

ARCHITECTURE OF WEB BASED INFORMATION SYSTEM FOR EDUCATION eDU-TK

Assist. Prof. Ph.D. Veselina Ivanova Nedeva

Assoc. Prof. Ph.D. Venelin Borisov Bochev

Technical College of Thracian University, 38 Gr.Ignatiev Str., 8600 Yambol, Bulgaria,
phone:+359/46/66-91-81, e-mail:vnedeva@yahoo.com

Keywords: Web site, Architecture of the sites, Internet marketing, student education.

The report is part of the scientific research project "Internet marketing in the education", which was financed by the Ministry of education and science in 2003. Scientific research and analysis of the web sites of the universities in Bulgaria about their possibilities for implementing Internet marketing was conducted. The research has been made from February to May 2004. One of the conclusions states that it is necessary to maintain an information system, which is presented on the Internet, and will provide the information that is necessary for the education and service of the students. The information system for education and service of the students eDU-TK points towards the self – education of the students, and other people, wanting to improve their qualification and aiming towards effective development of their artistic abilities. The system has been developed for the needs of Technical College-Yambol.

1. INTRODUCTION

The results of the conducted research of the sites of the universities and colleges in Bulgaria show [1], that the efforts should be directed towards the existing faults in the web sites of the universities. One of these problems that need to be overcome is elaborating the architecture of the sites.

The main characteristics of eDU-TK are two. The first is about the main purpose of the system – gathering, preserving and processing the information. As a base for this purpose we use the suitable environment for preserving and accessing the data – MySQL. The base should give security and allow effective access. The choice of the environment also depends on the difficulty of the computing processes, which have to be done. A separate server should be used for a supplemental algorithmic processing necessary for the inclusion of a virtual laboratory. Its realization can be done on appropriate programming language, different from the one of the server programs – this could be C++ for example. The server programs are written on PHP. The preferences are directed towards software with an open code, which is completely free of charge. The "quartet" LPAM (Linux-PHP-Apache-MySQL) completely satisfies all the requirements about the architecture. The new applications, which are being developed at the moment, are directed towards the use of virtually unlimited access of the resources in the Internet and the use of the network for customer service through the global network. The most significant in the new architectures is their orienting towards services (SOA – Service-oriented architectures). Connecting using CORBA and DCOM creates strongly bind connections. Today the separate parts of

the applications are connected through the standards for Web services like SOAP (Simple Object Access Protocol) and WSDL (Web Service Description Language), which creates loosely connected systems allowing easy adaptation for future development. The latest version of the PHP5 language matches these technological challenges.

The second characteristic is the orientation of the end user of the data, which are offered by the system, independently from the particular hardware realization. eDU-TK should contain developed friendly interface, allowing fast and easy access to the resources. The security of the system is another requirement of the information system.

The specific characteristic of the information system are the tasks, which it solves in the particular subject area. The Web based eDU-TK solves tasks about:

- The static presentation of pages and DB information;
- Possibilities for downloading data from DB;
- Taking a test – choice of a test; possibility for choosing difficulty level; solving the test;
- Assessment of the test answers;
- Presentation of the test results, including comparison with the previous test takers;
- Sustaining a DB for the site's visitors;
- Sustaining a DB for the visitors, who have taken the test;
- Dynamic generation of information, necessary for the site's visitors;
- Searching for information on the site and so on.

The basic standards and their characteristics: the language for hypertext (HTML) formatting, the protocol for hypertext (HTTP) transfer and the number of network protocols for transfer of the TCP/IP data, are taken care of.

A three-layer client sever architecture is enough for the realization of a great part of the task of the web based information system. A multi-layer architecture with at least four hierarchical levels [Fig.1.] is necessary for the functioning of the virtual laboratory.

First level – The client is realized using Internet browser – Internet Explorer, Netscape Communicator, Opera, Mozilla.

Second level – Web server – Apache. The operating system is either Window or Linux system. It performs the server functions:

- Runs server programs written on the chosen programming language – PHP and Java;
- Provides the graphical interface to the client for identification of the user; generates requests; sends request to the DB server and the application server; processes the answers and generates dynamic pages for the client;
- Performs functions for the server's different services;
- Maintains the standards for granting server resources like files, programs, technical devices and others.

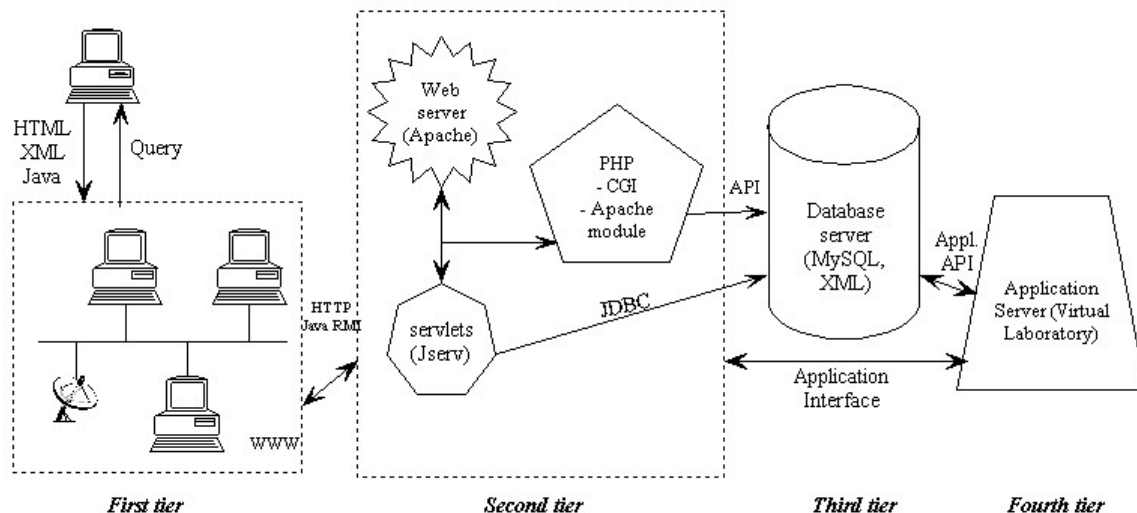


Fig.1. Architecture of the Information system for education eDU-TK.

Apache is HTTP server with possibilities for running scripts and accessing scripts from different SQL servers. Almost all existing scripting languages are supported. Our preference is PHP.

The third level is the DB server. It executes the functions for managing the DB, which contains the following basic data structures:

- (A) Preparation materials (includes lection course, ending with a short test, which is taken only by personal preference) – lection material; supplemental literature for class preparation; Internet resources on the different topics, covered in the lecture material;
- (B) Test for evaluation the knowledge, covering every chapter of the lecture material, which is working in two modes – self-preparation and evaluation of the knowledge – using tests;
- (C) Tasks for self-preparation – exercises, lab practice;
- (D) Example course projects and reports (including example reports, ready materials and manuals for their realization) – syllabus; course projects and tasks.

These materials include assignments given in their final variation given as tests, the answers to which are produced at the moment of taking the tests. The access to the answers is realized on two levels – the student, who can see his results; and the professor, who has access only to answers from his subject. The subjects, thought by different professors are projected as different objects, no matter that they have the same name.

- (E) Providing information about the administration, the rights and the obligations of the students in the college – Statute-book and regulations for the proceedings in Technical College – Yambol; Decisions of the College's counsel, concerning the education; Courses timetable; Exam timetable.

- (F) eDU-TK for education and service allows maintenance of a virtual laboratory, which is under construction.

The management of the data in the third layer needs software for RDBMS, which stays hidden from the customers. The requests' language is SQL. In order to follow the chosen direction for the use of software with SQL we base the whole system on MySQL. It is fast and suitable for applications, for which the most frequent task is data search, and the changes are insignificant.

Fourth level – Application server. It maintains Internet environment for sending data to remote diagnostic devices, receiving the results from the devices, interpreting the received data and their visualization in the wanted by the customer format – either as a text, a table or a graphic.

The four-layer architecture allows the interaction between the DB, the server, the applications layer and the client layer. The clients' layer represents the data for the customer, in a format suitable for him and retrieves information about him. The protocols and the virtual environment connecting the clients and the middle layer meaning the connection between the web browser and web server is maintained by the internet standards. The HTTP, XML and Java technologies are applied for the generation of the web pages in the browser. The sending of request for resources to and from the web servers, from which the answer is expected with the fulfilled request, is done using HTTP protocol and Java RMI. Bigger part of the application's logic can be found in the middle layer. The DB layer keeps, processes and extracts information. The ODBC or JDBC standards are used according to the maintained servlets. The middle layer executes the tasks for the connection of the other two layers, shows the structure and the data content, which are necessary for the client. The applications server communicates with the DB server using Application API and the web server.

3. CONCLUSIONS

1. If the Information System for education eDU-TK includes virtual laboratory it requires four tier of the architecture.
2. The applications for algorithmic processing if the virtual laboratories are located in specific certain tire.
3. eDU-TK should allow adding additional functionality so the best way is the combination of object-oriented and procedural approach.
4. The Information system for education must be platform independent and thus allowing different operation systems and platforms to access the information databases.

4. REFERENCES:

- [1]. Fuecks, Harry, Build your own Web Service with PHP and XML-RPC, <http://www.sitepoint.com/>, 16.07.2002

[2]. Petrov, N.Iv., Galina St. Panayotova, Problems In Creation Of The Mathematical Insurance Of High Technology Systems, XXXIX International Scientific Conference on Information, Communication and Energy Systems and Technologies, 2004, Bitola, Macedonia

[3]. Stogov, Dmitry, PHP SOAP Extension, http://www.zend.com/php5/articles/_php5-SOAP.php, 16.03.2004

[4]. Башмаков А.И., Жедяевский Д.Н., Попов В.В. Технологии и средства компьютерной поддержки инновационной деятельности на основе методов управления корпоративными знаниями. // ВКСС connect.– 2002.- № 4.– С. 81-83. <http://doc.unicor.ru>, cit. 20.06.2004

[5]. Иванова, З., К. Стоилова и др., Системно-алгоритмични модели на информационните услуги в Интернет, сп. Автоматика и информатика, бр.3/2003 г.

[6]. Недева, Веселина, Информационни технологии за Web маркетинг на образователни услуги, Научна конференция с международно участие, Стара Загора 2003, 5-6.06.2003 год. ISBN 954-9329-03-8, том II, стр.39-43