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Professor Dr Heinrich Daembkes, president of the ARTEMIS Industry Association, answers **Portal's** questions on developments around cyber-physical and embedded systems

Cyber-physical futures

During 2015's ITEA ARTEMIS Co-summit, Portal sat down with the president of the ARTEMIS Industry Association (ARTEMIS-IA), Professor Dr Heinrich Daembkes, to discuss topical developments around embedded and cyber-physical systems and the work of the association.

Since the last Co-summit in 2013 there have been big changes for ARTEMIS. In 2014, the joint undertaking (JU) merged into the newly created Electronic Components and Systems for European Leadership (ECSEL) JU. However, the ARTEMIS-IA continues as a private partner in ECSEL. Daembkes stressed that all on-going projects will continue to be supported and cared for under the new organisational arrangement.

Being one of three private partners in ECSEL, alongside the Association for European NanoElectronics ActivitieS and the European Technology Platform on Smart Systems Integration, ARTEMIS-IA represents actors from the embedded and cyber-physical systems sector. The transition, Daembkes explained, was not very easy, and efforts persist to ensure co-existence and the mode of co-operation, with three associations interacting with the central JU office. He added that, in co-operation with the other partners, a common roadmap to build input for calls in 2014 was successfully developed.

"This was done remarkably well. We joined forces and we established common working groups between the three associations, working on

themes, and depending on the availability of the experts we had mixed populations in these working groups. We decided on chapter leaders and then they were writing these chapters."

However, in the 2014 programme, there were issues over the use of the budget and the work plans to be adopted. In the projects resulting from the first two parallel calls last year, only around 20% of funding was made available to cyber-physical systems-related activities. Acknowledging the disappointment within the ARTEMIS community, Daembkes made clear that ARTEMIS-IA efforts are on-going to ensure that more resources are devoted in the future.

Sending out the message
Communicating the potential impact and the importance of embedded systems is a priority. When applying for funding, the complexity of projects in this arena presents a clear challenge. The ARTEMIS-IA has learnt from this experience, with efforts coming forward to strengthen application processes and explain the expected impacts. Work is maturing, the

association president told Portal, and ARTEMIS-IA is learning how to rapidly transfer research results into application.

Daembkes went on to detail a promising series of projects that the association is continuing to support. Reflecting on the establishment of the CRitical sYSTem engineering AcceLeration (CRYSTAL) project, he said: "A very difficult phase of this project was the setting up of the group of companies, as there were a lot of competing companies in the software sector involved. These are big suppliers of software, or tool providers, as well as smaller ones, who target the original equipment manufacturers directly. Through CRYSTAL, they finally agreed to work together and to work on interoperability standards to allow the inception of thorough, straight, seamless chains of tools.

"For the user they can configure various elements and bring that into application. That is a big success, and this project is still on-going. A spin-off group is working on new standards of interoperability and will come up with a spin-off that will establish such standards for design tool chains, especially for safety-critical applications."

Moving on to further efforts, Daembkes continued: "Through our focus on safety and secure implementations, we discovered that one of the missing building blocks is the certified multicore processor. A number of small projects have been supported that analyse the situation. For instance, they analyse the properties of multicore processors which are available on the market. One produced by Infineon, as an example, is already used today in automotive environments, yet research came to the conclusion that for future applications, with higher demands on certifiability, the processing performance for avionic applications is not sufficient. As a result, the avionic industry defined the requirement for future multicore processors, and this is now being picked up by industry more widely."

Follow-up projects will help to define the conditions under which the development of multicore processors can take place, and make these processors useable in various applications.

Daembkes continued by detailing how the EMC² – Embedded Multi-Core systems for Mixed Criticality applications in dynamic and

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The ARTEMIS-IA was able to showcase its successes in Berlin

changeable real-time environments – project is going further, saying: "It is working to establish multicore technology in all relevant embedded system domains. It is helping to develop a certifiable multicore processor that is available for several performance classes. The project is looking to establish the conditions to develop a system which is allowed, during run time, to change composition and configuration so that there is varying boundary conditions under real-time operations."

Further work is going ahead on projects in the medical domain, and these are especially relevant in critically sensitive areas such as brain surgery. The association president outlined the work taking place to prepare the conditions for making visible the results of medical investigations: "The next step is to act on this. This means using the information to, for instance, support surgeons carrying out brain surgery or even using it for highly automated surgery where robots provide assistance. In this case, medical practitioners have to trust that the information being used is absolutely true and correct.

"That means there is a need to have high performance, high reliability, and safety-critical computing power to generate the images and to then, out of these images, deduce information to support the surgery, whether it is carried out by a human doctor or an automated surgery arm."

Meanwhile, Daembkes is confident of ARTEMIS's success in other sectors, too. He highlighted the association's work in the energy domain as one example. Efforts here will help contribute to developing stations for fast recharging, setting the stage for the development of future solutions.

"In many areas we are making significant progress," he said, "and we are also learning how to better transfer the results in a shorter time to application. That is also due to the learning process on the funding side; the European Commission and the national authorities are now less concerned when we become closer to an application.

"Previously they were very much afraid that this short distance to an application is distorting the market. Yet, as long as there are competing actors, and as long as the work is really open and conducted in a precompetitive approach, it is much easier to do that, and we are establishing ways to do it. Nevertheless, there are a lot of hurdles to overcome, which limits the power of our instruments in relation to big projects.

"There is room for improvement: we want to see a deeper involvement of the ARTEMIS-IA organisation and be informed about the achievements of projects so that we can learn from them and apply these lessons to our future activities."

Moreover, now that it is apparent that funding for future calls under ECSEL is to be significantly reduced, and with the European Commission wishing to fund the industrial participation of innovation actors in so-called 'innovation action projects' with only 15% of the direct cost, the industry's confidence has been shaken. Daembkes warned: "Under my responsibility, as president of ARTEMIS-IA, I received several very strong reactions from the members of the ARTEMIS community saying that under the conditions as we see them now, as we understand them, this approach might endanger the goals of the ECSEL programme as they may no longer be interested in participating."

He continued: "The additional efforts are too high for some potential partners to justify the benefit of the co-operation. Many potential partners are indicating that the co-operation itself is very welcome, and it justifies the effort needed. Yet from the point of view of industry, if there is too much of a burden on partners, then there may be a need to go and consider a different instrument."

The ARTEMIS-IA president stressed that through these approaches, the benefits of combining national efforts with European efforts might not be realised: "In a number of areas, activity continues to be split between the different national efforts and European activities."

Will to succeed

In the global context, this creates a challenge. Daembkes explained: "This split activity just confirms the fragmentation of Europe. While some leading nations might draw benefit out of the arrangement, I don't know if there is a long term pan-European benefit. While it could present an advantage to conducting national projects, more widely there is a move towards platforms and products that are aimed at larger sized markets. These markets are at least on a European level. We need to have developments that are valid for the whole of Europe or indeed the world. If we do something just in one small region, the impact may be limited."

Moving forward, efforts continue to be focused on communicating the need for research in embedded and cyber-physical systems and on creating a pan-European strategy with input from industry, to find a win-win situation which is best for our members, the European industry and, not to forget, end users.

Reflecting on the programme's attractiveness, Daembkes said: "Based on the results of our activities, and especially based on the road mapping that we are doing, a lot of academic partners, as well as SMEs and large industrial partners, are firstly attracted because we are offering a platform
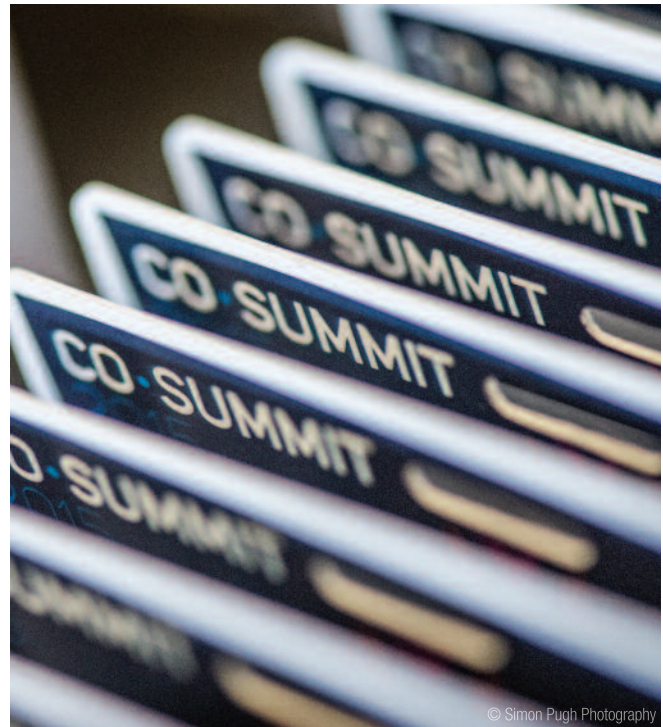
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The Co-Summit proved an opportunity to network and debate key issues

to discuss the roadmap towards future innovation, identifying the gaps that exist, and proposing actions to fill these gaps. This is attracting a lot of new players."

In order to further developments here, the association is working to reach out at a national level, where there are a lot of companies and institutions willing to contribute and to inform potential users of the advantages of new technologies.

Daembkes concluded: "Now we have to see what the benefit of engagement is and whether this translates into projects. But out of these activities, through attracting people by road mapping and strategy building, our association has gained several new members who see that by having the right to vote on, and to actively contribute to, our work, they enjoy a benefit. By being involved from an early phase, there is a wider understanding of upcoming trends, which aids organisations in increasing their preparedness for the future."

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