An E-Learning Platform for Academy and Industry Networks

Giuseppe Alì[1], Eleonora Bilotta[2], Lorella Gabriele[2], Pietro Pantano[3]
[1] *IAC, Consiglio Nazionale delle Ricerche, and INFN-Gruppo c. Cosenza*
[2] *Department of Linguistic, University of Calabria*
[3] *Department of Mathematics, University of Calabria*
g.ali@iac.cnr.it, bilotta@unical.it, lgabriele@unical.it, piepa@unical.it

Abstract

The European project COMSON (Coupled Multiscale Simulation and Optimization in Nanoelectronics) is a Marie Curie RTN project that involves five partners from academia and three from industry world, with the main objective of realising an experimental Demonstrator Platform (DP) in software code, which comprises coupled simulation of devices, interconnects, circuits, EM fields and thermal effects in one single framework.

The DP will be the basis for a lifelong e-learning system, devoted to the training and transfer of knowledge within COMSON, in order to promote exchange of resources and to share knowledge.

In this paper we give a brief description of COMSON and summarize the characteristics and functionality of MODMAT.net, a prototype e-learning platform realized for the management of information and didactics on-line. In our intention, this platform will be used as the starting point for developing an e-learning platform with high levels of portability and reusability.

1. Introduction

E-Learning methodologies make use of modern Information and Communication technologies (ICT) for learning purposes. Strictly speaking, e-learning is a way of teaching and learning based on delivery of instructions, via all available electronic media, including Internet, intranets, extranets, satellite broadcasts, audio/video tapes, interactive TV, and CD-ROMs, in order to distribute online multimedial didactic contents. Thus, technology is used for designing, distributing, managing and spreading "training", by carrying out personalized training paths. This general program, underlines a dramatic change in traditional learning paradigms. The foreseen new learning paradigms should make provision for [1,2,3,4]:

- an active and participating role of learners;
- a strong sense of presence and belonging (groups, working communities, virtual classrooms);
- a stronger personalization of the learning path, by means of an articulated system of instrumental and human resources at disposal;
- a thorough exploitation of network hypertextuality as place, mean and social environment of learning [5,6].

A very important component of e-learning is the **platform** for managing the distribution and use of training. An e-learning platform is an integrated software environment, which allows to track the user's attendance to the courses and her/his training activities (number of accesses, connection time, evaluation test results,…).

Another basic component of e-learning is the **virtual classroom** [7]. This is an environment specially designed for allowing the users to interact in **syncronous mode** (videoconference, audioconference, chatting,…), **asyncronous mode** (web pages, web forum, e-mail, document repository,…), or **mixed mode**, where both modes are available on internet (streaming video, streaming audio,…).

In 1994, some members of Apple Computer, National Science Foundations, universities, publishers, and many others began to design the first exemplar of Educational Object Economy (EOE), a community interested in improving the availability and quality of web-based learning materials. A key part of an EOE is web site technology that helps empower community members to work together and to freely exchange resources and share knowledge (www.eoe.org).

Along the line of these ideas, we would create a community of Educational Object Economy in order to promote exchange of resources and to share advanced

Proceedings of the Fourth Annual IEEE International Conference on Pervasive Computing and Communications Workshops (PERCOMW'06)
0-7695-2520-2/06 $20.00 © 2006 IEEE

technological knowledge in microelectronics, within the framework of the European project COMSON, described in further details in the following section. The main objective of COMSON is the realisation of an experimental Demonstrator Platform (DP) in software code, for mid-size problems in microelectronic industry.
The DP will be the basis for a lifelong e-Learning Platform (e-LP) for training young researcher in mathematics applied to technology, both from a theoretical and practical viewpoint. The e-Learning Platform will be integrated within the Demonstrator Platform. The e-LP will provide the theorical concepts and high theoretical training, which can be deepened in a concrete way, through practical examples, by using the DP to simulate and test specific phenomena and problems which arise from industry.
This work will be articulated in three main phases:

1. setting of a ready prototype of an e-learning platform (MODMAT.net);
2. assessement of usability methods, to test the needs of the user that will utilize the e-learning system;
3. data analysis from the usability tests, taking into account the characteristic of the existing e-learning platform and industry's formation needs, in order to implement the final version of the platform.

In order to ensure the portability and/or reusability of the system, the platform will be developed according to the standards of IEEE P1484.1 LTSA [8].

The COMSON project represent an interesting experiment, both for the high training level of the users, and for the strong collaboration between industry and academy within all phases of the realization of the integrated DP and e-LP.

In the following section we give a brief description of COMSON. Then, in section 3, we summarize the characteristics and functionality of MODMAT.net, a prototype e-learning platform realized for the management of information and didactics on-line. In our intention, this platform will be used as the starting point for developing the e-LP above described.

2. The COMSON project

The European project COMSON (Coupled Multiscale Simulation and Optimization in Nanoelectronics) is a Marie Curie RTN project, anticipated to start on October 1, 2005. This project involves five partners from academia (University of Wuppertal, Politehnica" University of Bucharest, University of Calabria, University of Catania, TU Eindhoven) and three from industry (Infineon Technologies Munich, Philips Research Laboratories Eindhoven, STMicroelectronics Catania).

The key objective of COMSON activities is to realise an experimental Demonstrator Platform in software code, which comprises coupled simulation of devices, interconnects, circuits, EM fields and thermal effects in one single framework. The basis is the development and validation of appropriate mathematical models to describe the coupling of different physical effects, their analysis (wellposedness) and related numerical schemes. The platform does not aim at replacing existing industrial or commercial codes. However, it will be capable of analysing medium sized coupled problems of industrial relevance, thus offering a chance to develop advanced mathematics for realistic problems.

As for the training programme, innovative e-training methods will be used for:

• defining and developing training and educational plans for all researchers, including internal training, by using a web-supported system of documentation and interchange of knowledge;

• adapting the Demonstrator Platform to training needs: in particular, (i) development of suitable interfaces which highlight coupling paradigms, (ii) important modelling issues, (iii) algorithmic issues and all other issues analysed in the training and educational plans;

• virtual classrooms, which transfer traditional classrooms on a network (remote access for all system users; direct interaction between students and lecturers/tutors; support to communication among students);

• a continuing education environment supplying information about the materials and some general documentation of the platform (annual progress reports on the project; software; on-line lectures; communication tools).

Based on these general requirements, the COMSON project foresees the development of a lifelong learning system (didactic materials, work tools, forums,...) and a system for reproducing specific events (a virtual classroom environment for workshops, summer schools, conferences).

Some of these tools (e-mails and video-conferences) allow for a continuous contact with the teacher; others (forums and mailing lists) favour the cooperative work and the exchange of know-how; others (on-line conferences, workshops, summer schools) allow to deepen the knowledge acquired by a specific event. With the virtual classroom environment, it is possible to transfer a traditional classroom on a network, according to the following modalities: remote access for all system users; direct interaction between students

and teachers/tutors; support to communication among students. This environment offers the possibility of transferring on-line the knowledge furnished by conferences, workshops and summer schools organized by the RTN project.

It will be also available a repository with a set of documents, codes and software.

The lifelong learning environment will store information about the training materials and some general documentation on the platform.

There will be also available:

- annual progress reports inherent the project;
- software;
- on-line lectures;
- communication tools;
- link to the topics on which to focus on.

3. The platform MODMAT.net

In this work, we present a prototype platform realized for the management of information and didactics on-line. In our intention, this prototype, called MODMAT.net, will be the starting point for the realisation of the COMSON e-Learning Platform. The presented system allows to share scientific and didactic resources, in the framework of a virtual community of teachers and experts; allows to create and manage authomatically virtual classrooms, offering a set of tools for the publication on web of scientific and didactic material, as well as the possibility of interacting on-line by means of interactive virtual laboratories.

In a nutshell, the basic idea is the creation of a system, which can be used effectively both for scientific and didactic activities. This system should allow to:

a) search and find information easily;
b) share resources, and scientific and educational materials;
c) create common standards;
d) save time;
e) facilitate the use of advanced tools.

The e-learning system **MODMAT.net** runs a set of informative, didactic and scientific resources, encoded in a database. In particolar, these resources comprise **Links**, **News**, **Reviews**, **Scientific Articles** (including a search engine, by Title, Author, Key Word) **Lecture Notes**, **Exercises**, **Evaluation Tests**, **Source Codes**, **Softwares**, **Lectures**. The system is designed for two categories of users: registered users, and non registered users. Non registered users have access to all information, can search the whole database, but can download only a limited number of documents and cannot upload information or files in the system.

These resources are organized in two main structures, ModMat and VirtualC, devoted, respectively, to the management of information, and to on-line didactics, with a set of tools usable by users for the publication of interactive material on web, including virtual laboratories.

The structure of the platform is shown in the following flow chart (see figure 1):

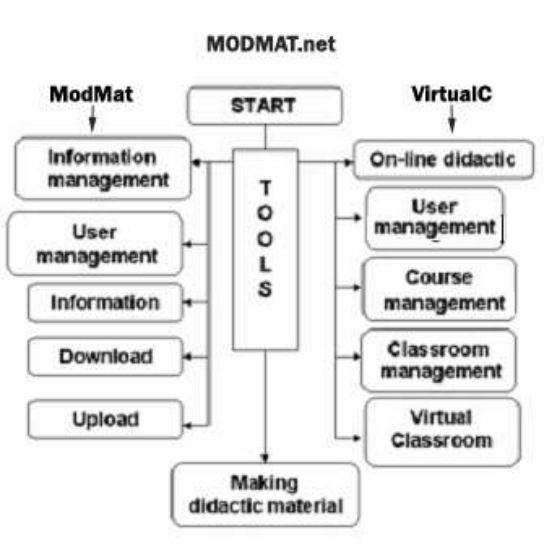

Figure 1- MODMAT.net structure.

ModMat comprises various modules and functions, like, for example, File Upload and File Search, Messages, News, Links, System Administration, Forum.

In this environment we intend to create a set of databases: a main data base with basic didactic unities, and a set of cross-sectional data bases with didactic unities about summer schools, workshops and conferences. There will be a repository of didactic software and a repository of experiments and simulations appropriately developed, and a media-repository (sounds, images and movies).

Users can also download and/or utilize some useful tools for on-line interaction (communication tools for interacting in the lessons; tools to reproduce and modify the simulations; tools for calculus and scientific visualization) and for the exchange of knowledge and information with other users (e-mail, forum).

VirtualC is organized in two areas, Teachers and Students, which we describe below.

✓ TEACHER Area

Teachers can create, modify or delete courses. They can abilitate and disable students to the courses they run, can send and receive local messages from students, can send email, can visualize the personal file of each student.

A teacher can be also system administrator. In this case, in addition to the above tasks, he/she can abilitate other teachers, can run the service of system messages, can access the personal files of all teachers, can change passwords.

- ✓ STUDENT Area

On request, students can be abilitated for a course and, if authorized by the teacher, can access the available material of the course. They can exchange messages with teachers through the message utility, and can modify their passwords.

Each user who accesses the system is requested an identification password. If the teacher or student has not been abilitated by the administration system, he/she must send a request for abilitation. Furthermore, the teacher's authorization is needed for accessing a virtual classroom. A student connected to the system, can use the system's message service for requesting the inscription to an active course, for changing the identification password and, if eligible, for accessing the principal menu of a course.

In VirtualC, the structure of a virtual classroom includes a presentation of the event (contents and goals), some explanations on the contents of the lessons (arguments, timetables, teachers), a form for the registration to the courses. Besides this, each registered user can obtain a limited amount of information on students and teachers (e.g., curriculum, telephone number, fax number, e-mail address), for requests of clarification on the contents of the lessons or for any other kind of collaboration and personal interaction.

Users can follow the lessons in streaming modality and take part to them through interactive tools.

Finally, a user can access the following areas:

Information, containing the presentations of all courses, with organizational details (duration, program, exercises, credits, and so on).

Lectures, containing the material used for the delivery of the lectures, such as Powerpoint slides, or videolectures.

Laboratory, containing all executables (.exe), a set of simulations, linked to the contents of the course, and, if needed, source codes and comments.

Evalutation, containing intermediate and final tests, the results of the tests, and a repository with all tests assigned for the previous courses.

Communication, containing the system's message service, and all forms of teacher-student communication (email, chat and videoconference).

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