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Abstract

In this document we describe the initial exploitation plan of FED4SAE, as defined at the start of the project. The overall exploitation strategy addresses three main tracks: the exploitation of the CPS technologies that are available in the project and offered to third parties in application experiments, the leverage on the communities and ecosystems that exist around FED4SAE DIHs and that will be extended and reinforced, and ensuring sustainability of the FED4SAE DIH network and the innovation services it can offer to European businesses. At this initial stage, the FED4SAE exploitation plan particularly focuses on the individual plans of the FED4SAE partners to build up, activate, and extent their local ecosystems around their CPS platforms and technology domains. Over the course of the project the individual exploitation efforts of the project partners will progressively be integrated to form a global strategy. The exploitation plan will be updated yearly and will be refined based on progress of the project and lessons learned.

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1 Introduction

The overall ambition of FED4SAE is to boost and sustain the digitization of the European industry by strengthening competitiveness in Cyber Physical Systems (CPS) and embedded systems markets.

In alignment with the "Smart Anything Everywhere" initiative goals, FED4SAE aims to:

- Create a pan-European network of Digital Innovation Hubs (DIH) by leveraging existing regional ecosystems across value chains and a range of CPS competencies. These DIHs will enable both tech and non-tech innovative businesses (Start-ups SMEs, Midcaps) from any sector to build new products and services with "digital inside".
- Act as a European added-value one-stop shop to facilitate cross-border partnerships between innovators and suppliers to accelerate innovation in products and processes of European businesses. This is enabled by providing technical, industrial and innovation management expertise to businesses for increases in market shares, productivity, and a broader adoption of CPS and embedded systems solutions.
- Facilitate links between innovators and investors associated with DIHs to reach out to further funding opportunities and accelerate commercialisation.
- Ensure the self-sustainability of the DIH network by developing cooperation with regional organizations and key stakeholders engaging public and private investment to fund further activities after project completion.

FED4SAE will give birth to a competitive ecosystem where European Start-ups, SMEs and Midcaps will thrive as they access to leading technology sources, competencies and industrial platforms and also to well-connected business infrastructures and existing regional innovation hubs.

1.1 Task objectives

To achieve the ambitious goals of FED4SAE and to maximize the industrial uptake, impact on targets, and outreach of the results, whilst ensuring the long-term sustainability and growth of major project outcomes, FED4SAE defines and continuously evolves a comprehensive set of strategic exploitation activities.

FED4SAE has a large potential market, a differentiated offering, significant potential profits, a highly skilled team and a scalable business model: all these elements can guarantee the outcome of the project finding easy entrance into the market, boosting EU competitiveness and growth. Potential customers identified by FED4SAE are distributed globally with strategically important markets. FED4SAE is targeting tech and non-tech Start-ups, SMEs and Midcaps that need support in accessing technologies, expertise and innovation management services.

The exploitation activities are closely linked to the project's dissemination actions, which ensure that all relevant communities are broadly aware of FED4SAE offerings and results. Hence the exploitation work is placed together with the dissemination activities in a dedicated work package (WP6 "Creating cross-border CPS and Embedded System DIH, Dissemination and Exploitation") with participation of all project partners; this will ensure that the exploitation activities are carried out with the same level of commitment as technical work. A major objective for FED4SAE is to facilitate pan-European benefits from the project outputs and results.

Overall, the exploitation strategy has the following dimensions:

- For FED4SAE partners that are providers of CPS and Embedded System platforms
  - It will enable new use cases and more platform sales,
  - Additional insights about end users which currently only the distributor captures,

- For FED4SAE partners that are advanced component providers (RTOs and Technology transfer-oriented university institutes),
  - Maturation of advanced enablers towards increased market readiness,
  - Industrial transfer opportunities through third parties.
- For FED4SAE DIHs,
  - New capabilities and increased competitiveness through partnerships in federated networks allow to provide more holistic services to local Start-ups, SMEs, Midcaps (better services for local businesses, better access to future funding and commercial contracts),
  - Easier market entry to other EU countries through federated hubs,
  - Funding to help local CPS and Embedded System sector grow,
  - Third party growth - new products, services and scale-up opportunities supported in the region.

Alongside the growth of major project outcomes, FED4SAE will adopt and exploit the results in a sustainable way during and beyond of the project scope to ensure the long-term sustainability. The business model of FED4SAE self-sustainability will rely on the setting-up of a public/private co-financing of the action to further apply the cascade-funding scheme.

1.2 Purpose of this document

The aim of the exploitation plan is to define the specific goals for exploiting both the innovative solutions created by FED4SAE application experiments and the further valuable assets available to FED4SAE DIH network, and to devise strategic actions to achieve those goals to ensure high impact of the project outcomes.

In particular, the exploitation plan aims to provide a strategy on two levels:

1. **Individual activities by FED4SAE partners** that focus on the particular technical expertise and focus domains of the project partners. These will ensure further maturation of the partners' technologies, increase of their uptake and growth of the respective user base. Furthermore FED4SAE DIH partners will create and intensify links to stakeholders within their local innovation ecosystems to facilitate connecting CPS innovators to resources and services available within these ecosystems.
2. **Integrated, project-wide activities** that are designed to connect the local FED4SAE DIH to a pan-European one-stop shop and to develop business models for a long-term sustainability of this network.

The FED4SAE exploitation plan presented in this document constitutes the initial strategy of FED4SAE, as defined at the start of the project. As such it particularly focuses on the individual plans of the FED4SAE partners to build up, activate, and extent their local ecosystems around their CPS platforms and technology domains. The plan will be updated yearly and will be refined based on progress of the project and lessons learned.

2 Overall Exploitation Strategy

The FED4SAE exploitation strategy builds on three main pillars:

1. Exploitation of CPS technologies and application experiment results
2. Community and ecosystem building around FED4SAE DIHs
3. Ensuring sustainability of the FED4SAE DIH network and its services

Activities defined for these pillars are described in the following subsections.

2.1 Exploitation of CPS technologies and application experiment results

At the core of the exploitation strategy for advanced CPS products and services is the FED4SAE partners' commitment to provide access for innovative businesses from various sectors to cutting-edge CPS technologies.

FED4SAE makes available Europe's key CPS and Embedded Systems industrial technology platforms. In this framework, FED4SAE offers companies involved in selected application experiments dedicated support and expert advice around leading-edge CPS platforms, allowing a faster understanding of platform capabilities, uses and constraints for more rapid solution development and thus faster time to market. In addition to this, FED4SAE readily offers a rich menu of complementary advanced technology bricks from large research institutes specifically targeted to SMEs to reach long term products and services differentiation. FED4SAE also provides expert mentoring and coaching for business case analysis, go to market condition analysis and supply chain management.

Due to the strong local networks of the FED4SAE partners, additional support can be activated as needed. For example, driven by the SMEs, the market and the capabilities, if complementary technology are required, other technology providers can also be involved in application experiments, and FED4SAE will active its local innovation hub players to identify suppliers to collaborate with the companies involved in application experiments.

To achieve impact of the results developed in application experiments, third parties will be supported to prepare market introductions through brokerage activities to identify potential customers and partners using FED4SAE DIHs network. Indeed the strength of FED4SAE is to connect to larger local networks to facilitate interactions between stakeholders which will also contribute to generated business opportunities. Specific activities will be conducted to leveraging on FED4SAE network and by the help of showcasing events.

The detailed technology offerings of the FED4SAE consortium and the individual strategies of the partners related to their technologies are described in Sect. 3.

2.2 Community and ecosystem building around FED4SAE DIHs

An important element for FED4SAE to ensure impact of the project's results and contributions is to create a strong network of all relevant stakeholders that can provide support to reach the FED4SAE goals. This relates to connecting to the existing regional ecosystems of the FED4SAE partners, involving public funding authorities and private investors, and linking up to other National and European initiatives and projects that contribute to the DIH vision.

Fostering regional partner ecosystems

All FED4SAE partners are strongly connected to and actively involved in rich innovation ecosystems in their respective regions, as detailed in the descriptions that follow in Section 3. To leverage on these ecosystems, FED4SAE has defined a dedicated task (within WP6 "*Creating cross-border CPS and Embedded system DIHs, dissemination and exploitation*") to foster and grow these existing networks of stakeholders around the platforms and technologies supported by the different FED4SAE centres for

their focused smart domains. The goal is to create the necessary knowledge about which actors and services can be accesses to support establishing user-supplier relationships, and to enable the exchange of learning assets and best practices. A central element in building such innovation eco-systems to achieve synergy will be to establish links between the FED4SAE centres and other existing regional and national innovation hubs. To understand the regional FED4SAE ecosystems, a number of activities have been defined:

- Create a validated inventory and network mapping of offerings of the FED4SAE centres and other relevant entities to which centres have access. This particularly includes identifying key firms, key research institutes, key academic partners, learning networks, innovation centres, digital hubs, incubators, investors and funding programmes.
- Analyse offerings of the ecosystem players, with a particular focus on learning opportunities, such as courses and common interests, and suitable promotion channels such as exhibitions, courses and workshops.
- Develop internal, relevant visualizations and catalogues for the aforementioned inventories, network mappings, elicited offerings and learning opportunities.

Based on the understanding of the regional ecosystems, FED4SAE will encourage further collaboration within these ecosystems, for instance by:

- Connecting to external innovation support organisations to promote businesses supported by FED4SAE through their participation at relevant events.
- Inviting external stakeholders to "community events" organised by FED4SAE centres around their supported platforms and technologies for their focused smart domains, to inform about new developments, showcase experiments, and exchange experiences.

These activities will facilitate the matching of businesses, both the ones that are supported by FED4SAE in application experiments and companies that contact the FED4SAE DIHs to look for such support.

Moreover, FED4SAE will be dedicated to demonstrate that pan-European activities multiply the impact of local initiatives at the European scale by enabling cross fertilization exchanges and boosting actions supported by local help with the goal to encourage local players adopt the best practices inherited from FED4SAE DIHs actions and adapt them to their own organization. FED4SAE will thus multiply local players' actions by bringing in the FED4SAE DIHs network and expertise.

Access to finance

Many ideas and products fail, not because they do not work technically, but because they failed to identify the market needs and/or requirements or did not make it in time to the market. FED4SAE goes beyond technical support provided to businesses and will also provide expertise and know-how to conduct a proper business case to establish relevant go-to-market plans and help them fine tune and improve their strategy to growth and raise investment if needed. Regarding the latter aspect, FED4SAE aims to liaise with investors, organizations providing innovation services such as banks, and other regional or national public funding initiatives. Depending on the company profiles and maturity of the AE results, access will be provided to private funding with investments or loans or to public funding to further support the development. Businesses involved in FED4SAE application experiments will benefit from a wide range of support, which will be tailored to the specific needs of the company:

- Identifying relevant funding sources that will further support businesses in reaching industrialization and commercialization of their projects. Access to loans, public funding, private investors but also crowdfunding will be considered for each application experiment depending on the supported company profile, developed product and targeted applications.

- Reach relevant investment readiness level for each supported application experiment and company in:
  - Encouraging companies to acquire customers in early stage of their project so they can satisfy private investment criteria in highlighting the value of their innovation
  - Adopting relevant business model and positioning in the value and supply chain for value creation
  - Preparing relevant business plan and documentation to be introduced to financial partners
- Accelerate and facilitate access to funding in engaging discussion with relevant investors part of FED4SAE community.

FED4SAE will also engage private investors already in the AE selection and support. They will be invited to take part in the evaluation process and to provide advice on how to support Third parties to reach relevant investment readiness level. In engaging them early in AE maturation, it will encourage future investment. Finally, all companies can be eligible to further public funding. FED4SAE DIHs will facilitate their access to support from national and regional agencies.

Connecting to other relevant initiatives

Through involvement of its project partners FED4SAE is interconnected to a number of activities that can provide synergies. In addition to this FED4SAE will actively seek to connect to other initiatives that are contributing to the DIH vision. Moreover, FED4SAE will establish links to existing and emerging regional (smart specialisation) or national innovation hubs. Apart from the links that the FED4SAE partners hold or will establish within their individual regional eco-systems, as described in Sect. 3 below, FED4SAE has identified the following initial list of relevant EU-wide projects and initiatives to which it will connect:

- **Smart4Europe** (https://smart4europe.eu/), which is the coordination and support action (CSA) coordinating the projects within the Smart Anything Everywhere initiative. Direct links are provided through CEA, BLUMORPHO and fortiss, who are project partners in Smart4Europe. This will ensure that FED4SAE outputs, service offerings and insights will be spread broadly.
- **Platforms4CPS** (https://www.platforms4cps.eu/), a CSA coordinating the H2020 projects within the CPS cluster. With its focus on community building around CPS platforms this is an excellent forum for FED4SAE to position its objectives in the context of a general vision and take benefit of its ecosystems building objectives.
- **MIDIH** (http://midih.eu/) is a project within the I4MS initiative and aims to establish digital innovation hubs in the manufacturing domain. fortiss is a MIDIH partner and provides the direct link to mutually share knowledge and facilitate the exchange of services between the two projects.
- The **EIT Digital** (https://www.eitdigital.eu/) network for digital innovation supports business creation and growth of European technology scale-ups. KTH and fortiss are part of the EIT Digital co-location centre network and can facilitate the promotion of FED4SAE third parties to receive further support to commercialize results created in successful application experiments.
- The DIHs to be established by FED4SAE will be contributed to the **DIH catalogue** (http://s3platform.jrc.ec.europa.eu/digital-innovation-hubs-catalogue) that is currently being developed as part of the S3 initiative, to increase the outreach and visibility of FED4SAE offerings.

Further initiatives that FED4SAE will link to include:

- The **Vanguard Initiative** (http://www.s3vanguardinitiative.eu/) aims to enable new growth through smart specialisation by bringing together various regions across Europe.
- The **EU 13 DIH initiative** (https://www.pwc.com/mt/en/publications/Smart-factories-in-new-Europe.html) supports to build a network of DIH for Smart factories in the new EU Member States.
- **New DIH projects** to be established in other domains, e.g. the DIH in robotics called for in the current H2020 call DT-ICT-02-2018 that are expected to start in late 2018.

Leveraging on all of these and other initiatives, FED4SAE will be able connect Start-ups, SMEs and Midcaps both to local innovation hubs and across European smart specialisation regions and help to build a FED4SAE community of CPS innovation stakeholders in every European region.

2.3 FED4SAE Sustainability

The major instrument to secure sustainability of the FED4SAE pan-European network and the innovation services it provides to stakeholders is to evolve the FED4SAE project as a specific organization in a form of legal entity. We call it here FED4SAE II. The ambition it to assess and define potential business models for FED4SAE II self-sustainability on the setting-up of a public/private co-financing of the action to further apply the cascade funding scheme. To this end, FED4SAE aims to carry actions to tap on the following potential revenue sources:

1. The public financing will be supported by local authorities with the support of ESIF to encourage the European added-value of cross border collaborations. This public financing will be dedicated to support risk management for innovation adoption by Start-ups, SMEs, and Midcaps in FED4SAE II.
2. Based on the value generated through FED4SAE action, the consortium partners will raise private investment for FED4SAE II following a payback model that will be based on the following rules. Any industrial company generating value (sales, access to private finance outside of the cascade funding scheme) from FED4SAE II support will be eligible for the payback model. It will concern:
    - Business who after completion of FED4SAE-supported application experiments are launching successfully new products on the market and generating sales based on FED4SAE II support or reaching private investment. They will be invited to reimburse the FED4SAE II financing after deduction of their own investment in the application experiment. FED4SAE II will evolve under a loan financial scheme with prepayment and reimbursement rate based on results reached (depending on revenues generation and investment raised). The reimbursement will be done by the third party one year after the generation of revenues or its fundraising so as not to impact its cash flow level. We are expecting first payback at Year 4 of FED4SAE II.
    - Technology suppliers addressing new markets and new customers and thus selling components or services to those companies and generating substantial revenues. They will pay a success fee to FED4SAE II, after deduction of their own investment in the application experiments.

A dedicated task has been defined within the work plan in order to discuss and assess potential business models for FED4SAE innovation hubs and initiate collaborations with local innovation organisations to establish the basis for the long-term sustainability of FED4SAE centres as CPS and Embedded System DIHs. Based on an analysis of the specific needs and sustainability requirements of each FED4SAE centre collaboration models for services of FED4SAE hubs are developed and validated such that these can be sustained in cooperation with other local organisations. Moreover, potential other funding sources or revenue streams for further services of FED4SAE hubs will be assessed, such as access to the hubs'

eco-systems and matchmaking/brokering services, or learning and training programmes. Cross-fertilization exchanges of local actions will be triggered in order to extend local third party support with European cross-border actions. Finally, FED4SAE experiment success stories will be promoted to regional and national innovation programmes and investors to demonstrate the added value of cross-border collaborations and to raise interest in implementing similar schemes.

A tentative business plan has been developed by FED4SAE prior to the start of the project and will serve as the basis for continuous refinements and updates based to the analyses described above. The initial plan has been based on the assumption of a total of 130 third parties supported within the FED4SAE project itself (30 third parties) and the first 5 years of FED4SAE II (another 100 third parties) with average cascade funding of 60k€ and innovation support as provided under FED4SAE. Sources of funding will be based on the engagement over 5 years of 10 European regions adopting the DIH model with a financing of 1M€ per region for a 3 year-period to benefit from FED4SAE II support. The FED4SAE consortium will expect co-financing by ESIF to set-up European added-value. Private financing will come first from industrial partners further engaging into FED4SAE II as they are currently doing in FED4SAE. Industrial sponsorship will be also considered. The progressive implementation of the payback model as described previously is expected to apply in year 4. Such financial scheme is aligned with the European Commission cohesion policy reform encouraging the use of financial instruments under ESIF to shift from a grant-based approach to a loan-based one.

The mission of FED4SAE II will be to accelerate CPS innovation adoption by European SMEs and midcaps. Any profit generated will be reinjected to further provide financing support to SMEs and midcap through cascade funding. Specific actions will be undertaken to sustain the FED4SAE DIHs network by encouraging the adoption of the DIH model locally in many European regions.

3 Individual Exploitation Strategies by FED4SAE Partners

All FED4SAE project partners have devised detailed plans for their individual exploitation activities, which are provided in this section. The partners' strategies rely on both their particular expertise in a wide range of CPS technologies and application domains as well as their strong involvement in local and regional ecosystems. The individual exploitation strategies per FED4SAE partners therefore describe the partners' expertise in their particular technical focus areas as well as the ecosystems and related communities in which they are active, and list the specific exploitation goals of the partners together with dedicated actions to address these goals.

3.1 CEA

3.1.1 Context

Partner description

Leti, a technology research institute at CEA Tech, is a global leader in miniaturization technologies enabling smart, energy-efficient and secure solutions for industry. Founded in 1967, Leti pioneers micro- & nanotechnologies, tailoring differentiating applicative solutions for global companies, SMEs and start-ups. Leti tackles critical challenges in healthcare, energy and digital migration. From sensors to data processing and computing solutions including CPS activities, Leti's multidisciplinary teams deliver solid expertise, leveraging world-class pre-industrialization facilities. With a staff of more than 1,900, a portfolio of 2,700 patents, 91,500 sq. ft. of cleanroom space and a clear IP policy, the institute is based in Grenoble, France, and has offices in Silicon Valley and Tokyo. Leti has launched 60 start-ups and is a member of the Carnot Institutes network. This year, the institute celebrates its 50th anniversary.

CEA Tech is the technology research branch of the French Alternative Energies and Atomic Energy Commission (CEA), a key player in innovative R&D, defence & security, nuclear energy, technological research for industry and fundamental science, identified by Thomson Reuters as the second most innovative research organization in the world. CEA Tech leverages a unique innovation-driven culture and unrivalled expertise to develop and disseminate new technologies for industry, helping to create high-end products and provide a competitive edge.

Ecosystem

CEA Tech irrigates today ecosystems Grenoble and Saclay and their region, Rhône-Alpes and Ile-de-France. For the economic development of their environment, the platforms function as industrial motor source of innovation and growth for businesses:

- Integrated circuit and embedded systems design platform
- Nanoelectronics and micro- and nanosystems platform
- Technological innovation showroom (demonstrators)
- PULSE (Platform from IRT Nanoelec)
- CEA has launched the construction of an Open Innovation Centre structured around the main stages of the recovered innovation process in global standards, the OIC is conceived as a singular infrastructure providing networking, expertise, equipment, methods, innovative spaces and full range of service offerings to accelerate innovation and propose immersion in the world of innovation to technological component.
- The project supports the CEA TECH recovery strategy which is envisaged in connection with its ecosystem. The OIC is strongly supported by the local authorities: the Regional Council Rhône-Alpes and the Departmental Council of Isère provide respectively 35 and 23% of the project financing. In addition IRT Nanolec will also contribute with 4M€.

Focus area

CEA-Leti, has been involved in the CPS solution development within European projects since several years especially with the lead of the already running CPS European projects (first SAE projects phase): EuroCPS and Gateone:

- EuroCPS aims at building a full CPS value chain of competences and platforms to enable Third parties from any sector to build innovative CPS products. It brings together key European players into a network of competences to service Third parties. EuroCPS acts as a facilitator to mitigate ecosystem complexity, thus lowering entry technical barriers. A set of target experiments has been selected according to the available competences and platforms in the network and strategic EU priorities
  FED4SAE could benefit from EuroCPS network in expending in Europe awareness of the technologies they are promotion
- Gateone-project provides innovation as a service to European SMEs. Gateone-project is a free evaluation program of demonstrators defined in collaboration with SMEs and selected for the relevance of the business case to lead to economic value. In Gateone-project, 50 demonstrators are developed and tested by European SMEs. Gateone-project initiates collaboration between SMEs and RTOs from product definition up to market sampling with relevant demonstrators dedicated to specific usage
  FED4SAE will benefit from Gateone's expertise in business case validation, supply chain management as well as first customers acquisition through functional demonstrators.

Related Communities

CEA relies also on Minalogic, partner of fed4SAE as CEA linked third party who brings In-depth knowledge of the regional ecosystem, In-depth knowledge of local SMEs and ability to connect pertinent actors together:

- Minalogic is a global innovation cluster for digital technologies serving France's Auvergne-Rhône-Alpes region. The cluster supports the region's leading innovators by facilitating networking, fostering collaborative R&D, and providing companies with personalized assistance throughout all phases of business growth. The products and services developed by our members address all industries, from ICT and healthcare to energy and advanced manufacturing.
- Minalogic today boasts more than 300 members, including 270 companies. The cluster has certified nearly 450 projects that have secured total government funding of €794 million of the more than €2 billion in total R&D spending these projects represent.
- Minalogic is member of the Silicon Europe Alliance, one of the biggest technology clusters in the world. In the Silicon Europe Alliance 12 leading European semiconductor clusters bring together the technological expertise and resources of Europe's leading players in micro- and nanoelectronics, one of the recognised "Key Enabling Technologies". This "cluster of clusters" represents over 2 000 members (over 75% SMEs) and more than 250,000 jobs.

3.1.2 DIH exploitation strategy

Exploitation goals

CEA-Leti exploitation strategy relies on the following policy and offer: CEA-Leti will support Third parties (Start-ups, SMEs and midcaps) to integrate innovative technologies in their products and services. To do so, CEA-Leti will transfer advanced low-power technology bricks, IoT Device management middleware, Sensor Fusion platform into Third parties CPS solutions, and will also propose Testbeds platform to ensure the adequacy between technologies and use cases.

CEA-Leti aims at strengthening or creating new collaborations with Third parties, extending its ecosystem to reach more Third parties. This strategy is indeed the mission of the CEA TECH, part of the DNA of the institute, based on the excellence and also based on the innovation transfer to our industrial partners.

CEA-Leti can foresee several kind of benefits:

- Learning about innovative products and services technology needs by Third parties.
- Learning about start-ups, SMEs, midcaps business case constraints.
- Identification of the next technologies to develop.
- Learning about innovation management needs and requests, to adopt innovation.

Planned exploitation activities

In the short term, CEA-Leti will support Application Experiments (AEs) with Third parties, more specifically AEs that use CEA-Leti advanced technologies and testbed in the development of new innovative applications and show-cases.

Thanks to the positioning of CEA-Leti, with the objectives to innovate and transfer innovation to industries, and as the proposed advanced technologies have got a TRL – Technology Readiness Level – between 4 and 6, the timescale for CPS developments is seen as short and medium term.

CEA-Leti targets to grow awareness about its advanced technologies and testbed. Results and demonstrators/proof-of-concepts resulting from the executed Application Experiments can serve as attractive showcases and assets for this purpose.

CEA-Leti plans to initiate further collaboration with industry (Third party, industrial partner) and academia in research and innovation projects to promote its advanced technologies and testbeds, to extend their functionality or adapt it to further use cases and increase its user base.

Through the construction of an Open Innovation Centre (OIC) structured around the main stages of the recovered innovation process in global standards, CEA-Leti will offer a singular infrastructure providing networking, expertise, equipment, methods, innovative spaces and full range of service offerings to accelerate innovation and propose immersion in the world of innovation to technological component. The OIC is strongly supported by the local authorities and supports the CEA TECH recovery strategy which is foreseen in connection with its ecosystem.

In the long term, CEA-Leti plans to be active in the following tasks

- Participate in suitable funding programmes with types of innovation support activities similar to the Open Call and financial support mechanisms used in FED4SAE, on regional, national or European level.
- Promote SME support scheme of FED4SAE to regional stakeholders and funding authorities, to develop new or adapt existing funding schemes in a similar way.

3.2 Intel

3.2.1 Context

Partner description

Intel Corporation engages in the design, manufacture, and sale of computer, networking, and communications platforms. It operates its business through the following groups: Technology Manufacturing Group, Client Computing Group, Data Center Group, Internet of Things Group, Non-

Volatile Memory Solutions Group, Intel Security Group, Programmable Solutions, and Artificial Intelligence Product Group and Sales and Marketing Group. It has over $60 billion in revenue, 100,000 employees worldwide of which 23,000 are the European region supporting the key business units. For a detailed breakdown of Intel division see D6.4.

Intel's path to market. In the main, Intel does not sell branded products directly to end consumers. While it does design, develop and manufacture motherboard chipsets, network interface controllers and integrated circuits, flash memory, graphics chips, embedded processors and other devices related to communications and computing, these technologies are brought to market through a global ecosystem of partners.

For the **IOT/CPS Markets**, Intel uses distribution partners referred to as "disti's" such as Arrow, Rutronik, Mouser and RS Components to distribute building block components directly to consumers in the IOT markets. Intel also partners with companies such as Advantech, Ingram, Kontron, Dell, AAEON, Arrow Electronics, Arris, who provide range of Intel based Gateways, Single Board Computers, Set Top Boxes etc. A number of these are members of Intel Technology Provider which help end customers to develop solutions using components from Intel and integrates them with other components or software and develop final customer branded products to market. These ITP partners are distributed worldwide and have both the technical and domain expertise in their specific local markets. The get easily access to new technologies, training and support and access to technical expertise. More Info https://www.intel.com/content/www/us/en/technology-provider/overview.html

Ecosystem

So the ecosystem reach will be achieved through three main channels

1. We plan to approach at least two of these "disti" partners (RS Components and Mouser) to post material on the FED4SAE project on their website where thousands customers purchase various components including the Neural Compute Stick, the Compute Card or other boards from other platform providers. We have already engaged with partners Dell, Kontron, Advantech to raise awareness of the FED4SAE Programme in their EMEA network.
2. When customer purchase the Neural Compute Stick they can then register and use the **NCS Forum** to connect, share learning and insights https://ncsforum.movidius.com/discussions through this online community. We plan to connect to these customer and make them aware of the FED4SAE Project and the opportunities.
3. Other Direct or Indirect challenges through our Sales and Marketing teams, Employees, or attending Conferences, trade shows or locally through National organisations such as Enterprise Ireland and IRDG, Hardware Accelerator such as DCU Alpha, who we have already started to engage.

The success criteria for Intel are very clear for Intel – it is all about volume, volume, volume of units shipped and the impact of the product on the market place. A key goal of the FED4SAE project for Intel is to identify new customers who we may not have reached through our traditional channel partners. These may be in a geographic region or country where our partner network may not have a strong presence or in novel vertical markets say -- military, healthcare, automotive, medical etc. --, or market niche where we were not targeting the platform. As both of Intel platforms -- Neural Compute Stick and the Compute Card -- are new to market, we are hopeful that interesting use cases will arise. So if a company is doing something really novel or innovate with the platforms that we can showcase to drive adoption into new markets then that may also be an important measure of success. These novel use case may be supported from Intel through the funding or white papers or promotional videos – these typically show customer success stories and are useful marketing collateral to drive further market adoption.

Focus area

Intel is all about high volume manufacturing and mass market adoption. In this project Intel are seeding two newly developed leading edge technologies which we see as having mass market appeal in their specific markets.

(a) the Movidius Neural Compute Stick

Firstly Intel see huge potential opportunities for applying artificial intelligence into almost every facet of our lives. Intel is keen to enable and accelerate the AI (Artificial intelligence) market by offering a suite of world leading platforms in this area. In recent years Intel has made of large number of strategic AI related acquisitions from Nervana, Safron, Mobileeye, Movidius to name but a few. Intel Capitals its Venture Capital arm has invested over $1 billion in start-ups targeting the AI market.

There are many market segments and while different analysts present various market sizes, they all agree that the market is a multibillion $ industry and it is just getting started. Therefore in this project we are seeding the Movidus Neural Compute Stick to enable and accelate European Companies adoption of the hardware and exploitation of this huge market.

Computer Vision

The Neural Compute stick targets the computer vision market and it can be thought of as a hardware accelerator – While the underlying VPU can run it own operating system and power a complete platform or it can used to offload compute intensive image classification activities from a standard CPU to its VPU in a highly efficiently manner to classify / identify the objects. Compute Vision and edge computing will enable all whole new class of intellent objects from autonomous drones, robots to cars.

The Movidius Neural Compute Stick is powered by a Myriad VPU (Visual Processing Unit). The Intel® Movidius™ Myriad™ 2 VPU is the industry's first **always-on vision** processor. It delivers high-performance machine vision and visual awareness in severely power-constrained environments. Further Details https://www.movidius.com/solutions/vision-processing-unit.

The Myriad VPU targeted for ultra-low power computer vision applications that generally operate at the edge of the network. The typical use cases for this technology are drones/robots, security cameras, such as HiksVision Security Cameras which are the world leader and home devices such as Google's Clips and future growth vectors such as Augmented, Merged or Virtual Reality platforms.

These edge devices run deep neural networks algorithms which enables them to recognise objects or classifying events. So the Movidius Neural Compute Stick will allow European Companies to prototype their compute vision applications and the trained CNN in either Caffe or Tensorflow formats which are compiled, deployed and executed Neural Compute Stick using the Movidius SDK. These tools and SDK enable the developer to identify bottlenecks and tune the performance (such as using alternative filters) and make energy trade off decisions in the execution of the network.

The goal of the Movidius Team in the FED4SAE project is to identify a number of European Companies that wish to create applications that utilise the Neural Compute Stick as a prototyping tool. The stick itself uses the standard USB interface which can be plugged into any standard PC and exploited however to develop a custom solution will require the development of a custom board solution that may contain one or many VPU depending on the level of compute parallelism required to support the specific workloads anticipated.

(b) Intel Compute Card

The second platform which Intel is seeding into the FED4SAE Project is the Compute Card™. Intel has been a leader in delivering technology to help realize the benefits of the Internet of Things and enable more smart and connected devices. The Intel Compute Card is being developed with that in mind, to transform the way compute and connectivity can be integrated and used in future devices.

The Intel Compute Card has all the elements of a full computer, including Intel SoC, memory, storage and wireless connectivity with flexible I/O options so hardware manufacturers can optimize for their particular solutions – from interactive refrigerators and smart kiosks to security cameras and IoT gateways. Device makers simply design a standard Intel Compute Card slot into their device and then utilize the best Intel Compute Card for their performance and price needs. This reduces the time and resources needed to design and validate the compute block and helps speed up innovation to bring the power of intelligence into an ever wider range of devices.

The target market for compute card is broad and many from retail, education whiteboards, service robotics industrial and white goods - anywhere compute, low power or mobility are important factors . The card can be removed upgraded or replaced with a family of pin compatible cards at a range of price points thus providing a range of additional compute levels, memory and storage capacity depending on the specific needs of the individual customer's use case. Another advantage of being pin compatible is that as the technology advances with Moore's Law, the end consumer can simply replace the compute card with the latest model offering additional performance with minimal disruption thus the user can protect and reuse their investment in display technology and only upgrade the compute card component.

The card will be available the European Companies through similar wide partner distribution channels such as Mouser and RS Components.

3.2.2 Partner exploitation strategy

Exploitation goals

Vector	Good	Better	Best
Number of new customers to the platform that we would not have reached through existing network and has the resources to scale the product into the European & Global market.	5 NCS Customers and 4 Compute Card Customers who develop successful Application Experiments.	1 Customer who uses both NCS & Compute Card plus 4 NCS and 4 Compute Card based Application Experiments.	9 New Customers who successfully complete Application Experiments that then use both NCS and Compute Card and ramp both into the market.
Quality Platform Feedback the influences the roadmap and thus increases market adoption. New partnerships/ access to markets through Digital Innovation Hubs	Feedback from the AE that the boards and documentation provided is useful and no major gaps in functionality, documentation or bugs in the platform.	Lots of insightful feedback from the customers that help influence and improve the product features / roadmap.	New partnership developed through the programme and a sustaining network of DIH through which Intel can partner to offer new technology offerings and get feedback.
Combination Advanced Technologies with Intel Platforms to enable us to address new markets.	Successful integration of one of more of the Advanced Technologies / Testbeds platforms in the project with Intel's platform.	Interesting combination of an Advanced Technology platform / Testbed that creates a compelling product offering for a market	Compelling commercial solution enabled by a combination of an Advanced Technology platform / Testbed that creates a compelling product offering for a market

Planned exploitation activities

Depending on the location of the application experiment but the intent is for Intel Field Sales Engineer to visit the customer's site or for them to visit an Intel site to work with them directly to see how we can

assist the customer both in their Application Experiment, connect them into the Intel Partner Ecosystem to determine how we can assist them to scale their product into the European and Global markets. This support may be though Intel or a system integrator partner who has domain knowledge of the customer's specific Geography and vertical market (Retail, Education, etc.)

3.3 ST-I and ST-F

3.3.1 Context

Partner description

ST is one of the few semiconductor companies world-wide able to provide a comprehensive set of products to support IoT enabled solutions, including intelligence (microcontrollers), sensing, communication, low power management and security features. In addition, ST has the possibility to provide prototypes quickly and cost-effectively with a complete range of development ecosystems, including the STM32 open development environment.

To keep its technology edge, ST has maintained an unwavering commitment to R&D from the beginning with approximately 7,500 people working in R&D and product design and spent about 19% of its revenue in R&D in 2016. Among the industry's most innovative companies, ST owns and continuously refreshes a substantial patent library (~16,000 owned patents in ~9,500 patent families and ~500 new patent filings in 2016

Ecosystem

ST has established a worldwide network of strategic alliances, including product development with key customers, technology development with customers and other semiconductor manufacturers, and equipment- and CAD-development alliances with major suppliers.

These industrial partnerships are complemented by a wide range of research programs conducted with leading universities and research institutes around the world, in addition to playing a key role in Europe's advanced technology research programs such as PENTA (Cluster for Application and Technology Research in Europe on NanoElectronics), a successor to CATRENE, and industry associations such as AENEAS (European Nanoelectronics Initiative), H2020 and ARTEMIS-IA (Embedded Computing Systems Initiative)

Focus area

ST Italy (ST-I) will push forward its own reference platform WeSu, exploiting synergy between a STM32 microcontroller with inertial modules iNEMO and Bluetooth® low energy wireless network processor, to explore new eco-systems driven by innovative SMEs and challenging applications, suitable to penetrate new potential markets in the next future. To favourite a fast and affordable prototyping, ST-I promotes, together with the previous platform, a broad range of expandable boards (X-Nucleo), based on leading-edge commercial products and modular software, of the Nucleo STM32 Open Development Environment eco-system.

ST France (ST-F) offers development platforms and an Open Development Environment based on the STM32 microcontroller family which provide support for a broad range of components for processing, sensing, connectivity, power and analogue functionality.

Related Communities

Makers and developers from prototyping through to final products.

3.3.2 Partner exploitation strategy

Exploitation goals

Both ST-I and ST-F, in the project, act as platform providers targeting a cheap and fast prototyping for new use cases and CPS applications. The solution proposed by ST is based on a modular HW and SW approach. At the core of this solution we have the STM32 platforms having 10 product series and more than 40 product lines. The STM32 combined with our state of the art devices on sensing, low power consumption and communication makes it easy to create third parties projects using the ST turnkey hardware solution and an easy-to-use STM32 open development environment (ODE).

The main exploitation goals for ST-F is to expand our customer network. The involvement of ST in this project represents a way to collaborate and support directly innovative SMEs in realizing their vision via experiments based on our best-selling STM32 platforms. ST-F has shipped over three billion of its advanced STM32 microcontrollers, which are used in high-tech products from the smallest sensors and implantable medical devices to consumer gadgets, white goods, power tools, media devices, communications, computing and industrial control. However the last development in networking and/or sensing can open up a large opportunity in developing new IoT solutions. The collaboration in FED4SAE enables innovative third parties to build professional, mass-market products on a trusted platform without previous knowledge of embedded system design. Both ST-I and ST-F along the life of the project will stay fully committed to adapt the ST product roadmap to better address the third parties application requirements.

Planned exploitation activities

In addition to the project's activities, a specific promotion (in exhibitions and fairs) will be planned to propose our platforms as useful tool for everybody to face easily the challenge of an even more pervasive digitalization. The project activities reinforce and provide material to enlarge the kind of application for ST solutions.

A number of actions beyond the lifetime of FED4SAE project:

- Grow awareness among technology in a larger number of business units. Results and demonstrators coming from the executed Application Experiments can serve as attractive showcases for this purpose.
- Initiate further collaboration with SMEs and academia in research and innovation projects to promote Time4Sys, to extend its functionality or adapt it to further use cases, and increase its user base.

Last but not least, ST-F exploitation can be divided as short term actions and medium/long term actions. The short term actions targeting the promotion of the STM32 microcontroller family as the perfect platform solution to experiment with. These actions will promote the ecosystem grow putting in evidence the fantastic opportunity to release creativity using the STM32.

The long-term actions is to support the third parties that have decided to use the STM32 platform with a performance and cost effective STM32 product roadmap. This approach will help third parties to meet their ambition to grow at the European scale and behind with a cost effective product line.

3.4 Thales

3.4.1 Context

Partner description

Thales is a world leader for mission critical information systems, serving Defence, Security, Space, Aerospace and Ground transportation. With a worldwide operation in over 56 countries, it employs 62000 people with 14 Billion of euros in sales and 19 Billion euros order intake (2015). Thales dedicates 20% of its revenue to research and development.

Thales develops its strategic capabilities in component, software and system engineering and architectures through its R&T organization. Its 'Open research and Open Innovation policy' relies on a Thales international network of research centres as well as on a long lasting cooperation in research and technology with major and first class worldwide RTOs, academic and governmental institutes.

Thales SA is involved in the FED4SAE project through its corporate research centre, the Thales Research & Technology centre from Palaiseau (France) near Paris, located since 2006 on the campus of the Ecole Polytechnique engineering school, close to CEA. It employs 220 full-time staff, and some 40 doctoral students and 50 outside researchers are present on site. Strong involvement in this project will come from the Critical Embedded Systems Laboratory who works on advanced architectures and development tools for processing solutions in the different application domains of the THALES Group.

Ecosystem

Thales Research & Technology is located in Palaiseau at the heart of the new campus Paris-Saclay which gathers top level French universities and scientific graduate schools as well as research centres from industry including Danone, EDF, Horiba, etc. Very close to Thales Research & Technology is the CEA NanoInnov centre. The ecosystem in this area includes a very large number of SMEs and other organisations which are members of the Systematic cluster. Within an approach of open innovation, "Systematic Paris-Region", world-class competitiveness cluster, gathers and leads an excellent ecosystem of more than 800 members. Systematic connects the actors of the software, the digital technology and the industry, accelerates the digital projects by the collaborative innovation, the development of the SMEs, the getting in touch and the sourcing business on the sectors of future: energy, telecoms, health, transport, information systems, factory of future, digital city, safety & security. The cluster also has for mission, to promote its actors, territory, projects of innovation to increase its fame and develop the attractiveness of the territory.

Focus area

The Critical Embedded Systems Laboratory from Thales Research & Technology which is involved in the project specifically focuses on cyber-physical systems for the numerous domain where Thales is present (avionics, railway, space, communication, security, defence, etc.).

The electric airplane will first permit to remove existing hydraulic systems and then even modify the propulsion system. The connected airplane will permit to improve the comfort and satisfaction of passengers (IFEC) and setup a permanent supervision. This supervision is based on many sensors (smart and autonomous), less wires (wireless) enabling predictive maintenance useful for companies to develop added value services for new business models in the domain. The need for advanced autonomous sensors, pervasive electronics in the airplane require real breakthroughs with respect to power consumption. Beyond power consumption of components (processors, memories), the need for dedicated components (SOC system-on-chip) is necessary even for low volume series. Breakthroughs in design costs are required.

Railway transportation (main lines, subway, tram, etc.) are following a spectacular evolution thanks to new functionalities enabled by digitalisation and improvements of electromechanical equipment towards integration of electronic systems in rolling stocks and infrastructure or signalling. This transformation permits the evolution from automatization to autonomy of vehicles with new localisation, auto-localisation, perception and understanding of the environment. The integration of a large spectrum

of sensors (cameras, Radars, Lidars, etc.) allows a progressive modernisation and will accelerate that cycle in transportation where safety is highly required. Resilience to cyber-attacks due to increased connectivity implies new robust solutions.

In order to make new technologies available for the software design of these types of systems, the main needs addressed by Thales Research & Technology are:

- To foster an ecosystem of SMEs offering solutions for software engineering;
- To evaluate emerging technologies and standards for safe and secure cyber-physical systems and to suggest necessary extensions;
- To provide the relevant expertise services about emerging technologies for future products.

With the aim to improve the flexibility of critical real-time software solutions and their design productivity, TRT developed and now promotes the **Time4Sys** CPS Platform. More information can be found at *https://www.polarsys.org/proposals/polarsys-time4sys*.

Related Communities

TRT specifically focuses in the project on software engineering SMEs, which are mainly tools providers developing software programming frameworks. Open-source software platforms communities (eg Polarsys) permit to activate a critical mass of developers to further extend, promote and maintain these technologies.

The Time4Sys platform brought by Thales in FED4SAE is particularly relevant for the embedded software applications. At the European level several coordinate actions such as Platforms4CPS led by Thales are structuring a community on the CPS domain, proposing a vision, promoting relationships between different kinds of stakeholders including industry, academics, non-profit organisations, etc.

National communities like Embedded France are also fully relevant in that objective. Embedded France is the association of the French representatives of embedded software and systems. As a non-profit organization, Embedded France is opened to all the industrial suppliers and integrators of systems and embedded software, as well as the clusters and representative professional associations of domains integrating embedded systems. Embedded France was created in 2013 with for objective to develop the employment in the French sector of embedded systems and software, and to contribute to the competitiveness of “Nouvelle France Industrielle”. Founding members are the national “competitivity clusters” Aerospace Valley, Captronic, Image&Reseaux, Minalogic, Syntec-numerique and Systematic. The other members are 29 industrial or academic members. Note that an action was recently led towards French authorities to promote CPS (report provided to the French minister of Economy in August 2017) with an R&T roadmap covering the technology challenges and selected use cases and highlighting the importance of action at European level.

3.4.2 Partner exploitation strategy

Exploitation goals

The exploitation plan of the Thales Time4Sys platform technology for the critical real-time domain targets four objectives:

- The growth of the ecosystem of developers and users around Time4Sys open-source platform to make it more perennial and enable new developments around it
- The evolution and maturation of technologies based on open-source Time4Sys platform
- The promotion, transfer and deployment of technologies and tools based on the Time4Sys platform

- The search for further financing resources to allow a sustained activity with SMEs.

Planned exploitation activities

- **Actions to grow the eco-system:**
  - Complementarily to the actions targeting the Application Experiments success, Thales relationship with organisations structuring the CPS community (European CSAs, existing DIHs, national competitiveness clusters and organisations) will permit to leverage the promotion of the technology, and increase its user base.
  - Thales will also initiate further partnerships with SMEs to promote Time4Sys, to extend its functionalities and adapt it to further use cases. For instance, Thales will collaborate with SMEs having an ambition to grow on the European market through FTI (Fast Track to Innovation) European projects.
- **Actions for the evolution and maturation of the technologies based on Time4Sys:**
  - Application Experiments will represent a significant step for the technology progresses with SMEs. Thales will specifically support AEs that use the Time4Sys platform for the development of associated tools for real-time domain.
  - Beyond the lifetime of FED4SAE project, Thales will contribute to the existing ecosystem bringing new building blocks and new application cases. This will thus permit to continue the expected developments enhancing the functionalities. An extension of the range of real-time system applications developed in the frame of Time4Sys will also permit to gain experience and suggest further evolutions of design and analysis tools attached to the platform.
- **Actions to promote the technology (including internal actions towards the Thales global business units):**
  - Such an action is made necessary because software system designers and architects are generally reluctant to introduce new engineering technologies because of process changes and initial costs. In order to mitigate these hesitations, TRT will organise internal events to encourage business units engineers to use the tools based on the proposed platform.
  - When they will be available, results and demonstrators coming from the executed Application Experiments will be presented at these events. SMEs will be invited to perform these presentations in front of a large panel of worldwide Thales engineers and experts.
  - Further internal experiments will be executed on selected technologies according to the internal integration process standardised within Thales.
- **Actions to search further resources:**
  - At European level TRT will propose participations in relevant funding programmes based on support activities similar to mechanisms used in FED4SAE.
  - On regional and national levels TRT will contribute to the promotion of the support scheme of FED4SAE to funding authorities such as the Ile-de-France region (Paris area) through Systematic cluster, to adapt and improve their existing funding schemes.

3.5 AVL

3.5.1 Context

Partner description

AVL LIST GmbH is the world's largest privately owned and independent company for the development of powertrain systems as well as simulation, instrumentation and test systems. AVL has about 3450

employees in Graz (over 2400 graduated engineers) and a global network of 65 representations and affiliates resulting in more than 8050 employees worldwide. AVL´s Powertrain Engineering division activities are focused on the research, design and development of various powertrains in the view of low fuel consumption, low emission, low noise and improved drivability. The Advanced Simulation Technologies division develops and markets the simulation methods which are necessary for the powertrain development work. The Instrumentation and Test Systems division is an established manufacturer and provider of instruments and systems for powertrain and vehicle testing including combustion diagnostic sensors, optical systems as well as complete engine, powertrain and vehicle test beds. AVL supplies advanced development and testing solutions for conventional and hybrid vehicle components and systems like simulation platforms, development tools and system integration tools.

As engineering partner of leading OEMs throughout the world, AVL is constantly seeking for new capabilities and their exploitation. AVL is continuously carrying out research and technical development in the field of advanced automotive powertrains including e-mobility. AVL is active in many European interest groups like ARTEMIS and EPOSS, ERTRAC, EARPA, EGVI, FCH, etc. Since Framework Program 3 AVL has participated in more than 150 European RTD projects as partner as well as coordinator.

Ecosystem

AVL is located in Graz, Austria, and is very well connected to the regional (Austrian) R&D community. Especially, AVL is part of different clusters, e.g., ECSEL Austria[1] (chair), AC Styria[2], Platform industry 4.0[3] to name only a few. Further important ecosystem are the start-up incubators A+B centres[4] (a letter of intent was provided during the preparation of the FED4SAE proposal).

Focus area

AVL's main focus area is the automotive market, ranging from engineering part to simulation, instrumentation and testing solutions. AVL network is covering the entire world, with specific focus on European automotive industry.

This components platform from AVL supports the entire development process for road vehicles from office to lab to road by integrating real (hardware) and virtual (simulation models) development methods into one framework: Such an integrated development platform offers a seamless exchange of data from the concept phase to road testing. Thereby, the characteristic operating conditions like legislative test cycles, real world driving emissions and customer specific drive profiles or misuse tests can all be applied in a real as well as in a virtual environment during all phases of development.

This also includes a cross-phase usage of tools like automatic optimization and calibration. This approach facilitates an efficient and goal-oriented development and validation of extremely complex drive configurations. Benefits for the researchers and engineers: Test cases and development tasks can be performed with a plant model of the entire vehicle, independently of the availability of hardware components in every stage of the development process.

Specific features are:

- Interfaces for a wide variety of simulation tools used for vehicle development and control
- Support of FMI (Functional Mock-up Interface)

[1] http://www.ecsel-austria.net
[2] http://www.acstyria.com
[3] http://plattformindustrie40.at/
[4] https://www.aplusb.biz/

- Link to PLM systems and data bases

In FED4SAE, AVL will support SMEs to foster their products based on AVL tools and platforms. Within this framework, different tools can connect on and exchange product-related information over the tool boundaries by means of well-defined mechanisms. The control logics and the diagnostic procedures can be implemented and tested on dedicated SW and Hardware-in-the-loop features.

3.5.2 Partner exploitation strategy

Exploitation goals

The main exploitation goals and expected results are as follows:

- New and enhanced collaboration with third parties.
- Third parties enhance knowhow and products.
- New use cases for the IODP.

Reaching these goals will have various benefits, including

- Better integration in Austrian CPS/incubator ecosystem (e.g. ECSEL Austria, AplusB-Centres, AC Styria).
- New applications for IODP, awareness raising for IODP potentials.
- Support increasing complexity of vehicle technology R&D.

Planned exploitation activities

AVL's individual exploitation strategy includes a number of activities:

- Promoting expected results via presentations at international events.
- Integration of results in AVL strategy.

Overall AVL follows an integrated approach as platform provider and competence partner to ensure an optimal collaboration with SMEs and implementation of Application Experiments. For the Application Experiments, AVL will actively promote FED4SAE to SMEs that are strong technology experts having an innovative solutions being able to extend the AVL IODP platform in an agile way. This targets a win-win situation:

- For AVL: strengthening of the ecosystem by having SMEs able to move in a fast and agile way toward integration of new technologies
- For the SME: having a strong engineering partner well implemented on the market, therefore being able to support the SME in term of technology / market consulting and acting as a multiplicator for the SME business on the automotive market

3.6 Digital Catapult

3.6.1 Context

Partner description

Digital Catapult is a market-led technology and innovation centre, helping businesses of all sizes to use digital technologies to grow, export and increase productivity. In the context of FED4SAE, Digital Catapult serves as a competence centre and Digital Innovation Hub, with well-established links to the UK ecosystem.

Digital Catapult works across the UK, with centres currently in London, the North East & Tees Valley, Yorkshire, Brighton and Northern Ireland, in collaboration with local enterprise partnerships and universities, and industry partners including Rolls-Royce, Swiss Re, PwC, and Thales.

Several teams work on relevant CPS topics including big data, artificial intelligence and Internet of things, and Digital Catapult actively help UK companies familiarise themselves with Low Power Wide Area Networks technologies.

In addition, Digital Catapult actively supports the development of next generation connectivity, such as 5G, white space communications and the Janet academic network with a 100Gbps channel.

Ecosystem

Digital Catapult will act as a facilitator for the UK experiments through its facilities in Central London and across the UK, proactively engaging SMEs in the experiment selection process.

It enjoys strong connections with major organisations interested in collaborating around our projects. These include organisations such as the BBC, the British Library, BT, Cisco, BOC, HP, Intel, the Met Office, Mozilla, the NHS, O2, the Royal Air Force, Samsung, Vodafone and a number of leading universities including Oxford, Queen's University Belfast, Southampton, Edinburgh, Surrey and UCL, and most importantly, collaboration agreements with world-class high-tech clusters such as Cambridge Wireless and London Shoreditch/TechCity, as well as others around the country.

Additionally, Innovate UK is helping launch four new IoT hardware accelerators in the UK and Digital Catapult will help AE participating companies to be best prepared to be selected for and benefit from these accelerators programs.

Focus area

LPWAN network:
Things Connected is an initiative by Digital Catapult, to support UK businesses using LPWAN technologies. As part of the innovation programme, Digital Catapult has built a free to use LoRaWAN™ network. This network is intended for the prototyping of new products and services that can benefit from the unique features of LPWAN and the piloting of solutions with potential customers.

The current network of over 50 LoraWAN gateways covering central London and some of the surrounding areas. Funding has already been received to extend the program in 2018 in terms of regional coverage to four new metropolitan areas in the UK and opening the platform to other LPWAN technologies such as Sigfox. Digital Catapult is also working on making NB-IoT access available in collaboration with some operators. This technology could be made available in time for the 2nd and third open call.

Complex innovation management processes:
Practical methodology and collaborative platform to help companies go from a prototype to market: Communication technology selection, PCB design, Design for manufacturing, Small volume manufacturing, UX and service design, testing, certification, new IoT business models.

Related Communities

Digital Catapult engages with a wide range of UK technology business and stakeholders in the CPS/IoT value chain ranging from module suppliers to network equipment vendors, network operators to end to end solution providers.

A particular focus community of Digital Catapult represent innovate businesses who enable CPS/IoT solutions through low power wide area network (LPWAN). This includes both providers of LPWAN based hardware products, LPWAN module vendors but also end to end solution providers.

There is a diverse set of innovation communities that are relevant:

- Things Connected[5] represents the primary target innovation community, where Digital Catapult engages a range of SME innovators through challenge led innovation programmes. So far 40 SMEs have been part of two innovation programme this year. In addition over 450+ users have registered on the public LPWAN network in London.
- The LPWAN London Meetup[6] community is another relevant community the Digital Catapult is coordinating. The community brings together 580+ SMEs and innovators around LPWAN technology.
- Another more broadly relevant community is the IoTUK[7] programme that the Digital Catapult is responsible for. IoTUK coordinates different government funded IoT initiatives and has over 5K followers across the UK.
- Digital Catapult is also well connected to other emerging UK LPWAN innovation clusters, such as in Belfast, Bradford, Bristol, Cambridge, Edinburg, Glasgow, Manchester, Milton Keynes and Reading.
- In terms of more established businesses, TechUK[8] provides another relevant community. Digital Catapult is part of the IoT council of TechUK and able to reach out to the relevant IoT/CPS stakeholders.

3.6.2 DIH exploitation strategy

Exploitation goals

The goals of Digital Catapult are well aligned with the impacts that the Digital Innovation Hubs in FED4SAE are trying to achieve. Being an organisation that is in major parts funded by the UK government, the focus is naturally on strengthening UK digital sector and enable win-win partnership for UK companies with other European players.

Our own exploitation goals for the FED4SAE project is to amplify ongoing activities of the Digital Catapult in the CPS/IoT sector and to leverage the European dimension and complementary expertise of the project for maximising our impact generation as an organisation. This includes in particular the acceleration of SME innovation in this technology area and increasing adoption of these technologies by the UK technology sectors.

More specific goals include:

- Accelerate UK CPS/IoT solutions to market in particular for SMEs
- Grow UK CPS companies and the market share of their products
- Increase competiveness of CPS businesses by leveraging best in class technologies from our European partners
- Drive adoption of CPS technologies by UK businesses including midcaps to enable more rapid digital transformation of their organisations
- Primary focus around LPWAN as critical national IoT connectivity infrastructure for UK

[5] http://thingsconnected.net/
[6] https://www.meetup.com/LPWAN-London/
[7] https://iotuk.org.uk/
[8] http://www.techuk.org/

Digital Catapult aims to create of new collaborations with Third parties, generating more opportunities for UK business on a global market, stimulating adoptions of new opportunities solving challenges for regional / national context.

We aim to improve the capability to serve local businesses innovating with access to expertise in the entire CPS value chain, create a better understanding of complex innovation management processes, improve capability to link local business to European investment/funding opportunities, and stimulate our own CPS market in particular around digital health which is one of the priority areas for Digital Catapult.

Planned exploitation activities

- Alignment with Things Connected programme, to enable acceleration of more SMEs in LPWAN space
- Leverage DIH network with complementary expertise to become more attractive for own commercial customers and better support the needs to our SMEs
- Provide new disruptive CPS enabled business solutions in partnership with FED4SAE innovators to customers
- Export – market entries in other European countries

3.7 Fraunhofer IISB

3.7.1 Context

Partner description

The Fraunhofer Institute for Integrated Systems and Device Technology IISB conducts applied research and development in the field of electronic systems for application in, e.g., electric mobility or energy technology. In this connection, the IISB extensively covers the complete value chain from basic materials to entire power electronic systems.

With its two business areas, semiconductors and power electronics, the institute provides innovation and solutions in materials development, semiconductor technology and manufacturing, devices and modules, vehicle power electronics, energy electronics, and energy supply systems. This is supplemented by broad activities in reliability, simulation, characterization, and metrology.

The headquarters of the IISB is located in Erlangen. The institute has two branches in Nuremberg and one in Freiberg. As one of the 67 institutes of the Fraunhofer-Gesellschaft, the IISB does contract research for industry and public authorities. Moreover, it closely cooperates with the University of Erlangen-Nuremberg and is a member of the "Energie Campus Nürnberg" (EnCN). The IISB has about 200 employees plus numerous students working as research assistants. The institute is equipped with high-class laboratories, such as a test centre for electric cars and an application centre for DC grid technology. Together with the University, it operates 1500 m2 of cleanroom area for semiconductor technology on silicon and silicon carbide.

Fraunhofer IISB will bring in its π-Fab infrastructure, which comprises a continuous silicon CMOS and silicon carbide process line in an industry-compatible environment. Based on three decades of experience in microelectronics research and development, IISB has extended its activities to industry-oriented low-volume prototype fabrication of custom-tailored electron devices, with a focus on power devices, CMOS devices, passives, sensors, and MEMS. These prototypes might be combined with the core platform by the Third parties and accelerate innovation and reduce the time to develop POCs (Proof of Concept) and thus reduces their time to get to market.

Ecosystem

The IISB is a close partner for national and international industry. Its main objective is to provide excellent research to its customers and to set technological benchmarks as one of the leading research institutions in electronic systems. In order to maximize the reach of all of its FED4SAE activities, Fraunhofer IlSB will utilize all applicable regional networks, e.g.:

- Leistungszentrum Elektroniksysteme (LZE)
- Energie Campus Nürnberg (EnCN)
- Cooperation with Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU), with its Chair of Electron Devices (LEB) and its Chair of Energy Electronics (LEE)
- User Groups of GMM-VDI/VDE-Gesellschaft
- Bayern Innovativ

Focus area

Fraunhofer IISB focuses on CPS solution development in the area of smart energy and smart manufacturing. Fraunhofer IISB was actively involved in the CPS solution development within the European project EuroCPS, one of the projects of the first SAE phase. Within EuroCPS Third Parties from any sector were addressed to build innovative CPS products.

FED4SAE will benefit from the network created in EuroCPS and Fraunhofer IISB will address the following topics within the project:

- Assist SMEs to participate in one of the open calls of FED4SAE to develop CPS solutions in the area of smart energy and smart manufacturing
- Provide the relevant knowledge for the development of CPS solutions
- Validation of emerging technologies
- Deployment of technology building bricks to further enhance the technical capabilities of CPS solutions developed by Third Parties

Related Communities

Additional to the local ecosystem Fraunhofer IISB will utilize its German wide and European networks to maximise the reach of the FED4SAE activities. The following entry points are foreseen:

- FMD (Forschungsfabrik Mikroelektronik Deutschland)
- SEMI (SEMI is the global industry association serving the manufacturing supply chain for the micro- and nano-electronics industries)
- Other European projects in H2020, ECSEL and PENTA

3.7.2 DIH exploitation strategy

Exploitation goals

Fraunhofer IISB is aiming at strengthened or new collaborations with third parties. IISB is expecting the following benefits:

- Learning about the needs by third parties (technology, innovation and business wise)
- Integration of innovative technologies, like power devices, CMOS devices, passives, sensors, and MEMS.) in the developments and products of third parties.
- Feedback on third parties needs to improve the supplied technology and to develop required technology bricks in the future.

Planned exploitation activities

At the beginning of FED4SAE Fraunhofer IISB will promote the open call opportunities (during workshops, meetings etc.) and will support Application Experiments (AEs) with Third Parties based on the industrial platforms as well as the advanced platform of IISB.

Fraunhofer is aiming to initiate further collaboration with industry (Third parties, industrial partners) and academia in research and innovation projects to promote its experience in co-developing of CPS solutions and advanced technologies.

Finally, IISB is planning to

- participate in applicable future programmes as follow-up to FED4SAE
- promote FED4SAE instruments (technological, financial, innovation and business support) to regional stakeholders and funding authorities for local implementation of such activities

3.8 fortiss

3.8.1 Context

Partner description

As a research and transfer institute for software-intensive systems, fortiss focusses on application-driven research for engineering open, cooperative and trustworthy CPS for the market place. In close collaboration with industrial partners, fortiss conducts R&D projects in various application domains such as automotive, robotics and industrial automation, avionics, and business IT and cloud systems. In its role of a FED4SAE competence centre, fortiss provides expertise in a range of fields including model-based software and systems engineering, model-based synthesis, design space exploration, analysis and design of dependable systems, adaptive automation architectures, and software engineering for industrial automation. In the context of FED4SAE, fortiss builds on technical CPS platforms and engineering assets, with a specific focus on the smart manufacturing domain (“Industrie 4.0”).

fortiss's mandate is to facilitate research and technology transfer in software-intensive systems and services, thereby triggering future-ready innovation. To this end, fortiss develops and prepares advanced fundamental research results and aims at attracting contract research for further uptake of these results in industrial practice. Demonstrators that may be developed in experiments are key ingredients in this mission to showcase potential innovations and facilitate collaboration with business partners, aiming to commercially exploit the results.

Ecosystem

fortiss is located in Munich, which has been ranked Europe's ICT hotspot number one by a recent EU study. Research and development centres of global powerhouses such as Audi, BMW, Huawei, Infineon, Intel, SAP, or Siemens, are located in the vicinity of fortiss, and there are more than 20.000 ICT-related SMEs and mid-caps in the Munich metropolitan region. There is an accelerating influx of ICT technology companies (e.g., Google, Microsoft, IBM Watson IoT), and numerous private investors and VCs are active in the region. Munich is also home to renowned academic institutions such as Technical University of Munich (TUM) and Ludwig-Maximilians-Universität, which are top-ranked in Germany.

Currently, major public investments are being made by the Bavarian Federal State as part of its digitisation strategy to accelerate the digital transformation of industry. The newly founded Bavarian digitisation centre *Zentrum Digitalisierung Bayern (ZD.B)* represents the main pillar for executing this strategy. fortiss is closely collaborating with the ZD.B centre and is an integral part of its mixed academy-industry thematic platforms, including ones for Connected Mobility, Cyber-Security, Digital Production, and Digital Engineering. Actions to exploit the technology platforms of the fortiss DIH and

to achieve sustainability of FED4SAE's innovation support activities will leverage fortiss' link to ZD.B and its close contacts to SMEs in Bavaria, in particular through the ICT cluster network BICCNet.

Focus area

fortiss specifically focuses on adaptive production systems in the Smart Manufacturing domain. The field of production systems is becoming more interdisciplinary as IT is entering the scene. The Industrie 4.0 trend comes with a shift in the automation industry towards software solutions, which aim at making the main platform architecture more flexible and more adaptable. Consequently, new approaches are necessary for the incorporation of automation systems with IT. The application of those approaches, however, is hard for small and mid-sized enterprises (SMEs) that commonly have strong technical background only in mechanical and electrical engineering rather than IT and software.

Control applications represent the lower level of manufacturing and are built from tiny devices referred as programmable logic controllers (PLCs). One of the barriers to innovation is that PLCs are mostly proprietary to a few classic suppliers. Furthermore, Industrie 4.0 technology development and corresponding standardization efforts are mainly driven by large companies in the field. For SMEs it is difficult to keep up with the new developments, as often they lack access to base technologies for adaptive production systems. SMEs need to be able to establish relevant knowledge in the technologies fields required for the creation of Industrie 4.0 capable applications. A key challenge is to incorporate SMEs into the Industrie 4.0 eco-system and enable them to use upcoming Industrie 4.0 technologies, such as OPC UA for machine-to-machine communication, IEC 61499 for flexible distributed control, or FMI for virtual co-simulation.

Hence, the main needs addressed by fortiss in this domain are

- To enable SMEs to participate in future value chains to build adaptive production systems;
- To validate emerging technologies and standards for adaptive production systems and to suggest necessary extensions;
- To provide the relevant knowledge for using the technologies in future products and services developments.

To improve adaptivity of automation solutions and overcome vendor lock-in, the fortiss DIH encourages the integration of open source platforms in the development process. Specifically, fortiss offers Eclipse **4diac™** as an Advanced CPS Component:

- Eclipse **4diac™** (http://www.eclipse.org/4diac/) is an open-source solution for programmable logic controllers (PLCs) of the next generation. It implements the IEC 61499 standard and therefore enables the development and management of platform-independent, distributed control applications in industrial automation as well as their real-time capable execution on any platform.

Related Communities

The **value chain in industrial production and automation** includes various stakeholders, with different sets of expertise:

- Device vendors: device expertise (software and hardware)
- Machine vendors: machine expertise
- System integrators: integration expertise
- Industrial enterprises: operational expertise
- Tool and service vendors: RTOS/standards expertise (e.g. for runtime platforms) and software tools/methods expertise

Within FED4SAE, fortiss specifically focuses on engineering and technology SMEs, which are mainly tools and system providers, system integrators, or small, specialised control hardware vendors utilizing programming software from a few small software companies.

Communities around open-source software platforms are important to activate a critical mass of developers to further extend and help promote the DIH technologies. In particular, 4diac is integrated in the Eclipse community (http://www.eclipse.org/).

As 4diac is based on the IEC 61499 standard, participation in **standardisation committees** is an important means to feed back experiences gained with applications of 4diac to the standard, to propose extensions and influence future versions of IEC 61499.

Further channels to promote the fortiss DIH technologies for the manufacturing domain consist of related **national and international initiatives and projects**, such as e.g. the IEC 61499 European Competence Centre, or projects and Digital Innovation Hubs of the I4MS initiative, and **professional associations** (e.g., the German *Plattform Industrie 4.0* or the German Mechanical Engineering Industry Association *VDMA*).

3.8.2 DIH exploitation strategy

Exploitation goals

The following strategic goals drive the exploitation plan of the fortiss Advanced CPS component technology for the manufacturing domain:

1. **Maturation of open-source technologies**: Extend the range of applications of Eclipse 4diac for development of adaptive production systems to validate current implementations and standards for adaptive production systems and gain experience to suggest further necessary extensions.
2. **Promotion of IEC 61499 standard** in a broad range of automation-related fields: Perform complementary and cross-domain showcases to support the creation of a landscape of uses of 4diac/IEC 61499 for software development in automation and control systems applications.
3. **Grow the ecosystem of users of Eclipse 4diac/IEC 61499**: Promote 4diac as an open-source platform to provide access to technology to all stakeholders along complete value chains, from device manufacturers to systems integrators to service and tool providers, particularly SMEs.
4. Getting **access to relevant further financing resources** to ultimately allow a sustained provision of innovation support activities to SMEs in the style of FED4SAE experiments.

Planned exploitation activities

Short-term actions addressing the identified goals 1 and 2 are the following:

- **Execution of Application Experiments with industrial third parties**: The fortiss DIH will specifically support Application Experiments that use the 4diac framework in the development of new innovative applications and show cases in various industrial automation areas.
- **Actions to share knowledge and best practices** to *promote the IEC 61499 standard and grow the eco-system*: SMEs are often hesitant to introduce new technology because this implies change and change usually comes with cost. fortiss will organise seminars and tutorials to encourage SMEs to embrace new standards and tools that clearly improve and overcome the limitations of the existing ones, thus supporting businesses to become new actors in the value chains involving IEC 61499 and 4diac.

To address goal 3, a number of actions planned to be executed also beyond the lifetime of FED4SAE project:

- **Grow awareness** among technology firms in manufacturing and automation about the capabilities and benefits of the IEC 61499 standard and system development with Eclipse 4diac. Results and demonstrators coming from the executed Application Experiments can serve as attractive showcases for this purpose.
- **Assist companies** to learn about how to use the 4diac platform in their application developments, by organising trainings, tutorials and user workshops.
- **Initiate further collaboration with industry and academia** in research and innovation projects to promote 4diac, to extend its functionality or adapt it to further use cases, and increase its user base.
- **Support interaction within the 4diac users** and developer community via an online user forum.

The following **longer-term actions** are planned to address the fourth goal:

- Participate in suitable funding programmes with types of innovation support activities similar to the Open Call and financial support mechanisms used in FED4SAE, on regional, national or European level.
- Promote SME support scheme of FED4SAE to regional stakeholders and funding authorities, e.g. the Bavarian state government, to develop new or adapt existing funding schemes in a similar way.
- Promote successful experiment third parties that have an ambition to grow on a European scale to the innovation network EIT Digital to receive further support in access to markets and finance. fortiss is also hosting the Munich Satellite Co-Location Centre of EIT Digital.

3.9 CSEM

3.9.1 Context

Partner description

CSEM is a private non-profit Swiss organization for research and innovation. Supported by the Swiss Confederation, our mission is to enhance the competitiveness of industry by developing new technology platforms and transferring it to the industrial sector.

Our operation is based on five strategic programs:

- Microsystems (Design & process Integration & packaging)
- Systems (Scientific instrumentation, Medical device technology, Automation)
- Photovoltaics & Energy Management (Crystalline Silicon & metallization , Modules & System integration, Thin film coating & devices, Printable photovoltaics, Energy Management)
- Ultra-Low-Power Integrated Systems (System-on-chips, Wireless, Vision)
- Surface Engineering (Nanotechnology, biotechnology, printable electronics)

CSEM plays a key role in the innovation value chain, by narrowing the gap between fundamental research and industrialization. By expanding CSEM's knowledge and adapting it to industrial needs, new products are brought to market and new ventures are created. CSEM works with a wide range of stakeholders, from start-ups to SMEs and large organizations.

Our services include contract R&D, strategy and innovation consultancy, development of specific business solutions for several Industrial Sectors (Space & Scientific Instrumentation, Watchmaking,

Health & Lifestyle, Communication & Semiconductor, Energy & Environment, Automation & Control, Aeronautics, and Transport & Security).

Facts at-a-Glance:

- Founded in 1984;
- CHF 83 million in revenues (2014);
- More than 450 employees in Switzerland;
- 249 industrial clients and 400 industrial projects (2014) worldwide;
- Headquartered in Neuchâtel, centers across Switzerland: Alpnach, Muttenz, Landquart and Zurich.
- Sister company in Brazil (CSEM Brazil)

Ecosystem

CSEM is a national innovation accelerator—a catalyst for the transfer of technologies and know-how from fundamental research to industry. This role involves four principal tasks: we develop and maintain technology platforms, we integrate and combine technologies into workable systems, we mature those technologies until using them will add value to our industrial clients, then we support the process of transferring those technologies to industry. The development of our highly innovative platforms is supported by the Swiss Confederation, by the Cantons of Neuchâtel, Basel Land, and Graubünden, and by the cantons of central Switzerland (Obwalden, Luzern, Nidwalden, Schwyz, Zug, and Uri).

CSEM is also a major player in the Micro-manufacturing Science and Engineering Center (M2C), created recently in Switzerland which aims at addressing and anticipating the future needs of industry in term of innovation and implementation of new advanced manufacturing processes.

CSEM aims to be the privileged partner of the two Swiss federal institutes of technology—Lausanne's EPFL and Zurich's ETHZ. But our mission—knowledge and technology transfer to industry—also leads us to actively seek partnerships beyond these two bodies and other institutes in the ETH domain. These partnerships increasingly involve CSEM combining forces with Swiss universities and universities of applied sciences. In this way, CSEM adds value by enhancing the creation and exchange of know-how. These relationships also make possible the accelerated industrialization of ideas and research findings.

- EPFL—Federal Institute of Technology, Lausanne.
- ETHZ—Federal Institute of Technology, Zurich.
- SUPSI
- The Universities of Fribourg, Geneva, Lausanne, Neuchâtel, and Zurich.
- Universities of Applied Sciences - Bern, Zurich, Central Switzerland (HSLU), Western Switzerland (HES-SO), Northwestern Switzerland (FHNW), Southern Switzerland (SUPSI), and Valais.

CSEM maintains privileged relationships with the main Swiss research centres—EMPA (materials science and technology research) and the Paul Scherrer Institute (natural and engineering sciences). CSEM also works closely on knowledge and technology transfer projects with other national research bodies, including:

- The University of Bern's ARTORG (on medical devices).
- Geneva's Centre Wyss (on implantable electronics).
- Agroscope—the Confederation's centre of excellence for agricultural research (on agriculture and the environment).

Further collaborative projects are ongoing in the medtech field, where CSEM partners University Hospital of Bern (Inselspital), Geneva University Hospitals (HUG), and Lausanne's CHUV, principally regarding clinical validation. Similar collaborative efforts are currently under negotiation, including with the SITEM Centre, Bern.

Focus area

In FED4SAE, CSEM is focussed on four areas: Advanced Manufacturing, packaging and MEMS, surface engineering and ultra-low power integrated systems:

ADVANCED MANUFACTURING, PACKAGING AND MEMS: microfabrication facility fully equipped 100mm and 150 mm wafer fabrication line; MEMS device simulation and modelling (mechanical, optical, thermal, thermo-mechanical, microfluidics, design for assembly); back-end clean room for packaging (galvanics, high-precision adhesive fixing, optical assembly and testing, flip-chip bonding, hermetic sealing, laser welding, waver-lever bonding, laser microstructuring, micromilling, thermal bonding of polymer parts, thermal and adhesive lamination with foils, electrical performance characterization), 3D manufacturing tools;

***FED4SAE technology focus areas**: Advanced Manufacturing and Packaging (additive manufacturing + microfabrication) and Soft MEMS (Stretchable soft membranes that can be integrated on MEMS)*

SURFACE ENGINEERING: simulation tools (diffractive optical simulation), wet deposition processes (screen printing, gravure and inkjet printing, dip and bar coating and printing, slot die coating, electro-spinning, Aerosol jet printing), vacuum deposition processes (plasma enhanced CVD and low pressure CVD tools, PVD multi-chamber, MVD molecular vapour deposition), surface patterning (laser scribing and microstructuring, reactive ion etching, replication processes - hot embossing and UV curing, COC rapid prototyping, injection molding), modification of surface chemistry (covalent grafting of polymers, functional silanes or biomolecules), functionalization of mesoporous films (encapsulation of nanoparticles and dyes), sol-gel (chemistry and processes), surface characterization tools (AFM, environmental SEM, optical microscopy, fluorescence, phase contrast, differential interface contrast), chemistry and biochemistry infrastructure (biosafety level 2 laboratory, cell culture and microbiology labs, chemistry labs).

***FED4SAE technology focus area**: Nanotechnology for chemical sensing*

ULTRA-LOW-POWER INTEGRATED SYSTEMS: fabless ASIC design flow (TSMC, UMC, EMM, TowerJazz, SFAB, LFoundry, Global Foundries, Candence & mentor graphics); fully equipped laboratory for ASIC validation and industrialization (IC test & reliability qualification subcontracting); Measurement lab (RF, optical, imaging, temperature); wafer probing including RF probing; Packaging solutions (chip-on-board, plastic & ceramic package, solder bumbing, flip-chip, optical packaging); prototyping; antennas and propagation; anechoic chamber; wireless phantom.

***FED4SAE technology focus area**: vision systems (Vision in a Package / Intelligent Camera, Intelligent Camera System for Hyperspectral Imaging), and wireless systems (WiseNET Ultra Low Power Wireless Sensor Network and WiseMAC protocol, GPS free localization solver for any LoRa® / LTE-M / NB-IoT / WiFi / BT Network and WiseDep Robust low power wireless for safety-critical applications).*

Related Communities

Swiss MNT Network: Since 2006, the Swiss MNT network gathers the main Swiss institutional actors in the field of micro and nano technology.

Nano-tera.ch: The Nano-Tera initiative aims to bring Switzerland to the forefront of a new technological revolution: using engineering and information technology to improve health and security, and to broaden our management of energy and the environment.

Swiss plastic cluster: It is the mission of the cluster to enhance the competitiveness and productivity of its members by actively promoting plastic engineering technologies, fostering public private partnerships, offering tailored continuous staff training, creating exchange, networking and business opportunities between its members and value-adding services.

Association NTN Innovative Surfaces: The National Thematic knowledge and technology transfer Network (NTN) Innovative Surfaces is the leading network in Switzerland for targeted and performance-oriented Knowledge & Technology Transfer (KTT) between public research institutions and companies seeking innovative surface technologies and collaborations to stimulate competitiveness and value creation.

CSEM is active in international conference: I**EEE international conference on Micro Electro Mechanical Systems (MEMS 2018)**: Michel Despont is chairman and steering committee member. Member of the Int'l Steering Committee of the **Micro- and NanoEngineering (MNE) conference and** representative at the **Micro- and Nano- Technology Workgroup**, European Spatial Agency (ESA).

3.9.2 DIH exploitation strategy

Exploitation goals

CSEM will be initiating the Swiss DIH (available technologies, Application Experiments, Engaging SMEs, Innovation Management, Access to Funding). CSEM is in the heart of the digital innovation in Europe through the EPoSS membership, the HTA alliance, EARTO and the partnership in related projects (Gateone project, SMARTER-SI, etc.)

As the Swiss DIH, our goals are to support start-ups and SMEs in their digitalization processes based on our FED4SAE focus areas: Advanced Manufacturing, packaging and MEMS, surface engineering and ultra-low power integrated systems technology platforms.

More broadly, our goal (and mission) is to help Swiss and European companies in their innovation roadmap and consolidating our internal development by opening new possibilities of industrial collaboration; allowing CSEM to get closer to the industrial sector and reaching new potential partners.

Towards this goal, CSEM seeks to build a network of stakeholders around the platforms and technologies supported by the different FED4SAE centres for their focused smart domains, to support establishing user-supplier relationships and to enable the exchange of learning assets (e.g. best practices). A central element in building such innovation eco-systems to achieve synergy will be to establish links between the FED4SAE centres and other existing regional and national innovation hubs.

Planned exploitation activities

In-line with our mission, the focus of CSEM's exploitation plans is on helping Swiss and European companies in their innovation roadmap and consolidating our internal development by opening new possibilities of industrial collaboration

Additionally, CSEM will make publicity about the FED4SAE at different events such as MEMS 2018, MNE 2018, and IMCS 2018.

3.10 KTH

3.10.1 Context

Partner description

KTH in Stockholm is the largest and most international technical university in Sweden, and also a leading European university. KTH is located in Stockholm, Sweden. Sweden was in 2016 ranked as Europe's most innovative country, according to a European Commission ranking (http://europa.eu/rapid/press-release_IP-16-2486_en.htm). The Stockholm region is frequently also very highly ranked when it comes to digitalization (see e.g. http://www.technologist.eu/sweden-the-land-of-unicorns/).

KTH is particularly strong in Cyber-Physical Systems, as manifested by its research centres on Autonomous systems, Control and Communications, Embedded systems, and in domains such as transportation, health and manufacturing. KTH has set up strategic collaboration partnerships with industry such as ABB, Ericsson, SAAB, Sandvik and Scania, and with public bodies such as Stockholm city and Stockholm community council. KTH is a partner in EIT Digital, one of the European Knowledge and Innovation Communities, in the ARTEMIS Industrial Association and ECSEL.

KTH as a Digital Innovation Hub (DIH) on Cyber-Physical Systems (CPS) is hosted by the Mechatronics and Embedded Control Systems Division at KTH, supported by the Division of Integrated Product Development, and closely associated with the ICES centre and competence network, focusing on Embedded and Cyber-Physical Systems. The KTH hub is also active in several national and international networks which further facilitate bringing stakeholders together, and making it possible to connect resources of different kinds.

Ecosystem

KTH is a top ranked Technical University in Sweden, located in Stockholm, with a well-established network of Industry, Research and Innovators. We are working closely with ICT-related SMEs and mid-caps in the Stockholm region. In the ecosystem you could find players like Scania, Atlas Copco, Ericsson and Electrolux. We are also working closely with public funding and support structures; like VINNOVA and Business Sweden. With KTH as a platform, the Mechatronic Division offers a very strong, deep and broad, academic research competence. We have close ties with industry in several domains and academic collaboration with many universities around the world.

KTH is also running a number of key research project strongly related to CPS that will give significant value to the DIH. For example; Secure iIOT (SCOTT), Affordable Safe & Secure Mobility Evolution (ASSUME) and Architecture and Safety for Autonomous Heavy Vehicles (ARCHER).

The KTH DIH will be embedded in and hosted by the Mechatronic Division. Actions to exploit the technology platforms of the KTH DIH will leverage the result from KTH Research Projects together with the close contacts we have to ICT oriented SME/Midcaps in Sweden.

Focus area

The KTH DIH has an overall focus on challenges which are common across industrial domains in the area of CPS, and which typically require interdisciplinary collaboration. Many of these challenges relate to how to the manage complexity of increasingly capable, connected and automated CPS, but also to strategic leadership, recruitment and competence provision.

Within FED4SAE, the KTH DIH has a specific focus on

- smart mobility and automated vehicles, and
- interoperability for life-cycle engineering of CPS.

There are strong drivers towards automated driving, but still many open issues to resolve when it comes providing safe, available and cost-efficient realizations of such advanced vehicles, especially for higher levels of automated driving. While large efforts are invested into this area, there is a lack of open platforms that enables to experiment with novel solutions. To support research and innovation in this

area, KTH therefore provides open platforms for sustainable transportation, specifically for connected and autonomous transport. In particular, KTH has developed a Research Concept Vehicle (RCV), which constitutes an open, evolving and experimental fully electric and x-by-wire platform. The RCV exists in two versions, one of which is equipped with 5G.

CPS development is typically characterized by fragmented product descriptions such as requirements, design descriptions, models, source code, hardware descriptions, configuration data, etc. All these fragments will be stored and managed through a number of tools and databases. It is important to be able to efficiently relate these fragments to each-other, to keep them consistent, and to understand how a change in one artefact impacts other. To address this problem, KTH provides the AIDE platform, with an overall goal to lower the threshold of integrating and managing data among software tools, thereby improving end-user processes, in turn with potential for improvements in time to market, effective use of resources and product quality.

Hence, the main needs addressed by KTH in these areas are to

- enable SMEs to participate in future value chains to build automated driving and smart mobility systems, as well as interoperable CPS engineering assets;
- validate and extend emerging technologies and standards in these areas,
- provide the relevant knowledge for using the technologies in future products and services developments.

The RCV and the AIDE platforms are further described on the Fed4SAE web-site (https://fed4sae.eu/), under "Advanced Platforms/Advanced Technologies" and "Advanced Platforms/Testbeds", respectively.

In particular, the AIDE platform provides support open-source tools for creating tailored "tool-chains" and integrations of data for the engineering of CPS. The approach targets data integration based on open standards (such as OASIS OSLC <http://www.oasis-oslc.org/>, and the Linked Data family of standards) and open source software.

Access to the RCV will be granted according to agreement with KTH, depending on the nature of the experiments. KTH currently has 2-3 RCV's at disposal. The access will also depend on the planning of other activities and experiments. Regarding tests and data collection, KTH has access to a relatively nearby test track at Arlanda. For tests requiring 5G infrastructure, we have access to the Connected Mobility Arena in Kista north of Stockholm. Specific agreement with Ericsson is needed for such tests.

Related Communities

KTH is connected, direct or indirect to a number of national and international initiatives and projects. For the FED4SAE DIH, KTH will pay extra attention to CPS and iIOT SMEs. Our close connection with the iIOT Hub THINGS will be one of the partners in that domain.

KTH is also hosting ICES, the ecosystem for industry and academia, excelling in embedded systems education, research and innovation. ICES is established as a KTH competence centre, an organisational form used for establishing multidisciplinary cooperation across KTH schools and with industry.

3.10.2 DIH exploitation strategy

Exploitation goals

The following strategic goals drive the exploitation plan for the KTH Digital Innovation Hub.

1. **Grow and strengthen the regional eco-system:** This goal entails to further strengthen the regional eco-system in particular by creating collaborations with new third parties and by continuing to strengthen and grow the competence network.

2. **Grow and strengthen European collaboration:** The FED4SAE digital innovation hubs bring together an interesting set of competences and networks where European level collaboration will be explored and strengthened where it already exists (for example with fortiss). The larger network of FED4SAE may also provide opportunities for access to other financing, innovation and competence resources.
3. **Promote innovation for dependable automated driving through RCV-based experiments:** The RCV platform provides openings for a wide range of technologies (from sensors, over embedded to edge computing) and potential application in a wide range of automated driving scenarios.
4. **Grow the ecosystem of users and scope of the AIDE interoperability tools**: Promote AIDE as an open-source platform in order to stimulate both adoption as well as contributions to the tools. The tools have already been adopted by several large companies as well as SMEs. The openness and standards based approach facilitates for SMEs to provide contributions and to grow the scope of the tools over the life-cycle of CPS engineering.
5. **Drive sustained operation of the KTH Digital Innovation hub beyond the life-time of FED4SAE**

Planned exploitation activities

Short-term actions addressing the identified goals 1, 3 and 4, include:

- **Execution of Application Experiments with industrial third parties** in the focus areas defined by KTH (corresponding to exploitation goals 3 and 4). The KTH DIH will specifically support Application Experiments that use the KTH platforms in the development of new innovative applications and show cases in relevant industrial domains.
- **Actions to share knowledge and best practices** with respect to the KTH platforms and to grow the eco-system. KTH will organise workshops/tutorials directly regarding the platforms, and with respect to related technologies and methodologies, engaging the eco-system, and with a purpose to attract new partners.

To further address goal 2, interactions with the other DIH's will be undertaken to investigate the potential for collaboration, and to share relevant best practices regarding innovation eco-systems.

To further reinforce all of the goals, the following longer-term actions are planned:

- **Grow awareness** among technology firms in relevant CPS engineering domains regarding the KTH DIH provided platforms. Results and demonstrators coming from the executed Application Experiments can serve as attractive showcases for this purpose.
- **Assist companies** to learn about how to use the KTH DIH provided platforms, in particular by improving on-line information and by organising trainings, tutorials and user workshops.
- **Initiate further collaboration with industry and academia** in research and innovation projects to the platforms, to extend its functionality or adapt it to further use cases, and increase its user base.
- **Establish complementary funding** for the KTH DIH, through industrial engagement and support as well as through other suitable funding schemes.
- **Promote successful experiment third parties** that have an ambition to grow on a European scale to other relevant innovation networks including STING (Stockholm Innovation and Growth), the Swedish Innovation Programs, and EIT DIGITAL, all of which KTH already has excellent collaboration with.

3.11 BME

3.11.1 Context

Partner description

The Department of Electron Devices (DED) of the Budapest University of Technology and Economics (BME) is an educational and research centre in microelectronics with special focus on smart system integration and Multiphysics design and characterization. Its reputation in this field was fostered by participation in many international projects, several of which concluded in spin off companies. As such BME DED has maintained excellent relationship with SMEs for decades, for both in terms of creating spin offs and supporting other SMEs with industrial research and development coaching. The best known among them is the thermal and reliability characterization company MicReD that is today a part of Mentor Graphics, a Siemens business. The tools developed by this company are used now worldwide in the testing facilities of electronics manufacturers. These tools form the basis of the world class reliability testing laboratory that BME DED offers in the FED4SAE project.

Another enthusiastic team of researchers of BME DED formed the core design team of the first Hungarian team picosatellite MASAT and later they span out as C3S Ltd, which became an important player in the central European space technology sector. This activity has resulted in broad knowledge in harsh environment application that can be also exploited in the FED4SAE project. Related to microfluidics a new spin off company SpinSplit LLC was created recently based on the microfluidics research of the department.

In the last decade within the framework of Hungarian national projects BME DED supported Hungarian SMEs in their R&D activities, leading to successful new products in solid state lighting. The same kind of SME support activity has been continued as the department is one of the CPS/IoT design centres of the H2020 EuroCPS project of the Smart Anything Everywhere initiative. In this framework the department provides coaching support to several SME projects from Hungary and from abroad, namely from Estonia and Ireland.

Ecosystem

As for a long time BME DED was the *only* university department dealing with microelectronics design and characterization in Hungary, and from its origin being very active in the international research community, BME DED has very broad connections to the related research community in Europe. With the successful activity in a large number of research projects both international and national, the department has a very broad cooperation partnership, both national and international, and high reputation, especially in the electronics reliability and smart system integration field. Several researchers and designers of the department are heavily involved in the organization of international conferences where they could build up close relationships with new contacts.

As the department teaches computer programming for roughly 1200 new students yearly, the name of the department in Hungary is closely connected to computers and software development. This means that if in Hungary electrical engineers need support in using the newest technologies, e.g. CPS and IoT, they first turn to one of the teachers of BME DED. In the recently formed EuroCPS design laboratory, we have consulted a large number of Hungarian SMEs, even those who did not get any financial support from the project in using the design platforms of the platform providers of EuroCPS.

BME DED is a partner of the Smart Systems Integration European Master project, offering joint international degree. In this Master project very highly qualified international students pursue their Masters studies with EU support, and usually follow their career in Europe, carrying the knowledge of our capabilities broadly in Europe.

The very large number of our alumni forms another large base of our information sharing activities.

We are in very close contact with the Hungarian national research and development agency. We regularly participate in their information sharing events, and can reach the innovative Hungarian SMEs also through their various networks. We are in good contact with the Hungarian Association of Entrepreneurs.

Focus area

Our major focus area is smart systems integration and low power software design.

Within smart systems integration we have outstanding capabilities in reliability testing with special focus on testing the quality of the integration. With our unique Structure Function based methodology we can test how the integration of the system changes after the application of various wear conditions. The novel thermal testing, reliability testing and integration testing platform that has been developed in recently finished FP7 projects will be offered for all the industrial experiments especially those that are targeting new smart system development.

In the EuroCPS project we have gained broad experience with low power CPS design platforms that we intend to exploit also in the Fed4SAE project.

A further focus are is solid state lighting.

Related Communities

As temperature-related and reliability issues are highly relevant in automotive applications we will focus on this area with our power electronics design, testing, and reliability testing capabilities. Solid state lighting is also an important field in automotive applications.

Smart systems integration is a crucial question in microfluidic applications, where we also have broad experience. Lab-on-chip type applications require most of our knowledge base. These applications connect us to chemical, biological and medical applications.

3.11.2 DIH exploitation strategy

Exploitation goals

1. Maturation of the services offered by the advanced reliability testbed
2. Grow the ecosystem of the users of the smart systems integration testbed
3. Strengthen the existing and create a number of new cooperation in the field of using European CPS platforms and IoT design, extend the business network of BME DED
4. Getting closer to the European industrial sector
5. Offer better services in coaching innovative SMEs
6. Gain new knowledge and experience in IoT design, learn current best practices from partners
7. Create new knowledge and skills that can be transferred to international master students and to the regular students of BME in the design and realization of smart systems.

Planned exploitation activities

Execution of industrial experiments

Any industrial experiment that we coach will directly contribute to reaching the exploitation goals 3, 4, 5, 6 and 7.

Demonstrate the capabilities of the advanced SSI reliability testbed

This activity contains the preparation of support materials, application notes, examples of using the testbed and demonstrations of the various fields of applications. This activity will contribute to achieving the goals of 1 and 2.

3.12 University of Cantabria

3.12.1 Context

Partner description

University of Cantabria (UNICAN), represented in FED4SAE by the Network Planning and Mobile Communications Laboratory, has a strong background in the participation in European projects and collaborative initiatives. In this sense, and related to the main topics to be tackled within the project, it is worth highlighting the technical management of the SmartSantander project. In this sense, the access and exploitation of the SmartSantander platform will be available through the lifetime of the project.

In its role of a FED4SAE competence centre, UNICAN presents a great expertise in the following areas:

- Protocols and architecture design and implementation for mobile communication networks.
- Context management and context-aware solutions from network to application level, through the implementation of different schemes, based on the provided information, to manage the access to the network.
- Middleware platforms for sensor networks and other mobile technologies, in order to uniform and homogenize the access to subjacent sensor technologies from the upper layers.
- Internet of Things, including deployment and installation issues, as well as the management of the whole network, the execution of different researching experiments and the provision of several services to the citizens.
- Contactless communication technologies, such as RFID, NFC, MIFARE and its evolution DESFire, applied to smartcard solutions and NFC-based mobile environments.

The relevance of the research activities of the Group is supported by the intense and successful participation in different research programmes, both with national (CENIT, INNPACTO, PSE) and international public scope (FP5, FP6, FP7, H2020), as well as private funding, bringing about the establishment of a number of collaborations with the industry, fostering the university-industry couple, key factor to reach the quality within the R&D/Innovation activities.

Ecosystem

University of Cantabria is located in Santander, a medium-size city in the north of Spain, with approximately 180,000 inhabitants.

SmartSantander project, in the European Framework Programme headed by UNICAN, brought to Santander a city-scale experimental research facility in support of applications and services for smart cities. The great potential which has arisen in the region regarding Smart Cities has engage a large number of SMEs specialized in the ICT, for research and development of projects in the area of Internet of Things (IoT).

Large companies are also involved in Santander ecosystem, like Telefonica and NEC which, with Santander municipality, provide the Santander Smart City platform to simultaneously manage all the urban services of the smart city and the instruments of citizen participation that have emerged in the municipal administration from it.

Most of the ICT companies are located in the PCTCAN, an innovation business park promoted by the regional government. This business park acts as a point of reference for interaction and innovation of the economy and business in the region, being a space that groups and encourages the creation of innovative companies.

Besides University of Cantabria, several research institutes, like IDIVAL or IBBTEC in the biomedical environment, are part of Santander ecosystem, promoting the knowledge transfer from the academic institutions to the industry.

Focus area

UNICAN is mainly focused on the Smart City dimension through SmartSantander platform. This city-scale IoT experimentation facility deployed in Santander is already supportive for scientific experimentation and principally to smart city service experimentation and provision. The platform is already integrating heterogeneous data streams originating from deployed wireless sensor network, city Open Data records and citizens smartphones (through participatory sensing).

In this sense, the main role of UNICAN throughout the FED4SAE project will be tightly linked to the Third parties/AEs that address the SmartSantander testbed. By harnessing the technical expertise achieved in a number of research projects since the inception of the platform itself, UNICAN will undertake the responsibility of providing technical coaching, support and access to their research institute testbed environment to the corresponding Third parties.

UNICAN will provide access and technical coaching to the SmartSantander IoT/smart city testbed, briefly described below:

- Capillary network covering wide area of the city
- 12,000 IoT diverse devices
- About 3000 IEEE 802.15.4 devices
- 200 GPRS modules
- 2000 RFID tags/QR codes

Examples of the type of experiments/ applications that can be supported by the testbed are:

- Environmental monitoring
- Outdoor parking area management
- Mobile environmental monitoring
- Mobile environmental monitoring sensors
- Traffic intensity monitoring.
- Traffic sensor installation in the main roads of the city
- Guidance to free parking lots
- Parks and gardens irrigation.
- Soil moisture sensors installations in parks and gardens
- Augmented reality
- Participatory sensing
- Native experimentation
- Experimentation at service level

Besides these core tasks already exposed, UNICAN will close the loop of an experiment's lifetime by being involved in the cascade funding and innovation stages. It is worth highlighting that for this two last phases, UNICAN's activities will be complemented by Santander City Council, acting as third party.

Related Communities

The stakeholders involved in the smart cities environment can be classified as follows:

- City councils: they are the main promoters of the smart city concept, to improve the efficiency and sustainability of the city and the quality of life of its citizens.

- Business: responsible of providing services and tools to the smart city (tools and service providers) and the infrastructure to support those (IoT devices/infrastructure providers).
- Universities/Research institutions: promoters of the knowledge transfer from the academic institutions to the industry.
- Citizens / end users: last beneficiaries of the smart city advantages, but also contributors to its creation and development.

UNICAN will contribute in managing and facilitating interactions between key innovation stakeholders including local authorities, industries along the entire value chain up to the market as well as investors.

3.12.2 DIH exploitation strategy

Exploitation goals

The following strategic goals drive the exploitation plan of UNICAN DIH in the Smart City domain:

- **Enrichment of the local ecosystem with new stakeholders**: Attract start-ups, SMEs and Midcaps, increasing the portfolio of companies involved SmartSantander platform, making it a reference in terms of testing platform for assessing potential technology and market impact.
- **Access to relevant further funding resources:** Attract additional investment to allow a sustained provision of innovation support activities.

Planned exploitation activities

Short-term actions addressing the different goals are:

- **Actions to engage the community** through local dissemination activities.
- **Assist companies** to learn about how to use SmartSantander platform in their application developments, by organising trainings, tutorials and user workshops.
- **Execution of Application Experiments with technological third parties**: UNICAN DIH will support Application Experiments that make use of SmartSantander in the development of new innovative applications and show cases in technological areas.
- Interaction with third parties and **detection of convergences** between AEs to maximize the impact of the local ecosystem.

In a long-term, the following **longer-term actions** will be addressed:

- Participation in suitable funding programmes with innovation support activities on regional, national or European level.
- Promotion of the support scheme of FED4SAE to regional stakeholders and funding authorities,
- Dissemination the most highlighting outcomes from the different AEs at a European level.

3.13 BLUMORPHO

3.13.1 Context

Partner description

BLUMORPHO is a Private Innovation Accelerator, accelerating innovation based on Lean and Open Innovation. BLUMORPHO operates in Deep Tech, Digital and Smart systems, including CPS and Embedded systems and in addressing more than 24 different vertical businesses.

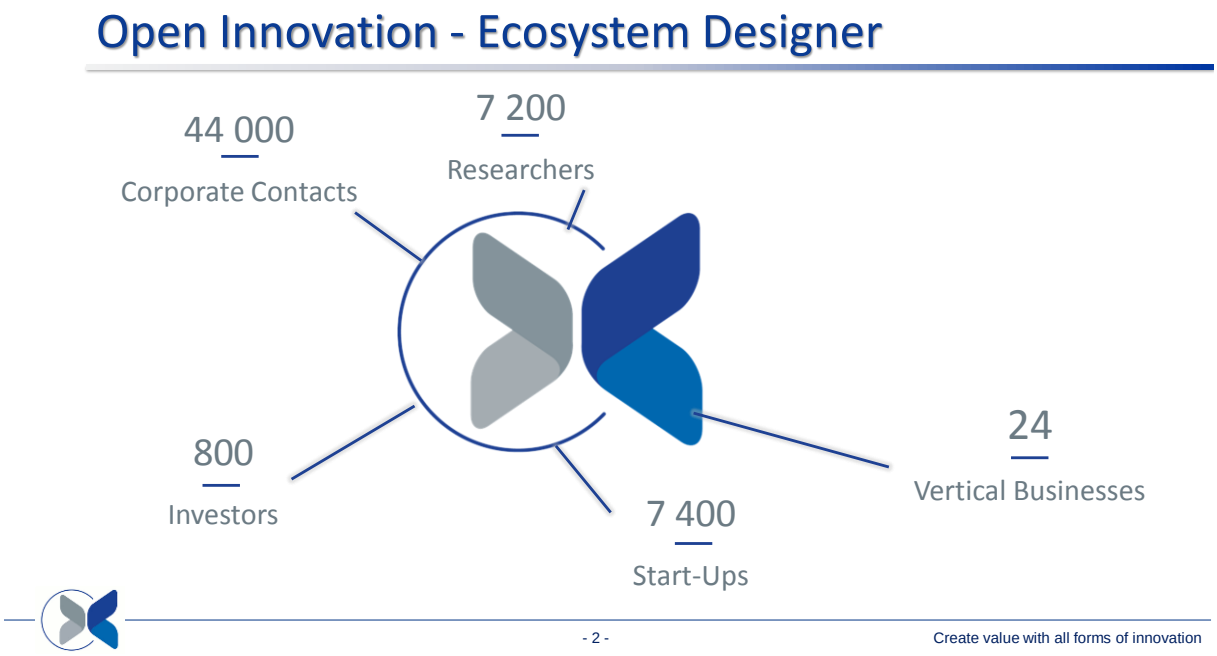
Based on its recognized technical and business expertise, as well as its global network composed by more than 60 000 contacts, BLUMORPHO generates high valuable innovation for any company looking for new product, new business model, new technology or new market. BLUMORPHO is accelerating the transition from technology to market adoption in structuring the relevant value chain. Its team is working hands on to develop innovation with high differentiation that will make the difference in the market place.
BLUMORPHO has a recognized expertise in go to market strategy in working on relevant business cases for the exploitation of innovative technologies.
Covering the full innovation cycle for innovation inception to commercialization, BLUMORPHO links innovation providers with private investors after validating and supporting their investment readiness.

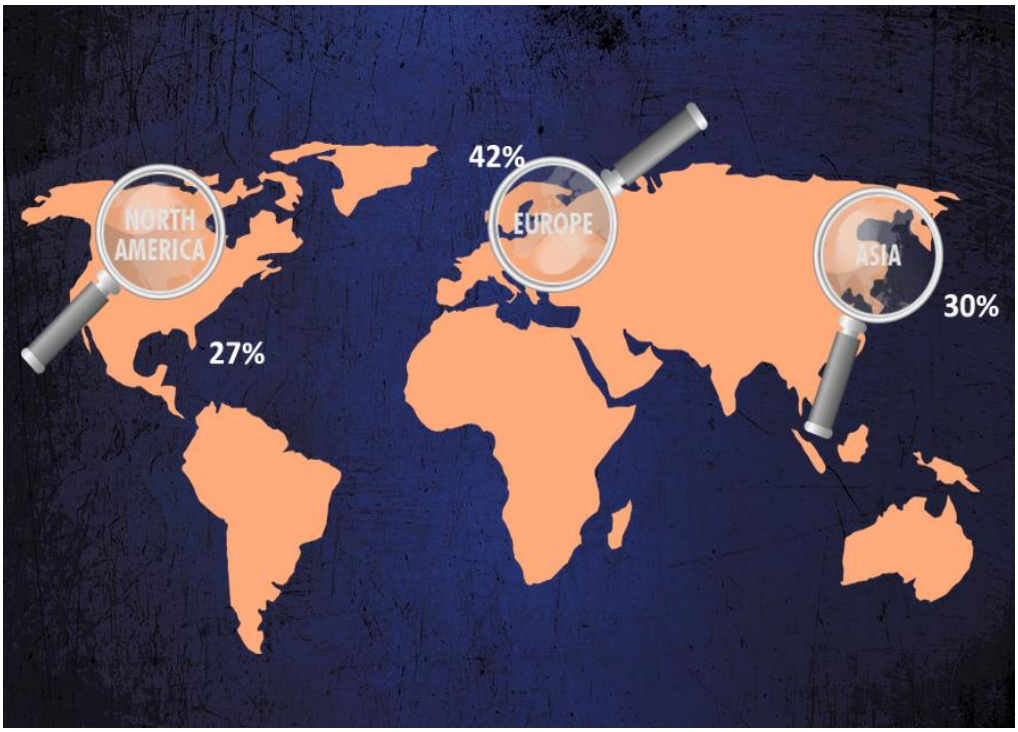
In the context of FED4SAE, BLUMORPHO supports selected applicants to implement efficient innovation management process facilitating CPS and Embedded solutions adoption towards commercial exploitation. BLUMORPHO is also providing start-ups with a facilitated access to its private investors network as well as SMEs and midcaps to relevant funding opportunities.

Ecosystem

BLUMORPHO is located in Paris (France) and Berlin (Germany). Inherited from the COWIN European Commission CSA and with Yole Développement as shareholder, BLUMORPHO benefits from a large ecosystem covering the full value chain in deep tech, digital and smart systems, from material, component, systems manufacturers up to end-users. Focus on exploitation of innovation, BLUMORPHO ecosystem gathers all innovation stakeholders: research organizations, start-ups, SMEs, midcaps, large corporations, clusters, national and international institutions including banks as well as private investors from business angels to corporate ventures. BLUMORPHO is part of an international ecosystem active in Europe, North America and Asia.

BLUMORPHO leverages on its unique network to design relevant ecosystem for each innovation BLUMORPHO team is involved in. BLUMORPHO is contributing to gather players at different level of the value chain to work from development to industrialization and commercialization.





Focus area

BLUMORPHO focuses on accelerating the transition from technology readiness level to market education and adoption.

This company is dedicated to turn innovation potential into economic value while generating solutions with high differentiation from a technical but also from a business models point of view.

BLUMORPHO does not have a specific focus in terms of applications fields. This Innovation Accelerator is especially working on cross fertilization identifying valuable challenges in various fields and connecting solutions in an open innovation scheme.

BLUMORPHO is working with all types of organizations and adapting collaboration depending on the type of companies.

Part of BLUMORPHO activities are dedicated to start-ups and SMEs, since BLUMORPHO is providing external resources in terms of innovation management that most of traditional SMEs do not have in their own organization. BLUMORPHO is also working with innovative start-ups to support their strategic positioning with operational and business driven actions dedicated to generate business in a short term.

Related Communities

Within FED4SAE, BLUMORPHO especially focuses on European start-ups, SMEs and midcaps that are entering into digitization and are looking to link innovative technologies with applications in combining hardware and software solutions.

BLUMORPHO benefits from a large community including more than 700 European SMEs that have participated to the gateone-project, Innovation Action part of Smart Anything Everywhere. The gateone-project is facilitating adoption of smart systems by European SMEs through the development of functional demonstrators to be tested by SMEs.

This gateone-project SMEs community will be enlarged to all European start-ups, SMEs and midcaps part of BLUMORPHO network so they can know more about CPS and Embedded systems attractiveness for their activities.

BLUMORPHO will also reach start-ups, SMEs and midcaps through its network of European clusters active at different levels of the value chain and in different applications fields.

BLUMORPHO will also communicate to the private investors community to encourage investment in companies developing or integrating CPS and Embedded systems. Concrete examples of value generation will be highlighted and companies introduced to private investors.

3.13.2 Partner exploitation strategy

Exploitation goals

BLUMORPHO works in close collaboration with FED4SAE partners providing industrial and advanced platforms to promote CPS and Embedded systems solutions attractiveness. It will contribute to enlarge the community of companies entering into the digitization of the European industry through deep tech, digital and smart systems adoption for the benefit of the whole European industry and society.

FED4SAE acceleration activities are designed to generate success stories that will further encourage new companies to adopt CPS and Embedded systems to gain in new market and market shares. Such expected success will contribute to attract further investment supporting CPS and Embedded systems adoption. It is one of the main strategic goals driving BLUMORPHO exploitation plan.

Planned exploitation activities

Short-term actions:

- **Promoting CPS and Embedded Systems innovation and FED4SAE** acceleration support for fast path to innovation to a large community of European companies with interest in digitization. BLUMORPHO is de-risking innovation for innovation companies. BLUMORPHO will not

only promote FED4SAE actions but will share with European SMEs how to leverage on FED4SAE to build their innovation roadmap towards value generation;

- **Promoting FED4SAE to regional, national and international clusters and institutions** to leverage on CPS and Embedded systems attractiveness visibility while encouraging companies to apply to the program;
- **Engage regional, national and international clusters and institutions to benefit from FED4SAE** activities to experiment our process to further contribute to it and invest in FED4SAE scheme;
- **Engage private investors into FED4SAE** acceleration support for CPS and Embedded systems adoption to demonstrate value generation potential and encourage further investment.

The following **longer-term actions** are planned:

- Promote successful experiment third parties to expand FED4SAE activities while engaging the sustainability of our action. A dedicated action plan will be set-up to reach this goal.

4 Conclusions

The FED4SAE partners have defined a detailed and comprehensive strategy to exploit the assets created by the project: innovative prototypes for new CPS and embedded systems products and services resulting from application experiments with third parties, the communities and ecosystems around the FED4SAE DIHs and related initiatives across Europe, and the network of FED4SAE DIHs itself and the innovation services it can offer to European businesses.

At this initial stage of the project, the FED4SAE exploitation strategy particularly relies on the individual plans of the FED4SAE partners to build up, activate, and extent their local ecosystems around their CPS platforms and technology domains. As the project progresses, emphasis will move towards the integration of these individual efforts into a global strategy in order to achieve the vision of a one-stop shop for innovation in CPS.