Integration of Video Conference into eLearning Platform Based on Moodle for the Vocational School

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Abstract – **In vocational education students should acquire skills required in the labor market. In Macedonia the practical work takes place mostly in the schools, and very little in the companies. On the other hand video conferencing can provide distance learning in real-time discussions with educators and experts in the particular field. This paper will cover two parts. The first part dealt with the limitations and potential of the technology used for video conferencing, what server is required, what software is needed and so on. And the other part will involve researching whether students and teachers are ready to use video conferencing.**

Keywords – **eLearning, server, technology, video conferencing.**

I. INTRODUCTION

How to enrich an eLearning environment such as Moodle with the possibility of video conferencing, faster creation, sharing and monitoring of effective educational experiences for students and teachers. In recent years a very popular question is how students from vocational schools will acquire the necessary skills? What if students do not have many opportunities to perform some of the practical work in real companies. Does video conferencing can provide distance learning in real-time discussions with educators and experts in the particular field, and thus students to acquire communication and IT skills, but also specific skills needed for the labor market.

The basic idea is derived under strange circumstances. If you install Adobe package and then run Microsoft Word, you can see an icon for starting a video conference or on-line meeting through Adobe Connect. What is Adobe Connect? Adobe Connect is the solution for web conferencing, web meetings, learning and can provide extremely rich interactions. Through this system you can participate in online web conferencing in real time, to use resources such as audio (microphone), video (webcam), presentations (in PDF or PPT,

which are converted to Flash), and to share them on your computer screen or whiteboard. Even when you cannot attend a meeting or you want to get back later to check something, Adobe Connect allows you to see recording of what happened, like videos on YouTube [1]. But this is a closed source software, and should be paid.

Is it possible to set up something similar based on open source and integrate it into Moodle?

It is possible if you have a server under your control, and if you could include support for multiple simultaneous users. Installation, configuration and setup is not so easy, but with more engagement and energy it can be done.

Such a solution, perhaps more powerful than Adobe Connect is OpenMeetings. Code and manuals are hosted on Google Project Hosting. OpenMeetings same as Adobe Connect, has the ability to set up audio and video conferences, to convert presentations into flash format, to record meetings, to share documents on a whiteboard, to share screen etc. But the most important thing is that runs across all platforms. OpenMeetings is a free browser based software that allows you to set up instantly a conference in the Web. You can use your microphone or webcam, share documents on a white board, share your screen or record meetings. It is available as hosted service or you download and install a package on your server with no limitations in usage or users [4].

In [2] is described spread of video conferencing as a tool for connecting students in an efficient and economical way to "real world" outside the classroom walls. Additions of the book offers a wealth of resources and checklists for making the experience of video conferencing successful.

"Historically, the cost of maintaining dedicated telephone lines for ISDN videoconferencing connections has been a major obstacle to adoption in schools. Line fees can range into the hundreds of dollars per month for a resource that may be used only once or twice a month. Now that IP connectivity is more readily available and codecs are offering higher rates of compression (thus more available bandwidth), more content providers are offering IP-delivered programs. As a result, more schools can consider equipment purchases. Getting started with video conferencing may require a school to invest approximately three to five thousand dollars." [3].

What is the main purpose of this paper? This paper will cover two parts. The first part dealt with the limitations and potential of the technology used for video conferencing, what server is required, what software is needed and so on. And the other part will involve researching whether students and teachers are ready to use video conferencing.
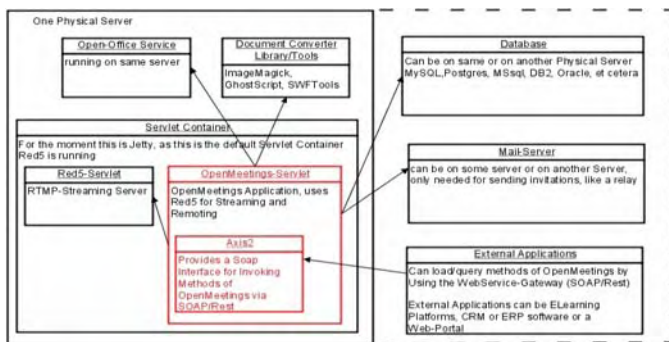
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Fig. 1. Technologies used to integrate OpenMeetings

Fig. 2. Showing previously recorded video conferencing room

Fig. 3. Importing documents into whiteboard in Conference room
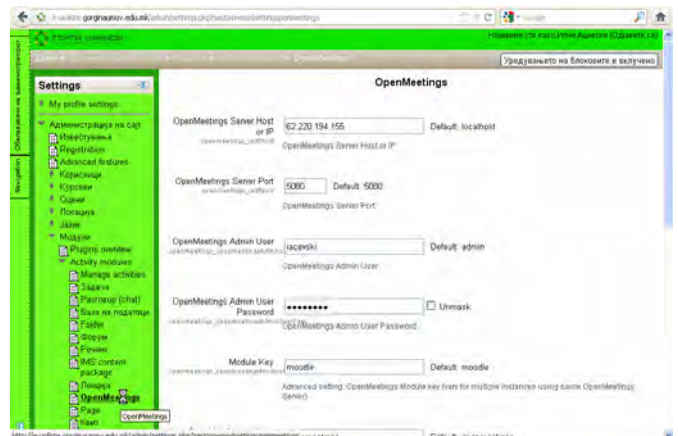

Fig. 4. Configuration of the OpenMeetings plugin

II. METHODOLOGY OF RESEARCH

A. Technologies

Technologies used to integrate OpenMeetings is shown at Fig. 1. Openmeetings uses Red5 server as media streaming server. By default OpenMeetings uses the integrated Apache Derby database. For production environment you should consider using MySQL, Postgres or for example IBM DB2 or IBM DB2. Let see some other open source applications needed for OpenMeetings to work with all features: FFMpeg codec and SoX (Sound eXchange) to record, convert and stream audio and video, shown at Fig. 2, ImageMagick for image uploading and importing to whiteboard, GhostScript and SWFTools for importing of PDFs into whiteboard, OpenOfficeConverter for importing of .doc, .docx, .ppt, .pptx and all Office Documents into whiteboard, Fig. 3. [5].

B. RED5 vs FMS

OpenMeetings is suitable for e-learning platform, as well as commercial Adobe Connect, but the license for Adobe FMS-Flash Media Streaming server is very expensive. Open source Red5 server written in Java is used by OpenMeetings instead of Adobe's Flash Media Server. FMS features can be written only by Adobe FMS team. Red5 features can be adjustable.

FMS uses Real Time Media Flow Protocol -RTMFP and Red5 work with Real Time Messaging Protocol-RTMP, RTMP over HTTP Tunneling-RTMPT, RTMP Secured-RTMPS and RTMP Encrypted-RTMPE.

FMS uses FLV and H.264 for Streaming Audio/Video, and Red5 work with FLV, F4V, MP3, MP4, AAC and M4A.

FMS uses FLV, MP3, AAC and Speex for Live Stream Publishing, and Red5 work with Sorenson, VP6, h.264, Nelly Moser, MP3, Speex, AAC and NSV.

AMF (Action Message Format) Objects are used by RED5 for communication with the flash clients. There are 2 techniques for communication: Flash-Remoting and RTMP. In Flash Remoting technique, this objects are sent over HTTP (new connection for every request cause latency), and in RTMP technique AMF Objects are sent over TCP (one connection for the whole session cause unnecessary open connection). Red5 uses port 1935 for RTMP, 8088 for RTMPT and 5080 for HTTP [6].

From the above mentioned can be concluded that Red5 can be a good substitute for the expensive FMS.

C. Integration into Moodle

One of the main reasons for which Openmeetings are used in this paper is the easy integration into eLearning platform based on Moodle. Once the OpenMeetings is installed on your server can be easily integrated into Moodle. You can get the latest Version of the Plugin for Moodle from [5], and unzip it to Moodle's mod directory. After that, you will find the Plugin's configuration that is shown at Fig. 4.
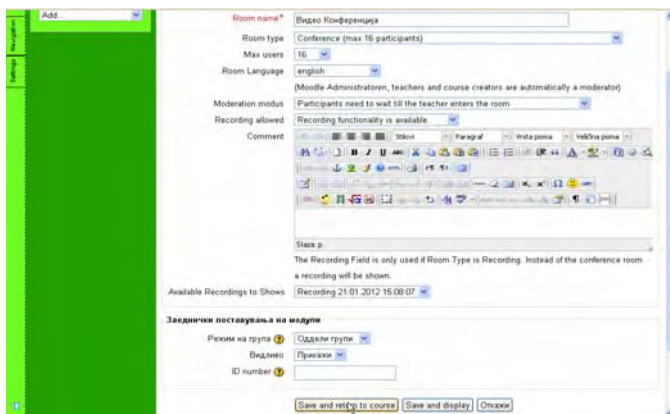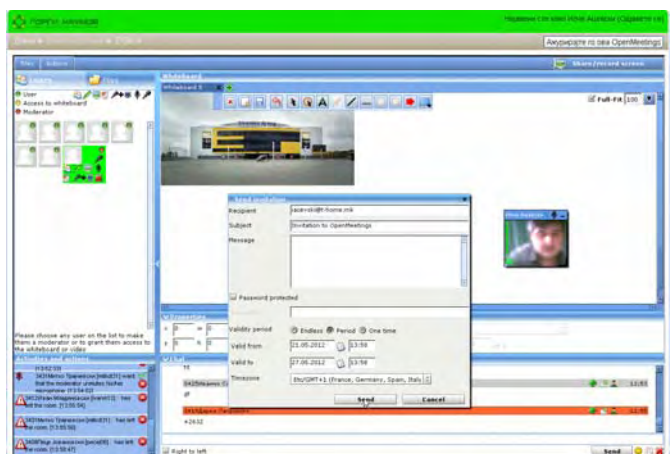
Fig. 5. Creation of OpenMeetings activity

Fig. 6. Student privileges and guest invitation in Audience room

After configuring, OpenMeetings appears as an activity in all courses in Moodle platform, and every teacher can create this activity for his students. With the integration in Moodle all members of the courses are also members of OpenMeetings. During creation of OpenMeetings activity, Fig. 5, teachers are moderators by default. Every student can request some privileges from the teacher, who can assign specific privileges to the student, for each individual user and for each possibility separately, that is shown at Fig. 6. *Sent invitation* from the *Actions* menu is used to send an invitation via email to an outside guest, as an expert in the field to whom students can ask questions. Namely in the video conferencing rooms access have only teachers and students who attend the course. With this invitation, an outside guest will receive an email with link which will lead to the conference, and with a period when the meeting will be scheduled, Fig. 6.

D. Hardware and Operating System Requirements

Openmeetings has been tested twice for this paper.

The first time it has been installed on a computer with Windows XP operating system, AMD Processor 3000 + 1,81 GHz and 1GB of RAM, to feel the software and see if it can be used for nonprofit purposes and restricted conferencing.

The second time, Openmeetings has been installed on a much better Linux-Mint server machine with Intel Core2Duo Processor and 2GB RAM and tested with Moodle.

E. Who will use video conferencing?

All that is mentioned before will be without context, if there are no real use of it. For this purpose a research was done through surveys of teachers and students. These surveys were designed to show whether students and teachers are ready to use video conferencing. Both surveys were in native language, for the students (http://tinyurl.com/753rh8p) and for the teachers (http://tinyurl.com/7durqyk), and was created by Form in Google Docs.

From total of 71 teacher, the survey for the teachers was answered by 50 of them. There was 17 questions in survey, but 3 of them were particularly important for this research. Other questions were for educational quality, and maybe for another researches. This questions were: "8. Would you like to trie, some extra or additional classes to hold through video conference if it is provided by the school?", "10. Would you like to attend a short training for using ICT, …, using video conferencing, …?", "17. Would you held a video conference with a group of students and expert from the appropriate field in which the students could ask questions?"

The survey for the students was answered by 213 from total of 792 students (8-10 from each class). There was 17 questions (similar with that of a teachers survey, but prepared for the students), and 3 of them are relevant for this research: "7. Would you like to try some extra or additional classes to hold through video conference if it is provided by the school?", "8. Do you think that the use of ICT in ways that are mentioned in the above questions would raise your skills and achievements as a student?", "17. Would you participated in a video conference with an expert from your vocation, if the teacher provide it, to be able to ask him questions?".

III. RESULTS OF RESEARCH

The first time on a computer with Windows XP, For several participants at a conference this hardware meets the requirements that refers to the processing and the time delay. But the translation of documents, can kill the process. The machine very often can spontaneously reboot in this case and shut down the meeting.

The second time, on a much better Linux-Mint server machine, using Openmeetings is at first tried when all users are in the same LAN (using OpenMeetings in the classroom), and time delays are awful - up to half minute with 3-4 or more participants in *Conference* (max 16 participants), shown at Fig. 3 and *Aaudience* (max 32 participants) room, Fig. 6. It makes the application unusable in some cases. In Webinar (max 150 participants) room, Fig. 7 this delays are much smaller with more participants, about few seconds.

When the users are at home, all with their own Internet bandwidth, the results are much better and mostly depend on OpenMeetings server. In our case test was done with 7 participants in Conference room, and more than 10 participant in Audience and Webinar room. Results were pretty much better than that from the School LAN, with about 1-2 second delays for audio/video and screen sharing.

Let's see the results from teachers survey. Original results (in Macedonian) can be seen at http://tinyurl.com/73o6rur.
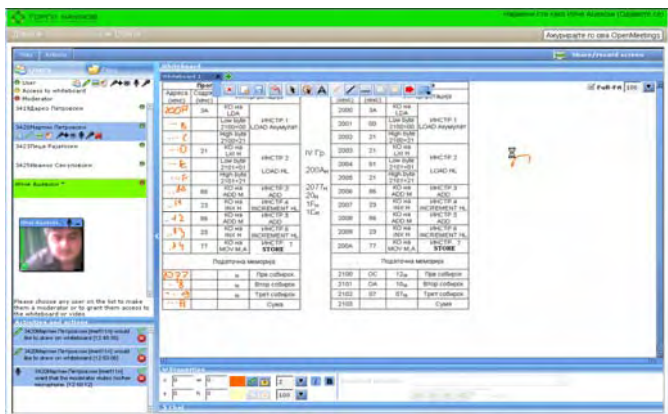
Fig. 7. Webinar (max 150 participants) room

Results shows that about 82% of surveyed teachers would like to held a video conference with expert from the appropriate field. Results are shown on Fig. 8, for every important question from the teachers survey.
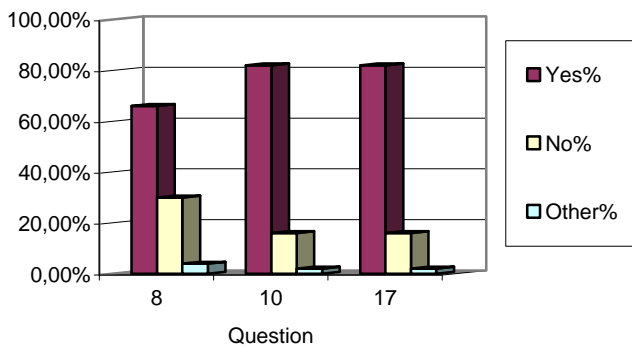

Fig. 8. Results from the teachers survey

Results shows also, that about 76.06% of surveyed students wished to participate in a video conference. This is shown on Fig. 9. Original results from the students can be seen at http://tinyurl.com/7ldnavj.
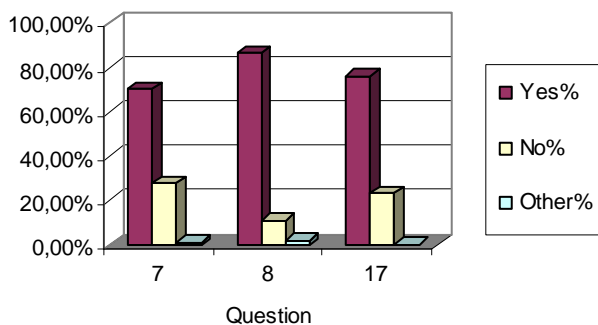

Fig. 9. Results from the students survey

IV. DISCUSSION

From the experience with Windows XP can be conclude that: setup and installation is fairly simple; during documents conversion setup problems arise, and the hardware does not meet requirements.

Of course that under Linux there are quite a lot of tricks when installing, but the following conclusions can be obtained: setup and installation are not so simple; the hardware is good for document converting and for application to work; by adding on more than 10 users, each with its own camera, problems can occur depending of the hardware at the client side; real problems can occur with the flow and there is need of QoS. Hardware and bandwidth can be limiting factors. The router on which the test is done has no QOS. Another note for the end: It is better to use headphones when using OpenMeetings. If speakers are used it may cause audio feedback with a delay, which further reduces quality.

Also, from this research can be concluded that students and teachers are ready to use video conferencing. For this purpose, tutorials were prepared in written and video format.

At http://gorginaumov.edu.mk/?page_id=1703 can be seen video tutorials. Also, tutorials in written format can be seen at http://www.issuu.com/ilceacevski/docs/video_konferencija.

V. CONCLUSION

During Integration of Video Conference into eLearning Platform, a lot of different techniques were used. OpenMeetings is a powerful tool written in Java, and uses open source applications. With Openmeetings you can use your microphone or webcam, share documents on a multi-whiteboard, share your screen, record meetings, send invitation via email to an outside guest, as an expert in the field that are studied in a course etc. OpenMeetings uses Red5 server as a good substitute for the expensive FMS. There is a need of powerful server machine, wide bandwidth and QoS. Once the OpenMeetings is installed on your server can be easily integrated into Moodle.

At the other hand, through teacher's and student's surveys can be concluded that students and teachers are ready and wish to use video conferencing. But, even though that the tutorials are prepared in written and video format, there is need of quite a job for fairly implementing of this project, and must be other activities which directly or indirectly encourage teachers to change the way they work.

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