

Moodle Cloud

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1. EXTENDED ABSTRACT

With over 73,000 registered instances worldwide, Moodle has already become one of the most popular Learning Management Systems, used by a variety of educational institutions from 224 different countries across the globe. Teachers appreciate its ease of use and a wide range of built-in tools, which allow them to deliver various forms of e-learning content to students and test their knowledge in many different ways. On the other hand, the system administrators and programmers make use of its open license, which allows them to develop their own system plugins and integrate it with the third party educational systems, like Mahara e-portfolio or Big Blue Button videoconferencing tool.

The scope of Moodle popularity causes that currently most of the teachers are engaged in more than a single online course and provide their educational materials to many different student groups. Moreover, some of these courses are very often distributed between multiple Moodle instances, which additionally could be managed by different schools or universities. As a result, when the teachers want to publish the same material for different student groups, e.g. a single .pdf, .doc, .ppt, image, audio or video file, they must upload individual copies of these files to every Moodle platform they are using. Furthermore, when they need to update the previously uploaded materials, they have to edit them on every single course of each platform. Depending on the number of courses and e-learning content being used, this could be the cause of many arduous administrating tasks repeated frequently by the teachers.

In this paper we present the system we have developed to solve the above stated problems, which could be easily integrated with any up-to-date Moodle platform (starting from the version 2.x). Our solution derives from the popular cloud-computing model, in which all the data are stored centrally on dedicated servers, and can be accessed and managed remotely using different, universal internet protocols, e.g. HTTP or its extended version WebDAV. To implement this concept we made use of the ownCloud platform, which is a free and open source data storage and sharing solution. We have developed our own plugins for both systems, i.e. Moodle and ownCloud, thanks to which we were able to integrate them very precisely and keep our teachers' data secure.

The ownCloud is the backbone of the whole system. It acts as a central file repository in which the teachers can store all their educational materials. Its functionality is very similar to the popular cloud storage systems, like Dropbox or Google Drive. The ownCloud users are able to access their remote resources using the web browser, where they can upload new files and manage them in different ways, e.g. rename, delete, copy or organize in folders. They can also update their learning materials very easily, by simply replacing the adequate files with their new versions. The changes made in the central repository are automatically visible in all the Moodle courses connected to these resources.

All the files that are stored in the teachers' ownCloud folders can also be easily listed and accessed directly from the Moodle platform, using its standard file picker module. The file picker is the Moodle's main mechanism responsible for the learning resources management and linking. In its standard form it is mostly used to access the local files stored on the platform, i.e. files that have been previously uploaded to certain courses. We have extended its default functionality, thereby giving the teachers an easy access to their ownCloud files directly from the Moodle platform. To make it work better, we have also developed a dedicated network interface in the ownCloud, which

can now serve the adequate file lists in an XML format. The XML files received by the Moodle's file picker module always contain the URL, pointing to the ownCloud resources selected by the teacher.

The biggest challenge was to secure these URLs and prevent the teachers' ownCloud resources from illegal access, e.g. where they could be linked from the outside of certain courses. We have achieved this with the use of the Moodle's built in filtering mechanism, which is a very flexible and extensible content-parsing solution. We have developed our own content filter, which dynamically generates the ownCloud hyperlinks in the Moodle courses for each visiting user. When the link is selected the Moodle passes it to a special ownCloud interface, where it is later parsed and validated. To protect the ownCloud resources from unauthorized access, we have additionally made use of the popular HMAC algorithm, which ensures that teachers' files are available only for the trusted Moodle platforms.

The whole system has also been integrated with the single-sign-on service, which in our case was the popular CAS solution, as well as with our university's LDAP user database. That substantially simplified the integration of both systems. Moreover, with the use of the standard ownCloud functionality our teachers can easily publish their files also outside of the Moodle platforms, e.g. link them on their own public websites or send them via email. That gives them even more possibilities of simple file sharing and their version management.

2. REFERENCES

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