



THE INTEGRATION OF THE ACADEMIC PORTAL WITH THE MOODLE VIRTUAL LEARNING ENVIRONMENT IN UNIVERSIDADE ABERTA

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Summary

The academic portal (AP) is the system where students are formally enrolled in courses and programs, and where grades are published. This information must be shared with the Virtual Learning Environment (VLE) where students in fact take their online courses. Universidade Aberta's (UAb) Pedagogical Model present additional challenges, which must be reflected in both systems: in each course students are grouped into classes; also, students must make a decision in the middle of the semester, about their assessment mode. The approach followed minimizes changes in both systems. An intermediate database was created, as well as additional independent source code, in order to establish the integration of the two systems.

This work allowed us to reduce teachers' administrative work, by automating several processes. We consider that this was a fundamental step to the success of the new pedagogical model.

1. Introduction

This paper reports on the integration of the academic portal (AP) with the Moodle VLE (Virtual Learning Environment) in Universidade Aberta (UAb). Subsequent improvements and faced difficulties are discussed.

The AP is the system where students are formally enrolled in courses and programs, and where grades are published. This information must be shared with the VLE where students in fact take their online courses. UAb's Pedagogical Model present additional challenges, which must be reflected in both systems: in each course students are grouped into classes; also, students must make a decision in the middle of the semester, about their assessment mode (continuous or final assessment). The approach followed minimizes changes (database and source code) in each of the two systems, which were considered stable. An intermediate database was created, as well

as additional independent source code, in order to establish the integration of the two systems.

This work allowed us to reduce teachers' administrative work, by automating several processes. We consider that this was a fundamental step to the success of the new pedagogical model.

In the rest of this paper, section 2 specifies the requirements of the proposed integration, and in section 3 we describe its implementation. In section 4 we discuss the main difficulties faced and how we overcame them, and in section 5 we end with some conclusions and future work.

2. Requirements

UAb is an open and distance education university, but administrative enrolment processes are similar to those in any other university. Students enroll in several courses the context of a program leading to a degree. An online portal for all administrative tasks (AP), separate from the learning environment, is available to students, where formal enrolment in courses and grade consultation functionality is provided.

In our pedagogical model [1], implemented by the VLE, the student is enrolled in one of several classes within each course. Each class has a separate space in the VLE.

Also according to the pedagogical model, a student needs to select an assessment mode, from two possibilities: continuous or final assessment. In continuous assessment, there are several moments during the semester when she is assessed by submitting a small work (called e-folio) in the VLE, complemented by a written test (called p-folio). In final assessment mode she only needs to make a final written exam. Since students do the written assessments near to their physical locations, we are required to know in advance the assessment mode of each student, so that the correct document (p-folio or exam) is sent.

Figure 1 shows an overview of the global system. Included in the diagram are other aspects such as additional common virtual spaces, where students, teachers, program coordinator team, and staff can communicate and socialize.

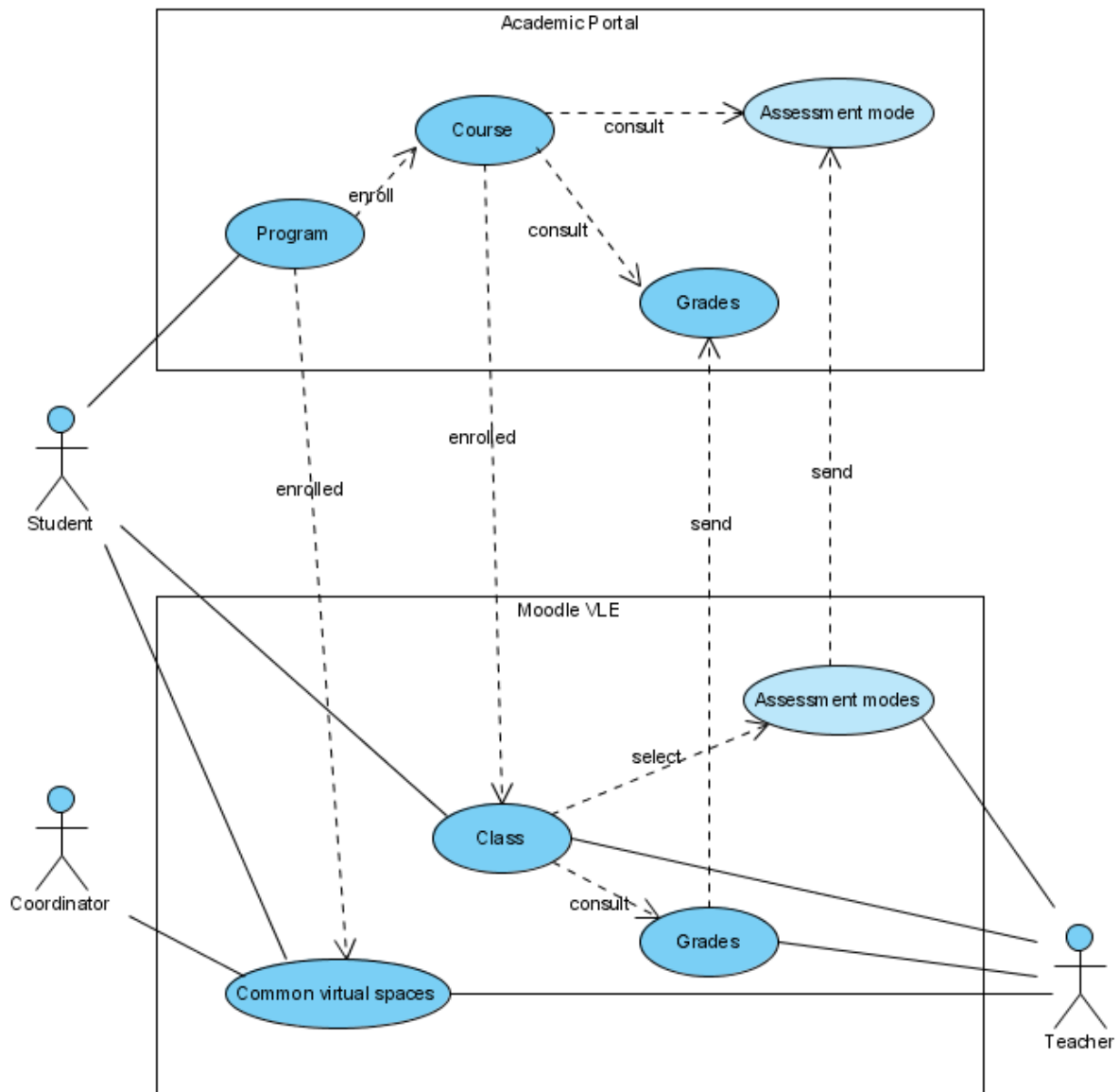


Figure 1 – System Overview

The diagram clarifies the interconnections needed, that are for the most part, like those in any other university, except the information on assessment modes. A requirement is that a student is automatically enrolled in common virtual spaces, and in her classes. As a second requirement, assessment modes and grades must later be sent to the AP. This requirement saves teachers from having to manually calculate the student grades and insert them in the AP, since the VLE automatically combines all the individual assessment pieces into a final grade.

In the first year we implemented the pedagogical model without AP integration. The teacher was responsible for enrolling students in each class, and to send the assessment mode information to the administrative database responsible, who inserted it into the system. In the end of the semester, teachers had to manually calculate and insert grades into the AP. In short, all the information transferred between the AP and the VLE (see Figure 1), was done in a manual basis.

This integration could be achieved by modifying the source code of Moodle, adapting it to our needs, since it is freely available. This is the solution adopted by several other organizations, according to reports posted on Moodle forums (moodle.org). However we

consider that this approach has a major disadvantage: once we change the source code to our specific needs, we are on our own, concerning future updates and bug corrections, contributed by the global community. Moodle users community also serve as a large test community, that increases the software reliability, provided that it has no custom modifications.

So, the first aspect in our approach for the integration is neither to compromise the normal usage of the VLE, nor to complicate upgrades. This means that we must not edit the source code of Moodle.

Since the VLE is a critical application in UAb, we chose to outsource its hosting, in order to have a near perfect uptime and stable page response, even in heavy traffic periods [2]. This leads to the other aspect of our approach, which is the need to establish communication between the two systems over the (insecure) internet, as opposed to internal secure connections.

In the case of the AP the situation is even more critical, since it is a commercial product, and system maintenance and upgrading would be seriously compromised if we changed the code. So we limit to the changes only to the information that could also be edited by the teacher using the user interface, provided by the vendor. This also guarantees that this system will continue working like it used to, and if the integration fails, the teacher can always use the AP directly.

3. Implementation

Due to the reasons stated in the previous section, we propose the system architecture of Figure 2, allowing us to keep both systems intact and working independently.

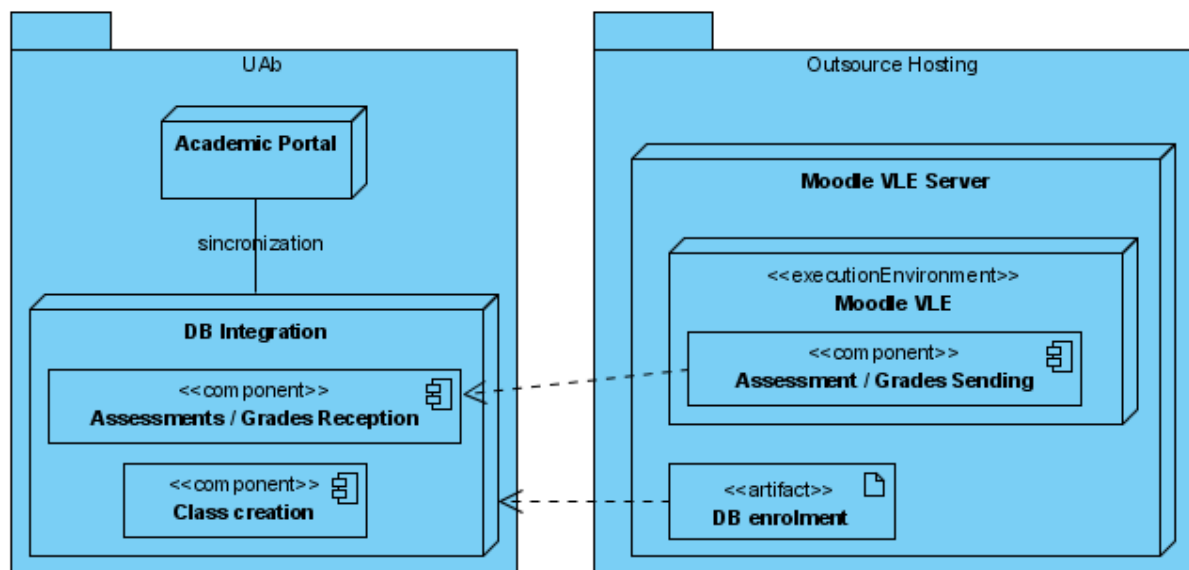


Figure 2 – System Architecture

In our internal network, we set up a new server, the DB Integration, whose information is synchronized with the AP. In the “DB Integration” server, we have two applications, one to create and manage classes for the students in each course, and other to receive and validate assessments and grades sent by the VLE. In the VLE side, we developed a Moodle Block, allowing us to send assessment modes and grades, keeping the core code of Moodle intact, and enabling normal upgrades and bug corrections. The Moodle open source project is prepared for developers to create their own blocks, as

independent software modules. This allow us to access the course contents, including grades, without having to change the community-maintained code.

A database (DB enrolment) was locally created in the VLE server, containing the information in “DB Integration” required to enroll students in classes, through a synchronization process. This replica allows us to use the information from the AP that is required in the VLE without the delay of a connection to the “DB Integration” each time something is needed.

Figure 3 shows a sequence diagram that illustrates the whole integration process, involving the DB Integration server as a intermediate system between the AP and the VLE.

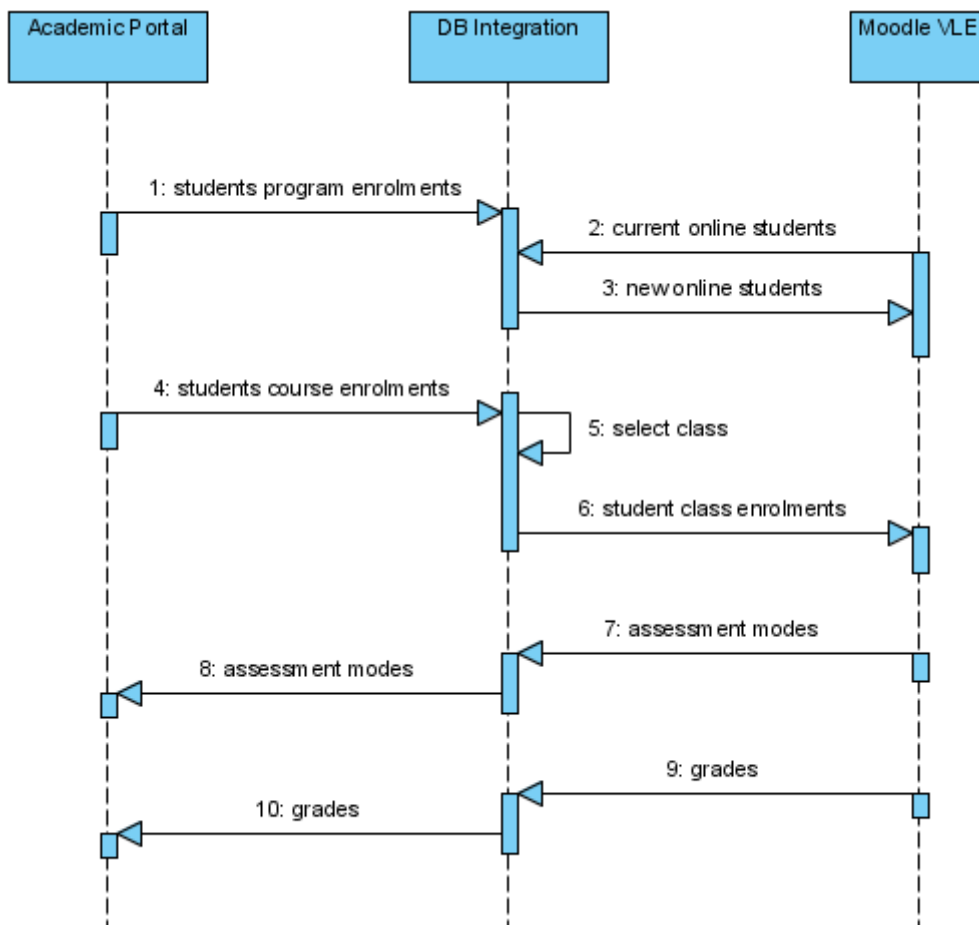


Figure 3 – Sequence Diagram

The first step is to create a VLE account for each student, at the beginning of each year. This corresponds to steps 1 to 3. Information about students in the AP is synchronized with the “DB Integration” (step 1), the list of current online student accounts is obtained from Moodle (step 2), and accounts for new students are created in Moodle (step 3).

To determine the new online students, we need to select those that are not included in the list sent in step 2. An additional process, which is not depicted in the diagram, includes sending emails to the new students, informing them of their VLE credentials.

The file with the new accounts is uploaded in Moodle through the administration interface. In these accounts, additional information fields contain the name of the program, and the student id number. These fields cannot be changed by the student, and are used as non-ambiguous information to identify students, and to guarantee data coherence between systems.

Steps 4 to 6 describe the process to enroll students in a class in the VLE. First, the “DB Integration” is synchronized (step 4) with the student enrolments in courses information in the AP. Through an application in the DB Integration server, students are then grouped into classes (step 5). Finally, student-class information is sent to the DB enrolment artifact, for proper enrolment in the respective online spaces in the VLE (step 6). This artifact is simply a separate database, which we use for enrolling students through a standard feature in Moodle, and thus not requiring any extra programming, as intended. In order for the integration to work, teachers are required to correctly configure their virtual classes with the exact code assigned in step 5. This process is active throughout the semester, meaning that student cancelations are automatically reflected in the VLE, as desired.

Assessment modes and grades, step 7 and 9, are sent using the Assessments grades sending Moodle Block. The block is the same for both steps, since they occur at different times in the semester. The assessment mode information is collected from a choice activity in Moodle, and grades are obtained from the learning card [3]. The data is sent via web, with proper security, and validation information, to an application “assessments / grades reception” that validates the received information, and stores it, in order to be synchronized to the AP in steps 8 and 10. Security and validation mechanisms implemented in the communication, prevent external entities from sending false information.

4. Faced Difficulties

Since the university was in a transition phase from the previous “pen-and-paper” model, during which students and programs had courses in both models, some difficulties arose.

Some of the processes described in this paper did not run as smoothly as we would like.

One of the problems was the timing for institutional student enrolments in courses. In the previous model, since students were only assessed by a final exam at the end of the semester, this was not critical. But in the new model, students need to be enrolled at the beginning of the semester. Unfortunately, the inertia from the previous model prevailed, resulting that some students were enrolled later and others left in the middle of the semester (in some cases, temporarily, due to irregular administrative situations). Late enrolment forced us to repeat steps 1 to 6 of Figure 3, and delay step 7 as much as we could without compromising the course plan. Classes had to be revised every time changes in the enrollment database occurred, taking a lot of unforeseen time to program coordinators. Because of this, an administrative service was created for this task in the second semester. Even after step 7 was performed, new enrollments occurred - in those cases, students couldn't be integrated into the virtual class, and the possible solution was to assign them a limited role (similar to visitors). For those cases steps 1 to 3 needed to be repeated, and teachers had to enroll those students manually.

Temporary unenrolment was less damaging, since Moodle stores information submitted by users, even if they are unenrolled. Once they re-enrolled, that information became available again. However, this caused some confusion in teachers and students.

Another problem was the fact that many students didn't provide a valid active e-mail address in the AC, since it was not a requirement when students first registered in the

University. Since access notifications were sent by e-mail, many students could not be reached, due to valid inactive e-mails. Other cases (invalid or inexistent e-mails) were mostly solved by using other means of contact (phone or postal mail), despite the amount of work involved. Clearly, an e-mail validation mechanism (and student responsibility to keep the e-mail address updated) on the first contact with the University is necessary, in order to guarantee access to the online systems (AP and VLE).

No serious problems occurred in step 7 in the first semester, because there was no hurry to import the information to the AP (step 8), and all submissions could be carefully monitored. After the confirmation that all classes in the VLE had sent the information, the data was imported to the AP and used to send the correct document (p-folio or exam) to the various places. The same did not happen in steps 9 and 10 (sending the grades), since a synchronization script for importing the grades to the AP is required to run permanently. Since we weren't able to properly test the whole system, problems had to be solved in production time. Also, network and server problems occurred, leading to us upgrade the back office infra-structure. We expect considerably less problems in the next semester.

5. Conclusions

Despite all the problems reported above, the integration described in this paper was a necessary step in the virtualization of teaching and learning processes in UAb. We considered that this step was successful, since all problems were quickly solved and the whole solution became more robust and endurable. This work allowed us to reduce teachers' administrative work, since student enrollment in classes is now automatic, assessment modes are sent through two mouse clicks, and grades inserted in the VLE are easily reflected in the AP. The automatization of these processes also reduces errors and the amount of users' complaints.

There is still work to be done, namely steps 2 and 3 of Figure 3 need to be optimized, and e-mail validation when the student registers in the University, in order to minimize administrative work in the following semesters. We will also consider, in the future, the use of directory (LDAP) and single sign-on mechanisms in order to centralize user and access information.

In the medium term, we plan to update the approach used in this integration to a service-oriented architecture (SOA) philosophy, which will enable us to more easily maintain the interfaces between different systems, while adding other systems to the overall environment.

6. References

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