

Distance Learning System Application for Maritime Specialists Preparing and Corresponding Challenges Analyzing

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Abstract. Learning management system Moodle application for maritime transport specialists preparing in university with territorially distributed subdivisions and worldwide moving students is described. Corresponding arising challenges are shown and analyzed.

Keywords: Electronic teaching and methodical materials · Learning management system · Maritime transport · Remote subdivisions · Specialists preparing · Training system hardware choosing

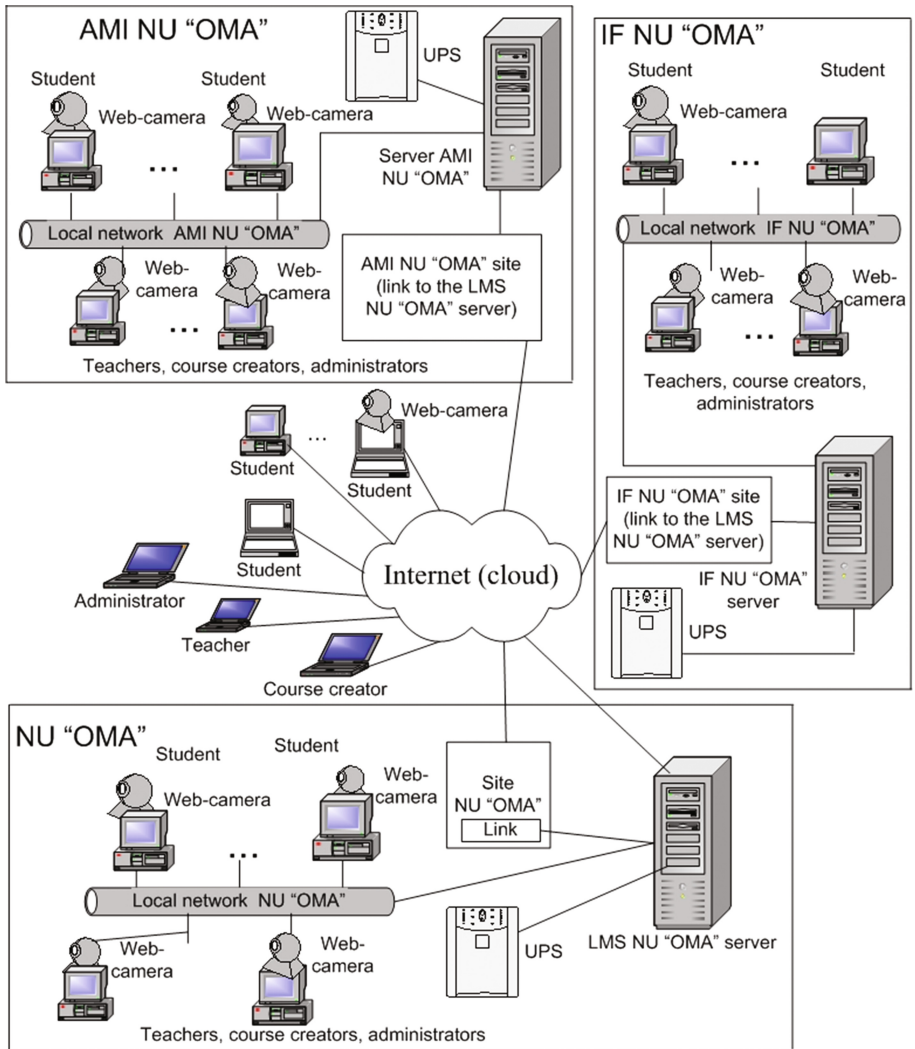
1 Introduction

Last years Ukrainian universities implement learning management systems (LMS) very actively. In connection with impossibility to buy quite expensive software the choice usually stops on free and open source LMS Moodle. It renews regularly, it has convenient interface and a lot of possibilities to work for students, teachers, teaching and methodical materials (TMM) developers [1, 2]. Bit by bit some books appear in different languages where procedures of distance courses creation, TMM elaboration and LMS administration are described with different levels of specification [3–5].

Significant difference of National University “Odessa Maritime Academy” (NU “OMA”) [6] from a lot of different another universities is in presence of remote structured subdivisions in different parts of Ukraine: in the city of Izmail (Izmail faculty, IF) and in the city of Mariupol (Azov maritime institute, AMI). Moreover thousands of full time students, students by correspondence, postgraduate students, advanced training courses students and trainees every year pass many month naval training on different type of commercial vessels and need to have access to TMMs and teacher’s consultations, being far from the home and NU “OMA”. Before these possibilities could be realized by passing paper or electronic TMMs to vessels during crew members change (unexpectedly and unreliable), sending electronic TMMs via e-mail or downloading electronic TMMs from NU “OMA”’s web site [6] (these ways were realized during 13 years without any statistics, registration, efficiency analyzing, etc.). Using LMS Moodle (in test mode it has begun in September 2009, in full mode it has begun in September 2010) has significantly allowed to enhance quality of TMMs preparing, and also theirs quantity and

actuality, and to prepare teachers and students step by step for regular using of Moodle possibilities wide spectrum.

Scheme of distance information interaction between participants of educational process which is realized in NU “OMA” is presented on Fig. 1.



NU "OMA" - National University "Odessa Maritime Academy"
 AMI - Azov Maritime Institute, city of Mariupol
 IF - IZmail Faculty, city of IZmail

Fig. 1. Structure of information interaction between NU "OMA"'s subdivisions

It's known that in most cases students begin studying of disciplines from school books, which are created by universities' teachers, where they study. Precisely these school books much simpler (in comparing with books of another authors and franchisors) to place in LMS because by this way it's possible to minimize problem of content piracy and another juridical aspects.

At present time distance learning system of NU "OMA" is based on Moodle 1.9.6 [5] software and provides work of more than 8400 users (including 320 teachers). For fast registration of big number of users special additional software is created. Using of LMS allows to get additional positive results in studying of interested students [1, 2]. Activity and interest of LMS using by students of different studying forms are growing permanently.

2 Methodology

In any information system can happen some fault or failure that's why it's necessary to store backup copy of LMS folders structure with created distance courses and another materials and database of users. When moving LMS Moodle from one physical server to another one there is a possibility to export all data from previous server in SQL format (database dump) and to import all these data to new server. But during LMS exploitation

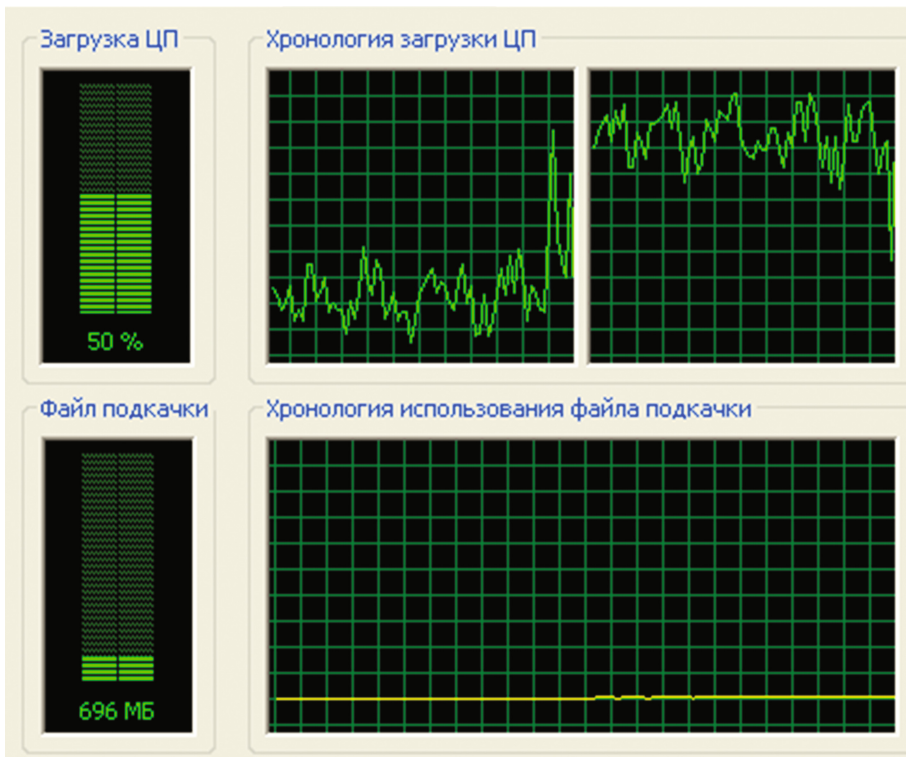


Fig. 2. Minimal local computer loading during database dump importing

server will store new distance courses with a lot of different methodical materials and tests in the frame of hundreds or even more than thousand disciplines, archive files which contain backup copies of each course will be added, new users will be added as well, thousands of users will upload different files, pictures and will take part in forums and so on. As a result the volume of stored data will grow very fast, the volume of export SQL file will grow very fast as well and will take place the problem of importing database dump at new server even from administrator's console on server computer without LAN using. Time of import will exceed network (browser) time out value and process of importing will be interrupted itself without finishing. Concurrently level of hardware utilization of quite modern typical computer configuration is very high (50–94% of 2-cores CPU resources and 700–1200 MBytes of RAM). Also LMS Moodle uses CRON scenario (system job) which works in endless cycle checking and processing all new events in LMS and adds significant CPU and RAM loading.

Graphics of computer resources utilization with small, middle and high loading are shown at Figs. 2, 3 and 4 accordingly. These graphics contain following information: CPU utilization (50, 76 and 94% accordingly) and chronology of CPU utilization in the top part of graphics; swap file size (696, 941 MBytes and 1.21 GBytes accordingly) and chronology of swap file using.

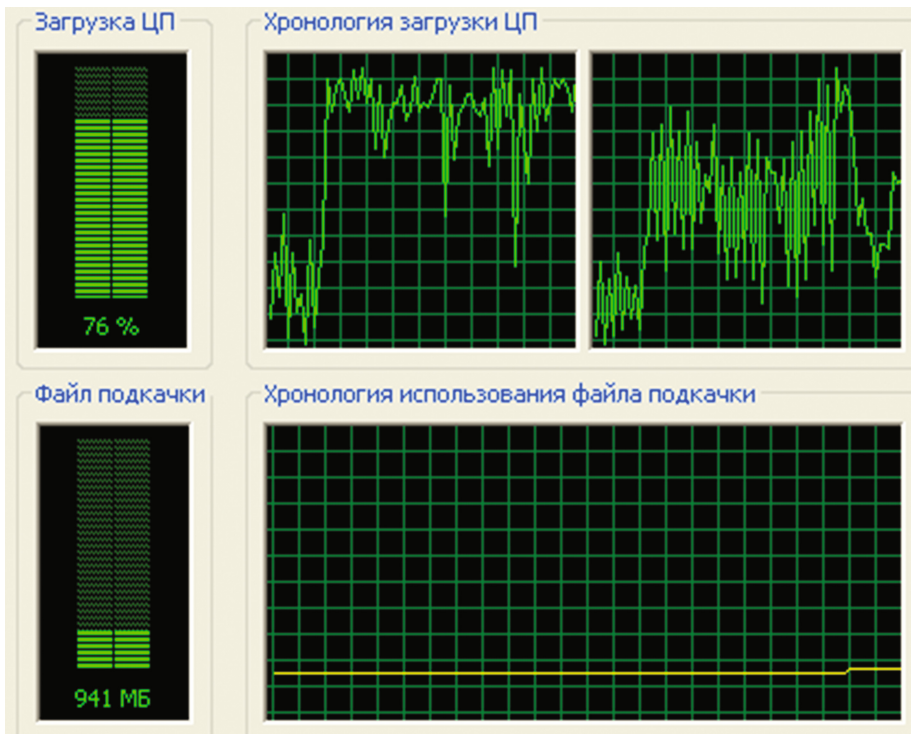


Fig. 3. Middle local computer loading during database dump importing

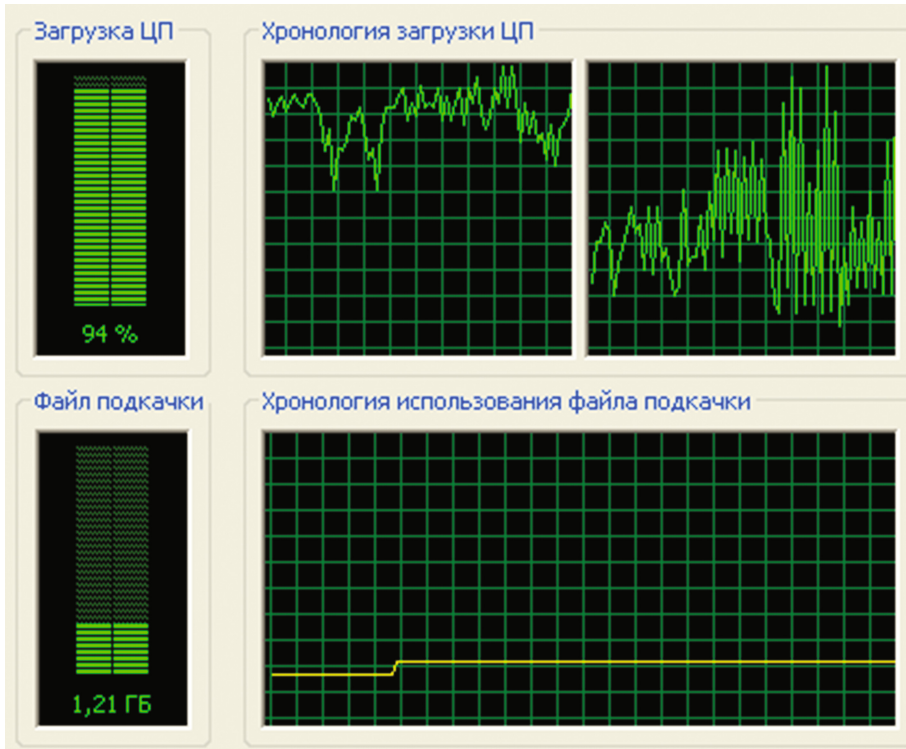


Fig. 4. Maximal local computer loading during database dump importing

In the same time repeated manual data input which is necessary to restore LMS is quite primitive, very boring, long and laborious process which can take between some days and some weeks of LMS administrator work depends on his qualification and experience. Herewith it's undesirable to attract any staff for execution of these works inside LMS in connection with necessity of full administrator rights granting to additional people and unpredictable results of further work because of human factor (fully unworking LMS in unexpected moment, appearance of faked users, plagiarism of different learning materials and so on).

Some tasks and problems which have to be solved in university information systems are described in [7].

It's necessary to formulate some recommendations for LMS Moodle administrators based on own 6 years long experience.

1. Not to add LMS users one by one manually even when number of these users is not too big. It's much preferably to create external text files with full list of user's data using special template, to add new users in the end of this file and to execute automatic procedure of importing by means of LMS Moodle, because file exported from LMS which contains the user's data will not contain user's passwords and in the case of LMS fault requires some additional manual processing of exported files

which requires additional time. Also this way involves the necessity of new passwords generation and user's informing about this situation with naturally arising dissatisfaction and mess, or searching and restoring of previous versions of passwords.

2. Before exporting of full database dump it's necessary to delete beforehand all archive copies of distance courses from the server, because presence of these files significantly increases database dump (sometimes even in times).
3. It's necessary to restrict file sizes (especially for graphical files), which will be uploaded on the server by users.
4. Not to import database dump to the server by LAN. Generally the most of Ukrainian universities use Fast Ethernet with 100 Mbps bandwidth as LANs. Just LAN data transfer speed will be as bottle neck because even bandwidth of old hard drive connection interface IDE is 100 MBps (theoretically 8 times faster), and modern SATA interface has at least 150 MBps. At the same time the same LAN will be used by another users which will take some part of bandwidth as well. So, during importing of database to the server directly from administrator console LAN will not become as restricting factor.
5. To store archive copies of each distance course on external hard, optical, flash drives, streamers and so on. It will make procedure of data restoring for separate distance courses or whole database much simpler and faster.
6. During database restoring on new server at first it's necessary to restore only categories and subcategories structure and to create empty distance courses without restoring of their content, and to make database dump. Such dump will have relatively small size and can be simple and fast restored, being the skeleton of LMS.
7. Before importing of big database dump it's necessary to enlarge values of following parameters: *max_execution_time*, *max_input_time*, *memory_limit*, *default_socket_timeout*, *mysql.connect_timeout*, *session.gc_maxlifetime* in configuration file *php.ini*.

Last 10–15 years it's become absolutely clear that Life long learning (LLL) conception is necessary to be realized by any engineer, developer, valuable specialist working in the field of automation, industry, transport, data transfer and control systems, etc. One of the facilities to get new knowledge, practical skill, experience, etc. is using of training equipment.

Main lack of any training equipment is big or huge cost because modern training equipment consists of high performance computers, network equipment, very expensive touch panels with big diagonals (at least 40 in) and high resolution and so on. Typically training equipment may cost several tens, hundreds or even millions dollars depending on functionality and sphere of application. In the same time even super modern equipment becomes morally outdated very fast because of appearance of new hardware, software, technologies, network protocols, concepts, algorithms and so on. That's why from the economical point of view such training equipment has to be used 24 h per day. Thus it's necessary to choose optimal hardware (memory volume and performance, disk subsystem type and performance, network and graphical interfaces bandwidth, central and graphic processors productivity, network technology and data transfer rate) configuration taking into consideration cost/productivity ratio.

Additionally it's very complex to realize training equipment loading during whole day in real life. Moreover very often trainees, which have to pass corresponding training, live in different cities and even countries, have different level of language speaking, work in different companies (for example, in maritime branch). These reasons quite often don't allow to get all them together. That's why very important property of training equipment is possibility to work with trainee and to be controlled by administrator and/or trainee remotely.

One more task to be solved is Internet channel bandwidth optimal choosing and analyzing and calculating of additional loading in corporate (campus) computer network. Transferring of uncompressed graphical data will be reason for unstable network condition. Fast Ethernet network technology with 100 Mbit/s data transfer rate, which is most popular in Ukrainian campus networks, will become the bottle neck. There are 2 evident ways to solve this problem.

1. Using of additional real time data compression boards which will contain own CPU and memory.
2. Upgrading of network equipment (switches) from Fast Ethernet to Gigabit Ethernet or even to 10 Gigabit Ethernet for some network segments and structured cabling system or some it's segments from category 5 twisted pair to newer twisted pair category or fiber optics.

3 Conclusions

In this paper some challenges and problems connected with modern university learning management systems software and hardware are touched on and some recommendations on exploitation of such systems are proposed. Currently learning management system is a part of more complex enterprise information systems, it can be combined with another software like ERP-, CRM-, BI-systems, complex computerized training systems for seafarers within the same computer network and hardware using virtualization technologies in particular. Inasmuch in present time learning and self-learning is life long process in any field of human activity and is very actual and will become much more dynamic, these recommendations may be useful not only for specialists in education system but for specialists which create and exploit different information systems as well.

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