Smart Anything Everywhere

DIGITAL INNOVATION HUBS

ACCELERATORS FOR THE BROAD DIGITAL TRANSFORMATION OF THE EUROPEAN INDUSTRY

March 2018

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This brochure has been created by

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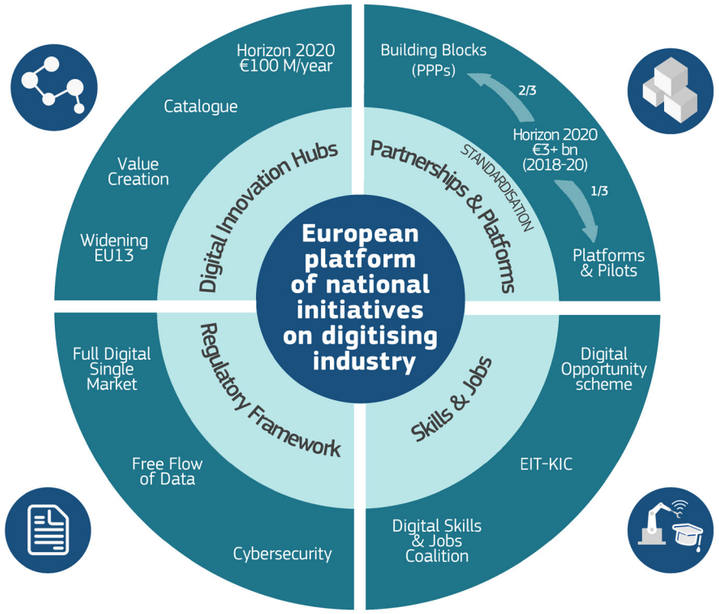
in cooperation with the European Commission, DG Connect / Units A2 and A3
within the project „Smart 4 Europe“ under the grant agreement 761448

DIGITAL INNOVATION HUBS (DIH) – THE CONTRIBUTION OF SMART ANYTHING EVERYWHERE

In April 2016 the European Commission presented the Digitising European Industry Strategy (DEI)[1] . The overall objective of this initiative is to ensure that any industry in Europe - big or small, wherever situated and in whichever sector - can fully benefit from digital innovations to upgrade its products, improve its processes and adapt its business models to the digital age. This requires not only a dynamic digital sector in Europe but also the full integration of digital innovations across all sectors of the economy. The DEI strategy is based on an ambitious collective effort involving public and private stakeholders across Europe at regional, national and EU level. It consists of four areas of work: Digital Innovation Hubs, Partnerships & Platforms, Skills & Jobs, Regulatory Framework. This work is monitored and stirred by the European Platform of national initiatives on digitising industry.



Digital Innovation Hubs (DIHs) are one of the key elements of the DEI strategy. They are support facilities that help companies – notably SMEs, start-ups and mid-caps – to become more competitive through the adoption of latest digital technologies. The DIHs act as a one-stop-shop, providing their customers with:

- access to digital technologies and competences,
- infrastructure to test digital innovations,
- training to develop digital skills,
- financing advice,
- market intelligence and
- networking opportunities.

Every company in Europe should have a DIH at a working distance, and the aim is to have at least one in every region in Europe. Member States and regions are investing to establish the DIHs infrastructure with different sources of funding at national and regional level, but also through the management of European funds such as EFSI (European Fund for Strategic Investments). The European Commission, from its side, invests in EU-wide collaboration across the network of DIHs and networking among the DIHs. This started in 2013 with the ICT Innovation for Manufacturing SMEs (I4MS) initiative followed by the Smart Anything Everywhere initiative (SAE) in 2015.

1 https://ec.europa.eu/digital-single-market/en/news/communication-digitising-european-industry-reaping-full-benefits-digital-single-market

Smart Anything Everywhere: enhancing the digital transformation of the European industry through Digital Innovation Hubs

The goal of Smart Anything Everywhere (SAE) is to let SMEs, start-ups and mid-caps enhance their products and services through the inclusion of innovative digital technologies. DIHs will bring user companies (with a need to invest in digital technologies) in contact with supply companies that have suitable ICT products that address the needs of the users. They will get the opportunity to do a focused application experiment where the novel product or service is developed. This creates a win-win situation for all actors: the user company can evaluate whether this innovative product brings benefit to its business. The supply company has an early customer and can improve its offering based on this experience. The DIH has grown its ecosystem, and can support both companies to nurture their innovations further.
The ultimate goal of the application experiments is on the one hand to help foster competitiveness of in particular SMEs and mid-caps, and on the other hand to establish fully functional ecosystems of DIHs that can also provide services beyond technical advice such as business consulting and training.
The two phases of the SAE initiative have been dedicated to the creation of well-functioning ecosystems around regional DIHs in four technology areas:

- Cyber-physical and embedded systems: the goal is to help businesses from any sector uplift the quality and performance of their products and services with innovative embedded ICT components and systems and to support eco-system building for promising platforms.
- Customised low energy computing powering CPS and the IoT: the aim is to help businesses to develop products for applications where high computing capacity at low energy consumption creates a competitive advantage and to support eco-system building for promising platforms.
- Advanced micro-electronics components and Smart System Integration: the target is to support the take-up of electronic components, sensors, smart objects and systems by providing i) access to advanced design and manufacturing for academia, research institutes and SMEs, and ii) rapid prototyping capabilities for SMEs.
- Organic and large area electronics: the goal is to help businesses in further maturing, innovating and validating their products with organic and large area electronics technologies by i) giving them access to mature and ready to use design and prototyping facilities, and by ii) performing application experiments driven by concrete user requirements and business cases. The European industry should therefore gain competitive advantages.

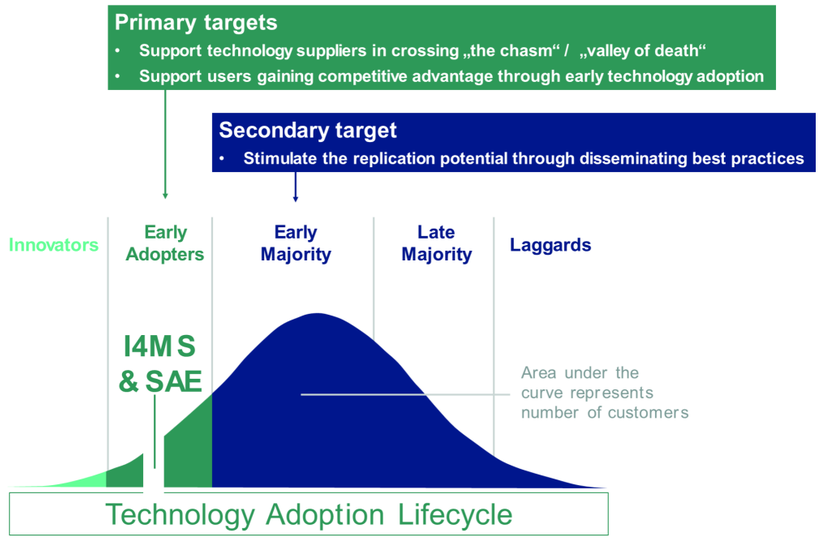
Phase 1: Creating a well-functioning ecosystem

The first phase of the Smart Anything Everywhere initiative started in 2015 under H2020. It was building on the successful experience of the TETRACOM and COLAE projects of FP7. The total funding of these projects was €32 million.
The 160 application experiments that were conducted both in FP7 and H2020 have involved 48 DIHS, 150 SMEs and mid-caps. They have created enormous economic and societal impact, which is shown in the success stories in this brochure.
H2020 brought a major improvement. Through using the new “Financial Support to Third Parties” scheme (the so-called “cascade funding”), companies can sign a light contract with one of the projects’ beneficiaries rather than entering into a direct and more complex contract with the European Commission.

Phase 2: Growing the ecosystem and its European dimension

The second phase of SAE started in autumn 2017 with 4 new Innovation Actions (IA) and one Coordination and Support Action (CSA) to support the existing and new DIHs into forming a coherent pan-European network of

DIGITAL INNOVATION HUBS (DIH) –
THE CONTRIBUTION OF SMART ANYTHING EVERYWHERE



hubs with a total funding of approximately €26 million. Special focus is on reinforcing the role of the DIHs in offering all innovation services that companies need. Not only testing and experimentation, but also skills development and having access to finance. Furthermore, collaboration with nationally/regionally funded DIHs is highly encouraged to be able to cover the whole of Europe.
The CSA, Smart4Europe, has an important role to play in integrating new DIHs in the existing network. They are organising networking events e.g. back to back to relevant world class events such as the Hannover Messe. Through these projects, a new set of more than 120 application experiments is foreseen, involving 40 new DIHs and 120 SMEs. They all have a cross-border dimension to foster collaboration on European level. In addition, this new phase also reflects the evolution of technology since the start of the initiative.

Skilling SMEs in digitising their business

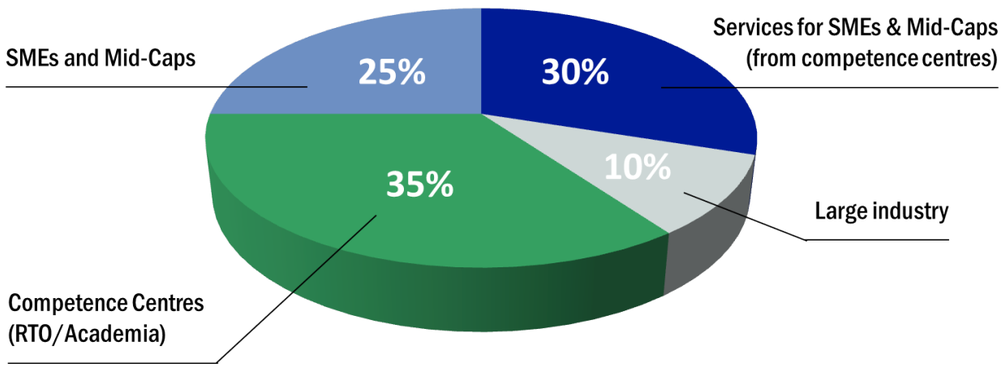
A major role DIHs have to play is to deepen the understanding of the decision makers in SMEs, start-ups and mid-caps about which opportunities the digitisation provides for their company. This goes clearly beyond just technology transfer or offering digital services in an affordable manner. DIHs should provide the relevant staff in companies with the skills to use digital technology in order to improve their way of working and to digitise their products and services, processes and business models. The target is that at least 10-20% of the efforts in application experiments are devoted to skills development.

Further supporting SMEs and mid-caps

The total EU funding of Phase 2 is €26 million, of which about 60% will be spent to directly support SMEs and midcaps, either as direct funding or as services by DIHs. About 50% of the total funding will be allocated through 15 open calls in 2018-2020.
The presence of large industrial players in SAE will ultimately help SMEs and mid-caps, as establishing a customer relationship with such big players as reference will boost their business. The existing marketplaces will also be further enriched with new service offers and a new marketplace for additive manufacturing services will be established. Furthermore, the DIHs should attract investors to support business development of SMEs and mid-cap actors in successful application experiments.

FINANCIAL SUPPORT TO SMES AND MID-CAPS

Distribution of the nearly 32 million EUR funding in % (Phase 1)



HIGHLY ATTRACTIVE TO INDUSTRY

In Phase 1, out of 180 current contractors **150 are from industry.**

70% of the industrial partners are **SMEs and mid-caps**.

As 50% of the industrial participants are end-users, the direct application of the application experiments' results is guaranteed.

SAE provides **SMEs** with **easy access** to:

- competences and skills
- pan-European competence and business networks
- financial support

COLLABORATION ACROSS EUROPE FOR A STRONGER EUROPEAN INDUSTRY

More than 60% of the application experiments have a relevant European dimension and are executed in collaboration of partners from different EU member states combining existing regional strengths and know-how. Even more of them facilitate collaboration and interaction across different regions.

23 member states and associated countries are involved.

160 application experiments have already been launched in Phase 1. They have either been completed achieving the intended technological and economic impact or are in their final state of implementation.

More than **120 application experiments are foreseen in Phase 2**, involving **40 new DIHs** and **120 SMEs**.

OPEN CALLS TO PROMPTLY RESPOND TO EMERGING MARKET CHALLENGES

More than €18 million funding was used to support SMEs and mid-caps with their digital transformation in 9 calls during phase 1. More than 15 calls are expected to be launched in 2018 and until 2020 in Phase 2.

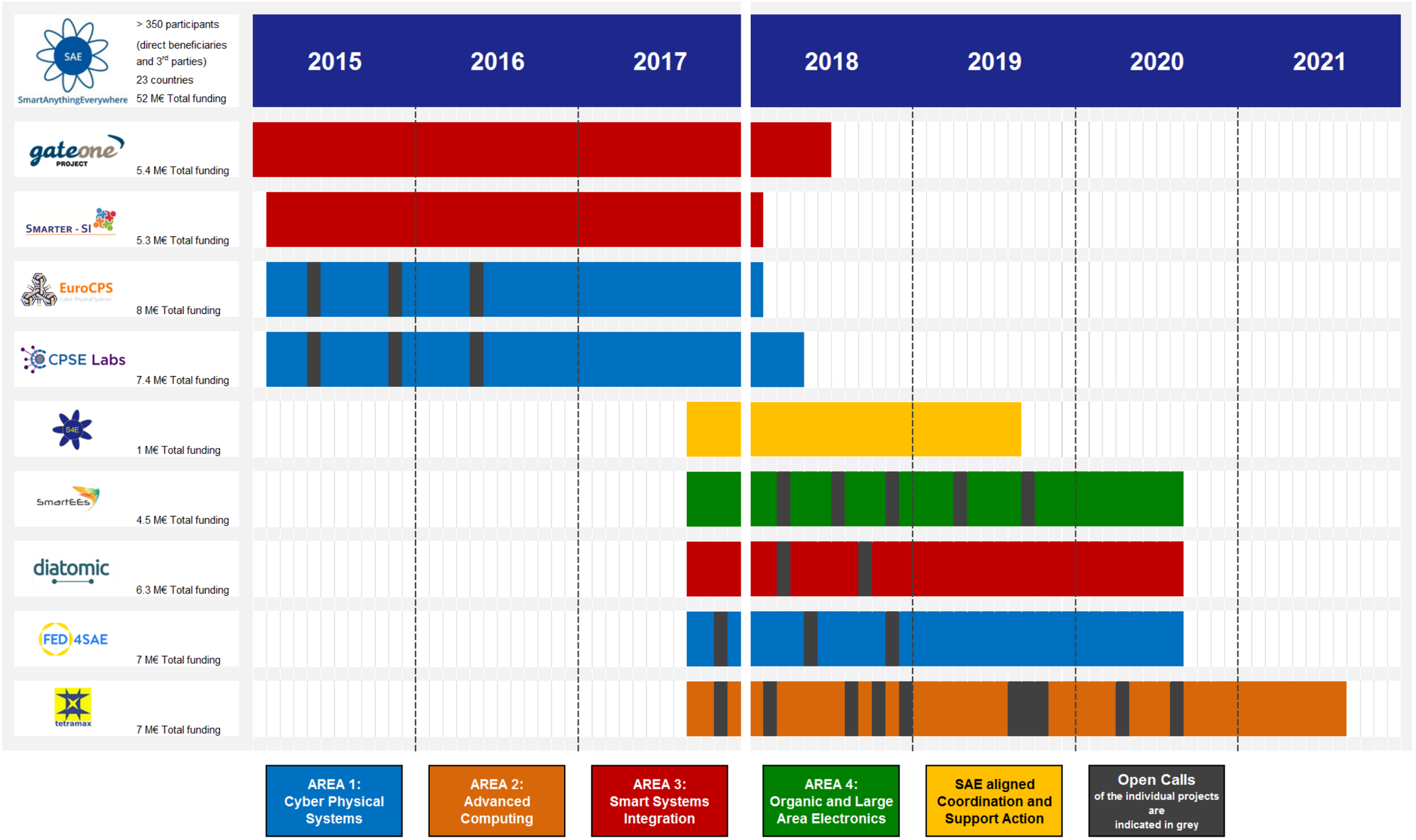
Light, **SME friendly application scheme:**

- 10 page proposal
- Calls tailored to market challenges
- Very short time to application experiment start

Interest of SMEs and mid-caps has strongly increased, e.g. doubling the proposal numbers from one call to the next and receiving up to 100 proposals per call.

SMART ANYTHING EVERYWHERE TIME-LINE

The SAE Time-Line indicates the runtime of individual projects by coloured bars.
Grey time-slots indicate Open Calls (Cascaded Funding) foreseen under the respective projects.



NETWORKED TRAFFIC MANAGEMENT

Problem and solution
Many European countries have dense road networks and significant traffic problems. The flow of traffic on Europe's roads is managed by a series of traffic management systems that are owned and controlled by various local and national authorities. A traffic management system (TMS) consists of a collection of digital control systems linked to physical devices installed along the roadside. These can be sensors that collect traffic data (such as cameras, radar detection systems, and induction loops) or actuators that are used as control measures by giving instructions to road users through signs and signals. Existing traffic management solutions are run centrally from regional control centres. While cooperation between various road authorities at a governance level has improved recently, technical barriers for collaborative and distributed traffic management systems over regional borders must still be removed.

The TEMPO experiment aimed to tackle this problem by providing collaborative, distributed control architectures for traffic management systems that engage with each other in automated negotiation. The negotiations are targeted to find control measures that optimise traffic flow cross-border and for the traffic network as a whole. The experiment applied an existing modelling and simulation platform called Overture for TMSs. Models can demonstrate the correctness and benefits of designs prior to costly implementation. Traffic simulations produce a large amount of numerical data that need to be interpreted and presented in an understandable way to non-IT experts. The existing Overture technology has been extended with 2D/3D visualisation to illustrate the effect of the automated negotiations on the traffic flow.

The role of the DIH
The DIH at Newcastle University brought together the partners and facilitated technology transfer of Overture from Aarhus University to West IT through training, guidance and support. Apart from upskilling West IT on Overture, the DIH helped West IT reach potential customers by engaging with road network stakeholders from across Europe from the outset and throughout the experiment.

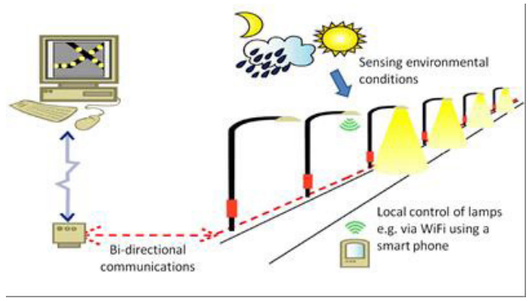
Impact
West IT has increased its competitive capabilities in the smart mobility area and expects additional revenue of 200k€ in the first year, leading to an increase of 1.5M€ over five years. The digital skills obtained by West IT employees will benefit the company in current and future projects, both in traffic management and other domains. The results can also be of benefit to organisations such as stadiums, harbours and airports not commonly associated with traffic management, who increasingly take the initiative in guiding large volumes of traffic themselves.

The results will have significant societal impact if adopted by national, urban and commercial road authorities, greatly improving road network performance and reducing pollution.

End-user: West IT (SME, NL)
Technology provider: Aarhus University (RTO, DK)
DIH: Newcastle University (RTO, UK)

SUCCESS STORIES - CYBER PHYSICAL SYSTEMS

SMART STREETLIGHTING INCREASES SAFETY AND REDUCES ENERGY USE



Problem and solution
Citizens' feelings of safety while walking in the city at night correlate strongly to light levels. For municipalities, this presents the challenge of providing sufficient light at clearly reduced levels of energy consumption. Cities are investing in new (LED) lighting installations, but available solutions are proprietary. That binds municipalities to a single vendor for services and replacement lamps, among other drawbacks. Moreover, these systems are not smart enough to incorporate new flexible, sophisticated features enabled by bi-directional communication capacities of the luminaire. For example, a smart street light should transmit its health status to the operator to ensure that defective lighting elements are replaced before they fail – providing the double benefits of lower maintenance costs and ensured illumination. In addition, the communication capacity of street lighting could be useful for giving driving instructions for autonomously driven cars. Finally, energy-conscious operators would benefit from smarter dimming by reducing the electric current in cooler weather conditions, when LEDs are more efficient.

In response to these challenges and opportunities, this EuroCPS project developed an upgradeable, re-configurable lighting-control solution constituting a "future-safe" investment with clear benefits both for citizens and operators of the lighting installations. The non-proprietary "smart SSL solutions" concept targets system-level applications with advanced communications. These allow LED luminaires to become part of smart-city solutions through bi-directional communication, separating the communications protocol from the actual physical medium of the data transfer. Using Intel's Edision IoT/CPS platform, various smart functions could be added to LED-based street-lighting luminaires: e.g. performance-status data and smart dimming.

The role of the DIH
BME assumed the role of the DIH in this EUROCPS experiment in consulting the SME Hungaro Lux on system design and implementation of the new intelligent LED luminaire controller. With its detailed knowledge of Intel's IoT platform BME helped realizing missing device drivers and interfaces. Furthermore, BME provided the SME with laboratory testing facilities, which is a second dimension of a DIH's role.

Impact
Hungaro Lux Light is building a new production facility for its PearlLight luminaires that will go into production in 2018. The company also developed a new smart luminaire control center. A pilot setup was built with a Hungarian electric utility, and production planning is in the final phase. With this pilot implementation, predicted energy savings of 6-8 percent will be tested. A further ~5 percent energy-efficiency improvement is also expected from the new anti-reflective coating introduced by the company's optics design.

End-user: Hungaro Lux Light (SME, HU)
Technology provider: Intel (LE, IE)
DIH: BME (RTO, HU)

SUSTAINABLE FARMING - FEWER PESTICIDES THANKS TO IOT TECHNOLOGY

Problem and solution

It is estimated that agriculture accounts for more than 70 percent of the world's water consumption and that up to 58 percent of the pesticides applied in agriculture is unnecessary. Therefore, the ability to determine whether crops in the field need water, fertilizers or pesticides – and if so, when and how much – is vital to sustainable agriculture and to fight hunger in an ever-growing world population. Decisions on crop management are at best made based on records collected at public climate monitoring stations. While this information applies to very large areas, agro-climatic conditions vary over short distances and thus global information is of little use for the optimization of crop growing. For example, key variables such as soil-moisture content may change within just a few meters. In order to collect and analyse key parameters for optimized crop growing, the CNODE experiment within the EuroCPS project designed and built low-cost sensor nodes with just a few sensors to monitor highly variable and critical parameters: air temperature and humidity, and soil moisture at three different depths. The solution is based on spectrally efficient modulations such as differential binary phase-shift keying (DBPSK) and Gaussian frequency-shift keying (GFSK) and simultaneously optimizes network capacity and maximizes the communication link budget. Despite sending data directly to the server over long distances, the nodes require minimal maintenance and enable a battery life of at least five years using Sigfox's low-power, wide-area (LPWA) connectivity. This makes the solution affordable and practical to use. The accurate information collected by the solution will on average enable farmers to reduce pesticide application by 35 percent and irrigation-water consumption by 50 percent.

The role of the DIH

CEA-Leti, a research institute of CEA Tech, acted in this experiment as DIH connecting its Sigfox transceiver to the STM32L0 Microcontroller Platform and transferring the entire solution suitable for the sustainable farming application to the SME Encore that is active in that field.

Impact

The CNODE technology is being integrated in Cesens, Encore Lab's flagship, sensor-based product for providing farmers with real-time information about their crops. Thanks to the extended functionality of its flagship product, the company expects to sell more than 10,000 units within the first five years after its 2017 market launch. Sales are estimated to reach 1M€ by 2022. In addition, the company expects to double its staff to 20 during that period, thanks to the results of the CNODE project.

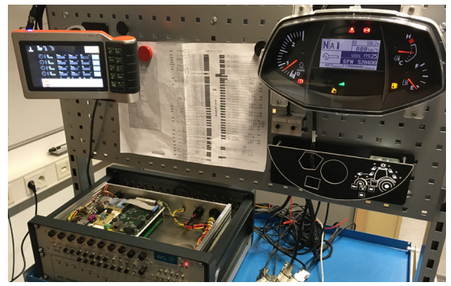
Dramatically optimising water consumption in crop farming has also a huge humanitarian dimension, as persistent hunger is in particular observed in areas where water availability is limited. Increasing harvests thanks to optimized consumption of the rare resource water will strongly contribute to the fight against hunger.

Finally, the considerable reduction of pesticides has also environmental impact in using fewer chemicals that contaminate the soil.

End-user: Encore Lab (SME, FR)
Technology provider: STMicroelectronics (LE, FR)
Design Centre: CEA-Leti (RTO, FR)

SUCCESS STORIES - CYBER PHYSICAL SYSTEMS

RAPID VERIFICATION OF NEW FUNCTONLITY FEATURES FOR TRACTORS AND MEDICAL DEVICES



Problem and solution

Tractors and other off-road vehicles have strongly evolved from just plough-pulling machines to complex systems allowing for a huge variety of functions. New digital technologies have enabled many innovative, efficiency-enhancing functions such as autonomous farming applications using GPS data or automatic transmissions driving very diverse farming machines. As for any product, the safety and reliability of new features must be tested in realistic environments before finding their way to commercial markets. In particular real field tests add significant costs and delay time to market. They are not really reproducible due to varying real-life conditions. Software glitches occurring during field-testing are nearly impossible to fix, because there is rarely an opportunity to take the vehicle back to a garage for error analysis.

In a EUROCPS experiment an Automatic Test and Verification System platform has been developed to shorten testing time and to improve testing quality. By integrating real hardware and virtual components (simulation models), the platform provides a seamless exchange of data and know-how from the concept phase to road testing. It allows plugging the test system into a real environment with the capability to switch between real data and generated stimuli. This affordable hardware-in-the-loop (HIL) system uses remote data tracking in the field to collect data from real vehicles. The data is then used for reproducible test-and-simulation models in the lab. The new solution was applied to test innovative commercial off-road-vehicle features. The system reduces both the testing effort and time by 30-50%. This also holds for application areas that combine generated and real data as part of testing cycles such as medical equipment. For example, the platform was also used to test an innovative type of catheter, which is a highest-risk-class medical device requiring extensive testing before market launch. The PiCSO Impulse Catheter, which is designed for patients with myocardial infarction, redistributes blood flow into the damaged area of the heart. The HIL system's automated testing capability accelerated product development by eliminating the need for costly and time-intensive manual testing.

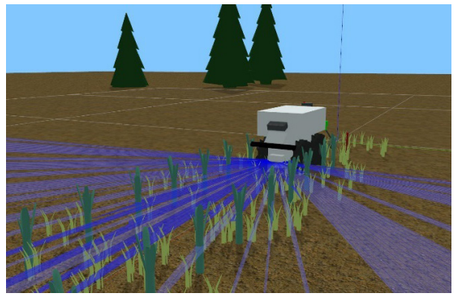
The role of the DIH

In this experiment CEA was the DIH that helped to bring the technology provider AVL and the SME CDE together. As catalyser, CEA set up the process of technology transfer and supported the technology transfer between the technology provider and SME throughout the experiment live-time.

Impact

CDE is an Austrian embedded hardware and software company. Thanks to the enormous gain in testing time and effort an agreement with a major, new customer has already been signed. Furthermore, discussions with multiple potential customers are underway. New medical-equipment applications are being developed. New business models suggested by these enhanced capabilities offer the potential to diversify CDE offerings into mobility, industrial services and energy-supply industries. It is expected that the revenue will increase by 30 percent by 2020. Moreover, the company estimates that reusing components, tools and skills will boost earnings by more than 10 percent.

End-user: CDE (SME, AT)
Technology provider: AVL Graz (LE, AT)
DIH: CEA (RTO, FR)



ROBOTS MAKE AGRICULTURE ECO-FRIENDLY

Problem and solution

Agricultural robots have emerged as innovative and eco-friendly means for easier farming. In particular, autonomous weeding allows farmers to efficiently maintain their crops without using herbicides or chemical weed control products. Electrically-driven robots require less energy than a tractor. They are also lighter than a tractor and thus avoid compacting the soil, even when used frequently.

Naïo Technologies is a pioneering SME in this domain. Their first product was Oz, a weeding robot for small crops of vegetables. The company is now targeting the market of large-scale vegetable crops and vineyards, and has started the development of bigger and faster robots. However, the deployment of such robots introduces new potential risks to the users and their farm. Since the safety regulations and standards are not yet established for autonomous robots in agriculture, SMEs like Naïo need to adopt a proactive approach in the acquisition of dependability-related technologies.

In order to implement a successful solution Naïo needed skills concerning safety analysis and validation technologies. More precisely, Naïo increased its ability in performing structured and systematic analysis of operational risks, formal assessment of architectures and simulation-based testing.

The role of the DIH

The DIH provided Naïo with access to leading edge safety methods such as HAZOP-UML for the analysis of the operational risks induced by the robots and Altarica for the assessment of candidate robot architectures. It also helped Naïo to establish simulation-based testing as an essential part of their validation process, based on recent research results on testing robots in virtual worlds. The DIH facilitated the collaboration of its members with Naïo by not only providing academic tutorials but also by focusing on practical problems and bridging the gap from robot prototypes to mature products.

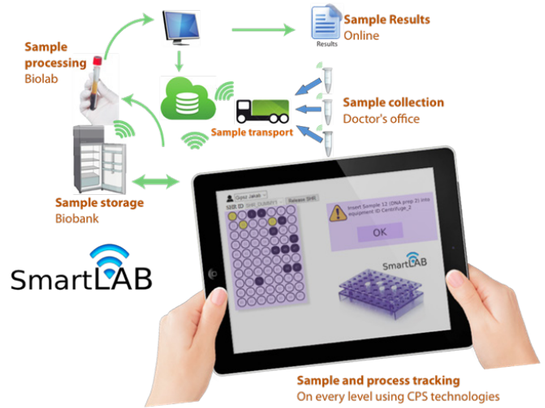
Impact

An immediate impact of the experiment was a one-third reduction in validation costs, for the functionalities that can be tested with the developed simulator. Naïo now use this simulator for two robots out of the four they have in development. In the longer-term, the transfer of safety-related technologies has put Naïo into a better position to get into the market of large-scale crop maintenance. Meeting legal requirements, in particular as regards safety, is a prerequisite for selling their robots at the European and international levels.

The experiment was part of Naïo's continuous effort to reach the business objective of doubling their turnover each year. They expect to go from 1.2M€ this year and 40 robots sold, to more than 10M€ of turnover and 300 robots in 2020. This ambitious objective is in line with the huge potential for development in agricultural robotics. Tractica, a US research organization, forecasts that the agricultural robot market will increase exponentially from $3 billion in 2015 to $16 billion in 2020 and then $73 billion in 2024.

End-user: Naïo Technologies (SME, FR)
Technology provider: LAAS-CNRS, ONERA (RTO, FR)
DIH: LAAS-CNRS, ONERA (RTO, FR)

SECURE MONITORING OF MEDICAL SAMPLES THROUGHOUT THE LAB



Problem and solution

High-throughput medical-diagnostics laboratories and bio-banks face an ever-growing number of biomedical samples to be processed and stored locally. This requires reliable and secure identification of test tubes in the entire laboratory ecosystem. In just one large-scale lab, this could involve tens of thousands of sample test tubes. These facilities are under constant pressure to monitor samples during processing, transportation and storage of tubes and to shorten the time it takes to provide patient results.

The innovative solution called SmartLAB responds to all these challenges. With Intel's embedded Edison platform, the system uses RFID-tagged test tubes and sample holders. The touchless and highly flexible radio-frequency-identification technology ensures reliable and secure monitoring of test tubes. It enables tracking sample movement with continuous quality assurance seamlessly integrated in the laboratory ecosystem, therefore reducing risk of sample loss or misprocessing, while providing patient results more efficiently.

The role of the DIH

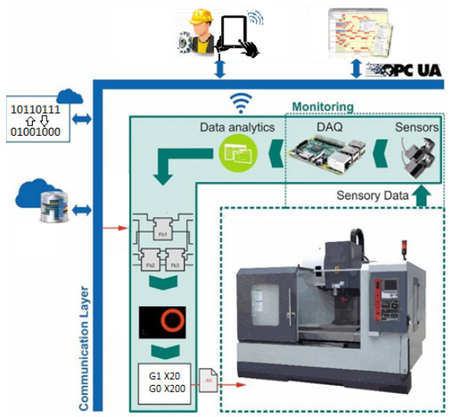
In this experiment of the EUROCPS project BME took the role of the DIH enabling an SME of their eco-system to take advantage from newest digital technology. They integrated their leading-edge knowledge about Cyber-Physical-Systems (CPS) into the platforms of technology providers INTEL and STM such that the SME Neumann Diagnostics was provided with the solution and guidance to add important features to their existing tests for cancer prevention and related laboratory products.

Impact

Neumann expects SmartLAB to boost its revenue by up to €2 million over the next five years. It is positioned to enable highly automated workflows extended with quality-controlled, sample-handling solutions for high-throughput labs, especially in the field of infectious diseases like STDs and HPV screening, which involve millions of patients in the EU.

The reagent market for HPV screening in Europe is forecasted to reach €500 million within 10 years. In addition, SmartLAB as an additional service may increase the value of the laboratory systems the company offers.

End user: Neumann Diagnostics Ltd. (SME, HU)
Technology provider: Intel (LE, IE), STMicroelectronics (LE)
DIH: BME (University, HU)



ADVANCING LEGACY MACHINE TOOLS TO DIGITAL MANUFACTURING

Problem and Solution

A new trend in industry is to offer production services on a digital marketplace, with the vision to minimize the overhead needed to create and organize production chains. While computational power is getting cheaper every year, the backend processing is still relying on expensive machine tools – for example to create metal parts via milling. The investment cycle for such machines is completely different from the rapid changes in information technology. Especially SMEs use the machine tools for decades, which binds a large amount of equity capital. A solution to prevent that new trends in manufacturing become disruptive for lots of SMEs is to integrate legacy machine tools into digital production chains. Hence, the main goal of the LegInt project (short for **LEG**acy **INT**egration) was to develop and verify the necessary toolset to support this integration. LegInt developed a "shell" that augments legacy machine tools through a set of interfaces to embed them into an advanced Cloud Manufacturing environment. This shell contains hardware and software components, and its potential has been demonstrated in practice using legacy numerical controlled milling machines.

To enable the integration of legacy milling machines into digitised production chains LegInt uses Function Blocks, which represent features to be created by milling processes. The DIH at fortiss provided their open source framework Eclipse 4diac and the necessary expertise to enable the product designer to describe complex milling processes with parametric Function Blocks. The contributing SME FormTec brought the knowledge and skills to generate traditional numerical control code files on the fly from the Function Blocks via a driver-based system.

The Role of the DIH

CPSE Labs provided the ideal setting to bring together the necessary partners to realise the LegInt ambition: the SME FormTec with expertise in cutting technologies and software development, and two universities in Patras and Cranfield as additional technology providers for monitoring and cloud systems. The CPSE Labs DIH at fortiss offered Eclipse 4diac for distributed industrial control based on the Function Block standard IEC 61499 and provided necessary technical training and consulting. For SMEs such as FormTec realizing research activities alongside the daily business is a challenge. The CPSE Labs funding enabled FormTec to devote time and effort to evaluate Eclipse 4diac, and the DIH also supported the consortium to demonstrate their results at the 2017 Hannover Fair to connect to potential new customers and initiate further exploitation activities.

Impact

The LegInt results allow to adapt large investments in machine tools for future digitised usage. FormTec estimates that over 1000 companies in Europe running expensive legacy production milling machines in the range of several billion Euros can benefit from the technology or at least parts of it and constitute potential FormTec customers. The results of the project build the base for consultancy and individual solution development for this large customer base, and is a foundation of a new branch of business of FormTec with an expected potential of additional revenue of 0.5M€ over the next five years.

End-user: FormTec GmbH (SME, DE)
Technology provider: University of Patras (RTO, EL), Cranfield University (RTO, UK)
DIH: fortiss (RTO, DE)

SUCCESS STORIES - CYBER PHYSICAL SYSTEMS

ENABLING EFFICIENT CPS TOOL CHAIN INTEGRATION

Problem and Solution

The development of Cyber-Physical Systems (CPS) includes multiple experts from different disciplines and is characterized by fragmented descriptions that need to be considered. These fragments are stored in and managed through a multitude of tools and databases. Since the corresponding descriptions are interrelated, it is important to be able to relate them, to keep them consistent and to efficiently be able understand how a change in one item impacts other. There is an immense need for European CPS industry to be efficient in product development to maintain a competitive advantage on a global market. Especially speed in product development is of great importance, as the market windows are getting smaller and smaller. Before it was acceptable with release cycles of typically 6 to 18 months to introduce new features in industries such as telecom and automotive, but now it can be a matter of weeks. This challenge can be addressed by better use of information throughout the product development lifecycle. Reducing manual efforts for duplicating and reproducing data and making more information available for decision makers decreases development time and effort. A key success factor to achieve this is to manage data and tool integration among the wide range of engineering tools used in the CPS domain. The Digital Innovation Hub Sweden (KTH) has addressed this opportunity with an aim to lower the threshold of integrating and managing data among software tools, thereby improving end-user processes. This is accomplished by providing support 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) and open source software. The specific objective for FindOut Technologies in this experiment was to further develop and exploit the increased use of OSLC in the CPS industry, focusing on demonstrating how visualization of OSLC resources can support better understanding and better decision-making during the development of complex CPS products. The main outcome of the experiment is a software application called LDVis, Linked Data Visualizer, now contributed to open source. Through the experiment, the application has shown to be a powerful component for visualization of OSLC/LinkedData resources and hence a means for improved CPS product development.

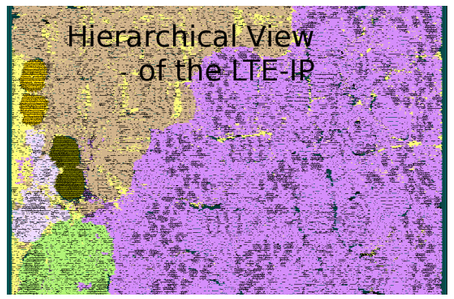
The role of the DIH

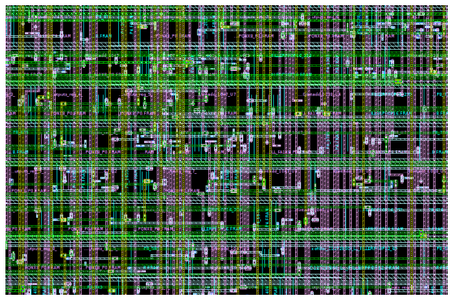
The DIH skills in OSLC and Linked-data have been crucial for the project; skills and technology insight were transferred during the experiment to FindOut. The combination of skills by the DIH and the skills of FindOut provided for a synergetic collaboration and the technological means for success. The DIH played an important role of providing not only technical expertise but also contacts with other industrial players, in particular exposure to CPS industry and domain particulars. For the visualization demo case, the data was obtained from a research project between the CPSE Labs partners KTH and OFFIS. As an SME with limited resources and networks, FindOut would not have been able to establish this kind of partnership and project relations without a programme such as the SAE initiative.

Impact

With LDVis FindOut Technologies has obtained a unique selling point by improving on their already existing knowledge in this field. It is estimated that the commercial outcome of the experiment will lead to an increase of revenue in the order of 1MEUR over a five-year period of time. FindOut Technologies is an SME with approx. 30 employees and an ambition to grow to 50 employees until year 2020. A significant part of that growth will be related to the increased revenues in the field of tool chain integration services and visualization solutions. Already because of this experiment, a commercial relation with the automotive company Scania has emerged within this field.

End-user: FindOut Technologies (SME, SE)
Technology provider: KTH (RTO, SE)
DIH: KTH (RTO, SE)





A POWERFUL LTE TURBO - CODE DECODER - ENABLING COMPONENT FOR NEXT GENERATION MOBILE TECHNOLOGY

Problem and solution
Mobile Communication is one of the key technologies of modern information societies. Increased mobile communication and services require an ever increasing data throughput. Therefore, the next generation of wireless systems needs to provide for higher data rates greater than 16 Gbps, shorter delays (latencies), and even greater capacity. To meet the challenges of such future high throughput wireless systems an LTE Turbo-Code Decoder (Forward Error Correction – FEC) is required that has the capabilities to deliver these very high data rates being compliant with the mobile broadband standard specifications.

To make their existing solution future proof CREONIC teamed up with the University of Kaiserslautern in order to develop a cutting-edge LTE Turbo-Code Decoder solution within a technology transfer experiment of the TETRACOM project. The major technical advantages of the achieved new LTE Decoder solution are the small chip size, which leads to less energy consumption and an extended battery life. The higher throughput (> 1Gbit/s) enables mobile internet connection with a seamless user experience due to short response times and fast downloads. The architecture is highly scalable to fit perfect to the target application (e.g. base station or mobile device). The near ideal communications performance allows for a reliable communications even at places with poor network coverage. This decoder (see the figure above) is a near to marketable solution and will become a future product of CREONIC.

The role of the DIH:
The Microelectronic Systems Research Group at the University of Kaiserslautern transferred more than 250 PY of experience and knowledge in designing and verifying high throughput channel decoders to CREONIC. This upskilled the engineering capacities of CREONIC significantly facilitating them to offer highly competitive solutions on the market.

Impact
The LTE solution is one major step to enhance CREONIC's product portfolio towards a complete set of solutions of forward error correction cores. This provides CREONIC with the significant competitive advantage to serve its existing and new customers with highly sophisticated solutions. It is expected that CREONIC will increase its number of employees by 50% and its revenues by 20% until 2020 thanks to this TTP.

End User: Creonic (SME, DE)
Technology provider: University of Kaiserslautern
DIH: University of Kaiserslautern

SUCCESS STORIES - ADVANCED COMPUTING

DEVELOPING EFFICIENT SOFTWARE AND HARDWARE FOR ARTIFICIAL INTELLIGENCE VIA COLLABORATIVE OPTIMISATION

Problem and solution
Developing competitive Artificial Intelligence (AI) -based products requires years of intensive R&D to come up with an efficient software and hardware solution given an overwhelming number of combinations of algorithms, models, features, data sets, frameworks, libraries and platforms. The main risk is to make wrong choices which can lead to a slower, less accurate and expensive solution than from a competitor and potentially waste the whole investment. To give a concrete example: autonomous driving requires robustly detecting cars, pedestrians and other objects under a variety of conditions. State-of-the-art algorithms for object detection, however, either process accurate images too slowly (1 image 4 seconds) or do not meet functional safety requirements, for example, fail to recognise pedestrians in low-light conditions. Nevertheless, they require running on compute platforms that consume hundreds Watts of power and cost thousands of euros. While this is acceptable for proof-of-concepts, it is prohibitively expensive for mass production. Collaborative optimization can bring automotive platforms that consume perhaps under ten Watts of power and cost perhaps under a hundred euros, while meeting recognized safety standards.
In a 50k€ TETRACOM experiment the non-profit cTuning foundation has developed such a collaborative optimization framework called Collective Knowledge (CK) to collaboratively optimise software and hardware for emerging workloads. CK enables industry and academia to share reusable and customisable Artificial Intelligence (AI) artefacts and workflows with a common application programming interface (API) while facilitating technology transfer. Continuously aggregating collaborative optimisation results obtained on systems ranging from Internet of Things (IoT) devices to supercomputers helps automatically predict most efficient solutions, and therefore dramatically accelerate R&D, save millions of Euros, minimize risks and reduce time to market for new AI products. Automatic and collaborative CK-based software optimisation has already enabled several components of deep neural networks (essential part of AI) to run 10-30x faster on ARM-based hardware while reducing time to market by 5-10 times.

The role of the DIH
The cTuning foundation served as a DIH to transfer the CK technology to ARM, the world-leading supplier of microprocessor technology with over 100 billion ARM-based chips deployed since 1991. Adopting CK-based workflows provided the critical know-how and skills to extrapolate experimental results using predictive analytics and enabled ARM to optimise their software and hardware for AI workloads in only a fraction of the time required by conventional optimisation. Furthermore, the DIH facilitated the foundation of a start-up company that commercially exploits the developed solution.

Impact
The knowledge, experience and open source technology acquired from this experiment helped establishing a start-up called dividiti in 2015. Within 2 years, dividiti became a leading provider of AI optimisation services for ARM and several Fortune 50 companies including General Motors, and grew from the 2 co-founders to 7 staff with over €1M in revenue.

End users: ARM (UK), dividiti (SME/start-up, UK)
Technology provider: cTuning foundation (RTO, FR)
DIH: cTuning foundation (RTO, FR)

SAVVY ECG BODY SENSOR FOR DETECTION OF CARDIAC ARRHYTHMIAS

Problem and solution

The main causes of death among the elderly population are cardiovascular disease and cancer. For example, the atrial fibrillation (AF) is a cardiac arrhythmia that affects more than 4 million people in the European Union and about 100 million worldwide. The AF is associated with more frequent hospitalisations because of stroke, transient ischemias, and heart failure. Long-term electrocardiographic (ECG) recordings are recommended from the European Society of Cardiology and European Heart Rhythm Association for detection and maintenance of AF and other threatening arrhythmias. Screening for the early detection and appropriate management of diseases could dramatically improve health outcomes and reduce the cost of medical treatment. Existing long-term ECG recording technology is costly, cumbersome in management and bulky therefore hindering the movement of the patient e.g. in doing sports. Furthermore, it is mostly applied for 24 hours only.

In a TETRACOM experiment the Jožef Stefan Institute (JSI) and medical centre SIMED d.o.o developed a medical graded ECG wireless body sensor with a low power Bluetooth connection to a smartphone, and corresponding software for interpretation of measurements. The system is suitable for long-term monitoring of the heart activity, from a few hours up to a whole year or even longer. Because of its simple use and acceptable price, the system can be used as a personal medical device or in a mobile health system. The system can support solutions to every-day problems of the medical personal in hospitals, health clinics, homes for the elderly and health resorts.

The role of the DIH

The CE certification of the innovation as a medical device was recognised as a crucial requirement for further industrialisation and mass production. The DIH Jožef Stefan Institute supported the activities for CE certification, and consequently the successful know-how transfer from research to industry. The activities included preparation of technical maps and other documentation for medical device certification. SIMED d.o.o. established the spin-off company Saving d.o.o exclusively for the purpose to take up the developed technology and organise the production and marketing of the Savvy ECG sensor recognised as CE marked Class IIa professional device serving as Event Recorder or Long Term ECG Monitor.

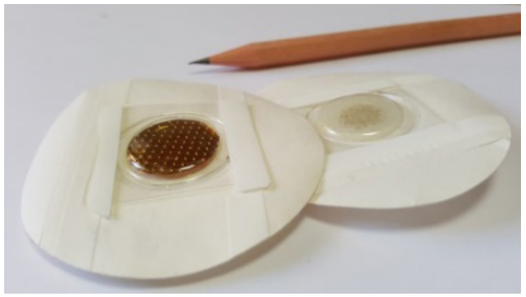
Impact

End of January 2017 Saving d.o.o has completed all necessary registrations for selling the solution in the EU, which started on February 2017. The Savvy ECG sensor has already been successfully implemented in the public and private health care sector such as cardio centres and hospitals. In 2018, the company expects 5.000 customers growing to 50.000 until 2020. The company estimates revenues of €200.000 still in 2017 that should grow to €1.750.000 by 2020.

The societal impact of the developed solution is enormous. The low cost of the Savvy ECG sensor allows for more monitoring ultimately saving lives without increasing health care cost. The patient enjoys more flexibility whilst being monitored also being informed in real time about his heart activity.

End-user: Saving d.o.o. (SME, SI)
Technology provider: SIMED d.o.o (SME, SI)
DIH: Jožef Stefan Institute (RTO, SI)

SKIN INTERFACE FOR A WEARABLE MEDICAL DEVICE



Problem and solution

When patients are admitted to hospital it is of the utmost importance to monitor their vital signs with accuracy. The current solutions require multiple systems and it is not possible to monitor all hospitalised patients. Currently 10% of patients in the UK are harmed during their hospital visit and this represents an extra cost to cover the additional length of stay.

Sensium Healthcare develops and sells a low cost wearable patch to monitor the vital signs which will enable early detection of sepsis, cardiac arrest and respiratory depression. However, reliable data requires a good interface between the body and the monitoring system, and therefore careful skin preparation is the key to acquiring quality data. Despite this, in many situations such as emergency admissions, the skin preparation guidelines are not adequately followed because it is time consuming and adds a burden to the clinical flow. Moreover, the silicone gel becomes progressively hard over time and the reliability of the electrode-skin interface deteriorates during long term monitoring.

The Tyndall National Institute in Cork has developed a strong knowledge in the manufacturing of microneedles which has progressively evolved towards a proprietary process using a biocompatible polymer and metal coating. Those patches are painlessly applied without skin preparation and have already proven their potential to deliver accurate electrocardiography (ECG) measurements. The combination of Tyndall's technology with Sensium's wearable patch was a perfect match between a problem and a potential solution.

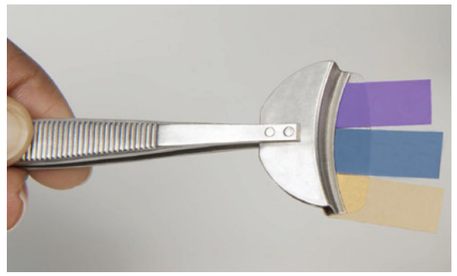
The role of the DIH

At this stage of the respective technologies of both partners, it was important to move to a clinical proof of concept demonstrator. It was necessary to test these patches on real patients to record data under controlled conditions. The Gateone-project was the perfect Open Innovation tool for this cross border experiment. The European funding was used by Tyndall to pass the ethical clearances and deliver the probes in sufficient quantity and quality. Sensium invested resources and money to tailor their patch to accommodate the use of microneedles and recruited 12 patients on whom to perform the tests.

Impact

The probes proved to work remarkably well and delivered very good ECG recordings without skin preparation. A future partnership will help to move to the production level of the patches and the production ecosystem is already known. Both parties are currently discussing the future steps required to reach the market at the end of 2018.

End-user: Sensium (UK)
Technology provider: Tyndall National Institute (RTO, IE)
DIH: Blumorpho (FR)



HEALTHY CLIMATE BY AN INNOVATIVE SENSOR SYSTEM

Problem and Solution

As a natural part of the air carbon dioxide (CO_2) is also the most important indicator of indoor air quality. A human, who is working in an office, exhales about 20 litres per hour of that odourless and tasteless gas. High CO_2 concentrations affect the performances of humans and can lead to fatigue and headaches. So, smart gas sensors provide the necessary data for a demand-based and energy-saving ventilation and air-conditioning in industrial and public buildings. But in this sector the business models of smaller companies are increasingly being restricted or endangered by dwindling component suppliers, which suddenly act as competitor. That is why SMEs have to look for new customers by use of competitive high-performance technologies and that means adapting supply chain management. Here, we introduce a novel sensor principle using an encapsulated sensitive dye that changes the colour upon CO_2 exposure, which can be reliably detected by a unique optical-electrical sensor:

- Sensor system based on highly-sensitive optical-electrical transducer
- signal pre-processing module (provided by CiS)
- CO_2 sensitive sol-gel film nanotechnologies (provided by CSEM)
- hermetic casing (provided by IL Metronic)
- signal processing, calibration and device (provided by ConSens).

The role of the DIH

In this SMARTER-SI experiment the RTOs CiS and CSEM invested their specific knowledge on advanced micro- and nanotechnologies and their verified research results and components. Thereby assuming their role as DIHs they helped the system manufacturing SME ConSens to develop an innovative solution for the building automation market.

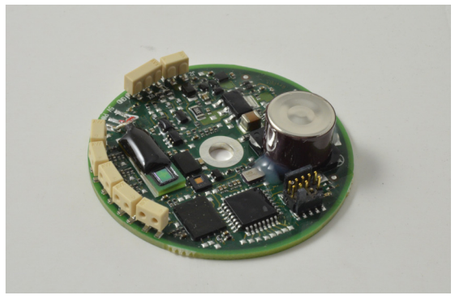
Impact

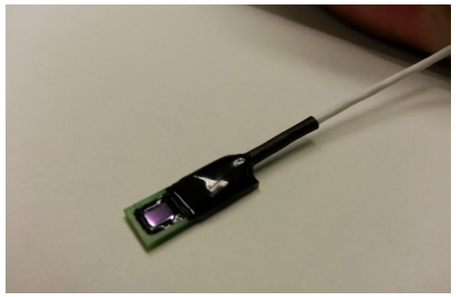
There is an increasing demand on the market for CO_2 sensors and for other gases like ammonia, chlorine or nitrogen oxides in air. For ConSens the turnover with CO_2 sensors is most important. Required stability and cost of the novel sensor system presupposed, 5.000 pieces per year are targeted with a grown revenue up to 500.000 € per year. According to the recent changes in the competition situation worldwide, the SME has included in this forecast evaluation kits for other gases as well as customer specific solutions. Here the activities of DIH partners CSEM and CiS will come into action and play an important role in further development. The cooperation with the DIH will be steadily expanded using the diversity potential of building blocks for new markets and customers.

End-user: ConSens GmbH (SME, DE) as system manufacturer for the building automation market
Technology provider: CiS (RTO, DE), CSEM (RTO, CH), IL Metronic Sensortechnik GmbH (SME, DE)
DIH: CiS (RTO, DE)

SUCCESS STORIES - SMART SYSTEMS INTEGRATION

ENVIRONMENTAL SUPERVISION UNIT





Problem and solution

When electronic equipment is used in harsh environments with long expected lifetime there is a need to understand that environment in detail. This situation is today a reality for many application areas including the automotive sector, heavy industry, defence sector and more. To fully understand the working environment a unit has been developed to monitor physical data to be used as input in the product development phase. Within the SMARTER-SI consortium a unique condensation sensor developed by CiS is available that can detect if condensation occurs. A combination of this sensor and commercially available sensors for other parameters was combined in a prototype environmental supervision unit (ESU) developed by the SMEs SETEK Elektronik and Niranova in Sweden. In the design work of the ESU a number of industries in Sweden were involved giving an insight into the varying demands for sensor configurations for different industrial sectors. The ESU is a modular design that rapidly can be adopted to different measurement situations.
The contributions required for the solution have been:

- A physical understanding on the requirements for electronic units in harsh environments and related tests (provided by Swerea IVF)
- A unique sensor for the detection of condensation (provided by CiS) and identification of the substances that condensate (provided by Hahn-Schickard).
- A packaging concept (provided by CSEM).

The role of the DIH

SMARTER-SI, conformed by different RTOs acting as DIHs, allows, through their cooperation, to provide a solution to this problem. The four DIHs involved are Swerea IVF, CiS, CSEM and Hahn-Schickard. The smart system designed to solve this application problem consists of a condensation sensor and the integration of this together with various commercials sensors that withstand harsh environments.

Impact

SETEK Elektronik and Niranova can provide a multi sensor module for the industries that have a high demand on reliable electronics in harsh environments. Currently there are three industrial sectors being approached by the SME that show an interest in the ESU. Since electronics are used more and more in harsh environment today the potential market for this unit is steadily growing. Expected yearly sales are in the range a few hundred the first year. Revenues will be in the range of 50 kEuro the first year and increasing the following years as a result of acceptance by the industry of the concept of “physics of failure”.

End-user: SETEK Elektronik (SME, SE), Niranova (SME, SE)
Technology provider: Swerea IVF (RTO, SE), CiS (RTO, DE), Hahn-Schickard (RTO, DE), CSEM (RTO, CH)
DIH: Swerea IVF (RTO, SE)

DELIVER SELECTIVE SENSING TO VISION

Problem and solution
Short-wavelength infrared (SWIR) cameras with InGaAs detectors are not only an important technology in the domain of security and safety, they can also be used in the agriculture, transport and automotive sector, or food and waste sorting industries. At this time, most existing SWIR cameras face issues for all-weather outdoor use with strong illumination variations. The French SME New Imaging Technologies (NIT) is specialized in manufacturing logarithmic wide dynamic range (WDR) imaging sensors and cameras in the visible and SWIR domain. The combination of Hyperspectral Imaging and WDR logarithmic contrast-based imaging sensors guarantees a high robustness in spectral measurements whatever the light source and its variations. Many applications can be fulfilled, like ice detection on road surfaces, plastic recycling, food chain monitoring, smart agriculture, de-camouflage, but also in the art industry for detecting underlying painting layers or counterfeiter.
Main contributions to the solution are:

- Tunable Fabry-Pérot filters design and fabrication
- hyperspectral imaging
- hypercube capture
- spectral analysis
- optical design
- camera integration

The role of the DIH
New Imaging Technologies has joined the Gateone-project to make its product evolve from multispectral to the hyperspectral level. Multispectral means multiple filters or even multiple cameras. In this demonstration, with a single tunable Fabry-Pérot filter mounted onto a NIT camera, it is now possible to acquire a full cube of high contrast images with different focal lengths. Images can be collected from 1100 to 1600 nm frame-by-frame with full control of required wavelengths. This is achieved with a bandwidth that can be selected (10nm or 20nm) and with resolution down to 10nm.

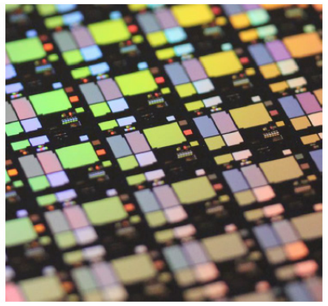
Impact
The identification of plastic types or ice vs water detection has been demonstrated in the VTT lab and the camera will now follow a test campaign by NIT to explore all the capabilities offered by this camera. This demonstrator is an addition of 2 high technology building blocks. Multiple customers have already submitted use case studies to the company. The two partners will enter into an agreement to embed the filter into a more compact and lightweight version of a hyperspectral camera.

End-user: NIT (SME, FR)
Technology provider: VTT (RTO, FI)
DIH: Blumorpho (FR)

SUCCESS STORIES - SMART SYSTEMS INTEGRATION

SILICON CAPACITORS FOR NON-VOLATILE MEMORIES

Non-volatile SRAM co-packed with ultrathin high density silicon caps as System in Package (SiP)



Problem and solution
ANVO Systems is providing their clients with solutions to protect the data generated by their exploitation systems even in case of power shutdown. To do so, they are associating an external capacitor with their proprietary non-volatile SRAM. However, the semiconductor company had the ambition to deliver a stand-alone solution that would integrate the energy storage in the package. This co-packaging approach can only be made possible if a very high-density capacitor is available. This new version would also permit a full compliance of the pinout with the market standards. The problem is that there is no capacitor commercially available that can be small enough and store the required amount of energy.

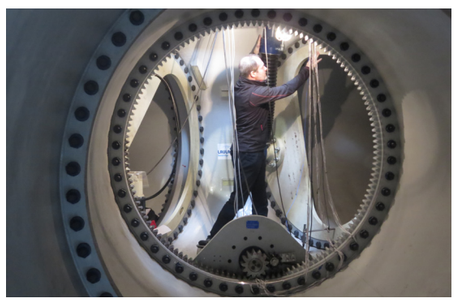
Fraunhofer IPMS has developed a design and process that combines high-K material deposition and a 3D configuration that permits to achieve record capacitance values. The challenge was to demonstrate the expected energy density storage capability which meant to break a record in capacitance density.
Main contributions to the solution are:

- Semiconductor capacitors
- atomic layer deposition
- conformal deposition of high-K material on 3D structure
- 300 mm semiconductor processing.

The role of the DIH
Thanks to the Gateone-project, they were able to beat this record by shifting from a 2D to a 3D technology using atomic layer deposition of high-K material on structured substrates. With their silicon capacitor, they increase their memory capacity from 100 nF/mm^2 to 500 nF/mm^2. Their new technology is now available in 300mm- which makes the solution immediately available in an industrial standard. This approach is the only acceptable format to produce at the expected cost.

Impact
By meeting this technical and economical challenge a new product can hit the market in a short timeframe. This new approach will open new market opportunities for ANVO Systems for an accessible market estimated to at least one million Euros. The company and the research organisation are now planning the production phase of this concept.

End-user: ANVO Systems (SME)
Technology provider: Fraunhofer IPMS (RTO, DE)
DIH: Blumorpho (FR)



MONITORING OF WINDMILL BEARINGS

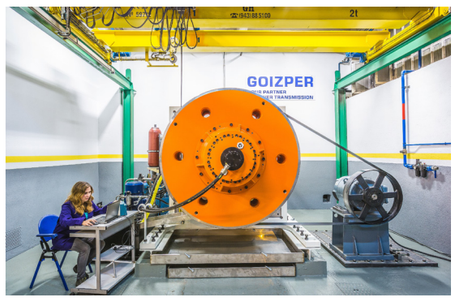
Problem and solution
The change of paradigm from fossil to renewable energy production for a greener world is somewhat affected by the cost of renewable energy. The cost of wind energy is strongly impacted by the expenses related to servicing in particular offshore wind turbines including condition monitoring, fault diagnosis and structural health monitoring (SHM). Cost of servicing could be considerably cut, if parameters such as temperature, stress and vibration of the bearings of windmills that are located in hostile and hard to access environments would be measured and transmitted constantly and without the need to access the wind turbine. The information transfer by radio signal poses particular challenges due to the metallic environment of the bearing.
Within the GATEONE project staring from an existing system a solution has been developed that facilitates health monitoring of the bearing through autonomous sensor nodes for measurement of temperature, strain and vibration, including the wireless operation of the sensor nodes. This will ultimately reduce servicing cost of wind turbines considerably.

The role of the DIH
In this experiment IK4-Ikerlan took the role of the DIH and transferred their knowledge about miniaturized wireless sensor technology to Laulagun Bearings providing them with knowledge and technology that the SME did not have and that potentially would have been a show stopper for any sophisticated solution to the problem.

Impact
Laulagun Bearings produces different types of bearings for wind turbines, both blade (pitch) bearings and slewing rings (yaw) that generate up to 10 MW of power. Marketing of the new bearings will start through discussion/negotiation with customer and evaluation "in the field" along 2017 to get the feedback from the windmill customers, followed by industrialisation/qualification in 2018. The company delivers between 3000 and 5000 products a year with revenue of 40M€. It is estimated that the new monitoring capability will increase the revenue of Laulagun Bearings by 5M€ over the next 5 years.

End-user: Laulagun Bearings (SME, ES)
Technology provider: IK4-Ikerlan (RTO, ES)
DIH: Blumorpho (FR)

CLUTCH-BREAK WEARING MONITORING



Problem and solution
The clutch-brakes transfer the continuous motion from a motor flywheel to pieces of a machine that need repetitive motion steps, being the key solution in machinery in different sectors, mainly where power transmission is needed, like servo presses. The clutch-brake system has three main parts: the body connected to machine shaft, the clutch friction disc and the brake friction disc. Currently the wear check is done manually by qualified technical staff, stopping the machine, with all involved downtime cost. Furthermore, in case of bad conditions running, it is uncontrolled. A predictive maintenance, based on continuous wearing control, would provide a high added value solution.

The contributions required for the solution have been:
- Sensor concepts, packaged intrinsically in the piece
- signal conditioning
- data processing and low power electronics
- Low power wireless communication
- energy harvester and power management

The role of the DIH
Different RTOs acting as DIHs, could provide a solution to this problem by their cooperation in the SMARTER-SI project. The two DIHs involved are IK4-Ikerlan and Hahn-Schickard. The smart system designed to solve this application problem consists of an inductive distance transducer, a thermocouple temperature transducer, a kinetic energy harvester, a Bluetooth low energy module and electronics which assists both data processing and data transmission needs.

Impact
The main benefit of this new smart sensor will be the optimum use of the pad/lining wear volume, no unscheduled downtime, to avoid other malfunctions in the clutch-brake (assembly or alignment error), and therefore to reduce the maintenance costs. It is estimated that this monitoring capability will increase the revenue of a company which delivers between 1.500 and 2.000 clutch –brake units per year, by 1M€ over the next 5 years from the integration of this smart system in their product.

End-user: Goizper (SME, ES)
Technology provider: IK4-Ikerlan (RTO, ES), Hahn-Schickard (RTO, DE)
DIH: IK4-Ikerlan (RTO, ES)

DRUG ROADSIDE CONTROL

Problem and Solution
Detection of driving under the influence of drugs, and in particular cannabinoids (one of the most consumed illegal drugs in Europe), is important for the safety of roads. Ideally, road tests would allow the analysis of human fluid samples by a police patrol and reduce significantly the time between the initial collection and testing. This would be a major advantage as by the time the sample arrives to a laboratory the drug can have degraded or changed its composition.
The solution presented by this system is a portable system for detection of cannabinoid consumption with high precision. The system will provide a quick analysis of an oral sample (saliva) on the roadside. Such system aims to offer highest accuracy in comparison with existent drug detection system, without compromising its portability.
The required knowledge/efforts from the different partner in this project have been: capillary electrophoresis separation, microfabrication and system integration (Tyndall); high power electronics (IK4-Ikerlan); polymer 3D fabrication.

The role of the DIH
The availability of the SMARTER-SI hub provided the conditions to explore alternative materials from the standard use of silicon and glass, which can be costly and complex. In addition, the access to a custom made high power module allowed the optimisation of the system's size, which is important in regard to portability.

Impact
The company Glantreo has been able to access a market (roadside testing) that otherwise would have been out of its reach. The company is already establishing links with USA companies for further testing and applications of the system.
According to figures in USA, there were over 1.1 million police officers in the US in 2008. A conservative estimate of 1 car per 5 police officers would give an estimated 220,000 police cars in the US. Even assuming that 50% of these would be fitted with drug screening technology and a device price of $5,000 this would give an estimated market size of $550m.
The system also offers potential applications as point of care testing device, for testing that prescribed drugs are taken by the patient and not used in the black market. This is also a possibility that the SME is currently investigating.

End-user: Glantreo (SME, IE)
Technology provider: Tyndall National Institute (RTO, IE), Swerea IVF (RTO, SE), IK4-Ikerlan (RTO, ES)
DIH: Tyndall National Institute (RTO, IE)

SUCCESS STORIES - SMART SYSTEMS INTEGRATION

CALLING MOUNTAIN RESCUE WITH NO NETWORK

Problem and solution
There is a strong evolution of the ski practice towards Freeride or Ski Mountaineering with an increased number of skiers at risk. Every year, the number of interventions by mountain rescue teams augments where victims cannot be located because of bad weather conditions or lack of GSM network availability or exhausted GSM batteries.

The SECURELOC solution of LETI is using PMR radio frequencies (Walkie Talkie) in a point to point link allows to send GPS coordinates over a distance of 10km without the need of a network. Furthermore, the solution provides for a Bluetooth connection to the user smartphone where a network is available, transmitting a distress message including the position.

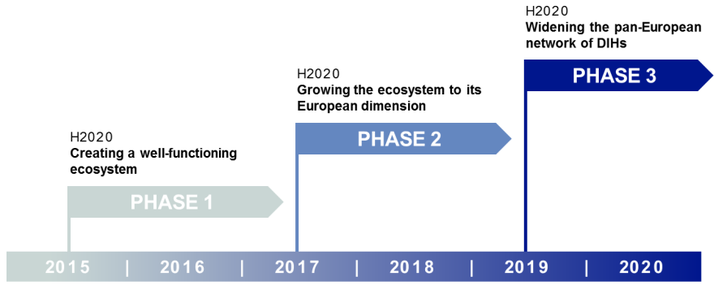
In the frame of the GATEONE project LETI's solution was integrated with Alpride's airbag system that maintains the skier on top of the snow slide. Whenever the airbag is inflated, GPS coordinates are sent both on the GSM network whenever it is available and also on PMR frequencies for a longer reach and extended operation time under harsh conditions (e.g. a person hit by an avalanche).

The role of the DIH
Following customer requests Alpride had the need to integrate positioning into their existing airbag solution. However, the company did not have the required know-how to initiate such a product development. The DIH CEA LETI provided Alpride with their SECURELOC solution and guided Alpride in the integration process. This important technology transfer puts Alpride into a highly competitive position.

Impact
Alpride's new air bag solution has been showcased to Rescue teams and existing Alpride customers and received a lot of interest. The new air bag product will help the SME to strengthen its position in its respective market as a security supplier for mountain practice.

End-user: Alpride (SME, CH)
Technology provider: CEA-Leti (RTO, FR)
DIH: Blumorpho (FR)

Phase 3: Consolidating collaboration and widening the pan-European network of DIHs



In 2019 there will be a H2020 call for Smart Anything Everywhere projects in the focus area „Digitising and transforming European industry and services". 64M€ will be available for Innovation Actions stimulating the uptake of advanced digital technologies by European industry - especially SMEs and mid-caps - in products that include innovative electronic components, software and systems, especially in sectors where digital technologies are underexploited.

The areas addressed are:

Area 1. Cyber-physical and embedded systems: the goal is to help businesses from any sector uplift the quality and performance of their products and services by including (semi)-autonomy, paying special attention to security and privacy and to the collaboration between humans and machines.

Area 2. Customised low energy computing powering CPS and the IoT: the goal is to help businesses who are developing products for situations where high computing capacity and low energy would be a competitive advantage.

Area 3. Flexible and Wearable Electronics: the goal is to help businesses in further maturing, innovating and validating their products with thin, organic and large area electronics technologies, including wearable, portable and embedded objects. Focus is on i) access to design, technology and prototyping which are ready to use, and ii) application experiments driven by concrete user requirements and business cases.

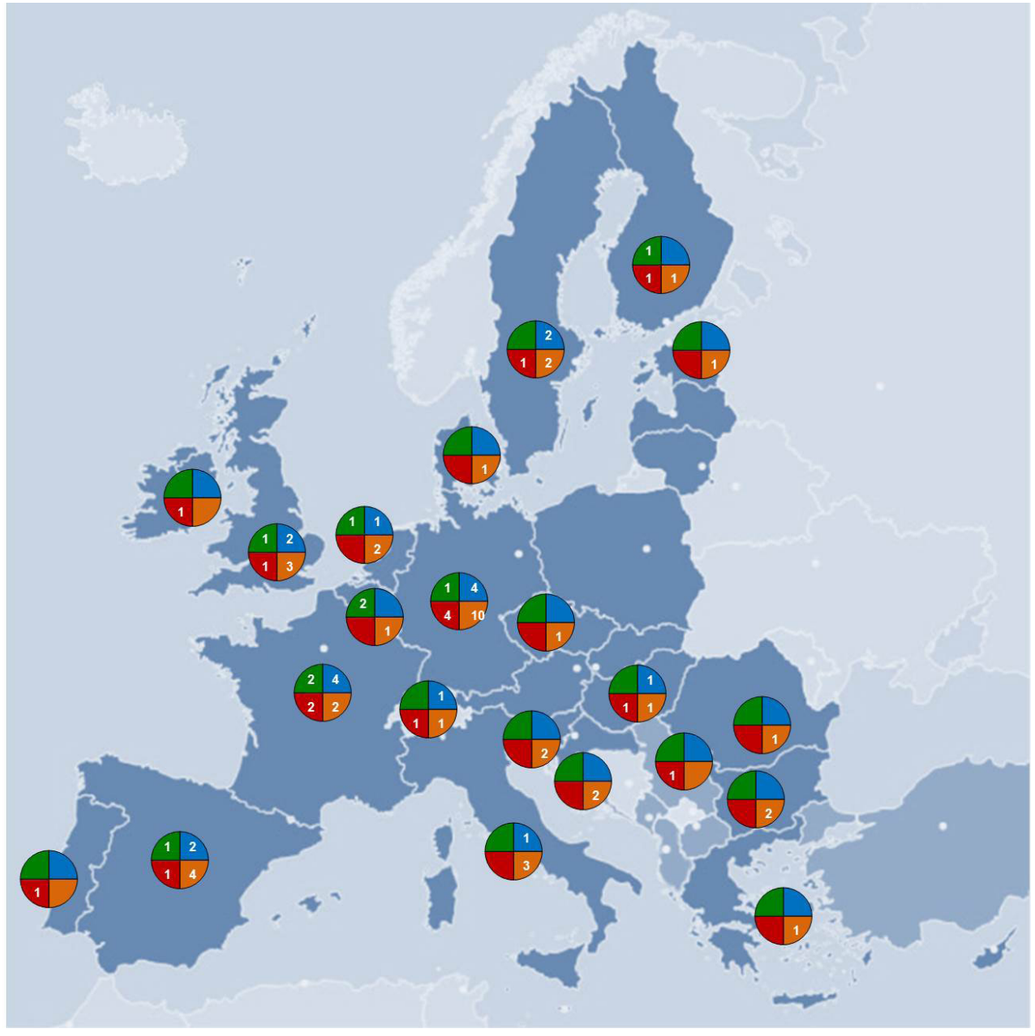
Area 4. Widening Digital Innovation Hubs: it addresses all three technology areas mentioned above and the technologies addressed in I4MS. It calls for Digital Innovation Hubs in industrial regions which are so far underrepresented in Smart Anything Everywhere and I4MS, and builds upon a mentoring programme developed by I4MS[1] and Smart Factories in new EU Member States[2] . These hubs should strongly collaborate with other Innovation Actions funded under SAE and I4MS, e.g. through joint highly innovative cross-border experiments.

These new projects should contribute heavily to meet the goal of the Digitising European Industry Strategy (DEI) to have at least one DIH in every region by 2020. In the context of the Smart Factories project 30 organisations were selected at the end of 2017 to study the feasibility of becoming a Digital Innovation Hub that serves the needs of their region. Area 4 will be the opportunity for the coached hubs to become an integral part of the EU ecosystem of DIHs.

All in all, the European Commission plans to continue investing €100 million per year until 2020 in fostering DIHs as a main pillar of its Digitising European Industry strategy. Apart from SAE, calls for DIHs are launched for other related initiatives such as Innovation for Manufacturing SMEs (I4MS) (2020), for Photonics technologies (2020), for Robotics technologies (2018), for Big Data (2020) and for their overall coordination (2019).

1 https://dih.i4ms.eu/
2 https://ec.europa.eu/futurium/en/implementing-digitising-european-industry-actions/digital-innovation-hubs-smart-factories-new-eu

The map shows all partners in SAE aligned projects that can be regarded as Digital Innovation Hubs (DIHs).



	SAE projects	DIHs involved
AREA 1: Cyber Physical Systems	3	18
AREA 2: Advanced Computing	2	41
AREA 3: Smart Systems Integration	3	15
AREA 4: Organic and Large Area Electronics	1	9
SAE aligned Coordination and Support Action	1	5

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