ARTEMIS

MAGAZINE

ARTEMIS
Industry Association

View of collaborative research for innovation
Interview with George List

ECS SRA, the 'book',
by chapter and verse

FOREWORD

A lot is happening this year.

We are now very busy organising the European Forum for Electronic Components and Systems (EFECS 2017) that will take place in Dec. 5-7 in Brussels (see www.efecs.eu). The event is co-organised by AENEAS, ARTEMIS-IA, EPoSS, ECSEL-JU and the European Commission. Many interesting speakers are invited and during the first two days feedback sessions will take place on the 10 chapters of the new ECS SRA. The ARTEMIS-IA members already provided their first round of feedback during a full-day discussion-session on Oct. 4; a report of this session you will find in this magazine.

The new ECS SRA is a common full value chain document by AENEAS, ARTEMIS-IA and EPoSS, and the three associations based their ECSEL MASRIA 2018 fully on this new SRA. Laila Gide, president of ARTEMIS-IA is the leader of the inter-association team drafting the document. She is interviewed in this Magazine by Chris Horgan; she explains that the ARTEMIS SRA 2016 is still valid and that the new ECS SRA presents a different side of the coin in respect of embedded intelligence.

New in the cooperation of AENEAS, ARTEMIS-IA and EPoSS is that they now commonly support a ECS collaboration tool (ECT) that for the ARTEMIS members replaces the ARTEMIS Project Idea Tool. The ECS collaboration tool supports creation of project ideas, finding partners for your idea, connect with ideas of other consortia, and a message board. The tool is funding-programme-agnostic and can be used for all existing funding programmes. Further explanation is given in this magazine.

Also new this year are the by the ECSEL Joint Undertaking initiated "Lighthouses" that start from an ECSEL project as cornerstone-project. The idea is that connection will be made with European key-projects inside ECSEL and outside ECSEL (like key-projects in H2020, Eureka, etc.) to build common roadmaps including non-technical issues as European regulations, customer acceptance, etc. So far the ECSEL Governing Board agreed two Lighthouses: Mobility.E and Industry4.E. Both are still in an early phase and interviewed in this magazine.

Further in this magazine you can read:
+ on the R&I landscape in the UK (as seen by Richard Foggie from KTN).
+ George List, Vice President of AVL, gives a preview on his EFECS keynote speech on collaborative research for innovation.
+ The AXIOM project team explains their project on smart CPS

Three members of the ARTEMIS-IA Presidium are interviewed for their ideas beyond the H2020 horizon: FP9.

Finally, a preview is given on our Brokerage Event 2018, that will take place on Feb. 6-7 in Berlin. We hope to see you all at this event.

I wish you an enjoyable read.

Jan Lohstroh
Secretary General of the Industry Association

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THE UK R&I LANDSCAPE

A PERSONAL VIEW FROM RICHARD FOGGIE

by **CHRIS HORGAN**

Richard Foggie is Knowledge Transfer Manager, Digital at The Knowledge Transfer Network (KTN) where he works with public and private partners on new e-service offerings, new semiconductor technology, and the development of public policy in technological and business contexts. Richard leads on 'IoT' in the Digital & Creative team – Smart X, IoT – and is well connected in the European context, such as Horizon 2020, AIOTI and the ECSEL Joint Undertaking. With a science background and experience in both large and small business coupled with a long spell in Whitehall working on innovation support measures, he is just the right person to bring us up to date on what is happening in the UK's innovation landscape.

CATAPULTING IMPACT

The launch of the Compound Semiconductor Applications Catapult is an interesting development in the ARTEMIS/ECSEL context. Catapults are centres of excellence set up by the Innovate UK around specific topics that we feel are of particular importance to the UK economy. The UK has academic research strengths and a good industry base, including some great SMEs in compound semi. It's looking at core capabilities in RF, photonics and power electronics – the latter with a view to electric vehicles and tying into our Centre for Connected and Autonomous Vehicles. Transport is a key area, as is space – we've a good near-Earth observation ecosystem, supported by the Satellite Applications Catapult with a big appetite for millimetre wave. And, of course, digital. With the move to 5G, you're going to need rather complex hybridised, multi-waveband RF front-ends in devices and a lot of GaN infrastructure. We've a 5G Testbeds and Trials push on to demonstrate realistic use cases. It's very much a business-focused initiative, all about outcomes and impact. Fundamentally, it's about applying tech to raise productivity, create jobs and economic growth.

VALUE OF COLLABORATION

The UK has always been a bit 'semi-detached' from the European technology platforms. Some 15 years ago, as a civil servant, I was sent to Brussels to explore the terrain. Initiatives like ARTEMIS and ENIAC were so attractive that the UK was delighted to be a founder member. Of course, the ebb and flow of economic fortunes have caused contributions from EU member states to fluctuate over the past few years. Now, with Brexit on the horizon, we don't currently have a clear idea what post-Brexit R&D collaborations will look like. Whatever the 'deal', I think it is inconceivable that we will not continue to participate in some way. R&D in the UK currently benefits to the tune of around 0.8 billion euros. If that were to disappear, a significant gap would appear. The value of collaboration on both sides of the Channel is clear. It's good for research and it's good for business. And that's mutual. We have not engaged in the higher TRL programmes like EUREKA, which are much closer to market and deliver real business value, but a post-Brexit future may afford such an opportunity.

PARALLEL PRIORITIES

With the future being so up in the air at the moment, we are, as some might say, preparing for all eventualities! It would make a lot of sense for the UK to continue to participate in European framework programmes. We know that it is possible for non-member states to participate. There are various models to enable that. True, as a full member you get to influence the agenda, set priorities and so on. On the other hand, it is the case that the UK's priorities in all the key technology areas are identical to Europe's. So while we may lose our voice at the table, I'm quite confident that the priorities for future EU programmes will map directly to the UK's priorities.

FROM DIGITISATION TO DIGITALISATION

The government is currently putting additional funding into R&D via an Industrial Strategy Challenge Fund that targets digitisation from industrial IoT - where we're linking the industrial mathematics base to high-value manufacturing, looking at modelling data, functional dependency, uncertainty quantification (eye-watering mathematics particularly useful in HVM) – to 'services4.0' a bit like industrie4.0 - but for services. We are also seeing a move from digitisation – the mechanics of catching the 0's and 1's - to digitalisation, simulation and making much more use of cybernetic representations like digital twins. With the increasing rate of transformations in manufacturing and media, we are living in exciting times. Sometimes my job feels like being in a Sci-fi movie!

IMMERSE UK

Speaking of Sci-fi, we have pulled together a group called Immerse UK. This is a cross-sector network for businesses and research organisations across all parts of the UK economy that are interested in the way that augmented and virtual reality can help drive productivity, social and economic growth. The idea is to help UK business ranging from media, like CGI companies (all those Marvel films, etc), to industrial icons like Rolls Royce, take full advantage of new opportunities, identify demand, make connections, facilitate collaboration and tap into new areas for

growth. By building and nurturing this network we aim to grow the UK as a world leader in the application of immersive technologies. It's already generating interesting cross-fertilisation between the creative and industrial spaces. As we chop up, dissect and disseminate all the data in the digital environment, it is vital to take account of the human-machine interface. Insights from the creative industries are proving very useful in understanding the relationship. Collaboration between technologists and artists can be very insightful and productive, there's something fundamental about story-telling and the role of visuals and sounds in how a process or service is represented, perceived and consumed.

TRANSFORMATIONS

In this context of the human-machine interface, I think one of the biggest transformations we are going to witness in the next year or two is the rise of the natural spoken language interface. We'll just speak to systems, whether that's your mobile phone (that will likely morph into an earphone and eye patch connected over a Body Area Network), in your house or on the assembly line. I'm pretty sure that speech is on its way to becoming the dominant interface between humans and machine, the keyboard is the floppy disc of the future. The other transformation is likely to be the rise of the chatbots. These are supremely good at structured data. They can determine questions being asked and reference answers from structured data quite easily, and very convincingly. It's quite impressive but also a little sad that people on the web think they are talking to a human being when it's actually a bot. Blend in some AI and the bots will consistently start passing the Turing test.

+ https://csa.catapult.org.uk
+ https://www.gov.uk/government/organisations/centre-for-connected-and-autonomous-vehicles
+ https://sa.catapult.org.uk
+ https://www.gov.uk/government/publications/5g-testbeds-trials-prospectus
+ https://www.gov.uk/government/collections/industrial-strategy-challenge-fund-joint-research-and-innovation
+ http://www.immerseuk.org

AN ECS SRA FOR AN INCREASINGLY INTEGRATED WORLD ...

... AND A PAN-EUROPEAN DIRECTION FOR ELECTRONIC COMPONENTS AND SYSTEMS

by CHRIS HORGAN

The ARTEMIS SRA published last year set out the pathway for the digital revolution in respect of embedded intelligence and how the ARTEMIS Industry Association will focus on providing strong technological capabilities over the whole value chain in a multi-domain approach where digital platforms including embedded intelligence will help build stronger eco-systems. We need to accelerate innovation and create new business models.

This year AENEAS, ARTEMIS-IA and EPoSS decided to generate an overarching SRA, the ECS SRA, that combines the centre of gravities of their separate SRAs. The ECS SRA is now reaching it final stage. A draft is available on the EFECS website so the EFECS attendees may become familiar with it and prepare their participation in the parallel sessions with the opportunity for feedback.

Laila Gide, president of ARTEMIS-IA, spoke about the reasons and purpose of the strong implication of the ECS SRA as leader of the inter-association team charged with drafting a Common Strategic Research Agenda on Electronic Components and Systems, in which the three associations speak with one voice. In fact, this new ECS SRA, as far as the ARTEMIS-IA strategy goes, is not so much a different currency from the ARTEMIS SRA 2016, but more a different side of the same coin in respect of embedded intelligence.

PAN-EUROPEAN DIRECTION

"The ECS SRA focuses on ten 'chapters' [see article on ECS SRA day in Brussels] that cover the kind of technologies we would like to develop," Laila explained. Of course, the differences are evident in the larger scope of the ECS SRA because we are making closer ties and integrating the value chain from microelectronics and semiconductors to cyber-physical systems and systems of systems. So essentially, in terms of embedded intelligence, the two SRAs don't differ fundamentally. Distinct but complementary. The three associations are right at the centre of the digital transformation, and have a key role to play by integrating the strengths and expertise we have across the chosen technologies in the application areas on which we are focusing, thereby achieving real impact. This ECS SRA aims to set a pan-European direction for ECS, which is so important for Europe's prosperity.

POWERS OF INNOVATION

"A number of new challenges are also in this ECS SRA. For example, in addition to the computing challenge and low-energy computing, we also have stronger consideration of aspects like high-performance computing. Coming up with potential solutions will put our powers of innovation to the test. Artificial intelligence is another aspect that is taking on a growing role. This is also evident in this SRA. Human-machine interface, human-centric solutions, far-reaching automation – these are central themes in areas like health, manufacturing, mobility and digital life. However," Laila warns, "we cannot ignore the need for human intelligence and consciousness. It's a matter of finding a way to get the two intelligences synchronised for optimum societal benefit."

AN INTEGRATED WORLD

"I think this ECS SRA represents an integrated approach. It doesn't supersede or replace the ARTEMIS SRA. What is contained in the ARTEMIS document is still valid, also in the context of this new ECS SRA, which shows that the objectives of the three associations united in ECSEL are well aligned. This common SRA is the house in which everyone can find a room in which they can do their work and make full use of their specificities and expertise, where they can walk down the corridor and 'connect' with another room, enlarge their scope and extend their leverage, share the challenges and together address new opportunities. I think this ECS SRA represents what is to happen in the world, a world that is becoming increasingly integrated."

A HIGHLY PRODUCTIVE DAY IN BRUSSELS

ECS SRA, THE 'BOOK', BY CHAPTER AND VERSE

by CHRIS HORGAN

Human intelligence wrestled with the topic of Artificial Intelligence, M2M interaction occasionally needed H2M intervention to get the slide show running as it should and smart choices were needed to select snacks from the wide variety available. These were the minor challenges on 4 October in Brussels when members of the ARTEMIS community met to consider the major challenges of the Strategic Research Agenda for Electronic Components & Systems. Capably hosted by Jan Lohstroh and Ad ten Berg, participants shared views and opinions, took in the content and debated various standpoints.

ANSWERING CHALLENGES WITH IMPACT

Laila Gide, President of the ARTEMIS Industry Association and charged with leading the elaboration of this ECS SRA, opened the 'book' with an introductory 'chapter' on the purpose, status and propositions contained within this SRA. Her message was very clear that this is "not yet another SRA but a common ECS SRA for the members of the ECSEL JU – AENEAS , ARTEMIS-IA and EPoSS – to speak as one voice on the complete ECS value chain and ensure that the right set of RD&I projects is generated." In outlining the guiding principles that underlie the drafting of this ECS SRA, Laila pointed to the fact that this was not a matter of starting from scratch since there was already considerable material available from previous years that can be reused whenever appropriate.

This Strategic Research Agenda has a matrix approach to cover both application areas and essential capabilities, with a focus on no more than 10 top topics or chapters. "We will use the ECS SRA as input to write Calls for projects (ECSEL, H2020, EUREKA Clusters) by highlighting the game changers and major drivers, focusing on the challenges, not the solutions, and it is up to the project proposals to answer those challenges and indicate the expected impact." The EFECS conference from 5-7 December would provide the next opportunity to get to grips with the implications and contents of the chapters in various workshops involving the core team and chapter leaders. And, with the introduction complete, the first chapter could begin.

CHAPTER 1: TRANSPORT AND SMART MOBILITY

In citing the STRIA Roadmap on Smart Mobility and Transport Services and Systems that "mobility is not only a visible expression of Europe's economic and societal prosperity: it is also an important source of that prosperity," AVL's Michael Paulweber underlined the centrality of this chapter to the centrality of this chapter to the socio-economic landscape of Europe. The main (a word that has superseded 'grand') challenges

are: clean, affordable and sustainable propulsion; secure connected, cooperative and automated mobility and transportation; interaction between humans and vehicles; infrastructure and services for smart personal mobility and logistics. As Michael noted, while these challenges may appear familiar, they contain a number of new elements. By addressing these challenges, and particularly the key aspects such as safety, security and privacy protection, sustainability and affordability, human interaction, societal acceptance and the need to boost performance, the benefits in societal terms from research in these areas will, Michael emphasised, "lead to transportation for persons and goods and smart mobility for an inclusive society, personalisation and accessibility while, at the same time, zero/low-carbon transport will help protect the environment. It will also enable mobility in urbanized, smart cities and make transport safe and secure, not forgetting facilitate personal mobility for an ageing and digital society."

CHAPTER 2: HEALTH

Ronald Begeer of Philips opened the Health chapter by looking at the technological game-changers on whose basis a set of main technology oriented rather than application challenges was outlined to which R&D&I priorities are linked, noting that "food is now an implicit part and not a specific subject anymore, and indeed partly covered by digital life." The game-changers vary from cognitive computing and transaction mechanisms for data security, like Blockchain, to robotics, IoT, regenerative medicine and new enhanced imaging modalities. "The R&D&I priorities are guided by five major challenges," Ronald explained. "These are getting healthcare from hospitals into our homes and daily life enabling preventive and patient centric care, restructuring healthcare delivery systems to maximize their value for patients, creating new solutions for engaging individuals more actively in their own health and wellbeing, providing affordable healthcare for increasingly chronic, lifestyle related diseases and an ageing population, and finally developing platforms for wearables/

implants, data analytics, artificial intelligence for precision medicine and personalised healthcare and wellbeing." Quite a list of challenges so how can we make it happen? Ronald suggested a lighthouse on Health and wellbeing should be established and bottlenecks removed by improving political and social acceptance, standards, platforms, interoperability and data security. Coherent regulation focused on supporting health systems to provide better healthcare for people along with collaborative research and innovation would be essential to tackling these challenges. Furthermore, innovation could be enhanced by streamlining (disruptive) innovations from universities, RTOs and SMEs to global sales by large enterprises. Finally, digitisation platforms provide a means to improve healthcare in Europe.

CHAPTER 3: ENERGY

And so to Energy with Antonio Imbruglia of STMicroelectronics, who considered the challenges and the game-changers that shape the vision of this chapter. "Why do we need the Energy chapter," Antonio asked rhetorically. "The energy world is in transition, there is a growth of renewable energy sources, unidirectional distribution is becoming bi-directional, we have the issue of storage systems, mobility must become zero-emission mobility … there are many limitations to be solved." He went on to list the three key challenges: sustainable power generation and energy; efficient community energy management; reduction of energy consumption. "We need intelligence and security features at each level of the grid and interfaces," Antonio said. "We are confronted by game-changers like new renewable electricity sources, consumers becoming prosumers, electricity storage needs, smart AI connected grids and new business models. So the Energy chapter must develop enabling technologies like System-Component Integration, Connectivity and Interoperability, Dependability and Trust, Safety, Privacy and Security, Computing and Storage. Europe must use its competitive edge sharpened by system knowledge and holistic system solutions. Ultimately, saving energy is equivalent to reducing costs and

being more competitive, and ECS for energy supports EU and national energy targets. The impact on job generation and education will be huge. It is vital, therefore, for us to have complete understanding of systems and competence from small-scale solutions up to balanced regional energy supply solutions."

CHAPTER 4: DIGITAL LIFE

Paul Merkus of Philips Lighting took over the baton and presented the vision of the Digital Life chapter. "In our modern life, digital services are part of almost everything we do," he said, "be it at work or during our free time. Our modern lives are occupied with work, travel or leisure. If we are not on the move, we are at home or at work, and we want to have a safe, comfortable and fulfilling life in a sustainable environment. What the Digital Life chapter covers is the intelligent (and preferably anticipating) applications that support our lives in all these different environments, wherever we are and whatever we are doing." Digital Life targets four distinctive (smart) 'spaces': public, professional, private and environment. "In terms of the major challenges, there are certain synergies with three other ECS SRA chapters," Pauls adds: "in Health the major challenge is to ensure healthy and comfortable spaces and so contribute to the aim of keeping healthy people healthy in Digital Life. In the Transport and Mobility chapter, infrastructure-related aspects will be tackled along with 'being on the move'. Finally, Energy. Electrical Energy is a pre-requisite of Digital Life since the energy scavenging of IoT sensors and actuators, energy storage and wireless charging of smart phones and other wearables can be an essential element of a Digital Life." In a SWOT analysis Paul revealed the relevant game changers that include the ubiquitous availability of smart phones and resulting availability of accurate sensor data, the online ubiquitous connectedness that has empowered citizens to become prosumers and has led to maker communities and created neighbourhood watch groups on WhatsApp. Last but not least, the impact of 24/7 always-on culture enables two drivers for change: access to information and adaptation to rapid change. This 'new' chapter got the senses stirring in the room.

CHAPTER 5: DIGITAL INDUSTRY

With coffee next on the agenda, Mika Karaila of Valmet, quickly cut to the chase in his presentation of the Digital Industry chapter. "Digital Industry will require new applications and methods to get current factories working at maximum flexibility and efficiency and at optimised production levels. Fewer workers will increase the information need and access to that information as it is needed. This kind of easy access still requires security and a lot back-end server capacity to process information ready to be used. Optimally, we should have self-organising intelligence at the factory level."
The major challenges come in the development of 'digital twins', simulation models for the evaluation of industrial assets at all factory levels and over system or product life-cycles, and the implementation of AI and machine learning to detect anomalies or similarities, and to optimise parameters. Digital platforms must also be developed, application development frameworks that integrate sensors and systems. Interoperability is key. "In ideal world," Mika added, "interoperability works on a communication level, but in terms of application there are ontological and semantic challenges." Solutions may be found in improved overall equipment efficiency and profitability through increased efficiency, flexibility and robustness of the production process. Industrial IoT applications are using the data available, business analytics, cloud services, enterprise mobility and many others to improve these industrial processes. Future IoT developments integrated into the digital economy will address highly distributed IoT applications and processing at the edge of the network by using platforms that provide computation, storage, and networking services between edge devices and computing data centres.

A BREAK IN THE ACTION AS FOOD 'DISRUPTS' TECHNOLOGY

And as the major challenges of the first five chapters led to questions and answers, propositions and disagreements, the technology debate was disrupted briefly by a more leisurely convivial interlude as real hard choices had to be made between the

delicious snacks on offer during the lunch break. Refreshed, it was then back to food for thought as the remaining chapters took their turn.

CHAPTER 6: SYSTEMS AND COMPONENTS

Up stepped Jürgen Niehaus of SafeTRANS to explain the ins and outs of this chapter. "What's in are processes, methods and tools to design, integrate, analyse, optimise and test current and future ECS. What's out is computing and storage nodes, which is part of chapter 9. However, developing systems employing these nodes is 'in', as general V&V and test methodology although the technologies specific to these qualities belong to chapter 8. Interoperability of IoT, SoS, components, subsystems and nodes is part of chapter 7 on Connectivity but the interoperability development tool is 'in'." That being cleared up, Jürgen cited the game-changes for this chapter, such as ECS networked amongst each other and with the cloud and the ever increasing autonomy of ECS. "Humans are becoming cooperation partners with machines, industrial processes are changing and software becoming more important … the list goes on. So all this presents us with R&D&I challenges. We have to manage critical, autonomous, cooperating, evolvable systems. Complexity, diversity and multiple constraints have to be managed. We need to deal with integrating miniaturised features of various technologies and materials into smart components. In other words, component level integration. And in terms of module level integration, the challenge is to provide effective module integration for highly demanding environments. And that brings us to the need to increase compactness and capabilities by functional and physical systems integration at application level. We have plenty to do in this chapter."

CHAPTER 7: CONNECTIVITY AND INTEROPERABILITY

Jerker Delsing of Luleå University of Technology then went through the three major challenges of this chapter. "The first major challenge is to meet future

connectivity requirements, leveraging heterogeneous technologies. We see the availability of derivative semiconductor processes and innovative packaging, MID and printed circuit technologies as the target of our ambition to develop an innovative connectivity solution and thus strengthen Europe leadership in 5G and IoT markets. Our R&D&I efforts will focus on developing a European ecosystem able to support heterogeneous integration with the aim of creating an innovative connectivity technology. The second major challenge is to enable System of Systems integration through nearly lossless interoperability. Our aim, therefore, is to develop a connectivity that will allow for SoS integration and scalable and evolvable System of Systems. The game-changers here are open interoperability along with integration and the ease with which new and secure IoT hardware and radio solutions like 5G can be integrated. It is essential that we develop reference architectures that are compliant with the critical performance requirements in the relevant application areas. The third challenge relates to ensuring security interoperability across any connectivity so that connectivity chains and networks can go from hardware over software to system of systems with the appropriate security engineered and enabled in both design time and run time. A real game-changer will be flexible and adaptable IoT and SoS connectivity security technology and engineering tools that are able to reduce security deployment, operations and maintenance costs by 40%. We expect to enable the open implementation of reference architectures that support security evolvability and autonomous behaviour as well as provide the tools and technology to support autonomous security translation in connectivity chains and networks."

CHAPTER 8: SAFETY, SECURITY AND RELIABILITY

Daniel Watzenig of Virtual Vehicle explained that "we have to cover all aspects to build trustable technology so that measures are taken to mitigate technical faults (safety, reliability), to offer protection against malicious or unintended human intervention (security), and to provide assurance on the

related use of personal data (privacy). To be competitive we need to deal with mandatory items in many sectors where Europe has leadership or a significant position and increase penetration of safety & security solutions within applications and supporting infrastructures. European actors will have to transform innovations to market products and services through standardisation, assurance and certification. The novel products and services must be of significant benefit to society. But if these innovations are not dependable and trustable, there is a big risk that they will not be accepted." The major challenges are: Safety, Security and Privacy by Design whereby the priorities are to Reinforce the Design, Harden the Edge and Protect the Reach; Reliability and Functional Safety where the focus will be on enabling new European ECS products to get to global markets fast, gain market share rapidly and to maintain leadership positions sustainably in order to secure jobs and wealth in Europe; Secure, Safe and Trustable Connectivity and Infrastructure geared towards secure IoT devices, secure communication protocols and secure IT infrastructure; Privacy, Data Protection and Human Interaction where the aim is to develop methods and framework enabling deployment of privacy, data protection and human interaction and facilitating the uptake of connected services and products for all industry sectors in compliance with European directives and national regulation.

CHAPTER 9: COMPUTING & STORAGE

In the absence of Marc Duranton, Huy-Nam Nguyen of ATOS-Bull took responsibility for bringing the room up to date on this chapter but in view of the misunderstandings that had occurred about what had been expected, this following is summarised from the working ECS SRA document. Computing and storage are the fuel of the digital revolution in providing a constantly higher performance for existing and emerging applications at a constant or decreasing cost. To continue the expansion of the digital revolution, computing and storage has to continue along this trend while it has recently been confronted by the limitation of physics that restricts the performance increase and raises the cost, so new

paradigms should be sought. Parallelism, heterogeneity and distributed systems provide technical solutions for increasing performance and reducing energy but they have a drastic impact on programming and on the efficient management of the ever-increasing complexity of computing and storage systems. Performance is shifting from an absolute number or operations per second to operations per second and per watt for all domains of computing. The shift to cyber-physical systems and intelligent systems are also drivers to reconsider how computing and storage is done. The major challenges faced by computing and storage are: increasing performance at acceptable cost, for high-performance computing and for low-power and ultra-low power computing; making computing systems more integrated with the real world; making 'intelligent' machines; developing new disruptive technologies like quantum technologies, neuromorphic computing and optical computing.

MAKING IT HAPPEN

In summary, it is clear that the technological challenges arising from future technologies require advances well into the next decade. Furthermore, European industry in sectors as diverse as healthcare, automotive, energy, smart cities or manufacturing depend significantly on having highly specialised tailor-made electronics devices that enable added value and new functionalities in their products. Laila stressed the importance of securing the supply of future talent. "It is vital to give attention to university education in close collaboration with the industry by means of joint (Academia and Industry) courses, traineeships and other support actions (including EC grants). After all, if we want to strengthen Europe's R&D position, a strong and advanced educational system is essential along with the presence of some of the world-leading research associations."

ECS
COLLABORATION
TOOL

by IRIS HAMELINK & ANDRE HEBBEN

ARTEMIS-IA and AENEAS have merged their collaboration support tools into a single co-managed service: the ECS Collaboration Tool. AENEAS and ARTEMIS Industry Association wanted to create one tool to facilitate easy information exchange within the ECS community and allow the collection and management of all relevant data, ideas and project proposals in one place.

NEW ECS COLLABORATION TOOL

The ARTEMIS Project Idea Tool is replaced by the ECS Collaboration Tool and is open to all in the ECS Community, and 24/7 available. The new tool is released to prepare for joint consortium building at EFECS, but is available to support any related event, regardless of the funding instrument involved. It can also be used as a "stand-alone" project consortium building tool. Users can initiate projects and invite partners, or use the messaging system to look for partners or projects. After forming consortia, project teams can assess the best mechanism for funding support for their project, be it a National, ECSEL-JU, European Commission or EUREKA type funding.

ADDRESSING THE COMPLETE VALUE CHAIN IN ECS

Electronic components and systems (ECS), based on electronic and ICT technologies, have an impact on all industrial sectors and almost all aspects of life. The ECS Value Chain stands for everything "smart", based on designing and manufacturing semiconductor chips, sensors and actuators. By utilising integrating software and specialised interfaces that bring them to life, it creates the essential building blocks for the Internet of Things and future Systems of Systems.

Together, technologies for nano-electronics, smart systems integration, embedded intelligence and cyber-physical systems all play a dominant role in creating innovative, smart, connected yet secure products, powered by sustainable and efficient energy sources. These products enable many applications that improve mobility, health and wellbeing and quality of life as well as supporting the creation of a smart competitive industry in our increasingly digital economy.

JOIN AN EFFICIENT COMMUNITY TOOL

The ECS Collaboration Tool aims to support collaboration in multiple technologies and stimulates to form creative and innovative projects ideas which can be built by strong consortia
Visit https://ecscollaborationtool.eu/, create an account and start networking online!

HOW CAN THE TOOL BENEFIT YOU?

CREATE A PROJECT IDEA

Initiate a project idea and invite partners, and browse other project ideas.

LOOK FOR A PARTNER

Use the partner search to look for possible partners based on their expertise, and invite them to join your project idea.

LOOK FOR OTHER PROJECT IDEAS

Browse through the tool to find project ideas and send out an online request to join a consortium.

MESSAGE BOARD – GET NOTICED EVEN MORE

Leave a message on the message board for possible partners or interesting project ideas.

GEORG LIST

VIEW OF COLLABORATIVE RESEARCH FOR INNOVATION

by CHRIS HORGAN

"And as far as ECSEL is concerned, and looking ahead to my keynote address at the EFECS conference, what we are keen to push is the collaborative angle and the cooperation between software, hardware and system."

Vice President of Corporate Strategy at AVL List GmbH, Georg List is a fervent champion of collaborative Research & Innovation. With a mechanical engineering MSc and an MBA, Georg 'marries' technical and business insights in his role in developing corporate strategy at AVL, the world's largest privately owned company for development, simulation and testing technology of road-vehicle powertrains. So, as a committed collaborative partner, what role does he feel that large companies play, or should play, in the innovation chain?

Let me start by saying that in comparison to our customers in this industry we are a small and highly specialised company. We serve the same breadth of technologies, but we focus on engineering services and development tools for simulation & testing. And as far as ECSEL is concerned, and looking ahead to my keynote address at the EFECS conference, what we are keen to push is the collaborative angle and the cooperation between software, hardware and system. In terms of content, cooperative research is incredibly useful to us. The automotive industry can be very competitive and not always keen to share information and knowledge. I feel that all the things happening around automated driving or electrification cut across all of those boundaries so if we really want to make progress in innovation, then we will have to remove the barriers and collaborate.

INNOVATION AT THE INTERFACE

For example, we cooperate with Virtual Vehicle as a research institute. They have the sensor fusion expertise and by combining our knowledge we can then determine an appropriate algorithm in the control software that does the actuation and actually drives the car. So by combining each our own specific area of expertise in a collaborative relationship, we can come up with benefits for both the manufacturer and the user alike. Infineon has its chip, we do the software and Virtual Vehicle does the sensor – if we don't work together, we're not going to innovate. We don't all have to innovate together – it's at the interfaces where that innovation occurs.

NEW PLAYING FIELD

We, as AVL, like to work in collaborative research also with large companies, our customers.. At the end of the day, it's the OEMs that make the final products so they are always essential partners. While they are not so interested in multi-sectoral projects and careful about divulging competitive advantages, they are still very keen on the results and on working with other parties along the supply chain. Which is where

we come in. This way there is no direct competitive pressure with a rival OEM and this allows an open, pre-competitive research environment in which innovation really has a chance to flourish. There is also a good chance that these project partners eventually become customers. What is interesting in this ecosystem in which we collaborate is that the roles are becoming increasingly blurred. For example, the sharp definitions of supplier and customer, partner and competitor are losing their traditional meaning. It's a very dynamic world. A new playing field has been opened up by all the new technologies and the players are taking different roles in different phases of the game. The hierarchy of the past has been flattened to some extent by this dynamic ecosystem in which we operate. So, for some time now, we have been familiar working even with competitors in a pre-competitive world and with others like tier 1s that can be customer – supplier – competitor and partner all rolled into one.

FINDING COMMONALITIES

We want to be an innovation leader and develop new technologies, so this is a good reason to be involved in such projects as well as coordinate larger programmes like CRYSTAL. This is a good example of targeting research across different industries. Within the automotive industry, system engineering doesn't have a common language or tool or standards. CRYSTAL was an attempt to resolve this problem of heterogeneity and learn lessons from different industries. It was a great opportunity to coordinate this large, wide-ranging project. Of course, it was good for our positioning and we transferred findings also into AVL products like model. CONNECT. Now we are coordinating the ENABLE-S3 programme, involving around 70 partners, which is on the topic of autonomous driving, a strategic topic for us.
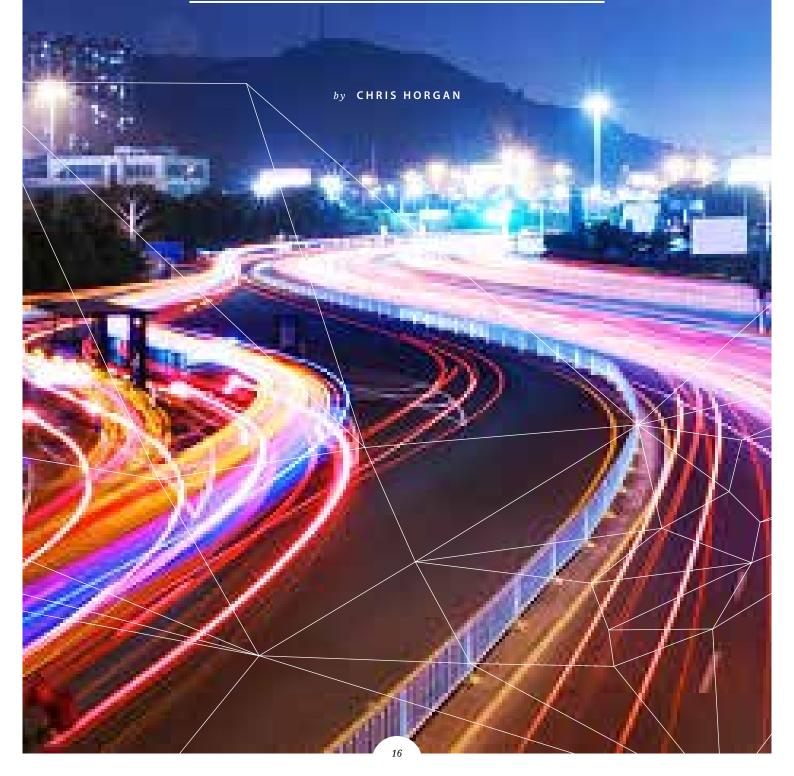
SMART HARDWARE

Research is such an important part of our corporate make-up and we do invest a significant amount of time, money and effort in it. Given the topics on the European agenda, like automated driving, it's essential

to invest in electronics and software. It must be a collaborative effort and comes back to the basic idea of ECSEL. You just have to look at what we call the 'car'. It's a cognitive vehicle driving around, sending data to the Cloud, connected to the infrastructure, interacting with and assisting the driver, automating critical actions … And this highly complex car is driven by software but the software without smart hardware doesn't do anything. The hardware has to allow all the functionalities that the software can provide. We sometimes tend to forget that.

INCENTIVES TO COLLABORATE

These are topics that no single company can hope to tackle alone, either intrinsically or financially. If I look to FP9, and the automotive and mobility challenges that lie ahead, I hope that we don't fall into the trap of trying to sprinkle everything and then just scratch the surface. I think it's important to focus on a number of key topics, and make sure that the funding does not continue to become increasingly marginal, a trend that has become evident in recent years. The danger is that industry could become put off by low funding rates and not participate. So it is crucial to incentivise this participation, otherwise OEMs like Daimler or BMW won't want to play anymore. And if these large partners don't play, then it will become more difficult for us because a big portion of the attractiveness of funded programmes for us is gone. It is key for us to collaborate with the major OEMs. We have the choice whether to do the research in house, outsource it to a research institute or participate in a collaborative programme. I would argue that anything below 50% funding will be a hard act. In ECSEI, during Horizon 2020 we're approaching or have already passed that limit in actual funding rates, which is a concern. We need to create momentum, bring people together, and the funding programmes and agencies have a very important role to play in facilitating the right conditions for different players to participate and achieve the ambitious targets for innovation in these new fields.

THE LIGHTHOUSE MOBILITY4.E

by **CHRIS HORGAN**

ILLUMINATING THE ROAD TO ELECTRIC, CONNECTED AND AUTOMATED CARS

*The European Commission (EC) has set the ambitious target of achieving a **60% vehicle emission reduction by 2050 compared to 1990**, through the progressive implementation of a zero-emission policy. From an engineering perspective, the **zero-emission** target is implemented through **drivetrain electrification**, while the benefits of co-modality are achieved through **connectivity**, which plays a major role in the megatrend of digitalisation. All car manufacturers, public authorities, and other stakeholders are in agreement that (cooperative) driver assistance, active safety systems and automated driving functions are vital to approach Europe's vision 2021 and the long-term goal of zero fatalities, zero injuries and zero accidents. In parallel, economic development requires an **efficient and sustainable mobility system**.*

Smart Mobility is therefore a key topic in the ECSEL vision of a future transport sector based on vehicle electrification, connectivity, autonomous functions and digitalisation driving large-scale lighthouse initiatives such as Mobility4.E. The lighthouse programme concept focuses on addressing major technological, legal and infrastructure innovation challenges facing the large-scale deployment of safe, electrically powered, automated/autonomous and connected vehicles. Its goal is the deployment of a zero-emission/zero-accident intelligent mobility systems accessible by all. Reiner John of Infineon Technologies, project leader of the Lighthouse project AutoDrive, presents his views of this initiative and the roadmap that will be illuminated by its example.

Reiner John
Director R&D Projects at Infinion Technologies AG

THE LIGHTHOUSE MOBILITY4.E IS DRIVEN BY COOPERATING RESEARCH PROJECTS

The Mobility4.E Lighthouse Initiative supports the roadmap towards safe, electric, automated/ autonomous and connected smart mobility. The ECSEL project AutoDrive is the first cornerstone of this Lighthouse Initiative that will provide fail-aware, fail-safe, and fail-operational integrated electronic components, Electrical/ Electronic (E/E) architectures as well as (deeply) embedded software systems for highly and fully automated driving to make future mobility safer, more efficient, affordable, and end-user acceptable. Reiner explains. "In addition to technology research and innovation, it

"I cannot emphasise enough the role of digitalisation in tackling the technological challenges and moving this transition forward. Without digitalisation and connectivity there is no automated/ autonomous mobility."

covers areas such as standardisation, the regulatory and policy context in which public-private collaboration interacts. The AutoDrive project will advance the current level of safety and reliability by considerably driving forward fail-operational technologies and by making use of safety and security concepts from the aviation domain.

MOBILITY AS A SERVICE

Automated/autonomous driving is a disruptive technology that opens the door to future multi-billion markets. It provides business opportunities to value chains in the automotive and semiconductor industry. In Europe, the industry has competitive strengths in developing and manufacturing highly reliable electro-mechanical systems. So, in order to preserve this capability, European standards must be established for high-level control, such as real-time computing, data processing and platforms interoperability. "One of the paradigm shifts, occurring in the automotive industry, is the emergence of Mobility as a Service. In aviation, this concept is already long established. Soon, all we will be concerned about is that we leave and arrive on schedule, safe and sound, and that the trip

fulfils our wishes in terms of comfort and convenience. This is where the Lighthouse will focus its beam – to light the way to all the technical and non-technical issues, so that, along the roadmap, we can overcome bumps, obstacles and potholes that we may come up against."

CRITICAL MASS FOR SAFER MOBILITY STANDARDS

The vehicles that will operate this 'service' in the future will need to be robust and safe, because they will be operating fairly constantly, "unlike the cars that are owned today and are used perhaps for just an hour a day," Reiner reminds us. "The AutoDrive project aims to design fail-aware (self-diagnostics), fail-safe and fail-operational (hardware and software redundancy) electronic components and systems architectures that enable automated driving to be introduced in all car categories. Currently, of course, even the most sophisticated automated/ autonomous vehicle technology on the road is not able to surpass human driving capabilities – especially considering context awareness in any situation. Moreover, there is no common agreement on quantifiable

dependability measures, which hardware and embedded software has to achieve to allow safe automated/autonomous driving for SAE Levels 3-5. This is where the Lighthouse Initiative will come into play: By enabling semiconductor companies, suppliers, OEMs and research institutes, connect together with the AutoDrive project, to create a pan-European ecosystem, which has the critical mass to initiate standards and provide the components and subsystems for automated driving. The results of AutoDrive will significantly contribute to safer and more efficient mobility, boosting end-user acceptance and comfort by supporting drivers in highly challenging situations (active safety) as well as in regular driving situations and, subsequently, reducing the number of road fatalities."

"I cannot emphasise enough the role of digitalisation in tackling the technological challenges and moving this transition forward. Without digitalisation and connectivity there is no automated/ autonomous mobility. It is crucial 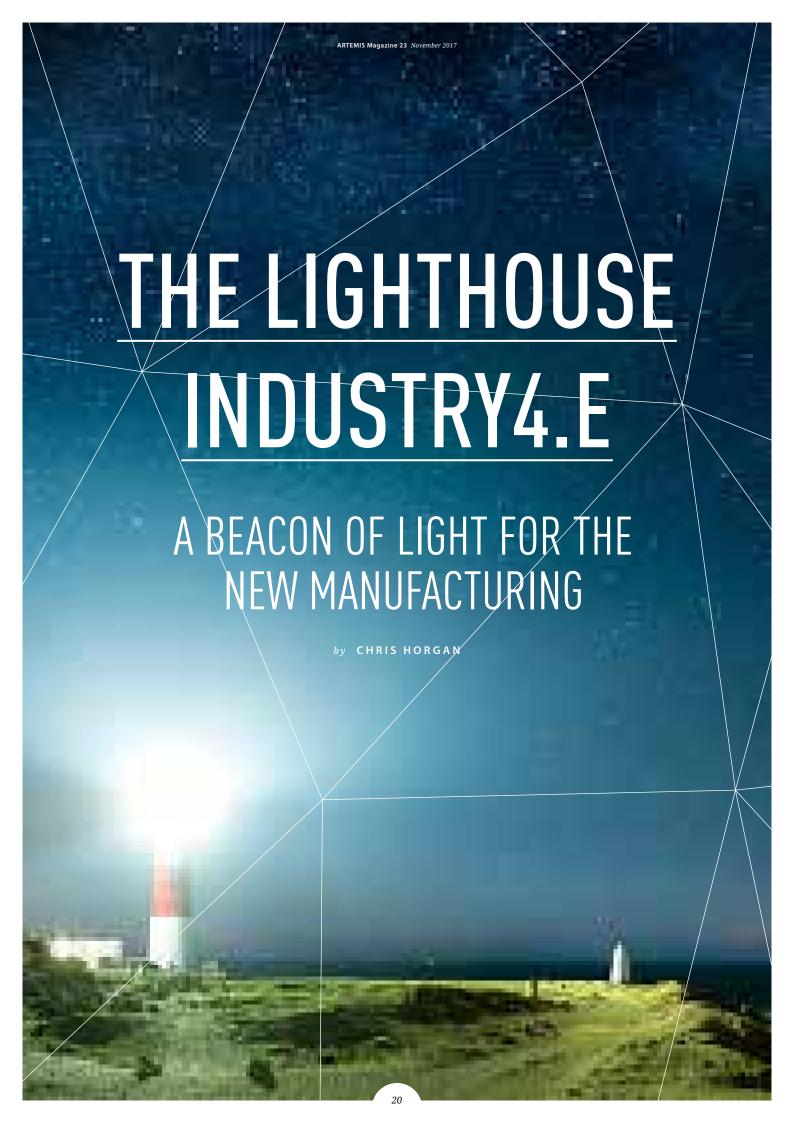to the stage we have to reach: From senses to brainpower to decision-making and actuation. We collect, process, interpret data and act on the processed data. Deciding what to do and how to use that data is a function based on abstraction. There is plenty of intelligence being built into vehicles, but it still lacks the self-awareness, self-organising, self-learning capacity, and that's where we need to make progress before we can truly automate. The vehicle's brain can use its various sensors to help you avoid obstacles and intervene, but we have not yet reached the stage of independent thinking, as it were."

MISSION ZERO

The development from a technology perspective goes hand in hand with the user needs and preferences within a regulatory landscape that comprises standardisation, privacy, legal, environmental, ethical and other issues. "Looking at the development of electric vehicles," Reiner says, "we began from a perspective of fuel efficiency and low emissions. Now, prospective electric vehicles owners tend to be primarily concerned with affordability and range. As electric propulsion (battery, fuel cell, etc.) become mainstream, the main focus will be automation and mobility. So, as the roadmap heads towards 2030 and Mission Zero (victims and emissions), new and different requirements will steer developments, both technical and non-technical. The emphasis will move increasingly from vehicle to mobility, in other words, connections: Not putting more vehicles on the road, but optimising their use to enhance the flow of people and goods. All the time, we must keep in mind the Mission Zero target. This is, of course, essential for user acceptance. And so, in the light of Mobility4.E Lighthouse Initiative, it is important that the relevant peripheral challenges like standards, rules, regulations, legislation, liability and obligation are well signposted and can be tackled just as effectively as the technology challenges. If we can do this, we can help to sustain leadership in Europe and sustainably boost economic growth and prosperity as well as quality of life."

THE LIGHTHOUSE INDUSTRY4.E

A BEACON OF LIGHT FOR THE NEW MANUFACTURING

by CHRIS HORGAN

The ECSEL Lighthouse initiative is the talk of the town. In any case, it was the topic of a talk with Bert De Colvenaer, ECSEL Executive Director, and Chris Decubber, Technical Director at the European Factories of the Future Research Association (EFFRA). This particular lighthouse focused its 'beam' on the 'digitalisation of industry'. If the fruits of this transformative digitalisation are to be enjoyed, then the fragmentation that exists must be overcome and enable manufacturing to become competitive. This can only be done by gaining more and more IT and ECS-driven knowhow, based on platforms, standards and appropriate certifications for safety. Hence the introduction of a 'Lighthouse Initiative', a concept introduced by the ECSEL Joint Undertaking to signpost specific topics of common European interest.

THE ILLUMINATING BEAM

Before zooming in on the specific Industry4.E lighthouse, Bert De Colvenaer explains that the general purpose of the initiative "is to facilitate contributions to standardisation or assist in the uptake of technology to address societal challenges. They provide a kind of 'container' or 'umbrella' for a set of well-coordinated activities." Using the analogy of the purpose of an actual lighthouse, Bert describes the initiative as acting in the same way. "It helps ships find their way to harbour – it lights up the route, providing vectors and signposts so that they can all arrive at the same port of call. Essentially, then, a Lighthouse Initiative builds on well identified market-pull demands related to societal needs. It offers visionary solutions for those demands, creating ecosystems along the relevant value and supply chains. It illuminates the route or roadmap. The aim is to have a strong pan-European dimension at each stage of the process all the way from demands, solutions and ecosystems to technologies and demonstrators. Strategic IP management policy or standardisation policy could be established if and where possible and relevant while clustering projects in

identified areas, where appropriate, will help attract other contributing projects as needed through a transparent competitive process. By addressing and resolving, where possible, the relevant non-technical issues such as legislative, regulatory and social aspects, Lighthouse Initiatives will focus part of the ECSEL JU activities on achieving concrete socio-economic objectives following an agreed approach."

FACTORIES OF THE FUTURE

"There is also a very good reason why ECSEL is working with EFFRA in this Industry4.E Lighthouse Initiative," Bert says. "We want to understand their needs and find out how EFFRA can help us identify our roadmap." EFFRA is a non-for-profit, industry-driven association promoting the development of new and innovative production technologies. It is the official representative of the private side in the 'Factories of the Future' public-private partnership whose aim is to promote pre-competitive research on production technologies and thereby launch hundreds of market-oriented, cross-border projects throughout the European Union.

"As an industry-driven association, the Lighthouse Initiative appeals to us because we want our community to be aware of enabling technologies, approaches or even standards that apply and are relevant to the innovations they want to come up with," explains Chris Decubber. Of course, there is already a lot of knowledge and expertise around among all the different players, but the lighthouse will contribute to providing a common view.

STANDARDS AND STANDARDISATION

Citing another concrete example, Bert refers to the issue of communication among different machines in the factory of the future, all needing to understand each other. "Interoperability is needed to be able integrate all these different machines, tools and equipment in the factory. The added value of the lighthouse could be to help standardise this communication protocol and thus align and automate the hardware, software, machine-building, information systems and logistics processes, bringing more efficiency and competitiveness."

And Chris underlines the need for collaborative strength in dealing with what is a significant challenge. "With the Internet of Things, diversity of standards and standardisation, emerging technologies, 5G, real-time communication, high volumes of data, you name it … putting all those enablers, protocols together is quite a challenge. In the Industry 4.0 there is a group of experts that is investigating all the standards that act as enablers to facilitating Industry 4.0. So we don't have to reinvent any wheels here but bring those communities together so that we can benefit from all this information."

BREAKING DOWN THE SILOS

"Going back to what Bert said about bringing efficiency and competitiveness," Chris continues, "I would like to add the word 'effective'. There is a lot going on, especially in respect of digitalisation, but in the medium term I would like to see us establish a common view not only technology-wise, but also in terms of business models to utilise the added value in digitalisation. If the Lighthouse Initiative can help us bring all the information and knowledge together, I think this will help the ECSEL JU to determine the best strategy to achieve the transformation. So I think it's the effectiveness of gathering the information and deriving a strategy from that information that really adds value."

"To take this to one level higher," Bert says, "we are aiming to achieve a bigger impact in all our European activities. In Europe we tend to work in silos and one of the objectives of the lighthouse initiatives is to break down those silos." There are various initiatives in Europe that are trying to boost the capabilities of industry in the same kind of way, Chris suggests, "so what we need to do is to put the interfaces where they belong and establish the channels that will allow us to arrive at a more coordinated strategy, and a faster uptake of the technologies and ideas that are generated by different programmes and projects."

LET'S GO TO THE MOON

Bert champions a mission approach rather than the creation of individual kingdoms, and suggests that this would be a much better approach to take for FP9. "Like 'let's go to the moon', 'let's remove the plastic from the oceans' or 'let's get rid of CO2 emissions'. If you have this kind of common objective, everybody has to connect, combine and cooperate, and the Lighthouse Initiative is already taking a step in this direction."

Applying this approach to manufacturing, Chris agrees that a mission statement – the beam from the lighthouse as it were – is valuable in setting the focus through which projects set their objectives and develop innovations. "I think the Lighthouse is making the programmes much more effective by ensuring that the projects address the right challenges, and then the projects themselves create the impact in implementing the technologies. The Lighthouse brings greater awareness of what the projects are doing now, and in developing the strategy, it ensures that future projects will be doing the right things and that the people working in these projects actually implement the technologies and innovations in their daily business and in the daily lives of consumers through the products and services that come out of the results."

"It is the aim of Electronic Components and Systems," Bert concludes, "to enable the Industry 4.0 community to go quicker. By addressing what we know the community needs. So the label will be a 'Made in Europe' not 'Made in China'. Better quality for a cheaper price. This is where the consumer will feel the impact of the lighthouse." Chris is also convinced of the new opportunities that are being created for manufacturing in Europe. "And initiatives like lighthouse can make sure that we have the manufacturing capabilities to make the products Bert talks about."

THE ROADMAP

Joined by Yves Gigase, in an act of perfect timing, it was time to shine a little light on building the Industry4.E roadmap. "First and foremost, we have to address the industry's needs in terms of digitalisation and the corresponding tools," Yves explains. "The roadmap has to make it clear to industry how ECSEL and other funding programmes are going to help. It is not just the technology but we also have to include education and training, standardisation where we can. Support from the public authorities is very important in helping us to achieve the targets we set out in our roadmap." Moving on to the Lighthouse Initiative, Yves stresses that with twin interests within ECSEL – the entrepreneur and the public authority – what the Lighthouse should strive to do is "to allow the industry to move forward but, at the same time, be mindful of the public funding element and therefore what it is that the public authorities want the projects to focus on. We should not forget that a large chunk of the digitalisation effort in Europe will be guided by public policies. So we need to take account of this and bring these two elements into the same picture. The Lighthouse can play a role in balancing these twin interests."

AND A FINAL QUESTION – WHAT DOES THE 'E' STAND FOR?

"The E stands for ECSEL, Europe, Excellence, Electronics … it can stand for all kinds of things," Yves suggests. "We want to differentiate this from 4.0. The other Lighthouses also contain the 'E'. You could call it our brand."

CALENDAR

EFECS 2017
5-7 December 2017
BRUSSELS, BELGIUM

EFECS is the international forum with a focus on 'Our Digital Future' along the Electronic Components and Systems value chain in Europe. The organisers of this event, AENEAS, ARTEMIS-IA, EPoSS, ECSEL Joint Undertaking and the European Commission joined forces to bring all stakeholders together on 5-7 December 2017 and focus on this years' theme: 'Our Digital Future'.

HIPEAC 2018 CONFERENCE
22-24 January 2018
MANCHESTER, UNITED KINGDOM

The HiPEAC conference is the premier European forum for experts in computer architecture, programming models, compilers and operating systems for embedded and general-purpose systems. The 13th HiPEAC conference will take place in Manchester, UK from Monday, January 22 to Wednesday, January 24, 2018.

ICF WORKSHOP 2018
6 February 2018
BERLIN, GERMANY [*CO-LOCATED]

The ICF team of the ARTEMIS-IA Standardisation Working Group organizes a half-day Interoperability Coordination Workshop, co-located and organized back-2-back with the ARTEMIS Brokerage Event in Berlin. The workshop in particular has the goals to:
• inform about the recent ARTEMIS-IA initiated Interoperability Coordination Forum (ICF), an effort that will strive to precisely leverage existing interoperability results and create a community that furthers these results.

ARTEMIS
Industry Association

• disseminate and raise awareness of existing interoperability results and resources, including but not limited to the interoperability specification (IOS), linked data/OSLC, FMI and HLA (co- simulation) and results from ongoing projects such as ACOSAR, Enables and Arrowhead.
• provide a forum for pitching project ideas and discussing collaboration on interoperability related topics.

ARTEMIS BROKERAGE EVENT 201
6/7 February 2018
BERLIN, GERMANY [*CO-LOCATED]

The annual ARTEMIS Brokerage Event will take place in Berlin on 6-7 February 2018. This event prepares for the ECSEL-JU calls and other Embedded Intelligence related calls of 2018.

EPOSS PROPOSER'S DAY & INSSIGHT BROKERAGE EVENT 2018
8 February 2018
BERLIN, GERMANY [*CO-LOCATED]

The EPoSS Proposers' Day and inSSIght Brokerage Event 2018 will take place in Berlin on 8 February 2018 and is free of charge for EPoSS Members and the InSSIght project partners.

INTEROPERABILITY COORDINATION FORUM (ICF) WORKSHOP 2018
6 February 2018
BERLIN, GERMANY [*CO-LOCATED]

The ICF team of the ARTEMIS-IA Standardisation Working Group organizes a half-day Interoperability Coordination Workshop, co-located and organized back-2-back with the ARTEMIS Brokerage Event in Berlin.

CESIS – GLOBAL INTERNET OF THINGS
20-21 February 2018
MUNICH, GERMANY

CESIS 2018, the IoT conference for Exchange of Strategies, Innovations and Solutions, is the second top-of-the-line VDI congress addressing business strategies and visions related to Internet of Things and Industrial Internet of Things.

IOT WEEK
4/7 June 2018
BILBAO, SPAIN

IoT Week 2018 is coming to Bilbao, Spain from 4th until 7th of June 2018. Mark your calendars for this unique event addressing the latest trends in the IoT domain! The IoT Week gathers the community of stakeholders engaged in developing new Internet of Things (IoT) technologies and solutions. During the IoT Week 2018, the Euskalduna Conference Centre will host prominent IoT experts, researchers, IoT focused companies, research centres, European research projects, start-ups and international organizations to meet, discuss and identify emerging trends and technologies that will impact the future. The event is co-organized by the IoT Forum and IK4-TEKNIKER.

BEYOND THE HORIZON

A PRESIDIUM-EYE VIEW OF FP9

by CHRIS HORGAN

At the end of a long, informative ECS SRA day in Brussels, three members of the ARTEMIS-IA Presidium came together to look ahead to consider their hopes for what lies beyond the Horizon (2020) in the context of the next European Commission funding programme. Knut Hufeld, Daniel Watzenig and Michael Paulweber sat around the table and considered the snacks on offer and, more importantly, what was on offer on the future European front.

NEED FOR FOCUS …

Looking at the technologies that will be crucial to the next EC funding programme, it is clear that there are still many to be mastered. Michael: "Take an automotive plant – you need artificial intelligence, machine learning, image recognition, software, edge computing, high-performance computing, communication, security, safety … the list goes on. You need all this things to make a product you can sell to customers, something that is easy to use, intuitive and nice to have. The problem we are faced with is the ever-increasing complexity." And, Knut suggests, programme streamlining is not actually the answer to solving this problem because we "need the overlaps between projects and programmes. I think that by allowing consortiums to compete, as it were, in the same areas, on the same topics, you increase the chances that the right approach will become evident. After all, when you come to a fork in the road with no signposts, how do you know which is the best one to take?"

… AND DIVERSITY …

Daniel takes up this same notion. "In the United States in the automotive sector different consortiums are given the funding to research a limited topic. An assessment of the initial research results narrows the candidates down to only the best two for further funding to continue their research." Michael interjects with an important comment that "the proposal is actually written by the DoE and, on the basis of this, the consortium has to write an implementation proposal. So it is absolutely clear what has to be researched, and then things can get moving." This means that the topic and focus of the topic are clear from the start. All three would be keen for more guidance on the technology topics and the expected focus. However, as Daniel points out, there is also merit in diversity. The EU is a diverse mix of countries, policies and systems, and this does produce a wide range of research projects. Focus is not easy to achieve but by thinking in terms of ecosystems, Michael expresses a hope "that the next framework programme will provide more help and assistance to establish these ecosystems."

… AND CONTINUITY

The ECS SRA outlined and discussed that same day is in many ways a preparatory document for the next framework programme. It contains the focal challenges and expected impacts. It tries to come to terms with the evolutionary changes taking hold on industry and technology. "But there is still plenty of thinking to be done in the ECSEL camp," Michael reminds us, "to enable European industry to take the lead in the new prosumer-consumer landscape that is developing and radically changing the way products are sold. One of the main strengths of ECSEL is that it ensures that the new technologies developed in the large projects are disseminated throughout European industry. This is vital to the sustainable creation of jobs and prosperity in Europe." Evolution is a key word here. Knut hopes that "this evolution will continue in a structural sense, having seen how much work has gone in to setting up ECSEL. Continuity is a necessity." And, as Daniel underlines, "Continuity is a quality that is well embedded in ECSEL. We are constantly assessing where we are, whether we are doing the right things, what direction we are heading in. Just look at the ECS SRA we have been discussing today. We have introduced many new topics. We have shown how responsive we are to change, to the speed of change and for the need to focus on future trends and developments. This underlines the extraordinary continuity there is in ECSEL."
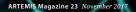
PROJECT PROPOSAL 'FILTER'

In making a good case beyond the Horizon towards FP9, the commonly held view, or hope, expressed around the table was that a project outline phase could, and should, be used to filter the number of proposals going into the second round so that time and effort does not get wasted in submitting full project proposals when the chance of the project being awarded is one in 10 to 20, Knut suggests that "by cutting the oversubscription rate and boosting the chance of getting the project awarded to maybe one in two or three, this is more motivating to do the necessary preparations. The effort for the preliminary stage – 15 pages or so – is worth it. Of course, you realise that not everyone can be funded, but those that

get through this 'filter' then have a realistic shot at funding, which means that a 100-page FPP is worth doing." Daniel echoes this sentiment. "Take the IoT calls, which had a thousand or so proposals, it is tempting to wonder whether it is worth the effort knowing that only a few will get funding. So it is something that has to change in future." Indeed, you can have wonderful strategies and research areas but if the right proposals don't come in, then you will have to accept that other projects outside your strategy will get funded. So your strategy could stand or fall by the quality of the proposals and the projects that subsequently get funded or not.

BURNING ISSUES

Michael relates the problem of assessing proposals to the ECSEL context. "They have an impossible job, really. They have to compare proposals that are related to technology, to semi-conductors, to application software – these are practically impossible to compare. My hope would be that the programme acknowledges the nature of these differences, create pockets in which similar things are compared and try to ensure that we achieve the goals of our programme. A lot of effort goes into identifying the burning issues. Of course, not every area is covered but where we believe that specific areas are important, we must ensure that there is a project devoted to this." Knut adds that this "is specific to the ECSEL programme. Other programmes in H2020 are quite narrow in scope. In ECSEL we have such a wide spread. The more specific your focus, the more likely you are to succeed. In the ARTEMIS-type of heterogeneous consortium, it is more difficult to argue the justification. And in an application-oriented context, the larger and more complex the project, the greater the chance that the proposal will contain inconsistencies. So for such projects a kind of 'hearing' phase with the proposal evaluators would be highly desirable."

Hear, hear! And with that chorus and other pressing engagements that same evening, it was decided to call an end to the discussion … for the moment, at least. There was still plenty on the agenda for another time.

ARTEMIS-IA BROKERAGE EVENT 2018

6-7 FEBRUARY IN BERLIN, GERMANY

by CHANTAL SCHOEN

The ECSEL Programme will open already its fifth Call in Q1 2018. As one of the three ECSEL partners ARTEMIS Industry Association will organise its annual Brokerage Event in 2018. The ARTEMIS Brokerage Event focusses specifically on Embedded Intelligence (Embedded & Cyber-Physical Systems, Internet of Things and Digital Platforms) related project proposals. This event is designed to help with finding the right consortium partners and the drafting of project proposals for Embedded Intelligence relevant calls, such as the ECSEL and other H2020 Calls.

About 250 participants from all over Europe are expected to attend this event. Co-located, on 8 December, EPoSS (also partner of ECSEL) will organise its EPoSS Proposers' Day 2018. The ARTEMIS Brokerage on 6-7 December open for all stakeholders in the ECS community and free of charge for the members of the ARTEMIS Industry Association.

ARTEMIS Brokerage 2018 will follow-up on the activities and results of the EFECS event 5-7 December 2017. EFECS, a new annual event with a focus on 'Our Digital Future' along the whole value chain of Electronic Components and Systems. Organised by all three partners of ECSEL (AENEAS, ARTEMIS-IA and EPoSS), the ECSEL-JU and the European Commission. These five parties are joining forces to bring all stakeholders together in one event. The first days of EFECS will focus on the ECS-Strategic Research Agenda. Project ideas pitches will be clustered by SRA
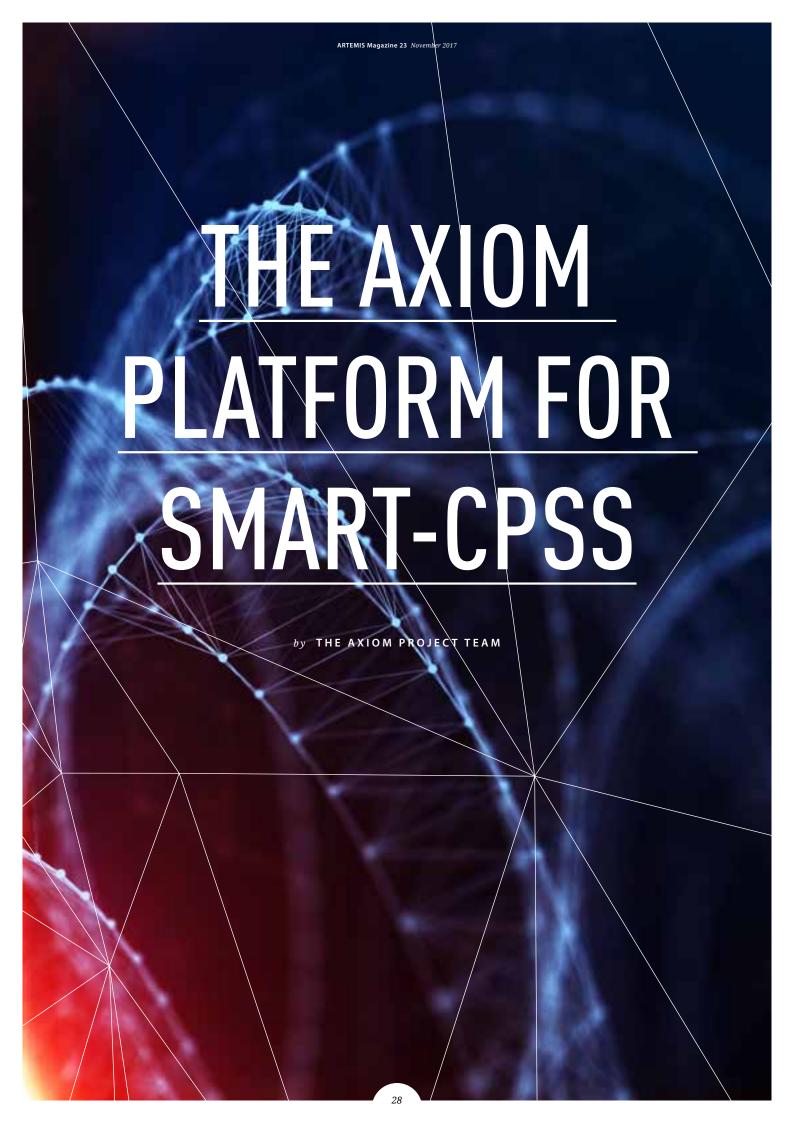
chapter and the ECS Collaboration Tool will provide an overview of all project ideas.

Although EFECS already provides opportunities for project idea development, the ARTEMIS-IA community voiced that there is a strong need for more intensive discussions and interaction in order to establish quality consortium for large system projects. The annual ARTEMIS Brokerage is a 2-day event dedicated to support the creation of project proposals with a high complexity of topics, focus on maximal impact and consisting of a large group of European partners.

The ARTEMIS Brokerage has been refined over many years to exactly implement the right process to build these high quality complex system projects. The programme consists of structured project idea pitches, followed project poster exhibition for overview and initial discussions. After which

smaller meetings are set-up in order to have in depth discussions and more elaborate presentations with the project idea initiator.

The Brokerage Event 6-7 February 2018 is the right place to bring together well targeted ideas and clearly defined cooperation needs from the research and business sector. We look forward to seeing you in Berlin.

THE AXIOM
PLATFORM FOR
SMART-CPSS

by **THE AXIOM PROJECT TEAM**

The AXIOM Project commenced February 2015, with the objective of researching new software/hardware architectures for smart Cyber-Physical Systems (CPS), to meet the growing needs of distributed and autonomous systems that incorporate multi-sensory inputs. Common applications of CPS are intelligent homes, smart cities, and security surveillance.

MULTIDISCIPLINARY RESEARCH COLLABORATION ACROSS EUROPE

The development and wealth of knowledge behind the AXIOM Project consists of three research groups/universities – the University of Siena, in charge of coordinating the project;

Barcelona Supercomputing Center (BSC), leading the software toolchain development; and the Foundation for Research and Technology-Hellas (FORTH), leading the interconnection development. Along with four enterprises–SECO, Vimar, Evidence and Herta Security, all of whom bring expertise

from their respective segments–embedded systems, intelligent homes, Linux operating systems, and biometric security.

Two-years after the project was born, the initial batch of AXIOM boards arrived out of the oven; the first board that combines three worlds in one: Arduino, ARM computing and FPGA. Giving members of the consortium an opportunity to put into practice their extensive research. It runs a version of Barcelona Supercomputing Center's flagship parallel programming model, OmpSs, allowing straightforward FPGA programming. It's designed to be the perfect combination of high-performance computing, embedded computing and CPS. As such, it aims to provide the ideal platform for real-time data analysis of a huge amount of data in a short time frame, machine learning, neural networks, server farms, bitcoin miners – you name it.

AXIOM
Agile, eXtensible, fast I/O Module for the cyber-physical era

HETEROGENEOUS AND RECONFIGURABLE COMPUTING

At the heart of the board is the heterogeneous Xilinx Zynq Ultrascale+ ZU9EG, a multiprocessor system-on-chip (MPSoC), with a 64-bit Quad core A53 @ 1.2GHz, a 32-bit Dual core R5 @ 500 MHz, 600K System Logic Cells on the reconfigurable side, and high-speed transceivers allowing four 10Gbit/s ports. With the capability to process a huge amount of data, the project developed the "AXIOM-link", which is undoubtedly one of the most relevant features in the architecture, since it provides a fast, low latency, inexpensive and easy to operate way, to interconnect multiple AXIOM Boards

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to arrange small clusters. With development lead by FORTH, inspired by research accrued creating the prototype manycore Formic board under the ENCORE Project. The "AXIOM-link" consists of a custom Network Interface Controller, synthesized in the FPGA fabric, and dedicated drivers created by EVIDENCE, who lead the Runtime and Operating System development, to enable RDMA transfers to quickly move data between system's node. Four USB Type C connectors are used to build small clusters of AXIOM boards using inexpensive but high speed cables without the need of external routers or additional hardware.

The production of the AXIOM board is just one of the realizations of the three-year long project. The architecture advancements gained by the collaboratory consortium have been applied to other projects, like the unique UDOO X86, an open-spec single-board computer aimed at makers and professionals, containing both a Intel Quad Core 64-bit processor and an Intel Curie module. Crowdfunded on Kickstarter last year, it surpassed its funding goal eight-fold by raising $800,000. Thanks to the AXIOM project, the OmpSs programming model can be run on a cluster of UDOO X86, allowing users to craft their own supercomputer.

REAL-WORLD SCENARIOS

Herta Security, a leader in software development for biometric security applications, when using the AXIOM board, experienced a ten-fold increase in performance of their security focussed algorithm that uses a Convolutional Neural Network (ConvNet) to process the many deep layers of visual imagery. Recently, their BioSurveillance NEXT tool, built upon this algorithm, was selected to be part of a groundbreaking pilot programme run by the German government at Südkreuz station, Berlin. As part of the pilot, around 300 volunteers had their photographs scanned and stored in a database. The visual input from three cameras are interpreted in real time, with the numerous faces extracted and compared against the database.

Partner Vimar is using the AXIOM board to create a Smart Home Living application, using algorithms to achieve a high level of automation, while still allowing the user to interact with the processes. Such a system can monitor media inputs, like a video door entry system that uses voice for commands, and iris recognition for security. With the powerful core of the system, it is possible to expand into the surrounding environment, to

enable people to share data, reinforcing and expanding the security fence to a wider area, to improve the safety of the community.

Another possible scenario could be a smart mall, with both retailers and the mall proprietor accessing different aspects of data. The system can analyse and collate biometric data of the mall occupants, to provide a significant in-depth look into the subsets of consumers visiting the various retail spaces, categorised by gender, ethnicity and age. In addition, the billboards in the interconnected walkways can be updated to reflect the calculated interests of the public in its proximity.

INDUSTRIAL MARKET

SECO, involved in the embedded systems market since 1979, contributed extensive knowledge of the industrial segment to the AXIOM project. In addition to managing the hardware development of the AXIOM board prototype, they also adapted the board for their industrial market, by developing a SMARC Rel. 2.0 compliant module, SECO SM-B71, that will be placed into a carrier board that has the possibility to interconnect with the user's existing embedded infrastructure.

EDITORIAL INFORMATION