Tools Used in a Distributed Learning Environment University

DAN TUSALIU, ADRIAN NEATU, DAN MANCAS
Computer Science Department
University of Craiova
13 A.I.Cuza Street, Craiova
ROMANIA

Abstract: - One of the main attributes of the ODL (open distance-learning) where teacher and students physically separated in time/or location can interact is the role of self-directed learning e.g. without the regular presence of a teacher to suit the learner. Telecommunications and computer technologies are converging to make e-Learning one of the fastest moving trends in higher education. The e-learning supports a new paradigm in education, characterized by: flowing (interchangeable) roles, learner-centred curriculum, distributed/shared resources, virtual facilities, and asynchronous teaching/ learning. This paper presents some examples of tools used in a virtual university. These tools can be found on the website of the “ViReC e-Initiative” project.

Key-Words: - ViReC project, communication tools, chat system, forum system, online lab sessions

1 Introduction
The project “ViReC e-Initiative” – University Virtual Resource Centre based on a Distributed Learning Environment represents an European dimension attempt for changing learning environment through ICT and ODL in higher education institutions. This project is clearly oriented to development of innovative practices and services, having in view setting up a virtual resource centre composed of the Distributed Learning Environment (DLE), arising awareness of the impact of ODL (open distance-learning) and the use of ICT (information technology and communication) in education. A “university” has to develop multimedia concepts to constitute multimedia techniques wherever it increases the quality and efficient of study, research and internal workflows.

Virtual schools are becoming a reality across Europe and new ICT technologies are currently to improve learning in new and powerful ways. A continuous individual and collective improvement of learning processes is required in order to cope with the flood of information (due also to the growing use of the Internet) with an active participation of learners, as well as managers and trainers.

2 DLE Forum
One of the basic idea developed in the “ViReC e-Initiative” project, which is a component of Minerva scheme, consists in realizing a forum for a good and efficient communication in the University. The need for such a forum is obvious. There are a lot of situations concerning communication between different actors involved in this project: project managers, implementers, testers, coordinators, professors and the students. After the experimental period, when all objectives were realized and the project finishes by outputting all the issues, the DLE University will run and the created forum will be one of the most used tool for information exchange not only between students but also between professors. The forum can be divided into two parts: one is the asynchronous section and the other is the synchronous one. Each section has a great role in the overall goal of the project.

The asynchronous section contains discussions aimed at communication between members of Project Management Group, communication between technical staff involved in the project, dissemination of the results of the project, communication between teachers and students/learners, gathering the feedbacks from students/learners acting within ViReC.

Synchronous section contains the chat system - online support for students/learners - and the videoconference environment aimed at bimonthly meeting of PMG members, bimonthly meeting of Expert Team members, online support for students/learners, presentations involving lecturers from different countries/locations.

2.1 The asynchronous section.
The asynchronous section contains a forum for the discussions needed while implementing the DLE university and after that for the students and the professors. This forum is very powerful tool for the information exchange between the people involved in the DLE University. It is implemented with php and mysql. PHP and MySQL are becoming increasingly popular, and the demand for people who can use these tools has increased.
PHP stands for 'Hypertext Pre-Processor' and is a server side HTML scripting/programming language. PHP is a tool that lets you create dynamic web pages. PHP-enabled web pages are treated just like regular HTML pages and you can create and edit them the same way you normally create regular HTML pages. PHP runs 5 to 20 times faster than Java!! It is extremely easy to use and you can develop very complex web/e-commerce applications very rapidly in a very short period of time.

MySQL is the fastest relational database on the market. It outperforms all the leading databases in almost every category. It has almost all the functionality the leading databases have. MySQL is more than just a database. It is a system that manages databases. It controls who can use them and how they are manipulated. It logs actions and runs continuously in the background. MySQL uses tables and columns to hold data that can be related by keys. It is well suited for this role. A relational database, simply defined, is a database that is made up of tables and columns that relate to one another. These relationships are based on a key value that is contained in a column. These are some points that made us use php and mysql for the DLE forum, the asynchronous part.

The main page of the forum is:

![Fig. 1. Main page of the forum](image1)

As can be seen from here the visitor can access the forum in two ways:

1. Restricted user – just for reading the messages
2. Full user – it has a username and password given by the administrator

In the restricted user mode an anonymous person can read messages only from public available themes. He can choose to see the messages from a certain theme; also he can chose to see all the postings from the selected theme or only the messages from the last day, the last 7 days or from the last 30 days. This can be seen in the below image:

![Fig. 2. Access example – restricted user access](image2)

First it will be displayed the headers of the messages and if a user wants to read a specific message then it can choose to read what ever message he wants from the posting list.

The full user can login at a specific theme. He receives the user and the password from the administrator. Here, depending on the user, he can login to the theme of interest, he can post messages and he can replay to other postings. The login interface is simple and in the next figure can be seen an example of a logged person and its options:

![Fig. 3. Access example – full user access](image3)

If the user wants to post a message he also has the possibility to attach a file to the message. Also if he posted a message he can also delete the message. There can be many replays to each message and because the web page can contain many messages it was adopted not to display the messages. If the user wants to read the messages or the replays he has to open each of them; So, after reading the posting the new page can be closed with no altering the old page displayed. Every message contains a subject, the date when the message was posted and the person who made this posting.

The full users are of two types depending on what the administrator of the forum decides:
1. Can POST/REPLY
2. Can Only Reply
The choice is done in the admin frame. Here can be done a lot of settings regarding a user that will be added to the database. In the “add user” frame it will be filled the full name, the username and the password assigned. Also it will be selected the discussion theme and it will be chosen the rights of the new user: “post/replay” or “only replay”. With the first choice the user can replay to the messages but it can also post new topics to the discussion theme. With the rights from the second choice the user can only replay to the messages. In the “delete user” frame, the administrator can delete a certain person. He has the information of the registered persons and filling with the username of the desired person, the deletion will be done. Of course the administrator will have to specify also the discussion theme from where the user to be deleted. The administrator can also add new discussion themes and delete such themes with the help of the two frames dedicated for such purposes, as can be seen in the below image:

Fig. 4. Administrator page

Behind all these interfaces there is a database implemented in mysql. The database contains three tables:
• Channel – for the themes of the discussion;
• Postings - for the messages (contain all the fields necessary: subject, message, if it is reply, who is the parent message, data of the post, when it was last read, who posted the message, the name of the attached file). This is another feature of the forum: a message can have an attach;
• Users – for the user who can login. This table also contains all the information necessary: full name, username, password, admin and channel.

2.2 The synchronous section
The DLE forum consists also in a synchronous part which contains the chat system and the videoconference environment aimed at bimonthly meeting of PMG members, bimonthly meeting of Expert Team members, online support for students/learners, presentations involving lecturers from different countries/locations.

The chat system is needed for on line support for students and for an efficient communication between professors and administrators. Professors and students can login the ViReC Chat with their assigned username and password by the administrator. The client does not have to install anything because the chat is a java applet. There is also an option for “no pop-up version”. If the computer does not have the java plug-in it is downloaded automatically.

Fig. 5. The chat system access

The database for the chat login is the same as for the DLE University. After the user is logged he can choose the channel for discussions. The channels are the topics opened for discussions; this is the courses which are opened for the students. A user can choose only from the list where he is in the database. Also, the user can change the background color of the applet and the color for the text. After a person is logged he can see the full name and also the ip address from where it is connected. The applet looks like in the below image:

Fig. 6. The chat system – the inside
3 Simulation Tool

Besides good communication tools there is also the need for simulation tools that are to be used in laboratory sessions along side real equipment, in case such real equipment is available.

For instance, the “Computer Architecture” module is one of the main modules where simulation tools were implemented.

3.1 Complex simulation tools

The following tool is used in laboratory sessions concerning the “Instruction Set” of a processor.

Description of the model
The structure belongs to a very simple digital computer consisting of only 4 units linked by two buses, one on 16 bits and one on 8 bits.

1. Arithmetic Logic Unit (ALU)

ALU consists of two distinct areas: the processing device and the group of local registers. Two arithmetical operations are implemented on 8 bits: addition and subtraction. The set of registers in the following: A (accumulator), B, C, H, L (general registers), PSW (flag register), all on 8 bits and SP (stack pointer) on 16 bits. The flag register PSW contains the following flags: CY (Carry), Z (Zero), P (Parity), S (Sign).

2. Control Unit (CU)

CU contains the instruction register (IR) on 8 bits, program counter (PC) on 16 bits, the control block and a logical decoder.

3. Memory Unit (MU)

MU contains a memory block of 216 locations, each on 8 bits; it comprises also two functional registers: Memory Address Register (MAR) on 16 bits and Memory Buffer of the Memory on 8 bits.

4. Input/Output Unit (I/O U)

The I/O unit consists of max 256 I/O ports. Each port is considered a register on 8 bits. The input/output ports are communicating with the processor through the 8 bit Data Bus for data transmission, while addressing is realized through the 16 bit Address Bus. The operation is realized sequentially according to von Neumann’s principles.

The simulator was created using the Java programming language, being intended to be used inside an Internet browser, as a Java applet.

Basically, the operation of the simulator was conceived as simple as possible. On the main panel, occupying the right-most part, the student may choose the instructions to be used in writing programs. On the left part of the interface there is the status information. The student is able to see at any time the values of the internal registers of the processor, the instructions that were used in the program and the value of the active port.

![Fig. 7. The simulator interface – main panel](image)

After writing the program, the student has to press the “END” button and a new interface will be displayed. The new interface is slightly different; mainly, the button panel from the first disappears and is being replaced by a memory panel. At any instant there can be visualized the values from 256 locations. The range of addresses can be modified, such that all memory locations can be inspected (checked).

The program will be run in a step by step fashion (that is, instruction by instruction); all that the student needs to do is to press the “STEP” button. The current instruction will be executed and all involved registers of the computer will change their displayed values automatically.

After running the whole program, the user can return to the main interface, with the help of the button “RESET”. All registers will be cleared, as well as the values of the ports and all memory locations.

There is provided an additional button named DET, that allows the user to detail furthermore the execution of an instruction; if the “DET” button is pressed it will open a new browser window with a Flash made simulating environment, which presents in full detail how the instruction is executed internally.

In Fig 8 it is depicted the memory panel inside the interface:
The application provides also a large variety of ready made examples. The user can very easily run any of these demo programs by using another button called “PRESET”; by pressing this button the following dialog box appears (Fig 9).

There is a list box that allows the user to actually choose the program that is wanted. The samples that can be loaded are listed below:

- Simple Loop
- Arith+Logic
- Loop+IO Port
- I/O Port
- Subcall + Jump
- Stack Use
- Nested Routines
- Multiplication
- Division
- Binary to BCD
- BCD to Binary
- Interchanging two registers
- Changing register and memory location contents
- 2’s complement - calculates 2’s complement of a number
- 9’s complement - calculates 9’s complement of a number
- 10’s complement - calculates 10’s complement of a number

Let us take, for instance, the “Binary to BCD” conversion sample. After choosing it and after pressing the button “OK”, all instructions of the program will be loaded in the simulator memory. In the next picture (Fig 10) it is presented the memory panel showing the memory content for the first 256 locations (and one could see actually, in the first few memory locations, the written program, presented with mnemonics), the flags and the program itself listed in the scroll box:

### 3.2 Simpler Simulation Tools

The next tool to be presented is used in a laboratory session concerning the “Interrupt Mechanisms” component of the “Computer Architecture” module.

**Description of the model**

The particular mechanism presented and used in the lab session is the daisy-chain. All theoretical aspects are presented in the textbook, and explicitly detailed in the tutorial section corresponding to the “Computer Architecture” module.

The first stage consists in assembling an interface for the mechanism; the second stage consists in reusing the previously built device to build the actual daisy-chain mechanism.

The “simple” adjective refers to the fact that this tool is used solely for this session, compared for instance with the previously presented tool which was used to perform
all laboratory sessions dedicated to that particular module.

The second stage is presented in figure 12:

This is how it looks after placing some gates and wiring them together:

The operation is fairly simple. There is a toolbox on the right side of the page, from which the student may choose the gates needed for the interface for example. The gates are limited, so the student needs to know where to place them in order not to run out of components. Moving the pieces is accomplished by first clicking the toolbox component and then dragging it to the spot. Wiring is also extremely easy. First click the initial point of the connection and then on the second, and the wire is drawn.

All wires are actually images that are stretched either in width or in height, depending on the particular type of wire that is to be drawn. The gates are of course images that are dragged and dropped on the page. All programming is client side JavaScript.

4 Conclusion

The need for communication and information is increasing day by day and the implementation of the new technologies will make our adaptation easier to all these changes.

The DLE forum will be used by all the people that take part in this project (PMs, professors, administrators) and all the students enrolled at this virtual university. It is easy to be developed if other constraints or new demands are needed. The use of known technologies makes it easy to administrate and change. It is a very useful and needed tool for the overall ViReC project objectives.

References: