

A Moodle extension to book online labs

José M. Martins Ferreira¹, António M. Cardoso²

¹ jmf@fe.up.pt; ² antonio.cardoso@eee.org

FEUP / DEEC – Rua Roberto Frias – 4200-465 Porto - PORTUGAL

Abstract

Moodle is an open-source content management system that is now widely accepted worldwide within the academic community. Its social constructivist philosophy makes Moodle an excellent choice to deliver e-learning contents that require collaborative activities, such as those that are frequently associated with online labs (virtual labs, mixed-reality labs, or remote labs). However, the development of online labs that include remote experimentation resources presents specific functional requirements that may not be entirely met by the current features of Moodle, since the number of such labs will always be smaller than the number of students. This discrepancy creates the need for a booking tool to reserve online lab time beforehand, avoiding access conflicts and at the same time helping the students to organise their time and activities. In most cases those online labs will be meant to support hands-on activities that are associated with learning contents delivered via the web. Tutors will in that case need to integrate the booking link into the experiment script, a task which will be facilitated if such tool is embedded in the e-learning platform that is used to deliver the course contents. This paper presents a Moodle extension that offers a booking tool to support resource sharing. Such tool has an immediate application for organising access to online labs, but may in fact be used with any other type of scarce resources, such as the videoconferencing rooms that are needed to support collaborative activities.

1. Introduction

The work presented in this paper was developed within the scope of MARVEL (Virtual Laboratory in Mechatronics: Access to Remote and Virtual e-Learning), a Leonardo da Vinci project running from December 2002 to July 2005 [1]. MARVEL developed and evaluated online labs that comprise access to remote resources be in a strict remote experimentation context, or as part of mixed-reality environments. The main application areas covered by MARVEL are mechatronics, solar energy labs, robot training and electronics. For further information and to access the MARVEL labs, visit <http://www.marvel.uni-bremen.de/>.

The main objective of MARVEL is therefore to make available online labs providing access to remote experimentation resources. The number of such resources will always be smaller than the number of students willing to use them, and as such we come across the general problem of sharing a scarce resource among an eventually large number of users. The fact that such experiments are delivered via the web, combined with the open-source nature of Moodle, created an opportunity to develop the booking extension that is presented in this paper.

The Moodle course management system is briefly introduced in section 2, followed by a detailed presentation of the booking tool that was developed by FEUP within MARVEL. A real remote experiment that is available online is described to illustrate the usage of this tool. The final section presents the conclusions of this work and summarises the further development plans that are envisaged for the near future.

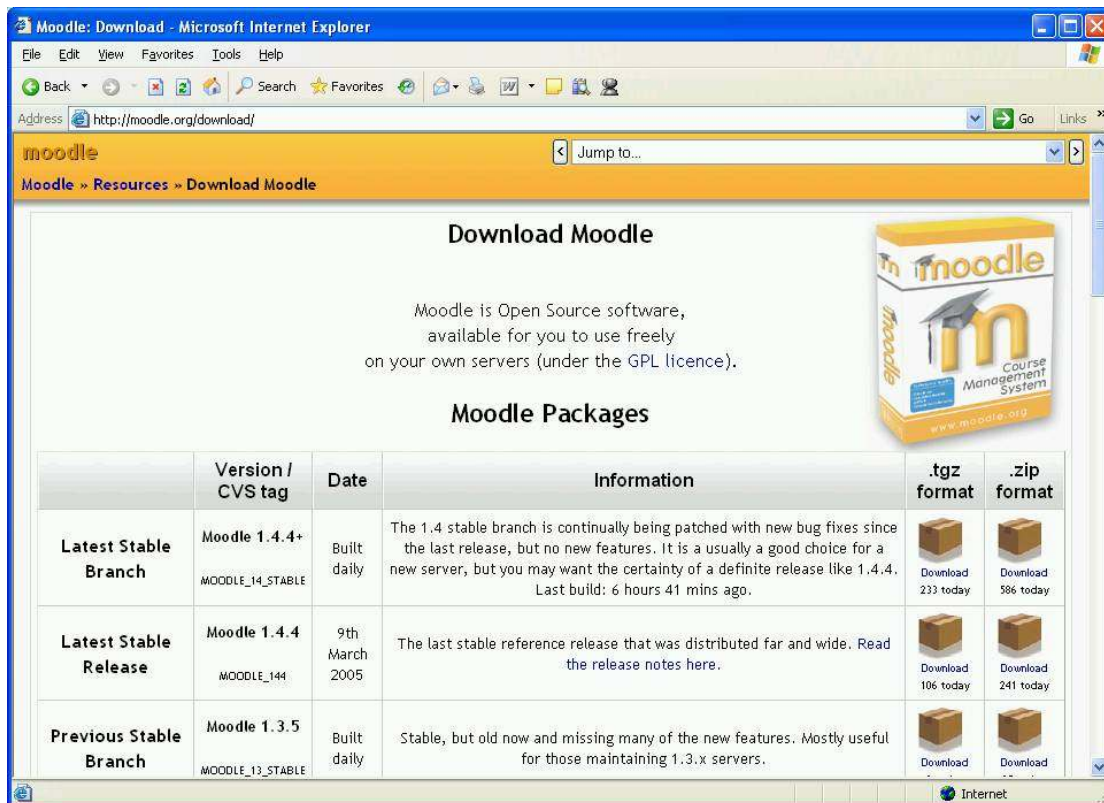
2. The choice of Moodle

One of the first tasks in the MARVEL project work plan consisted of recommending an e-learning platform to be used across the consortium. There is a wide offer of such platforms available on the market, and many web sites summarising their features and other information, such as Edutools [2] and e-Learning reviews [3]. Some of the well-established players in this domain adopted price policies that do not recommend their choice when the number of students involved is relatively small. On the other hand and on recent years, we have witnessed a widespread acceptance of Moodle [4], an open-source content management system that is now used worldwide as an e-learning platform closely associated with a social constructivist learning model (<http://moodle.org>). The open source nature of Moodle facilitates the development of additional features that may be needed to

support specific application requirements, which was an additional reason to recommend its usage within MARVEL.

There are a few pre-requirements to a successful installation of Moodle, although the whole process is very straightforward and indeed several ready-to-use installer packages may be downloaded from the web. Moodle needs a web server and a database, for reasons that are better explained by transcribing from Moodle documentation \ Administration \ Apache, MySQL, PHP (at <http://moodle.org/doc>): *Moodle is written in a scripting language called PHP, and stores most of its data in a database. The database we recommend is MySQL. Before installing Moodle you must have a working PHP installation and a working database to turn your computer into a functional web server platform.*

For reasons of consistency and to facilitate maintenance and support, a standard configuration consisting of an Apache web server [4], MySQL [5] and PHP [6], were recommended within MARVEL. The latest stable release of Moodle at the time of completing this text is version 1.4.4 (available since March 9th, 2005), which may be downloaded from <http://moodle.org/download/> (see figure 1). Detailed installation instructions may be found on Moodle documentation \ Administration \ Installation at <http://moodle.org/doc/>.



Download Moodle

Moodle is Open Source software, available for you to use freely on your own servers (under the GPL licence).

Moodle Packages

	Version / CVS tag	Date	Information	.tgz format	.zip format
Latest Stable Branch	Moodle 1.4.4+ MOODLE_14_STABLE	Built daily	The 1.4 stable branch is continually being patched with new bug fixes since the last release, but no new features. It is a usually a good choice for a new server, but you may want the certainty of a definite release like 1.4.4. Last build: 6 hours 41 mins ago.	Download 233 today	Download 586 today
Latest Stable Release	Moodle 1.4.4 MOODLE_144	9th March 2005	The last stable reference release that was distributed far and wide. Read the release notes here.	Download 106 today	Download 241 today
Previous Stable Branch	Moodle 1.3.5 MOODLE_13_STABLE	Built daily	Stable, but old now and missing many of the new features. Mostly useful for those maintaining 1.3.x servers.	Download	Download

Fig. 1: Download Moodle.

3. The booking extension

Since the delivery of pedagogical contents in most of MARVEL scenarios is done via the Moodle e-learning platform, FEUP developed a Moodle extension that is made available as a *booking module*. This module is shown to the tutors in the form of a standard content-building option in the drop-down menu that is visible while in editing mode.

3.1. Students' view (carrying out an experiment)

The theoretical concepts underlying the experiment will be delivered using the usual Moodle modules (e.g. lesson, quiz, etc.). The booking link, illustrated in figure 2, will enable the student to book a one-hour time slot to carry out his remote experiment, whenever he feels that it is time to do so.

The screenshot shows a Moodle course page titled "Introduction to electronics" in a Microsoft Internet Explorer browser. The page displays a calendar, upcoming events, recent activity, and an administration menu. A graph titled "Filter1: Frequency Response" is shown, plotting dB Gain against Frequency (kHz). The graph shows a flat line at 0 dB until approximately 1 kHz, after which it drops sharply at a rate of 40 dB per decade. Below the graph, the text reads: "Figure 2: Gain x frequency for the circuit shown above (Chebyshev filter)." Below this, there is a numbered list of instructions for the experiment, followed by a note about taking notes and emailing a PDF report. At the bottom, there is a link labeled "Second-order low-pass filter experiment" with a yellow callout bubble that says "Click here to book a one-hour time slot".

Fig. 2: The booking link.

By clicking on this link, a seven-day calendar will be displayed, as shown in figure 3. The first day shown corresponds to today's date, and its weekday / date cell is displayed with a blue background. With the exception of today's column, all weekday / date cells contain a link that shifts the calendar to the left, so as to bring that column into the leftmost position. If that same link is clicked on today's column, then the calendar is shifted one day to the right, and yesterday becomes the leftmost column. The left and right arrows shown below the summary description on top are used to shift the calendar in one week slots.

The calendar page shows the local time (at the user's time zone), which may of course be different from the server time (at the remote lab time zone). The time conversion takes place automatically, so that users at any time zone see the free / booked slots market according to their local time zones.

14/4/2005 - 20/4/2005
This experiment uses a waveform generator and an oscilloscope to determine the cut-off frequency of a low-pass filter that is implemented in the remote laboratory.

Local Timezone Server time: quinta-feira, 14 de Abril de 2005 18:05:15

	Thu April 14	Fri April 15	Sat April 16	Sun April 17	Mon April 18	Tue April 19	Wed April 20
0:00							
1:00							
2:00							
3:00							
4:00							
5:00							
6:00							
7:00							
8:00							
9:00							
10:00							
11:00							
12:00							

Fig. 3: The calendar displayed by the booking module.

By clicking on the book icon (📅), the client is able to book the required one-hour slot. Any reserved slot may be released by its owner, by clicking on the unbook

icon (🚫). When the reserved slot becomes the current one-hour slot, a red arrow link is displayed and enables access to the remote experiment, as shown in figure 4.

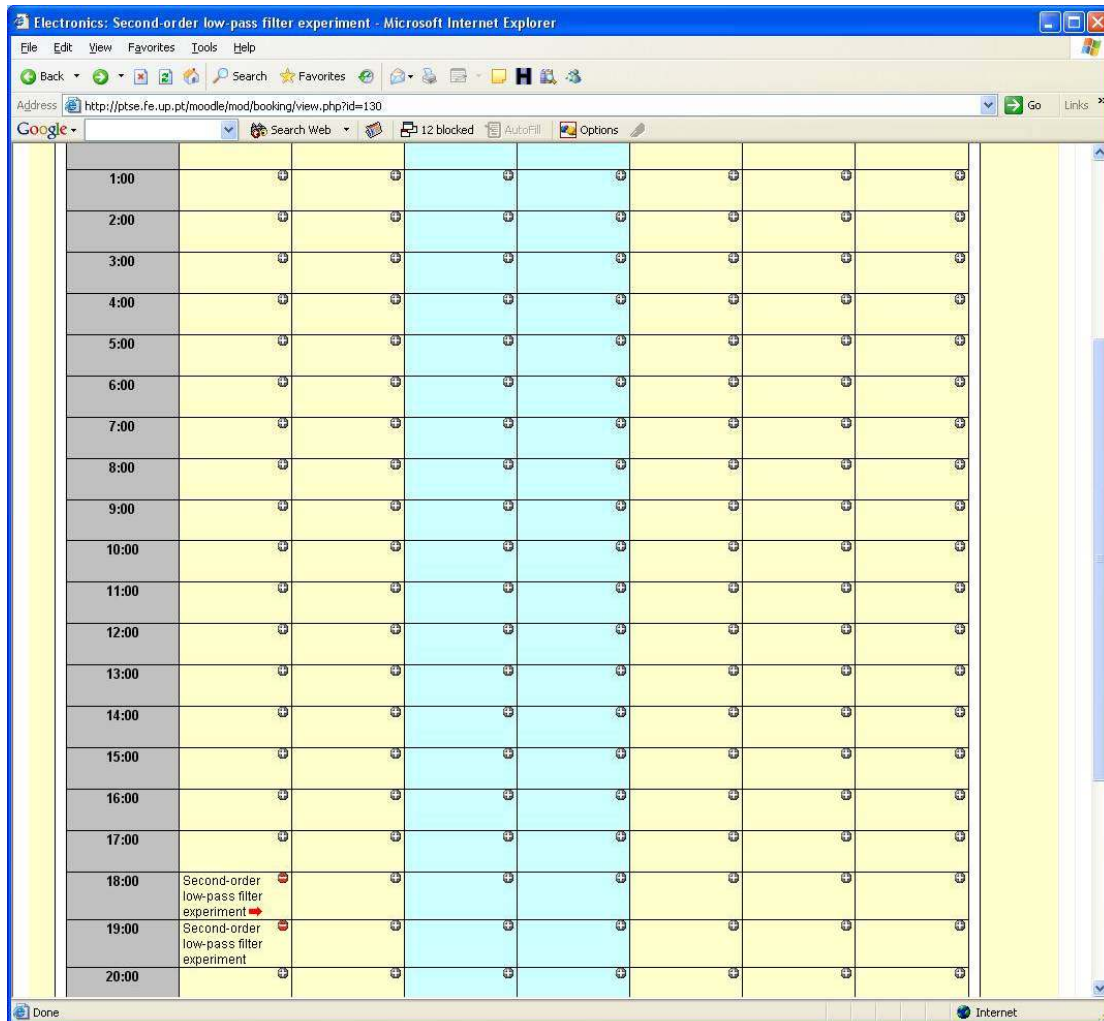


Fig. 4: The link to the experiment (➡).

Clicking on this link launches the remote experiment page, enabling the students to do their work. Notice that the synchronous communication tool is launched separately, and may actually not even be active, if the experiment is done by a single student. Whenever necessary, the students may communicate via internet telephony or videoconferencing, so as to have everything prepared when their one-hour slot is reached.

3.2. Tutors' view (creating an experiment)

While in editing mode (selected by the “Turn editing on” button that is available on the upper right of the course contents page), the tutor may insert a booking link by selecting this entry in the “Add” drop-down list, as illustrated in figure 5.

The screenshot shows a Moodle course page titled "Introduction to electronics" in a Microsoft Internet Explorer browser. The page is in editing mode, as indicated by the "Turn editing off" button in the top right. The main content area displays a "Topic outline" with two items. Item 1 is a heading, and item 2 is a text block containing a description of a second-order low-pass filter, a circuit diagram (Figure 1), and a frequency response graph (Filter1: Frequency Response). A yellow callout bubble points to the "Add..." button in the topic outline, with the text "Click to revert to non-editing mode". Another yellow callout bubble points to the "Booking" option in the "Blocks" menu, with the text "Select to insert a booking link". The "Blocks" menu is open, showing options like "Add...", "Assignment", "Booking", "Chat", "Choice", "Forum", "Glossary", "Journal", "Label", "Lesson", "Quiz", "Resource", "Survey", and "Workshop". The sidebar on the left contains navigation tools such as "People", "Search", "Calendar", "Upcoming Events", and "Recent activity".

Fig. 5: Adding a booking link while building pedagogical contents.

The tutor is then prompted for information concerning the experiment, as shown in figure 6. The “booking name” will be shown to the student to identify the experiment. The summary description inserted in the text field below will be displayed above the calendar, when the student proceeds to book his one-hour time slot. The “maximum number of students” field enables the tutor to specify the acceptable team size for each experiment. The URL of the experiment is generated dynamically at runtime, and is created randomly using the base URL indicated by the tutor in the “URL base (fixed string)” field. Experiment URLs are not predictable and therefore the experiment page may not be accessed directly. The “Command file location” field contains the path to the file that is used by Moodle to generate the runtime URL of the experiment. A 32-character string is written by Moodle in this file when the user clicks on the experiment access link (➔), and is later used to build the [ACCESSKEY] that is referred in the “URL base”

field. Finally, any experiment is associated with a start date, when the booking link becomes available, and an end date, when it ceases to be displayed.

Fig. 6: The information required by the booking module.

3.3. Installation of the booking extension

The booking module that was developed at FEUP is an extension that is not yet part of a standard Moodle installation. To install this module follow the two simple steps presented below:

1. Copy the folder “booking” into the “mod” directory at Moodle’s root (this folder is available from the MARVEL web site at <http://www.marvel.uni-bremen.de>)
2. Login as administrator and enter the administration area of Moodle

The booking module will be installed automatically on execution of step 2 above, since Moodle will look for any new modules and proceed to their registration. The

next time that a tutor enters the “editing on” mode, the booking module will be available on the drop-down menu that is used to create learning contents (see figure 5).

4. Conclusions

The booking tool presented in this paper was developed as a Moodle extension and enables any user of this e-learning platform to share scarce resources in a coordinated manner. It was written in PHP and integrated into Moodle version 1.4.4. The trials carried out so far involved a remote electronics workbench (experiment described in our Moodle server at <http://ptse.fe.up.pt/moodle> — Electronics \ Introduction to electronics \ username “demo”, password “public”) available at FEUP, which uses videoconferencing over the web to meet the collaborative requirements of the experiment script. The interface to the remote equipment was developed using LabView 7.0 [1], and the video-conferencing room was created using a Flash Communication Server. All booking actions report to the local time zone of the users, facilitating the usage of this tool in a multinational environment.

Future plans include extending the current version of this tool to support booking in a multi-user / multi-lab context (the current version is multi-user / single-lab). The new version will enable several groups of students to access multiple instances of the same online lab, in a way that is entirely transparent to the user.

References

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