SAE

ENHANCING THE DIGITAL TRANSFORMATION OF THE EUROPEAN INDUSTRY

THE SMART ANYTHING EVERYWHERE INITIATIVE

JUNE 2016

SAE

European Commission

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https://smartanythingeverywhere.eu/

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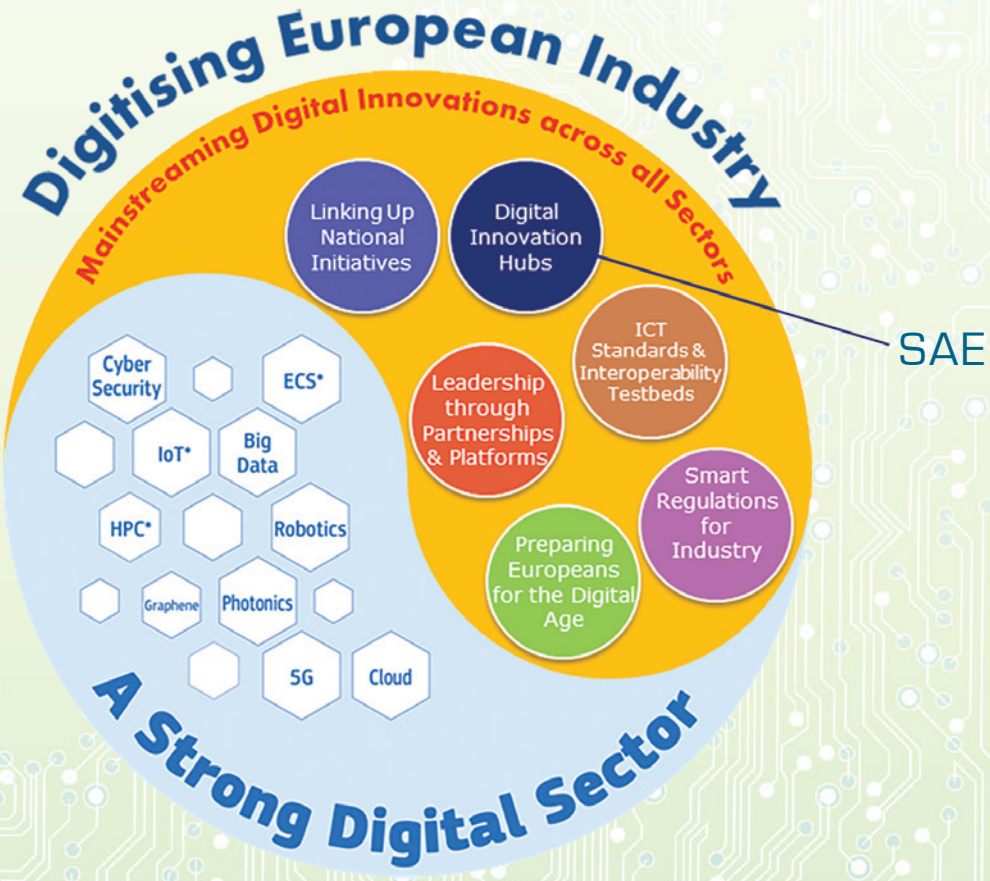
Led by Commissioner Oettinger, the European Commission has published **its communication on "Digitising European Industry – Reaping the full benefits of a Digital Single Market"** in April 2016*. The overall objective of this European strategy for digitising industry is to ensure that any industry in Europe, big or small, wherever situated and in any sector can fully benefit from digital innovations to upgrade its products, improve its processes and adapt its business models to the digital change. 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.



To bring the benefits of digital innovation to every industry, the Commission will invest in digital innovation hubs. Hubs are based on competence centres located in technical universities or research organisations. They will provide companies, in particular SMEs, with access to facilities for experimenting and testing digital innovation. They will also supply advice on potential sources of financing and support industry in digital upskilling training. EU support is used to leverage much higher investments in these hubs by member states, regions and (co-financing) industry.

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

THE SAE INITIATIVE IN A NUTSHELL

The **Smart Anything Everywhere** (**SAE**) initiative of the European Commission is at the core of this action line on digital innovation hubs. The SAE initiative networks several groups of competence centres across Europe supporting **product and service innovation** through digital technologies. Starting in summer 2011 under FP7 with highly successful pilot projects, it is now more broadly rolled out in H2020 with a total funding invested so far under H2020 of nearly 26 M€.

SAE aims at supporting SMEs and mid-caps along three dimensions:

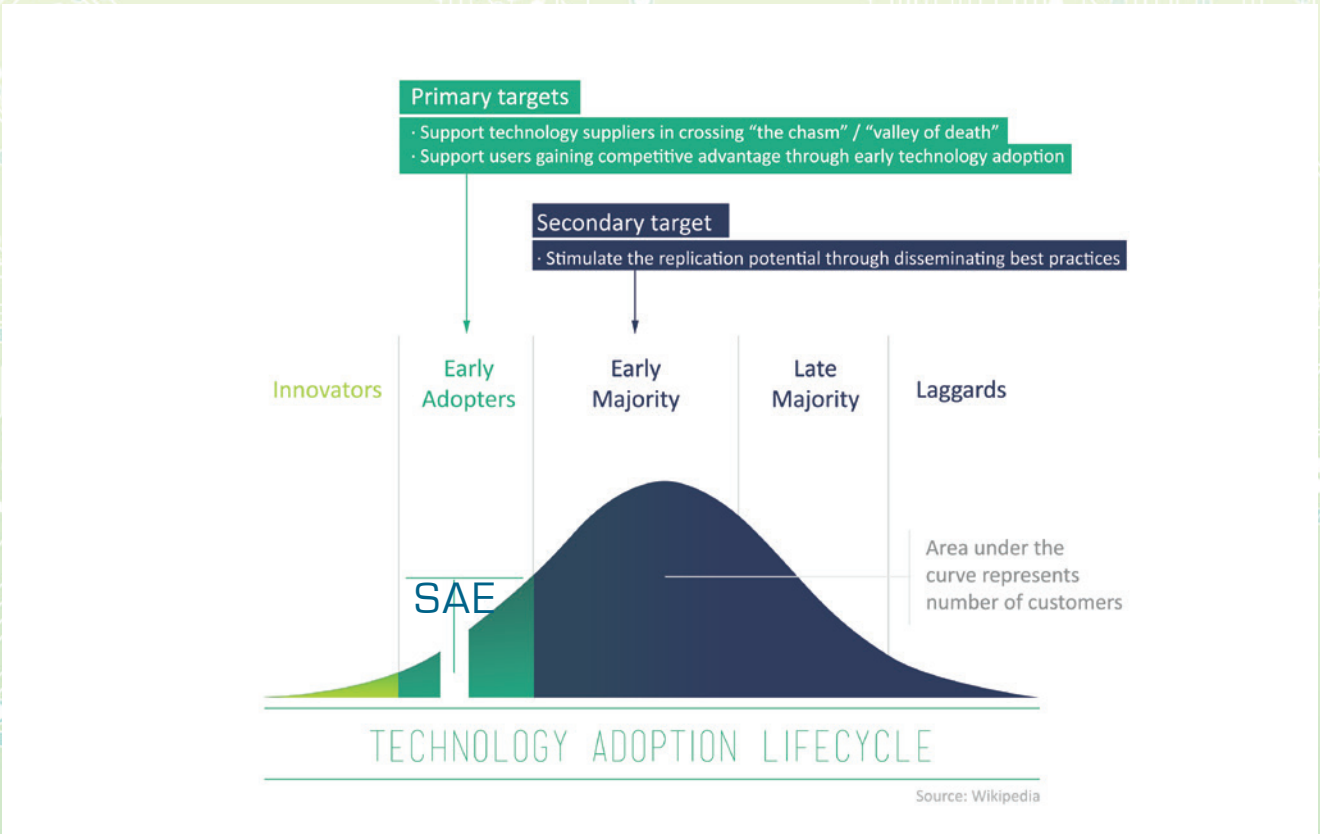
- Provide access to competences that can help in assessing, planning and mastering the digital transformation.
- Provide access to innovation networks of a broad spectrum of competences and best practice examples.
- Provide financial support to SMEs and mid-caps on the demand and the supply side to master the digital transformation.

The underlying idea is to enable and to foster the collaboration of SMEs and mid-caps across their value chains via European competence centres / digital innovation hubs (e.g. top universities, application oriented research organisations, platform providers) in predominantly cross-border experiments to create a win-win situation for all.

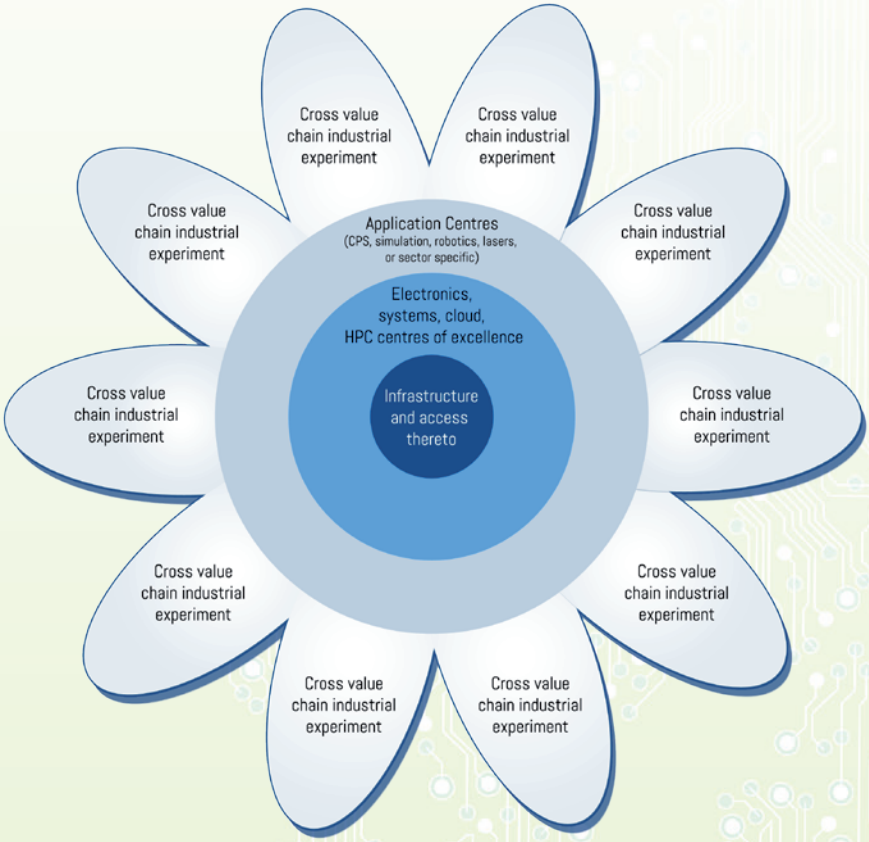
Within the focused experiments of short duration, brokerage and transfer of technology know-how are provided by the digital innovation hubs to the SMEs and mid-caps. SAE not only resolves the competence gap of SMEs, but also provides them with the financial means to adopt leading edge digital technology. In this way, the SMEs are capable to bring innovative and highly competitive new products and services to the market.

Innovative platform providers profit from SAE as the experiments enable them to mature their existing technologies. The experiments also broaden the field of application and ultimately open them new markets and services.

Last but not least, the competence centres benefit from the initiative, as they extend their largely research oriented activities with industrial projects thereby gaining a new sustainable business model.



THE SAE INITIATIVE IN A NUTSHELL



The initiative focuses on four technology areas that have been identified to be key for the digital transformation of European industry:

- **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.

A pilot phase started under FP7 with two technology transfer projects in which competence centres were funded by the EU for transferring their knowledge to predominantly SMEs and midcaps (5.75 M€ funding).

Under H2020, four large innovation actions have been started with a total budget of nearly €26 million. 23 of Europe's leading competence centres in the components and systems value chain are involved.

To allow for a lean and efficient support to the end user SMEs and midcaps, the administrative **procedures** to benefit from EU funding have been **simplified** further using the flexible and dynamic "**Financial Support to Third Parties**" scheme of H2020 ("**cascade funding**"). Rather than entering into a direct contractual agreement with the European Commission, companies sign a light contract with one of the projects' beneficiaries.

CYBER-PHYSICAL SYSTEMS

CPSELABS:

The Cyber-Physical Systems Engineering Labs project (Horizon 2020) provides support and funding for innovative experiments which are designed and carried out in collaboration with SMEs and midcaps working on cyber-physical systems. CPSE Labs partners provide access to a broad range of leading-edge CPS design technologies and expertise in various CPS fields, including Internet of Things, industrial automation and control, autonomous vehicles, e-maritime applications, and model-based techniques for collaborative engineering and safety analysis and monitoring. The CPSE Labs marketplace provides an open forum for sharing platforms, architectures and software tools for the engineering of dependable and trustworthy CPS. The target is 20 focussed and fast-track experiments (3-6 partners during 12-18 months) with innovation objectives.

EUROCPS:

EUROCPS (Horizon 2020) is a network of design centres boosting and initiating synergies between SMEs, major CPS-platforms and competence providers to conquer emerging markets of IoT products. The first goal is to transfer innovative CPS solutions available in design centres to SMEs and midcaps from any sectors. This match-making between the competence centres and the SMEs is done by the so-called networking partners. The second goal is to link users and suppliers across value-chains and regions with the help of the competence partners (e.g. coaching on development plans). The target is 30 industrial experiments initiated and led by SMEs.

ADVANCED COMPUTING

TETRACOM:

The aim of TETRACOM (Framework Programme 7) is to boost European academia-to-industry technology transfer (TT) in all domains of Computing Systems such as communication & multimedia, industrial automation, health, safety & security, automotive, and data analytics. While many other European and national initiatives focus on training of entrepreneurs and support for start-up companies, the key differentiator of TETRACOM is a novel instrument called Technology Transfer Project (TTP). TTPs help to lower the barrier for researchers to make the first steps towards commercialization of their research results. TTPs are designed to provide incentives for TT at small to medium scale via partial funding of dedicated, well-defined, and short term bilateral academia-industry collaborations that bring concrete R&D results into industrial use. This is implemented via open competitive calls for TTPs, whose coordination, prioritization, evaluation, and management are the major actions of TETRACOM. TETRACOM is supporting 47 adoption experiments based on 34 competence centres. User beneficiaries receive services from the competence centres. They do not receive direct funding.

SMART SYSTEM INTEGRATION

GATEONE:

The mission of GateOne (Horizon 2020) is to accelerate Smart System adoption by SMEs in facilitating access to advanced technologies for the development of innovative and smart solutions. The target is 50 small scale experiments to turn innovative concepts into demonstrators tested and validated by end-user SMEs. The GateOne offer is to work with SME to consolidate a business case and develop the necessary demonstration for a "hands-on" experience of the technology. This service is free of charge for the SMEs.

SMARTER-SI:

The Smarter-SI project (Horizon 2020) provides smart access to manufacturing for systems integration. The goal is to test a new concept for small lot production, called the Cooperative Foundry Model (CFM). During previous research, all RTOs have built components / parts of systems, i.e. building blocks, which are available and characterised by their high Technology Readiness Level (TRL). The idea is now to join the effort of these RTOs and combine these building blocks in so-called Application Experiments (AEs), thereby creating innovative Smart Systems which serve SMEs' needs. The target is a test bed to realise 10 application experiments.

ORGANIC AND LARGE AREA ELECTRONICS

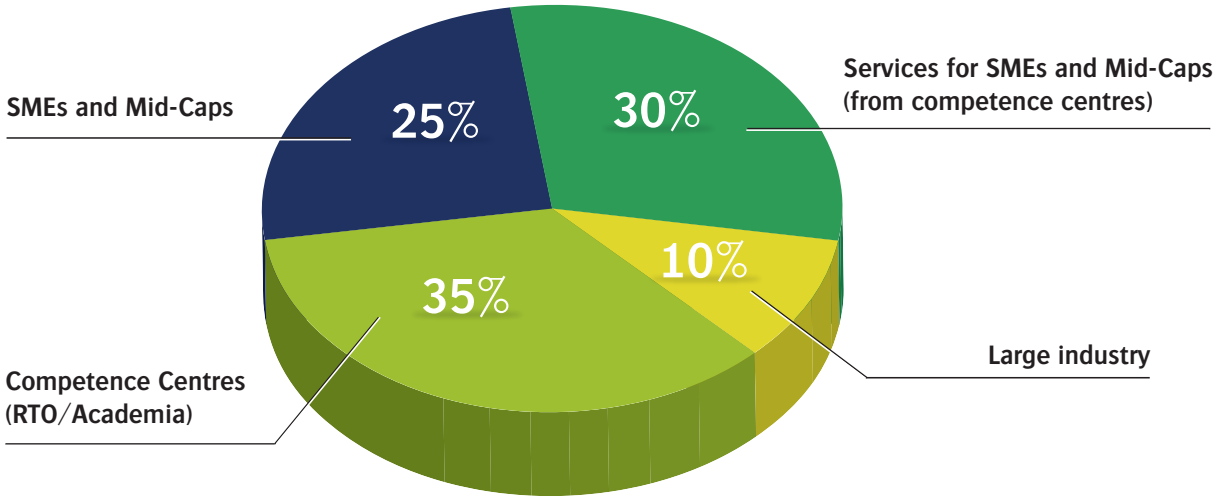
COLAE:

The main objective of the COLAE coordination action (Framework Programme 7) was to promote the commercial exploitation of organic and large area electronics (OLAE) technologies for the benefit of European industry and economies. COLAE aimed to bring together the leading European companies and new start-ups along the present and potential OLAE value chains, harness the knowledge base and technology know-how of the European research partners and their regional clusters, and provide a range of services to support new product and business development. COLAE has developed a virtual European OLAE foundry concept and manufacturing and pilot production services. 10 trial cases have been selected for the feasibility evaluation and further consultation.

FACTS AND FIGURES

FINANCIAL SUPPORT TO SMES AND MID-CAPS:

DISTRIBUTION OF THE 32 M € FUNDING IN % (PILOT PHASE AND PHASE 1):



HIGHLY ATTRACTIVE TO INDUSTRY:

In the pilot phase and phase 1, out of 183 current projects partners, **155 are from industry**.

As the industrial participants are largely end-user SMEs and Mid-Caps, the direct application of the experiments' results is guaranteed.

Going beyond purely financially oriented SME instruments, SAE provides SMEs with easy access to:

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

COLLABORATION ACROSS EUROPE FOR A STRONGER EUROPEAN INDUSTRY:

Many of the 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. Many of them facilitate collaboration and interaction across different regions.

19 Member States and Associated Countries are involved (Pilot Phase and Phase 1)

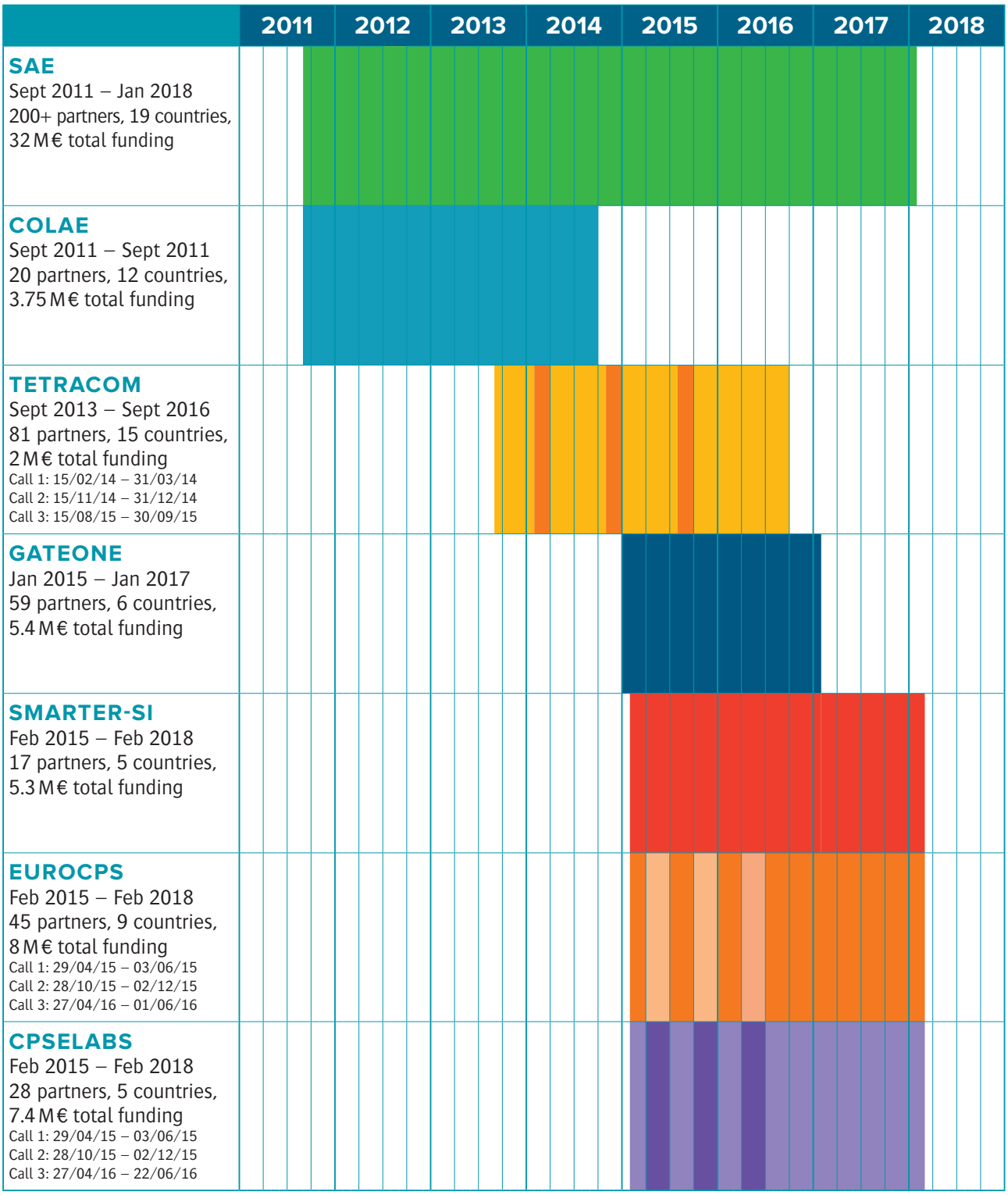
47 experiments have already been completed during the Pilot Phase achieving the intended technological and economic impact.

72 experiments have currently been started in Phase 1 and **about 40 additional experiments** are still to be launched during the remainder of Phase 1.

100+ more experiments are expected to be selected through open calls establishing new user-supplier collaborations during Phase 2.

FACTS AND FIGURES

SAE TIMELINE:



OPEN CALLS TO PROMPTLY RESPOND TO EMERGING MARKET CHALLENGES

About 10 million EUR funding distributed in 9 open calls allocated to SMEs and Mid-Caps.
Light, SME friendly application scheme: less than 10 pages per proposal.
340+ proposals received in open calls.
Success rate of proposals is one out of three.

CPSELABS

Enhanced safety for airfield management

Airfield Lighting Installations

A mobile and autonomous robot to control them

PROBLEM AND SOLUTIONS

For safety reasons the light intensity on airfields is to be measured and determines whether or not the runway can be open to air traffic. Currently, human operators perform the control of airfield lighting. However, this is a costly and unpleasant task: it has to be done late at night (from 1am to 4am) and may cause eye strain. The task would thus be a perfect fit for robotic operation. However, today, no robot is authorized on airports due to safety issues.

In the experiment of the CPSE Labs project of the SAE initiative safety-related technologies provided by the CPSE Labs Design Center France are integrated in robotics systems of the company Sterela in order to demonstrate that the robots can be execute safety related tasks on airports in full compliance with the safety regulations. These technologies include model-based safety analysis (HAZOP-UML and Altarica), safety monitoring (SMOF), analysis of worst-case execution time (MAUVE), and a testing framework based on the simulator MORSE.

HOW DID SAE HELP?

The CPSE Labs experiment is a unique opportunity to provide an innovative SME with access to leading edge technology being only available to research centres so far for the mutual benefit to on the one hand side verify those technologies in a real world and challenging use case, and to – on the other hand – enable the SME to reach out to new markets.

IMPACT

Assuming that 144 regional and 80 international airports in Europe will be equipped with the new technology within the 5 years after the end of the experiment, Sterela estimates to sell a total of 224 service robots representing an aggregated turnover exceeding €8.9 million after 5 years. Moreover, the runway light inspection is only one exemplary payload for robots in airports, which could be used for other inspection tasks (fences and gates), runway sweeping, snow plowing, runway de-icing.

End-user: Sterela (SME, FR)
Technology providers: LAAS-CNRS, ONERA (RTO, FR)

CPSELABS

Networked Traffic Management systems for less stress and pollution

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 (TMSs) that are owned and controlled by various local and national authorities. A TMS consists of a collection of distributed systems and devices installed along the roadside such as sensors that collect traffic data (e.g. cameras, radar detection systems...). Current TMS architectures are usually run centrally by regional control centres. A low degree of collaboration hinders efficient management of traffic problems that straddle boundaries between authorities, because TMSs cannot communicate between regions and may have competing goals for traffic flow. While cooperation between various road authorities at a governance level has improved recently, technical barriers for collaborative and distributed TMSs are still to be removed.

The TEMPO experiment tackles the problem of disconnected TMSs by providing them with collaborative and distributed control architectures that engage with each other in an automated negotiation processes. Negotiations are targeted to find the best control measures traffic network as a whole. To do so, TEMPO uses the open source Overture technology as a basis that is a software platform for modelling and analysing systems. Models can demonstrate the correctness and benefits of designs prior to costly implementation. Traffic simulations produce a large amount of numerical data. It is therefore imperative to present them in an understandable way to non-experts. The existing Overture technology has been extended with 2D / 3D visualization to illustrate the negotiations between TMSs and the effect on the traffic flow.

HOW DID SAE HELP?

The Smart Anything Everywhere initiative funded the TEMPO experiment through the project CPSE Labs, improving Europe's road networks by bringing together the industrial and academic expertise needed to take the next step towards collaborative TMSs. TEMPO has engaged with road network stakeholders from the beginning, and the CPSE Labs network provides access to further stakeholders across Europe. Through TEMPO and CPSE Labs, SAE contributes to the development of robust platforms for the design of cyber-physical systems (CPS) outside of the transport domain and to the creation of a regional hub for CPS design in Newcastle, both extending beyond the project duration.

IMPACT

West IT will expand their existing business from the TMS area to the emerging collaborative TMS market. As part of an initiative to work in smart mobility, West IT expects to increase their revenue by 1,5M€ over five years. A new market for West IT emerges from organisations such as stadiums, harbours and airports not commonly associated with traffic management that increasingly take initiative in "guiding" traffic themselves, typically bringing multi-model transport (cars, public transport) into the equation. TEMPO can help them in applying policies and in collaboration with TMS deployed by the traditional parties.

The wide adoption of the TEMPO results will have significant societal impact in greatly improving road network performance and reducing pollution.

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

EUROCPS

Biological sample management and tracking using CPS technologies

PROBLEM AND SOLUTION

High throughput medical diagnostics laboratories and bio-banks have to face an ever growing amount of biomedical samples processed and stored locally. Just for one large scale laboratory for tens of thousands sample test tubes a reliable and secure identification of the test tubes in the entire laboratory ecosystem must be ensured. During processing, transportation and storage of tubes it is imperative to avoid loss or confusion of samples and to shorten the time of providing results for the patients.

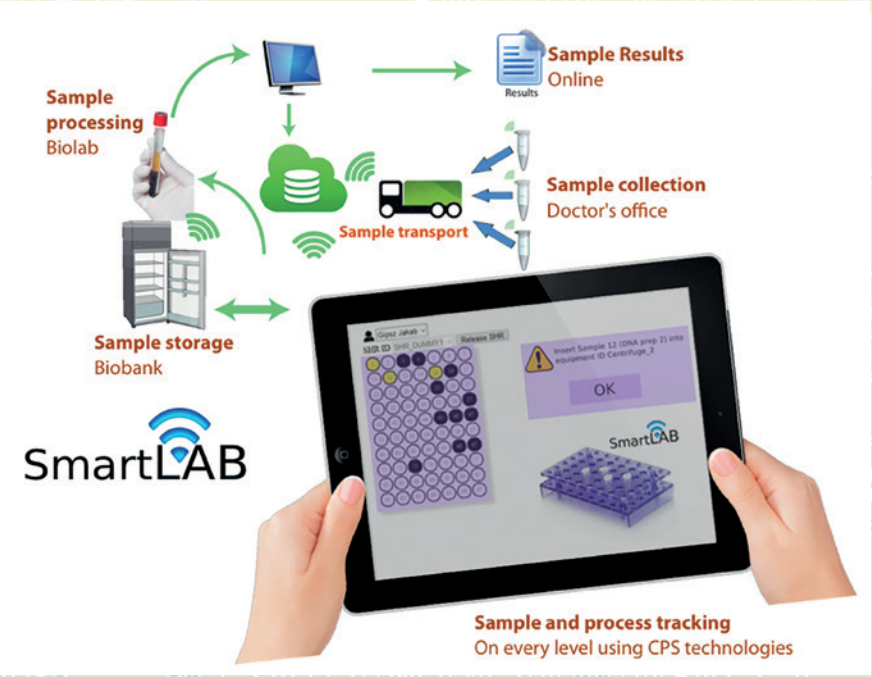
This has been achieved by an innovative solution called SmartLAB. It uses RFID (Radio Frequency Identification) tagged test tubes and sample holders and utilizes coordinator modules in laboratory and refrigerated sample storage areas operated by Intel's embedded Edison platform. Thanks to the platform's flexibility and other existing IoT solutions all hardware subsystems were integrated in the Laboratory Information Management System (LIMS) using ST's microcontroller platform ST32 and wireless solutions as end point HW.

HOW DID SAE HELP?

The EuroCPS project within the SAE initiative enabled the cooperation of the SME NEUMANN with the design center BME and provided the direct access to Intel's and ST's up to date solutions. By funding the integration of the platform provider's solutions and by the application of the newest leading-edge academic knowledge of BME the project helped NEUMANN to add extra values to its existing tests for cancer prevention and related laboratory products with CPS based sample tracking and quality control solutions, which was not possible before due to NEUMANN's limited capabilities concerning CPS based system development.

IMPACT

Using the SmartLAB system NEUMANN can provide highly automated work-flows extended with quality controlled sample handling solutions for high throughput laboratories especially in the field of infectious diseases like STDs and HPV screening which involves millions of patients in the EU. Given that the reagent market for HPV screening in Europe is expected to reach €500 million within 10 years NEUMANN expects to augment their revenues by up to 2 M€ in the coming 5 years thanks to the availability of a highly innovative and competitive solution. INTEL and STM will profit from NEUMANN's success with higher sales of their components.

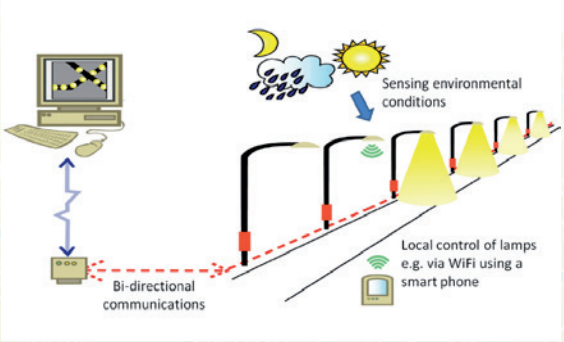


End user: Neumann Diagnostics Ltd, (SME, HU)
Technology provider: Intel Ireland, ST Microelectronics
Design center: BME (University, HU)

EUROCPS

Smart streetlighting for less energy consumption and improved safety

PROBLEM AND SOLUTION



Walking through the city during night, the feeling of safety of citizens is strongly correlated to actual illumination levels. The challenge for municipalities is to provide an illumination that gives citizens the feeling of safety at clearly reduced energy consumption. At present municipalities are investing into new (LED) lighting installations, but available solutions are proprietary and not smart enough to incorporate new flexible, sophisticated features enabled by bi-directional communication capacities of the luminaire. E.g. a smart street light should be able to feed back its health condition to the operator to make sure that a defect lighting element is replaced just before its failure with the double effect of lower maintenance cost and ensured illumination. It should also be capable to "communicate" with the citizens that could locally demand to increase the low (energy-saving) lighting levels by their smartphone. Furthermore, the communication capacity of street lighting could be useful in the context of giving driving instructions for autonomously driven cars. Finally, operators would benefit from smarter dimming reducing the electric current when LEDs are more efficient under cooler weather condition, as this will result in energy savings.

In an experiment of the EUROCPS project an upgradeable, flexibly re-configurable lighting control solution has been developed constituting a "future-safe" investment with clear benefits both for the citizens and for the operators of the lighting installations. The „smart SSL solutions" concept targets system level applications with advanced communications, envisioning LED luminaires to become parts of smart city solutions through bi-directional communication, separating the communications protocol form the actual physical medium of the data transfer. Using the Intel's Edision IoT/CPS platform different smart functions could be added to LED based street-lighting luminaires. These include detailed health monitoring data provided for the operators to easy plan maintenance and smart dimming which considers local circumstances such as temperature or enable citizens e.g. through their smart phone application to temporarily and locally increase illumination when and where needed.

HOW DID SAE HELP?

Within the SAE project EuroCPSthe SME HungaroLux Light Ltd. received support from the BME design centre to implement the system plans through the actual module developments, integration of Intel's embedded Edison platform to finally system testing. The funding received for this industrial experiment helped HungaroLux Light Ltd. to introduce the latest CPS platforms in their designs. Without this financial support, without Intel's application engineering support and BME's support in the implementation it would have been difficult for HungaroLux to enter the IoT arena with their SSL solutions. The project also facilitated HungaroLux to demonstrate their innovative ideas to a wider audience by means of engineering prototypes of their new LED based lamps.

IMPACT

HungaroLux Light Ltd. targets small and medium sized municipalities with their products. Their PearLight series of LED street-lighting luminaires has been enhanced by the new unique selling points offered by the SmartSSL luminaires. This provides the company with a competitive advantage in their market segment. In Europe there are still about 43 million streetlighting luminaires to be "LEDified", out of which 5 million units are expected to become "smart". HungaroLux aims to cover this market with the solutions developed in the project, both with complete smart luminaires and as a supplier of off-the-shelf intelligent control units for third party luminaires. In terms of foreseen additional revenues just from the luminaire or control unit sales HungaroLux Ltd. calculates with a market potential of 50 to 200 MEUR in a 3 to 5 years period.

End-user: HungaroLux Light Ltd, (SME, HU)
Technology providers: Intel (LE, IE)
Design Center: BME (RTO, HU)

GATEONE

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).

HOW DID SAE HELP?

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 and resources to initiate such a development. The GATEONE project of the SAE initiative teamed up the Swiss SME with the French research organization LETI that did not know each other before and financed the integration of the SECURELOC technology from LETI into a new Alpride air bag system providing the SME with a highly sophisticated new product.

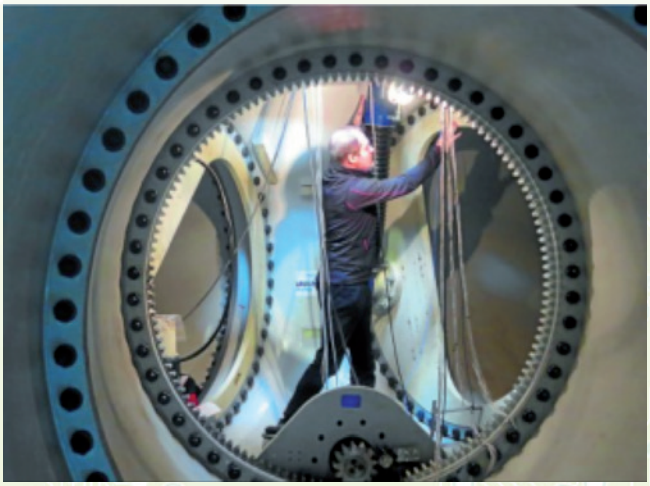
IMPACT

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: LETI (RTO, FR)

GATEONE

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 off-shore 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.

HOW DID SAE HELP?

The GATEONE project as part of the SAE initiative allowed a fast and effective match from the existing capabilities and developments at IK4-Ikerlan, consisting of a miniaturized wireless sensor module, and the needs of the company Laulagun Bearings to enhance their existing solution. More specifically, the project helped to release the risk onto a specific issue that could be a show stopper.

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.

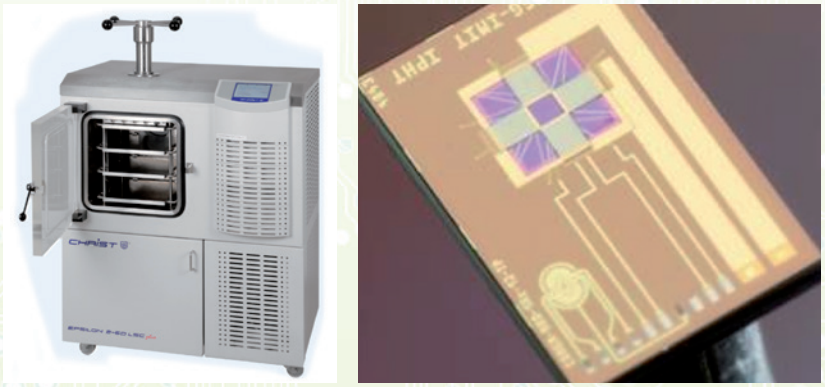
End-user: Laulagun Bearings (SME, ES)
Technology provider IK4-IKERLAN (RTO, ES)

SMARTER-SI

Energy saving drying processes enabled by an innovative smart sensor system

PROBLEM AND SOLUTION

Freeze drying is the most gentle method to conserve materials. Nowadays, these drying processes in industrial equipment are operated based on experience plus a safety margin. They could be performed far more time and energy efficient by using real-time-monitoring of the progress of the drying process (humidity sensing). However, no adequate sensor system is available on the market that could reliably operate under harsh temperature conditions.



Pilot freeze dryer (left) for testing the dew point measuring system (right)

Within the SMARTER-SI project as part of the SAE initiative, leading-edge building blocks (temperature measurement diode of CiS, integrated Peltier-cooler of IPHT and sensitive thermo-electrical layers of Hahn-Schickard) were integrated into a new type of sensor system that includes all necessary functions to determine absolute humidity at extremely low temperatures (about -60°CTd). A world-first solution is the micromechanical integration of a Peltier-cooler in the sensitive part of the Silicon chip that creates a cooling cascade together with a second external Peltier-element. Depending on the actual process parameters some 20% of energy can be saved with this new solution during the drying process.

HOW DID SAE HELP?

The know-how regarding the needed building blocks and the technology for the manufacturing of the sensor system is concentrated at commercial foundries or distributed among different RTOs and SMEs in Europe. Whilst foundries for obvious reasons would not collaborate with SMEs, SMARTER-SI brought relevant RTOs and SMEs together, organised their cooperation along a distributed manufacturing chain to finally enable the successful exploitation of this sensor system and its components by the cooperative foundry formed by the SMARTER-SI partners. Therewith, SMEs in Europe get an easier access to Smart Systems Integration technologies.

IMPACT

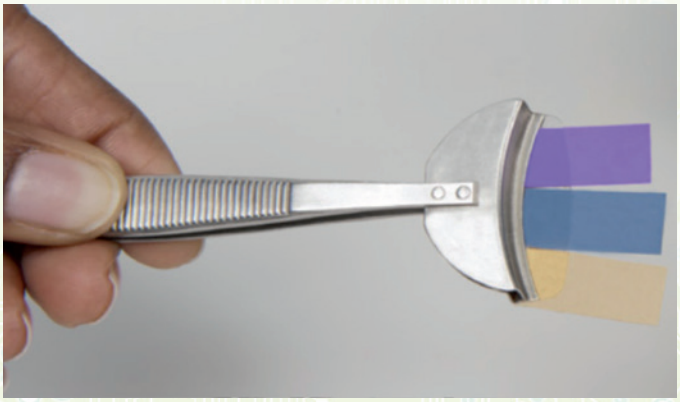
Martin Christ, a global leader in development and production of freeze drying equipment, will integrate the new sensor system in their new products to be marketed worldwide from 2017 onwards. This will strengthen their position as front-runner in the freeze drying market. It is estimated that the new solution will increase the revenues of Martin Christ by more than one million Euros over the next five years.

Additionally, the results of the project will be exploited in another attractive market segment: The SME TechnoLab, a service provider in the field of environment analytics and simulation, plans to enhance their business activities with calibration services of parameters such as humidity, temperature and gas concentrations. They will implement the new sensor systems in their mobile calibration units leading to estimated revenues of several hundred thousand Euros during the first five years period after product launch.

End-user: Martin Christ Gefriertrocknungsanlagen GmbH (SME, DE), Technolab GmbH (SME, DE)
Technology providers: Hahn-Schickard (RTO, DE), CiS (RTO, DE), IPHT (RTO, DE), Swerea IVF (RTO, SE), IL Metronic Sensortechnik GmbH (SME, DE)

SMARTER-SI

Healthy climate by an innovative sensor system



Indoor air control measuring system (left) with an integrated CO2 sensitive colour changing foil (right)

PROBLEM AND SOLUTION

Carbon dioxide (CO_2) is a natural part of air. It is also the most important indicator of indoor air quality. A person working in an office exhales about 20 litres per hour of that odourless and tasteless gas. In the current regulation on air quality, a CO_2 limit of 1.500 ppm is specified as the maximum permissible value, as higher CO_2 concentrations affect the performance of humans and can lead to fatigue and headaches. Ventilation and air-conditioning in industrial and public buildings are designed to ensure air quality. In order to do so in an energy-efficient way the systems rely on data input from smart gas sensors.

In an experiment within the SMARTER-SI project a completely new CO_2 sensor principle that combines ground breaking sol-gel thin film nanotechnologies (building block by CSEM) with state-of-the-art optical detection technologies (building block by CiS) was developed. Under CO_2 exposure the encapsulated sensitive dye reversibly changes the colour, which can be reliably measured by an optical sensor. The result is an innovative and highly competitive, maintenance free measuring system with minimum power consumption (≤30 mW), large measuring range (0...10.000 ppm), reduced cross sensitivity to humidity, accuracy of +/- 100 ppm, zero ppm detection capability, and user-friendliness.

HOW DID SAE HELP?

For the creation of this new innovative class of CO2 gas sensor a number of conditions were to be met: A high readiness level of advanced micro- and nanotechnologies including verified research results, an interdisciplinary team of experts with a deep understanding of the technical interfaces. Those conditions were fulfilled in the SMARTER-SI project of the SAE initiative, as a constructive collaboration between partners providing the necessary technology components has been established that helped CONSENS as system manufacturer for the building automation market with limited personal and financial resources to develop a high-tech product. The financial support provided by the EU finally helped to reduce the greater entrepreneurial risk encountered by SMEs in the product and innovation development process.

IMPACT

The exceptional properties of the new system provide CONSENS with a clear competitive advantage in their respective market. In the building automation market, the company will deploy in the first year after project end about 1.000 sensors for the new product family of indoor air control measuring systems, afterwards 5.000 pieces per year are a realistic demand. Based on that, additional revenues of 2.5 to 3 Mio Euros are expected for the first five years period.

The used modular system concept can easily be adapted for other gas sensing applications like detection of ammonia, chlorine or nitrogen oxides in air, paving the way for the involved partners to exploit the project results also in other markets.

End-user: ConSens GmbH (SME, DE)
Technology providers: CiS (RTO, DE), CSEM (RTO, CH), IL Metronic Sensortechnik GmbH (SME, DE)

TETRACOM

Efficient, reliable and cheap computing – everywhere

PROBLEM AND SOLUTION

Everywhere – from tiny computers embedded in "things" even smaller than smart phones to enormous supercomputers – increasing the efficiency and decreasing the cost of computing is critical to innovation and wellbeing. Unfortunately, the sheer complexity and poor understanding of trade-offs (e.g. speed vs. energy efficiency vs. accuracy), combined with the cost and time-to-market pressures, typically lead to very incremental improvement of the next generation, as the design and optimisation potential can hardly be explored. This in turn results in over-expensive and under-performing and energy hungry computer systems.

To optimise the methodology to design new computer systems in an efficient way a sort of Wikipedia for computer design is needed that allows the community to share representative programs, data sets, tools and predictive models as reusable components, crowdsource and reproduce experiments, and apply predictive analytics to continuously grow knowledge about optimising computer systems. The cTuning foundation have developed Collective Knowledge (CK), an open framework, repository and methodology for reproducible and collaborative R&D, and released CK under a permissive license that was validated in a TETRACOM technology transfer experiment with ARM, the world-leading supplier of microprocessor technology. Using CK, ARM was able to obtain valuable insights into performance of its products in a fraction of the time required by conventional analysis.

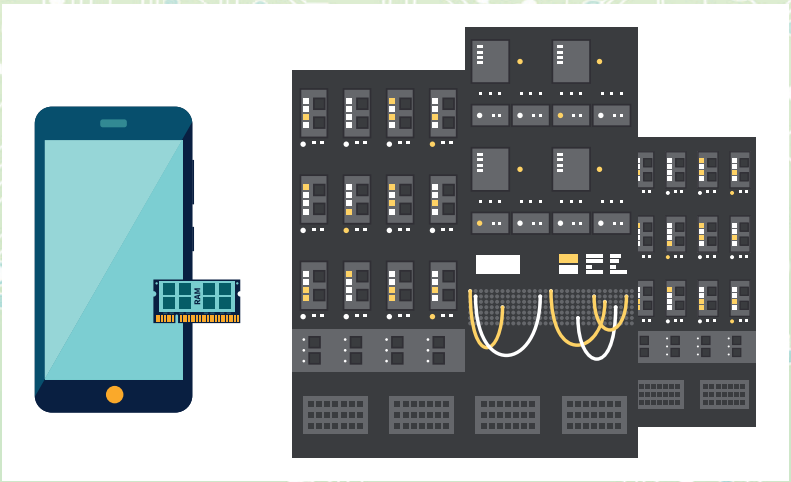
HOW DID SAE HELP?

The SAE project TETRACOM helped in two significant ways: it provided know-how and funding to mature the CK solution and facilitated collaboration and validation with a major player in the computing arena. It was, therefore, paramount to showcase the potential of CK to spur the design of next generation, high performance and energy efficient computer systems.

IMPACT

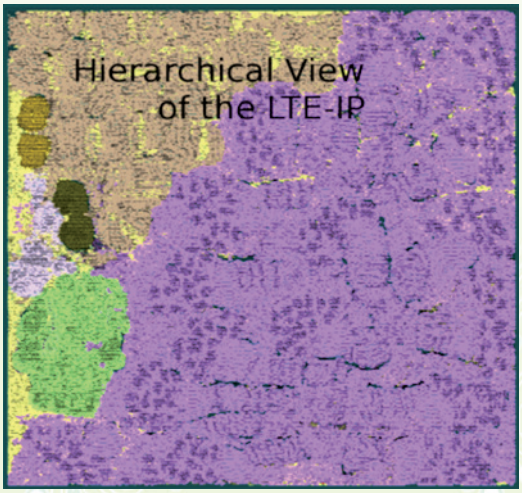
The experiment demonstrated that adopters of the CK solution will dramatically increase the performance of their products (making them cheaper, smaller, faster, more energy efficient and more reliable), and thus save millions of euros within 2 years and tens of millions of euros within 5 years. To exploit the CK solution commercially, a start-up called **dividiti** was founded in 2015. Already now their clients include a cloud computing company and an automotive company from the Fortune 50 list. Based on the strong demand for their services, dividiti are projecting the revenue in the region of €300K in 2016. From 2 full-time co-founders, the headcount will be increased to 4 full-time staff and several part-time staff by the end of 2016. It is expected to double the headcount and quadruple the revenue in 2017.

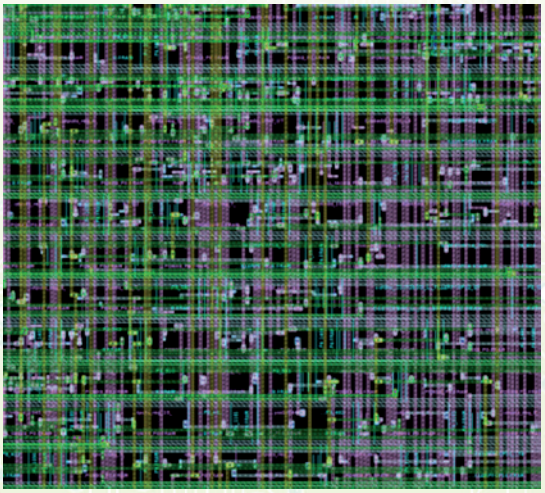
End-user: ARM Limited (LE, UK)
Technology providers: cTuning Foundation (RTO, UK) and dividiti (SME, UK)



TETRACOM

A powerful LTE Turbo-Code Decoder – enabling component of 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.

HOW DID SAE HELP?

The TETRACOM TTP (technology transfer project) enabled and financed the transfer of more than 250PY experience and knowledge of a renowned competence centre (the Microelectronic Systems Research Group at the University of Kaiserslautern) in designing and verifying high throughput channel decoders (FEC) to CREONIC. Due to the close cooperation and the established know-how exchange it was possible to generate a high quality, future-proof LTE Turbo-Code Decoder, which a very small company such as CREONIC would not have been able to design with its limited resources.

IMPACT

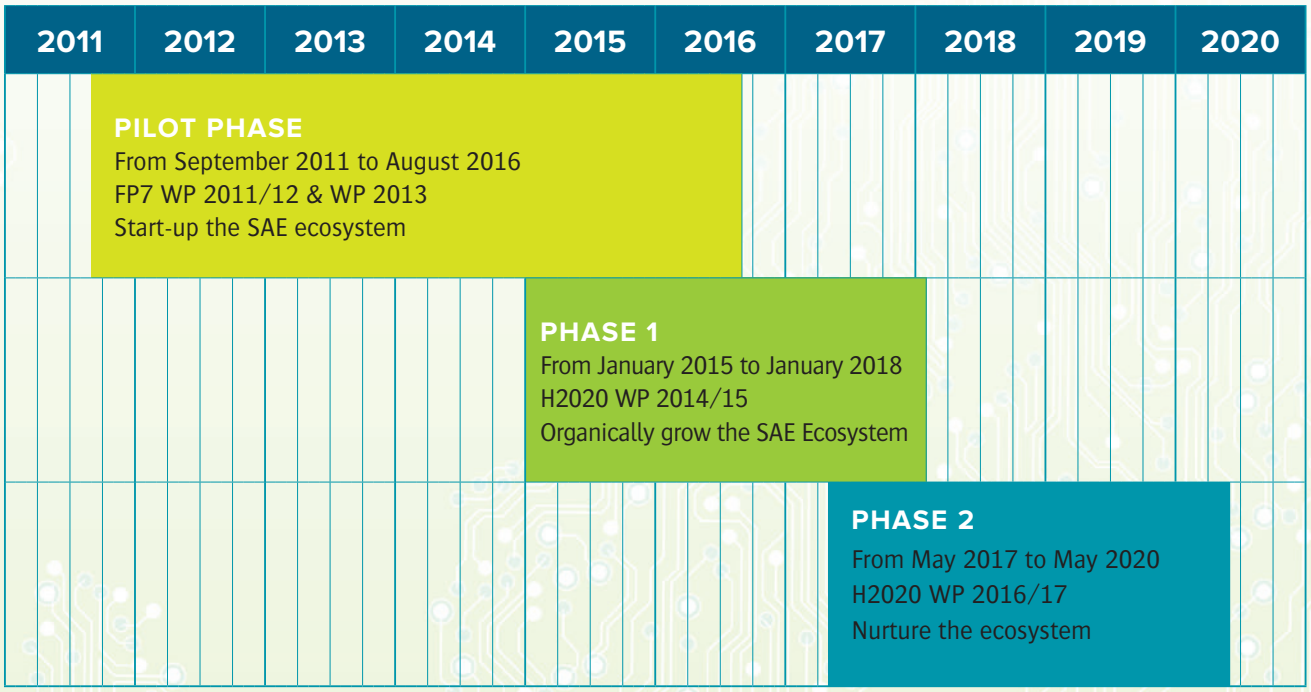
The LTE solution is one major step to enhance CREONIC's product portfolio towards a complete set of solutions of forward error correction cores. This provides CREONIC with the significant competitive advantage to serve its existing and new customers with highly sophisticated solutions. It is expected 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 providers: University of Kaiserslautern (RTO, DE)

COMPETENCE CENTRES AND DIGITAL INNOVATION HUBS IN SAE

Cyber-Physical Systems (EUROCPS, CPSELABS)	**23 hubs** (15+8)
Smart System Integration (SMARTER-SI, GATEONE)	**16 hubs** (7+9)
Advanced Computing (TETRACOM)	**34 hubs**
Organic and large area electronics (COLAE)	**20 hubs**

WHAT'S NEXT?



SAE PHASE 2

Following the very successful implementation of the pilot phase and the already witnessed growth of the SAE network and ecosystem during phase 1, the European Commission will continue its investment in SAE under H2020. SAE Phase 2 will be called in the Work Programme 2017 under the call ICT-04-2017 with deadline for submission of proposals in November 2016. The focus will be on facilitating and enabling SMEs and mid-caps to collaborate at European level to carry out highly innovative experiments that will multiply the impact of local initiatives to a European scale.

The focus of the call is on Innovation Actions that should address all of the following three aspects.

i. Establishing across Europe networks of multidisciplinary competence centres offering one-stop shops/marketplaces for companies that want to experiment with digital technologies inside their products. Centres should act as "innovation hubs" offering facilities (access to technology platforms) and services for developing innovative products, such as design, manufacturing, rapid prototyping and life-cycle management. They should also act as brokers between suppliers and users of technology products and solutions. Competence centres are encouraged to link to existing and emerging regional (smart specialisation) or national innovation hubs. If Horizon 2020 funding is complemented by ESIF or other regional or national funds, Horizon 2020 funding should be used for carrying out highly innovative experiments that will multiply the impact of local initiatives to a European scale, and will build partnerships between businesses in Europe.

ii. Carrying out a critical mass of cross-border experiments bringing together different key actors along the full value chain to customise the technologies according to the requirements of the users. Driven by the requirements of first-time users, Application Experiments bring together the actors of the value chain and the experts necessary to enable new users to develop novel products or services and assist them in customising and applying these in their respective environments. Alternatively competence centres could provide access to design and prototyping and small value production or a combination of the above. Experiment descriptions in proposals should include an outline of the initial exploitation plan and business scenario. To remain flexible on which experiments will be carried out and to stay flexible in fast moving markets, the action may involve financial support to third parties.

iii. Activities to achieve long-term sustainability of one-stop shop / market place services by the competence centres and the eco-system. This includes the development of a business plan for the competence centres and the marketplace, of which an outline business scenario should be described in the proposal. In addition, investors should be attracted to support business development of SMEs and mid-cap actors in successful experiments. Such activities would include also dissemination and support to exploitation.

WHAT'S NEXT?

As for the pilot phase and phase 1 of the SAE initiative, the innovation actions are expected to focus on one or more of the following four areas of technologies as described in more detail above:

- Cyber-physical and embedded systems
- Customised low energy computing powering CPS and the IoT
- Advanced micro-electronics components and Smart System Integration
- Organic and large area electronics

With the size of the initiative and the number of actors growing, a coordination and support action is planned to be used to coordinate the initiative and to **nurture the SAE ecosystem**: Its role is to reinforce the collaboration between the innovation actions supported under the SAE initiative, to increase the outreach of these actions and their impact and to achieve a wider coverage of stakeholders in technological, application, innovation, and geographic terms.
In addition, the coordination and support action shall link SAE to national and regional initiatives of similar nature.

THE FUTURE

Also in the future, the Smart Anything Everywhere initiative is planned to be continued. Focus will move more and more towards providing European added value on top of national and regional initiatives. Focus of EU investments is on networking these initiatives to improve cross-border and Europe-wide collaboration and on providing support to highly innovative cross-border digitisation experiments for new products and services.


SAE

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