An approach to Computer Assisted Education, local and remote, with respect to GRID technologies

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***Abstract* — Instruction and Education is carried out nowadays, in most cases, following the "classical" approach of a professor in front of a class/group of students. Gradually, one way or another, the computer assisted instruction is becoming more and more "visible" in the area of education; as an alternative to the classical approach, the new concept is aiming for an individual instruction rather than a collective one. The Internet comes out with substantial new alternative means able to replace the classical instruction system; its main advantage, the remote education system, offer a real break through in completing or even replacing the instructor, mainly due to the large capacity to store informations in large archives. The paper is suggesting the use of GRID technologies to store and process large quantities of data, informations and knowledges, absolutely necessary in the educational process.**

***Keywords* — Computer Assisted Instruction (CAI), GRID Tehnologis (GT).**

I. Past and present activities

Since the first attempts to implement consistent computer assisted education systems, at the beginning of the 60-ies till these days, there is a large choice of successful products in this area, a number of spectacular evolutions and transformations of mentalities are to be considered [1]. Of course, this is also due to the outstanding evolutions of the information technologies involving both hardware and software.

These days, a large number of applications -- "drill and practice" type, tutorials, learning games and many others can be found on the market [2].

II. Necessities

Computer assisted education systems are targeting a number of specific groups and communities of users:

- learning and education;
- companies which intend (or, may be, are forced) to upgrade the knowledge and know-how of their employes;
- administration involved in man-power re-conversion.

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III. Education globalization. Attempts to build up domain application oriented standards

The globalization process forced the need for standards in different domains of qualifications and specialized directions as well as for education planning and, even for curricula. There is an urgent need for "minimum knowledge base" manuals ("knowledge nucleus") for a specific domain as well as for an evaluation system oriented standard, able to evaluate the level of qualification of the employes for that particular domain. Also, the man-power must be able to deal with an increasing demand of mobility.

IV. Requested features of a computer assisted system for education

Such a system must include the following features [3], [4], [7]:

- the self tutoring module-provides access to a course in electronic form that may be taken in various ways by students;
- the self evaluation module - provides access to question, with subjects from courses, and to the answers so that the student may check his own answers;
- the evaluation module-existence of quantified questions to which the student must answer and at the end the computer grades the answer;
- the documentation module - provides access to a library system so that the student has easy access to books,magazines and other materials regarding the taught lessons.

V. Involving GRID technologies in computer assisted education. How a GRID center should look like

One can imagine involving all the interested factors in an virtual organization [5], which, using GRID technologies, will be able to create a consistent solution, distributed and flexible (adaptable) system for computer assisted education.

a. The GRID center is crucial in offering the necessary informations for such an organization:

- in real time;
- with primary as well as secondary fast processing.

b. The GRID center is involved in a continuous activity to manage, survey and store data, information as well as

the necessary knowledge.

c. The GRID center within the suggested virtual organization can substantially increase the efficiency of the educational process.

The above mentioned GRID center can be used by members of the virtual organization (e.g. at the beginning, in universities) aiming to involve other interested participants in the future.

The GRID technology comes out with the alternative to create a consistent solution for data processing and storage; it consists in using usual computer units and, eventually, fast interconnections between computer units and storage servers, able to emulate the equivalent of a supercomputer. Roughly, considering the first possible step, it is not yet taken into consideration the use of individual computer units, but, setting up a number of centers able to administrate and operate a considerable large computer power as well as a very large (disk) storage capacity -- e.g. tens of computer units and tens of TB of disk.

The GRID concept has come out not long ago, and considerable efforts are undertaken all over the world to assimilate and develop this concept. One of the most important GRID centers is at CERN (European Nuclear Research Center), offering physicists involved in elementary particles research, huge data processing and storage facilities, aligned to the requests of the LHC research programs (Large Hadron Collider).

The IFIN-HH group in Romania is affiliated to the virtual organization ATLAS, which is part of the LCG Project, administrating the site RO-02-NIPNE, which participate (since more than one year) in the program to create simulated events within the ATLAS cooperation. It is to be mentioned that the results indicate an encouraging 92% efficiency in job execution [6].

For the sake of comparison, if the WEB provide access to the distributed global information, the GRID, in turn, provides the same kind of access, this time oriented towards data processing and storage capacity.

One can see nowadays a strong development of GRID solutions in unexpected domains. This way, it is to be noticed that the GRID concept is a direct consequence of the evolutions taking place in the modern society and, particularly, in the scientific and technical communities, which request new technologies able to offer cooperative activities a well administrated and managed access of resources.

The process of designing a GRID center able to operate a consistent, distributed and adaptable (to different operator's requests), must necessary consider first the features of the process of collecting data, information and knowledge and be followed by the operating general and particular characteristics.

VI. THE (MINIMAL) CONFIGURATION OF A GRID CENTER ADAPTED TO THE REQUIREMENTS OF COMPUTER ASSISTED EDUCATION.

a. A Computing Element (CE) provides the connection with other GRID centers and is in charge with the distribution of work tasks to local resources.

b. A Storage Element (SE) in charge with input and output file storage necessary in jobs execution and result storage.

c. Work Nodes (WN) - are responsible with receiving and executing tasks dispatched by CE.

d. An access interface to GRID, provided by User Interface (UI), which, involving all necessary hardware and software capabilities, offers a safe access to the GRID resources; access to GRID is restricted to UI.

e. A communication server (CS), providing an Internet connection of minimum 1 Gbps.

VII. CONCLUSIONS

The authors have reached experience in the area, being involved in designing, administrating and operating different computer assisted education projects.
Technical University of Civil Engineering of Bucharest (TUCEB)-- Hydrotechnical Faculty -- is currently involved in developing a CAI system in conformity with IV.

TUCEB is also involved in creating a GRID center in conformity with VI.

The first experiences of assembling 3 with 4 are due to take place during 2008.

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