COLLABORATIVE ECSEL-AUSTRIA
PROJECTS

High impact for the ecosystem of the
Austrian Electronic based Systems (EbS)

ECSEL
Austria

Index

Foreword

Operating in a field of accelerated and massive digitisation, electronic based systems are playing more of a key role as enablers, drivers, and "fuel cells" of global change now than ever before.

No smart factory, efficient logistics, advanced robotics, no Internet of things, no automated driving, no distributed sustainable energy system, no data-driven economy will become an economic reality without these miniaturised technologies of intelligence, adding new properties and network functions to what are at present mere physical, mechanical systems.

ECSEL, the European flagship programme for electrical components and systems, was born in the spirit and firm conviction that electronic based systems play a fundamental and crucial role in our economies. They represent a kind of strategic industry sector, pivotal for the prosperity of the next generation of conventional and digitised industry and crucial to the innovative capacity of Europe's societies and economies. Inspired by this battle call, ECSEL will square off against our global competitors in Asia and the US and will demonstrate the strong common European will to fight back and to provide a powerful base for the future of this key sector in Europe.

After eight years of dedicated effort (including the predecessors ARTEMIS and ENIAC), much has been achieved but much also lies ahead. Success can be seen in the maturity of operations, the professional management of a complex billion euro programme with several financial supporters, extensive national and European regulations and various bodies, as well as in the contracting of several large-scale projects that have already deeply penetrated the processes, products, and systems of leading companies in Europe. Further improvement is expected with respect to an executable common vision, a stronger focus, and more critical mass for real impact.

Austria and the Ministry for Transport, Innovation and Technology were co-initiators and early adopters of this initiative. Backed by a strong and healthy industrial base and an extremely capable RTD community on Austrian soil, our financial and intellectual commitment has since far surpassed our relative economic size. As can be seen in the following pages, our success confirms this approach. Extensive participation in a multitude of industrial applications has improved our competitiveness, deepened our knowledge profiles in these domains, and created highly qualified jobs. Last but not least, the programme and the Austrian ECSEL community have served as an important boot camp for a new, large scale national initiative that aims to change the game for this sector at home: SILICON AUSTRIA.

Michael Wiesmüller
Head of Department
Key enabling Technologies for Industrial Innovation:
ICT, Manufacturing and Nanotechnologies
Austrian Ministry for Transport, Innovation and
Technology (BMVIT)
Member of ECSEL Governance Board

Michael Wiesmüller

bmvit
Austrian Ministry
for Transport,
Innovation and Technology

FFG
Österreichische
Forschungsförderungsgesellschaft

The annual conference of ECSEL Austria was held in Graz on 16 October. Around 80 international experts attended and discussed future challenges in the domain of electronic based systems (EBS).

This year's conference focus was: **Electronic based systems – Key pillars for the future of the Austrian economy.**

Electronic based systems and their underlying key technologies are an essential part of the answers to many of the major social challenges that we are facing today. They will impact the everyday life of Austrian and European citizens as well as activity in all sectors of the economy. Driving the EBS ecosystem opens up huge opportunities by widening the scope of worldwide business with innovative products and services.

To address these challenges, a new generation of public-private partnerships was established in 2014 under the H2020 programme, and the Electronic Components and Systems for European Leadership Joint Undertaking (ECSEL JU) took over the ENIAC and ARTEMIS JU projects and the EPoSS framework, continuing to further strengthen its impact. As a result, these activities have also been merged in Austria and are continuing to foster Austria's global EBS ecosystem. Collaborative projects at the European level are vital to cutting time to market with winning innovations.

In the fields of embedded systems, micro-electronics, nanoelectronics, and system integration, Austrian players in the EBS domain continue to be very active in the ECSEL framework. An exhibition was organised next to the conference to demonstrate the impact these mostly industry-led large European ECSEL projects are generating in the Austrian EBS ecosystem.

This brochure contains the posters displayed during the event. This will provide you with an overview of the project goals, project coordinators, and partner ecosystems, but more importantly will show you the innovations envisioned and their impact on the Austrian economy.

You can find detailed information about the conference on the ECSEL Austria web site: www.ecsel-austria.net/eventsfull/events/ecsel-austria-fall-event.html

Many thanks to all ECSEL Austria stakeholders for making this annual event a huge success.

Pleasant reading.

Josef Affenzeller & Johann Massoner
*Chairmen ECSEL Austria*

Johann Massoner

Josef Affenzeller

Introduction

This booklet is a summary of posters shown at the ECSEL-Austria event "Electronic Based Systems - Key pillars for the future of the Austrian economy" on October 18, 2017 in Graz. These pages demonstrate the success of Austrian partners during the past years in ECSEL calls.

The next page gives an overview of the main projects with Austrian coordinators or partners indicating the total project budget and the Austrian contribution.

The following pages are a summary of impact statements from the project partners. They clearly illustrate the importance of these activities and the strengthening of the Austrian economy in the industry as well as in R&D institutions.
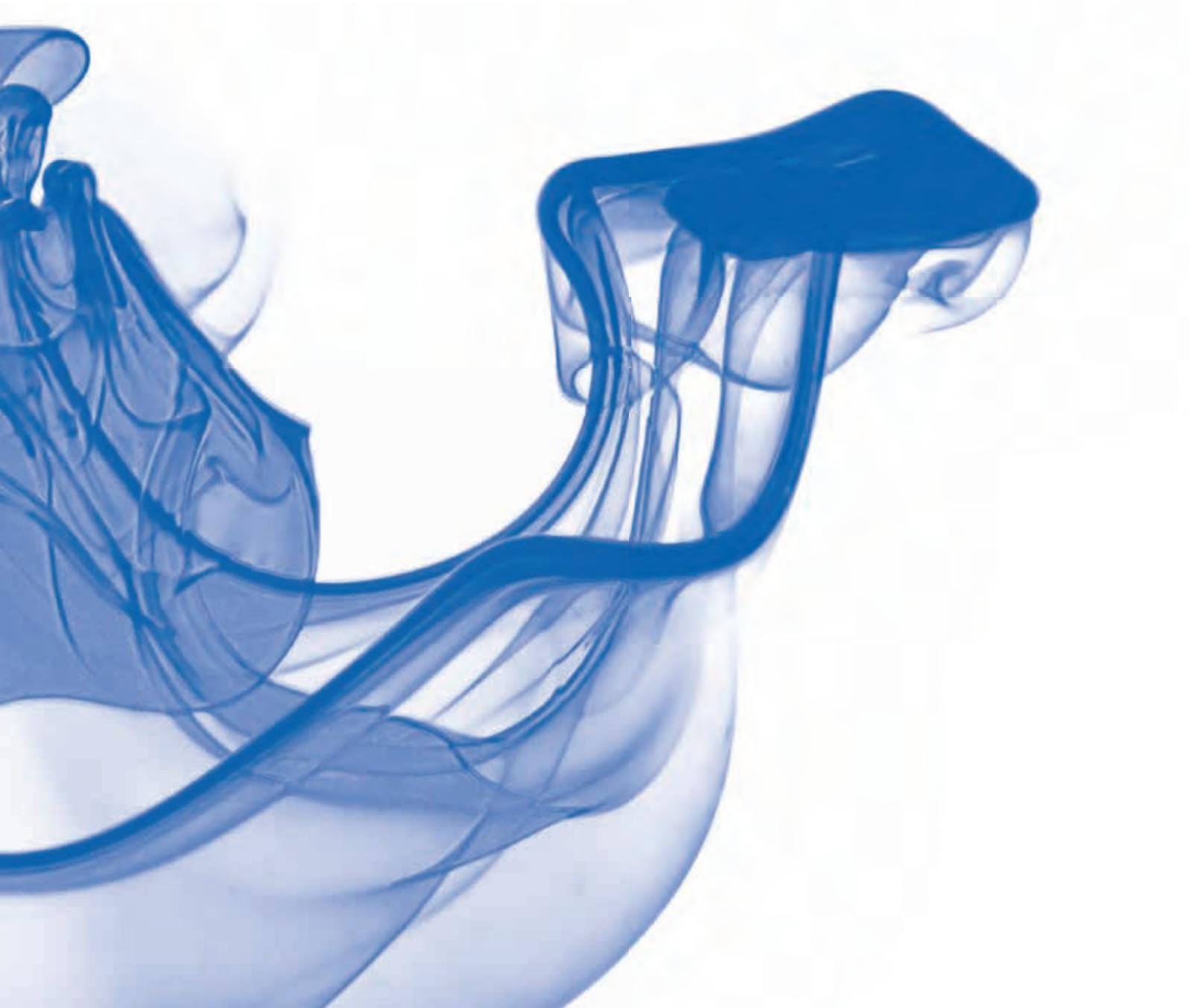
Overview

Project Name	Project Duration	Total Cost in Mio €	Austrian Contribution in Mio €
AQUAS	05/2017–04/2020	18	1.4
ARROWHEAD	03/2013–02/2017	68	3
AutoDrive	05/2017–04/2020	75	9.6
CRYSTAL	05/2013–07/2016	82	2.6
DEWI	03/2014–04/2017	39.6	3.8
EMC2	04/2014–06/2017	93.9	14.7
ENABLE-S3	05/2016–04/2019	68	16.2
eRamp	04/2014–05/2017	52.5	13.2
INDEXYS	04/2009–03/2012	7	3.4
MSP	09/2013–04/2017	18.5	5.7
POLLUX	03/2010–09/2013	33	7.2
PowerBase	05/2015–04/2018	87.5	24.1
Productive4.0	05/2017–04/2020	106	8.2
SafeCer	04/2012–03/2015	15	3.7
SCOTT	05/2017–06/2020	39.1	7.9
SemI40	05/2016–04/2019	62	21.5
		865.1	**145.5**

Data based on EU-CORDIS and partner information

During the years 2014-2016, 11 additional projects were awarded funding with total costs of over 790 mio €, thereof approx. 40 mio € were the contribution of Austrian participants.

Impact/long-term benefits

AQUAS

- The AQUAS performance/safety/security co-engineering approach is expected to have a very positive impact on the market and employment growth in technical and engineering services jobs but also on non-technical employment linked to embedded systems like marketing or administration.

- The improved infrastructure for cooperation between disciplines will lead to greater openness of engineering processes. This will make it easier for SMEs such as start-ups to become involved with large industry engineering projects.

- The technology obtained in AQUAS will help to strengthen SIEMENS' technological and market position, and AIT's tools will gain quality towards product maturity.

- In particular the virtual prototyping technology focusing safety critical systems in combination with WEFACT [Workflow Engine for Analysis, Certification and Test] will reduce the overall design efforts. From today's perspective 10% shorter design times compared to the standard flow seem achievable.

ARROWHEAD

- ARROWHEAD had two major challenges when the project started: to create information interoperability between devices and to integrate automation systems with such devices. The technology solution provided is the Arrowhead Framework and is based on service oriented architecture, SOA, technology. This approach was applied in several industrial use cases in multiple domains in 26 demonstrations.

- The ARROWHEAD framework is now publicly available as a complete open-source imple-

mentation, together with IoT demo platforms and a wide range of publications describing the development, use and the results of this transformation.

- Several products containing Arrowhead technology are already on the market, such as charging stations for electric vehicles and containers for glass recycling that announces when it needs to be emptied. Also, four spin-offs have started and at least three ongoing EU projects are using the Arrowhead Framework.

AutoDrive

- Road Safety: The project aims to reduce accidents caused by human errors and as a result have less fatalities and collateral damages. The focus will be on active safety focusing on the reduction of fatal accidents caused by human drivers.

- TTTech included the results of the AutoDrive project into their automative Ethernet/ TTethernet platform, in order to launch the next level of automation of the "road from SAE automation level 4 towards SAE automation level 5". Additionally, a major target will

be to maximize impact by applying/porting results to multiple domains like aviation, industry 4.0 and robotics as well as off-highway domains in order to attract following to the automotive domain.

- Cost & competitive advantages for the automotive industry: The industry will provide more reliable solutions for autonomous driving based on the project results. This will increase the competitive advantage of the participating companies.

CRYSTAL

- The results of the CRYSTAL project had significant economical and societal impacts. Companies can benefit from better supplier collaboration and reduced system design costs due to the improved and smart integration of tools for system analysis, safety analysis, testing and system exploration.

- Two particular success stories at AVL are Model.CONNECT, which enables the co-simulation of heterogeneous simulation models and Data.CONNECT which enables the seamless integration of data sources to interlink data artefacts over different engineering disciplines.

- The Austrian consortium, as a whole, was well-balanced and consisted of OEMs, engineering companies, tool suppliers, research institutes and academia.
The strong and focused involvement of Austrian organizations in CRYSTAL has further strengthened Austrian's leading edge know-how in the design, development, and deployment of interoperable safety-critical embedded systems.

DEWI

- DEWI introduces the concept of a locally adaptable wireless "sensor & communication bubble" – the so called "DEWI Bubble" - featuring:

- Locally confined wireless internal and external access.

- Fast, easy and stress-free access to smart environments.

- Flexible self-organisation, re-configuration, resilience and adaptability.

- Dependable wireless communication and safe operation.

- Open solutions and standards for cross-domain reusability and interoperability.

- This concept, as realised through 21 industry-driven use cases, tackles challenges including:

- Dependable, auto-configurable, optionally secure, short-range communication.

- Local energy-management: efficiency, harvesting, storage.

- Localization of sensors and mobile devices.

- Smart composability and integration of wireless sensor networks.

EMC^2

- System Architectures: New explorations of scalability and system compatibility for a dynamic multi-core multi-criticality software platform.

- Executable Application Models and Design Tools for Mixed-Critical, Multi-Core Embedded Systems.

- Dynamic Runtime Environments and Services: Knowledge in mechanisms and architectures for run-time environments enhanced to support mixed-critical systems, security techniques, safety and real-time properties.

- System Design Platform, Tools, Models and Interoperability: Key innovations regarding HW/SW co-engineering, non-monolithic integration framework which generalizes the concept of "Internet of things" for tools and adaptors.

- System Qualification and Certification: Main innovations are software-based fault-tolerant algorithms and architectures for multi-cores, safety and security assurance methodologies for a holistic approach to system dependability.

ENABLE-S3

- Impact on European level: Automated cyber-physical systems, ACPS, have the potential to change society with all benefits and risks. By handing over a part of our responsibilities to a machine, ACPS promise to improve safety, provide accessibility to all sectors of society, e.g. the elderly, rural areas, and improve productivity by freeing humans from routine tasks. ENABLE-S3 will add important missing V&V technology bricks, which are required to ensure the dependability, safety and security of ACPS at affordable costs. As a result, European companies will take a global leading role in the highly competitive field of automated systems.

- Impact on Austrian level: ENABLE-S3 will ensure the leading position of Austrian partners in the field of automated systems, such as automated driving. For example, four of five shareholders of the Styrian test region ALP.Lab are ENABLE-S3 partners. Major technology bricks developed within this project will be applied in ALP.Lab.

eRamp

- eRamp aimed to set an innovative step forward to strengthen Europe's leading position in MtM semiconductor technologies and -manufacturing capabilities relating to energy efficient electronic solutions. Fast time-to-market and further improved reliability of MtM semiconductor products will significantly strengthen the competitive position of European electronic industry in energy efficient solutions for automotive and industrial applications. The combination of semiconductor technologies with novel assembly/packaging technologies guarantees highest integration capabilities and optimum energy efficiency.

- "The eRamp results have created the prerequisites for keeping the production of power electronics in Europe competitive. Power electronics guarantee an ever more efficient generation, transmission, and use of electric energy. And it is in this area that eRamp has significantly expanded our expertise in Europe", said project coordinator Dr. Oliver Pyper, Infineon Technologies Dresden.

INDEXYS

- Decreased development cost: Cross-domain tools and methodology will minimize the need to spend resources on the development of domain-specific tools. Domain independent development tools can be reused in different application domains.

- Decreased time to market: Provision of cross-domain architectural services with an associated model-driven development methodology. It reduces the validation efforts, enabling subsystem reuse, and cross-domain tools.

- Integration across different application domains: INDEXYS architectural services integrate diverse and heterogeneous application subsystems using uniform interfaces, precise service specification and a cross-domain system development methodology.

- The INDEXYS project pushes the market position of TTTech in the area of software based TTEthernet solution more to the front. The concepts developed inside the INDEXYS project enable to apply their TTethernet solution more easily in different cross-domain markets like e.g. automotive, aerospace and railway, thereby increasing the usability of the solution.

MSP

- The MSP demonstrator system implemented in a wearable wristband device comprises a total of 57 sensors – this is a worldwide unique sensor system!

- Several innovative technologies, processes and devices ranging from a novel TSV-based micro-hotplate chip integrating 16 gas sensors on a single device to a highly complex over-molding technology were successfully realized.

- Demonstrating the ultimate state-of-the-art in multi-sensor system integration worldwide, the MSP project paves the way for future integrated sensor systems.

- The MSP consortium is proud to announce that the MSP project contributes to reinforce European industrial leadership through miniaturization, performance increase and manufacturability of innovative smart systems.

- The MSP-project has the objective of strengthening the leadership of European industries in the highly competitive area of smart sensing systems in building manage-ment and mobile applications.

POLLUX

- Primary energy savings: Lighter and smaller sized cars could be designed with an ideal powertrain requiring less than 60Wh/km and a reduced overall battery pack. The path toward low cost electrification is a complex one involving new approaches to vehicle design as well as a shift to co-modality, including a change of the consumer's attitude towards alternative powertrains.

- TTTech focused in the POLLUX project on analysis and implementation of FlexRay technology and the development safety-crit-ical multi-purpose ECU Hardware, thereby pushing their technology in newly defined safety ECU hardware, bringing the auto-mation level of the ECU up to level 4. This put TTTech in a frontrunner position on the market in the area of automated driving, also for electric vehicles.

PowerBase

- PowerBase focuses on value creation in Europe, aiming at keeping Europe at the forefront of technology development and deployment. Positioned as "Innovation Action", exploitation of the project's results is a primary goal, thus bridging the gap between research and exploitation.

- Power Semiconductors are key drivers for the innovation capability of European industries, large and small, in turn generating economic growth and supporting meaningful jobs for citizens. At the critical interface between data

processing and the harsh, real world, they support solutions for some of the difficult societal challenges addressed by European policies for 2020 and beyond. For both reasons, it is vital that investments continue to be made to assure European collaboration, and access to the technologies, know-how and capacities which guarantee growth potential and strategic independence in the face of tough competition and increased globalization.

Productive4.0

- Digitising industry: TRL6-8 implementation of a supply network wide approach including the infrastructure to include the large data streams created by the production processes.

- Developing Standards and interoperability: Building on the Arrowhead communication technology. Extending to full supply network solution including lifecycle management. The eco-system created by the TRL6-8 will drive towards standardisation.

- Making the most of the data economy and cloud computing: The industrial scale deployment of Productive Framework will deliver the entrance to a big-data era. The huge potential of big-data will be addressed by the development of big-data tools to find trends, define actions etc.

- Unlocking the benefits of e-services and advancing digital skills: The key combination of universities, industries and service organizations enable education on key topics on the digital agenda driven by datasets from real world industrial demonstration.

SafeCer

- SafeCer fostered market innovation in several respects, including:

- Innovation for process, component models, safety arguments and verification/validation, applicable to multiple domains, targeting cost-efficient reuse which leads to lighter, cheaper and faster certification of safety-related, software-intensive embedded real-time systems.

- Instantiation of methods and tools for automotive, avionics, aerospace, construction equipment and rail domains. Creation of integrated certification and development

framework. Market impact through the development, verification and certification of tools, providing direction for methodology, reference architecture and prototype tool environment.

- Research aimed at extending to an open framework for new [other] domains and for certification for cross-domain use of components.

- Contribution to standards and regulations. Focus on software components qualified for certification. Impact on European industry.

SCOTT

- The outstanding partner consortium of SCOTT covers the complete value chain from silicon to end-users and operators. SCOTT aims to establish an eco-system for trustable wireless solutions and services for both professional and private users. Together with the deployment of open innovation approaches and stakeholder engagement, as well as close collaboration with the Alliance for Internet of Things Innovation - AIOTI - and other cluster organizations all over Europe, SCOTT will further boost the growing Internet economy.

- SCOTT will generate new market opportunities for the European industry, significantly reduce time to market, and decrease the cost of trustable wireless solutions on the market.

- Ultimately, SCOTT will foster European leadership in the field of Smart and Connected Things - including the Internet of Things - and strengthen Europe's independence in the area of security-enabling components and systems.

SemI40

- Through implementing the technical research outcomes and solutions for the related SemI40 use cases in a cross-domain approach and enabling the connected manufacturing, the Semi40 project will ensure long-term competiveness of European semiconductor industries with cascade benefits on other related industries along the supply chain.

- Balancing of system security and production flexibility will allow a more cost-efficient IT and production environment.   Safe secure, trustworthy and authenticated communication will enable a better managing of complex activities between partners or between Fabs of the same company.

- Improve operational efficiency, e.g. uptime, asset utilization, better men power management…, through advances in data analytics and learning algorithms. Deep learning infrastructures will be applied and evaluated in the application domains of the Consortium.

- Energy efficiency KPIs in combination with statistical control functionality, allow energy savings..

AQUAS - Aggregated Quality Assurance for Systems

Project description

AQUAS aims to improve capabilities for managing complexity to provide a **holistic system life-cycle for safety, security and performance,** collaborate to specifically understand and improve the interlinking of the above qualities, through the product life-cycle and across domains, and bring multi-concern aspects into Functional Safety Standards.

AQUAS will provide solutions for a holistic approach to Safety/Security/Performance Co-Engineering [CE] through a domain-flexible framework, supporting the entire Product Life-cycle [PLC]. Moreover a strong contribution to Standards Evolution [SE]. These three points, co-engineering, product life-cycle and standards evolution represent the three core goals on which our objectives and work will be founded.

Austrian contribution

The Austrian Consortium comprises

- **Siemens AG**

- **AIT Austrian Institute of Technology GmbH**

The Austrian Contribution is elaborated in a collaboration between SIEMENS AG an AIT:

- Application of AIT's safety and security co-engineering methods to Siemens' Industrial electric drive controller, verify performance constraints together with safety and security requirements for selected scenarios based on a virtual HW prototype of the whole system

- Providing a widely automated certification process to the prototype applying AIT's workflow engine WEFACT

Impact/long-term benefits

- The AQUAS performance/safety/security co-engineering approach is expected to have a very positive impact on the market and employment growth in technical and engineering services jobs but also on non-technical employment linked to embedded systems like marketing or administration.

- The improved infrastructure for cooperation between disciplines will lead to greater openness of engineering processes. This will make it easier for SMEs such as start-ups to become involved with large industry engineering projects.

- The technology obtained in AQUAS will help to strengthen SIEMENS' technological and market position, and AIT's tools will gain quality towards product maturity.

- In particular the virtual prototyping technology focusing safety critical systems in combination with WEFACT [Workflow Engine for Analysis, Certification and Test] will reduce the overall design efforts. From today's perspective 10% shorter design times compared to the standard flow seem achievable.

AQUAS

Project Duration:
05/2017 – 04/2020

Project Coordinator: **THALES Alenia Space, Spain**

Project Costs: **18 Mio. €**

Partners: **24 partners, 7 countries**

Contact: **filip.veljkovic@thalesaleniaspace.com**

Website: **www.aquas-project.eu**

ARROWHEAD

Project description

Advances in Internet connectivity, cloud computing, Web services, and new software architectures enable disruptive changes, sometimes described within the term Industry 4.0, or more specifically as industrial Internet of Things. The new paradigm allows to escape the tight constraints of a closed hierarchical system, allowing intelligent devices across any level to connect to and interact with powerful Web services on the cloud.

Arrowhead is addressing efficiency and flexibility at the global scale by means of collaborative automation for five application verticals: production [manufacturing, process, energy], smart buildings and infrastructures, electro-mobility and virtual market of energy. The vision is to enable collaborative automation by networked embedded devices. The grand challenges are enabling the interoperability and integrability of services provided by almost any device. A service-based approach is now available, enabling collaborative automation.
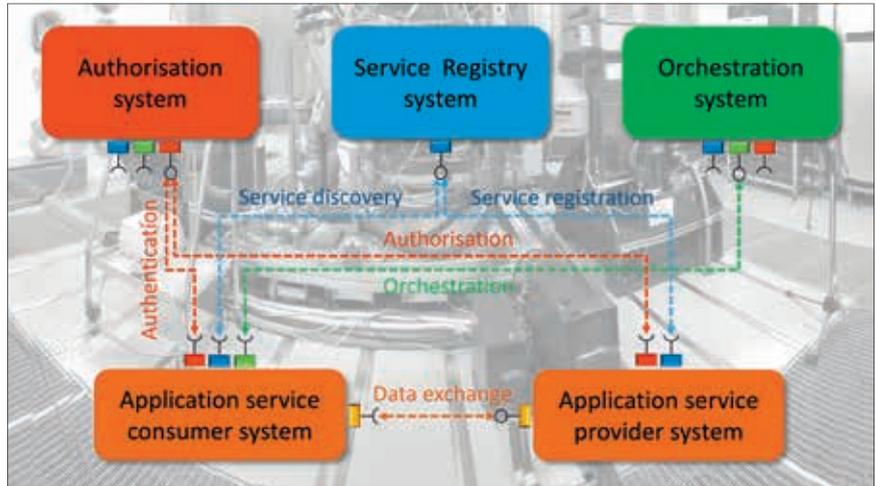
Austrian contribution

- **AVL List GmbH** led task 1.1, and provided the use case "smart service". Together with partners, AVL addressed secure communi-cation authentication challenges to develop prototypes of connected measurement devices based on existing products. Such devices interact with servers via Internet to demonstrate, test and evaluate smart services such as automatic maintenance scheduling in close-to-reality environments.

- **AIT** provided know-how and safety and security analyses along the IEC standards for „Secure and Safe Industrial Communication" [IEC SC 65B, SC 65C, SC 65E] including suggestions for countermeasures and adjustments against cyber security risks.

- **TUG and IFAT** collaboratively designed the Mediator key concept as a base design for the smart service use case, to help achieving the information security objectives.

- **FH Campus02** performed the business model evaluation . The result allows to establish trusted digital eco systems in the automotive industry and beyond.

Impact/long-term benefits

ARROWHEAD had two major challenges when the project started: to create **information inter-operability** between devices and to **integrate automation systems** with such devices. The technology solution provided is the Arrowhead Framework and is based on service oriented architecture, SOA, technology. This approach was applied in several industrial use cases in multiple domains in 26 demonstrations.

The ARROWHEAD framework is now publicly available as a complete open-source imple-mentation, together with IoT demo platforms and a wide range of publications describing the development, use and the results of this transformation.

Several products containing Arrowhead technology are already on the market, such as charging stations for electric vehicles and containers for glass recycling that announces when it needs to be emptied. Also, four spin-offs have started and at least three ongoing EU projects are using the Arrowhead Framework.

Project Duration:
03/2013-02/2017

Project Coordinator: **Jerker Del-sing / Lulea Technical University**

Project Costs: **68 Mio. €**

Partners: **78 partners from 15 countries.**

Austria: **AVL, AIT, Evolaris, TUG, FH Campus02, IFAT**

Contact: **info@arrowhead.eu**

Website: **www.arrowhead.eu**

AutoDrive

Project description

AutoDrive - Advancing fail-aware, fail-safe, and fail-operational electronic components, systems, and architectures for **highly and fully automated driving** to make future mobility safer, more efficient, affordable, and end-user acceptable - will provide fail-aware, fail-safe, and fail-operational integrated electronic components, Electrical/Electronic architectures as well as deeply embedded software systems for highly and fully automated driving to make future mobility safer, more efficient, affordable, and end-user acceptable. Advancing towards fail-operational systems will require increased reliability and availability of components, new redundancy schemes as well as architectures, and methodologies to appropriately manage and balance complexity, cost, robustness, and flexibility. A holistic perspective, from electronics to systems will be necessary to take this step in automated vehicles.

Austrian contribution

- **AIT Austrian Institute of Technology:** 3D environment sensing, verification/validation techniques. Combined safety and security analysis for vehicles and V2X communication.

- **AVL List GmbH:** Predictive maintenance, anomaly detection for fleet monitoring, machine learning, big data analysis for autonomous driving and algorithms for autonomous driving and integration in demonstrators.

- **Infineon Technologies Austria AG:** Leader Supply Chain 8. Semiconductor development focus mainly on sense/control, microcontroller, 5G, ADC and system solutions.

- **Kompetenzzentrum - Das Virtuelle Fahrzeug, Forschungsgesellschaft mbH:** Leader Supply Chain 2, active safety for automated driving. Provide an open vehicle platform for sensors, actuators, and multi-core platforms.

- **Technische Universität Graz:** Model-based reasoning and testing of methods for fail operational systems.

- **TTTech Computertechnik AG:** Leader Supply Chain 6. Vehicle internal communication and network, thereby ensuring safety and security.

Impact/long-term benefits

- **Road Safety:** The project aims to reduce accidents caused by human errors and as a result have less fatalities and collateral damages. The focus will be on active safety focusing on the reduction of fatal accidents caused by human drivers.

- TTTech included the results of the AutoDrive project into their **automative Ethernet/ TTethernet platform,** in order to launch the next level of automation of the "road from SAE automation level 4 towards SAE automation level 5". Additionally, a major target will be to maximize impact by applying/porting results to multiple domains like aviation, industry 4.0 and robotics as well as off-highway domains in order to attract following to the automotive domain.

- **Cost & competitive advantages for the automotive industry:** The industry will provide more reliable solutions for autonomous driving based on the project results. This will increase the competitive advantage of the participating companies.

Auto Drive

Project Duration:
05.2017 – 04.2020

Project Coordinator:
Infineon Technologies AG

Project Costs: **75 Mio. €**

Partners: **58 industrial, academic and research partners form 13 different countries**

Contact:
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CRYSTAL

Project description

The process for developing **safety-critical embedded systems** is highly complex and requires specialized tools supporting different activities throughout the entire product life cycle. In this process the collaboration among all stakeholders and consequently interoperability between the tools they are using is of utmost importance.

The project CRYSTAL has identified this need and established an **Interoperability Specification IOS and framework** as an open European standard for the development of safety-critical embedded systems in the automotive, aerospace, rail and health care domains. This standard allows loosely coupled tools to share and interlink their data based on standardized and open web technologies that enable common interoperability among various life cycle domains. CRYSTAL was driven by real-world industrial use cases and built on the results of successful predecessor and parallel projects like CESAR, iFEST, MBAT, SAFECER, SAFE, TIMMO-2-USE, OPENCOSS and EMC2 on European
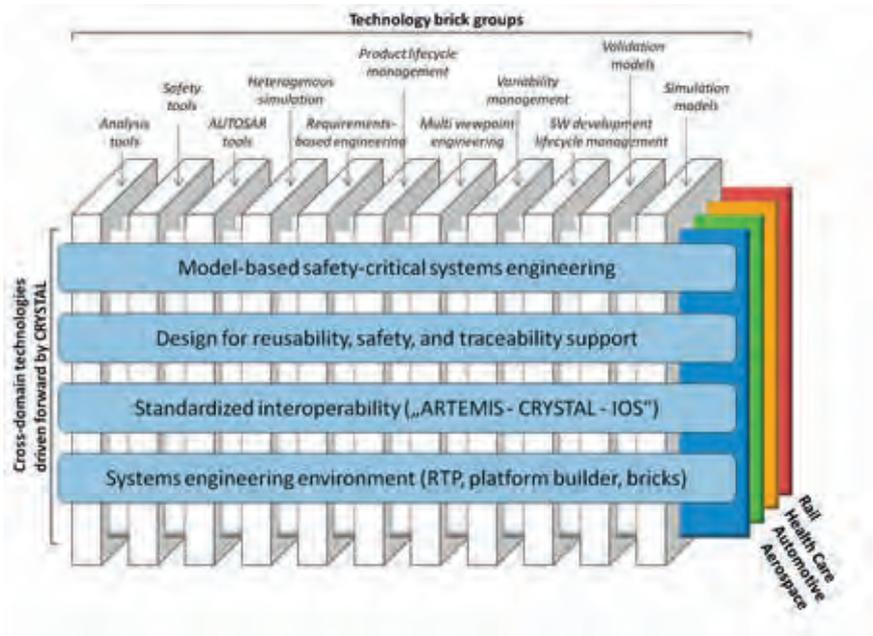
Austrian contribution

- **AVL** was the global coordinator of CRYSTAL. As an engineering company AVL contributed with automotive use cases and as a tool provider AVL focused on testing, calibration and verification.
- **TTTech** led the work package on AUTOSAR tools and components and focused on development of a platform as well as of associated configuration tools.
- **AIT** concentrated on the development of new methods and tools for verification and validation of highly reliable and safe software and systems, in particular supporting use cases in the automotive and rail domain.
- **Thales Austria** brought in use cases from the rail domain concentrating on the "TAS platform", a technology platform for all types of safety-critical transport applications.
- **TU Graz** focused on tools for safety integration and model-based test case generation.
- **ViF** led the automotive public use case and concentrates on model-based requirements engineering, test and validation, multi-domain co-simulation, and tool integration and implementation.

Impact/long-term benefits

The results of the CRYSTAL project had significant economical and societal impacts. Companies can benefit from better supplier collaboration and reduced system design costs due to the improved and smart integration of tools for system analysis, safety analysis, testing and system exploration.

Two particular success stories at AVL are Model.CONNECT, which enables the co-simulation of heterogeneous simulation models and Data.CONNECT which enables the seamless integration of data sources to interlink data artefacts over different engineering disciplines.

The Austrian consortium, as a whole, was well-balanced and consisted of OEMs, engineering companies, tool suppliers, research institutes and academia. The strong and focused involvement of Austrian organizations in CRYSTAL has further strengthened Austrian's leading edge know-how in the design, development, and deployment of interoperable safety-critical embedded systems.

Project Duration:
May 2013 – July 2016

Project Coordinator:
AVL List GmbH

Project Costs: **82 Mio. €**

Partners: **71 partners from 10 European countries**

Contact: **christian.elsalloum@avl.com**

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DEWI

Project description

DEWI provides **key solutions for wireless seamless connectivity and interoperability in smart cities and infrastructures,** by considering everyday physical environments of citizens in buildings, cars, trains and aeroplanes. DEWI, with its four industrial domains - Aeronautics, Automotive, Rail, Building - adds clear interoperability and cross-domain benefits in the area of wireless sensor networks and wireless communication, in terms of re-usability of technological building bricks and architecture, processes and methods.

Based on more than thirty clear business needs identified by DEWI industrial partners, the concept of the DEWI Bubble is being realized in twenty-one industry-driven use cases, aimed at tackling dependable, auto-configurable, optionally secure, short-range communication, local energy-management, the localization of sensors and mobile devices, and the smart composability and integration of WSNs.

Austrian contribution

The DEWI project once more highlights the pioneering role in innovation played by Austria, and in particular Styria, with its capital city of Graz. The close collaboration with leading international facilities and companies, such as Volvo, Siemens, Valeo, Philips, Indra, Airbus, Thales, and many more, sustainably strengthens the position of VIRUTAL VEHICLE, AVL, and NXP in the European research and technology landscape.

- **Kompetenzzentrum – Das Virtuelle Fahrzeug Forschungsgesellschaft - VIRTUAL VEHICLE**
- **AVL List GmbH**
- **NXP Semiconductors Austria GmbH**
- **FTW Forschungszentrum Telekommunikation Wien**
- **Technische Universität Graz**
- **Universität Klagenfurt**
- **Universität Linz**

Impact/long-term benefits

DEWI introduces the concept of a locally adaptable wireless "sensor & communication bubble" – the so called **"DEWI Bubble"** - featuring:

- Locally confined wireless internal and external access.
- Fast, easy and stress-free access to smart environments.
- Flexible self-organisation, re-configuration, resilience and adaptability.
- Dependable wireless communication and safe operation.
- Open solutions and standards for cross-domain reusability and interoperability.

This concept, as realised through **21 industry-driven use cases,** tackles challenges including:

- Dependable, auto-configurable, optionally secure, short-range communication.
- Local energy-management: efficiency, harvesting, storage.
- Localization of sensors and mobile devices.
- Smart composability and integration of wireless sensor networks.

Project Duration:
01.03.2014 – 30.04.2017

Project Coordinator:
Kompetenzzentrum – Das Virtuelle Fahrzeug

Project Costs: **39.61 Mio. €**

Partners: **58 partners in 11 European countries**

Contact: **dewi@v2c2.at**

Website: **www.dewi-project.eu**

virtual vehicle   AVL   NXP   ftw   bmvit   FFG   ECSEL Austria

TU Graz   ALPEN ADRIA UNIVERSITÄT   JXU

bmvit
Austrian Ministry
for Transport,
Innovation and Technology

FFG
Austrian
Research Promotion Agency

ARTEMIS **EMC²**

Project description

A major industrial challenge is the need of **cost efficient integration of different applications with different levels of safety and security** on a single computing platform. The objective of the EMC² project was to foster this change through an innovative and sustainable service-oriented architecture approach for mixed criticality applications in dynamic and changeable real-time environments.

EMC² solutions:

- Dynamic Adaptability in Open Systems
- System features as Service-on-Demand
- Mixed criticality applications under real-time conditions Deployment and management of integrated tool chains, through the entire lifecycle
- The EMC² approach forced breakthroughs and deployments of Multi-Core technology in almost all application domains where real-time and mixed-criticality are issues.

- Technological work packages developed dedicated technologies required for the development of embedded, mixed-criticality multi-core systems. The living labs implemented these technologies in several demos.
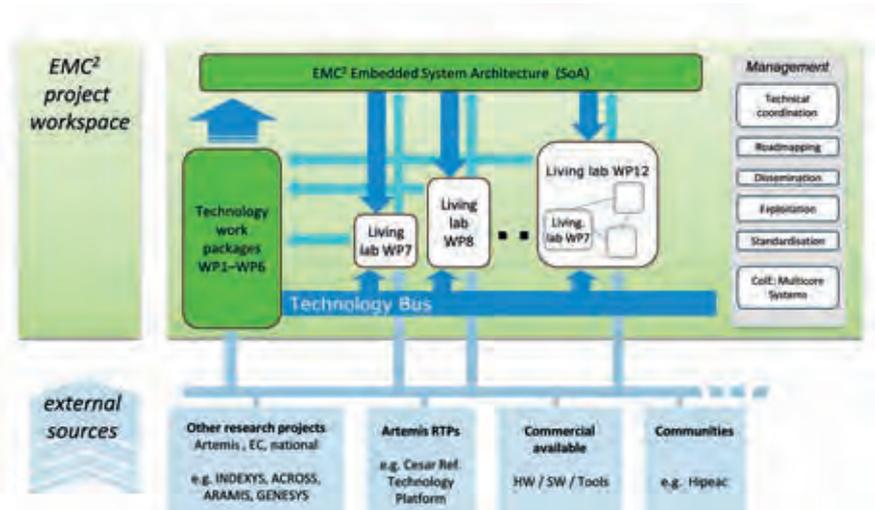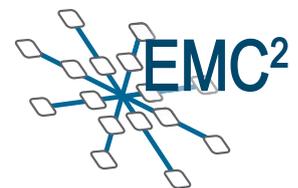
Austrian contribution

- **Infineon:** Next Generation Aurix Family Development: three cores, diverse lockstep features, hardware security module.
- **AVL:** Demonstrators of automotive multicore control systems and automotive solutions for simulation and test-beds adapted for the validation of mixed-criticality application on multi-core.
- **TTTech & Thales:** Networking components that allow the development and deployment of mixed-criticality networks where different communication types can coexist on one physical networking infrastructure.
- **TUW:** Dynamic reconfiguration techniques based on ontologies. Results also be used in academic purposes: lectures, practical assignments, and research documents.
- **VIF:** Systematic test data generation for distributed vision applications: For training and assessing robustness of the visual perception and object recognition features.
- **AIT:** Research on safety & security co-engineering: Consideration of multiple dependability attributes during the development.

Impact/long-term benefits

- **System Architectures:** New explorations of scalability and system compatibility for a dynamic multi-core multi-criticality software platform.
- **Executable Application Models and Design Tools** for Mixed-Critical, Multi-Core Embedded Systems.
- **Dynamic Runtime Environments and Services:** Knowledge in mechanisms and architectures for run-time environments enhanced to support mixed-critical systems, security techniques, safety and real-time properties.
- **System Design Platform, Tools, Models and Interoperability:** Key innovations regarding HW/SW co-engineering, non-monolithic integration framework which generalizes the concept of "Internet of things" for tools and adaptors.
- **System Qualification and Certification:** Main innovations are software-based fault-tolerant algorithms and architectures for multi-cores, safety and security assurance methodologies for a holistic approach to system dependability.

EMC²

Project Duration:
39 month, started in April 2014

Project Coordinator:
Infineon Technologies AG

Project Costs: **93.9 Mio. €**

Partners: **101 Partners +
1 associate partner from
16 EU Countries**

Contact: **info@artemis-emc2.eu**

Website: **www.artemis-emc2.eu**

ARTEMIS · infineon · AVL · TTTech · THALES · bmvit
Austrian Ministry for Transport, Innovation and Technology · FFG Austrian Research Promotion Agency · ECSEL Austria · TU WIEN · virtual vehicle · AIT

ENABLE-S3

Project description

ENABLE-S3 aims at significantly **raising the level of dependability of automated systems** and keeping the effort and costs for testing at a reasonable level. This will be achieved by the provision of a comprehensive modular verification and validation framework. Methods and bricks will be developed to reduce the required test effort across six industrial domains - Automotive, Aerospace, Rail, Maritime, Health, Farming, fostering cross-domain reuse and knowledge exchange wherever possible and reasonable.

Austrian contribution

- **AIT:** development of test & validation methodology
- **AVL List:** development of test & validation methodology as well as test platform development – simulation environments, DrivingCube
- **Dr. Steffan Datentechnik GmbH:** extension of testing tools and application of UFO and driving robots for automotive use cases.
- **Johannes Kepler University Linz:** automatic extraction of traffic scenario from recorded data
- **Linz Center of Mechatronics GmbH:** development of stochastic traffic participant models
- **Magna Steyr:** set up of virtual testing environments
- **NM Robotic GmbH:** formal verification methodology
- **TU Graz:** Sensor simulation and sensor stimulation; driver simulator; security testing
- **THALES Austria GmbH:** provider of railway use case
- **TTControl GmbH:** provider of the farming use case
- **TTTech Computertechnik AG:** development of test platform
- **Virtual Vehicle Research Center:** simulation platform and interface definitions

Impact/long-term benefits

- **Impact on European level:** Automated cyber-physical systems, ACPS, have the potential to change society with all benefits and risks. By handing over a part of our responsibilities to a machine, ACPS promise to improve safety, provide accessibility to all sectors of society, e.g. the elderly, rural areas, and improve productivity by freeing humans from routine tasks. ENABLE-S3 will add important missing V&V technology bricks, which are required to ensure the dependability, safety and security of ACPS at affordable costs. As a result, European companies will take a global leading role in the highly competitive field of automated systems.

- **Impact on Austrian level:** ENABLE-S3 will ensure the leading position of Austrian partners in the field of automated systems, such as automated driving. For example, four of five shareholders of the Styrian test region ALP.Lab are ENABLE-S3 partners. Major technology bricks developed within this project will be applied in ALP.Lab.

Project Duration:
May 2016 – April 2019

Project Coordinator:
AVL List GmbH

Project Costs: **68 Mio. €**

Partners:
68 partners/16 countries

Contact: **ENABLE-S3@avl.com**

Website: **www.enable-s3.eu**

eRamp

Project description

Over three years, 26 partners have explored the production and usage of innovative electronics components for **using energy more efficiently.** Focus was on the rapid introduction of new production technologies, such as packaging technologies for energy-saving chips. The eRamp project covered the entire power electronics value chain, from generation and transmission to consumption.

The research results were tested for practical viability directly in the semiconductor production environment. The research partners used existing pilot lines and comprehensive production expertise at five sites:

- Dresden, Germany and Villach, Austria (power semiconductors based on 300mm wafers; close cooperation of two Infineon pilot lines)

- Regensburg, Germany (chip packaging technologies for power semiconductors; Infineon)
- Reutlingen, Germany (power semiconductors, smart power and sensors based on 200mm wafers; Bosch)
- Unterpremstaetten near Graz, Austria (3D/TSV pilot line; ams)

Austrian contribution

- **ams:** WP2 lead, DFX, 3D process integration, high performance analog design, IC
- **CISC Semiconductor:** Top level simulation aspects
- **Infineon Technologies:** WP3 lead, Simulation application, DFX
- **Infineon Technologies IT-Service:** server architectures, high performance computing, platform services
- **Joanneum Research:** WP1 lead, statistical models for prediction of reliability and yield
- **Intel:** on-chip analog Process Monitor in enhanced CMOS Technologies
- **Materials Center Leoben:** failure and material characterization for device critical parameters, gas sensor integration into CMOS technology
- **NXP Semiconductors:** methods and algorithms for reliably devices
- **Polymer Compentence Center Leoben:** Investigation of the influence of polymeric dicing tapes on the reliability of semiconductor chips production
- **Technische Universität Wien:** Monte Carlo simulation methodology
- **Universität Innsbruck:** Task scheduling, Askalon, Multi-Obj. Parameter Optimizer

Impact/long-term benefits

eRamp aimed to set an innovative step forward to strengthen Europe's leading position in **MtM semiconductor technologies and -manufacturing capabilities** relating to energy efficient electronic solutions. Fast time-to-market and further improved reliability of MtM semiconductor products will significantly strengthen the competitive position of European electronic industry in energy efficient solutions for automotive and industrial applications. The combination of semiconductor technologies with novel assembly/packaging technologies guarantees highest integration capabilities and optimum energy efficiency.

"The eRamp results have created the prerequisites for keeping the production of power electronics in Europe competitive. Power electronics guarantee an ever more efficient generation, transmission, and use of electric energy. And it is in this area that eRamp has significantly expanded our expertise in Europe", said project coordinator Dr. Oliver Pyper, Infineon Technologies Dresden.

Project Duration:
April 2014 – May 2017

Project Coordinator: **Infineon Technologies Dresden GmbH**

Project Costs: **52.5 Mio. €**

Partners: **26 partners from six countries: Austria, Germany, Netherlands, Romania, Slovakia, United Kingdom**

Contact: **eRamp@infineon.com**

Website: **www.eramp.eu**

INDEXYS

Project description

The objective of INDEXYS - INDustrial EXploitation of the genesYS cross-domain architecture - is to tangibly realize **industrial implementations** of cross-domain architectural concepts developed in the GENESYS project in three domains: automotive, aerospace and railway, thereby relating to ARTEMIS-JU Industrial Priority: "Reference designs and architectures".

GENESYS - Generic Embedded System Platform - is developing a **cross-domain architecture** according to requirements of the ARTEMIS Strategic Research Agenda. The GENESYS architectural style supports a composable, robust, and comprehensible component-based framework with strict separation of computation from message-based communication. So components can be massively reused in differing contexts.
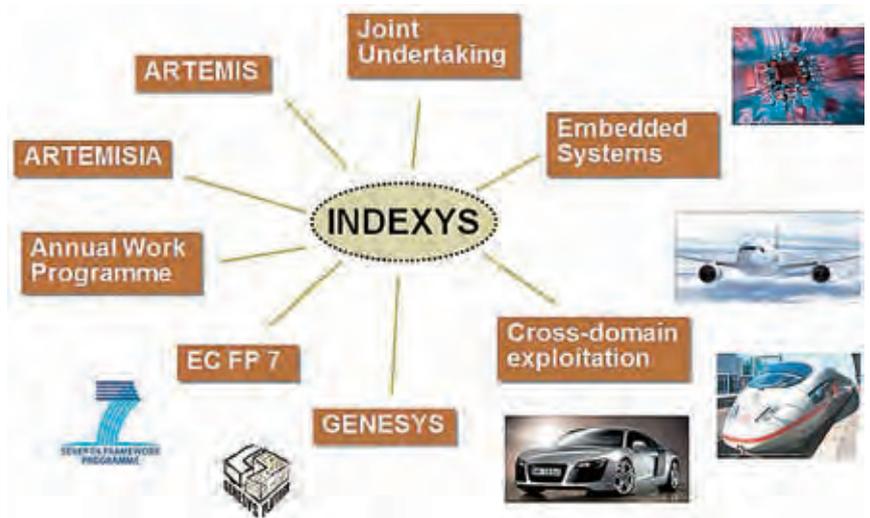
Austrian contribution

- **TTTech Computertechnik AG:** Overall coordination, development of FlexRay multi-router device, TTP based RDC SoC component for low-cost transducer interfacing, software-based TTEthernet end-system implementations.

- **Thales Rail Signalling Solutions GmbH:** Leader of Work Package 4 "Rail Platform", contributes to cross-domain integration, standardisation e.g. CENELEC.

- **Vienna University of Technology:** Contact to GENESYS project providing input on architectural services, development of programmable CAN interconnect.

Impact/long-term benefits

- **Decreased development cost:** Cross-domain tools and methodology will minimize the need to spend resources on the development of domain-specific tools. Domain independent development tools can be reused in different application domains.

- **Decreased time to market:** Provision of cross-domain architectural services with an associated model-driven development methodology. It reduces the validation efforts, enabling subsystem reuse, and cross-domain tools.

- **Integration across different application domains:** INDEXYS architectural services integrate diverse and heterogeneous application subsystems using uniform interfaces, precise service specification and a cross-domain system development methodology.

- The INDEXYS project pushes the **market position** of TTTech in the area of software based TTEthernet solution more to the front. The concepts developed inside the INDEXYS project enable to apply their TTethernet solution more easily in different cross-domain markets like e.g. automotive, aerospace and railway, thereby increasing the usability of the solution.

Project Duration:
04.2009 – 03.2012

Project Coordinator:
TTTech Computertechnik AG

Project Costs: **7 Mio. €**

Partners: **10 industrial, academic and research partners form 4 different countries**

Contact:
andreas.eckel@tttech.com

Website: **www.indexys.eu**

MSP – Multi Sensor Platform for Smart Building Management

Project description

Major objective was the development of a powerful technology and manufacturing chain enabling **flexible "plug-and-play" 3D-integration of devices and sensors on CMOS electronic platform chips.**

The MSP project focused on the development of a variety of sophisticated sensors and devices as elements of a "tool-box" for realizing smart multi-sensor systems for indoor and outdoor environmental monitoring.

This "tool box" is containing a variety of devices ranging from gas sensors based on nanowires or graphene, particle sensors, UV-, visible and infrared light sensors, to temperature sensor, humidity sensor, photovoltaic and piezoelectric energy harvesting devices and wireless communication module.
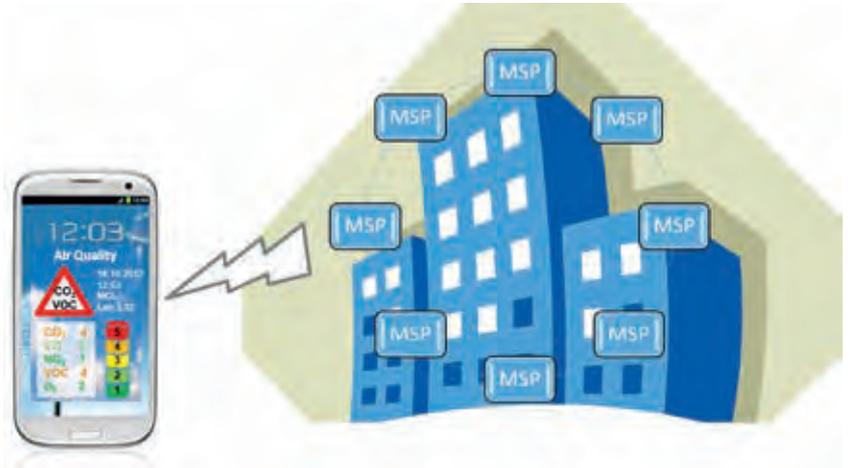
Austrian contribution

- **Materials Center Leoben Forschung GmbH:** Coordination of MSP, implementation of gas sensitive nanomaterials such as ultrathin SnO_2 films and different types of nanowires on CMOS fabricated micro-hotplates by post-processing; gas sensor tests

- **ams AG:** Design and fabrication of the electronic platform chips and novel low-power micro-hotplate chips; both based on Through-Silicon-Via Technology

- **EV Group:** Spray pyrolysis deposition of metal oxide films and ink-jetting of nano-particles on micro-hotplate chips for gas sensor functionalization, and 3D-integration technology

Impact/long-term benefits

The MSP demonstrator system implemented in a wearable wristband device comprises **a total of 57 sensors** – this is a worldwide unique sensor system!

Several innovative technologies, processes and devices ranging from a novel TSV-based micro-hotplate chip integrating 16 gas sensors on a single device to a highly complex over-molding technology were successfully realized.

Demonstrating the **ultimate state-of-the-art in multi-sensor system integration** worldwide, the MSP project paves the way for future integrated sensor systems.

The MSP consortium is proud to announce that the MSP project contributes to reinforce European industrial leadership through miniaturization, performance increase and manufacturability of innovative smart systems.

The MSP-project has the objective of strengthening the leadership of European industries in the highly competitive area of smart sensing systems in building management and mobile applications.

Project Duration:
44 months, start September 2013

Project Coordinator: **Materials Center Leoben Forschung GmbH**

Project Costs: **18.5 Mio. €**

Partners: **17 academic, research, industrial and SME partners from 6 different countries**

Austria: **Materials Center Leoben Forschung GmbH (Coordinator), ams AG, EV Group EVG**

Contact:
anton.koeck@mcl.at

Website:
www.multisensorplatform.eu

POLLUX

Project description

POLLUX - Process oriented electronic control units for electric vehicles developed on a multi-system real-time embedded platform - will reduce the development time and cost of the complex, high reliability **mechatronic systems** needed for the mass deployment of **electric vehicles** through the creation of a reference architecture for distributed embedded systems, including real-time middle-ware, multi-core hardware and in-vehicle communication. The objective of POLLUX is to develop a distributed real time embedded system platform for next generation electric vehicles, by using a component and programming-based design methodology. Reference designs and embedded systems architectures for high efficiency innovative mechatronics systems will be addressed with regard to requirements on composability, networking, security, robustness, diagnosis, maintenance, integrated resource management, evolvability and self-organisation.
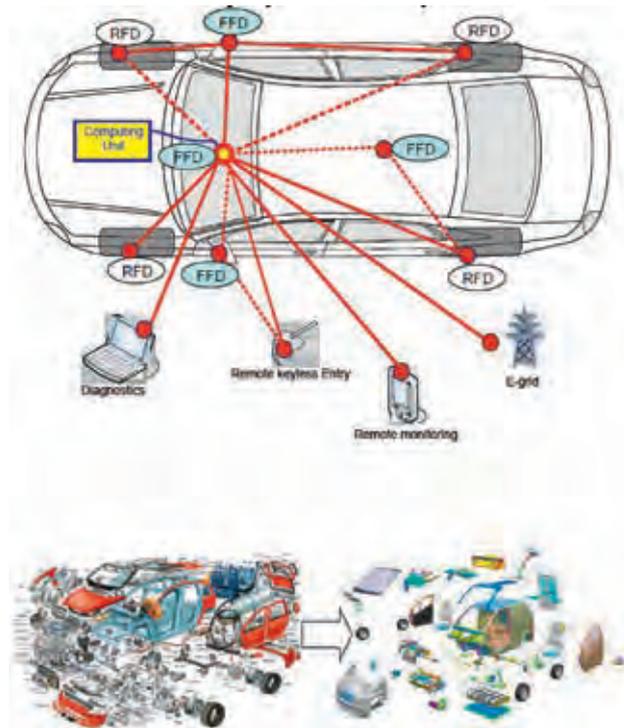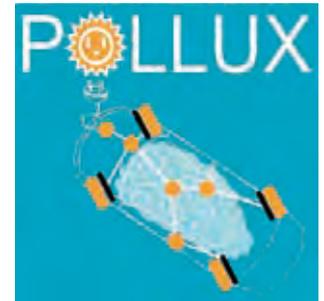

Austrian contribution

- **Austriamicrosystems AG:** Enhancements of FlexRay transceivers, interface function for photovoltaic-panel-control, enhancement of battery management, wireless sensor networks
- **AIT:** Data Time Flow Simulator, communication network schedule standard
- **Infineon Austria:** Design of EMI resistant wireless communication link, wireless links, design of wireless transceiver
- **CISC:** Simulation methodology of embedded system design, design for variability
- **AVL List GmbH:** Real time simulation of vehicle dynamics, subsystem test bench and validation
- **Das Virtuelle Fahrzeug:** Definition safety concepts, configuration operating systems, evaluation network protocols
- **FH-Joanneum:** Design fail-safe platform, safety monitoring for batteries, evaluate network protocols
- **TTTech:** Analysis of FlexRay technology, development of safety-critical multi-purpose ECU hardware
- **Österreichische Forschungs- und Prüfzentrum Arsenal Ges.m.b.H.:** Modelica models for simulation, testing/validating modelled electronic component

Impact/long-term benefits

- **Primary energy savings:** Lighter and smaller sized cars could be designed with an ideal powertrain requiring less than 60Wh/km and a reduced overall battery pack. The path toward low cost electrification is a complex one involving new approaches to vehicle design as well as a shift to co-modality, including a change of the consumer's attitude towards alternative powertrains.

- TTTech focused in the POLLUX project on analysis and implementation of **FlexRay technology** and the development safety-critical multi-purpose **ECU Hardware,** thereby pushing their technology in newly defined safety ECU hardware, bringing the automation level of the ECU up to level 4. This put TTTech in a frontrunner position on the market in the area of automated driving, also for electric vehicles.

Project Duration:
03.2010 – 09.2013

Project Coordinator:
Stiftelsen Sintef

Project Costs: **33 Mio. €**

Partners: **35 industrial, SME, academic and research partners from 10 different countries**

Contact: **info@artemis-pollux.eu**

Website: **www.artemis-pollux.eu**

PowerBase

Project description

PowerBase will setup and enhance **power semiconductor manufacturing pilot lines for wafer production and chip packaging,** with special attention for compact power applications. Demonstrators and full-scale testing are essential building blocks in PowerBase, stepping up Europe's innovation capability by developing technologies specifically addressing energy efficient systems.

The innovative power components envisioned, address the highest efficiency and reliability in energy generation, transformation and usage, providing these at a reasonable price per power unit. PowerBase addresses the "silicon path" and the "wide band-gap path" enabling major advancements in the area of "More-than-Moore" and System-in-Package.

Austrian contribution

- **Infineon Technologies Austria AG:** project coordination, WP3 leader, know how in power technologies, new substrates, pilot lines

- **Plansee SE:** new solution for GaN substrates and GaN packaging

- **Fronius International GmbH:** PV inverters with energy storage capabilities/ battery chargers

- **Kompetenzzentrum Automobil- und Industrie-eletronik GmbH:** thermo-mechanical phenomena from silicon devices and stress testing methodology

- **ams AG:** WP4 leader, development of heterogeneous integration, demonstrators for stacking of power devices and LEDs and wafer level molding

- **CISC Semiconductor GmbH:** provision of add-on EDA tool capabilities for design of GaN based semiconductor devices

- **Universität Graz:** statistical models for drift analysis and guardbanding, software specification for guardbanding

- **BESI Austria GmbH:** high-precision die bonding processes for LEDs and power devices and validation on final demonstrator assembly

- **CTR:** test design/-runs and comprehensive device analysis

Impact/long-term benefits

PowerBase focuses on value creation in Europe, aiming at keeping Europe at the forefront of technology development and deployment. Positioned as "Innovation Action", exploitation of the project's results is a primary goal, thus bridging the gap between research and exploitation.

Power Semiconductors are key drivers for the innovation capability of European industries, large and small, in turn generating economic growth and supporting meaningful jobs for citizens. At the critical interface between data processing and the harsh, real world, they support solutions for some of the difficult societal challenges addressed by European policies for 2020 and beyond. For both reasons, it is vital that investments continue to be made to assure European collaboration, and access to the technologies, know-how and capacities which guarantee growth potential and strategic independence in the face of tough competition and increased globalization.

Project Duration:
**36 months,
May 2015 – April 2018**

Project Coordinator: **Infineon Technologies Austria AG**

Project Costs: **87.5 Mio. €**

Partners: **39 partners from nine European countries: Austria, Belgium, Germany, Italy, Norway, Slovakia, Spain, UK, Netherlands**

Contact:
powerbase@infineon.com

Website:
**www.powerbase-project.eu**

Productive4.0

Project description

The main objective of Productive4.0 is to achieve significant improvement in **digitalising the European industry by means of electronics and ICT.** Ultimately, the project aims at suitability for everyday application across all industrial sectors – up to TRL8. It addresses various industrial domains with one single approach, that of digitalisation.

What makes the project unique is the holistic system approach of consistently focusing on the three main pillars: digital production, supply chain networks and product lifecycle management.

This is part of the new concept of introducing seamless automation and network solutions as well as enhancing the transparency of data, their consistence, flexibility and overall efficiency. Currently, such a complex project can only be realised in ECSEL.

The well balanced consortium consists of 45% AENEAS, 30% ARTEMIS-IA and 25% EPOSS partners, thus bringing together all ECSEL communities.
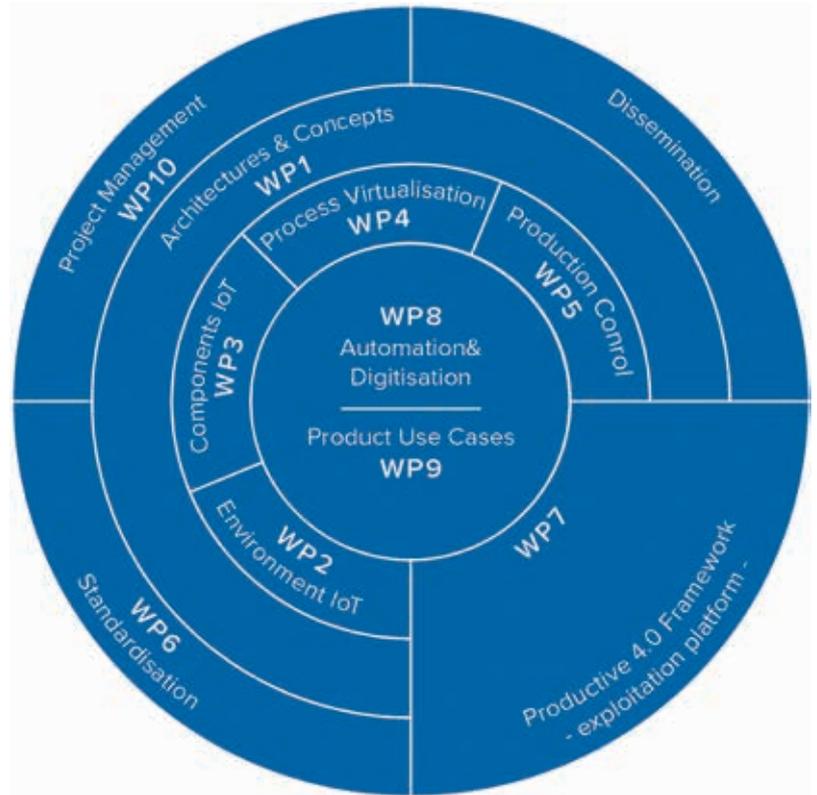
Austrian contribution

- **Infineon Technologies Austria AG**
- **AVL List GmbH**
- **Kompetenzzentrum – Das Virtuelle Fahrzeug, Forschungsgesellschaft mbH**
- **Thales Austria GmbH**
- **Evolaris next level GmbH**
- **TTTECH Computertechnik AG**
- **GUEP Software GmbH**
- **AIT Austrian Institute of Technology GmbH**
- **Fachhochschule Burgenland**
- **Technische Universität Wien**
- **Universität Klagenfurt**

Work Areas: Design of powertrain components and systems; Security and failure analysis: safety-critical systems deployed on embedded systems; Defining and implementing static and dynamic interfaces for communication between devices and data acquisition systems; Standardisation activities

Main WPs: WP1, WP3, WP6, WP9

Impact/long-term benefits

- **Digitising industry:** TRL6-8 implementation of a supply network wide approach including the infrastructure to include the large data streams created by the production processes.

- **Developing Standards and interoperability:** Building on the Arrowhead communication technology. Extending to full supply network solution including lifecycle management. The eco-system created by the TRL6-8 will drive towards standardisation.

- **Making the most of the data economy and cloud computing:** The industrial scale deployment of Productive Framework will deliver the entrance to a big-data era. The huge potential of big-data will be addressed by the development of big-data tools to find trends, define actions etc.

- **Unlocking the benefits of e-services and advancing digital skills:** The key combination of universities, industries and service organizations enable education on key topics on the digital agenda driven by datasets from real world industrial demonstration.

Project Duration:
01.05.2017 – 30.04.2020

Project Coordinator:
Infineon Technologies AG

Project Costs: **106 Mio. €**

Partners:
109 Partners from 19 countries

Key Partners: **BMW, Philips, Infineon, ABB, SAP, NXP, STM, BOSCH, Thales, AVL, VOLVO, CEA, BetterSolutions, IMA, KIT, AIT, FhG, Sysgo, DANOBAT, MONDRAGON, ERICSSON, VTT, SINTEF, LTU, LFOUNDRY ,TNO, TTTech, Siltronic, VIF...**

Key industrial domains: **Automotive, Machinery, Robotics, Semiconductor& Electronics, Consumer, Automation, Logistics**

Contact:
knut.hufeld@infineon.com

Website: **www.productive40.eu**

SafeCer

Project description

SafeCer targeted increased efficiency and reduced time-to-market by **composable safety certification of safety-relevant embedded systems.** The industrial domains addressed were within automotive and construction equipment, avionics, and rail. SafeCer also developed certification guidelines and training examples for other domains, considerably increasing its market impact.

A primary objective was to provide support for system safety arguments based on arguments and properties of system components as well as to provide support for the generation of corresponding evidence in a similar compositional way. By providing support for efficient reuse of certification and stronger links between certification and development, component reuse is facilitated. By providing support for reuse across domains the amount of components available for reuse increases.
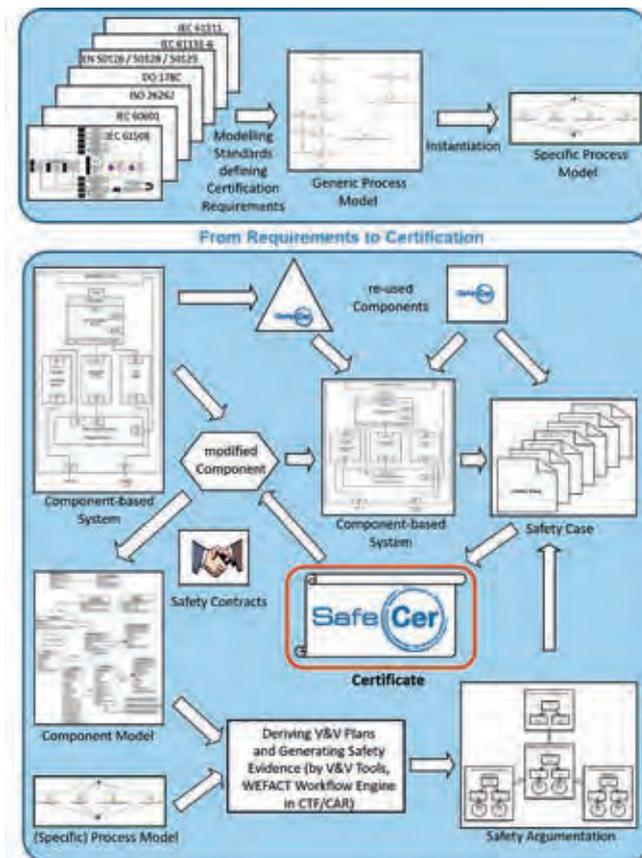
Austrian contribution

The Austrian consortium comprised

- **AIT Austrian Institute of Technology GmbH**
- **AVL List GmbH**
- **VIRTUAL VEHICLE Research Center**
- **TTTech Computertechnik AG**
- **Thales Austria GmbH**

Within the project, AIT further developed tools for supporting the certification workflow [WEFACT], model-mutation based test case generation [MoMuT] and robustness testing for time-triggered systems [BusScope]. Together with industry partners from the automotive and railway domains, the benefits of the novel methods were demonstrated.

Impact/long-term benefits

SafeCer fostered market innovation in several respects, including:

1. Innovation for process, component models, safety arguments and verification/validation, applicable to multiple domains, targeting cost-efficient reuse which leads to lighter, cheaper and faster certification of safety-related, software-intensive embedded real-time systems.

2. Instantiation of methods and tools for automotive, avionics, aerospace, construction equipment and rail domains. Creation of integrated certification and development framework. Market impact through the development, verification and certification of tools, providing direction for methodology, reference architecture and prototype tool environment.

3. Research aimed at extending to an open framework for new [other] domains and for certification for cross-domain use of components.

4. Contribution to standards and regulations. Focus on software components qualified for certification. Impact on European industry.

Project Duration:
April 2012 - March 2015

Project Coordinator: **Volvo Group Trucks Technology, Sweden**

Project Costs: **15 Mio. €**

Partners: **30 partners**

Contact: **lars-olof.berntsson@volvo.com**

Website: **www.safecer.eu**

SCOTT

Project description

Creating trust in wireless solutions and increasing their social acceptance are major challenges to achieve the full potential of the Internet of Things - IoT. Therefore, SCOTT – Secure COnnected Trustable Things, a pan-European effort with 57 key partners from 12 countries - EU and Brazil, will provide **comprehensive cost-efficient solutions of wireless, end-to-end secure, trustworthy connectivity and interoperability** – Technology Readiness Level 6-7 – to bridge the last mile to market implementation.

SCOTT will not just deal with 'things that are connected', but with 'trustable things that securely communicate', i.e. things interconnected by dependable wireless technology and valuing the end-users' privacy rules.
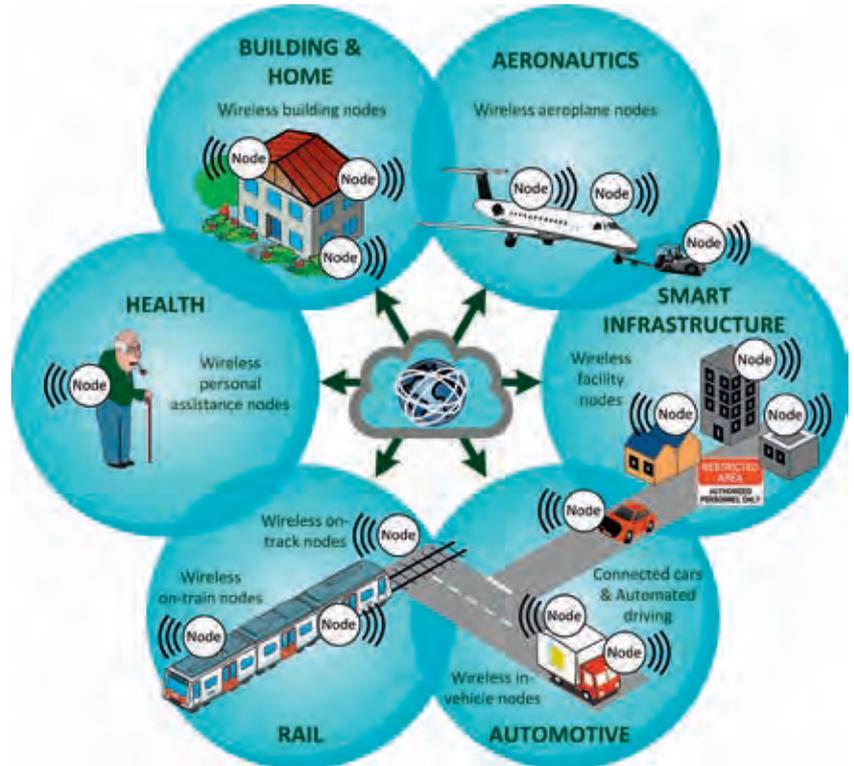
Austrian contribution

The SCOTT project once more highlights the pioneering role in innovation played by Austria, and in particular Styria, with its capital city of Graz. The close collaboration with leading international facilities and companies sustainably strengthens the position of Austria in the European research and technology landscape.

- **Kompetenzzentrum – Das Virtuelle Fahrzeug Forschungsgesellschaft mbH - Virtual Vehicle**
- **AIT Austrian Institute Of Technology GmbH**
- **AVL LIST GmbH**
- **CISC Semiconductor GmbH**
- **Universität Linz**
- **Linz Center Of Mechatronics GmbH**
- **NXP Semiconductors Austria GmbH**
- **SBA Research Gemeinnützige GmbH**
- **Siemens AG Österreich**
- **Technische Universität Graz**

Impact/long-term benefits

The outstanding partner consortium of SCOTT covers the complete value chain from silicon to end-users and operators. SCOTT aims to establish an eco-system for trustable wireless solutions and services for both professional and private users. Together with the deployment of open innovation approaches and stakeholder engagement, as well as close collaboration with the Alliance for Internet of Things Innovation - AIOTI - and other cluster organizations all over Europe, SCOTT will further boost the growing Internet economy.

SCOTT will generate new market opportunities for the European industry, significantly reduce time to market, and decrease the cost of trustable wireless solutions on the market.

Ultimately, SCOTT will foster European leadership in the field of Smart and Connected Things - including the Internet of Things - and strengthen Europe's independence in the area of security-enabling components and systems.

Project Duration:
01.05.2017 – 30.06.2020

Project Coordinator: **Kompetenzzentrum – Das Virtuelle Fahrzeug**

Project Costs: **39.1 Mio. €**

Partners: **57 key partners from 12 countries (EU and Brazil)**

Contact: **scott@v2c2.at**

Website: **www.scott-project.eu**

SemI40

Project description

Electronic components and systems are key drivers for the innovation capability of European industries, large and small, generating economic growth and securing jobs for citizens.

This is where SemI40 project is stepping in – it will establish **smart, sustainable, and integrated semiconductor production.**
The project will pave the way for serving highly innovative electronic markets with products powered by microelectronics manufactured in Europe.

Challenging aspects of utmost importance:

- Data Safety and security in manufacturing environment with special attention on legacy equipment.

- Agility in Enterprise Collaboration System production for fast adaptability to changes.

- Tools and methodologies for automated decision making in manufacturing shop floor, based on big data analysis methods.

- Virtualization and digitalization for advanced simulation in fab environment.

Austrian contribution

- **Infineon Technologies Austria AG:** Project Coordinator and Project Management. Industrial demonstrators will be implemented in production environment.

- **Universität Klagenfurt:** WP6 Leader for Dissemination and Exploitation. The Universitaet Klagenfurt will provide their expertise in production management/planning.

- **VIRTUAL VEHICLE Research Center:** WP5 Leader. Use cases, technical & socio-economic impact.

- **Austrian Institute of Technology:** WP1 Leader. AIT will contribute to the development of cyber-physical production system.

- **Know-Center GmbH:** WP3 Leader. Development of machine learning algorithms and their application in the semiconductor manufacturing environment.

- **Contributors:** Fachhochschule Burgenland, Materials Center Leoben Forschung GmbH, AVL List GmbH, PLANSEE SE, Technische Universität Wien, Fraunhofer Austria, AT & S Austria Technologie & Systemtechnik AG, Infineon Technologies IT-Services GmbH, Kompetenzzentrum Automobil- und Industrieelektronik GmbH

Impact/long-term benefits

Through implementing the technical research outcomes and solutions for the related SemI40 use cases in a cross-domain approach and enabling the connected manufacturing, the Semi40 project will ensure long-term competetiveness of European semiconductor industries with cascade benefits on other related industries along the supply chain.

- Balancing of system security and production flexibility will allow a more cost-efficient IT and production environment. Safe secure, trustworthy and authenticated communication will enable a better managing of complex activities between partners or between Fabs of the same company.

- Improve operational efficiency, e.g. uptime, asset utilization, better men power management…, through advances in data analytics and learning algorithms. Deep learning infrastructures will be applied and evaluated in the application domains of the Consortium.

- Energy efficiency KPIs in combination with statistical control functionality, allow energy savings..

Project Duration:
05.2016 – 04.2019

Project Coordinator: **Infineon Technologies Austria AG**

Project Costs: **62 Mio. €**

Partners: **37 partners in 5 European countries. The project is co-funded by grants from Austria, Germany, Italy, France, Portugal and ECSEL JU.**

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About ECSEL-Austria

Another challenge is to build more projects as pilot lines with the integration of hardware, software and smart systems as electronic based systems. These activities also include sensor actors, power electronics and high frequency including system integration.

Now the activities of ENIAC, ARTEMIS as well as EPoSS are combined within ECSEL-Austria, seeking to generate synergies and additional interconnection of value chains for the future. Another challenge is to build more projects as pilot lines with the integration of hardware, software and smart systems, as electronic based systems. These activities also include sensors, actuators, power electronics and high frequency including system intergration. Many examples of such cooperations already proved to result in innovations, which is also an ambitious goal in Horizon 2020.

Our Mission

... is to Secure supply of key technologies and critical knowhow in the field of electronic components and systems to support innovation in all major sectors of the economy and society in Europe.

Our Vision

- strengthen the international competitiveness of Austrian companies in this sector

- increase the international visibility of Austrian companies and R&D facilities

- encourage the cooperation, focus and performance of Austrian R&D institutions

- develop inputs for European research activities based on the strengths of Austrian actors

- accentuate the Austrian innovation landscape in Europe

- promote Austria as an attractive location for establishing a business and expanding high-technology production

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FH Technikum Wien

Fronius International GmbH

Infineon Technologies Austria AG

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