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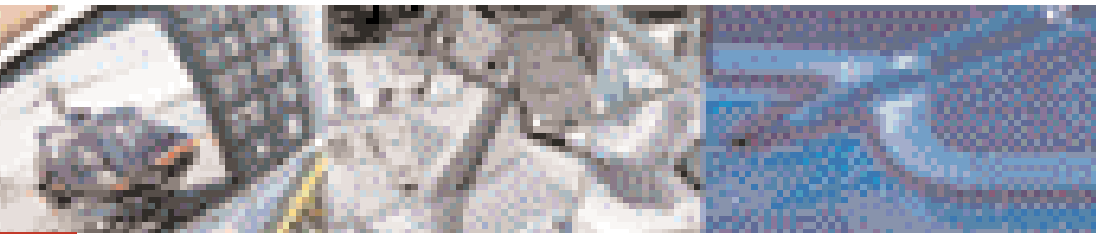
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## Strategic Research Agenda

# Innovation Environment



Strategic Research Agenda  
**Innovation Environment**

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## GLOBAL APPROACH

The ARTEMIS Innovation Environment will be based on new instruments in three key areas for the successful development of ARTEMIS :

1. CREATION OF INNOVATION ECO-SYSTEMS IN THE AREA OF EMBEDDED SYSTEMS
2. PROMOTING EUROPEAN PLAYERS IN THE INTERNATIONAL STANDARDIZATION ARENA
3. PUSHING THE TECHNOLOGY FRONTIERS

In this report, 8 concrete proposals for such new innovation instruments are presented.

# 1. Introduction

A key concept in innovation is the combination of invention and marketing: new technological ideas can only be regarded as innovative if they can result in marketable results (product, services,...). Empirical observation teaches us that many excellent technological developments, often representing leading ideas in their niche, fail to reach the status of Innovations as they fail to adequately address the specific requirements of a product in its target market. These requirements include specific embellishments for usability or integration into an existing market context, the presentation of the product or service in a properly calibrated commercial context (business model), support and maintenance considerations, etc., especially when the technology is to be brought to market by small company or institute spin-off. A secondary result of this is the appearance of many quite similar offerings, none of which would individually achieve significant market acceptance due to the inherent fragmentation.

In order that ARTEMIS can truly subscribe to innovation, these issues must be addressed. However, the simple funding of a pre-productisation phase is not what is needed. Instead, the Innovation Eco-system that will grow out under the aegis of Artemis, should ensure that a significant critical mass of resources is available to bring technological ideas to marketable products, by combating fragmentation and through the stimulation of supporting technology adoption by small and medium enterprises (SMEs) and larger enterprises alike.

In defining and setting-up an innovation environment for ARTEMIS, the purpose is indeed to ensure that the results of the R&D efforts engaged by all stakeholders translate into new products and market opportunities in a fast and effective way. We wish to make sure that there is a clear and obvious value chain, from the first steps of research, all the way down to designing products and services available to all European players in the area of embedded systems. The players in such a value chain - research institutes, high-tech SMEs, large industrial companies - constitutes an eco-system, i.e. a set of interconnected companies, specialized suppliers, service providers, and associated research institutions in a particular field. Eco-systems increase the productivity with which companies can compete.

Eco-systems are about competition and collaboration.

We do not expect competing automobile manufacturers or mobile phone designers to collaborate in their core areas of business. But it is important to understand that the full process of designing and producing a new car, aircraft or personal electronic device involves many intermediary technologies, products and services. Industrial groups have a clear benefit in pooling their resources to define and to create the tools and methods they need to drive their own innovation programs. Rather than waste resources developing proprietary design tools or non-standard middleware platforms, these industry players may gain a clear competitive edge by collaborating between themselves and with their technology suppliers (academia and SMEs) in the definition and implementation of technologies and products of common interest. Another reason for collaboration is the growing trend towards communicating objects and systems. This trend makes it mandatory to share the right level of standards, technology and methods across different market sectors in order to guarantee interoperability of objects and devices in various environments - car, aircraft, home, office, etc. - while complying with the regulations specific to each environment.

Eco-systems do not arise spontaneously. A European innovation environment for Embedded Systems has to be created in order to facilitate and to support key aspects that are unaffordable in terms of skills and costs for most companies and especially SMEs. This innovation environment will take advantage of the results of past EC IST Programmes, transnational Eureka clusters ITEA and MEDEA+, several major national initiatives. They all have contributed to the emergence in Europe of a richness of competences, research networks, open source consortium, regional clusters - or Pôles de Compétitivité - that has no equivalent in the world. This richness is an asset; it is also a risk, the risk of fragmentation and as a consequence of limited impact and lack of visibility from the rest of the world.

The ARTEMIS Innovation Environment proposes instruments that on one hand will organize and reinforce existing strengths in a consistent way; on the other hand will allow to develop new strength in areas where Europe is still lagging.

By bringing the right innovation instruments to the ARTEMIS stakeholders, the Innovation Environment will serve and support the efficient execution of the ARTEMIS Strategic Research Agenda (SRA), enabling to turn rapidly research achievements into innovating products, processes and services for the global market.

## 2. Innovation eco-systems

There is no straightforward approach for the setting-up of an innovation eco-system. It is a complex, multidimensional question that requires acting on several distinct aspects. Also, there already are a significant number of efficient instruments and organizations that provide starting points for our proposals.

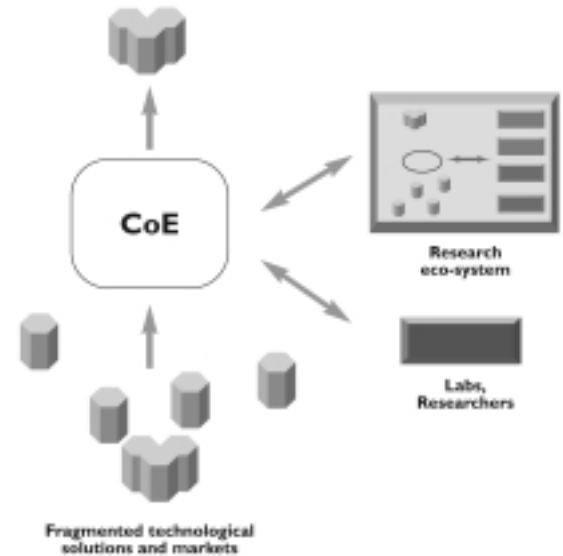
We propose to concentrate on four key instruments to be implemented under the JTI, according to the statements of the ARTEMIS Strategic Research Agenda (SRA).

- A new concept of European Centers of Excellence.
- Support actions for SMEs.
- Development of open or community source organizations for embedded software technologies.
- Sharing of Research Infrastructures

These proposals have been prepared with the three following founding principles:

1. **To take advantage of and to build-up on existing achievements and capacities in the member states and in Europe in terms of regional clusters, technical infrastructures, Open Source Software organizations, research institutes, that are dedicated to embedded systems technologies and applications;**
2. **To strengthen and reinforce each actor of the R&D value chain: large and small enterprises, academic research organizations**
3. **To ensure consistency throughout the R&D value chain**

### Optimised solutions



ARTEMIS' aim is to address the fragmentation in the existing market, and the concept of reference designs and middleware for specific application contexts is intended to refocus the structure of the market

### 2.1 Centres of Excellence (CoE)

#### Proposal 1: Centres of Excellence (CoE)

*The ARTEMIS Innovation Environment will build on existing regional clusters using Centres of Excellence (CoE). A CoE has its scope clearly defined as a coherent subspace of an application domain of the ARTEMIS SRA. It creates an Innovation Eco-system for that subspace, taking advantage of the critical mass of competences and resources that have already been organized in its supporting regional clusters. A Centre of Excellence, hence, represents a part of ARTEMIS industries in Embedded Systems.*

#### 2.1.1 Centre of Excellence: principles and objectives

The European R&D landscape has undergone a phase of intense reorganization and structuring in recent years. Several initiatives have been launched by member states creating regional clusters, such as the Pôle de Compétitivité in France, Pôle de Compétitivité in the Netherlands, Kompetenz-Netze in Germany, the cluster of Strategische Onderzoekscentra in Belgium, etc. Several of these regional innovation initiatives address the application domains of the ARTEMIS

SRA. Thus, it is important for the success of ARTEMIS that these regional innovation initiatives in Europe can participate to and be integrated into the ARTEMIS innovation environment. They will bring to ARTEMIS industry driven visions in each of their specific application area. Creating this integration between innovation clusters and ARTEMIS is the main rationale for establishing ARTEMIS Centres of Excellence (CoE).

An ARTEMIS Centre of Excellence is defined as an European alliance based on regional innovation clusters and similar cross-partners organisations addressing a coherent sub-set of an application domain of the ARTEMIS SRA (a CoE will usually consist of a core structure (set of existing regional clusters) and satellites partners (companies, labs)) Centres of Excellence will bring the following contributions and benefits for ARTEMIS:

- In terms of strategy: To feed domain-oriented requirements into the ARTEMIS Strategic Research Agenda by providing structured, domain-specific think-tanks;
- In terms of implementation: To contribute to the sustainability and industrial take-up of the ARTEMIS results:
  - by running integration platforms and test beds capacities
  - by providing business development instruments and spin-offing environments
  - by facilitating transformation of research results into innovative products (as part of regional, national and European programmes and as part of industry-funded JTI activities on innovation ecosystems)

Given the expectations on the scope of a CoE and the level of industrial involvement, it is expected that 4 to 6 Centres of Excellences are required to cover the ARTEMIS R&D landscape.

### 2.1.2 Main requirements on a Centre of Excellence

Sustainable innovation and research excellence

A Centre of Excellence shall:

- mobilize and integrate a critical mass at European level for driving a significant part of an application domain of the SRA;
- act as an instrument to help structure and to contribute significantly to its SRA part;
- facilitate and support the transformation of research results into industrial deployment in their domains;

- establish instruments for achieving cross-project synergies supporting industrial deployment, such as shared platforms, test beds ...;
- simulate innovation within its scope through spin-offing and business development activities.

### Industrial impact

A Centre of Excellence shall:

- have a synergetic vision and identify needs, solutions and applications, and represent a significant turnover;
- guide the identification of new product and market opportunities and help in the preparation of business activities;
- pursue the implementation of industrial research visions;
- build on and strengthen cooperation and aggregation through close links across industries, university, and research establishments;
- take-up industrial roadmaps of and interface with strategic domain specific entities relevant to the sector of the CoE;

### Industrial ecosystem

A Centre of Excellence shall:

- foster cooperation between SME and large industry;
- provide a stimulating environment for emergence of spin-off-companies;
- contribute to the creation of European jobs;
- ensure fast take-up by industry of CoE contributions, and
- establish industrial education programs to maintain European engineering leadership.

### Organizational excellence

A Centre of Excellence shall establish an efficient and appropriate organisation for carrying out its missions and have an appropriate governance.

## 2.2 Support actions for SMEs

In the ARTEMIS eco-system model, high-tech SMEs (1) are expected to play a key role in the capitalization and dissemination of the technologies

*(1) The European Federation of High-tech SMEs represents SMEs in the Steering Board of ARTEMIS. The Federation's role is to identify relevant SMEs across Europe and to set up a network of "ARTEMIS correspondents" which will reinforce SME involvement in the development of the Strategic Research Agenda.*

resulting from the execution of the Strategic Research Agenda. With respect to the large industrial companies participating in ARTEMIS,

SMEs have relations in different phases of the value chain:

- SMEs are research partners of large industrial companies in the upstream part of the value chain,
- SMEs are technology and services suppliers of these large companies in the downstream part of the value chain.

It is of major importance for the building of the ARTEMIS eco-systems, that strong user-supplier relations are built at all stages of the value chain, avoiding disconnection between the different stages.

The following instruments are proposed in order to develop and to support SMEs and to strengthen SMEs and large industrial companies relationships.

### 2.2.1 ARTEMIS SME pact

#### **Proposal 2: ARTEMIS SME pact**

***It is proposed to establish an ARTEMIS SME Pact between large industrial groups stakeholders of ARTEMIS and the European Federation of high tech SMEs, following the model already established in France. Programmes implemented in the framework of the SME Pact will be open to European SMEs in the technological sectors covered by ARTEMIS.***

The model of collaboration is inspired by the French initiative "SME Pact". The SME Pact is a pilot action implemented in France since 2005. Focused on SMEs with a strong growth potential, it is a voluntary commitment made by large public or private entities to strengthen their relationship with innovative SMEs. As a support measure, large companies and large public bodies are provided with schemes allowing them to work with the best innovative SMEs. A set of indicators is established in order to monitor the share of SMEs in procurement of innovative products or services.

From the large entities' standpoint, the SME Pact comes down to being able to reconcile two opposing constraints: reducing acquisition costs and globalizing demand while ensuring open innovation. By facilitating the access of innovative SMEs to markets in the whole European Union, this agreement would foster the emergence of the

1000 new large companies necessary to meet the Lisbon Agenda and take up the challenges of globalisation.

The following services provided in the frame of the French SME Pact will be extended and implemented in the framework of ARTEMIS, including:

#### **1. Technological strand: SMEsearch**

***Objective: help SME becoming more visible, to help large entities identifying technological providers for their direct or indirect purchases.*** This will be achieved by presentations to signing large entities by panels of SMEs on a specific technology topic (2).

#### **2. Legal strand : SMEadvocate**

***Objectives: inform large entities on the difficulties encountered by SMEs, reduce acquisition costs through legal support provided to SMEs.***

The ARTEMIS SME PACT will provide individual support to SME in the framework of their contractual relations with large entities. The results of general interest will be published in the ARTEMIS annual report providing the companies involved allow it.

#### **3. Purchasing strand : SMEtool**

Objective: exchange of experience and the definition of new tools between SMEs and large companies. The ARTEMIS SME PACT will install thematic working groups on the following topics:

- Adaptation of acquisition procedures to the specificities of innovative SMEs,
- Incentives to main suppliers to involve innovative SMEs in their proposals,
- Limitation of the risk taken by large entities,
- Incentives to purchase departments

#### **4. Strategic strand: SMEwatch**

The ARTEMIS SME PACT will organize a yearly conference and will publish an annual report. Two annual SME PACT Innovation Prize will be awarded:

- The first one to the most innovative SMEs in the area of Embedded Systems
- The second one to large entities having the best relationship with innovative SMEs.

(2) First instances of such meetings have been organized jointly by ARTEMIS and the High-Tech Federation in June 2005 in Paris and in May 2006 in Bilbao.

## 2.2.2 Support to consolidation of the SME environment

### **Proposal 3: ARTEMIS SME office**

*Within the ARTEMIS JTI, an Office will be established, that is dedicated to supporting the consolidation of the SME environment. This Office will bring services and supports to the SMEs besides the management of the SME PACT.*

The services and support actions will address the following topics:

- Clustering of SMEs according to ARTEMIS segments
- Growth strategy to maintain competence in Europe
- Business development support
- Interface with European Investment Bank and other financial institutions providing guarantees to SMEs
- Facilitation of access to EC instruments ("take up" actions, EC structural funds...)
- Liaison with Venture Capital firms.

## 2.3 Open & community source organizations for embedded software technologies

### **Proposal 4: ARTEMIS community & open source initiatives**

*ARTEMIS will establish source software sharing initiatives using the conventional Open Source Software model and the Community Source Software model. For the Open Source Software model, the strategy is to establish ARTEMIS as the leading European player in existing initiatives such as ObjectWeb 2, Eclipse Foundation Open SystemC Initiative, SCILAB...*

In close relation to Moore's law, the embedded software in most product areas doubles every few year, and requires continuously growing development budgets.

Sharing of not only cost but also of know-how and expertise is a good means to sustain economically viable product and software development, and preserve industrial activity in Europe (3).

The recognition that the major part of embedded software in products is common and non-differentiating across manufacturers, but needed as a basis for the remaining part of differentiating software, forms a basis on which sharing of software can be established. To make such sharing successful, business models of the participants must be supported.

ARTEMIS will implement the two following models, depending on the objectives from participants and on market issues:

#### **1. Open Source Software (OSS) model**

#### **2. Community Source Software (CSS) model**

In Community Source Software, a community of like-minded companies, institutes and individuals agree on the scope, rights and obligations and the rules of participation. This can lead to higher efficiency and lower threshold for participation, with the element of trust that distinguishes a community from a completely open environment

(3) As stated in the ITEA Report on Open Source Software "Open Source Software may well be one of the best tools to escape (at least partially) from the monopolistic position that certain giant non-European companies have established in areas that are key for European development and independence. ...In particular, it may also be one of the best tools for preserving and strengthening European access to and control of basic software for embedded systems in those application areas (e.g. automotive) where European software companies have a strong position, and where other global suppliers aim to extend their monopolistic positions elsewhere."



The following global strategy is proposed:

- The purpose is to capitalize on results of R&D Communities, to avoid non-differentiating redundant work (use of common and IP re-use), to prepare future products or services for SMEs and to package available software pieces from the research projects in the framework of the SRA.
- The technical scope will focus mainly on the following domains of the SRA:
  - Connectivity & Middleware
  - System Design
  - Specific vertical domains
  - For OSS, ARTEMIS will take advantage of existing OSS leading organizations relevant to the scope of ARTEMIS rather than set-up new organizations.

Among the most relevant organizations, are:

- ObjectWeb Consortium for middleware technologies;
- Eclipse Foundation for System Design technologies
- OSCI (Open SystemC Initiative)
- OSDL (Linux)
- SCILAB Consortium for mathematical libraries
- For CSS, ARTEMIS will encourage communities and will solicit best-in-class approaches to provide their infrastructure to support such communities

## 2.4 Sharing research infrastructures

### **Proposal 5: Sharing research infrastructures**

**ARTEMIS will identify existing research infrastructures in academic or industries contexts that are of interest for the execution of the ARTEMIS SRA and that could be shared; if necessary, existing facilities will be improved or new ones will be created in order to address specific areas of the research agenda. Together with the governance of each facility, ARTEMIS will define and manage the access by ARTEMIS stakeholders to this pool of resources.**

In fields like astro-physics (telescope), quantum physics (accelerator), fusion (reactor), nano-electronics (clean room), it is obvious that expensive tangible research infrastructure is needed, which goes beyond the capabilities of a single company, institute or even country. Although less known, this is also the case in the field of embedded systems: e.g. extensive user tests have to be conducted before embedded electronic products can be put on the market. For this reason, Philips for example has substantially invested in a “HomeLab”, where psychologists, sociologist, communication specialists and engineers analyse the way family members interact in a “normal” home environment with prototype products containing embedded systems. Such single-company initiatives are important, but have important drawbacks: its application space is limited (e.g. the HomeLab is limited to the private space), and SMEs, research institutes and universities, for which it goes beyond their own investment capabilities, have very limited access to the facilities created by the big companies.

In order to implement this proposal, ARTEMIS will:

- conduct a study to clarify the needs in each domain of the ARTEMIS SRA (applications and technical domains)
- identify existing research infrastructures in academic or industries contexts that are of interest for the execution of the ARTEMIS SRA and that could be shared;
- create if necessary new facilities or to improve existing ones in order to address specific areas of the research agenda;
- determine how should be managed the pooling of these facilities and the conditions under which they are accessible to:
  - the European universities and research institutes
  - the European SMEs and more globally by all European companies the value chain



# 3. Standards & Regulations

ARTEMIS proposes a structured approach for the future standardization of embedded system technology, which enables European ICT industry to serve best its customers by developing market relevant standards. Future standardization for embedded systems should be driven and directed by the stakeholders involved in technology and product development at an early stage to assure, that technological innovations reach their full market potential.

The reach of the support initiative will not be limited to R&D topics addressed within ARTEMIS, but be able to address standardization subjects of general importance to the development of embedded system technology within Europe. A core structure for this support initiative is already present in form of the ARTEMIS Standards & Regulations sub-WG, where major European electronics and software companies are involved. For the Artemis Standards & Regulations support initiative, a financing scheme as a support action should be established. This would need to cover approximately four, 2-day meetings per year of around six persons involved, totalling up to 48 man-days plus additional travel and organisational expenses per year.

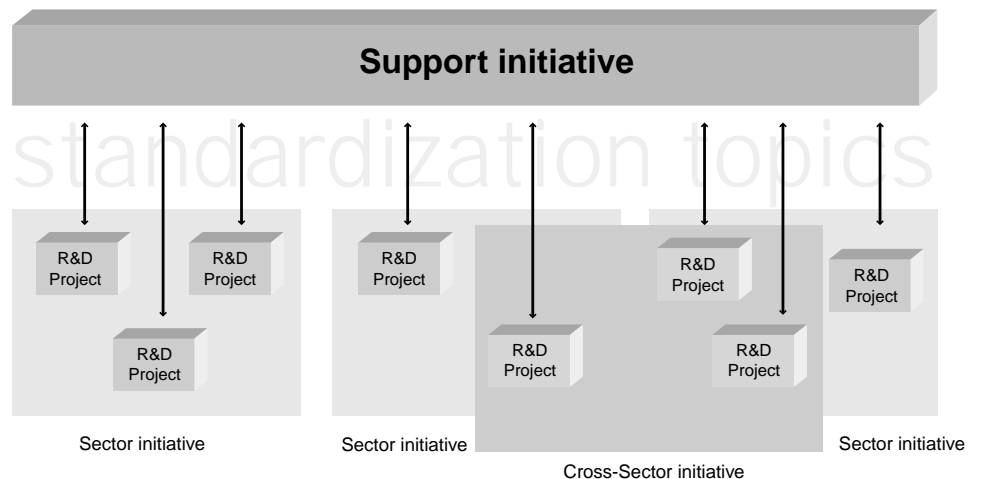
## 3.1 ARTEMIS Standards & Regulation support initiative

## 3.2 Proposal of sector specific or cross sector initiatives

**Proposal 6: ARTEMIS Standards & Regulation support initiative**

*To achieve a central communication, to address common subjects and to liaise with recognized standardization & regulation bodies, ARTEMIS will set-up a Standards & Regulation Support Initiative. This will, where necessary, interlink the activities of the sector specific or cross sector projects and establish an entry platform to ongoing activities. The support initiative should also address cross sector topics, such as a common terminology or cross sector platform standards such as open source distributions.*

To ensure that standardization activities of funded R&D projects are coordinated within one market sector, the ARTEMIS S&R sub-WG proposes the establishment of sector specific or cross sector special interest initiatives. These can be independent, funded R&D support initiatives, or a clearly identified task within an RT&D project (i.e. with verifiable deliverables). These should establish an overview of the standardization landscape for the specific sector and propose an integral approach for related R&D projects to develop market relevant standards in a short time frame. These sector specific or cross sector initiatives should aim at assembling major players along the value chain of the market segment concerned. The sector specific or cross sector initiatives should be open to address topics not treated within the ARTEMIS R&D projects.



### 3.3 ARTEMIS initiated R&D projects

R&D projects initiated under the framework established by the ARTEMIS technology platform are launched to develop market relevant technological solutions. For an actual market entry, standards often have to be developed. Therefore, the question of technology standardization can have a central impact on the actual market entry of a technical solution.

Critical parameters for market acceptance through standardized solutions are the time to market and the market acceptance of a standard. These questions should ideally be addressed during the development process and related activities undertaken. This can mean the joining of a standardization body, a consortium or a special interest group, or in some cases the founding of a new initiative.

ARTEMIS initiated R&D projects should address the question of market access and whether standardization is regarded as a useful approach during the project establishment period. The same holds for technologies where the market access is regulated by state or by European authorities, as it is for wireless technologies using frequency space. The following are specific requirements of ARTEMIS project proposals with reference to standardisation:

- Standardization activities must have a clear rational and deliverables defined
- Identification of link to standardisation development organisation or consortia
- Clear link and strategy for valorisation
- From the outset, identify relevant existing standards

### 3.4 Implementation

The crucial point for the impact of the ARTEMIS S&R initiative is the implementation of the recommendations. A key issue is the participation of major market players with a willingness to contribute to a common position. A first milestone would be the implementation of the standardization topic in all ARTEMIS initiated R&D projects, or at least it must be formally addressed in project proposals. A crucial point will be to convince a significant number of relevant technology stakeholders to participate in the sector specific or cross sector standardization projects. This will not be able only through addressing participants in the ARTEMIS technology platform, but a credible critical mass of industry support must be involved. The implementation of the recommendations should be driven by the support initiative.

- At the proposal stage, the statements made on standardisation must be validated by the support initiative.
- During project execution there must be a defined interface to the support initiative (e.g. regular reporting, reviews, etc)
- When an R&D project ends and the standardisation work is not finished then the standardisation work needs to continue as an extension under the auspices of the support initiative. (with budgets for appropriate funding)



## 4. Technology frontiers

Besides the applied research and development activities driven by its industrial stakeholders, it is essential for the long-term success of ARTEMIS to have an environment supportive of the upstream research conducted by the academic community in the large (universities and research institutes). Three main objectives are considered:

- How the academic community in the area can be structured for effective and efficient interaction with industry ?
- How to organize the international research cooperation between Europe and other leading regions ?
- How do we ensure that potential breakthrough or emerging technology get the right level of awareness and support by the embedded systems community.

### 4.1 Structuring the Embedded Systems academic community

#### **Proposal 7: Association for European Research & Education on Embedded Systems**

*To provide a common voice and labeling for research and education on embedded systems in Europe, ARTEMIS will set-up an Association for European Research & Education on Embedded Systems. The association will be established taking advantage of the achievements of the ARTIST 1 and ARTIST 2 Network of Excellence.*

The European landscape of universities and research institutes specialized in the field of embedded systems is still highly fragmented with one and sometimes several national champions in each member state. As a consequence, Europe does not yet have large universities or research institutes comparable to those in the USA, with powerful organisations and mechanisms for transfer, and a history of combining work on theory and applications. Nonetheless, at both national and European levels, we see an increase in awareness and initiatives are taken to meet this need. The Networks of Excellence ARTIST 1 and ARTIST 2 have created a community and a shared scientific vision. It is now

necessary to move one step further with the objective to provide a common voice and labelling for European Research and Education on Embedded Systems.

#### 4.1.1 Mission statement

The Association will be a non-profit organization, open to any European team that is active in the area of Embedded Systems. The vision is that this Association will represent and promote the highest level of scientific competence and will be an indispensable strategic partner for industry / government / academia in Europe and for interfacing with similar organisation in other regions (North America and Asia).

Thus, the Association will

- Provide a network that taps into highest level of competence,
- Have international outreach
- Maintain tight interaction with industry and other stakeholders,
- And make Europe internationally attractive for top researchers.

Its main missions will be to:

- Establish long-term research vision for embedded systems in Europe
- Establish a vision for Education and Training in embedded systems.
- Develop an International Collaboration programme in embedded systems.
- Enable innovation by and with transfer of research results

The Association will combine the relevant and decisive research groups in Europe and have access to relevant industry connections in Europe. It should be financially self-sustainable, through government funding, membership fees and providing of services

#### 4.1.2 Longer-term goals / Results

Among the longer-term goal and results of the Association are:

- Research
  - ◆ Accepted by government and industry as the leading entity
  - ◆ Emergence of Embedded Systems as a mature discipline
  - ◆ Establish a research pipeline with continuous production of top research results
  - ◆ Investment program in European excellence: proactively invest in research groups to avoid takeovers

- Education
  - ◆ Establish model curricula
  - ◆ Provide training for industrial engineers
  - ◆ Set quality standards for education & training (criteria for accreditation)
- Industrial liaison:
  - ◆ Impact on industry (jobs created, take-up of research, spin-offs, IP)
  - ◆ Industrial needs and feedback to research
- Infrastructure
  - ◆ Dissemination of results (web portal, newsletter, etc)
  - ◆ Set up a European Embedded Systems conference

#### 4.1.3 Interaction between industry and the academic community

The Association will promote interaction and collaboration with industry, and then can take the following forms:

- Joint Workshop Series on “Hot Topics in Embedded Systems” (e.g.: Beyond Autosar)
- Joint PhDs with industry (joint funding and sharing results)
- Joint graduate schools (models exist)
- Job rotation with industry (both ways)
- Joint PhDs between institutes (not just Marie Curie)

## 4.2 ARTEMIS orchestra contest

### **Proposal 8: ARTEMIS orchestra contest**

***To demonstrate the capabilities of Embedded Systems and show to a broad public how important they can be, ARTEMIS launches the “Artemis Orchestra”: a contest aimed at universities, research teams and technology institutions.***

One other core goal of Artemis is to enhance public awareness and create excitement around the field of embedded systems. We see it as part of our duty to

make all necessary efforts to attract young talents, who will become the skilled scientists and business leaders that our industries will need tomorrow. With this in mind, the Artemis Orchestra contest is created, a contest open to young teams from universities and schools, who will be challenged to produce embedded computer systems able to play real musical instruments. Annual contests will bring these intelligent instruments together on a yearly basis, for an innovative public performance. Every passing year, it is expected to see the Artemis Orchestra grow in skill and numbers, and play under the direction of a real live professional conductor, to the tune of European excellence and success.

Built on longstanding European traditions in music, the contest challenges participants to create devices that play real musical instruments with the help of various embedded technologies. It will comprise several categories and allow different levels of sophistication among the participants. For example, a machine playing alone or several machines playing together, etc.

The Contest is open to everybody and has two classes: junior teams (age 18 or less), and senior teams.

The contest has the following four levels:

- Solo Play, level 1: Playing music alone, timing by itself.
- Solo Play, level 2: Playing music alone, under supervision of a human conductor.
- Member of Orchestra: Playing music as part of orchestra.
- Orchestra: One team has an orchestra of at least three different instruments



## 4.3 International collaboration

The objective is to define “modalities” for interaction between the European R&D community, and the main international players in the area, including research institutions, professional organisations (ACM, IEEE), standardisation bodies (e.g.: OMG, IEEE), large consortia, funding agencies (e.g.: IST, NSF, DARPA).

International Collaboration covers a potentially wide range of activities, from the organisation of technical meetings, high-level meetings, conferences, schools, and joint international projects. These may have various aims, including education and training, dissemination, definition of standards, and development of joint R&D activities.

It is clear that International Collaboration should fit into a global win-win strategy, for achieving the participants’ long-range aims. Defining such a vision and strategy is important for guiding International Collaboration - and these are needed at this point. Our mission is to explore avenues for International Collaboration.

### 4.3.1 International collaboration strategies

A key issue in International Collaboration is to find win-win strategies, which ensure convergence of interests between the involved parties. The definition of International Collaboration strategies for Europe requires an understanding of the strong points in embedded systems research, with respect to potential International partners.

The European strengths are the following:

- Innovative ideas leading to international standards
- Foundational approach: people understand the foundations, less ad-hoc
- European industry is more interested
- Europe currently seems to have fewer difficulties than the USA in attracting and holding top researchers, in embedded systems.

European policies for International Collaboration should strive to boost these strong points. We provide here some examples of win-win situations:

- Joint degree programmes with non-US Universities outside Europe (with strong incentives for staying within Europe for some length of time)
- Attract international investment in European research labs, while taking the necessary measures for preserving IPs and rights (A European patent policy could be helpful in implementing these measures).
- High-Level Events: The aim of these events is to gather together top-level experts, to discuss trends and possible work directions on a “hot” topic in the area. These events could be used to introduce ideas to the Commission, to government agencies, and to industry. This type of cooperation has been tried with success, thus far mainly with the USA.

## 4.4 Identification of potential breakthroughs

The objective is to set up mechanisms and procedures for identifying breakthroughs and innovative ideas, to enable their dissemination and transfer to other parties (including industry).

The main idea is to set up a competition for Best Applied Research Results that could be included in a commercial product. A possible reward could be that one of the Artemis industrial partners takes up the results and brings them to market (respecting IP Rights). The competition could borrow ideas from SME start-up competitions (but with more emphasis on research).

Such results could innovate on products, or on methods. This competition will create an opportunity to promote the importance of the area, with a heavy emphasis on PR.



## 5. Participants working-group innovation environment

This report and the proposals it contains are the results of several active brainstorming meetings and exchanges between participants representing a large scope of backgrounds, expertise and experiences. Their dedication and contributions made it possible to elaborate and to build this report. Their names and affiliation are given below.

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Chair Sub - Working Group Technology Frontiers	Joseph Sifakis	Verimag
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George Matich	Selex-Sas	
Gerard Ladier	Airbus	
Heiko Doerr	Daimler Chrysler	
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Sylvain Prudhomme	Airbus	
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