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ILIAS Implementation of a Graduate Program on Information Technologies*

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Abstract

We describe our experience using ILIAS to implement one of the graduate programs offered by the Universidade de Vigo, Spain. This program is available only online. However, insofar organizational aspects and academic recognition is concerned, it fulfills the same requirements as other graduate programs in our University. Indeed, from the Universidade de Vigo's point of view, there are no relevant differences with other classical graduate programs offered. Our experience has shown that, if migration from the traditional model to an e-learning approach is adequately performed, online education at graduate level is acceptable both for students and academic institutions.

1 Introduction

Along the last years we have witnessed the success of the World Wide Web as a medium to deliver educational material. The Web supports the virtual university concept overcoming physical and temporal restrictions. Since the WWW combines advantages of distance education and capabilities of Computer Based Training (simulation, hypermedia material, etc.), it is a suitable platform where the learning process can be carried out successfully[BRFIBB02, ARLNFI01].

From the earlier Web-based educational systems to the present state of the art there has been an important evolution in a very short period of

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time. This evolution has taken advantage of improvements in the Web-based technology made available along the last years.

This paper presents the experience using ILIAS in one of the graduate programs offered by the Universidade de Vigo, Spain. This program stems from the collaboration of two departments at the Universidade de Vigo, Communication and Signal Processing and Telematics Engineering, and has been deployed according to two basic principles: it should be fully compatible with traditional graduate programs in our university, and it should be available through e-learning.

The first principle means that students enrolled in our program will have access to the same degrees and diplomas as the rest of the graduate students in our university, and the same procedures and policies will be applicable to them concerning admission, enrollment, rights and duties. The second one implies that courses and other related educational activities will occur online, with the help of appropriate facilities, resources and software tools.

The next section briefly describes the target of our experience, i.e. the graduate program *Tecnologías de la información (no presencial)* (Information Technologies, online), including some relevant organizational aspects, and the motivation behind it. Section 3 discusses the ILIAS implementation of the graduate program and how this tool has been adapted to our model. Next, we propose some features that we feel would be useful for ILIAS to include in future versions. Finally, in section 6 we present a brief summary of the paper and some conclusions.

2 Information Technologies Online

The basic objective of our graduate program is to provide advanced learning opportunities to research candidates and professionals in the field of Information and Communication Technologies (ICT). Besides, the e-learning approach facilitates an access to graduate studies to candidates that, due to their location or schedule limitations, cannot access the traditional graduate programs offered by our university. Students enrolled in this program belong to at least one of these two groups:

- Professionals or academics located outside Southern Galicia, Spain (i.e. the area of influence of our university). We have students from Northern Portugal, Latin America, Madrid, etc. In fact, due to financial and cultural aspects, in some young technical universities in Latin America this program is being considered by entry-level lecturing staff as the preferred graduate program to access to the required qualifications (i.e. a PhD) to apply for the equivalent of a tenure track in their home institutions.
- Professionals working at companies with demanding schedules, which

now have the chance to access to a graduate degree to improve their professional expectations.

Candidates must have a master-level degree (e.g. a four-year program) in Telecommunications, Industrial Engineering, Computer Science, Networking or other related engineering studies. Basically, admission possibilities depend on the adequacy of previous education, candidate's academic record, previous research activities and professional experience.

Candidates wishing to access to any of the Universidade de Vigo's graduate programs apply to the corresponding departments during early September. For this, they submit their applications and a copy of the curriculum vitae to the department's secretary. Applications are studied by a commission, which notifies the selected candidates that they have been admitted. Once the admission process is closed, admitted students are assigned an advisor and enroll in the courses selected among the possibilities offered by the program.

Note that admission, enrollment and all basic academic activities related to the graduate programs are common for all programs offered by our university. In other words, insofar our university is concerned, our *virtual* graduate program is just another program.

Academic activities evolve across three phases. For the first year, students have to take a minimum of 20 credits in graduate courses, where each credit corresponds to 10 hours of effective work. As courses are usually 3-credit, students must take a minimum of 7 different courses among an offer of 18 courses. During the second year, students must complete a minimum of 12 credits in guided research projects. After this initial period of two years, students prepare their PhD dissertation, which typically lasts between one and five additional years.

Besides the PhD degree, students completing the first year get a certificate stating the courses completed and their performance, and students completing both years of studies get an additional advanced studies diploma.

Student assessment is performed by the lecturers responsible of each course (first year), lecturers responsible of each research project (second year), a committee composed of three professors, at least one of them a full professor (overall assessment of the first two years of studies), which grants the advanced studies diploma after a positive evaluation, and a committee of five professors, at least three of them from other universities, to evaluate the PhD dissertation.

The teaching staff of this graduate program is presently composed by 24 professors in both participating departments.

Table 1: ILIAS software versions

| Package | Version Used | Version Recommended |
|----------------|-------------------|---------------------|
| Linux | 2.4.12 (oberon) | – |
| ILIAS | 2.1.0_beta | – |
| Apache | 1.3.22-2 | 1.3.24 |
| MySQL | 3.23.43-4 | 3.23.46 |
| PHP | 4.0.100-1 | 4.0.6 |
| Zlib | 1.1.3-16 | 1.1.3 |
| FreeType | 1.4pre.20010424-1 | 1.3.1 |
| ImageMagik | 5.3.9-1 | 4.29 |
| Info-ZIP Zip | 2.3 | 2.3 |
| Info-ZIP Unzip | 5.42 | 5.42 |

3 ILIAS Implementation

ILIAS has been the tool selected to support the learning activities along the first two-year period. However, some modifications have been included to support the whole process from the beginning, that is, to include support for online application for admittance to the program. Along the next paragraphs we describe how the activities outlined in Sect. 2 have been mapped into ILIAS, including a brief discussion about the problems encountered, but first we offer some technical details on our implementation.

3.1 Technical details

Our initial work with ILIAS started in June 2001 with version 2.0.2_beta. Presently (as of June 2002) we are using version 2.1.0_beta with a modified version of the Spanish localization developed by us. The version of ILIAS used also includes a modified registration service, as discussed in Sect. 3.2 below. Online notification to the ILIAS site to obtain a NIC was not possible due to the firewall architecture in our institution. E-mail notification was initiated, but a NIC has not been received so far.

The versions of the accompanying software packages are summarized in table 1.

With respect to the hardware architecture, our ILIAS system is hosted by a dual Pentium III@866 MHz Linux system with 512MB RAM and a 9GB on-board SCSI hard disk, connected to the university network infrastructure through a switched 100 Mbps Ethernet connection. This hardware system hosts the ILIAS course server, the program WWW site¹, and an e-mail

¹<http://www.elearning.uvigo.es>

domain ².

3.2 Management of Online Student Applications

Although ILIAS supports self-registration, where candidate ILIAS users submit a form to be granted an ILIAS account, the process was not applicable as is in our case. As described in Sect. 2, students submit an application to be studied by the department, which admits the most suitable candidates depending on their curricula.

For this, the initial ILIAS registration form has been redesigned to include all the information required by the university to all candidates, independently of the program. For example, students should provide academic details (diplomas, other universities, etc.), and should be able to upload a curriculum vitae to be studied by the department.

The new registration form is accessed from the ILIAS log-on page through an hyperlink available in that page. When selecting this link, the registration form is presented to be filled in and submitted by the candidate.

Once the form is submitted, an application record is created, which can be accessed by the ILIAS administrators from the administration pages. After applications have been studied by the department, selected candidates are registered as ILIAS students by an ILIAS administrator, and are notified by an (ILIAS-generated) e-mail confirming this fact.

The application process can be opened and closed by the ILIAS administrators using a new entry in the administration menu. When opening an application process, the administrator defines the text of the link that provides access to the registration form.

3.3 First Year of Studies. The Courses Year

For each course in the graduate program, in-charge professors create and become owners and/or administrators of an ILIAS group that will serve as the supporting environment for all educational activities related to the course: course forum; virtual store for documents, assignments, and student contributions; and online courses (cf. Fig. 1)

Almost all professors involved would have desired to have a single group to which both professors and students belong³. However, due to the ILIAS rights management model, where rights are defined in a per-group basis, this was found not to be a convenient approach. For example, assignments, ILIAS online courses, documents, etc. can be modified by all members of the group, or by none of them, depending on the actual group rights for the

²@elearning.uvigo.es

³Note that in a graduate program relations among participants are usually closer than in an undergraduate program. Education through creation of knowledge is seen as the result of a process to which both students and professors contribute, mostly at the same level.

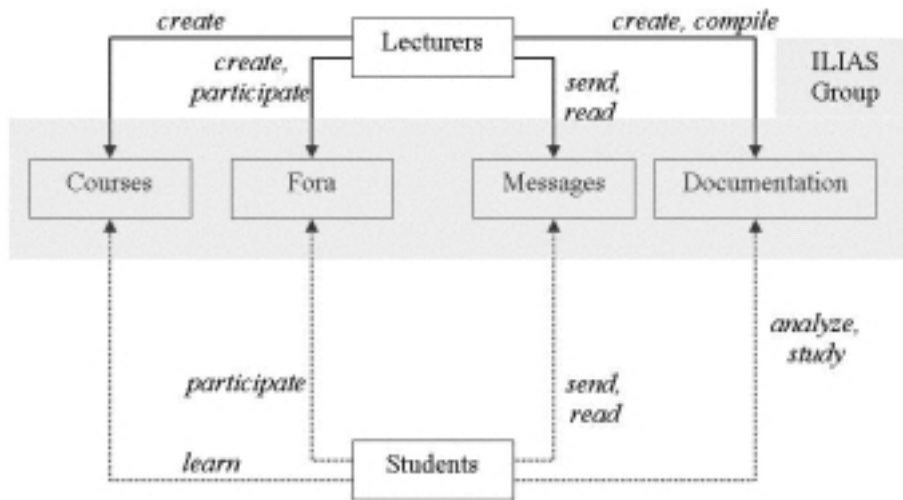


Figure 1: Activities around ILIAS groups

target objects. In this line, the possibility of having different object *access* rights for administrators/owners and users within a group would have been a desired feature.

The final approach was to define two groups for each course. One of them for the course responsables, and the other for all participants in the course. The course responsables produce objects for the course community keeping full access rights within their restricted group, and grant the desired access rights to the common course group.

The most used ILIAS features are discussion fora and file uploading. In most cases, course documentation was already available in electronic form. This documentation was submitted to the students as uploaded files, which will then perform the tasks required by the lecturers (comments on papers, short assignments, comments on other students' work, case studies, etc.) and submit their contributions to the common virtual store. To sum up, in general, contents were delivered as personal information packages, and not as ILIAS online courses created using the ILIAS authoring tool.

For each course in the program at least one discussion forum was also created. This forum is used to communicate relevant milestones and deadlines, and to discuss course related information and activities.

Assessment is performed taking into account documents produced by students, including comments on other students' contributions, and postings to the discussion forum. Personal interviews through e-mail or phone are also used if needed, for instance if doubts arise with respect to the actual authorship of some contributions. Besides, lecturers require frequent feed-

back from students to construct a profile characterising the student. In this way, the chance of other people being involved in a given student's activities are minimized.

3.4 Second Year of Studies. The Projects Year

For the project year, each professor is in charge of at most two students. Most of the work is performed by the student under the guidance of the professor. Typically, the professor provides the initial references and documentation, and all further contributions are produced by the students. From an initial survey, it seems that in most cases the preferred feature will be ILIAS mail system. Additionally, a dedicated ILIAS group to serve as a reference to all project-related activities is also a popular approach. However, as discussed above, per-user access rights management within groups would have also permitted the definition of a general project group, which was also proposed by many participants.

With respect to assessment, projects are graded taking in mind the fulfillment of the initial objectives, the quality of the results achieved with respect to other students, and the publication of results or their presentation in relevant conferences. The final grade will depend on the originality, relevance, and impact of the achieved results. A close relationship between lecturers and their students minimizes the chances of impersonation.

3.5 Problems encountered

Once students have been accepted in the graduate program, they select the courses that they wish to take, and they proceed to pay the corresponding registration fee. In our case, here is where the real world appears. Administrative and financial procedures in a public university have been defined prior to e-learning, and in most cases are not able to cope with the rapid evolution of learning technologies. Traditional graduate programs in our university required two visits to the graduate administrative offices for registration and payment. Besides, the forms needed were not available online.

After a tough negotiation with the academic authorities, we defined an interim procedure, that will eventually evolve to a fully e-payment solution in the near future: we provide all needed registration forms online, and students will be officially registered upon reception of the corresponding bank transfer and a faxed copy of the registration forms. The next step will be an integrated payment solution, based in the ILIAS e-payment module, adapted to the specifics of our case.

Committee-based assessment is another open problem. Probably, PhD Dissertations will keep its traditional flavor and will not be performed online. Apart from cultural reasons, this event occurs in most cases once in a lifetime, and not finding an e-learning approach for this does not seem

to pose a major problem. With respect to the advanced studies diploma, which is also granted by a committee after the first two years of study, the planned solution will be based on videoconference.

4 Proposals for ILIAS

In this section we discuss some aspects that, in our opinion, could be considered to improve future versions of ILIAS. Besides, we tried to identify the most promising initiatives in each case, taking into account their relevance and the chances of being generally accepted, for example as e-learning standards.

4.1 Content Packaging

The need for educational resource sharing among learning systems and authoring tools motivated the development of content packaging formats and procedures. In this way, the definition of a single entity (e.g. a file) where all ILIAS educational content is encapsulated, together with structure information and related metadata, will enable course transfer among different systems.

Furthermore, content packaging formats should be neutral with respect to the type of resources being packed, that is, they should permit the encapsulation of separate resources, a part of a course that can stand by itself outside of the context of a course, an entire course, or even collections of courses.

Presently, the IMS consortium has published the most advanced proposal in this field. IEEE's LTSC has also configured a working group devoted to this, the Content Packaging Working Group. Their first results are expected in the near future. The Content Packaging specification [AM01a, AM01b, AM01c] from the IMS consortium defines an information model based on a set of data structures to provide content interoperability in an Internet environment.

The key element in this model is the *package*. Packages can be interpreted as logical directories containing a manifest file, all format control documents for the manifest, and a set of subdirectories containing to be packed files. When this directory is put together into a single file (e.g. .zip, .jar or .cab compressed files), the resulting archive is named *Package Interchange File*.

The extensive use of metadata in ILIAS to define learning object properties and organization will definitely simplify the implementation of content packaging solutions.

4.2 Student Assessment

Student evaluation and grading is also being addressed by major e-learning standardization institutions. Although ILIAS supports an effective self-assessment system through multiple choice questionnaires, a more elaborated system could provide assessment tools able to compete with evaluation procedures in traditional learning.

Some recommendations about testing and grading are already available. They define taxonomies and vocabularies to be used to define tests. The corresponding data models define aspects ranging from question formatting to evaluation and assessment criteria.

The most advanced proposal concerning student assessment is that of the IMS consortium, the Question & Test Interoperability (Q&TI) specification. The primary objective of this specification is to allow systems, specifically Internet-based systems, to exchange questions (formally termed *Items*) and tests (formally termed *Assessments*). The specification consists of four documents:

- The Information Model [SS02b], which provides the conceptual definition of the core data structures and sets out the theoretical framework for Q&TI using UML.
- The XML Binding [SS02c], which describes the implementation of the information model in XML.
- The Best Practice & Implementation Guide [SS02a], which provides assistance to tool developers implementing the Q&TI specification.
- And the QTILite Specification [SS02d], which describes the simplest form of Q&TI, comprising solely a subset of the full QTI specification features and functionality.

4.3 Course Structure and Authoring

One of the consequences of the lack of standardization and diversity in computer-based learning systems is the lack of compatibility among platforms, that is, courses developed for one system cannot be easily integrated into similar systems from other vendors.

To make things worst, content development is, by far, the most resource consuming task in computer-based education. Even when representation frameworks are common (e.g. HTML), content adaptation is typically done by hand to fit those contents into the specific logic of the new platform because, in most cases, content organization and delivery is closely bound to the underlying logic. This is clearly the case for ILIAS.

To overcome this situation, several proposals have been done along the last years to simplify content sharing. Additionally, generally accepted

standards on content structures will permit the apparition of platform-independent authoring tools, with the corresponding benefits both for content providers and consumers.

Generally speaking, to transfer a course from one system to another we have to move all elements of the course (course pages, test pages, multimedia objects, etc.), together with their related metadata. On the other side, we have to re-create the corresponding course structure in the new supporting platform.

Typically, we relate the concept of course structure to a hierarchic, static organization of course elements. Although this is the case of ILIAS, some already available e-learning environments have advanced features that make course structures to adapt to student interactions. For example, some systems support the definition of prerequisites to access specific course contents. In this case, the course structure will change dynamically to reflect student activities.

Thus, specifications on course structures and formats should support the definition of the dynamic behavior of the former, as designed by the course creator.

The most outstanding proposals concerning content structures have been defined by the AICC and DoD's ADL initiative. The format proposed by the IMS, which is included in its Content Packaging specification [AM01a, AM01b, AM01c] is also a reference. In spite of its simplicity, this format is a convenient alternative for systems that lack adequate features to handle complex dynamic structures.

Note that these standards only recommend formats to enable course sharing among platforms. In other words, conformance to the standard only means that the corresponding platform has a utility to convert the platform's internal structure to that of the standard and vice versa. This approach could be easily integrated into ILIAS.

However, course structure standards do not solve completely the problem of content sharing. Other aspects, as discussed above, like content packaging or serialization, should also be addressed. For example, a model to dump a course in storage media or to send it through the networks should also be agreed upon.

5 Student Management

As their traditional counterparts, ILIAS handles information about their students. However, apart from personal information (e.g. address, phone number), additional information is available to characterize the student. For example, an e-learning system may handle information about preferences (e.g. operating system, network connection, desktop configuration), or academic history (e.g. courses completed, grades).

The main institutions involved in e-learning standardization have devoted part of their efforts to the definition of student data models. These models will provide a framework to define student characteristics in a structured way. As for content or course structure specification, student data models will also facilitate the sharing of student information among different platforms from different institutions.

Besides to the above mentioned student model, educational systems manage other structures that also include student information. Typically, the educational process is organized around student groups, a given schedule, etc. In other words, student information available defines individual student properties, but also states the relations among students and with other agents.

As in other applications where personal data is managed, security and privacy issues arise. Besides, student information should be provided according to different views, depending on the people accessing that information: students themselves, professors, management, family, other colleagues, general public, etc.

Probably the most elaborated proposal in this field is the LTSC's Public and Private Information (PAPI) specification [Far00]. IMS Profile[STR01b, STR01a, STR01c] and IMS Enterprise[CV02, VC02, CVA02] are also relevant references.

6 Concluding Remarks

We have described our experience moving a standard graduate program to an e-learning environment using ILIAS. The new program keeps its identity as a Universidade de Vigo's graduate program. However, all education-related activities occur online. Table 2 summarizes how the main aspects of this program, both at administrative and at educational levels, are mapped into a virtual learning environment.

In our case, the number of students continuing their studies at the graduate level is traditionally low. In our professional environment, the PhD degree lacks the recognition it deserves, and students with a degree in telecommunication engineering decide, in most cases, to start their careers in industry once they have obtained this degree. Besides, graduate courses usually are too research oriented, and therefore they are only attractive to people pursuing a career in university or related research institutions.

The online conception of our graduate program facilitates the access to graduate studies to people working in industry, because they can make compatible their studies with their professional careers. Besides, we can accept people beyond the area of influence of our university, as distance limitations are no longer a problem. This motivated us to develop a master program, based in the same principles, along the next years. Conversations

Table 2: Standard vs. online graduate programs

| Traditional program | Online program |
|---|--|
| Application using paper forms and CV | Online application using ILIAS had-hoc form and file upload |
| Acceptance confirmation letter and list of accepted students | Acceptance confirmation e-mail and list published at WWW site |
| Registration using paper forms | Registration form to download, fill in and send via fax |
| 2-way payment procedure with paper invoice and bank receipt | 1-way payment procedure through bank transfer |
| Traditional courses in lecture rooms | Online ILIAS courses and file sharing |
| Tutoring and mentoring at university facilities | Online tutoring through ILIAS mail and fora |
| Bibliography provided by lecturers and library facilities at the University | Bibliography provided through the ILIAS bibliography repository and ILIAS group-managed virtual object store |

are being held with the University of New Mexico, USA, to promote this planned master program into a joint, e-learning based master program.

Additionally, we tried to define the courses offered taking into account the new profile of our students, making them interesting and useful to professionals in our field.

The first results of this experience are positive. Although we have encountered some problems, mainly related to administrative procedures, results were indeed beyond our expectations from the educational point of view. In our opinion, the reasons for these are related to the reduced number of students⁴ and their profile, the motivation of all participants, and the kind of education offered.

ILIAS has been chosen as the supporting tool for these experience. Although other options were available, both commercial and open source, ILIAS is robust, was easy to install and maintain, does not require too much training to use it adequately, and provided the basic features needed in our specific case. As discussed above, the only relevant modification introduced was the new registration service needed to translate the initial application process into the virtual world, according to the rules established by our university. Additionally, in this paper we suggested some improvements to

⁴We had 14 students for the first year. However, this number is well above average taking into account all graduate programs in our university.

ILIAS that would meet our future needs.

References

- [AM01a] T. Anderson and M. McKell. IMS Content Packaging Best Practices and Implementation Guide. Version 1.1.2. Technical report, IMS Global Learning Consortium, Inc., August 2001. <http://www.imsproject.org/content/>.
- [AM01b] T. Anderson and M. McKell. IMS Content Packaging Information Model. Version 1.1.2. Technical report, IMS Global Learning Consortium, Inc., August 2001. <http://www.imsproject.org/content/>.
- [AM01c] T. Anderson and M. McKell. IMS Content Packaging XML Binding Specification. Version 1.1.2. Technical report, IMS Global Learning Consortium, Inc., August 2001. <http://www.imsproject.org/content/>.
- [ARLNFI01] L. Anido-Rifón, M. Llamas-Nistal, and Manuel J. Fernández-Iglesias. Internet-based learning by doing. *IEEE Transactions on Education*, 44(2):193+CD-ROM, 2001.
- [BRFIBB02] J.C. Burguillo-Rial, Manuel J. Fernández-Iglesias, F. Buendía, and J. V. Benlloch. Experiences with internet-based distance education. *World Transactions on Engineering and Technology Education*, pages 81–84, 2002.
- [CV02] G. Collier and W. Veres. IMS Enterprise Information Model. Version 1.1. Technical report, IMS Global Learning Consortium, Inc, April 2002. <http://www.imsproject.org/enterprise/>.
- [CVA02] G. Collier, W. Veres, and T. Anderson. IMS Enterprise Best Practices and Implementation Guide. Version 1.1. Technical report, IMS Global Learning Consortium, Inc, April 2002. <http://www.imsproject.org/enterprise/>.
- [Far00] F. Farance. Draft Standard for Learning Technology. Public and Private Information (PAPI) for Learners (PAPI Learner). Version 7.0. Technical report, Institute of Electrical and Electronics Engineers, Inc., June 2000. http://ltsc.ieee.org/wg2/papi_learner_06.doc.
- [SS02a] C. Smythe and E. Shepherd. IMS Question & Test Interoperability: ASI Best Practice & Implementation Guide. Version 1.2. Technical report, IMS Global Learning Consortium, Inc, February 2002. <http://www.imsproject.org/question/>.

- [SS02b] C. Smythe and E. Shepherd. IMS Question & Test Interoperability: ASI Information Model Specification. Version 1.2. Technical report, IMS Global Learning Consortium, Inc, February 2002. <http://www.imsproject.org/question/>.
- [SS02c] C. Smythe and E. Shepherd. IMS Question & Test Interoperability: ASI XML Binding Specification. Version 1.2. Technical report, IMS Global Learning Consortium, Inc, February 2002. <http://www.imsproject.org/question/>.
- [SS02d] C. Smythe and E. Shepherd. IMS Question & Test Interoperability QTILite Specification. Version 1.2. Technical report, IMS Global Learning Consortium, Inc, February 2002. <http://www.imsproject.org/question/>.
- [STR01a] C. Smythe, F. Tansey, and R. Robson. IMS Learner Information Package Best Practice & Implementation Guide . Version 1.0. Technical report, IMS Global Learning Consortium, Inc, March 2001. <http://www.imsproject.org/profiles/>.
- [STR01b] C. Smythe, F. Tansey, and R. Robson. IMS Learner Information Package Information Model Specification. Version 1.0. Technical report, IMS Global Learning Consortium, Inc, March 2001. <http://www.imsproject.org/profiles/>.
- [STR01c] C. Smythe, F. Tansey, and R. Robson. IMS Learner Information Packaging XML Binding. Version 1.0. Technical report, IMS Global Learning Consortium, Inc, March 2001. <http://www.imsproject.org/profiles/>.
- [VC02] W. Veres and G. Collier. IMS Enterprise XML Binding Specification. Version 1.1. Technical report, IMS Global Learning Consortium, Inc, April 2002. <http://www.imsproject.org/enterprise/>.