FP7 – 216693 - MULTICUBE Project

MULTI-OBJECTIVE DESIGN SPACE EXPLORATION OF MULTI-PROCESSOR SOC ARCHITECTURES FOR EMBEDDED MULTIMEDIA APPLICATIONS

Deliverable D5.1.2: Dissemination Plan (Initial Version)

Revision [11]

Delivery due date: M12 (December 2008)
Actual submission date: January 31st, 2009
Lead beneficiary: ALARI-USI

Dissemination Level of Deliverable		
PU	Public	X
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the Consortium (including the Commission Services)	
CO	Confidential, only for members of the Consortium (including the Commission Services)	
Nature of Deliverable		
R	Report	X
P	Prototype	
D	Demonstrator	
O	Other	

Author(s):	*Daniela Dimitrova, Leandro Fiorin, Umberto Bondi (ALARI-USI)*		
Reviewer(s):	*Marcos Martinez (DS2); Maryse Wouters (IMEC); William Fornaciari (POLIMI)*		
WP/Task No:	5.1	**Number of pages:**	32
Identifier:	D5.1.2_USI_12.2008	**Dissemination level:**	Public
Issue Date:	January 31st, 2009		

Keywords: Dissemination, deliverable production, training, publications, private website, public website, workshop

Abstract:

This document reports the dissemination activities for the MULTICUBE project during the first reporting period of the project workflow. The document also proposes a dissemination plan for the forthcoming period.

A Consortium collaborative website has been set up for the dissemination and exchange of documents, drafts, ideas within the project. Several mailing lists, organized by technical areas of the project, have been set up. Internal meetings and brainstorming sessions have been organized during the first reporting period of the project. On the external front, we have set up the MULTICUBE public website (www.multicube.eu) that will allow the general public to gather information about our project. The Consortium has also been present at a number of international workshops and conferences and has presented the objectives and early results of the research in various venues. Some papers have been published in international conferences and journals to spread the knowledge developed into the project.

Open source tools have been released on the project website and they are currently used in several academic courses to develop project works and Master thesis.

While keeping on the tracks initiated during the first reporting period, the forthcoming dissemination activities will focus on gathering more results from the project research and to produce more externally oriented material. To further increase the international visibility, we are planning to organize a booth at DATE'09 Conference. This will allow a direct contact with the embedded system community of stakeholders covering research, industry and CAD vendors.

Approved by the Project Coordinator:	**Date: February 12th, 2009**

Table of contents

I. Executive summary

As a first goal, the dissemination strategy has an internal target of helping to achieve a common understanding of all new concepts and terms across all of the fields and cultures within the Consortium. As a second goal, the dissemination activities should broadcast the objectives and the results of the MULTICUBE research to the wider external audience (both scientifically inclined or not) in a clear and precise way. Obviously and specifically when dealing with a potentially new approach to computing, the second goal cannot be reached without having reached the first one. For this reason, most of the dissemination activities during the first reporting period of the project have been oriented toward the setting up of tools and structures that mainly help the internal circulation of information.

As a first concrete achievement, all electronic media have been designed and setup at M3 (see D5.1.1). The Consortium collaborative website has been set up for the dissemination and exchange of documents, drafts, ideas within the project. Several mailing lists, organized by technical areas of the project, have been set up. Internal meetings and brainstorming sessions have been organized during the first reporting period of the project. This high level of internal communication has been felt necessary by the Consortium to ramp-up the project's research activities..

A significant vehicle for bottom-up dissemination of MULTICUBE project results has been the exploitation of the open source tools for academic and research purposes. In particular the MULTICUBE design methodologies have been presented within the context of Master courses by the academic partners. Furthermore, the related tools have been used to develop project assignments and Master's thesis since the beginning of 2008.

On the external front, we have setup the public website (www.multicube.eu) and the Open Source area as a mechanism for a MULTICUBE interest group which will allow the general public to gather information about our project and access the first delivered open source tools. In addition, a specific page on Wikipedia has been also setup to present the goals and the main references to the MULTICUBE activities.

The Consortium has also been present at a number of external workshops and conferences and has presented the objectives and early results of the research in various venues. An ad-hoc advertising poster and leaflet have been designed to standardize the interface to the Consortium and to facilitate the dissemination during public events.

Concerning the forthcoming period, a highlight will be the presence of a booth during the next DATE'09 that will be held in Nice, April, 2009. This activity will increase dramatically the international visibility of the Consortium and will enable us to get feedbacks during the demos. Moreover, it will enable an in-depth contact with all the kinds of stakeholders: industry, academy and CAD vendors.

II. Dissemination activities

Dissemination activities for MULTICUBE are performed in Task 5.1 which is scheduled to run for the whole duration of the project. The present deliverable is the first product of the project's dissemination actions and plan for the next phases of the project. This document covers all dissemination activities that were completed during the first reporting period (M1-M12) and planned for the next one.

MULTICUBE project Consortium distinguishes between internal and external dissemination actions, based on different channels adopted to spread out the knowledge created in the project.

1. Internal Dissemination: actions aiming at ensuring a good diffusion of information and documentation among the project partners with the aim of sharing the developed know-how. The Internal Dissemination has been achieved through the following channels/measures:

- **Internal project website:** the internal web site has been set up and it is used to ensure for all partners the proper information availability and visibility of the correct activities' progression. It is used as database and knowledge management tool, a gathering knowledge base on MULTICUBE-related scientific topics, reports, state-of-the-art and outputs of the project, and any information on specific resources that is available to all the different partners. Access is restricted to partners of the Consortium and the EC and it is protected by user authentication. The internal website will be regularly updated with all the information developed during the whole project.
- **Internal workshops and meetings**: internal project workshops and meetings have been and will be organized to share information and to strength the cooperation among the partners in the Consortium.

2. External Dissemination: actions aiming at ensuring the visibility and awareness of the results outside the Consortium border, i.e., in the scientific community, in academic institutions, in organizations, or in companies. More precisely, external visibility and public awareness and knowledge of the MULTICUBE project have been ensured through the following channels/measures:

- **Public project website:** the MULTICUBE public web site presents general project information, scientific publications done during the project, news about the project, events organized and public deliverables. Public documents, made available through the project public website, can be utilized by third parties to enhance their projects but also give these third parties the possibility to provide feedback and thus to further improve the results of the project.
- **Workshops and training courses:** project participants are already active in the embedded design community. The project participants plan to actively participate to workshops to provide a possibility to disseminate results of the project in the wider research community. Moreover, the project participants will organize appropriate workshops (eventually associated with conferences, see forthcoming activities section) conference booths and training courses to support the transfer of knowledge outside the Consortium.
- **Publication of research results:** project results and innovations have been and will be submitted for publication in scientific journals, conferences, and workshops relevant to the topic of the research activity carried out during the project. The submission of papers jointly written by project partners has been encouraged. The first results of this strategy are detailed in Section VII.

In particular, the deliverable covers both internal and external dissemination activities.

III. Dissemination strategy

III.1. Target Audience

The MULTICUBE Consortium dissemination policy is targeting both the internal project's audience and the external public. The external public includes the scientific community (either academic or industrial) and the general public at large. MULTICUBE project targets the Embedded System Design Community as well as the Computer Architecture Design community and, more in general, the Design Automation Community, where the European partners could enforce their scientific and technological strength, thanks to the synergy that will be established by participating into the project Consortium. Various disseminations media and/or events will be considered according to the various targeted audiences. Versions of the dissemination media will be specifically targeted to a certain type of audience as described in Table 1.

Media	Audience	Status
Public Website	Public	Ongoing from March 2008
Collaborative Website	Internal : Consortium, PTC, EC	Ongoing from March 2008
Mailing lists	Internal : Consortium	Ongoing from January 2008
Wikipedia	Public	Ongoing
Ms/Thesis projects	Public : Academic community	Ongoing from Academic Year 2008-2009
Papers at Ext Conferences / Workshops	Public : Scientific community	Ongoing
Internal tutorial	Internal: Consortium	Organized in November 2008
Internal meetings	Internal: Consortium	ongoing
Open Source repositories	Public: By subscription	ongoing

Table 1: Audience and current status of the various MULTICUBE dissemination media.

IV. Project websites

Nowadays, internet websites represent one of the primary media for the dissemination of project's activities. As a consequence, the design and setup of the MULTICUBE websites has been one of the first tasks after kick-off. Websites are used for both internal Consortium and public dissemination. For external dissemination a publicly accessible website has been set up. On the same website will be implement a section to download the Open Source tools. On the internal side a Consortium collaborative website has been setup. The main contributors for the websites design have been ALARI for both main websites. ALARI is also in charge of the hosting, domain registration and technical maintenance for the public website. Partners have contributed providing specific contents for both websites.

The setup of the web site has been first described in D5.1.1 released at M3 and periodically updated as an ongoing deliverable.

IV.1. Public website

IV.1.1. Goal

The public website is intended to provide a vision of the project to the general public. It is a part of the WP5 work-package on project dissemination and will be one of the main media for the dissemination of MULTICUBE public results.

The MULTICUBE website includes a plethora of public information relevant for the project and useful for dissemination activities. More specifically, information regarding the project's objectives and the public deliverable reports as well as the papers from conference proceedings, presented by project's partners are included.

In addition, the website makes use of the project's characteristic logo, which helps rising-up the recognition of the project by the public throughout the various dissemination activities.

IV.1.2. URL and hosting

The URL of the website is http://www.multicube.eu .

The internet public website has been online since March 3rd, 2008.

The website is hosted at ALARI-USI. The integrity of the project data is ensured by periodic backups, which are maintained on a different storage server.

IV.1.3. Main features

The public website has several sections devoted to present the project to external visitors.

A screenshot of the home page of the public website is shown in Figure 1.

Figure 2 shows the sitemap of the MULTICUBE website.

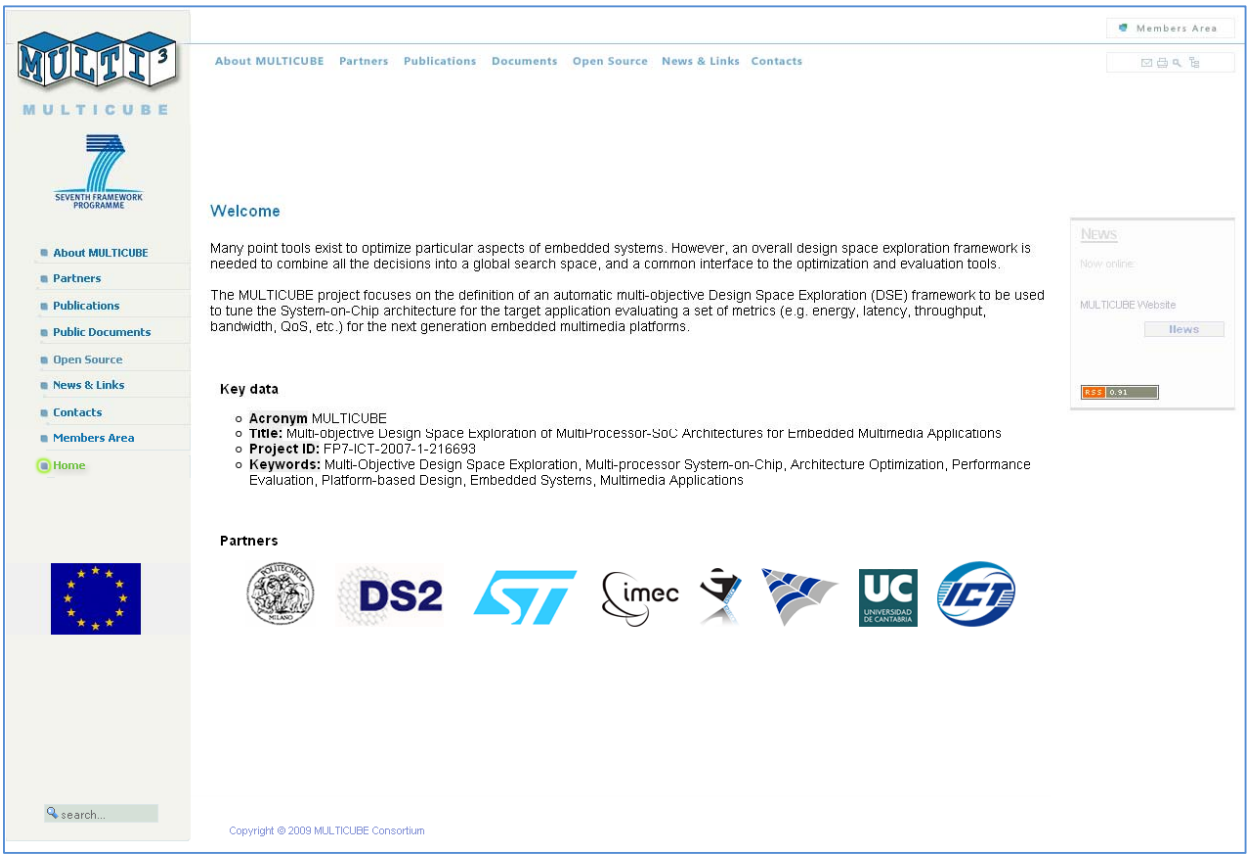


Figure 1: Screenshot of the home page of the public website.

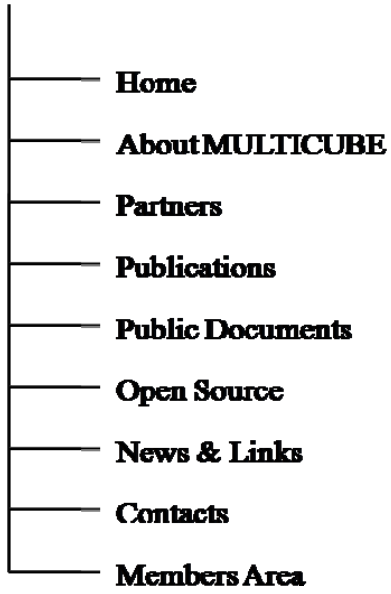


Figure 2: Sitemap of the MULTICUBE public website.

The website has the following main sections:

- **Home**: the home page of the website shortly introduces the MULTICUBE project and gives the important relevant information.
- **About MULTICUBE**: on this page are described the main goals and foreseen activities of the MULTICUBE project. They are linked to the first release version of MULTICUBE poster and leaflet. An ongoing activity is the creation of a glossary to be inserted at the end of the page, to share common definitions used during the project among the partners and to provide additional explanation to interested external users.
- **Partners**: this webpage section presents a brief description of the project partners, their logos and the links to the respective websites;
- **Publications:** this section lists research papers, related to the project, published by partners, with direct links to the documents or to where it is possible to download them.
- **Public Documents:** public deliverables released during the project are listed in this page. This page will enable interested people to access public deliverables.
- **Open Source** tools area**:** this area will give a possibility an interested audience to access the open source version of the project's results as SCoPE or M3Explorer. Since December 2008 the MULTICUBE first releases of SCoPE and M3Explorer open source are available at http://www.multicube.eu/open_source.html.
- **News & Links:** this page shows general news and events about the project. For example, meetings and the release of public deliverables will be announced in this section. Moreover, some relevant links about the scientific domains covered in the project will be listed. A list of conferences on topics related to the project and other projects whose goals or activities are linked to MULTICUBE are also shown in this section.
- **Contacts:** this section enables people to easily get in touch with relevant contact people of the project Consortium.
- **Members area:** this page allows to access the collaborative website used for partnership internal communication (see Figure 3 and the next paragraph).

IV.2. Collaborative Website

IV.2.4. Goal

The role of the collaborative website is to have a secure and private place to share documents among partners.

The collaborative website is totally private and a password is mandatory to gain access to it. It has been implemented using WebRatio® technology (http://webratio.com).

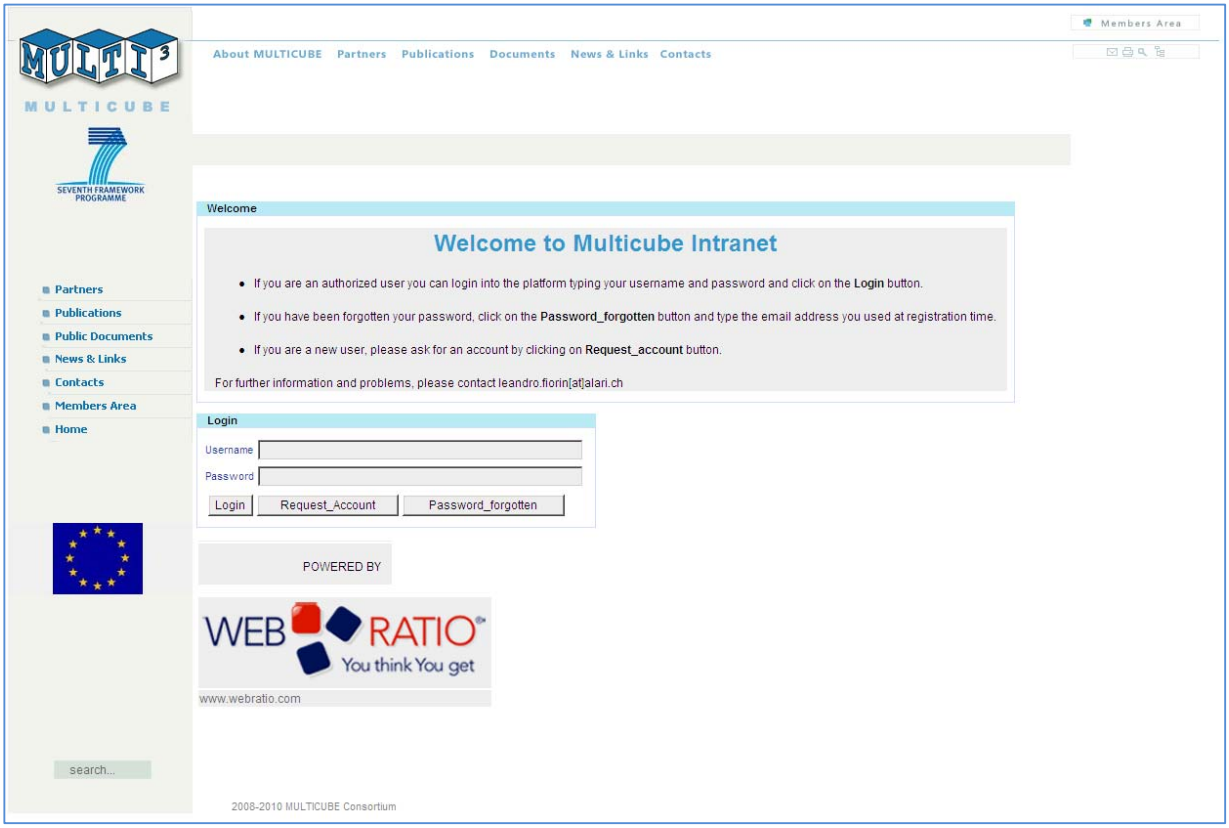


Figure 3: Screenshot of the login webpage to the collaborative website.

IV.2.5. URL and hosting

The collaborative website is hosted on: http://www.multicube.eu/multicube-intranet/ . The website is online since March 14th, 2008. It is fully operational since March 31st, 2008.

This website is hosted by ALARI-USI partner. Daily incremental backups and a weekly global backup ensure the integrity of private data.

IV.2.6. Main features

A screenshot of the welcome page of the collaborative website is provided inFigure 4.

The website offers the following features to the project members:

- **Shared Calendar:** for the whole duration of the project.

- **Workgroups:** workgroups have been set up in order to provide members with differentiate accesses to the collaborative area. A better description of this feature is given in section V.2.4.

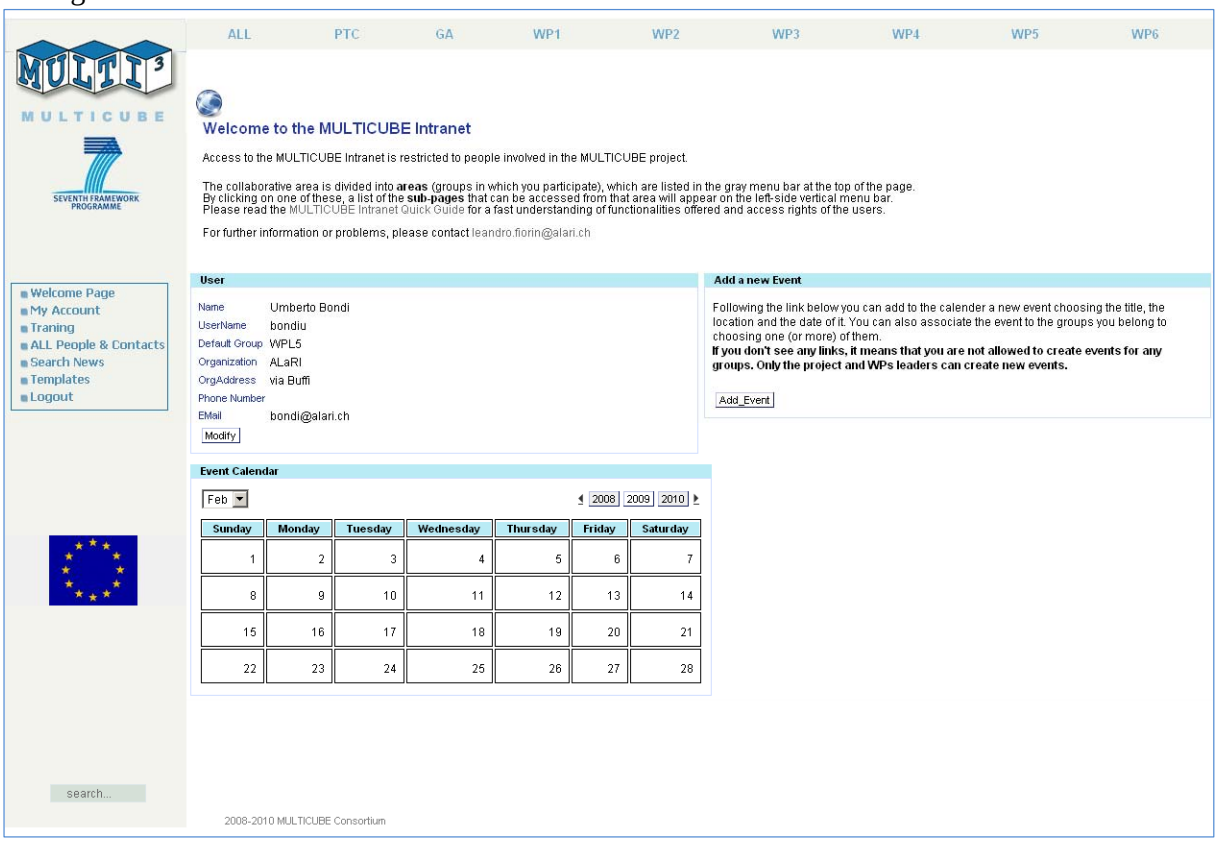


Figure 4: Screenshot of the welcome page of the MULTICUBE collaborative website.

- **Working documents sharing:** an area where to keep working versions of documents (such as ongoing version of reports and deliverables) was set up. Members of a group can access working documents associated to that group and upload new versions. When uploading a new version of a document, tracks of the modifications and of the comments added to the document are kept and automatically sent by email to the members of the groups.

- **Meetings minutes repository:** a section has been devoted to keep minutes of the meetings held during the project by the several working groups. In Figure 5 a screenshot of this page is shown.
- **Legal official documents:** a special sub-repository containing official legal documents such as the Consortium Agreement, contracts and the Description of Work.
- **Deliverables repository:** deliverables (public and confidential) released during the project are kept in this repository.

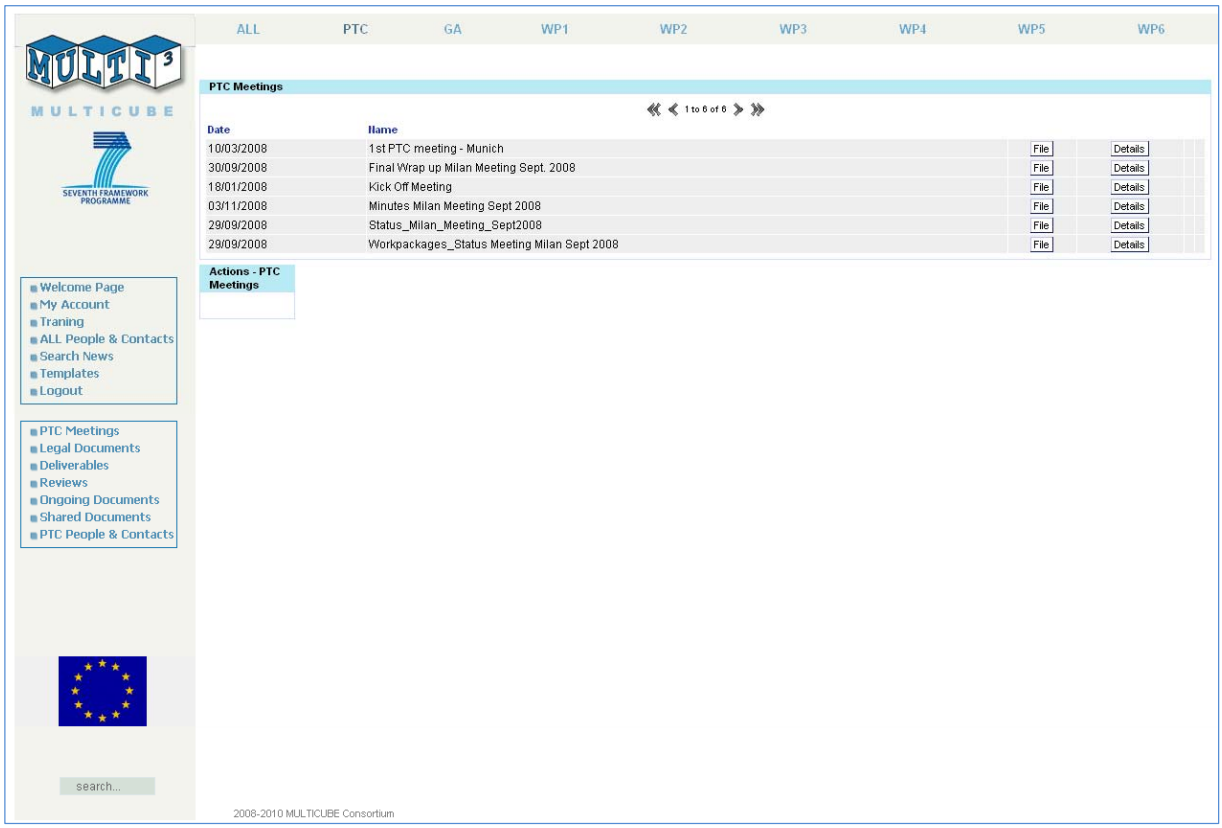


Figure 5: Page of the collaborative are showing uploaded Minutes of the PTC.

- **Templates:** a special sub-section has also been set up to provide templates for slides, meeting minutes, deliverables and logos.
- **Search News:** an internal news section is maintained to keep the partners updated about special meetings and events of the project (for instance for deliverables achievement).
- **Links:** this section is a repository of relevant links about the scientific domains covered in the project, such as design space exploration.
- **Training:** a section to keep and manage training material has been set up. Information stored can include background material, tutorial, relevant references, and internal course material.
- **People and contacts:** people involved in the several working groups are listed in this section. Contact information for the people is provided.
- **Shared calendar:** to set up meetings and to highlights conference call for papers, a shared calendar was implemented (shown in figure 4).

IV.2.7. Working groups

Several working groups have been identified for the project. Access rights to the collaborative area depend on the membership to the specific working groups.

Working groups identified are listed next:

- **PTC:** Project Technical Committee
- **GA:** General Assembly
- **WP:** Work-package members

The Project Coordinator (PC) is in charge of managing documents for the PTC and GA working groups, while work-package Leaders (WPL) manage documents for their respective work-package. An Administrator (Admin) is in charge of users' administration.

Different views were created for each working group (PTC, GA, WPx), allowing a differentiated access to the resources provided by the collaborative area. For instance, in the GA view, only access to definitive versions of documents is given, while in the WPx view the working documents area is also implemented.

Table 2 resumes access rights of the several users for the documents on the collaborative area.

	USERS					
INFORMATION	**PC**	**PTC**	**GA**	**WPL**	**WP**	**Admin**
Deliverables	Acc, Add	Acc	Acc	Acc, Add	Acc	Full
Templates	Acc, Add	Acc	Acc	Acc, Add	Acc	Full
Legal Documents	Acc, Add	Acc	Acc	Acc, Add	Acc	Full
Meetings Information	Acc, Add	Acc	Acc	Acc, Add	Acc	Full
Ongoing Documents	Acc, Add	Acc, Add	Acc	Acc, Add	Acc, Add	Full
User Information	Acc	Acc	Acc	Acc	Acc	Full

Table 2: Table resuming access rights of the several users

Legend:

Acc – The user is allowed to access the document or the information and use it for project purposes

Add - The user is allowed to upload new documents or information

Full – The web-side administrator has full access to all documents or information

V. Mailing lists and Wikipedia

In order to establish an efficient sharing of the information, several mailing lists were created. In particular, currently they are:

ALL@multicube.eu: for all project members;

PTC@multicube.eu: for members of the Project Technical Committee;

GA@multicube.eu: for members of the General Assembly;

{WP1, WP2, WP3, WP4, WP5, WP6}@multicube.eu: for members of various work-packages.

A page in Wikipedia (http://en.wikipedia.org/wiki/MULTICUBE) was also created to additionally disseminate general information about the project, its goals, and the methodologies being developed.

VI. Seminars, Workshops, Conferences and Presentations

VI.1. Internal Seminars and tutorials

MULTICUBE cooperation among the partners is enforced by organizing internal technical or plenary meetings, conference calls and tutorials. These meetings are organized in order to support good functioning and sharing of information and vision over the MULTICUBE work during the several phases of the project development.

The full list of the technical and plenary meetings is described in the Periodic Management Report 1 (D.6.2).

During the first reporting period, the modeFRONTIER tutorial has been organized by ESTECO in Trieste on November 27th , 2008 in conjunction with the WP1 technical meeting held on November 28th, 2008. The course titled “modeFRONTIER fundamentals and advanced optimization techniques, with emphasis on SoC design” has been tailored for MULTICUBE partners to describe basic and advanced optimization techniques exploiting modeFRONTIER as a multi-objective optimization and design environment targeting System-On-Chip. This tutorial represents the results of the retargeting activities of the modeFRONTIER tool towards the embedded systems field, carrier out by ESTECO in WP3.

VI.2. Academic courses and projects

Since the beginning of the project, particular attention has been paid to create awareness also “from the bottom” on the design methodologies under development in MULTICUBE and in particular on the practical usage of the open source side of the foreseen design flow. To this purpose, some academic courses on hw-sw codesign and embedded systems, taught both at the University of Cantabria, ALARI and at the Politecnico di Milano, included presentations of specific topics and development of project assignments/Master Thesis based on the MULTICUBE open source tools (MULTICUBE-Explorer and MULCICUBE SCoPES). Such involvement of students is important both for reinforcing in the medium term the consciousness on such type of design flows and tool availability towards the industry, and as a test vehicle to debug the tools themselves while improving their usability.

VI.3. International Workshops and Conferences

The first reporting period of activity of the project has seen the start of publications at external conferences and workshops in the following fields: Embedded Systems, Mapping Applications for System on Chip; Real Time Multimedia; Systems, Architectures, Modeling and Simulation; etc.

In addition to the publications, the members of the Consortium are also actively present in many scientific committees of conferences and scientific networks. This is another valuable set of entry points for disseminating the MULTICUBE results as well as to organize specific session on the related topics. Among the others, during 2008 the relevant participations to scientific committees have been: FDL, DATE, DSD, ES-Week, SASP, SAMOS, Micro-41, NoC Symposium, VLSI SoC.

Concerning the actual participation to the events, the following workshops were attended by MULTICUBE partners:

- **Software & Compilers for Embedded Systems (SCOPES) Workshop, 2008**

Munich, Germany – March 13-14, 2008

SCOPES focuses on the software generation process for modern embedded systems. Topics of interest include all aspects of the compilation process, starting with suitable modeling and specification techniques and programming languages for embedded systems. The scope of SCOPES includes memory-architecture aware compilation. Since today's embedded devices frequently consist of a multi-processor system-on-chip, the scope of this workshop is not limited to single-processor systems but particularly covers compilation techniques for MPSoC architectures. In addition, this workshop puts a spotlight on the interactions between compilers and other components in the embedded system design process. SCOPES 2008 was held as DATE Friday Workshop. The workshop was supported by the Artist2 network of excellence.

http://www.scopesconf.org/scopes-08

- **1st Workshop on Mapping Applications to MPSoCs, 2008**

St. Goar, Germany – June 16-17, 2008.

At the workshop, requirements and partial solutions for the problem of mapping applications to MPSoCs were identified. The topic was partitioned into two related areas: mapping and code generation. Working groups were formed and it was agreed to have joint follow-up workshops. The workshop was supported by the Artist2 and ArtistDesign network of excellence. There were a total of 37 participants.

http://www.artist-embedded.org/artist/Mapping-of-Applications-to-MPSoCs.html

- **2nd Artist Workshop on Models of Computation and Communication (MoCC 2008)**

Eindhoven, The Netherlands, - July 3-4, 2008.

The aim of the workshop was to bring together academic and industrial researchers in model-driven embedded system design, to discuss and advance the state-of-the-art in this field. The workshop presented worst-case analysis methods for scenario aware dataflow models. The workshop was supported by the Artist2 network of excellence.

http://www.es.ele.tue.nl/~tbasten/mocc2008/

- **4th Workshop on Embedded Systems Education, 2008**

Atlanta, US, – October 23, 2008

Embedded system education is still a very young area and frequently restricted to teaching the details of microcontroller programming. A long-term objective of this workshop is to stimulate the introduction of broader curricula. The workshop was supported by the ArtistDesign network of excellence.

http://www.esweek.org/

- **IEEE Workshop on Embedded Systems for Real-Time Multimedia. ESTIMedia**

Atlanta, Georgia, October 23-24, 2008

The aim of this workshop is to bring together people from different multimedia-related research communities (e.g, software, architectures, real-time systems, DSP, compilers, multimedia applications) who have worked separately, but did not interact sufficiently to address the challenges facing the design of hardware and software for multimedia systems.

IEEE ESTIMedia ‘08 is organized as part of the Embedded Systems Week 2008

During the workshop G. Palermo (Politecnico di Milano) presented the paper titled “Robust Optimization of SoC Architectures: A Multi-Scenario Approach." disseminating concepts of the MULTICUBE project to an audience of more than 40 people. During the conference several networking meeting have been used to disseminate the MULTICUBE concepts and ideas. MULTICUBE flyers have been also distributed during the conference.

http://www.science.uva.nl/events/ESTIMedia08/

- **HIPEAC Barcelona Computing System Week**

Barcellona, Spain, June 2-6, 2008

The aim of this Week is to put together most of the European researcher working in the architecture area. This week includes the following three co-located events: The HiPEAC NoE Cluster Meetings, the HiPEAC NoE Industrial Workshop and the Barcellona Multicore Workshop on the challenges raised by the multi/many-core architectures of the future.

During the HiPEAC NoE “Design Methodologies and Tools” Custer Meeting G.Palermo disseminated some concepts of the MULTICUBE project to an audience of more than 20 people with the presentation titled “Robust Design Space Exploration of Chip Multiprocessor Architectures”

http://www.hipeac.net/computing_systems_week_barcelona

The following conferences were attended by some of the MULTICUBE partners

- **Design, Automation and Test in Europe, DATE’08.**

Munich, Germany – March 10-13, 2008

DATE conference is the main European event bringing together designers and design automation users, researchers and vendors, as well as specialists in the hardware and software design, test and manufacturing of electronic circuits and systems. It puts strong emphasis on ICs/SoCs, reconfigurable hardware and embedded systems, including embedded software.

The conference addresses all aspects of research into technologies for electronic and (embedded) systems engineering. It covers the design process, test, and tools for design automation of electronic products ranging from integrated circuits to distributed large-scale systems. This includes both hardware and embedded software design issues. The conference scope also includes the elaboration of design requirements and new architectures for challenging application fields such as telecom, wireless communications, multimedia and automotive systems.

During the conference several networking meeting have been used to disseminate the MULTICUBE concepts and ideas. MULTICUBE flyers have been also distributed during the conference.

http://www.date-conference.com

- **IEEE Symposium on Application Specific Processors, SASP 2008**

Anaheim, California. June 8-9, 2008

The symposium explores (micro)architectural design approaches and trade-offs and compiler technologies, for both domain-specific and customizable embedded processors. The aims of the symposium is the generation of a forum wherein challenges and solutions will be explored, discussed and compared.

During the symposium V. Zaccaria (Politecnico di Milano) presented the paper "An Efficient Design Space Exploration Methodology for On-Chip Multiprocessors Subject to Application-Specific Constraints" disseminating concepts of the MULTICUBE project to an audience of

more than **40 people.** During the conference several networking meeting have been used to disseminate the MULTICUBE concepts and ideas.

http://www.sasp-conference.org/

- **International Conference on Systems, Architectures, MOdeling and Simulation. SAMOS-VIII**

Samos, Greece, July 21-24, 2008

The main focus of IC-SAMOS is on the state-of-the-art techniques in the design of embedded computer systems, including mapping techniques and synthesis, processors design and implementation, architectures, modeling issues such as specification languages, formal models, simulation and hardware/software co-design.

During the conference C. Silvano (Politecnico di Milano) presented the paper " An Efficient Design Space Exploration Methodology for Multiprocessor SoC Architectures based on Response Surface Methods" disseminating concepts of the MULTICUBE project to an audience of more than **50 people.** During the conference several networking meeting have been used to disseminate the MULTICUBE concepts and ideas. MULTICUBE flyers have been also distributed during the conference.

http://samos.et.tudelft.nl/samos_viii/

- **11th EUROMICRO CONFERENCE ON DIGITAL SYSTEM DESIGN: Architectures, Methods and Tools. DSD08**

Parma, Italy, 3-5, September, 2008.

The Euromicro Conference on Digital System Design (DSD) addresses all aspects of (embedded) digital and mixed hardware/software system engineering. It is a discussion forum for researchers and engineers working on state-of-the-art investigations, development, and applications.

It focuses on advanced system, design, and design automation concepts, paradigms, methods and tools, as well as, modern implementation technologies that enable effective and efficient development of high-quality (embedded) systems

During the conference G. Palermo (Politecnico di Milano) presented the paper “Discrete Particle Swarm Optimization for Multi-objective Design Space Exploration" disseminating concepts of the MULTICUBE project to an audience of more than 50 people. During the conference several networking meeting have been used to disseminate the MULTICUBE concepts and ideas. MULTICUBE flyers have been also distributed during the conference.

http://dsd08.iet.unipi.it

- **International Conference on Very Large Scale Integration of System-on-Chip. (VLSI-SoC)**

Rhodes Island, Greece, October 13-15 2008

VLSI-SoC 2008 explores the state-of-the-art and the new developments in the field of Very Large Scale Integration Systems and their designs. The purpose of the Conference is to provide a platform, to exchange ideas and to present industrial and research results in the fields of VLSI/ULSI Systems, VLSI CAD and Microelectronic Design and Test.

During the conference C. Silvano (Politecnico di Milano) presented the paper "An Efficient Design Space Exploration Methodology for Multi-Cluster VLIW Architectures based on Artificial Neural Network" disseminating concepts of the MULTICUBE project to an audience of more than **40 people.** During the conference several networking meeting have been used to

disseminate the MULTICUBE concepts and ideas. MULTICUBE flyers have been also distributed during the conference.
https://vlsi.ee.duth.gr/vlsisoc-2008/

- **International Symposium on Microarchitecture. MICRO41**

Lake Como, Italy. November 8-12, 2008

The International Symposium on Microarchitecture is the premier forum for presenting, discussing, and debating innovative microarchitecture ideas and techniques for advanced computing and communication systems. This symposium brings together researchers in fields related to microarchitecture, compilers, chips, and systems for technical exchange on traditional microarchitecture topics and emerging research areas.

During the conference several networking meeting have been used to disseminate the MULTICUBE concepts and ideas. MULTICUBE flyer have been also distributed during the conference. The Project Coordinator prof. Cristina Silvano, has been the General Co-Chair of the Symposium. She also was the organizer of a special session "EU-US Funded Research Opportunities and Trends in Computing Systems", November 10th, 2008. The goal of this session has been presenting both the European and the US perspectives for the funded research projects in the field of computing systems. The invited speakers of the special session were:

- *The European Perspective: FP7-ICT Outlook*, Invited Speaker: Panagiotis Tsarchopoulos, Project Officer, European Commission, Belgium.
- *The US Perspective: NSF Outlook*, Invited Speaker: Timothy M. Pinkston (USC, USA), NSF Program Director.

http://www.microarch.org/micro41/

VI.4. International Publications

Beside the participation of partners to the external workshops presented above, various publications and communications have been made during the first reporting period of the project. Publications are important tools for disseminating the research outcomes of the project. The members of the Consortium have strong commitment in publishing their work in relation to the Multicube project's theme and research topics in high quality conferences, journals, etc.

The following list gives a chronological overview of all public papers and communications done by MULTICUBE partners.

The following papers have been published in 2008:

- R. Baert, E. de Greef, E. Brockmeyer (IMEC). *"An automatic scratch pad memory management tool and MPEG-4 encoder case study"*. In Proceedings of the 45th Annual Conference on Design Automation (Anaheim, California, June 08 - 13, 2008). DAC '08. ACM, 201-204, 2008.
- G. Palermo, C. Silvano, V. Zaccaria (Politecnico di Milano). "*An Efficient Design Space Exploration Methodology for On-Chip Multiprocessors Subject to Application-Specific Constraints."* In Proceedings IEEE SASP'08 - Symposium on Application Specific Processors, Anaheim, CA, USA, June 2008
- G. Palermo, C. Silvano, V. Zaccaria (Politecnico di Milano). "*An Efficient Design Space Exploration Methodology for Multiprocessor SoC Architectures based on Response Surface Methods."* In Proceedings of IEEE IC-SAMOS'08 - Embedded

Computer Systems: Architectures, MOdeling, and Simulation, Samos, Greece, July 2008

- C. Baloukas, J. Risco-Matin, D. Atienza, C. Poucet, L. Papadopoulos, S. Mamagkakis, D.Soudris, J. Hidalgo (IMEC). *"Methodology of dynamic data structures based on genetic algorithms for multimedia embedded systems"*. In Journal of Systems and Software, Sept '08
- G. Palermo, C. Silvano, V. Zaccaria (Politecnico di Milano). "*Discrete Particle Swarm Optimization for Multi-objective Design Space Exploration."* In Euromicro Proceedings of DSD'08 - Conference on Digital System Design. Parma, Italy, September 2008
- G. Mariani (ALARI-USI), G. Palermo, C. Silvano, V. Zaccaria (Politecnico di Milano). *"An Efficient Design Space Exploration Methodology for Multi-Cluster VLIW Architectures based on Artificial Neural Networks."* In Proceedings of IFIP VLSI-SoC 2008, International Conference on Very Large Scale Integration of System-on-Chip. Rhodes Island, Greece, October 2008
- L. Fiorin (ALARI-USI), G. Palermo, and C. Silvano (Politecnico di Milano). *"A Security Monitoring Service for NoCs."* In proceedings of CODES+ISSS'08 - IEEE/ACM/IFIP International Conference on Hardware/Software Codesign and System Synthesis. Atlanta, Georgia, USA, October 2008
- G. Palermo, C. Silvano, V. Zaccaria (Politecnico di Milano). *"Robust Optimization of SoC Architectures: A Multi-Scenario Approach."* In Proceedings of ESTIMedia 2008 - IEEE Workshop on Embedded Systems for Real-Time Multimedia. Atlanta, Georgia, USA, October 2008

VII. Various dissemination activities

Beside the main dissemination channels described in the previous sections, various activities have contributed toward the dissemination of the MULTICUBE project. The goal for this first reporting period was to present the Consortium and the main objectives of the project and also to give an identity of its own to the MULTICUBE research program. Among those activities:

- MULTICUBE leaflet is available on the public website section About MULTICUBE for download. Leaflets are important support material for dissemination. As printed materials, they will be used for visibility in conferences, workshops and fairs. The flyers will give general information about the project aims and vision. A copy of the leaflet is reported in Appendix 2.
- A general informative poster of the MULTICUBE has been prepared by the Consortium. The poster, available for download on the public website section About MULTICUBE, is meant to give general information on the objectives and scientific approach of the project. The design of the poster is in line with the project's identity and at the moment the poster is used in conferences, workshops, and various events for enhancing the visibility and reach of the project.
- Information about the MULTICUBE project has been disseminated through the HiPEAC2 NoE newsletter (to appear in January 09). The aim of the newsletter is to establish a link between the partners of the MULTICUBE research community and the HiPEAC2 scientific community.

VIII. Dissemination plan for the forthcoming periods

For the second reporting period, several common activities are scheduled as collaborations to external networks in scientific community, therefore contribution to and co-organization of workshops, seminars and etc.

For the second reporting period, the following initiatives have been scheduled:

- Organization of the MULTICUBE booth at DATE 2009, April 2009 in Nice, France. In particular, we are working on organizing a full stand by exploiting the "European Project and Cluster Package", to improve the visibility of the project in a comprehensive range of stakeholders covering academic people, industry and EDA tool vendors. This presence in one of the two most representative international forum, will represent also a valuable opportunity to get up to date information on the potential exploitation strategies for the MULTICUBE results.
- Friday Workshop at DATE 2009, April 2009, Nice, France. The project coordinator Cristina Silvano and the WP2 leaders, Maryse Wouters, are among the organizers of the the Friday workshop, titled "Designing for embedded parallel computing platforms: architectures, tools, and applications". During the workshop, some of the invited speakers and the some of the poster presenters, will focus on spreading the knowledge on the automatic design space automation issues and challenges, such as those developed in the context of the MULTICUBE project.
- Participation to the "ASP-DAC 2009"Conference, that will be held in January 2009 at Yokohama, Japan, to presente the paper: G. Palermo, C. Silvano, V. Zaccaria. "Variability-Aware Robust Design Space Exploration of Chip Multiprocessor Architectures". In Proceedings of ASP-DAC 2009, 14th Asia and South Pacific Design Automation Conference. Yokohama, Japan, January 2009, pp. 323-328.
- MULTICUBE project presentation will be available on the Hipeac2 newsletter number 17 from January'09 and downloadable from the Network of Excellence website www.HIPEAC.net.
- Participation to the "1st Workshop on Rapid Simulation and Performance Evaluation: Methods and Tools (RAPIDO'09)", January 25 (Sunday) 2009, Held in conjunction with the 4th International Conference on High-Performance and Embedded Architectures and Compilers (HiPEAC), Paphos, Cyprus, January 25-28, 2009. The following paper has been presented: "A DoE/RSM-based Strategy for an Efficient Design Space Exploration Targeted to CMPs", G. Palermo, C. Silvano, and V. Zaccaria, Politecnico di Milano, Italy.
- The MULTICUBE Consortium has plans to submit other workshop proposals on the topic of Automatic Design Space Exploration to be considered by the Technical Program Committees of international conferences in the field of Embedded Systems.
- Some of the MULTICUBE parteners are steadily participating to Technical Program Committees of the following international conferences: FDL, DATE, DSD, SASP, SAMOS, NoC Symposium, VLSI Soc.
- During 2009, the dissemination activity within the Universities will continue as in the first reporting period, with presentation of project results and direct use of the open source toolset both for development of Master/Thesis and of the project assignment of courses at ALARI, Politecnico di Milano and University of Cantabria.

- The exploitation and dissemination of SCoPE and of its MULTICUBE extensions will keep on also during other European projects: ITEA 05015 SPICES and MEDEA+ 2A741 SoftSoc.

Therefore the dissemination and demonstration of the project results will continue through publications (scientific papers, presentations at conferences fairs or larger exhibition) in order to spread the knowledge acquired during the MULTICUBE project. During the second reporting period of the project, thanks to the expected maturity of the MULTICUBE project, it is foreseen a stronger cooperation in terms of joint publications among the partners and in particular between research and industrial partners.

The following conferences and journals are envisaged as relevant for submission of articles:

- International conferences: DATE, CODES+ISSS, CASES, ESTIMEDIA, ISC, ASP-DAC, SASP , DAC, SCOPES, DSD, SAMOS, MICRO.
- International journals:
  - IEEE Transactions on VLSI Systems
  - IEEE Transaction on Computers
  - IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems
  - Design Automation for Embedded Systems, Springer
  - Integration, The VLSI Journal, ELSEVIER
  - IEEE Transactions on Parallel and Distributed Systems
  - IEEE Transaction on Multimedia
  - IEEE Transactions on Real Time Imaging
  - Journal of Systems and Software
  - Journal of System Architecture
  - EURASIP Journal on Embedded Systems,

Furthermore, the most important dissemination instrument of the MULTICUBE project, namely the public website will be regularly updated with news and documents. In particular, the first public deliverables (scheduled at M12) made their way to the general public. General presentations and materials will also be regularly published on the public website. Open Source section on the public website which includes the links to the open source tools developed during the MULTICUBE project.

Dissemination will also be enabled by cooperation between the research centers for guidance of PhDs, Post Docs in the context of the MULTICUBE project. Proposals for organization of training seminars by IMEC will be discussed.

IX. References

[1] MULTICUBE F7-216693 Annex I: Description of work
[2] D5.1.1 Set up the Website with public and private area
[3] D5.1 Exploitation plan (Initial version)

X. Appendix I: Project Poster

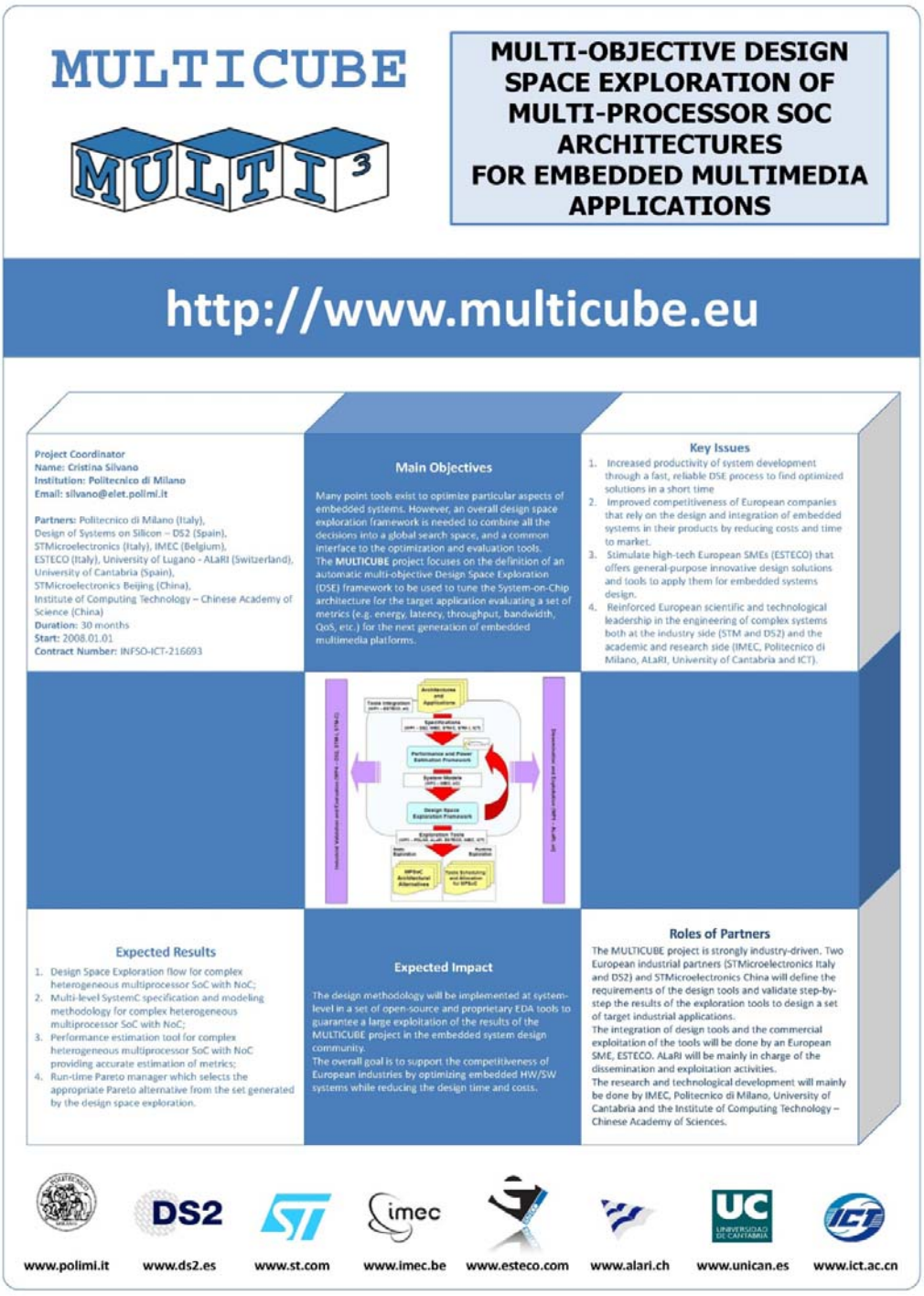


Figure 6: MULTICUBE Poster

XI. Appendix 2: Project Leaflet

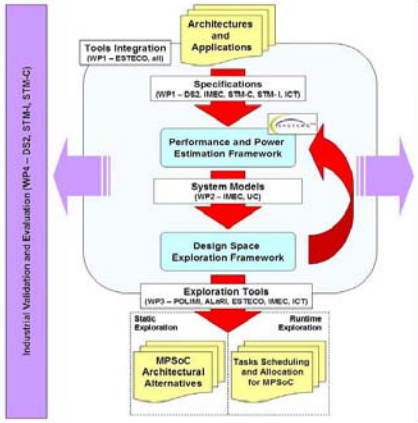
Figure 7: MULTICUBE leaflet, front side

Technical Approach

The goal of MULTICUBE is to cover the gap between the system-level specification and the definition of the optimal application-specific architecture. MULTICUBE activities are driven by the idea to cover this gap by building a stack of tools and accurate methodologies directly targeted to specific multiprocessor SoC based on Network on Chip architectures. In the MULTICUBE design flow, the specifications of the target architectures and applications will be provided as inputs to the design flow. A SystemC-based multi-level modeling methodology for multiprocessors will be developed. Once received the target architecture as input, we will provide to the next step the system model to evaluate different architectural alternatives in terms of metrics. Then, the Design Space Exploration framework will be defined to sail over architectural solutions following several heuristic optimization algorithms. This step is implemented as an optimization loop, where the selected architecture instance generated by the DSE framework is given back to the estimation framework for the metrics evaluation. The tool integration phase in MULTICUBE will be performed to implement an automatic system optimization engine to generate, for the target MPSoC architecture, either the best architectural alternative (if the exploration is done statically) or the best tasks scheduling and allocation solution (if the exploration is done at run-time).

Key Issues

- Increased productivity of system development through a fast, reliable DSE process allowing finding an optimized solution in a short time. DSE will be performed at system-level, thus avoiding costly, low-level analysis steps (i.e. ISS simulations).
- Improved competitiveness of European companies that rely on the design and integration of embedded systems in their products by reducing costs and time to market.
- Stimulate high-tech European SMEs (such as ESTECO) that offers general-purpose innovative design solutions and tools to apply them for embedded systems design.
- Reinforced European scientific and technological leadership in the engineering of complex systems both at the industry side (STM as a large company and DS2 as a SME) and the academic and research side (IMEC, Politecnico di Milano, ALaRI, University of Cantabria and ICT).



Expected Impact

The design methodology will be implemented at system-level in a set of open-source and proprietary EDA tools to guarantee a large exploitation of the results of the MULTICUBE project in the embedded system design community. The overall goal is to support the competitiveness of European industries by optimizing embedded HW/SW systems while reducing the design time and costs. To ensure a wide applicability of the proposed DSE framework, the MULTICUBE project is strongly industry-driven. Two European industrial partners (STM Italy and DS2) and STM China will define the requirements of the design tools and validate step-by-step the results of the exploration tools to design a set of target industrial applications. The integration of design tools and the commercial exploitation of the tools will be done by an European SME, ESTECO. ALaRI will be mainly in charge of dissemination and exploitation activities. The research and technological development will mainly be done by IMEC, Politecnico di Milano, University of Cantabria and the Institute of Computing Technology.

Figure 8: MULTICUBE leaflet, back side