ARTEMIS

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ARTEMIS Magazine -May 2014

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Projects that count: ARTEMIS is more than just
another funding programme
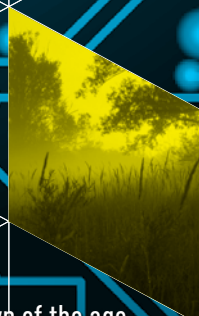
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ECSEL: A NEW VISION, A NEW CHALLENGE

FOREWORD

Jan Lohstroh
Secretary General
ARTEMIS Industry
Association

Dear ARTEMIS friends,

We are now in the middle of a lot of preparation activities to get the ECSEL Joint Undertaking airborne in mid 2014.

In this Magazine we have quite some articles and interviews that look forward to the challenges and opportunities of ECSEL. Heinrich Daembkes speaks about "A new start: ARTEMIS-IA to serve industry within ECSEL and Europe", Khalil Rouhana reveals his view on "The European Industry and its Competitiveness", Andreas Wild speaks about "ECSEL: a new vision, a new challenge", and an excerpt of the "ECSEL MultiAnnual Strategic and Innovation Agenda 2014" is presented by myself.

We have demonstrated over the years that the ARTEMIS-JU programme was more than a funding programme, due to all the leading and supporting activities of the ARTEMIS-IA Working Groups. With ECSEL this will not change. The activities of the ARTEMIS-IA Working Groups remain important to support the ECSEL Joint Undertaking. For this reason most of the ARTEMIS-IA Working Groups present themselves in this Magazine.

Further you find information about "OpenComRTOS Designer", an article of Alois Knoll about "The dawn of the age of autonomy", and reports of the ARTEMIS-IA Pre-Brokerage Event 2014, the ARTEMIS-IA Spring Event 2014 and the 2nd European conference on Interoperability for Embedded Systems development environments.

Alun Foster reports about the last ARTEMIS-JU Call and about achievements of the total ARTEMIS-JU programme.

Finally the Baton Blue(s) is written by Knut Hufeld.

I wish you a lot of reading pleasure.

Jan Lohstroh

FOREWORD

Alun Foster
*Acting Executive Director
/ Programme Manager*
ARTEMIS Joint
Undertaking

Dear readers,

In the foreword to the ARTEMIS Magazine number 15 I mentioned 'changes'. In the meantime the adage that "the only constant is change" has come again to the forefront, as preparations are now in full swing to launch the ECSEL Joint Undertaking that is expected to happen within a few short months of the time of writing – where ARTEMIS-JU, ENIAC JU and the EPoSS platform will merge. With that in mind, the only constant in this is that ARTEMIS Industry Association (ARTEMIS-IA) will continue to be the focal point for the running ARTEMIS projects and the embedded systems community in general, in addition to working alongside their colleagues in the AENEAS and EPoSS Associations in the new ECSEL Joint Undertaking.

Alongside more information about the start-up of ECSEL JU we present some articles about some of the successes of the ARTEMIS programme, both from past projects and looking forward to one of ARTEMIS' major initiatives 'EMC2', with an interview with this ARTEMIS Innovation Pilot Project's coordinator. A recent ARTEMIS Technology Conference and the work of the ARTEMIS Working Groups – the in-kind work done behind the scenes by the community players that keeps initiatives like ARTEMIS alive – also get a well-deserved spotlight here. We finish off what I hope you will find an interesting and enjoyable magazine with a look at the outcome of ARTEMIS' last call of 2013 and a brief look at how this contributes to the programme as a whole.

Alun Foster

NEW START:
ARTEMIS-IA TO SERVE INDUSTRY WITHIN ECSEL AND EUROPE

By Prof. Dr. Heinrich Daembkes,
President of the ARTEMIS Industry Association

The new year has heralded significant changes for our Community. In organisational terms, the major change is the imminent merger of both the ARTEMIS-JU and the ENIAC-JU into the new ECSEL Joint Undertaking and EPoSS becoming a member of the ECSEL-JU as well. The goal is to cluster the strengths of the three organisations and so better meet the new challenges through well-aligned approaches along the entire value chain. ARTEMIS-IA will continue its work as one of the constituent members of the ECSEL-JU and will also continue to embody the ARTEMIS- ETP, responsible for the pan-European Strategic Research Agenda of Embedded/Cyber-Physical Systems. The cooperation of ARTEMIS-IA with ITEA will continue.

By Heinrich Daembkes, AIRBUS Germany

Many of the key features of our technical products are already determined today by the Embedded Electronics Systems. They define the behaviour, limit the envelops of operability and enable unimagined performance and comfort. Autonomous driving, smart glasses, integrated medical diagnostic systems, smart implants or prostheses, networked Smart Systems, intelligent homes and smart cities: all are considered 'natural extensions' of today's systems. The underlying unified vision is to improve life through intelligent products, in our offices, in our cars, at home and for leisure! And the source is the intelligent combination of advanced electronic components with the built-in software, resulting in smart Embedded Systems – the combination of Nanoelectronics and Embedded/Cyber-Physical Systems – that are becoming so prominent in society today. They form the technological backbone, or neural system, of our modern world and as such act as key enabling technologies in many innovations and solutions for societal challenges. They are therefore a very significant factor in the competitiveness, employment and prosperity of countries and regions.

Sharing the work between Micro- / Nanoelectronics, and the software related part, ARTEMIS helps to provide the most advanced Embedded Systems, focusing on the software and system design aspect. While sensors and actuators as direct interfaces to the physical world are, and will remain, analogue, the essential properties of the global system are essentially determined by software and digital electronics. Digital technologies in the form of networked Embedded Systems are already vital but will become even more so for the future of our economy. For example, the centrality of software and electronic systems as key selling features of today's products can be illustrated by the assertions of the automotive sector:

BMW: '90% of the innovation today comes from electronics and software'

Daimler: '80% of the present customer functions are based on software'.

So market success depends on mastering complex electronic systems, and this traditional European industry strength must be maintained and extended. This is especially crucial given the enormous impact that 'smart' is having everywhere (Internet of Things); it will demand so much more of Embedded Systems. The more complex systems become, the more we need to create processes, methods and tools to enable these complex systems to be developed in time, which means a high degree of automation and automated checking along with incremental certification to reduce cost and duration. As an aside, but an important aside, it is striking to note how little the majority of users is aware of how these systems work and what really happens inside. It is only when privacy and security are affected that such questions get asked.

FROM PAST RESULTS …

The year 2013 closed off an important phase for ARTEMIS:

> We issued the final Calls under the ARTEMIS-JU
> We had to prepare the ARTEMIS-JU phase-out
> We were and are heavily involved in preparing the transition to ECSEL as the new common framework under which the ongoing projects will be finished and future activities will be launched.

With the ARTEMIS-JU period ending, we are able to summarise the engagement of the different parties. Unfortunately, several Member States once again reduced their contributions to the Calls, which is in contrast to industrial needs, and resulted in many of the excellent proposals, detailed, submitted and positively reviewed not being awarded.

All in all, after 6 calls of the ARTEMIS-JU, we have to state that the success of the ARTEMIS programme is/was clearly limited by the availability of Member State contributions; instead of the envisioned €800 million over that period, we received only €340 million in funding, leading to an overall programme effort of €1100 million instead of the originally envisioned €2600 million. The declared intention of private members to contribute much more to this programme could not be met. Therefore the budget available from the European Commission was underutilised. While some of the reasons for this can be attributed to the general economic downturn and financial difficulties of some Member States, we have to look at other effects as well.

… THROUGH PRESENT INITIATIVES …

The result of the last two Calls of ARTEMIS-JU fully confirmed the AIPP (ARTEMIS Innovation Pilot Project) concept: a clear shift in the heart of the project proposals and allocated budgets to 'Think Big' approaches. It is my impression that after several years of preparing the ground, the partners are now

able and willing to drive through the results of research into innovative solutions. They have understood this new instrument as an efficient way of bridging the valley of death, as it were.

Another observation: the final Call before ECSEL reveals a prototype of potential future projects. The AIPP "EMC2" covers the entire span, from electronic components to subsystems and systems approaches, for several relevant applications! With an overall budget of € 94 million and the involvement of 98 contributing partners, we expect clear impact on the use and usability of multicore processors for the benefit of key applications.

… TO FUTURE COOPERATION

The cooperation with the future partners in ECSEL, with AENEAS and with EPoSS, already started in 2012, when on request of the European Commission the High Level Strategic Research and Innovation Agenda of the ICT Components and Systems Industry, as represented by the ARTEMIS, ENIAC and EPoSS ETP's, was elaborated. The many meetings between the three Industry Associations enabled a solid base for trustful cooperation to be established. All relevant organisational issues were discussed and most of them settled. In order to prepare common Calls for 2014 and later, a common strategy document had to be worked out. Due to the historically different approaches, the first version of the MASRIA 2014 will still show its roots and have some homogeneities but a clear and smooth concept for a strongly integrated approach has already been agreed and will be implemented in 2014 for 2015. The harmonised and shared activities will allow us to achieve more efficient processes and enhance the competitiveness of Europe!

The cooperation beyond the JU programmes between ARTEMIS and ITEA has also been extended with the common Vision 2030 published in 2012, and expanded with a Vision 2030, published in 2013. This publication contains very detailed figures of market size and job creation, starting from a global view and detailing that for the relevant domains for Europe. It will be an important base for future discussion on the economic impacts and relevance of systems and software based activities in Europe. We are no longer guessing, we have a basis in fact! The document was very well received by the Public Authorities. The booklet was introduced to the public during the ITEA – ARTEMIS Co-summit event in Stockholm in December 2013 and together with ITEA presented to Neelie Kroes (Vice-president European Commission) and her team on 13 March 2014. Ms Kroes confirmed that Digital Technology is vital to employment in Europe.

The Co-summit and the common meeting with Ms. Kroes once again demonstrated the close cooperation of ITEA and ARTEMIS in one technical domain: two different instruments for one common goal, being used depending which is best fit for purpose!

'MORE THAN A FUNDING PROGRAMME': THE ARTEMIS WORKING GROUPS

By Ad ten Berg , Office Director ARTEMIS-IA

The background of the ARTEMIS Working Groups goes back to the first ARTEMIS Strategic Research Agenda (SRA) issued in 2006. The holistic approach of the SRA to R&D in Embedded Systems also required the support of activities outside the range of those that could be executed in the R&D projects. Therefore this SRA identified several objectives that were essential to 'Make it Happen' as the chapter title was named. To implement such activities, the Steering Board decided in several meetings (June 2008, January 2009) to establish the following Working Groups:

Working Group:	Chair(s):	Year
Standardisation:	Josef Affenzeller and Laila Gide	2008
Education and Training:	Erwin Schoitsch	2008
Success Criteria & Metrics:	Patrick Pype	2008
Strategic Research Agenda:	Laila Gide and Josef Affenzeller	
SME Involvement:	Pedro Ruiz	2009
Tool Platforms:	Werner Damm	2009
Centres of Innovation Excellence:	Jerker Delsing	2009
Repository	Mathias Vierimaa	2011

These came next to the existing Working Group Strategic Research Agenda, chaired by Laila Gide and Tatu Koljonen. The WG SRA was also formally established in 2008, but had already been active years before. The WG SRA is one of the most active and most visible Working Groups, producing a MultiAnnual Strategic Plan and an Annual Work Programme every year since 2008, with also a full update of the SRA in 2011, with again an update in 2013. Currently the WG SRA is actively bringing the ARTEMIS SRA topics into the draft MultiAnnual Strategic Research and Innovation Agenda (MASRIA) and Research and Innovation Activities Plan (RIAP) 2014 of the future ECSEL-JU.

At the Spring Event 2009 in Nice, France, all Working Groups presented their plans for the first time to the ARTEMIS Community in a special Focus Session. More in-depth information was presented in the ARTEMIS Magazine no.4 (July 2009), with interviews of all the Chairpersons of the ARTEMIS Working Groups.

Later in 2010 a workshop session was held back-to-back with the Co-summit 2010 in Ghent, Belgium. In this workshop the objectives of the SRA chapter 'Make it Happen' were discussed with the project coordinators. There the idea was born to think about options to capture the results of projects for future use and make these project results more sustainable. Based on this outcome, in spring 2011 the Steering Board decided to establish the WG Repository.

PART OF THE ARTEMIS SUCCESS

One may ask whether these Working Groups have actually added value to the ARTEMIS programme. The answer is a confirmative yes. The most important achievements of the Working Groups have been published in this Magazine, such as introductions of the labelled Centres of Innovation Excellence, directly resulting from the WG CoIE activities. Another result is the concept of ARTEMIS Innovation Pilot Projects, a new and innovative concept in project definition, created by the WG SRA.

In the **ARTEMIS Book of Successes**, an overview of the most important achievements of the Working Groups was presented. The achievements of the Working Groups are considered by the outside world as *programme level* achievements, unique to ARTEMIS. By this, the Working Group activities have been and are essential contributions to the success of ARTEMIS.

A shortlist of major achievements of the Working Groups is:

WG Tool Platforms
Created labelling criteria with an application procedure. The CESAR Tool Platform was labelled in 2012. New Tool Platforms are being scouted.

WG CoIE:
Created labelling criteria with an application procedure. Three CoIEs have been labelled: EICOSE (2011), ProcessIT.EU (2011) and ES4IB (2011). A new CoIE on Smart Cities is in the early stage of the proposal procedure at this moment.

WG Success Criteria and Metrics:
Created a set of Metrics and Success Criteria and organised two enquiries (2010 and 2012). The results were published in two reports, issued in 2011 and in 2013. A third enquiry is under construction and will be executed before the end of 2014.

WG Standardisation:
Has delivered a Standardisation Agenda (SA) through the FP7-CSA project "PROSE". A revival was made in 2013 with meetings in September and in early January 2014 to prepare for a new SA under Horizon2020.

WG Repository:
A first Repository prototype was demonstrated at the Co-Summit 2012 and further development took place in 2013. A second release of the Repository is expected in 2014.

HOW TO CONTINUE?

All Working Groups are staffed by the in-kind efforts of the members. However, the changing availability of in-kind effort of members has led to rather ad-hoc progress among most Working Groups over the last few years. The main underlying issue might be the lack of funding for such Working Group efforts, which means that all efforts can only be made in-kind. In the new Joint Undertaking, ECSEL, support actions are likely to become possible and we look forward to the opportunities this will provide for our Working Groups.

At the Spring Event 2014 on 18 and 19 March in Amsterdam all Working Groups met and discussed their plans for the future. All these plans were presented and discussed in the Steering Board meeting, while the results of the meetings of the Working Groups were presented in the General Assembly.

ARTEMIS-IA's activities, also under the umbrella of ECSEL, should be more than just about funding projects. ARTEMIS-IA has a Strategic Research Agenda to turn into reality and "Make it Happen", partly by stimulating and challenging projects under ARTEMIS-JU, and in the future ECSEL-JU projects, and partly by the Working Groups' activities, that also should continue in the ECSEL-JU era.

In the end, the in-kind effort and enthusiasm of members is and remains the basis for success of the ARTEMIS-IA activities and it is this enthusiasm of our members that is essential to implementing the challenging goals of the Working Groups.

In this Magazine, each of the Chairs of the Working Groups is interviewed to give you an insight in what is cooking and what next steps will be made by each of the Working Groups in the course of this year.

USING THE PAST TO IMPROVE THE FUTURE
ARTEMIS REPOSITORY

Group interview by Chris Horgan

The ARTEMIS Repository was established with the aim of making available the results of ARTEMIS projects to the R&D Community. Repository 1.0, launched in 2012, comprises the publicly available documentation – general descriptions and executive summaries – intended to enable new consortia and project partners to benefit from information on setting up new projects as well as provide a showcase to promote the results and the impact of these results. It also represents a snapshot of the coverage of industrial priorities and acts as a support mechanism for Centre of Innovation Excellence (CoIE) network building. The Repository targets a wide range of organisations and individuals in the R&D Community, both in Europe and around the world, from large companies to SMEs and from researchers and students to future projects and programmes, both ARTEMIS and other. As such, the Repository embodies the ARTEMIS way.

The Repository Working Group is chaired by Matias Vierimaa of VTT and its current members are Alun Foster (ARTEMIS-JU), André Hebben (ARTEMIS-IA), Ingrid Kundner (AVL), Frank van der Linden (Philips Healthcare) , Andrei Lobov (Tampere University of Technology), Reiner Schmid (Siemens) and Elena Tsiporkova (Sirris). The WG is keen to add industrial members to its ranks.

THE REPOSITORY MECHANISM

ARTEMIS-IA hosts the Repository, taking care of the information storage and IT. All ARTEMIS projects and partners are included in the Repository. In figures that's 12 challenges, 52 ARTEMIS projects and 1683 organisations (or project partners), which is quite a reasonable mass to start with. The Repository is regularly updated and projects themselves can now also directly access or upload to the Repository after they register to an ARTEMIS-IA account. The uploaded deliverables are automatically converted into HTML, while the possibility to upload using other formats such as PDF and Word is currently being explored. The visual browser will be updated so that the look and feel of the Repository is enhanced and to enable related projects to be viewed and to improve search functionality. As it now stands, version 1.0 represents a technical prototype and collection of public information. However, if the Repository is to achieve the real impact for which it has been created, there is a need to go beyond public information, since the public deliverables from projects tend to comprise largely limited technical information. So a *Repository Evolution Plan* has been devised to tackle this new challenge. The WG is currently working on version 2.0 with a view to realising version 3.0 with full deliverable integration.

GOING UP A LEVEL

The WG is looking at ways of taking the Repository up a level, going beyond public information and enabling public (PU status) and public restricted (PR) deliverables to be shared with other European and national research projects. Of course, there are still a number of issues and hurdles to be overcome, largely legal and centring on aspects such as intellectual property, licensing rights, how to handle open-source results and ensuring that the whole process is technically feasible. However, the will is clearly there and a flagship project, CESAR, has already shown the way in its Process 4 Exchange approach. This is a good example of the impact that such an approach can have.

In a collaborative project like CESAR, cooperation is the key to successful project execution ,so to exchange information with other research initiatives, the CESAR process 4 exchange was established, with both PU and PR deliverables available. RE (restricted) deliverables, however, remain confidential to the CESAR consortium. The coordinators of national and European research projects are able to request access to the share point that contains PU and PR documents, but while these may be shared within the respective consortium, they are expected to be treated as confidential information in respect of third parties. Projects already actively participating in the CESAR Process 4 Exchange are MBAT, SAFE, ARAMIS and RECOMP. Before the Process 4 Exchange got up and running, less than 10% of CESAR deliverables was public but that percentage has now risen to 25% of CESAR deliverables being accessible for ARTEMIS projects through the Process 4 Exchange.

FROM 1.0 TO 2.0 (AND 3.0)

So, what are the implications for the ARTEMIS Repository, and what are the issues that the WG members are putting their heads together to resolve? The WG team is currently in the process of planning the next level,

Repository 2.0, having already made a start on the technical implementation and gaining insight into the potential intellectual property rights (IPR) restrictions that could apply, as well as how to deal with licensing issues and open-source results. In addition, the WG is looking into what kind of public restricted material could be (made) available. Such information is essential in defining the process and guidelines for V2.0. Of course, the Repository is intended for the projects, so their information, requirements and expectations are vital to ascertain. And since nothing is free, the funding options for Repository 2.0 also need to be considered.

With the impending ECSEL Joint Undertaking gaining momentum with each passing day, the WG is also looking at the cooperation possibilities that could exist in this respect and at promoting and expanding the ARTEMIS Repository further. So, once the key issues of how to include public restricted material, deal with the various legal implications and overcome residual technical and practical matters, a decision can be made on proceeding to and implementing 2.0, and ultimately a fully integrated 3.0.

> THE WG IS CURRENTLY WORKING ON VERSION 2.0 WITH A VIEW TO REALISING VERSION 3.0 WITH FULL DELIVERABLE INTEGRATION.

WORKING GROUP STRATEGIC RESEARCH AGENDA

OVERSEEING A LIVING, DYNAMIC DOCUMENT

By Laila Gide , Thales, France

The pan-European ARTEMIS Strategic Research Agenda is a tool to realise the industry-driven, long-term vision of the ARTEMIS Technology Platform. It helps to align and coordinate research policies in Europe and helps to match the allocation of programmes and resources to different technology and policy challenges. The mission of the SRA was based on maintaining a strong technological capability in both the supply and application of Embedded Systems by overcoming fragmentation in the European supply base for the components and tools of Embedded Systems. By removing barriers between application sectors ARTEMIS aimed to yield multi-domain, reusable components and systems. The SRA has been used as a reference by the European Commission and by a number of national bodies when establishing their own research priorities and programmes.

As a living, dynamic document, the SRA has undergone a number of reviews, rewrites and repositioning. In the light of new trends and evolution of technology, of industry and

of society, the 2013 addendum to the 2011 SRA still underlines the need to deliver an overarching agenda that inspires research policies makers in Europe and their work programmes (mainly the Embedded and Cyber-Physical Systems sub-programme of the ECSEL-JU, the new Joint Undertaking, the EC H2020 work programmes, the multi-national EUREKA clusters ITEA3 and CATRENE programmes as well as the national and regional research programmes).

The 2011 ARTEMIS SRA stipulates that *'In a world in which all systems, machines and objects become smart, have a presence in cyber-physical space, exploit the digital information and services around them, communicate with each other, with the environment and with people, and manage their resources autonomously, the ubiquity of the Embedded Systems, with their present and forecasted evolution, will have more and more impact'.*

CYBER-PHYSICAL SYSTEMS
But Embedded Systems/ Cyber-Physical Systems are now entering a new era, as the societal and economic challenges

are not only highly relevant for European industrial growth, jobs and added-value creation, strengthening the value chain and Eco-Systems. We are also seeing that the technological responses have a strong impact on society and are shaping it. And the response to the grand societal challenges such as ageing population, healthcare, energy, food and water supply, sustainable mobility and transport is highly dependent on large, open networks of Embedded Systems that now form an invisible '*neural network of society',* driving innovation at the level of society rather than single industry. From an Internet perspective, these trends are leading to the *Internet of Things,* where billions of Embedded Systems are providing information about and interacting with the physical world that can be used in all kinds of information systems. In turn, this leads to a new area of *Cyber-Physical Systems* (CPS) where the networked Embedded Systems are considered an integral part of their physical surroundings, opening up new opportunities for powerful software systems and enabling new embedded system services through integration with the services of the information systems infrastructure. Internet

of Things, and consequently the Things of the Internet, and Cyber-Physical Systems are complementary directions that will together help to shape a society where humans and machines increasingly interact to provide services and solutions that benefit society but are inconceivable with the present state-of-the-art technology.

ACHIEVING GREATER IMPACT

For the coming period (2014-2020), the following priority targets have been selected to guide the Embedded Systems/Cyber-Physical Systems R&D programmes with the purpose of having greater impact and quick-to-markets results:

> Exploiting the ubiquity of the Embedded Systems/Cyber-Physical Systems that goes far beyond that anticipated, where embedded applications are surfacing (emerging). Embedded Systems are now connecting to the physical world (CPS) and share all kinds of networks (including Internet) and components in configurations whose conceptual structure has to map to their physical structure, with increased secure quality of services.
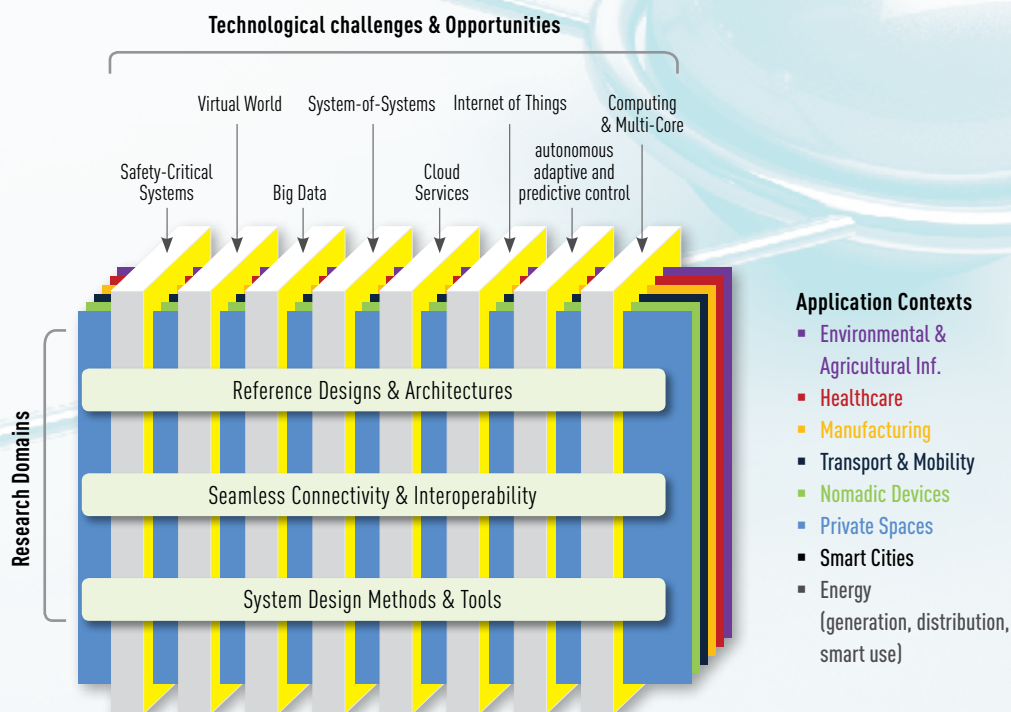
> Exploiting the connectivity of the networked Embedded Systems/Cyber-Physical Systems as the neural system of society that should no longer be only considered in isolated application contexts, but in relation to what present and future societal challenges they can address.

> Optimising the Technology Time to Market/Technology Time on Market factor that is continuously increasing and affecting new markets and products. Indeed, optimising the development cycles and accelerating transfer from basic research (academia) to applied research (academia and public research institutes) and to industrial research (large industry, OEMs, supply chains and SMEs) is a great challenge.

> Mastering the complexity while reducing cost and increasing performance is a key challenge: the exponential potential increase brought by the miniaturisation of semiconductors is creating great opportunities, and necessitating equivalent investment in Embedded Systems to leverage the exploitation of the new potentials. Ensuring the proper, secure collective and autonomous behaviour of the heterogeneous interconnected elements will be at the core of the challenge. It will encompass a multi-disciplinary approach, various levels of tooling and methodologies.

> Reducing and managing the energy and power consumption cost. Power is now the major limiting factor in all computing elements. For data servers and HPC, the cost of the electricity bill and the capacity of cooling limit the capacity of the data centres. For mobile devices, autonomy is limited by power consumption and even for cars this translates into non-negligible levels of CO_2 emission. For smart sensors, leveraging the energy of the environment (scavenging) or long autonomy on small batteries is mandatory.

Matrix 2.0

Technological challenges & Opportunities

Virtual World · System-of-Systems · Internet of Things · Computing & Multi-Core

Safety-Critical Systems · Big Data · Cloud Services · autonomous adaptive and predictive control

Research Domains

- Reference Designs & Architectures
- Seamless Connectivity & Interoperability
- System Design Methods & Tools

Application Contexts
- Environmental & Agricultural Inf.
- Healthcare
- Manufacturing
- Transport & Mobility
- Nomadic Devices
- Private Spaces
- Smart Cities
- Energy (generation, distribution, smart use)

STANDARDISATION WORKING GROUP

By Josef Affenzeller, AVL, Austria

The main ambition of ARTEMIS is to overcome fragmentation in the Embedded Systems industry by cutting barriers between application sectors so as to "de-verticalise" the industry and establish a new Embedded Systems industry that supplies the tools and technology that are today quite separate but will in future be shared across a wide range of application sectors. This activity indicates the strong position of ARTEMIS-IA in the ECSEL-JTI activities also in terms of Cyber-Physical Systems. In particular, interoperability for tool-chain building as well as for workflow is essential to reduce development time and cost. Greater accuracy and higher quality of results are also vital to retaining safety properties as product complexity increases. Some ARTEMIS projects have indicated great potential here and this should be considered in Tool Platforms, so-called RTPs, as well as for interoperability to the large PDM systems. To realise this vision, standardisation of interfaces between the tools' PDM system suppliers is needed, also in particular for the workflow in organisations whose business activities and structure have a geographical spread. The ARTEMIS Community identified the need to foster the standardisation activities in project networks and Working Groups.

INDUSTRY AGREEMENT ESSENTIAL

The Standardisation Working Group is looking not only for interoperability but also for standards in the electronic organisations, e.g. ISO, IEEE, IEC. Up till now, the Standardisation Working Group has provided two Strategic Research Agenda (SRA) documents and has been active in the promotion of standardisation activities via the partners in the projects. The last SRA was established via the support action (CSA) called ProSE, where processes and standardisation activities are described and recommended. Also, the introduction of so-called industry-agreed regulations, which are not official standards, is described. Such an approach has a high priority for the success of standardisation, as an agreement within industry is a prerequisite for the application of a standard.

CLOSE COOPERATION

The Standardisation Working Group should be seen as a group of experts which provides direct support for projects by communicating with the respective partners in the projects. In particular, the interoperability specification is one of the topics for the coming period. Within the interoperability theme, a lot of activities were created through projects. Enough progress has been made in recent years in order to start closer interactions with the ARTEMIS-IA Tool Platforms and to involve the EICOSE institute in incubating necessary follow-up projects. For all three activities, the interoperability specification is essential. Therefore, structured cooperation between the Working Groups requires synchronised activities. Based on internal discussions, it was agreed that the Tool Platform, along with other activities, will deal mainly with the various projects in terms of IOS results and harmonisation. In addition, the Standardisation Working Group will take over the interaction with standardisation bodies to bring the results to European and world standards. It is clear that close cooperation and interaction between the Working Groups are essential. Figure 1 illustrates the links between these activities including EICOSE.

SUPPORT ACTION

The Standardisation Working Group is seen as an essential activity within ARTEMIS-IA in order to respond to all the technical challenges. For the realisation of all these standardization activities, especially for the research centres, universities and industry, it is necessary to have dedicated financial resources to support this activity. For this purpose, it was agreed to initiate a new Support Action (CSA) under the H2020 LEIT-ICT Call. This support action should contribute to realising the vision of next generation development environments in a foreseeable future. The needs of the Working Group Tool Platform, the Standardisation Working Group and the EICOSE activities will be defined in this CSA. Further meetings will be planned with the members of the Standardisation Working Group in the near future to harmonise the planned activities.

WG METRICS : STATUS & PLANNING

By Patrick Pype, Belgium

First of all, the WG Metrics would like to thank all people and all consortia that have filled out the questionnaires. It is of very great value that many people respond in order to see credible results on what ARTEMIS means for the business of Embedded Systems in Europe. This will have a big impact for future subsidy programmemes at European level. We therefore would like to ask all of you to also pay a lot of attention to the next questionnaire which will be launched in September 2014.

As a reminder, we like to emphasize once more that the charter of the WG Metrics is to define and monitor success criteria of the ARTEMIS-JU programmemes in order to support the Public Authorities on evaluating the ARTEMIS-JU results and to provide inputs to the ARTEMIS Industry Association on priority setting and refocusing the ARTEMIS-JU programmeme.

So far, two reports have been launched, respectively in the first quarter of 2011 and 2013, based on questionnaires filled out by different project consortia of projects which have been running for at least two years. Where the first report was only based on a limited number of respondents - and as such was considered more as an initial experiment to derive results in a bottom-up matter -, the 2nd report was based on around 150 respondents.

The 2nd report has served as input for other ARTEMIS evaluation reports by different fora and has also served as input for the joint ITEA-ARTEMIS-IA high-level vision document '2030 – Opportunities for Europe – The impact of software innovation on revenue and jobs'.

In the 2013 report of the WG Metrics, the following key strengths have been identified:
1. New partnerships and involvement of SMEs
2. Growth of awareness of and interaction with Centres of Innovation Excellence (CoIE)
3. Business impact on reduced development costs, reduced Time to Market and higher re-usability
4. ARTEMIS Annual Workplan targets are a living instrument
5. Societal challenges are addressed properly – "security and safety" being number 1. However, taking into account the security and safety focal area of ARTEMIS (in comparison with the EU Policy), one can state that overall "Transport and Mobility" (including the security and safety aspects) remains the key focal area of ARTEMIS
6. Attention for prototypes and demonstrators is growing, including public trials and field tests.
7. More attention has been paid to press releases and press coverage.

ARTEMIS contributes through all of its activities to strengthen the European Innovation Eco-system and thus improve the level of competitiveness of the European industry.

Currently a 3rd round of the questionnaire is planned to be launched in September 2014 for even a larger group of respondents in order to have a new report ready in March 2015. Based on feedback from the respondents, the questionnaire is further being optimized. There will be less questions, because several respondents complained on the amount of questions or didn't finish all questions. So the goal is to reduce from 46 to around 30 questions. Furthermore the amount of multiple-choice questions will be increased. Finally, the questions on business impact will be revisited, because this is considered as one of the important criteria to monitor for the ARTEMIS programmeme.

The WG Metrics has succeeded in showing the efficiency of having both a bottom-up as well as a top-down approach in defining and monitoring success criteria for a large European programme as ARTEMIS. It helps in clearly seeing the impact that such a programme can bring towards the industry and research Community on Embedded Systems for different application domains. So let's continue doing our good work with the whole ARTEMIS Community !

WORKING GROUP SME INVOLVEMENT

By Pedro Ruiz , Integrasys S.A. Spain

The WG SME was set up by ARTEMIS Industry Association in January 2009. High-tech SMEs are an important link in the value chain for systems and solutions, and are expected to play an essential role in the capitalisation and dissemination of the technologies. With collaboration with large industry considered crucial for SMEs, the Eco-Systemmodel supported by ARTEMIS seems to offer the proper mechanisms to facilitate these synergies with the key players in the embedded world.

In the past few years, several initiatives have been set up from WG SME, with activities of varying intensity. In the new framework 2014-2020, we aim to revitalise the Working Group with the main objective of properly reflecting and supporting the interests of SMEs in this new period. It is important to mention that another ambitious goal of the Working Group is to see ARTEMIS projects being boosted and coordinated by SMEs.

Up till now, the WG SME has helped to achieve the following objectives:
> To enable a Chamber to have a member in ARTEMIS Industry Association Presidium.
> To give SMEs visibilty in the Magazine with at least one article in the ARTEMIS Magazine about SMEs. Different types of articles are published, such as interviews with relevant companies, information on participating in ARTEMIS, statistics of participation in projects and proposals, or success stories.
> We helped provide input about SME participation for national Brokerage Events.
> We organised a survey about the needs of SMEs, and tried to link these needs to specific actions to overcome them by reflecting these in the strategic documents that guide and set the scene on R&D and innovation on Embedded Systems in Europe. These documents are the SRA, MASRIA and Annual Work Programmes. We also aim to facilitate the administrative requirements and procedures for the participation of SMEs in ARTEMIS projects.
> We also implemented a section of SME expertise in the ARTEMIS-IA web pages, whose objective is to enhance the visibility of our enterprises in the Embedded Eco-System as well as facilitate new contacts and synergies.

We now have to revitalise the actions to be performed by WG SME toensure that our companies have the opportunity to participate in research and innovation activities in the new H2020 framework and to get our interests considered in the strategic agendas.

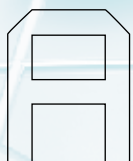In this period of transition between FP7 and H2020, it is essential to be active and guarantee that our voices are taken into account from the beginning. For this reason the main actions we plan to tackle in WG SME are:
> To strengthen, improve and follow up othe actions cited above: we need to influence the SRA, MASRIA, be represented in the Presidium, provide visibility of our companies in the Magazine, website, and facilitate participation in events…
> To promote at least one SME representative in each ARTEMIS-IA Working Group. This would help to get the SME viewpoint represented in the different WGs, to facilitate the communication among different actors, as well as to have first-hand access to information about different activities and to influence the decision-making at different levels.
> To implement a systematic way to collect needs from SMEs to be presented in the Presidium and in the Steering Board.
> To provide large industry and research institutions with access to our Working Group

It is important to note that the success of this Working Group needs the collaboration and involvement of a critical mass of SMEs as well as the support of the ARTEMIS-IA office. It is not possible to get good results, and our interests will be not be heard, with the participation of just three or four persons in this Working Group.

ARTEMIS EDUCATION & TRAINING WORKING GROUP

By Erwin Schoitsch , AIT Austria

RTEMIS aims to build self-sustaining Innovation Eco-Systems for European Leadership in Embedded Systems "to establish a new holistic approach to research, technology development, innovation and skill creation by improving the linkages between the three parts of the knowledge triangle education, research and innovation". Education and Training (E&T) is a crucial factor in maintaining leadership and competitiveness.

VISION, MISSION AND STRATEGY

The E&T Working Group is part of the overall ARTEMIS Vision to achieve self-sustaining Innovation Eco-Systems for European Leadership in Embedded Systems (ES)/Cyber-Physical Systems (CPS) in a world flooded by intelligent ES/CPS for the benefit of mankind. Its mission is to enable **long-term sustainability** of these Innovation Eco-Systems by:

> contributing to an infrastructure for E&T that facilitates new content and curricula
> strengthening links between industry and academia building on and integrating the results of European activities, networks and projects
> raising business awareness and facilitating short-term exchange and training in both directions (industry and academia), complementary to long-term basic research.

The ARTEMIS WG E&T plans to fulfil its mission by addressing "embracing activities" within ARTEMIS and in context of ECSEL. Such activities include contributing to the ARTEMIS SRA (ECSEL SRIA and MASRIA) and E&T relevant aspects of Work Programmes (e.g. requirements for proposals, evaluation criteria) as well as cooperating with other ARTEMIS WGs

and initiatives or programmes (particularly EIT ICT-Labs, CoIEs), concerning educational aspects and utilising the possibilities of funded support for roadmap activities in ECSEL or Horizon 2020. The WG will address particularly approaches to involve elements of the whole E&T chain that are not sufficiently addressed by existing networks and will link up with and tap into projects and their innovation activities.

THE ARTEMIS AND ECSEL CONTEXT

There is a good chance for our WG in ECSEL since this topic is NOT covered by the other Industry Associations in ECSEL: AENEAS and EPoSS. Combining hardware, software and smart systems integration will provide a broader basis to reach "critical mass". This holistic approach to systems engineering is an ideal Education & Training target!

An important issue is the ECSEL-JU Research and Innovation Activities Plan (RIAP), Annex 2 currently being discussed, where Education and Training is addressed under "Innovation Context" to "build self-sustaining Innovation Eco-Systems for European leadership in Embedded Systems", and "Innovation Environment" under "General Requirements for the Evaluation" that states "… the proposals should describe their organisation and contribution to overcome the gap between the theory of academic education and the practice in industrial application".

ACTIVITIES AND SUCCESSES OF THE WG E&T IN RECENT YEARS

The report 2013 to the ARTEMIS Steering Board included:

> Contributions to the last ARTEMIS WPs, MASP and SRA: E&T part of the "Innovation Eco-System", key to sustainability!
> Linking with projects: e.g. the ARTEMIS

projects MBAT, SafeCer and R3-COP have some E&T focus (in SafeCer even an „E&T use case") to provide some E&T material
> Cooperation with WG Standardisation: ProSE Support Action: educational aspects in Strategic Agenda for Standardisation included
> Informal contacts started with CoIE Process-IT (Jerker Delsing) and EIT ICT Labs (contacts and possible co-operation discussion at last Summer Camp and Co-summit informally)
> Special E&T Workshop Session at Euromicro SEAA (Software Engineering and Advanced Applications) 4-6 September 2013, Santander, Spain, "Teaching, Education and Training for Dependable Embedded Systems Engineering" (the same planned for 2014)
> Cooperation with ERCIM (European Research Consortium for Informatics and Mathematics), EWICS (European Workshop on Industrial Computer Systems, WG E&T) and ARTEMIS Austria.

2014 AND BEYOND:

The next meetings of the WG E&T will cover the most important issues addressed in the strategy part of the WG E&T (starting at the ARTEMIS Spring Event 2014, covering a period until 2016):

> Discussion of activities and engagement of interested parties, particularly cooperation with EIT-ICT Labs, CoIEs and involvement of Chambers A and C.
> ECSEL JU Research and Innovation Activities Plan (RIAP): Positioning of E&T
> Support action as a common approach for Working Groups to get some funding
> Assessing E&T aspects of other ARTEMIS WGs for possible cooperation
> Starting with "White Paper" or Roadmap for E&T in ECSEL context

WORKING GROUP CENTRES OF INNOVATION EXCELLENCE

By Jerker Delsing, Lulea University, Sweden

In 2011 the Steering Board of the ARTEMIS Industry Association decided to issue an ARTEMIS label for those Centres of Innovation Excellence that fulfil a set of criteria that are important for the ARTEMIS and broader Community. A CoIE is a group of multi-country, multi-organisation, interconnected R&D actors and businesses that achieves a significant advantage in innovation success through efficient planning, acting and cooperation. CoIEs exist mainly to create new, self-sustaining businesses, which in turn drive employment, social responsiveness, etc. The Working Group focuses on enhancing CoIEs, the labelling process and potential new CoIEs with a view to future needs and opportunities.

There are currently three labelled CoIEs:
> EICOSE (European Institute for Complex Safety Critical Systems Engineering), a virtual institute that leverages three recognised national initiatives onto a European dimension: Aerospace Valley, System@tic Paris-Region and SafeTRANS. EICOSE was awarded the title of ARTEMIS Innovation Cluster on Transportation, the first institute to receive this title.
> ProcessIT.EU, whose focus is on automation solutions primarily for the process industry in a number of European industry segments: Pulp & paper, Metals, Mining & minerals, Oil & gas, Chemicals, Energy & power, Pharmaceutical, Food processing and Infrastructure.

> ES4IB, a vital focal area related to the innovation chain in ICT for intelligent buildings and aiming to boost Europe's leadership in ICT-enabled energy efficiency through intelligent solutions and support Europe's objective to reduce energy consumption by 20% by 2020 and facilitate broad use of ICT systems to enable future buildings to become at least energy neutral.

As far as is known, no new CoIEs are in the proposal pipeline at the moment. However, there is clearly a desire to cover a broader range of applications than is currently the case. Such domains might include security and health. This would prove enormously beneficial to both industry and society, so if European players are encouraged to link up with ARTEMIS in these directions, everyone will benefit. The impact of the prospective ECSEL partnership could also help to broaden the scope.

CoIEs are also important in terms of contributing to the ARTEMIS Strategic Research Agenda on which they exert an influence on the direction and the content of the ARTEMIS programme. The CoIEs also have an important role to play in profiling the work of the ARTEMIS programme and projects – it is the 'excellence' factor that garnishes support from not only the industry partners but also from the Public Authorities around Europe and, ultimately, the citizens themselves as end

users, consumers and beneficiaries of the innovation. The ARTEMIS Community itself derives more benefit from the activities of CoIEs due to this profiling and access to such centres. Of course, they serve to align the different actors and stakeholders as well as the interests of individual countries and national programmes, helping to resolve one of the main objectives cited at the start of the ARTEMIS Joint Indertaking – to address industry fragmentation.

While the Working Group is pleased with the three CoIEs so far, a point on its agenda for 2014 is to look at ways in which more can be done to encourage more groups around Europe to apply for an ARTEMIS CoIE label. The WG wants to expand the scope. An overview of the items for 2014:

Spring 2014
> Revalidation of EICOSE, ProcessIT.EU, ES4IB
> Identify existing regional clusters in ES
> Pre-analysis of potential as CoIE

Autumn 2014
> Contact promising candidates and promote their labelling as ARTEMIS CoIE
> Activation of 2-4 CoIE candidates
> Support on CoIE labelling for 2-4 interested candidates
> Support candidates by guest invitation to WG SRA
> Support candidates on project consortia formation for ECSEL 2015 Call

SUCCESS OF ARTEMIS PROJECT CRAFTERS FURTHER DEVELOPED IN OpenComRTOS DESIGNER™

By Chris Horgan

The CRAFTERS project aims to produce a holistically designed Eco-System from application to silicon, one that will provide a tightly integrated multi-vendor solution and tool chain that complements existing standards. The focus of the project spans the different domains of real-time applications for heterogeneous, networked, embedded multicore systems. These applications suffer from the lack of trusted pathways to system realisation and application deployment. CRAFTERS therefore proposes a computing environment for multicore systems derived from vertical domains (represented with selected use cases) that will enable the evolution to horizontal domains by providing common methods, tools and reference platforms for embedded multicore applications.

SIMULATION AND DEVELOPMENT ENVIRONMENT

One of the partners in the CRAFTERS project, the Belgian company Altreonic, has benefited from its involvement by developing the first port of its OpenComRTOS Designer™ to the ARC family of Synopsis processor cores. It can be used as both a simulation and development environment in which a transparent programming model enables the source code to be retained and a network of processors to be considered as a virtual single processor.

CRAFTERS expands previous design approaches with a holistically designed Eco-System from application to silicon that could cover a wide application range with innovations, for multicore platforms, including the provision of a complete development environment that allows the best implementation strategy to be selected for a particular application. This involves the development of extensions and improvements for multicore architectures for state-of-the-art, model-based specification standards, early-estimation techniques, performance estimators, verification frameworks and parallelising compilers.

SEAMLESS CONNECTIVITY AND TRANSFER

Altreonic's OpenComRTOS Designer has taken this and other innovations on board to enable embedded software developers of heterogeneous distributed systems to cross-develop and simulate their application on a PC environment and seamlessly transfer their code to the target hardware. Although OpenComRTOS has a long history of supporting heterogeneous Embedded Systems going back to 1991 when processors were discrete components connected by communication links, today's architectures are commonly integrated onto a single SoC (System on a Chip) and heterogeneous cores are used to optimise performance and power

consumption, with tens of peripheral I/O blocks providing real-world connectivity. In the CRAFTERS project, seamless connectivity and middleware are being addressed directly by realising a common middleware layer that is designed to support new communication standards while being portable across different platforms.

Programming such a system, of course, is another matter since the target is complex. OpenComRTOS Designer™ is based on a formally developed programming model that separates the application logic from the target's topology by embedding the necessary inter-processor communication as a transparent service in the system layer. Hence the traditional middleware layers no longer run on top of the operating system but are merged into the operating system layer itself. A consequent major benefit is a much reduced code size, typically only 10 KBytes/node. In addition, the application developer can move the application code around by recompilation and access peripherals attached to other processing nodes. He can also cross-develop on his PC workstation.

KHALIL ROUHANA'S VIEW ON THE EUROPEAN ECONOMY AND ITS COMPETITIVENESS

Interviewed by Chris Horgan

Khalil Rouhana is the director for "Components & Systems" in DG CONNECT (Communications Networks, Content & Technology). The mission of the Directorate is to support research and innovation and ensure industrial and business development of smart, integrated and key-enabling ICT technologies, including Micro- and Nano Electronics, photonics, robotics, embedded and complex systems and advanced computing. In this interview, Khalil Rouhana considers the implications of Embedded and Cyber-Physical Systems for Europe and the challenges for the new ECSEL Joint Undertaking.

You support several key-enabling ICT technologies including Embedded & Cyber Physical systems. How important are Embedded & Cyber Physical systems for Europe in your opinion?
There are three main reasons why Embedded and Cyber-Physical Systems are so crucial to Europe. Firstly, the wider diffusion of ICT in all kinds of products and services along with the associated technological challenges. What we are seeing is the emergence of a new kind of ICT that I would call 'ICT out of the boxes' (not in the device but the ICT that is Embedded in our furniture, clothing, homes, offices construction material, etc.), the development of 'smart-x' environments, the Internet of Things. These are key drivers of innovation for the future and make the embedding of ICT extremely important. And this diffusion creates a lot of technology challenges. ICT solutions that have previously been

confined to very high-tech applications like automotive or aerospace because of their safety, security and time-criticality requirements, are becoming increasingly important for our everyday use. Other criticalities need to be taken into account now as well like power consumption – if we want the Internet of Things to develop, then we have to be able to embed ICT devices with minimum or no power consumption requirements. And, of course, as we move into this new world of interconnected services, the world of Cyber-Physical Systems, we also have to address the widescale distribution and networking challenges. Secondly, the wave of Internet of Things and Cyber-Physical Systems will generate opportunities in applications and services for the future in terms of our living and working environments, making them safer, more comfortable and energy-efficient, improving the quality of our

lives, boosting productivity at work. These are areas in which Europe has a strong hand. We know how to build IT systems and embed them as well as handle the inherent complexities. Thirdly, if we look at the value creation of Embedded Systems in Europe today, this is worth around a third of all the value creation worldwide (around 150 of 450 billion euros). This is a large slice and we need to maintain our lead here. What we have is a unique and fantastic opportunity to grow a competitive industry and knowledge in mainstream ICT fields including core areas such as operating systems and platforms as well as software development tools , areas in which we have lost ground.

In what way does research and development in the area of Embedded & Cyber Physical systems in your opinion contribute to the European Economy and its competitiveness?

As I said, the key issues arising today concern the mixed criticalities. In other words, the capacity to build software systems that will enable us to develop and deploy Embedded ICT responding to a diversity of stringent requirements, from power consumption, to safety and security to large-scale distribution and connection with the web. Of course, these are systems that are linked to physical objects, whether these are the brakes on a car or domestic energy devices. Then there is the matter of complexity: we have moved on from the single Embedded system for a single device or application to systems of systems with hundreds, even thousands, of ICT devices in our environment that we need to be able to program and control. Such challenges are significant and we need R&D to address them. And the more we can handle the complexities the wider the application of these systems will become in the future. In this challenge, knowledge is a key ingredient. Combined knowledge of the hardware and software – for example, you need knowledge of the hardware to enable the software to be optimised, and vice versa. This will become increasingly important in the future as we see more of the software becoming Embedded in the hardware. This R&D is an area in which we have seen investment gradually rising. It is why we created ARTEMIS – we needed to combine public resources, align strategies across Europe in order to be able to attract private investment and compete on a global scale . And we need to continue along this path if we want to ensure that Europe can sustain its competitiveness and leadership in these areas in the future.

The ECSEL Joint Undertaking together with 4 other JTI's will be officially launched on 9 July. In what way do you see the merger of the three

technologies (Embedded, nano & smart) in one JU better than in its previous form?

This convergence generates another opportunity: to bring in and share knowledge and skills from these three specific technologies. This is an essential and logical step. Of course, each of these areas – Embedded Software and Systems that is developing into Cyber-Physical Systems, micro-systems and semiconductor technology – has its specificities. A lot of innovation is stemming though from work covering the   whole value chain from components to Embedded software. It is essential, therefore, that we provide a framework for these multi-stakeholder communities to work together as interdependencies between software and hardware developments become stronger and the boundaries between the three areas become increasingly blurred. From the Commission side we're full of expectation for this new strcture.

What in your view are the incentives for the ECSEL Participating Member States?

If we want to be serious about supporting industrial development, bridging the gap to innovation and getting the maximum out of collaborative R&D, there needs be adequately attractive incentives for the private sector to commit investments and resources. For example, if you want to develop a common software development tool and a platform for the manufacturing sector in Europe, that will require something far beyond a typical collaborative project budget of 2-3 million euros. We've already seen it where Member States have been able to support a project of 30-40 million euros with a limited number of actors, whereby the user gains a complete platform, you have a real impact on the market. This is what happened in the CESAR project, and the AUTOSAR tool that is used by most car manufacturers today. So you need a critical mass of investment. This combination of resources enables us to put on the table from the public side the resources that will attract private investment and to develop solutions that can be applied across Europe. This helps us to avoid fragmentation, align strategies and combine resources. ARTEMIS has shown the success of this approach in its AIPPs – large-scale demonstrators that bridge the gap between R&D and the market. This is the kind of scale that will attract the necessary investment. Big may not always be beautiful but there are times when big is absolutely necessary. And the criticality is not just in the mass but also in the coverage of the value chain. To be able to draw on all the resources throughout Europe to build the partnerships that will have an impact on the market.
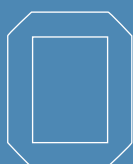
SPRING EVENT 2014

By Chantal Schoen , Office Operations Manager, ARTEMIS-IA

The Spring Event 2014 was hosted in Amsterdam on 18 and 19 March in the Crowne Plaza City Centre Hotel in the city centre, just a short walk away from the Central Railway Station. The central focus of this event was on the ARTEMIS Industry Association Working Groups, all of which were well prepared to elaborate about their achievements and future planning during the course of the two days.

n Monday, before the actual Spring Event started, the Working Group SRA kicked off, with its first meeting this year, preparing the opening steps towards an ECSEL-JU oriented strategy for the integrated MASRIA 2015. Over 25 experts shared their future visions in this meeting. Jan Lohstroh explained the status of the discussion on the new ECSEL Joint Undertaking, a discussion which not only involves the European Commission and Member States but also the opinions of the two other private members, the AENEAS and EPoSS associations. Whereas the MASRIA 2014 for ECSEL is still a stapled combination of the strategy documents of the three associations, the strategy for 2015 is to have an integrated MASRIA, created by the three associations together.

The Spring Event started on Tuesday with the meeting of three Working Groups of the ARTEMIS Industry Association; WG Metrics, WG Training & Education and WG Repository. In parallel the Steering Board meeting started to prepare for the General Assembly meeting on Wednesday. In the Steering Board meeting, the statuses of the Working Groups were presented in the afternoon, together with the achievements of the ARTEMIS Centres of Innovation Excellence, followed by the 2014 budget presentation.

Also the amendments to the Articles of Association were drawn up for decision in the General Assembly in order to prepare for partnering with the ECSEL-JU later this year.

In the evening a typical Amsterdam social event was organised. A boat tour to visit the scenic canals of Amsterdam brought the participants to the dinner location. While enjoying some Dutch cheeses and beers, the participants continued their discussions of the first event day. The evening continued in the historic building "in de Waag", where a dinner concluded the day. Unfortunately, the Dutch weather was illustrated by the pouring rain, which left the participants with a realistic impression of Amsterdam.

On Wednesday the other four Working Groups – WG SME, WG CoIE, WG Tool Platforms and WG Standardisation – had meetings in the morning, while the whole afternoon was dedicated to the General Assembly meeting. Unfortunately, the quorum for voting on the Articles of Association was not met, so that another General Assembly telco meeting will be held supported by electronic voting. During the General Assembly Jan Lohstroh informed the members of the latest developments on ECSEL and updated everybody with the ongoing discussions with the other two associations, AENEAS and EPoSS.

Several Spring Event participants remained at the same hotel to join E2GEST Working Group Workshop on Thursday March 20, organised back-to-back with the ARTEMIS-IA Spring Event. The Workshop focused on project incubation. European experts from industry and academia assembled to prepare future projects in European funding instruments, especially targeting the upcoming first ECSEL Call. Eleven project ideas could be further developed and future cooperation could be established and deepened. E²GEST (EICOSE Expert Group on Embedded Systems for Transportation) is open for new participants. Please visit: www.eicose.eu

2ND EUROPEAN CONFERENCE ON INTEROPERABILITY FOR EMBEDDED SYSTEMS DEVELOPMENT ENVIRONMENTS

By Martin Törngren, Kungliga Tekniska Hogskolan, Sweden

WITH SOME 60 PARTICIPANTS, PROVIDING A USEFUL REPRESENTATION OF DIFFERENT STAKEHOLDERS, THE CONFERENCE TURNED OUT TO BE A REAL SUCCESS.

The interoperability conference took place on 3 December 2013, preceding the ITEA - ARTEMIS Co-summit Event, and was labelled as an ARTEMIS technology conference.
More information including presentations is available at: www.ices.kth.se/event-listall.aspx?pid=3&selyear=2013
The conference provided a continuation of the ARTEMIS technology conference held in March 2012 and was organised in collaboration with the CPSE, CRYSTAL and MBAT projects[1].

While interoperability is of concern in many contexts, this conference had a focus on promoting interoperability among the heterogeneous tools, models and data that are increasingly required in developing Embedded and Cyber-Physical Systems.

The evolving functionality and scope of Embedded Systems based products are challenging current development paradigms by involving more and more specialists, often in distributed teams, that make use of a wide variety of tools and generate a multitude of information that need to be appropriately managed. The information produced as well as the tools are heterogeneous, reflecting the different concerns and diversity of the stakeholders involved.

This has indeed resulted in a variety of efforts driven by IT/ALM, PDM/PLM and Embedded Systems communities which, in turn, encompass a variety of stakeholders, ranging from end-users to Embedded Systems tool providers and IT consultants. The problem is moreover apparent in multiple industrial domains as manifested, for example, in ARTEMIS projects such as Crystal, iFEST and MBAT, as well as in other initiatives such as Eclipse, OMG and OSLC.

As a consequence, the conference had two main goals:
> To bring the communities together and exchange tool integration experiences, fostering better communication and providing a first step towards a common understanding of the main challenges to overcome.
> Discuss the way forward towards sustainable interoperability.

The conference keynotes featured representatives from telecom, PDM and ALM/OSLC domains, and moreover provided presentations of the experience from several industrial and academic domains, an exhibition including demos and posters, and finally a panel debate on how to progress towards sustainable tool interoperability; overall reserving lots of space for discussions. With some 60 participants, providing a useful representation of different stakeholders, the conference turned out to be a real success.

The potential gains in achieving cost-efficient interoperability are enormous by reducing waste in trying to find information, providing standardised methods and techniques to set up or maintain integrations, paving the way for new added-value services such as change analysis, providing new market opportunities for tool vendors, reducing lock-in that allows end-users to choose preferred tools, etc.

The discussions and presentations during the conference provided interesting insights into what was perceived as key challenges and ways forward, including the following needs:
> Establishing interactions and exchange across the PLM and ALM communities.
> Pushing standards and creating a momentum for adoption, with strong end-user involvement.
> Developing suitable (new) business models that take interoperability and new scenarios into account – thus hopefully providing convincing arguments for large tool providers to strive for more open tools. One can note that several speakers described interoperability as primarily a business model problem (rather than a technical problem).

In the PDM domain, several speakers also stated that management is starting to understand the importance of interoperability; the CODEX of PLM openness can probably be seen in this light. Here the domain of Embedded Systems still has some way to go!

There is clearly a need for a follow-up event – for which the planning has already started!

[1] CPSE is an EIT ICT Labs project, and CRYSTAL and MBAT are ARTEMIS projects. See links at the conference website.

ARTEMIS-JU LAST CALL: PROJECTS OF 2013

By Alun Foster, acting Executive Director, ARTEMIS-JU

ALMARVI (ASP 5)

The new societal challenges require high-end image/video processing to be lifted to the next level. ALMARVI aims to proactively address this at various system layers to enable highly efficient massive data-rate image/video processing. The project results will enable low-cost solutions for a wide-range of markets and improve the productivity and competitiveness of European players in different sectors.

DEWI (ASP 3)

DEWI (dependable embedded wireless infrastructure) wants to foster Europe's leading position in Embedded Wireless Systems and smart (mobile) environments for both personal and professional users.

A "sensor & communication bubble" using wireless technology enables less expensive and more flexible maintenance and re-configuration. Individuals will gain easier, safer and more comfortable, transparent access to information provided by the "bubble".

EMC² (AIPP 5)

Embedded Systems enhance mechatronic products with cheaper and new functionalities and, as inter-system communication enabler, strongly support today's information society. The EMC² project aims to develop an innovative, sustainable service-oriented architecture for mixed criticality applications in dynamic and changeable real-time environments, helping the European Embedded Systems industry to maintain its leading edge position.

R5-COP (ASP 4)

European manufacturing is confronted with increasing product diversity and the ongoing need to cut production costs. R5-COP responds to this challenge with a focus on agile, transformable and reusable automation and robotics in which agile manufacturing paradigms and specifically modular robotic systems support model-based design, engineering, validation and fast commissioning to reduce design, set-up and maintenance costs.

# ACHIEVEMENTS SUMMARY OF THE ARTEMIS PROGRAMME

By Alun Foster, acting Executive Director, ARTEMIS-JU

If we look at the overall achievements through the six ARTEMIS Calls, the following division and distribution can be observed in the charts below:
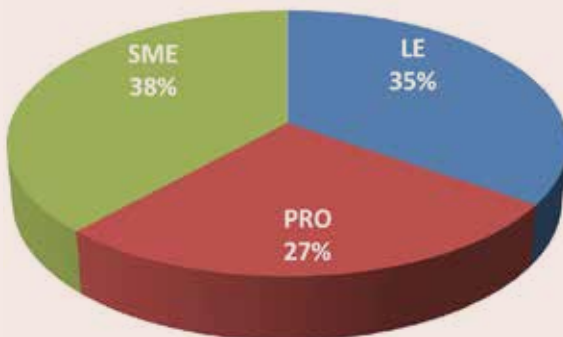
TOTAL PROGRAMME

TYPE	LE	PRO	SME	Grand Total
Participations	550	461	409	1420
Participants	268	208	295	771
Total Cost (M€)	615	271	213	1.099

TOTAL PARTICIPATIONS BY PARTNER TYPE

SME 29% — LE 39% — PRO 32%
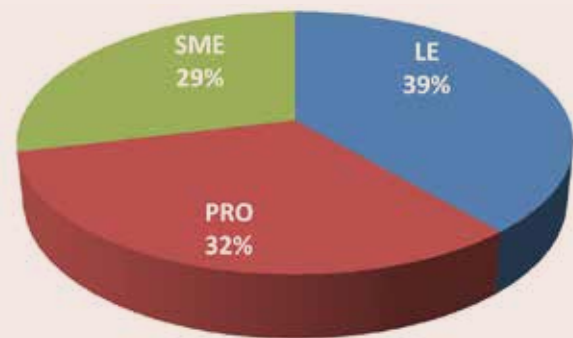
PARTICIPATION BY INDIVIDUAL PARTICIPANTS BY TYPE

SME 38% — LE 35% — PRO 27%

PARTICIPATION AS TOTAL COST

SME 19% — LE 56% — PRO 25%

A few things should be pointed out with respect to the facts and figures presented in the charts. While the total programme size of about €1.1 billion may seem to be disappointing, if we look at the original plans, the significant difference against the original expectations is largely attributable to the commitments from the Member States. Nevertheless, ARTEMIS has been the largest programme ever on Safety Critical Systems and on Multi-core Technology. Furthermore, a considerable achievement is evident in the proportion of SMEs among the individual participations, at 38%.

CALL 2013

The ARTEMIS Call 2013 was published on 26 February 2013 and closed on 6 June 2013. A new feature of this Call was the absence of a PO phase, with the consortia having to submit directly a full project proposal (FPP), although there was also the possibility for consortia to submit a non-mandatory expression of interest (EoI) by 8 March. The Call closed on June 6 at 5 pm. Of the 23 proposals submitted, one missed the deadline and the other 22 proposals were successfully received. However, two of these successful submissions were ultimately rejected because they failed to meet the criteria at JU level: ADMINVENTOR (only one partner) and Bioclues (only two ARTEMIS Member States). Therefore the following data relate to the 20 JU-eligible proposals.

The proposals represent €412 million in total costs, with 555 participations by 406 individual participants.
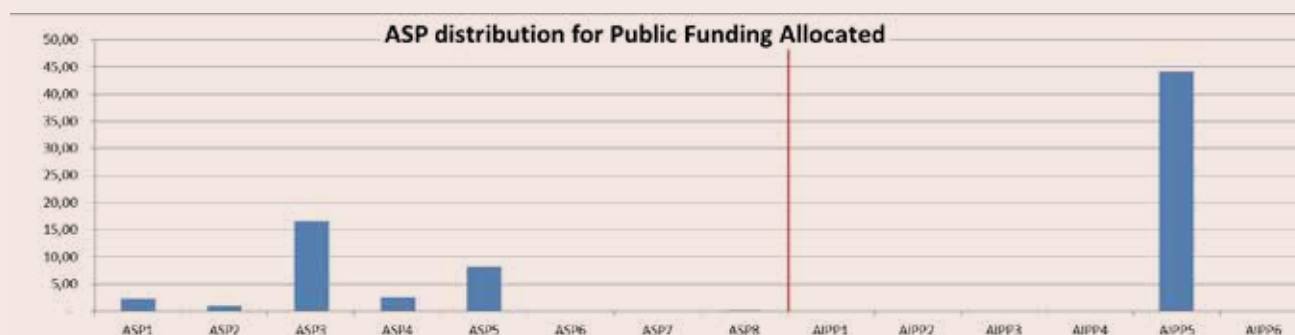
Split by Partner Type

	LE	PRO	SME	Total
All participations	235	149	171	555
Individual participants	180	92	139	406
All participations	42%	27%	31%	
Individual participants	44%	23%	34%	
Total Costs (€ m)	229,00	92,32	90,45	411,77
Total Costs	56%	22%	22%	

ASP/AIPP COUNT OF PROPOSALS
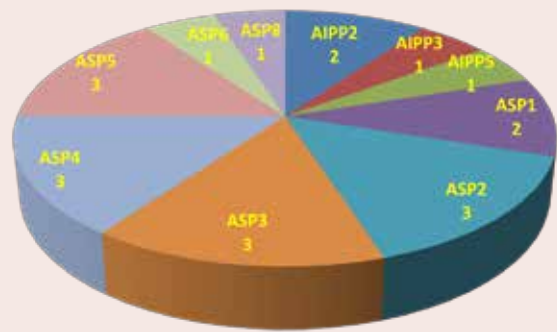
ASP/AIPPs BY TOTAL COST OF ALL ELIGIBLE PROPOSALS
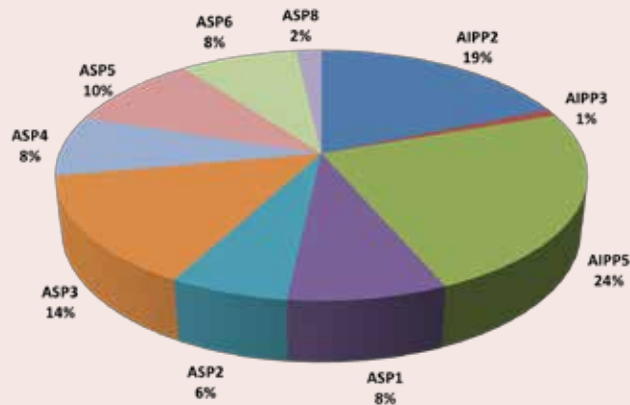
The projects selected for Call 2013:

> Almarvi
> EMC2
> DEWI
> R5-COP

SOME STATISTICS

The selected projects for negotiation from Call 2013 show the following profile in terms of their contribution to the various ASPs/AIPPs (NB – pre-negotiation figures). The contribution to each ASP is as defined by the evaluators i.e. not the self-declared allocation.
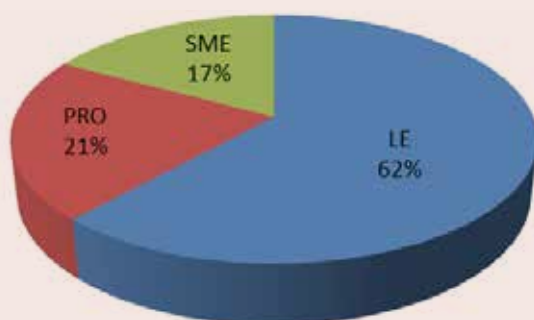
The negotiations of the four projects selected by the PAB for funding were concluded during the 4th quarter.

The final split of participation by partner type, as measured by the total costs (investment in € m, subject to closure of the necessary contracts) is:

LE	PRO	SME	Grand Total
100.8	34.5	28.0	163.4

Or graphically:

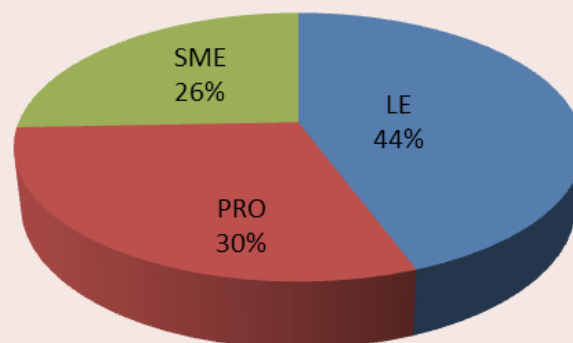**PARTNER TYPE BY TOTAL COST**

Counting the participations by partner type yields the following distribution:

LE	PRO	SME	Grand Total
44%	30%	26%	203

PARTNER TYPE BY PARTICIPATIONS

ECSEL MULTIANNUAL STRATEGIC RESEARCH AND INNOVATION AGENDA (MASRIA) 2014

THE FIRST COMBINED DOCUMENT FOR THE ECSEL JOINT UNDERTAKING BY AENEAS, ARTEMIS-IA AND EPOSS

By Jan Lohstroh, Secretary General, ARTEMIS-IA

In the beginning of this year the three industry associations AENEAS (the European Industry Association for Nanoelectronics), ARTEMIS-IA (the European Industry Association for Embedded and Cyber-Physical Systems) and EPoSS (the European Industry Association for Smart Systems) elaborated their first MASRIA, for the ECSEL Joint Undertaking in which the three associations will be the private members.

The MASRIA 2014 serves as input for the Executive Director of the forthcoming ECSEL Joint Undertaking as a basis for his MultiAnnual Strategic Plan 2014 (MASP).

SCOPE OF THE MASRIA 2014

The combination of Nanoelectronics, Embedded/Cyber-Physical Systems and Smart Systems plays an ever-increasing role in the societies of today. It will be (or is already) present in almost all products and services around and is, or will be, in many cases the technological backbone or neural system of society. It is the basis for many product innovations and solutions for societal challenges, and is therefore a very significant factor in the competitiveness, employment and prosperity of countries and regions as recently has been described in a couple of documents [1,2,3,4] among which the High Level Vision 2030 [4].

The products and services in the digital technologies value chain are getting more and more sophisticated and complicated, in such a way that no company alone can master all elements of their innovations that involve Micro- and Nanoelectronics, Embedded/Cyber-Physical Systems and Smart/Microsystems. Therefore we have to rely increasingly on transnational pre-competitive collaboration in R&I including competitors and involving Research and Technology Organisations (RTOs) and universities. The new ECSEL

Joint Undertaking is constructed to play a significant role in the collaboration of the key players in Europe, including SME's, in components and systems innovation in the next seven years. The Council Regulation concerning the ECSEL-JU stipulates that the Private Members Board, which represents the AENEAS Industry Association, the ARTEMIS Industry Association and the EPoSS Industry Association, should detail a MultiAnnual Strategic Research and Innovation Agenda (MASRIA).

The MASRIA has a horizon of some five years whereas the point on the horizon of the Strategic Research Agendas of the ARTEMIS, ENIAC and EPoSS ETPs is typically some ten years. This MASRIA 2014 is a pragmatic reflection of the cooperation between the three associations and their members, with their different backgrounds and independently produced SRAs and most other strategic documents.

This MASRIA 2014 consists of four sub-documents:
> Umbrella document:
  o Introduction
  o Vision, Mission and Strategy of the Research and Innovation of the ICT Components and Systems Industry based on [1]
  o Conclusion
  o References
> Annex 1: Nanoelectronics MASRIA within the scope of ECSEL, on behalf of AENEAS

> Annex 2: Embedded/Cyber-Physical Systems MASRIA within the scope of ECSEL, on behalf of ARTEMIS-IA
> Annex 3: Smart Systems MASRIA within the scope of ECSEL, on behalf of EPoSS

MASRIA VISION, MISSION AND STRATEGY

Vision
The vision driving the ICT Components and Systems Industries is of mankind benefiting from a major evolution in intelligent systems, a world in which all systems, machines and objects become smart, have a presence in cyber space, exploit the information and services around them, communicate which each other, with the environment and with people, and manage their resources autonomously.

In this vision the role of the European ICT Components and Systems Industries will be to (re)enforce their global competitive position by leveraging and aligning individual core competencies and strengths in design, in products and services as well as in their European integration and production capabilities and infrastructures, while remaining viable and profitable.
The vision of the European ICT Components and Systems Industries is to take a concerted approach to providing Europe with the controlled access for creating the indispensable technology basis for new products, systems and services that are essential for a smart, sustainable and inclusive European society in 2020.

Mission

The mission of the European ICT Components and Systems Industries is to progress and remain at the forefront of state-of-the-art innovation in the development of highly reliable complex systems and their further miniaturisation and integration, while dramatically increasing functionalities and thus enabling solutions for societal needs. "Remain at the forefront" and "miniaturise while dramatically increase functionality" are clearly prerequisites for realising the vision. The R&D experience that Europe has in ICT Components and Systems matches and, in most cases, surpasses the R&D capabilities elsewhere. Europe is at the forefront of many technologies, both established (like automotive, aeronautics or communication) and emerging (like medical or energy-efficiency related research). Europe is therefore in the somewhat luxurious position that it can write in its mission "to remain at" rather than "get to" the forefront. Nevertheless, the worst thing to do would be to underestimate the competition. A healthy European industry is a prerequisite for achieving the mission. An industry led eco-system of SMEs, large companies and academia supported by a public-private cooperation is the preferred solution.

> The "value chain" is rather complex in the case of ICT Components and Systems Industries because a plurality of technologies is always needed to address ICT services or to address societal needs. The R&D&I actors will answer the question what top priority actions need to be taken to remain at the forefront. The answer, in the form of grand technology challenges, is not "pick and choose". It is a plan of action that needs to be executed in its totality to accomplish the mission.

Strategy

The vision and mission statements above demonstrate the twofold role and responsibility of the R&D&I actors. They need to develop strategies that will lead to the accomplishment of the mission and therefore will be derived from the pan-European societal needs and – at the same time – Technology Platforms, competences and industrial infrastructure, which enable the respective industrial solutions.

The strategy of the European ICT components and Systems Industries is based upon exploiting European strengths and opportunities

> Exploiting strengths implies building on the leading positions in specific technology and application domains
> Creating opportunities implies for Europe to be positioned at the forefront of new emerging markets with high potential growth rates and to become a world leader in these domains

Innovation is key to the strategy. Its efficiency increases significantly by efficient transnational Eco-Systems between industry, institutes and universities supported by efficient Technology and Tool Platforms.

The strengths can be illustrated in the capability Europe has demonstrated to create innovation over the past 15 years with major success stories such as GSM mobile systems, automotive electronics applications, smart cards, lithography equipment and Silicon on Insulator (SoI), Fly-by-wire or Near Field Communication (NFC), to name but a few. Europe has a leading position in several domains including multi-market and industrial applications – such as lighting, robotics, automation, engine management, non-invasive medical treatment, chip cards and security – that are based mainly on software, module and so-called More-than-Moore technologies and Smart Systems devices. The synergy of strengths and opportunities will enable the European ICT Components and Systems Industries to expand their leadership position in Information and Communication Technology, Embedded and Smart Systems, Nanoelectronics, Advanced Manufacturing and Processing. Six focal domains have been defined, each addressing important societal needs. With the first two domains ("Smart Transport" and "Inclusive Innovative Society") the industry continues to build on its existing strength (1st element of the strategy) and with the remaining 4 ("Health and Well-being", "Safety and Security", "Energy Efficiency" and "Sustainability and Climate") it exploits opportunities for Europe by positioning itself at the forefront of emerging markets (2nd element of the strategy).

The technological enablers for the contribution of the ICT Components and Systems Industries to these six aforementioned societal needs are defined by five technology work areas ("Information and Communication Technology", "Embedded Systems", "Nanoelectronics", "Advanced Manufacturing and Processing"

Societal needs
S1 Smart Transport
S2 Inclusive Innovative Society
S3 Health and Well-being
S4 Safety and Security
S5 Energy Efficiency
S6 Sustainability and Climate

Technological needs
T1 Information and Communication Technology
T2 Embedded Systems
T3 Nanoelectronics
T4 Advanced Manufacturing and Processing
T5 Smart Systems Integration Technologies
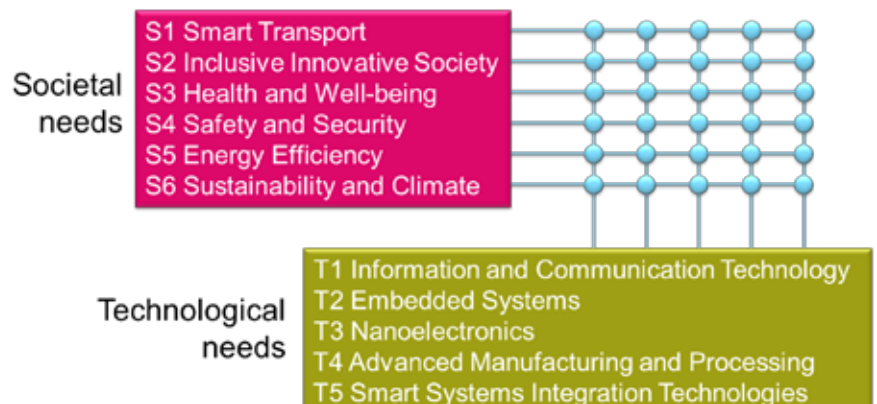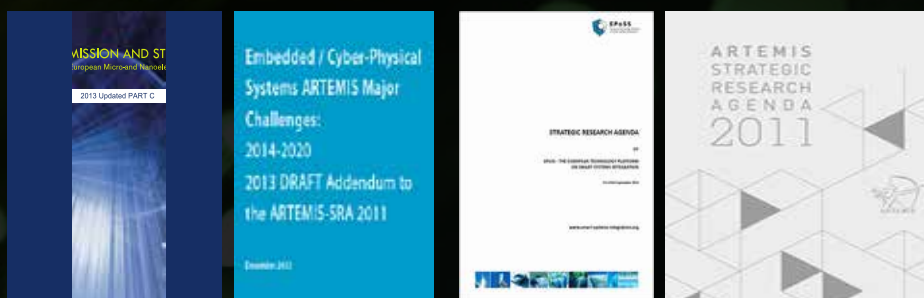
and "Smart Systems Integration Technologies"). The interdependence of working areas and technological enablers are sketched in the figure below.

Further details of this strategy can be found in [5,6,7,8].

CONCLUSION

The scope of work in the MASRIA 2014 is built on the results obtained by the ARTEMIS and ENIAC Joint Undertakings, the European Technology Platform EPoSS and work funded through other national and European programmes. It fosters in a proper and balanced way new developments in, and synergies between the following main areas:

a design technologies, process and integration, equipment, materials and manufacturing for Micro- and Nanoelectronics while targeting miniaturisation, diversification and differentiation, heterogeneous integration.

b processes, methods, tools and platforms, reference designs and architectures, for software and/or control-intensive Embedded/Cyber-Physical Systems, addressing seamless connectivity and interoperability, functional safety, high availability, and security for professional and consumer type applications, and connected services.
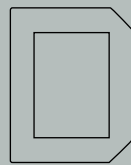
c multi-disciplinary approaches for Smart Systems, supported by developments in holistic design and advanced manufacturing to realise self-reliant and adaptable smart systems having sophisticated interfaces and offering complex functionalities based on e.g. the seamless integration of sensing, actuating, processing, energy provision and networking.

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[3] "Select industry group updates the roadmap on making Europe big in electronics", Dec. 2013; downloadable from: http://ec.europa. eu/digital-agenda/en/news/electronics-roadmap-europe

[4] "High Level Vision 2030 and opportunities for Europe", ISBN 978-90-817213-2-5,Dec. 2013; downloadable from http://www. artemis-ia.eu/publications (High level vision 2030 version 2).

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[6] "ARTEMIS SRA 2011"; downloadable from : http://www.artemis-ia.eu/publications (Book silver edition).

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[8] "EPoSS SRA pre-print Sept. 2013", Sept. 2013; downloadable from: http://www. smart-systems-integration.org/public/news-events/news/eposs-sra-2013-pre-print-version-now-publicly-available

ECSEL: A NEW VISION, A NEW CHALLENGE

Andreas Wild interviewed by Chris Horgan

r. Andreas Wild is the Executive Director of the ENIAC Joint Undertaking, a public-private partnership on nanoelectronics established as an autonomous European Union body. Prior to joining the ENIAC JU, Andreas Wild was the European R&D Director for Freescale Semiconductor and Motorola Semiconductor Products Sector; before that, he managed Motorola R&D laboratories in the USA, Latin America and Germany. He has an MSc degree from the University "Politehnica" Bucharest, and a PhD degree from the Institute of Atomic Physics in Bucharest, Romania. He has co-authored 28 patents and more than 50 technical publications.

Could you tell a little bit about what brought you to the ENIAC Joint Undertaking in the first place?

Well, to be quite honest, I was available and I felt that the experience, skills and knowledge that I had would be able to contribute to this new joint undertaking. My profile is a good asset fit for what we want to achieve. I am familiar with the industry, both in Europe and worldwide, so this made me a good candidate. And so I ended up in Brussels.

What prepared you for your next challenge: Executive Director of the ECSEL Joint Undertaking?

My industrial background was in a company specialised in embedded system, in which I performed R&D in semiconductors, embedded software and microsystem integration, just as ECSEL will do. As the current ENIAC-JU Executive Director, I am familiar with the JTI particularities and shall provide continuity in building upon the ARTEMIS and ENIAC-JU achievements – while bringing in EPoSS – and thus taking the ECSEL-JU to the next level

The merger of the ARTEMIS Joint Undertaking, the ENIAC Joint Undertaking and EPoSS is one of big proportions. This merger involves three different cultures, plans of action and three associations instead of one. How do you plan to guide this to a good result?

Yes, this is a bit of a challenge. In recent years each of the organisations has been developing its own identity, each contributing to their own specific disciplines. However, we must remember that by and large each of these disciplines serves the same industry, and there are already many companies that encompass all three disciplines – the development of components and embedded software along with the integration of these in Cyber-Physical Systems. Take, for example, tyre pressure sensors that a number of cars have on board today. They are integrated into the tyre, sense a pressure drop, recognise that as a tyre failure through the on-board computer and issue a warning for the driver. It contains all of the disciplines: components and embedded software integrated

into a single warning system. We can help industry become more competitive when we combine these disciplines to acquire benefits of scale. Such scale means greater impact and visibility for what needs to be done in our industry both by the industrial actors and by the Public Authorities that can help drive development. Of course, there are times when the specificities are crucial, and we mustn't lose sight of this, but there also times when we have to stress the commonalities. Each of the organisations has its own individual personality but together they make an unbeatable team and have even more of an impact on the competitiveness of our industry.

How will the new organisation affect the structure of future projects?
I think we will have two types of projects, mirroring the specificity/commonality axis I just mentioned above. On one hand, there will be projects focused on applications that serve societal needs, like clean and efficient transportation, efficient energy production, distribution and usage. For such projects I would expect the three different disciplines to be engaged and integrated. But in order in to achieve excellence we still need to progress in terms of our capabilities and the state of the art; for example, projects developing a new generation of semiconductor chips, or novel tools needed to develop embedded software, or integrating a cyber-physical system will be specific to that particular domain. In the new structure, even the projects primarily addressing one discipline will of course benefit of cross-fertilisation – of knowledge, method, thinking, creativity – that will benefit the entire value chain. This will also create efficiencies and opportunities for concurrent engineering and convergence, working together towards a common goal.

A lot of people know you as a good lobbyist or at least a brilliant networker to convince the countries to support the current ENIAC-JU. Is this something you plan to continue to do within ECSEL?
Well, I don't know if you could call me a lobbyist though I do spend most of my time trying to engage the various Public Authorities. Our mechanism, of course, is one that involves contributions from the Public Authorities in the Member States, and the industry, but then our organisation brings additional resources to the action, and this is different from what a lobbyist does. I do not own a magic wand, all I do is use the available flexibility to let the member states express their strategic needs and priorities, as well as have a say in the projects' selection and in the levels of funding allocated. Once they are confident that their needs and priorities can be taken into, they will take advantage of the additional JU contributions, especially in a time of austerity and crisis. It's a matter of trust. It will be essential to align the procedures and activities at joint undertaking level so that the stakeholders, and particularly the funding organisations, can direct their efforts towards their main priorities. And this translates to talking to people, gaining their trust, have them share with you their hopes and concerns, and come to solutions together. Such gains are not made overnight. So, I guess what you might call lobbying on my part, is actually building trust.

Within ENIAC your focus was on Nanoelectronics. When ECSEL starts you will have, in addition, Smart Systems and Cyber-Physical Systems. What is your vision on these three areas of expertise and how do you foresee to combine these areas in your strategy?
If I look at my own background, bringing together these three areas of expertise seems to be quite a natural progression. The immediate challenge that lies before us is getting together in the right way. We have a common goal, we have to serve society with advanced technological solutions and we have to make a difference. To achieve that is mandatory. That common goal is the pull that will bring together what has been divided in the past.

THE DAWN OF THE AGE OF AUTONOMY
WHITE PAPER

By Alois Knoll [1], Technische Universität München, Germany

"If humanity can just get past the next 200 years without driving itself to extinction, then we're good to go."

Stephen Hawking, 2010

[1] *Author's address: Alois Knoll, fortiss GmbH and TU München, Germany. Postal Address: Guerickestr. 25, 80805 München, E-mail: alois.knoll@fortiss.org.*

While the 20th century has certainly seen technological changes of epic proportions, the future is likely to see devices, appliances and hierarchies of complex Cyber-Physical Systems that can govern and control their own behaviour, independently making informed decisions whose consequences may directly affect human lives. This highly disruptive technology holds enormous potential, and may even be an indispensable toolset for the future survival of humanity. At the same time, because it will potentially have a deep impact on our own autonomy as human beings, technological solutions will have to be developed in parallel to enable individual humans and human society as a whole to maintain freedom of decision. The European Union is in a superb position to take the lead in this next wave of all-encompassing technology but to be in the pole position and become the trendsetter again, Europe needs to make the right investments now and in such a way that we intelligently capitalise on the existing investments in base technologies (hardware/software/commodity components) and concentrate on achieving the highest level autonomy functions. This effort should be accompanied by standardisation to help the commercial development of products using basic and increasingly advanced functions.

AUTONOMY: WHAT IS IT – AND WHAT IS IT GOOD FOR?

The use of the term "autonomy" in conjunction with technology has been inflationary – and often misleading. In the context of humans and societies, it is the capacity "of a rational individual to make an informed, non-coerced decision" and/or to "give oneself his own rules" according to which one acts in a constantly changing environment. It also means the "self-government of the people".

Technical systems that claim to be autonomous will be able to perform the necessary analogies of "mind functions" that enable humans to be autonomous, including perception of the environment, reasoning, planning, modelling,

memory and many more. Moreover, as in human and animal societies, they will have to abide by rule sets (or "law systems") that govern their interaction – between individual members and between groups.

When transferring the highly sophisticated and multi-faceted concept of autonomy to technical systems, a lot can be learned from the evolution of biological models. Not surprisingly, when looking for a way to have networked computers manage themselves without direct human intervention, in 2001, IBM took inspiration from the human autonomic nervous system (which is part of the human peripheral nervous system), which controls visceral functions in the human body. But getting to the level of the human cognitive system, and then even further to full "decision power", all in real time, will clearly be a huge step. However, progress in robotics, computational neuroscience and high performance computing mean this vision is about to become reality – and sooner than we think!

Among the many examples of autonomous systems that can be envisaged are:

> **Zero accident** cars **without steering wheels**
> Decentralised, **resilient, self-healing, smart energy grids** with **zero blackout** (recovery) **time**
> Autarkic **"city brains"** with the ability to control all material/communication flows within a city – optimised according to various target functions

The advent of technical systems that exhibit true autonomy will not come overnight nor effortlessly. As always in technology, the evolution will be in several "disruptive" phases. And clearly, massive investments will be needed to take the lead!

EVOLUTION OF AUTONOMY: WHAT ARE POTENTIAL STEPS?

From today's point of view, the following steps, which build on each other, are likely to be taken in the years to come to

create increasingly autonomous systems – synchronous with and in response to growing human needs:

Perception-based systems: systems with different kinds of sensors able to pick up and combine environmental information and so respond to the needs of a user who shares a (temporary) environment with that device, like most of today's mobile devices that are capable of sensing at least where they are and can draw additional information that may be relevant to the user. The challenge here is to *produce value-added information that precisely fits the need of the user* – and does not leave him alone in a sea of millions of web-pages.

Systems with context-awareness and context interpretation: the device will know (and/ or anticipate) its situational context (e.g., a decelerating car or the purse of a user entering a shop) and what its owner is doing – or is going to do. It also knows the state (of mind) of the user and can reason the user's intentions. It also has a certain sense of "self", and may memorise the consequences of past events, even abstract from them and transferring this knowledge to similar situations in the future. They can also *analyse information* and *interpret it* in a *given situational context*, producing *individualised knowledge* and giving *specific feedback* to their interaction partners. This can be considered as *networked context-aware, real-time information analysis, interpretation and synthesis*.

> **Perception → Cognition → Action (PCA)-systems**: the next stage of the evolution is systems that can act in the real world, i.e., move their body based on their own planning and/or manipulate objects. This is a completely new quality of technical systems: humans allow them the partial or full freedom to decide about physical changes in our man-made, real world. By *acting in the real world*, these systems can physically change the(ir) environment as well as gather information by systematically and deliberately moving their sensors into

new positions, and *they can learn*. This implies that they *make decisions at many levels of cognition* and *will eventually need to simulate all the high-level intelligence functions of humans*. Since these systems act directly (and not only indirectly through the human as a medium), putting them in a situation where they potentially could do harm, we clearly need a set of generally applicable rules and laws that govern these systems.

> **Societies of PCA systems**: once we master the technology of the PCA as an individual artefact, the next (and final) phase will consist of interacting, tightly cooperating "societies" of PCA systems – all with direct access to the whole of cyberspace. The societal models for such sets of systems can be simple systems like ant colonies that exhibit "swarm intelligence" or any other suitable heterarchical or hierarchical form of society. While such societies can perform very complicated and complex tasks, they can also present a major threat to human society. This will need to be dealt with as the technology develops.

While there is a sound Western philosophical foundation, namely Koestler's "holons", Uexküll's "umwelt" and Maturana's "autopoesis", for developing a theory for the autonomy of technical systems, the practical challenges will be:

> the development of design patterns for such systems;
> the development of some kind of "operating system" that unifies the basic building blocks, in terms of the skills needed for PCA system implementation;
> rules for open access to the complete software suites developed with public funding, as well as free meta-level software that *enables each individual human to (re-)gain control over the autonomous systems in as far as those decisions affect that person*.

The last point (iii) is particularly important and is analogous to the right to keep one's own data and privacy in cyberspace. If

Europe does not take the lead here, we will give up our cultural sovereignty completely to those who do, allowing them to become the leaders in the field.

Human sovereignty over these systems is a delicate matter involving many aspects – from IP to liability and free trade. Meeting the various requirements involved is also technologically difficult because there will be many situations in which a human being will critically dependent on an autonomous system that could very well have more information available to it than the human: think of an autonomous aircraft – what would it mean in this context that the human may always be able to assume control? These are far-reaching and highly relevant questions that need to be answered if the area of technical autonomy is to achieve user acceptance.

Experience teaches us that the deployment of increasingly complex systems can only be successful if the potential users are convinced that these systems are beneficial to them – that they improve their quality of life, that they will not harm them or the environment if they malfunction, and that they are reliable. In other words: these systems gain user trust only (i) if their behaviour and interaction are "reasonable" by human (ethnic and cultural) standards, and (ii) if they are completely and totally reliable.

We identify the following pre-conditions for achieving **user trust**:

> *Ego Transparency*: the system can explain itself at any given moment
> *Design Transparency*: system behaviour is always rational and deducible
> *Security and Guaranteed Privacy*: system detects any violation and shuts down/ reconfigures if corrupted

The preconditions for **total reliability** are (at least) the following:

> *Formally proven behaviour* for all possible sensor (environmental state) input envelopes

> *Autarky* (energy and information supply) – the system is always on
> *Automatic redundancy management* (the system repairs itself under all circumstances)

AUTONOMY: WHAT MUST EUROPE DO TO LEAD THE DEVELOPMENT?

It is quite obvious that we are entering a new age of technology development that may well lead to autonomous machines that can help produce machines just like themselves, eventually even becoming independent of humans. While this may sound like a potential threat, we should note that we are already completely dependent on technology for our survival, whether we like it or not.

Our vision must be to **strive for leadership in Autonomy** – if Europe wants to play a role in the future world. More to the point: **leadership in Autonomy will largely determine the importance in the future economy**!

Fortunately, Europe has a cultural, ethical and technological tradition that puts it in the pole position for the **Era of Autonomy** and the EU has invested substantial funding in advanced systems and cognitive robotics research over the past ten years. It is well worth mentioning here that the EU flagship "Human Brain Project" has a strong arm in technology development (novel computing architectures and neurorobotics), and would be an ideal instrument for connecting advanced cognitive science with the development of technical artefacts.

At this point in time, three lines of action are recommended:

> **Content/Methods**:
> There should be a joint, large-scale development effort for **generic architectures** for autonomous system classes as well as a Working Group initially summarising the state of the art in systems design and systems engineering, followed by the **development of**

radically new design methodologies and processes Translation/Clustering: architectures/tools that become fully-fledged companies to support the full "value chain" with networks for innovation to eventually develop into the "next SAP" for Autonomy Technology

> **Standards**: high-visibility standards committees for the all the base technologies so that researchers are encouraged to participate and the results of this research being the direct basis for the work of the design centres.

Drawing on our experience with **EIT ICT Labs, ECHORD++**, and others, the key success factors for such design centres can be identified as follows:

> **Close integration with local companies** – representing both technology providers and end users

> Establishment of a **living lab** to enable companies and interested persons to experience research results and the latest technology **Attractive and IP-preserving infrastructure** to enable companies to integrate their technology into the living lab and to allow end users to check solutions matching their requirements**Funding for small projects** conducted by researchers together with industry (both end users and technology providers)

> **Support of long-term, large projects** (modelled on the EU-flagships) to build up critical mass and to give a clear indication to the Community of researchers and entrepreneurs that Europe is willing to regain the leadership.

There is a lot to be done but one thing is for certain: Autonomy is not only a highly relevant, but also a far-reaching and innovative topic that European researchers should get excited about!

ARTEMIS
EVENTS CALENDAR

ECSEL STRATEGY EVENT
▼
Organised by AENEAS, ARTEMIS-IA

Date
May 20-21- 2014
Location
Brussels

ECSEL LAUNCH EVENT
▼
The ECSEL LAUNCH EVENT will take place the first week of June. More information will follow soon via the ARTEMIS Industry Association website.

Date
June
Location
Brussels

MICROELECTRONICS WORKSHOP
▼
Date
19-20 June
Location
Istanbul, Turkey

JTI LAUNCH EVENT
▼

More information will follow soon via the ARTEMIS Industry Association website.

Date
9 July
Location
Brussels

SAFECOMP 2014
▼
The 33rd International Conference on Computer Safety, Reliability and Security

Date
10-12 September 2014
Location
Florence, Italy

ITEA PO DAYS
▼

23 & 24 September
Amsterdam

Date
23 – 25 September
Location
Amsterdam, the Netherlands

ARTEMIS-IA PRE-BROKERAGE EVENT 2014

By Ad ten Berg

The ARTEMIS-IA Pre-Brokerage Event, back-to-back with the AENEAS Brokerage Event, was a great success. It proved a very well visited and dynamic start to the first expected ECSEL Call.

This first preparation of project consortia ahead of the first expected ECSEL Call in the field of Cyber-Physical Systems took place on 4 & 5 February 2014 at the Crowne Plaza hotel in Brussels.

The Pre-Brokerage Event 2014 was organised by the ARTEMIS Industry Association. With more than 250 participants from 20 countries and 36 project ideas proposed, the preparations for this first expected Call of ECSEL were a tremendous success.

We welcomed our 200 ARTEMIS-IA members and also 50 non-members to the event in which 36 project ideas were discussed, elaborated and sometimes merged during the poster and break-out sessions. This all contributed to a very lively and open atmosphere where starting project consortia and interested future partners met and mingled.

The first day started off with a presentation by Jan Lohstroh on the state of affairs at the ECSEL-JU with updates regarding the expected starting date of ECSEL, the ECSEL funding perspectives, Inter Associations Agreement and the Strategic Research and Innovation Agenda (SRIA). The second presentation of that morning was given by Laila Gide regarding ''*The Way Forward* ''through the 2014 MultiAnnual Strategic Research and Innovation Agenda (MASRIA) of the ECSEL Joint Undertaking. This R&I agenda has been elaborated by the three Industry Associations – AENEAS, ARTEMIS-IA and EPoSS – that plan to participate in ECSEL-JU.

After the high quality project pitch session with presentations of 18 projects, the 200m² poster room filled up with a large crowd of enthusiastic companies and eager research institutes from all over Europe. Around the project posters and even in the nearby hotel bar the first discussions started off immediately and continued for much longer than the day programme listed.

The second floor of the event venue was the place to be for a more closed get-together meeting. Not only were all 7 rooms used, but we even organised an additional *"secret"* , that is "difficult" to find, meeting room on the 3rd floor.

Many participants prepared themselves for this event through the ARTEMIS-IA Project Idea Tool (PIT) in which all ideas were uploaded in the weeks before the event. This tool gave access to project ideas, information on subjects such as Key Selling Points,

missing capabilities and partners, partners already involved and project idea PowerPoint presentations. In addition to this, the project signposts were tracked and shown on large screens so that all participants could trace the project discussion they wanted to follow.

The ARTEMIS Brokerage Event App enabled easy access for finding participants by means of a personal QR code on the back of the badge. It also provided a quick overview of the updates of project ideas, the location of project consortia meetings on the interactive floor plan and the scheduling of the Pre-Brokerage programme.

The table shows the numbers of participants per category and the number of organisations they represented (in brackets).

Besides the ARTEMIS-IA members, an additional 230 AENEAS/CATRENE participants also had their Brokerage Event to anticipate this first expected ECSEL Call for projects on the second day of the event. The hotel was packed with almost 500 participants of

companies and research organisations that work in the field of Cyber Physical Systems and Nanoelectronics.
Again, the International spread was high, with participants coming from many European countries, the largest groups originating from the Netherlands, Finland, Germany and Spain within the ARTEMIS-IA Community.

On the second day the plenary session started with the presentation of the ARTEMIS Repository by Matias Vierimaa

	Call 2014	Call 2013	Call 2012	Call 2011
Large Enterprises:	56 (37 org.)	61 (35)	50 (27)	37 (26)
SMEs:	20 (14)	38 (28)	36 (32)	39 (29)
Research org.:	58 (32)	48 (28)	53 (32)	55 (32)
Universities:	80 (41)	59 (40)	62 (35)	90 (44)
Non-Member:	55 (50)	47 (42)	52 (48)	58 (50)

and was demonstrated by Andre Hebben. The Repository is a great example of the embodiment of the ARTEMIS way. This means building on project results and sharing information within the ARTEMIS Community by making project results available to the R&D Community and applying these results within follow-up projects.

With the results of these two intensive days of buzzing project ideas, ARTEMIS-IA is convinced that this Pre-Brokerage will prove to be a solid base for a range of new projects to emerge under the flag of ECSEL-JU.

BATON BLUE(S)

*This column is the fourth in a series in which various members of the ARTEMIS Community pick up the baton and have a say on developments from a personal perspective and in their own way before passing the baton on. In this edition **Knut Hufeld, Infineon, Germany.***

Can you please introduce yourself?
I'm Knut Hufeld, Director of Research and Funding at Infineon Technologies. I started my professional career at the Corporate Research Department of Siemens (later Infineon) in Berlin and Munich where I worked on very different projects in hardware and software, including system process control, parallel processing and algorithmic characterisation of parasitic effects in circuit design. Since 2001 I have been coordinating funded research programmes at European and national level for Infineon Technologies AG. I have longstanding experience on PPP activities, representing Infineon Technologies AG in several strategic research initiatives and organisations like eNova, the Strategy Platform for e-Mobility of the German Automotive Industry, as board member of the Bitkom Working Group on Cyber-Physical Systems.

Your company is member of ARTEMIS-IA and you are an elected Steering Board member. What was your core motivation to join the Steering Board?
I was part of the ARTEMIS initiative right from the start, being involved in the SRA discussions. It was also at this time that I was involved in setting up the first project under FP6, something like a prototype for an ARTEMIS project. I have been a member of the steering board for about two years now. One of the main reasons for joining the steering board is that it gives me the opportunity to be at the heart of developments, to share knowledge with my peers and, of course, to give and get inspiration among such an inspiring group of people.

What are important focal points for Infineon in the ARTEMIS programme?
Infineon is a component supplier, and being part of the ARTEMIS programmes gives us the opportunity to become involved in the wider context of the chain, gaining knowledge and experience of embedded and Cyber-Physical Systems for which our components are, of course, used. And we can contribute our considerable expertise to add value in providing components whose functionalities are high-quality, reliable and secure in safety-critical contexts. From the ARTEMIS environment we are able to gain more understanding of the software side of things.
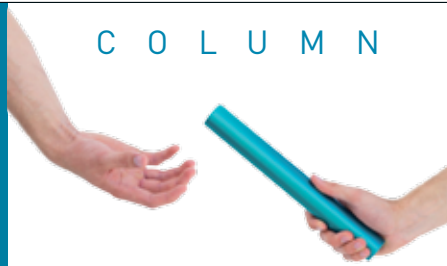
This is an important factor, especially in view of the trend to more and more system integration. So not only do we get to show what we are capable of but also get to explore the opportunities for semiconductors in this melting pot of ideas and innovation.

What are important achievements of ARTEMIS in your view?
First and foremost, network and Community building. In a very complex and fragmented world the ARTEMIS Joint Undertaking has managed to bring together many of the key players in Embedded Systems, from the software development side to tool builders, suppliers and education, providing a platform for widespread cooperation throughout Europe. In the safety-critical and real-time areas, for instance, ARTEMIS helped to further cross-domain knowledge, something that may be regarded today as normal but this was not the case before ARTEMIS. So that's a real achievement, too.

You are project coordinator of EMC2, one of the largest ARTEMIS projects ever, an AIPP. What are the benefits of such an approach over the regular ASP projects?
The EMC[2] project aims to develop an innovative, sustainable service-oriented architecture for mixed criticality applications in dynamic and changeable real-time environments. This has attracted a very large consortium – and we're talking upwards of 70 or 80 partners. Given the large commitment, we have organised the project into twelve, more or less independently acting sub-projects with either a technology or application focus. Of course, a huge project requires smart coordination. Living labs give us the opportunity test the technology through application, and this also gets the results downstream.

Karlheinz Topp handed over the baton to you and he had a particular question to you: As a component and chip developer, what is your view on the new combination of ARTEMIS, ENIAC and EPoSS under the ECSEL flag?
I think it is a good development because this merger, if you like, gives us the opportunity to benefit from holistic approaches and, at the same

time, from specific projects catered for by the individual communities. In the past, you had projects that focused on software but lacked the necessary hardware focus or vice versa. With ECSEL this somewhat artificial partitioning will be less evident and we will have much more of a systems approach, resulting a real software-hardware co-design. This certainly has the potential for us to gain value from as well as add value to all three communities.

What do you believe is the biggest challenge in the R&D of Embedded Systems for the coming years?
Certainly handling the multicore issue in a cost-efficient way and the need to incorporate more and more security in real-time, safety-critical systems – these are two key challenges that we have to deal with.

What is the personal motivating factor in your professional life?
In a few words, it's getting a project up and running and seeing it produce tangible results in the end. Along with the variety that I find in projects of very different natures. It's real fun!

To whom do you wish to hand over the baton/column and why? What particular question do you have for this person?
I would like to hand over to Jerker Delsing, the coordinator of the big Arrowhead AIPP project. My question to him is this. Jerker, ARTEMIS an now ECSEL is basically an industry-driven approach. Do you have the impression that science is integrated in a fair and appropriate manner and the right topics are being addressed?

What music goes together with reading of the column?
'Happy' by Pharrell Williams. I think people should have a cheerful, optimistic tune in their heads when they read this column.

EDITORIAL INFORMATION

ARTEMIS Magazine is published by ARTEMIS Industry Association and ARTEMIS Joint Undertaking.

ARTEMIS aims to tackle the research and structural challenges faced by European industry by defining and implementing a coherent research agenda for Embedded Computing Systems. Its ambition is to help European industry consolidate and reinforce its world leadership in embedded computing technologies.

ARTEMIS Industry Association is the association for R&D actors in Embedded Systems with 180+ members around Europa. The Industry Association is the private partner in the ARTEMIS Joint Undertaking. It continues the work of the European Technology Platform and is therefore responsible for the ARTEMIS Strategic Research Agenda. The Industry Association creates the meeting place where the stakeholders identify topics for major R&D projects that they want to pursue together, form consortia and initiate project proposals for joint collaboration, and building of Eco-Systems for embedded intelligence.

The ARTEMIS Joint Undertaking is a Brussels based organisation legally established in February 2008 and gaining autonomy in October 2009. It is a Public Private Partnership with the EC and 23 participating Member States. The ARTEMIS Joint Undertaking adopts a commonly agreed research agenda closely following the recommendations of the Strategic Research Agenda developed by the members of ARTEMIS Industry Association. The ARTEMIS-JU will manage and co-ordinate research activities through open Calls for project proposals through a 10-year, €2.5 billion research programme on Embedded Systems.

ARTEMIS Magazine provides information on the developments within the ARTEMIS Community. Its aim is to keep the ARTEMIS Community and beyond updated about the Association, Joint Undertaking, programme status & progress, achievements and events in Embedded Systems. An online version of ARTEMIS Magazine is available on www.artemis-ia.eu and www.artemis-ju.eu

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