and the joint preparation of research project proposals.
- Standardisation organisations, to which AMASS results could be transferred in the form of either proposals of new international standards, or recommendations, specifications, and modifications of existing ones.
- Companies, with which technology transfer contracts might be signed based on AMASS results. The



companies can belong to any application domain in which CPSs are used.

### 4.15.3 Participant Exploitation Plan

*How can you turn your ideas into reality? What steps do you need to take? How will the technologies, partnerships develop during and after the project?*

UC3 will use different means for fulfilling its exploitation plans. The main ones will be (1) the use of AMASS information and results for students' training, (2) the publication and presentation of AMASS results at different research venues and industry-oriented ones, and (3) the participation in new project proposals that relate to AMASS and that could address AMASS-sibling areas not directly or sufficiently addressed in AMASS itself.

Once AMASS completes, UC3 will continue using the above means to exploit the project results.

### 4.15.4 Commercial value

*Please give estimated commercial values or estimated growth in 1-2 years and 3-5 years.*

UC3 cannot provide an accurate estimated commercial value from the exploitation of AMASS results. It is an academic non-profit organization, and currently no commercial benefit is expected from the participation in AMASS.

Regarding growth, the UC3 research group involved in AMASS (Knowledge Reuse Group; Computer Science Department) expects that at least 1 Postdoctoral Fellow, 1 PhD student, 3 MSs students, and 6 BSc students will work on AMASS-related topics, and become members of the group during the project.

### 4.15.5 The means by which IPR will be protected

*How would you intend to protect IPR generated by AMASS? I.e., patent, collaboration agreement or else.*

No specific means are planned to be used at UC3 for IP protection. As a rule of thumb, the AMASS results that UC3 produces will be open. Open access will be provided to their publication, most AMASS deliverables to which UC3 contributes are public, and the implemented software will most likely be delivered to the AMASS open-source community. Authorship and copyrights are already handled in these results, with no extra action, e.g. authorship recognition and copyright management by the publisher for the publications.



## 4.16 Rapita Systems (RPT)

### 4.16.1 Business Idea/Product & Services

*What does your organization expect to achieve with AMASS? How will this benefit your organization? Examples might include: new products, new services, joint/partnerships, strengthening position in market.*

We plan that AMASS will provide Rapita with the following innovations:

1. RapiTest. Rapita is building a new product called “RapiTest Framework” that will provide our customers with the capability to reduce their test and certification costs. RapiTest is designed to drive inefficiencies out of low-level testing in large projects, thereby reducing costs and eliminating unnecessary delays in the testing process. Several key features of RapiTest Framework are being developed during AMASS, including specific language support. This will benefit Rapita by enlarging the market size and applicability of the product. Our customers will benefit by reducing testing costs through use of RapiTest.
2. Automated Qualification Data. Crucial to both RapiTest and our other products is the ability to quickly and automatically produce qualification documentation and tests that our customers can use directly. Through AMASS, Rapita is developing a new way of creating qualification data for DO-178C. This will eventually allow Rapita to reduce the cost of producing qualification data for different software versions.
3. Tool integrations: our products will benefit from tool integrations with a number of related tools, including DOORS (requirements traceability), Mx-Suite (system-level test), and possibly others.
4. On-target seamless integration. Our work in AMASS includes building new ways of integrating verification software within our customers’ systems. A new product feature will enable faster and easier integration, reducing costs of adopting tooling.

### 4.16.2 Markets/Customers

*Please list the markets or customers where you intend to exploit the results from AMASS.*

The target market is avionics suppliers providing DO-178C, assurance level A-C software systems, primarily Tier1 suppliers. Certification and qualification of systems and the tools used to produce them is vital in this market. RapiTest is designed to reduce the manual effort for certification and test of large projects, thereby reducing costs and eliminating delays in the verification process. Within this market, both “new project” and “legacy systems” are relevant opportunities, both in Europe and exporting to the US market.

### 4.16.3 Participant Exploitation Plan

*How can you turn your ideas into reality? What steps do you need to take? How will the technologies, partnerships develop during and after the project?*

- Rapita will add new AMASS-supported features to RapiTest Framework, bringing them to market as fast as they are available. The RapiTest roadmap of features extends well beyond its status today, with much R&D still required.
- As a new product, a fast release cycle is required, allowing us to support our customers’ certification/testing needs. Therefore, bringing the automatic qualification kit generation into a commercial state will be an important step in achieving impact. Rapita plans to roll out the first qualification data for RapiTest using a new framework, which will then be evaluated and improved as necessary.
- The marketing of the product will be accelerated, including promotion of its qualification data and



ease of integration.

- Support for tool integration with products like Mx-Suite and DOORS will open opportunities for partnership and joint exploitation opportunities.
- Rapita also plans to create a new service offering, based around own tools, and providing testing services for our customers.

#### 4.16.4 Commercial value

*Please give estimated commercial values or estimated growth in 1-2 years and 3-5 years.*

- Rapita will primarily benefit from the results of AMASS by generating more licence sales of RapiTest Framework and the qualification kit.
- The market opportunity is growing as software systems get more complex and harder to certify. Therefore, innovations to reduce our customers cost of test/certification have high value. For example, if RapiTest can reduce the cost of testing by 30% then for a large avionics project, where the cost of test is many millions, then this represents both a significant saving for the customer and significant revenue in licences and services for Rapita.
- RapiTest is expected to be licensed to large suppliers over the next few years; and along with value-add services such as integration and tool qualification, the company is expecting a return on investment within 2 years after termination of AMASS project, with revenue growth of 30%/year for the subsequent 3-5 years.

#### 4.16.5 The means by which IPR will be protected

*How would you intend to protect IPR generated by AMASS? I.e., patent, collaboration agreement or else.*

There are a number of different innovations in RapiTest Framework, which may need different types of protection. In general, the proprietary source code will be confidential and the knowledge and skills needed to replicate the product are hard to reproduce. Patents may be investigated for specific components if necessary.





## 4.17 The REUSE company (TRC)

### 4.17.1 Business Idea/Product & Services

*What does your organization expect to achieve with AMASS? How will this benefit your organization? Examples might include: new products, new services, joint/partnerships, strengthening position in market.*

The REUSE Company expects to exploit AMASS results in different aspects:

- R&D Acceleration: Improve its tools and open/interconnect them with existing tools, and methodologies within the engineering ecosystem.
- Stronger market position: raise awareness of TRC as a tool vendor in companies working with systems engineering methodologies about TRC offers to improve their products and processes. This mutual knowledge can be turned into partnerships with other companies, or generate a new customer for TRC. Thus, improving TRC position in the market.
- Standardization: Participate in the standardization (definition of the standards) around Knowledge Engineering activities, which are the core of TRC business.
- Synergies: generate synergies, both technical and commercial, with other tool implementers within the AMASS consortium.

### 4.17.2 Markets/Customers

*Please list the markets or customers where you intend to exploit the results from AMASS.*

- Quality Assessment Market for:
  - Requirements
  - Models
  - Etc.
- Industrial domains:
  - Aerospace
  - Automotive
  - Railway
  - Healthcare

### 4.17.3 Participant Exploitation Plan

*How can you turn your ideas into reality? What steps do you need to take? How will the technologies, partnerships develop during and after the project?*

With the envisioned improvements, TRC plans to consolidate its current customer base in the aerospace industry and make progress in others, such as automotive and railway. This will be done by offering them new capabilities to manage and create new evidences for certification processes.

These ideas will be included in our commercial products and they will represent the basis of the upcoming TRC tools releases.

Finally, we aim to gain either technical or commercial synergies with the other partners in the consortium.

### 4.17.4 Commercial value

*Please give estimated commercial values or estimated growth in 1-2 years and 3-5 years.*



The estimated growth for:

- Period 1-2 years: no new revenues from AMASS-derived products
- Period 3-5 years: starting with 5% in the 3<sup>rd</sup> year and ending in 10% at the end of the 5<sup>th</sup> year

#### **4.17.5 The means by which IPR will be protected**

*How would you intend to protect IPR generated by AMASS? I.e., patent, collaboration agreement or else.*

The IPR is protected by consortium agreement.

Non-Disclosure Agreements will be signed in case that we need to share confidential information with AMASS partners that we cooperate with closely.

We plan to protect our new features IPR by means of patent application.



## 4.18 OHB Sweden AB (OHB)

### 4.18.1 Business Idea/Product & Services

*What does your organization expect to achieve with AMASS? How will this benefit your organization? Examples might include: new products, new services, joint/partnerships, strengthening position in market.*

The development of critical on-board software applications such as Attitude and Orbit Control Systems (AOCS) is continuously becoming more complex as space missions become more autonomous. At the same time, it is expected that the pressure on budget and schedule will continue to increase such that the demand for efficient software development, still ensuring dependability and safety, will increase.

Within the AMASS projects, OHB expects to improve the engineering process of developing safety-critical systems for Space. This means making the engineering process more cost-effective without affecting quality. This will be crucial for future development of AOCS software in the telecom satellite programmes.

### 4.18.2 Markets/Customers

*Please list the markets or customers which you intend to exploit the results from AMASS.*

- ESA ARTES 33 program (Electra primary)
- Space market in general

### 4.18.3 Participant Exploitation Plan

*How can you turn your ideas into reality? What steps do you need to take? How will the technologies, partnerships develop during and after the project?*

Exploitation Plan:

- Evaluation of tools and methods provided by the AMASS framework, with the aim to create seamless integrated tool-chain to semi-automated evidence management and quality assurance activities. Additionally identification of methods to support identification of reusable components and generation of reuse-files.
- Dry run of the selected tools and methods within the Electra project.
- Compare result of using AMASS framework to results from original project to measure the effect on cost and quality.

### 4.18.4 Commercial value

*Please give estimated commercial values or estimated growth in 1-2 years and 3-5 years.*

Short term 1-2 years: Seamless integrated tool chain and methods for identification of reusable components is considered successful and the software engineering process is updated to describe these improvements. The engineering process is applied in selected OHB Sweden projects.

Long term 3-5 years: OHB Sweden has the objective of reducing the cost of developing safety critical systems, but without affecting its quality, and therefore establishing itself in a stronger position on the Space market.



#### **4.18.5 The means by which IPR will be protected**

*How would you intend to protect IPR generated by AMASS? I.e., patent, collaboration agreement or else.*

The IPR is protected by consortium agreement. Non-Disclosure Agreements will be signed in case that we need to share confidential information with AMASS partners that we cooperate with closely. In case of a new technology invention, the patent would be filled.



## 4.19 Masaryk University (UOM)

### 4.19.1 Business Idea/Product & Services

*What does your organization expect to achieve with AMASS? How will this benefit your organization? Examples might include: new products, new services, joint/partnerships, strengthening position in market.*

Partnership with Honeywell International, co-operation on integration of tool for system verification and requirements engineering into industrial tool chain. Industrial relevant benchmarks. Extended integration into AMASS-based tool chain, hence, partnerships with other AMASS partners.

### 4.19.2 Markets/Customers

*Please list the markets or customers where you intend to exploit the results from AMASS.*

Academic and Research.

### 4.19.3 Participant Exploitation Plan

*How can you turn your ideas into reality? What steps do you need to take? How will the technologies, partnerships develop during and after the project?*

Joint effort on tool integration, maintenance and tool support will persist once AMASS project terminates, and so the cooperation.

### 4.19.4 Commercial value

*Please give estimated commercial values or estimated growth in 1-2 years and 3-5 years.*

Although it is hard to value such things financial, the open source tool supports the university, its research and reputation.

### 4.19.5 The means by which IPR will be protected

*How would you intend to protect IPR generated by AMASS? I.e., patent, collaboration agreement or else.*

Our tool is open source, and we do not propose particular protection is required.



## **4.20 AVL List GmhH (AVL)**

AVL partner has left the AMASS consortium.



## 4.21 Kompetenzzentrum – Das virtuelle Fahrzeug Forschungsgesellschaft mbH (ViF)

### 4.21.1 Business Idea/Product & Services

*What does your organization expect to achieve with AMASS? How will this benefit your organization? Examples might include: new products, new services, joint/partnerships, strengthening position in market.*

ViF expects to strengthen its position in the development of safety- and security-related engineering methods for model-based System, Safety, and Security Engineering, and for Safety and Security Analysis, Failure Mode Effects Analysis.

### 4.21.2 Markets/Customers

*Please list the markets or customers which you intend to exploit the results from AMASS.*

OEMs and suppliers of safety- and security-critical systems in the automotive domain.

### 4.21.3 Participant Exploitation Plan

*How can you turn your ideas into reality? What steps do you need to take? How will the technologies, partnerships develop during and after the project?*

- Publishing and presenting results in both research and industry-oriented venues.
- Be active in preparing new project proposals, where AMASS results are used.
- Integrate results and knowledge, as generated by the project, in customer projects.
- Cooperation and interchange of results with other research projects.

### 4.21.4 Commercial value

*Please give estimated commercial values or estimated growth in 1-2 years and 3-5 years.*

Short term (1-2 years): Use of the AMASS results in R&D studies in the automotive domain.

Midterm (3-5 years): Use of the AMASS results in customer projects in the automotive domain.

### 4.21.5 The means by which IPR will be protected

*How would you intend to protect IPR generated by AMASS? I.e., patent, collaboration agreement or else.*

To be confirmed.



## 4.22 Alliance pour les technologies de l'Informatique (A4T)

### 4.22.1 Business Idea/Product & Services

*What does your organization expect to achieve with AMASS? How will this benefit your organization? Examples might include: new products, new services, joint/partnerships, strengthening position in market.*

A4T intends to strengthen its methodology and tool solution in Safety and security, and to combine other concerns such as availability or performance. Moreover, A4T intends to work on innovative solutions for multi-concern assurance, and to develop possible partnerships with AMASS partners such as KMT and AIT.

### 4.22.2 Markets/Customers

*Please list the markets or customers where you intend to exploit the results from AMASS.*

A4T is planning to target Safety and Security co-engineering tool market, by acquiring new costumers and augmenting market share in different domains.

### 4.22.3 Participant Exploitation Plan

*How can you turn your ideas into reality? What steps do you need to take? How will the technologies, partnerships develop during and after the project?*

A4T will define a methodology that corresponds to the AMASS needs and then propose a tool solution that will be integrated as a pilot implementation during the project. At project completion, the implemented solution will be further developed in order to support future needs of commercial users.

### 4.22.4 Commercial value

*Please give estimated commercial values or estimated growth in 1-2 years and 3-5 years.*

In short term (1-2 years) use of AMASS at research level and develop possible collaboration with AMASS partners.

In long term (3-5 years) increase Safety and security tool market shares in all domains and get new customers in multi-concern Assessment with co-engineering tool.

### 4.22.5 The means by which IPR will be protected

*How would you intend to protect IPR generated by AMASS? I.e., patent, collaboration agreement or else.*

The IPR generated by AMASS is protected by the consortium agreement and may be licensed to other partners.





## 4.23 COMMISARIAT A L'ENERGIE ATOMIQUE ET AUX ENERGIES ALTERNATIVES (CEA)

### 4.23.1 Business Idea/Product & Services

*What does your organization expect to achieve with AMASS? How will this benefit your organization? Examples might include: new products, new services, joint/partnerships, strengthening position in market.*

CEA LIST is a public research institute focused on the development of software and hardware technologies for complex systems in various domains (transport, energy, robotics, etc.).

In AMASS, CEA LIST focuses on two, out of its areas of expertise:

1. "Safety and Security by Design", covering system modelling, architecture design and analysis, including issues on safety, security and risk assessment, with regards to performance criteria.
2. "Safety and Security Verification", covering code analysis and code properties checking, in order to identify vulnerabilities in critical code via the production of correction evidences.

For CEA, the AMASS project represents an opportunity to increase the level of maturity and confidence in its offer on safety- and security-oriented design and verification tools, which are respectively Papyrus/Sophia and Frama-C. The expertise of CEA, already established in the field of critical industrial systems, will thus result strengthened. CEA aims at allowing non-experts of these issues to appropriate norms, standards, and reference practices.

The gained expertise in the project will help enforcing CEA involvement in standardization actions within the Object Management Group (OMG) organization, and extending its role in the Eclipse and Polarsys communities with its open-source strategy, by increasing the distribution of its tooling.

CEA has an important industrial transfer activity, and expects to strengthen its existing collaboration with A4T partner and increase the number of collaborations with industry actors and SME's, thanks to the AMASS project results.

Finally, CEA expects to improve its educational offer, on safety and security by design, for master and PhD students, as well as to propose new training services for companies.

### 4.23.2 Markets/Customers

*Please list the markets or customers where you intend to exploit the results from AMASS.*

- Transfer activity in favour of industries from various domains (railway, automotive, avionics, internet-of-things, manufacturing, etc.), by developing safety- and security-critical systems.
- Education activity, by proposing new courses and trainings on safety and security co-engineering for Universities, Engineering Schools, and Companies.

### 4.23.3 Participant Exploitation Plan

*How can you turn your ideas into reality? What steps do you need to take? How will the technologies, partnerships develop during and after the project?*

By working on the railway use case, CEA expects to develop a tight collaboration with ClearSy, by achieving a suitable tooling platform and methodology for the railway domain, from model to code together with Papyrus and Frama-C tools.



CEA has interest in developing collaboration with Tecnia for developing a seamless integration between Papyrus and OpenCert platforms.

CEA will further take advantage from the fact that Papyrus is a building block of the AMASS Core platform to develop interfaces to cooperate with external tools, as proposed in the AMASS platform, and with other tools connected via OSLC/transformation mechanisms.

In order to increase the visibility of AMASS platform tooling and methodological results, CEA LIST will conduct dissemination activities in national and international conferences, exhibitions, and symposiums. Demonstrations at CEA internal and external industrial events will be a vehicle for advertising and building new industrial collaborations.

#### 4.23.4 Commercial value

*Please give estimated commercial values or estimated growth in 1-2 years and 3-5 years.*

In 1-2 years, AMASS project will increase and demonstrate the maturity of CEA safety and security platform both on the design phase (Papyrus/Sophia) and verification phase (Frama-C).

In 3-5 years, through its industrial transfer activity and thanks to AMASS results, CEA expects to develop new direct collaborations with industrial partners in the railway domain, and to increase its number of collaborations in automotive and avionics domains.

Moreover, CEA expects to strengthen its partnership with A4T partner on Safety and Security by design, by providing complementary and joint research, development, and consultancy services.

#### 4.23.5 The means by which IPR will be protected

*How would you intend to protect IPR generated by AMASS? I.e., patent, collaboration agreement or else.*

To be confirmed.



## 4.24 CLEARSY SAS (CLS)

### 4.24.1 Business Idea/Product & Services

*What does your organization expect to achieve with AMASS? How will this benefit your organization? Examples might include: new products, new services, joint/partnerships, strengthening position in market.*

The results from AMASS are expected to reduce the development effort and time-to-market for safety critical systems development. ClearSy develops for the railways (signalling systems). They will naturally improve our competitiveness on this market and we forecast a growth of our activity as a direct outcome of the project.

### 4.24.2 Markets/Customers

*Please list the markets or customers where you intend to exploit the results from AMASS.*

The results from AMASS are expected to contribute to the market of safety critical systems for the Railways (signalling systems). Potential customers are train manufacturers (Alstom, Bombardier, Siemens) and metro/main lines operating organisations (RATP, SNCF, Metro, etc.)

### 4.24.3 Participant Exploitation Plan

*How can you turn your ideas into reality? What steps do you need to take? How will the technologies, partnerships develop during and after the project?*

The results from AMASS are expected to improve our existing development cycle, by strengthening it locally (improved level of confidence of several technical/assurance aspects).

Experiments will be conducted a posteriori on past developments. Based on feedback collected, AMASS technologies are intended to be applied on on-going projects. Some technologies adjustments are expected to ease their integration into existing development flow.

### 4.24.4 Commercial value

*Please give estimated commercial values or estimated growth in 1-2 years and 3-5 years.*

The results from AMASS are expected to:

- provide a growth of 500k€ per year during their deployment (1-2 years)
- provide a growth of 1M€ per year during their exploitation (3-5 years)

### 4.24.5 The means by which IPR will be protected

*How would you intend to protect IPR generated by AMASS? I.e., patent, collaboration agreement or else.*

As a SME, ClearSy rarely protects its assets with patents (some of our products are copied and we need to run faster than our competitors). The results of AMASS will be seamlessly integrated to our existing assets.

No specific collaboration is yet planned.



## 4.25 ALTEN SVERIGE AKTIEBOLAG (ALT)

### 4.25.1 Business Idea/Product & Services

*What does your organization expect to achieve with AMASS? How will this benefit your organization? Examples might include: new products, new services, joint/partnerships, strengthening position in market.*

The expectation from ALTEN on the project is to provide methods and tools for safety product development. Today the work is a very complex work from proving heavy load on all stakeholders of the work. The assurance procedure is also from a software perspective outdated with negative impact on the software product quality. Modern ways of working for software development are difficult to map to development of functional safe product.

The expectation is to see improvements affecting both methods and tools that manage “reuse” of components in a safety scenario.

Alten expects to update the software production line “Flord” with methods and tools that are able to handle the impact/dependability analysis, the relation of a specific change in the software and the consequently side effect.

The future Alten tool is the LBFarkle development. This tool will analyse the software and then generate a model. By using in parallel and incremental during development, the tool will be able to identify unforeseen impact.

The business goal is to reduce the actual design work of safety software development to be in line with the AMASS project goals. The specific extra overhead should define success not add extra work for the developer when adding a new feature in one existing software code. As a side effect, Alten also understands that the improved quality the tool will provide is valuable for any complex embedded software system.

### 4.25.2 Markets/Customers

*Please list the markets or customers where you intend to exploit the results from AMASS.*

Alten is a global provider of technology and services for all markets. The major domains are Aerospace and Automotive. The result of AMASS is expected to be used when developing future customer products in the embedded market with functional safety requirements. The customer expectations of Alten are strongly focused on the skills and competence of Alten individual engineers. Alten success depends on its employees ability to deliver customer satisfaction.

Alten examples for customers are Airbus, Volvo, Renault, Volkswagen, BMW, Ericsson, ALSTOM, Safran and Finmeccanica. The results from AMASS will make it possible to ensure that Alten is able to protect and possibly expand its market share on product development on market related to safety-assurance.

### 4.25.3 Participant Exploitation Plan

*How can you turn your ideas into reality? What steps do you need to take? How will the technologies, partnerships develop during and after the project?*

To understand the future market demand and potential of the competition is the rule of business success. The AMASS project will provide a strong package of methods and tools. The idea of AMASS is a very specific with a good understanding of the goals in relation to the State of Art.

The estimated market expectation on reliable and safe CPS is major. In near future, embedded product



will have a major impact, including human interaction. To develop safe CPS with shorter TTM and with a lower cost for development, it will be mandatory important to those who want to compete. The Alten scenario is in the context to be defined from a baseline of the requirements of relevant daily work. The idea is to fill the gap with new open source tools and adapt the methods. Furthermore, own tools will be improved with new technology from the project. Alten perspective in the AMASS project context is that Alten is a technology integrator. It is needed a high level of collaboration with the academic partners to insure valuable state of art knowledge of technology. It is also needed a high level of collaboration to understand the OEM roadmap, what is needed and how to reach the estimated goals. The project will also provide partnership of strategic nature.

Especially, Alten is focusing on Aerospace to address the exploitation plan.

The post project plans are to use the results from the project in relation to the above explained show case.

#### 4.25.4 Commercial value

*Please give estimated commercial values or estimated growth in 1-2 years and 3-5 years.*

The estimated growth of Alten business due the AMASS project is based on new customers and already existing customers. The estimated increased growth due AMASS will major. The figures are always hard to define, but as Alten major business (the estimation is about 800 MEUR for 2016) is related on best performance in this market. Not all of this turnover will be affected on a short term; the estimation is that about 1MEUR will be affected and the growth there will be +10%. The conclusion is that AMASS will definitely have a significant long term impact on the turnover. The estimation on the growth for the long term is that it will have an increase worth 10MEUR.

#### 4.25.5 The means by which IPR will be protected

*How would you intend to protect IPR generated by AMASS? I.e., patent, collaboration agreement or else.*

There are no plans to protect Alten IPR in the project. The LBFarkle tool to be developed will be protected as knowledge IPR and not a commercial product. Furthermore, the virtual IPR of gained goodwill both during the project and by using the results post the project, is not to be neglected.

In case the AMASS project decides to define a project common IPR (via open source or standard), Alten will support it.



## 4.26 Lange Aviation (LAN)

### 4.26.1 Business Idea/Product & Services

*What does your organization expect to achieve with AMASS? How will this benefit your organization? Examples might include: new products, new services, joint/partnerships, strengthening position in market.*

LAN expects to optimize the development life cycle of CPS and to reduce effort by using AMASS tools and methods. This will strengthen its position in order to achieve certification for own aviation products (costs, time to market).

### 4.26.2 Markets/Customers

*Please list the markets or customers where you intend to exploit the results from AMASS.*

Aviation / Avionics.

### 4.26.3 Participant Exploitation Plan

*How can you turn your ideas into reality? What steps do you need to take? How will the technologies, partnerships develop during and after the project?*

LAN will analyse how the AMASS tool platform can help reducing effort in its own R&D department. If successful, the design and development process will be adapted to be supported by AMASS tools.

### 4.26.4 Commercial value

*Please give estimated commercial values or estimated growth in 1-2 years and 3-5 years.*

1-2 years: usage of first AMASS methodology and tools with sufficient maturity in our development process for avionic products.

3-5 years: usage of AMASS framework as a central tool platform in R&D.

### 4.26.5 The means by which IPR will be protected

*How would you intend to protect IPR generated by AMASS? I.e., patent, collaboration agreement or else.*

Usage of additional Non-Disclosure Agreements (NDA) if we need to cooperate with any partner more closely. LAN does not expect to invent patent-related results during the AMASS project.



## 4.27 Thales Italia SpA (THI)

### 4.27.1 Business Idea/Product & Services

*What does your organization expect to achieve with AMASS? How will this benefit your organization? Examples might include: new products, new services, joint/partnerships, strengthening position in market.*

Hardware and Software of all radio-navigation systems produced by THI are intrinsically safety-critical due to their key role in positioning techniques and in air traffic management (ATM) procedures. Methods and tools provided by AMASS will therefore increasingly improve, for the new THI products belonging to ATM family, all the involved processes: specification, design, implementation, validation, etc. This will boost the efficiency of the quality processes, will reduce costs and efforts, and will increase THI capabilities to face the challenges associated to the next-generation applications of radio-navigation beacons.

### 4.27.2 Markets/Customers

*Please list the markets or customers where you intend to exploit the results from AMASS.*

- The ATM market, in the sector of landing, navigation, and surveillance systems
- The Air Forces market (landing and navigation systems)
- The Far East ATM market
- The Italian avionics market
- The Air Navigation Service Providers (ANSPs).

### 4.27.3 Participant Exploitation Plan

*How can you turn your ideas into reality? What steps do you need to take? How will the technologies, partnerships develop during and after the project?*

For THI the first step will consist in using the AMASS tools to complete a case study within AMASS, comparing the achievements with the results obtained, for similar developments, by using the previous-generation approach.

As a function of such achievements, the integration of AMASS tools and methods, into Thales development processes, will be considered.

### 4.27.4 Commercial value

*Please give estimated commercial values or estimated growth in 1-2 years and 3-5 years.*

THI invests about 5% of its turnover in R&D: AMASS will concur to keep stable the level of such investments, despite an ATM-market decline of 10-15% in the last 3 years.

For the next 5 years a market increase of about 5% per year is envisaged: the achievements, in terms of efficiency and technical competence, originated by AMASS, are expected to increase THI capabilities to face the challenges associated to such growth.

### 4.27.5 The means by which IPR will be protected

*How would you intend to protect IPR generated by AMASS? I.e., patent, collaboration agreement or else.*



No disclosure of IP is planned and, in any case, IPR are protected by the Consortium Agreement.  
Additional NDA will be signed in case confidential information needs to be shared with AMASS partners.  
No patents, associated to THI activities in AMASS, are expected.





## 4.28 SP Sveriges Tekniska Forskningsinstitut (SPS)

### 4.28.1 Business Idea/Product & Services

*What does your organization expect to achieve with AMASS? How will this benefit your organization? Examples might include: new products, new services, joint/partnerships, strengthening position in market.*

SP is a research institute with the mission to generate value and sustainable development for business and society, by offering knowledge and help throughout the innovation chain. We do this by participating in publicly funded as well as contracted research with industry partners. We also perform product testing in our extensive testing facilities, and certification in many areas, including safety for the automotive and industrial automation domains.

In AMASS, SP expects to strengthen its expertise in assurance and certification, especially regarding co-engineering and co-assessment of multiple concerns, and management of cybersecurity issues in safety-critical products. The expertise will be disseminated to industrial partners outside the AMASS project, in future collaborative research projects or other venues and partnerships, consistent with our role as innovation partner. The gained knowledge is also expected to represent useful input to the safety and cybersecurity standardization activities that we participate in, and as a base for improving and expanding our services in testing, certification, and training. Finally, we expect the participation in AMASS to lead to future collaborations with other consortium partners.

### 4.28.2 Markets/Customers

*Please list the markets or customers where you intend to exploit the results from AMASS.*

Our principal partners are OEMs, suppliers, and system integrators of safety-critical control systems, mainly within the automotive and industrial automation domains.

### 4.28.3 Participant Exploitation Plan

*How can you turn your ideas into reality? What steps do you need to take? How will the technologies, partnerships develop during and after the project?*

SP will use different means to exploit the results, both during and after the project.

- Publishing and presenting results in both research and industry-oriented venues.
- Be active in preparing new project proposals, where AMASS results are used.
- Continuously integrate results and knowledge generated from the project in our testing, certification, and training services.
- Cooperation and interchange of results with other research projects SP is concurrently involved in, such as national projects HoliSec (cybersecurity in the automotive domain), iTransit, and Chronos.

### 4.28.4 Commercial value

*Please give estimated commercial values or estimated growth in 1-2 years and 3-5 years.*

The commercial value for SP is difficult to quantify as we are a research institute and not a for-profit business. The main expected result is to improve our dependable systems expertise and our services, enabling us to become a stronger innovation partner, and fulfil the goal of generating value to business and society. Short-term, these goals include providing the results to partners outside AMASS and bring



results to new research projects. Long term, this also includes growth of the dependable systems research group, and of our testing, training and certification offerings.

#### **4.28.5 The means by which IPR will be protected**

*How would you intend to protect IPR generated by AMASS? I.e., patent, collaboration agreement or else.*

We currently do not foresee that any IPR requiring protection will be generated because, as a general rule, research results will be published publicly. The consortium and grant agreement regulates many of the IPR issues among partners. If a need for IPR protection should arise, collaboration agreements with specific partners may be needed.



## 4.29 Comentor AB (COM)

### 4.29.1 Business Idea/Product & Services

*What does your organization expect to achieve with AMASS? How will this benefit your organization? Examples might include: new products, new services, joint/partnerships, strengthening position in market.*

COM delivers expert services within safety-critical embedded systems. We combine long experience from the automotive industry with a strong cross competence between software and systems engineering.

COM expects to strengthen its expertise, especially in co-engineering and co-assessment of multiple concerns as well as management of cybersecurity issues in safety-critical products. This expertise will be disseminated to our customers.

### 4.29.2 Markets/Customers

*Please list the markets or customers which you intend to exploit the results from AMASS.*

COM's principal customers are OEM's, suppliers, and system integrators of safety-critical embedded systems, mainly within the automotive and industrial automation domains.

### 4.29.3 Participant Exploitation Plan

*How can you turn your ideas into reality? What steps do you need to take? How will the technologies, partnerships develop during and after the project?*

COM will use different means to exploit the results, both during and after the project:

- Publishing and presenting results in both research and industry-oriented venues.
- Continuously integrating results and knowledge, as generated by the project, in our expertise services.
- Participation in regional and international safety and security networks.

### 4.29.4 Commercial value

*Please give estimated commercial values or estimated growth in 1-2 years and 3-5 years.*

COM expects a growth in services related to safety and security in particular, and as a first step to expand the business from mainly safety expert services to also include more security and multiple concern services.

### 4.29.5 The means by which IPR will be protected

*How would you intend to protect IPR generated by AMASS? I.e., patent, collaboration agreement or else.*

Comentor mainly anticipates that product results will be publicly available. COM has not yet identified a need to protect specific IPR.



## 5. IPR Management

The AMASS project is expected to generate several items of intellectual property (IP). This section describes how intellectual property rights (IPR) will be recorded and controlled during the project.

### 5.1 Policy and Consortium Agreement

The primary place of reference for IP rights management is the project Consortium Agreement (CA). The CA follows the EC model agreement. The agreement regarding foreground IP can be loosely summarized as follows:

- IP is owned by the organizations/people who contribute to it (jointly if necessary).
- Foreground can be used by the contributors and licensed to third parties, providing a fair and reasonable compensation to the contributors.
- If access to another party's foreground is needed, this shall be granted under fair and reasonable conditions (e.g. free of charge for non-commercial R&D, demonstration and achieving interoperability with other foreground).
- Access to background is granted in good faith and, if such access is needed for proper use of foreground, then access must be granted upon fair and reasonable conditions.

### 5.2 IPR Register

A register of IPR has been created and is available to all partners in the internal SVN repository. The purpose of the IPR register is to simplify and clarify the ownership of IP.

When a participant recognizes that it has generated some IP, the IP shall be registered accordingly. Both Project Coordinator and Rapita support this activity. Note that the IPR register applies to all technologies, irrespective of whether it is to be licensed open source.



## Abbreviations and Definitions

API	Application Programming Interface
ADAS	Advanced Driver Assistance Systems
AOCS	Attitude and Orbit Control Systems
ARTEMIS	ARTEMIS Industry Association is the association for actors in Embedded Intelligent Systems within Europe
ATM	Air Traffic Management
CA	Consortium Agreement
COTS	Commercial Off-The-Shelf
CPS	Cyber-Physical Systems
E/E	Electrical/Electronic
EC	European Commission
ECSEL	Electronic Components and Systems for European Leadership
EPL	Eclipse Public License
ERTMS/ETCS	European Rail Traffic Management Systems / XXXX
ESA	European Space Agency
FAA	Federal Aviation Administration
FPGA	Field Programmable Gate Array
GDP	Gross domestic product
INCOSE	International Council on Systems Engineering
IoT	Internet Of Things
IP	Intellectual property
IPR	Intellectual property rights
JU	Joint Undertaking
LSIS	Laboratoire des Sciences de l'Information et des Systèmes
MARTE	Modeling and Analysis of Real Time and Embedded systems
NDA	Non-Disclosure Agreement
OEM	Original Equipment Manufacturer
OMG	Object Management Group
OO	Object Oriented
OSLC	Open Services for Lifecycle Collaboration
PLC	Programmable Logic Controller
ROI	Return of Investment



RTU	Remote Terminal Unit
SLOC	Source lines of code
SME	Small and Medium-sized Enterprise
SysML	Systems Modeling Language
TRL	Technology Readiness Level
TTM	Time to Market
V2V	Vehicle-to-Vehicle
WP	Work Package