



ArtistDesign Kickoff Meeting

Paris, January 29-30, 2008

Coordination

ArtistDesign

Scientific Coordinator: Joseph Sifakis

Technical, Financial, Admin Coordinator: Bruno Bouyssounouse

Concepts and Objectives – Main Ideas

Main Idea 1

Embedded systems are essential to ensuring a leading position for Europe in key industrial sectors services. This is well-recognized in the ICT FP7 priorities, and through the ARTEMIS ETP under construction.

Main Idea 2

Embedded systems design is an emerging scientific discipline, mobilizing a large international community, around a set of fundamental challenging and multi-disciplinary problems.

For this discipline to emerge, a considerable focused research effort by the best teams is needed.

Theory, Methods and Tools for ES Design

Design flow involves topics leading from initial requirements to a final implementation satisfying them. The objective is to study specific needs for these design activities, as well the possibility of integrating them in a coherent design flow.

We distinguish four essential topics, for which existing techniques should be adapted and extended :

- **Modelling and Validation:** We need formal modelling techniques that take into account the characteristics of a system's external and execution environments. These techniques should support component-based construction for heterogeneous components to be applicable throughout the design process. For embedded systems, validation focuses on testing and verification of non functional properties, including performance and dependability.
- **Software Synthesis, Code Generation and Timing Analysis:** Strong integration should be sought for these interrelated topics. The aim is to study and implement resource-aware synthesis and code generation techniques. These techniques allow the generation of an implementation meeting given user requirements from a functional description of an application (e.g. application software) and a model of a target platform.
- **Real-Time Operating Systems Scheduling and Networks:** The aim is to develop theory methods and tools for new real-time software infrastructures, for the execution and communication between embedded applications. The main problems include adaptive resource management and dependability techniques, in particular to improve robustness to deviations from nominal conditions.
- **Platforms and MPSoC Design:** The aim is implementation of complex applications on multi-core HW platforms. It raises a number of problems for ensuring predictability and efficiency. These include adaptive techniques for resource management, and the study of reliable programming models for multi-core architectures.

Long Term Integration

Embedded systems design is a multidisciplinary area requiring competences from hardware engineering, operating systems and networks, programming and compilation, modelling and software engineering, control engineering. The ArtistDesign NoE gathers together leading European teams from all these areas.

ArtistDesign will continue and extend these activities, both quantitatively and qualitatively. In setting up the consortium, we have sought the right balance between critical mass, excellence, and commitment from the core partners.

- **Critical Mass**

It was essential to gather a sufficient number of partners, to achieve a fair coverage of the main topics in the area, as well as to have the capacity to impact the European research landscape. Nonetheless, to ensure efficiency, we have limited the number of core partners, based on previous experience. At the same time, our impact is amplified through the large number of affiliated academic, SME, industrial, and international collaboration partners.

- **Excellence**

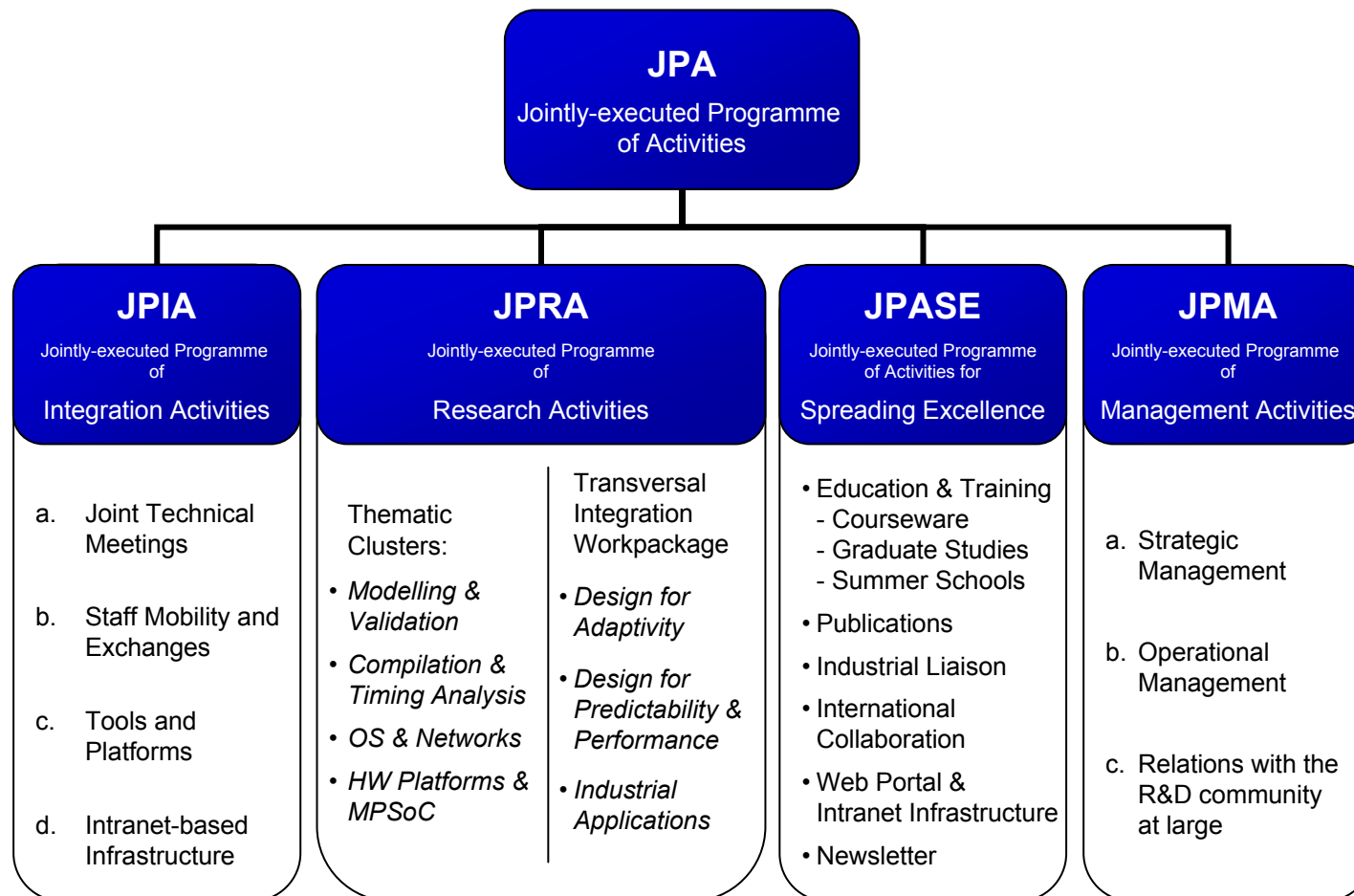
The ArtistDesign core partners include the main European leading teams, as attested by their leadership in their respective areas, as well as their strong involvement in national and European projects and initiatives.

- **Commitment**

The majority of the ArtistDesign core partners were already involved as core partners in the Artist2 NoE. They have demonstrated a high degree of investment to achieve the workprogramme objectives, by committing the resources needed, which are an order of magnitude larger than those provided by the NoE financing. We estimate that the effort for implementing the JPA is roughly 10 times the financial contribution for integration.

Joint Programme of Activities

ArtistDesign will act as a Virtual Centre of Excellence, composed of a set of virtual teams, called clusters. Each cluster gathers together selected teams from partners, to create the critical mass and expertise in one of the essential topics for embedded systems design.



Jointly-executed Programme of Management Activities (JPMA)

The Joint Programme of Management Activities (JPMA) includes:

- **Strategic Management**

The Strategic Management Board (SMB) plays a key role in ensuring ongoing integration at 3 levels: I) within the cluster; II) between clusters; III) with the larger European Embedded Systems Design community.

- **Operational Management**

is ensured by the ArtistDesign Office, and the Executive Management Board (composed of the Cluster Leaders). The ArtistDesign Office ensures that all aspects of the NoE are running smoothly, and that progress is made towards the overall NoE objectives. It is composed of the Scientific Coordinator, the personnel from Floralis (coordinating partner), including the Technical Coordinator, Administrative Assistant, and the Financial Coordinator.

- **Relations with the R&D community at large**

The NoE has a very strong presence within the embedded systems design community, at all levels. High-level interaction with the main institutions and bodies such as ARTEMIS/ARTEMISIA, professional organisations such as ACM TECS, NSF, DARPA, large conferences, are ensured and supported by various members of the Strategic Management Board, and the Scientific and Technical Coordinators.

Jointly-executed Programme of Integrating Activities (JPIA)

Each ArtistDesign research activity will have work within both the JPIA and the JPRA workpackages. Funds for staff mobility will be allocated taking into account the needs for research.

- **Joint Technical Meetings**

Present, discuss and integrate the ongoing work, and exchange points of view with other teams. They also serve to identify future work directions.

- **Staff Mobility and Exchanges**

Mobility should be justified by and refer to involvement in an activity from the JPRA or JPIA, or one of the following: co-funded scholarships with industry; exchange of students and personnel within the consortium.

- **Tools and Platforms**

Research platforms lay the groundwork for the JPRA, allowing common research to occur and capitalisation on research results. Platforms are used as the basis for transfer of research results to industry. Some of these have international visibility, and the ambition is for these to serve as world-wide references in their respective topics.

- **Joint Management of the Knowledge Portfolio**

ArtistDesign has an enormous potential in Tools and Platforms. We will set up a repository for managing and disseminating the participating team's IPR, including tools, software and hardware IPs. This repository will be used for dissemination purposes, as well as for marketing the partner's achievements.

- **Intranet-based Infrastructure for Communication and Collaboration**

To overcome the physical, cultural, and topic distances between teams, the Artist2 NoE has already set up a common infrastructure for communication and collaborative work between teams. This infrastructure will be further refined within ArtistDesign.

Joint Programme of Activities for Spreading Excellence (JPASE)

These NoE-level activities serve as a relay between the NoE and the international embedded systems design community at large.

- **Education and Training** These serve as incubators for developing integrated curricula and materials, and to disseminate results and spread excellence well beyond the partners and affiliated partners of ArtistDesign.
- **Publications in Conferences and Journals** Implemented through publication in the main conferences on Embedded Systems Design of the area, as well as the active participation for the organization and management of these events.
- **Industrial Liaison** This consists of actions oriented towards affiliated industrial partners, to transfer results follow and get feedback on the research and integration activities in the JPA (JPRA, JPIA).
- **International Collaboration** These activities will play a dual role: showcase the participants' results, and reinforce the NoE's leadership role worldwide. They will also collect relevant information about evolution of the state of the art outside Europe.
- **Web Portal** This will play a key supporting role for collaboration and Integration, such as interaction between clusters, management information, such as scholarships, internal events, and progress of the work. The web portal will also be used to disseminate any relevant information to the community at large. The web portal will be an essential mechanism for achieving integration and recognition.

JPASE: Extensions to the Web Portal

With respect to the Artist2 web infrastructure, the following improvements and extensions will be implemented to the publicly accessible Web Portal:

- **Calendar of Events**

A calendar-based view of events in the area will be implemented.

- **Interface with Google Maps**

An interface based on Google Maps would be provided, showing where the main activities per topic are located. This would cover labs in Europe as well as our International Collaboration partners.

- **Announcements archive**

The current Artist Mailing List would be expanded, to include automatic archiving, and availability via the Artist Web Portal.

JPASE: Extensions to the Intranet

With respect to the Artist2 web infrastructure, the following improvements and extensions will be to the Artist Intranet:

- **Budget interface**

Currently, the Artist2 detailed budget is managed using a large excel file, which is cumbersome to use by a large consortium. We will provide a web-based infrastructure to allow cluster leaders to update their parts of the budget, and all partners to see the available resources.

- **Web-based Reporting**

The initiative started in Y3 of Artist2 will be generalized, so that wherever possible, the partners will be able to report on advancement using a web-based interface.

- **Web-based Description of Work**

Essential parts of the DoW, such as the milestones, will be stored and accessible on-line.

- **Group Workspace**

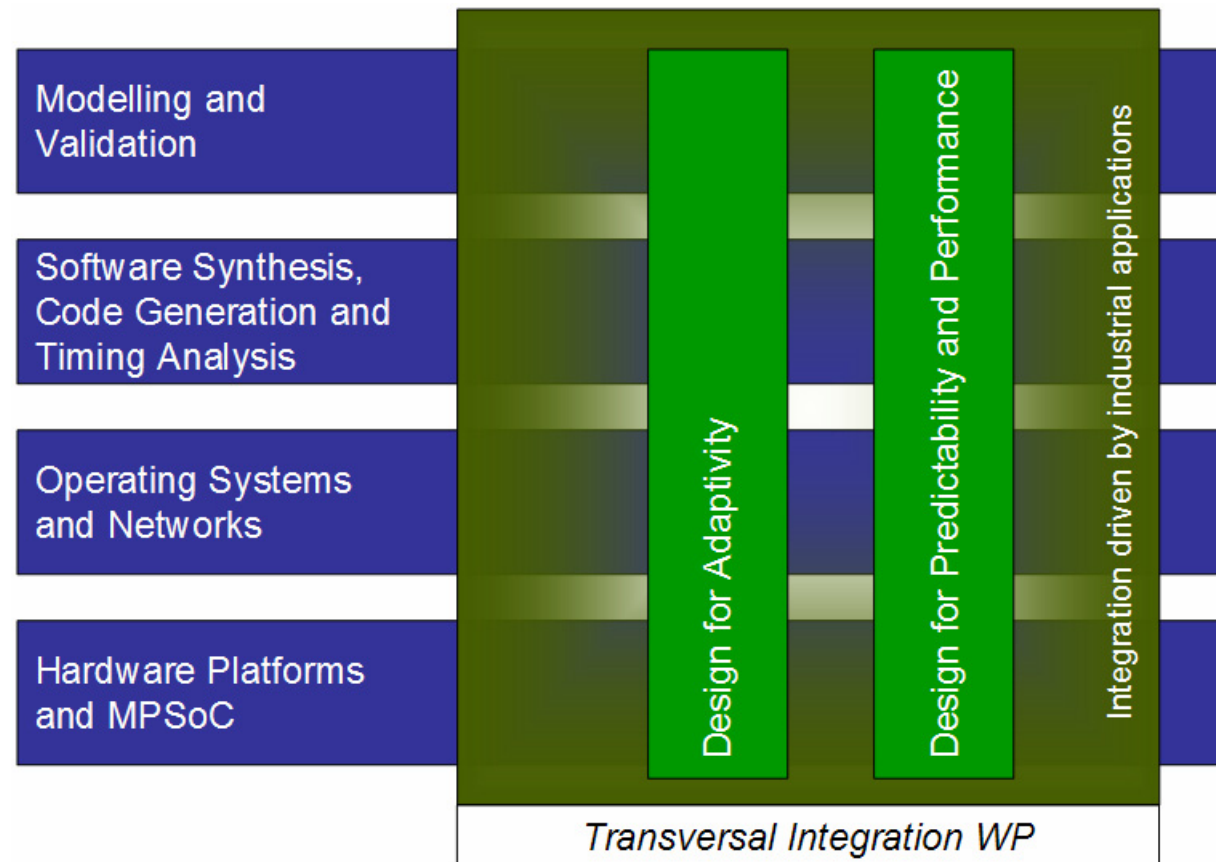
We will investigate possibilities for implementing group workspace services, such as shared files, shared calendars, etc.

Jointly-executed Programme of Research Activities (JPRA)

Clusters are autonomous entities, with specific objectives, teams, leaders, and a dedicated yearly budget.

The set of Thematic Clusters cover all the main topics in Embedded Systems Design. The thematic activities in the Transversal Integration workpackage focus on Design methodologies, with specific objectives (Predictability, Adaptivity).

Each cluster may have one or several Activities, as appropriate.



Workpackages

WP0	Jointly-executed Programme of Management Activities (JPMA)	MGT	Floralis
WP1	Jointly-executed Programme of Integration Activities (JPIA)	RTD	VERIMAG
WP2	Joint Programme of Activities for Spreading Excellence (JPASE)	OTHER	VERIMAG
WP3	Thematic Cluster: Modeling and Validation (JPRA) <ul style="list-style-type: none"> . <i>Activity: Modelling</i> . <i>Activity: Validation</i> 	RTD	Aalborg
WP4	Thematic Cluster: Software Synthesis, Code Generation and Timing Analysis (JPRA) <ul style="list-style-type: none"> . <i>Activity: Software Synthesis, Code Generation</i> . <i>Activity: Timing Analysis</i> 	RTD	Dortmund
WP5	Thematic Cluster: Operating Systems and Networks (JPRA) <ul style="list-style-type: none"> . <i>Activity: Resource-Aware OS</i> . <i>Activity: Scheduling & Resource Mgt</i> . <i>Activity: Embedded RT Networking</i> 	RTD	Pisa
WP6	Thematic Cluster: Hardware Platforms and MPSoC (JPRA) <ul style="list-style-type: none"> . <i>Activity: Platform and MPSoC Design</i> . <i>Activity: Platform and MPSoC Analysis</i> 	RTD	ETHZ
WP7	Transversal Integration (JPRA) <ul style="list-style-type: none"> . <i>Activity: Design for Adaptivity</i> . <i>Activity: Design for Predictability and Performance</i> . <i>Activity: Integration Driven by Industrial Applications</i> 	RTD	PARADES

JPRA Activity: “Modeling”

Tom Henzinger (EPFL - Switzerland)

Develop model- and component-based theories, methods, and tools that establish a coherent family of design flows spanning the areas of computer science, control, and hardware. Simultaneously address software, hardware resources, and the physical environment, in a quantitative manner. In order to gain independence from a particular target platform, embedded system design must be model-based. In order to scale to complex applications, embedded system design must be component-based.

JPRA Activity: “Validation”

Kim Larsen (Aalborg - Denmark)

Designing scalable techniques allowing for efficient and accurate analysis of performance and dependability issues with respect to the various types of (quantitative) models considered, covering a range of model-based validation techniques ranging from simulation, testing, model-checking, compositional techniques, refinement and abstract interpretation.

Software Synthesis, Code Generation and Timing Analysis

cluster leader:

Peter Marwedel (Dortmund – Germany)

JPRA Activity: “Software Synthesis, Code Generation ”

Peter Marwedel (Dortmund - Germany)

Software generation has evolved to a level where compilers are key components, but not the only components that are useful for generating executable code. New models of computations such as data-flow based models aim at avoiding the well-known disadvantages of imperative programming styles. It can also be expected that the link between software engineering and embedded systems will become stronger.

JPRA Activity: “Timing Analysis” Reinhard Wilhelm (Saarland - Germany)

Timing analysis of MPSoC systems is a new scientific field, and is very timely from an application perspective as MPSoC and Multicore architectures rapidly are becoming mainstream. A research effort in this area will thus establish European dominance in a field that rapidly is becoming very important.

JPRA Activity: “Resource-Aware Operating Systems” Giorgio Buttazzo (Pisa)

Investigate how RTOS have to be extended or modified to support emerging RT embedded systems (high complexity, highly variable resource requirements and parallel processing). Hence, another objective is to investigate kernel mechanisms that can efficiently manage the available resources, taking multiple constraints into account, while guaranteeing isolation properties.

JPRA Activity: “Scheduling and Resource Management” Alan Burns (York)

Provision of models of embedded platform resources and policies, and the necessary analysis for undertaking the run-time scheduling of these resources and policies. A key scientific challenge is to link this resource-centred analysis with models of the application (and their resource usage policies) and the performance profiles of the hardware platform itself.

JPRA Activity: “Real-Time Networks” Luis Almeida (U. Aveiro)

This activity will address numerous research challenges in the frameworks of Networked Embedded Systems (NESs), Wireless Sensor Networks (WSNs) and Mobile Ad-hoc Networks (MANETs).

Hardware Platforms and MPSoC

cluster leader:

Jan Madsen (DTU - Denmark)

JPRA Activity: “Platform and MPSoC Design”

Luca Benini (U. Bologna - Italy)

The main scientific challenges addressed in this activity are focused on how to map complex applications onto multi-core hardware platforms. This includes addressing allocation and scheduling issues like: scalability, flexibility, composability, predictability, design-time reduction and increased dynamism. The problem is complex and multi-faceted. On one hand, we have static (design/compile time) approaches, where applications are analyzed and optimal mapping decisions are taken before the platform is deployed in the field. On the other hand, we have dynamic, run-time approaches where mapping decisions are taken online, and they are triggered by environmental and workload variations.

JPRA Activity: “Platform and MPSoC Analysis”

Lothar Thiele (ETHZ - Switzerland)

Establish a set of models and analysis methods that scales to massively parallel and heterogeneous multiprocessor architectures, is applicable to distributed embedded systems as well, allows for the analysis of global predictability and efficiency system properties and takes the available hardware resources and the corresponding sharing strategies into account.

Transversal Integration

cluster leader:

Alberto Sangiovanni (PARADES - Italy)

JPRA Activity: “Design for Adaptivity”

Karl-Erik Årzén (Lund University – Sweden)

An embedded hardware-software system is adaptive, if it can modify its behaviour and/or architecture to changing requirements. Adaptivity is increasingly important as the complexity and autonomy of embedded systems increases. Adaptivity is required both off-line at design-time and on-line at run-time. Off-line adaptivity is required to handle changing system specifications and to support platform-based or product-family based development.

JPRA Activity: “Design for Predictability and Performance”

Bengt Jonsson (Uppsala - Sweden)

The technical achievements will contribute to a suite of techniques across the abstraction levels of embedded system design, including application modelling and analysis, scheduling support, compilers, and platform design techniques. The achievements will also entail interfacing of existing tools for design of embedded systems.

JPRA Activity: “Integration Driven by Industrial Applications”

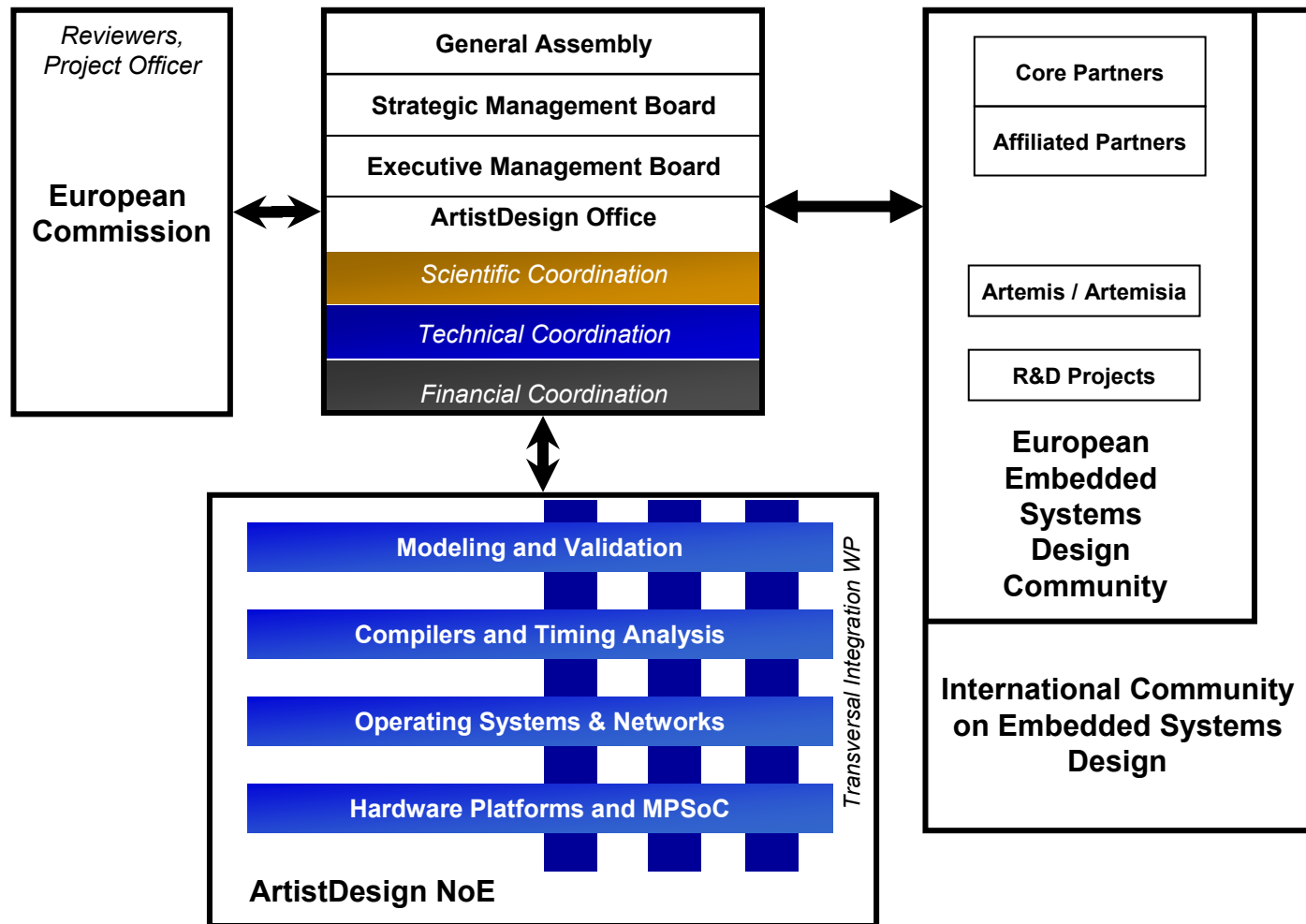
Alberto Sangiovanni (PARADES - Italy)

Ed Brinksma (ESI - Netherlands)

The ultimate goal of this activity is to provide the “meta rules” according to which the design transformations are carried out and interfaces are built and hence to provide strong guidance to the clusters to make their results more relevant and applicable.

- 7% **WP0: Jointly-executed Programme of Management Activities (JPMA)**
- 36% **WP1: Jointly-executed Programme of Integration Activities (JPIA)**
 - 12% Transversal Integration
 - 6% Each Thematic Cluster
- 12% **WP2: Joint Programme of Activities for Spreading Excellence (JPASE)**
- 9% **WP3: JPRA/Thematic Cluster: Modeling and Validation**
 - Activity: Modelling
 - Activity: Validation
- 9% **WP4: JPRA/Thematic Cluster: Compilers and Timing Analysis**
 - Activity: Software Synthesis and Code Generation for Embedded Systems
 - Activity: Timing Analysis
- 9% **WP5: JPRA/Thematic Cluster: Operating Systems and Networks**
 - Activity: Real-Time Operating Systems
 - Activity: Scheduling and Resource Management
 - Activity: Embedded Real-Time Networking
- 9% **WP6: JPRA/Thematic Cluster: Hardware Platforms and MPSoC**
 - Activity: Execution Platform and MPSoC Analysis
 - Activity: Platform and MPSoC Design
- 9% **WP7: Transversal Integration Activities**
 - Activity: Design for Predictability
 - Activity: Design for Adaptivity
 - Industrial Integration

Management Structure



Taking into account Evaluator's Comments

- ***Consider how to communicate ArtistDesign to the general press, both at the start and during the project, including press releases;***

ArtistDesign core partners have a strong tradition of communication to the general press.

As was done at the start of Artist2, ArtistDesign will hold a press conference to announce the start of the NoE, and to disseminate information about:

- the overall structure and objectives of the NoE
- the ArtistDesign Consortium, including contact points
- the expected impacts for the general public
- the strategic interests for the ArtistDesign partners

Taking in to account Evaluator's Comments

- ***Please provide evidence and commitment to long-term academic integration;***

Described in detail in section 1.2.4 "Long Term Integration".

1) Integration of recently-funded STREP projects

Beyond the continuing integration research and dissemination already initiated in Artist2, we intend to work towards integration between the recently funded IST STREP projects, that have a strong level of Artist involvement and leadership:

- ACTORS - Adaptivity and Control of Resources in Embedded Systems
- ALL-TIMES - Integrating European Timing Analysis Technology
- COMBEST - COMponent-Based Embedded Systems design Techniques
- PREDATOR - Design for Predictability and Efficiency
- Quasimodo - Quantitative System Properties in Model-Driven Design of Embedded Systems.

2) Setting up a European Institute of Technology (EIT)

A very promising perspective we are also currently investigating is in setting up a European Institute of Technology (EIT), on Embedded Systems.

- Funding for EITs is planned within IST FP7.
- Our community is well-positioned for this, in terms of credibility, critical mass, excellence and organizational infrastructures.

Naturally, competition for these funds is fierce. Nonetheless, we are convinced that, if Embedded Systems are selected for funding, that our community will be at the heart of an EIT on this topic.

Taking into account Evaluator's Comments

- ***Please specify the targets for the integration indicators;***

Global indicators for integration are provided in section 1.2.4 “Long Term Integration”, expressed as high-level objectives, that will deeply and qualitatively integrate academic entities in the area.

1. The NoE will extend the **integration of academic research**. Clustering around an emerging coherent theoretical embedded systems design framework contributes to the unification of the scientific community. This unification will be reinforced through measures for overcoming the inherent contextual, cultural, and disciplinary diversity – through implementation of the JPA (schools, joint workshops, etc.).
2. We intend to work towards **integration between the recently funded IST STREP projects**, that have a strong level of Artist involvement and leadership (see previous slide).
3. ArtistDesign will **impact R&D activities from an organizational perspective**. The NoE will explicitly aim to create a context, an infrastructure and a culture for embedded systems design. More specifically:
 - Exploitation and **improvement of the existing Web Portal** and Intranet
 - Continue efforts to **reinforce the Embedded Systems Week**, and place embedded systems design at the heart of the DATE conference.
 - Work and **interaction with and within ARTEMIS/ARTEMISIA** will be pursued. A lasting coordination structure, through a specific ARTEMISIA WG, will provide sustainability.
4. ArtistDesign will have structural impact on **European education** in Embedded Systems Design, by:
 - a) Integrating state of the art knowledge into the curricula, and accelerating the convergence towards unified multi-disciplinary approaches.
 - b) Promoting approaches, techniques, which are well-adapted to meeting current and future industrial needs.

Finally, a very promising perspective we are currently investigating is in setting up a **European Institute of Technology** (EIT), on Embedded Systems.

Taking into account Evaluator's Comments

- ***Please include a structure for the reporting and linkage with ARTEMISIA;***

From section 1.1 of the DoW:

As the leading Network of Excellence focusing on design for embedded systems, ArtistDesign will have a close working relationship with ARTEMIS and ARTEMISIA. A liaison group composed of ArtistDesign members having responsibilities within ARTEMISIA will be set up to manage interaction. This will concern contributions to the ARTEMIS Strategic Research Agenda (SRA), and the Working Group on Innovation Environment.

From the JPASE description in the DoW:

Furthermore, ArtistDesign will seek a tight interaction with the Artemis community, through the **Artemisia Liaison Task Force**. This is composed of the following prominent ArtistDesign members, also active in ARTEMIS/ARTEMISIA: Luca Benini, Ed Brinksma, Werner Damm, Jean-Luc Dormoy, Rudy Lauwereins, and Joseph Sifakis, and Rudy Lauwereins. Amongst these, the following are elected members of the ARTEMIS Steering Board. Joseph Sifakis is the chair of ARTEMISIA's Chamber B.

Cluster Internal Meetings

Main Research Trends in the Area

- <1-2 slides
Should provide a very clear view of the main research trends in the area, that can impact the work in the Cluster's activities.
- These should relate to possible industrial impacts as well. >

High-Level Objectives

<1 slide, providing a very clear view of the :

- overall objectives (see the Description of Work for inspiration),
- how these may be achieved, revised and why (very short, high-level synthesis) ;
- Expected impacts on industry should also be described>

Overview of the Cluster's Activities

- <Activity Name>
Leader: <name, affiliation>
*Short description (3-4 lines) shortdescription shortdescription
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- <Activity Name>
Leader: <name, affiliation>
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- <Activity Name>
Leader: <name, affiliation>
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Cluster Participants

*<NB: This can be copied directly from the Description of Work.
Nonetheless, it will be good to go into detail orally. >*

Core Partners:

- *<Name (affiliation – country)
Research interests >*
- *<Name (affiliation – country)
Research interests >*
- *<Name (affiliation – country)
Research interests >*

Affiliated Partners:

- *<Name (affiliation – country)
Research interests >*
- *<Name (affiliation – country)
Research interests >*
- *<Name (affiliation – country)
Research interests >*

Factual descriptions of the types of interaction and work that will be taking place, favoring integration and building excellence within the partners' teams.

Indicators, Milestones for Year 1

- <Specific indicators, milestones, in the next 12 months, and how these relate to the milestones. These should be taken directly from the Description of Work, and refined. >

Meetings and Interaction in Year 1

- <Concrete plans for the next 12 months, and how these relate to the milestones. >
 - Workshops
 - Interaction with Industry
 - Schools organized
 - Education and Training
 - Publications in Conferences and Journals
 - Industrial Liaison
 - International Collaboration
 - Contributions to the Web Portal

- Hyperion 8th 15 persons
RTOS & NW
- Helios 7th floor 9 persons
- HW & MPSoc
- Pythagore 1st floor 15 persons
Compilers & TA
- Lumiere (here) M&V



ArtistDesign Kickoff Meeting

Paris, January 29, 2008

Restaurant – Tuesday evening

Café de la Musique

213 ave Jean Jaurès

Place de la Fontaine aux Lions

Logistics

- Workshop on Predictability ...