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ASPECT

Best Practice Report for Content Use V2.0

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e*Content*plus

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[1] OJ L 79, 24.3.2005, p. 1.

Summary

Im ASPECT, WP3 aims to foster the adoption of standards and specifications for educational content use. The approach is to:

- Bring all content partners up to speed on a range of standards and specifications;
- Propose a methodology for how these standards and specs can be applied to resources being made by ASPECT partners;
- Provide technical support;
- Train staff; and
- Investigate the strength and weakness of different standards based solutions.

WP3 integrates the work of WP2 about metadata, search and discovery. In WP5, the technical work done by content providers, is supported by WP3 with tools and information. To support these content providers, a demonstrator website was added to the ASPECT Project website with scenarios, tools, links and useful advices. Videos of SCORM and Common Cartridge are also available on the website. They provide an introduction to content packaging to content providers.

This deliverable provides an update on Deliverable 3.1 “Best practice report for content use”, (February 2009) that included an introduction to content specifications and standards and outlined WP3 and WP5 joint working. In section 1 of this deliverable, we first provide an update on Common Cartridge and SCORM together with a summary of the progress made on the approach to LRE access controls.

Section 2 shows how content providers have started to work with content packing standards over the last year and how they have gained important new experience as a result of using SCORM and Common Cartridge. This section also reports on why some content partners do not feel that either SCORM or Common Cartridge is relevant for their content strategy.

Section 3 reports on how WP3 and WP5 partners have worked together to produce a small content ‘showcase’ containing both SCORM packages and Common Cartridges in order to demonstrate the added value that can be achieved by using the specific features provided by those specifications.

Section 4 provides an overview of Microsoft’s new Semblio authoring tool. The tools is a user-friendly tool to create Common Cartridges.

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1 Specifications and standards

This section updates the information on SCORM, Common Cartridge and the DRM/LRE that was contained in D3.1.

1.1 *ADL & SCORM*

There has not been a great deal of official news from ADL but there are signs that ADL is beginning to step up its activities. In particular, significant changes now happening at ADL in response to State Department funding that is in the process of being released to support a new group of activities.

It's also important to note that Paul Jesukiewicz, (former Deputy Director at ADL) has now returned to ADL and assumed the post of Director, taking over from Rob A. Wisher. He has begun the huge task of taking charge and re-shaping the full range of ADL activities and its position as a federally funded programme for the US Dept. of Defense.

In the ADL exhibition booth at I/ITSEC 2009 (November 2009), ADL displayed its programs and achievements, shared plans for the future, and set forward plans to strengthen relationships for future collaborations. In conjunction with the conference, ADL Initiative Director Paul Jesukiewicz also hosted the inaugural Worldwide ADL Directors Meeting. See ADL ITSEC LINK

The most important developments which are emerging in relation to the ASPECT project are summed up in the following ADL statements:

"Acknowledging the real problems facing adopters of SCORM, the ADL Initiative has committed to engage with stakeholders and key community members and to lead the way to a harmonized and enhanced version of SCORM by 4th quarter 2011." (Paul Jesukiewicz, Director, ADL Initiative)

To that end " Advanced Distributed Learning Initiative (ADL) has embarked on a major update to SCORM. Being that SCORM is a profile of a collection of standards, standards development and evolution is critically important to ADL. As part of the new work of SCORM "harmonization" - the alignment with current standards and practices - ADL are interested in a model of how standards can be used in SCORM as well as in the process of developing standards."

Recently a number of events have been attended by ADL staff members and experts which provide further information on what is being called the " ADL: Standards and SCORM: Maturity, Adoption, Process" (see the following hyperlinks for further details).

- CETIS event: http://wiki.cetis.ac.uk/Future_of_Interoperability_Standards_Meeting_2010
- ADL position paper for CETIS event: http://wiki.cetis.ac.uk/images/6/61/Adl.pdf
- Budapest presentation: http://www.adlnet.gov/Technologies/scorm/SCORMSDocuments/Conference%20Presentations/seam-20091104-v2.pdf

Critical observations which emerge from these presentations and papers are as follows :

ADL : "While we recognised the need for de jure standards describing interoperability of components, and encourage their development, our model measures only the existence of a normative process and normative wording." Accordingly, ADL have stated: "A significant challenge that our community faces is understanding and trusting the provenance of those normative statements and their associated IP rights. We need to understand the legal authority of the authors or standards developers to assert their rights, their licenses and provenance, and to have a commensurate trust in their processes. We < ADL> likewise need to understand how we can use, adopt and develop derivative works that use either one standard or that build upon multiple standards with different IP rights.

To move forward in updating SCORM, individual components and standards need to be identified, potentially revised or updated, and their maturity measured. This work on individual components and standards fits within a broader "harmonization" framework. ADL's revised process for developing the next release of SCORM includes:

- A schedule-driven release and update cycle advertised well in advance to allow vendors and developers to plan, e.g., first full release in 4thQ 2011. Capabilities are initially determined by maturity. Capabilities or updates may be dropped to meet the schedule. Full, regular ongoing disclosure of work progress, e.g., weekly, including summary status reporting from contributing organizations on standardization work.
- Public documentation of ADL's decisions combined with open meetings.
- Ex-ante IP disclosure and use of "open" licenses wherever feasible.
- Full support at release. In addition to the published underlying standards, release of supporting materials including descriptive documents, sample content and software, conformance, training, etc."

Conclusion:

It is worthwhile reading the CETIS white paper to get a grasp of the "maturity based model" ADL intend to use, to once again make progress. (see link above). The Interesting question is to ask " What actually will be the outcome with ADL once again moving to the forefront of Learning technology standards".

So, our report notes that "scenery shifting" is taking place; things are moving but not a great deal has actually happened publicly. We expect this will change over the next six months and the scene is now set to have some significant public releases from ADL on the harmonization front.

1.2 *Common Cartridge*

In this Section we report recent developments that happened around the Common Cartridge specification outside the ASPECT consortium. Developments within the consortium are reported in Section 3.

The ongoing development which is most important for the further take-up of the specification is the development and improvement of tools. Appendix 9 gives the status of Common Cartridge tool support at mid February 2010.

The Microsoft/Icodeon converter from SCORM to Common Cartridge is the major tool for rapidly producing a wide variety of cartridges. This tool is also used in the ASPECT project as reported at the demonstrator website (http://www.aspect-project.org/node/71#3). Thanks to this tool, a large number of common cartridges have now been created. It is worth noting here that The Open University UK (an ASPECT member) and Elsevier are the first major content providers which have received a Common Cartridge compliance mark.

A remarkable project exists in Austria to implement the electronic delivery of content from a group of content providers to most schools in Austria. These schools are equipped with the Moodle Learning Management System and content is planned to be delivered in the Common Cartridge format. The respective plans on this initiative were reported at SE@M 2009 (http://www.learningstandards.eu/seam2009/) but experience from this project is not available yet.

Already the mere conversion of pre-existing SCORM packages offers the added value to users that they can access parts of the content from any web site through the Icodeon Common Cartridge Framework. Naturally, such converted cartridges cannot fully utilize any of the special features of the Common Cartridge specification, such as assessments and question banks or discussion forums. Additional work is required to enrich converted cartridges with these possibilities. The MIR system, provided by LearnGauge, is the recommended tool for this work. It is freely available after registration. The part of the showcases reports on the current experience with MIR.

A major step forward towards easy editing of Common Cartridges can be expected when Microsoft releases its announced Semblio tool (http://www.microsoft.com/learningspace). This tool will integrate into Microsoft's Office suite and it will be easy to use (see Section 4).

It is worth noting that it is possible to import validated cartridges into the MIR tool and into the Icodeon Common Cartridge Platform without problems. This demonstrates that the Common Cartridge Specification is well suited to achieve interoperability between authoring and rendering tools.

The ASPECT linked BPN project, iCOPER, has evaluated successfully the support for SCORM and Common Cartridge in Learning Design authoring systems and players (iCOPER Deliverable D5.1). This worked best when the Learning Design Player is embedded into an appropriate Learning Management System. The results were presented at the SE@M 2009 Workshop in Budapest organized as an ASPECT dissemination activity.

Besides being interesting from the point of view of interoperability, the iCOPER experience highlights a popular misinterpretation of Common Cartridge which only too often prevents an appropriate use of cartridges. We observe a tendency to consider cartridges as packaged and sealed content, similar to SCORM packages. However the intention of the specification is to support blended learning scenarios where the teacher selects individual items from a cartridge for her students. In order to help teachers, content and tool providers to better understand the specifics of SCORM and Common Cartridge, WP3 has produced a short paper "Common Cartridge is not SCORM" (see Appendix 7.2).

As the Common Cartridge specification targets blended learning, its take-up will depend crucially on the support it gains from the community of Learning Management System providers. Currently (mid February 2010) three Learning Management Systems are marked as Common Cartridge compliant (ATutor, Desire2Learn and Angel Learning).

Both Moodle and Blackboard, two major Learning Management Systems (one open source and one commercial), have announced that they will release versions in the near future versions with Common Cartridge support. Here, Moodle is currently ahead by having released in the fall of 2009 its version 1.9 which provides access to the content of Common Cartridges. However, when tested, Common Cartridge import into Moodle V1.9 was not successful. Moodle has announced though that it will also provide support for authoring and exporting cartridges. The cartridge support in the Moodle system is currently under test in the ASPECT project. Blackboard has announced that it will have made major progress by July 2010.

While tool support for Common Cartridge is increasing, the work on Version 1.1 of the specification has progressed. A major addition shall be the support for the Basic Tools Interoperability specification (Basic LTI). This specification allows a cartridge rendering system to reserve a part of the browser screen and to launch an external tool in this area. Basic LTI is currently under voting at the IMS Technical Advisory Board. The Icodeon Common Cartridge Framework already supports this specification. On the Icodeon site this is demonstrated with a cartridge from Pearson Education which accesses content of an eBook by calling an eBook reader through a Basic LTI interface.

Basic LTI support is just a first step. In later versions, support for full LTI is foreseen which will enable third party systems, running in an LTI frame, to return values to the cartridge player. This would be particularly useful for the integration of advanced assessment systems.

In Common Cartridge 1.0 it is possible to declare that some parts of a cartridge are intended for instructors only. Common Cartridge 1.1 will add another role of “Mentor” for which specific content can be provided. This was particularly requested from the school sector. Support for embedding curriculum standards and lesson plans into cartridges is on the roadmap. In addition to these changes, IMS is considering to register a MIME type particularly for Common Cartridges.

Besides these changes, the Common Cartridge Application Profile Management Group reviewed experiences from existing applications at a meeting in February 2010. It decided to relax the requirements for Common Cartridge Version 1.0 conformance by declaring support for authorization and for the pattern matching question type to be optional. From an end user perspective, this could be problematic, since it no longer can be expected that a conformant Common Cartridge will run on a conformant Common Cartridge player if it uses one of these optional elements. The pattern matching question type was particularly useful as it was intended to tolerate spelling errors in students’ answers.

The Common Cartridge Alliance, through which IMS supports the take-up of this and other specifications, has a forum on cartridge compliance testing and a forum on cartridge use where members of the specification group regularly reply to questions from users. For the Learning Impact Workshop in May 2010, IMS plans a Common Cartridge Interoperability plugfest. The ASPECT project shall participate in this event with a representative set of cartridges that will be tested for interoperability with the tools – editors as well as Learning Management Systems – which shall be present at the event.

1.3 *DRM*

1.3.1 Access Control

The Learning Resource Exchange (LRE) is a pan-European infrastructure for exchanging educational content. When it was officially launched in December 2008, it included 21 participating repositories offering more than 145,000 learning objects (LOs) covering virtually all curriculum subjects. These LOs were all "open", meaning that they can be freely used by anyone, and, in some cases, can also be adapted and redistributed.

As new content providers start to express an interest in using the LRE to distribute commercial content, it will be necessary to allow them to protect these resources. For example, a content provider may want to request payment prior to any use of a LO, make sure that a LO is only used in a non-commercial context, or limit the type of use that is allowed.

This section provides an update of the Access Control[1] (AC) mechanisms which were presented in the deliverable 3.1 – section 4.5. This section also presents the AC binding for metadata, the service security, and the implementation plan.

1.3.2 LRE Distribution Models

Distribution models in the LRE are divided into three main categories: Open educational content, license-based access, and credit-based access. In the open educational content distribution model, content is freely available. However some usage restriction may be applied or even the user may need to login (using his own account or a guest account) to download content. The AC service needs to support several type of licenses and more than one "currency".

1.3.3 Access Control (AC) Metadata

Given the different distribution models, we propose a binding to describe access control information in the metadata (Figure 1). Based on AC metadata, the requestor is able to detect the distribution model of the learning object and know how to get it if the requestor has the right. The first element of AC metadata is the provider identifier who owns the learning object. The second element is optional and is to identify which collection the learning object belongs to. Open educational content which is freely accessible without any restriction does not need AC metadata. In case the provider requires the requestor to login to download the content, then the provider needs to specify the login type in the AC metadata. AC metadata for License-based contents need to state the supported licenses. The requestor is able to know the cost for the content which is available thought the credit-based distribution model.

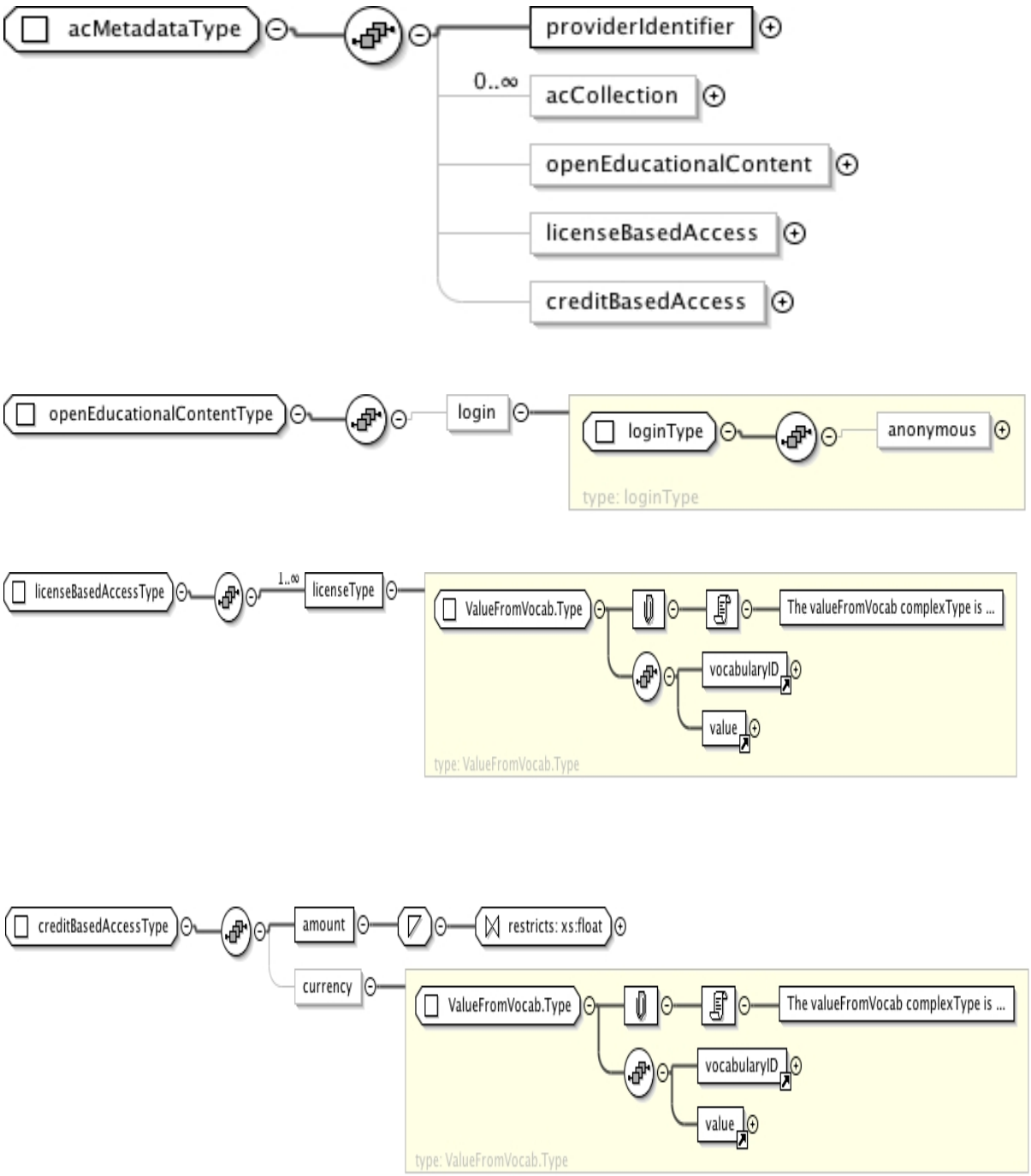

Figure 1: Access Control Binding

In LREv4.0 application profile, the Access Control Metadata (AC Metadata) are attached as separated facets. AC Metadata are located at manifestation level and/or item level. AC Metadata at manifestation level are applied to all the children (items belong to that manifestation). AC Metadata at item level overwrite AC metadata of the item's parent. One remark is that we do not use the rights' element of IEEE LOM for AC metadata. Even though the rights' element of IEEE LOM is good for open educational resources, which are freely available online, it is very difficult to use this section to describe the distribution models, the

costs, or how to get a copy of the LO when several providers offer the same LO in several formats using different distribution models with different prices.

1.3.4 Access Control Protocol

The AC protocol is described in deliverable 3.1 – section 4.5.4. However, there are two main and different points to understand. First, the AC service does not support the open educational content distribution model and Common Cartridge Authorization Service. The requestor can simply get the open educational content directly from providers without sending requests to the AC service and also is able to send the requests directly to the Common Cartridge Authorization Service Endpoint, which is presented in the cartridge. The second key point is that the AC service plays a role of a broker. i.e., in case the provider supports a LRE distribution model but does not implement the "standard" Access Control Web Service, the AC service is still able to send the request to the provider using the provider AC plug-in.

The access protocol relies on a simple request/response exchange, see figure below. First, the consumer requests access to a resource from a publisher by sending a request, expressed as a resource context, to the LO broker [2]. The exact context is determined from the resource metadata obtained during discovery. Next, the LO broker checks the request validity, queries the LRE repository registry to retrieve the service endpoint of the provider, and sends the request to that endpoint, after possible data and protocol translations. Finally, the LO broker receives the result, in a form that is dependent on the actual authorization protocol used, which is then translated into an appropriate handle that is returned to the consumer.

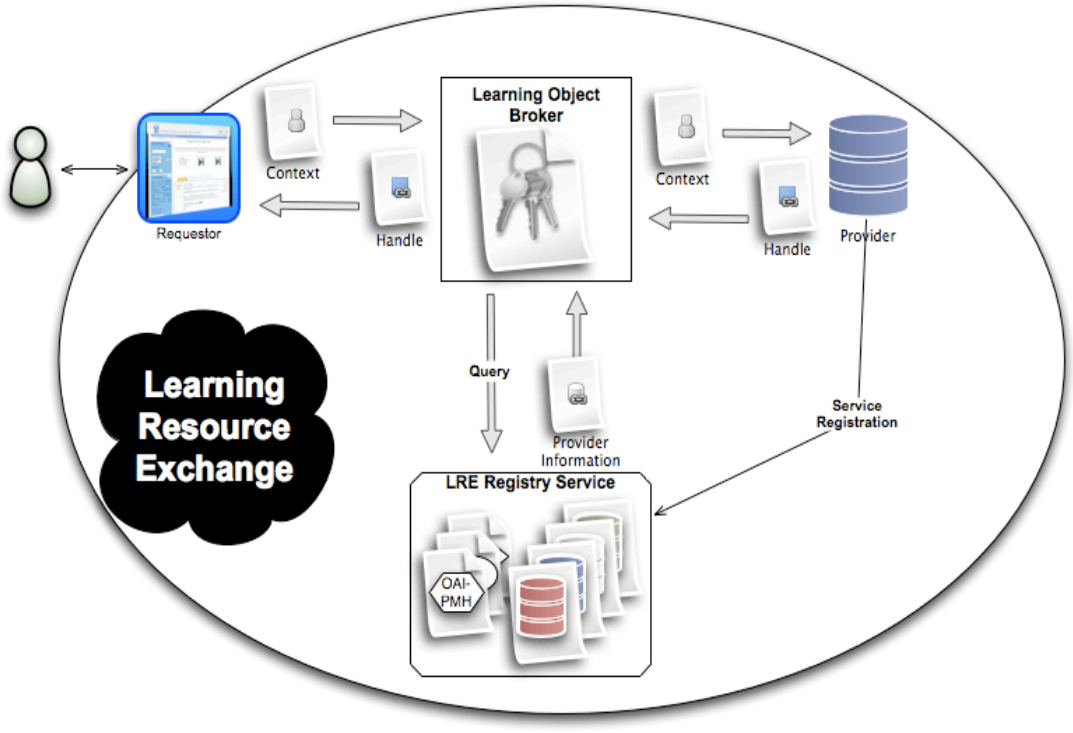

Figure 2: Access Control Protocol

This protection mechanism is able to protect not only web-based resources but also SCORM or Common Cartridge packages. The difference is on the consumer side. For SCORM or Common Cartridge packages, the consumer needs to download the content, integrate it into the player, and remove it after the expiration date.

1.3.5 Access Control Security

The AC service is available as a web service. This service uses WS-Security OASIS standard (http://www.oasis-open.org/specs/index.php#wssv1.0). All AC messages exchanged in the LRE are signed and encrypted.

1.3.6 Access Control Implementation

According to the plan, the first version of the Web Service Definition Language (WSDL) will be available at the beginning of March 2010. The AC service uses SOAP binding and support Web service security. A short demonstration was given in the 4th ASPECT Consortium meeting in Lisbon.

1.3.7 Conclusion

We have presented a solution that meets the needs of federations of learning object repositories such as the LRE in terms of protection of "non-open" content as proposed by commercial content providers. Our AC service is intended to bridge different access authorization systems and provide a unified view on distribution models. One of the main innovative aspects of the proposed solution is that it bridges the gap between different heterogeneous content protection systems.

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[1] The term “Access Control” replaces the term “DRM” due to the fact that the Broker service does not actually manage the content itself but only the access requests to the content.

[2] It is possible that the consumer sends the request directly to the provider but it requires that the consumer and the provider need to have an agreement, especially the security policy.

2 Experiences with Content Use Specifications and Standards

D3.1, the first report on content use, showed the current status of the content providers in the project before creating content packages using standards or specifications. Some partners had problems understanding the differences between SCORM and Common Cartridge. SCORM as a *de facto* standard was already being used by some partners but Common Cartridge, as a new specification, was not really known.

With freely available tools and scenarios, the content providers started to work with their own content. Building content packages was supported by WP3. Information about SCORM and Common Cartridge was provided on the ASPECT demonstrator web site and validation tools helped partners to identify problems in their content packages. A number of Common Cartridges have been created and tested at the ICODEON platform for Common Cartridge.

The following figures show SCORM and Common Cartridge development. Creating content packages can be done by using authoring tools, validating the content packages and play them in a LCMS or a simple player.

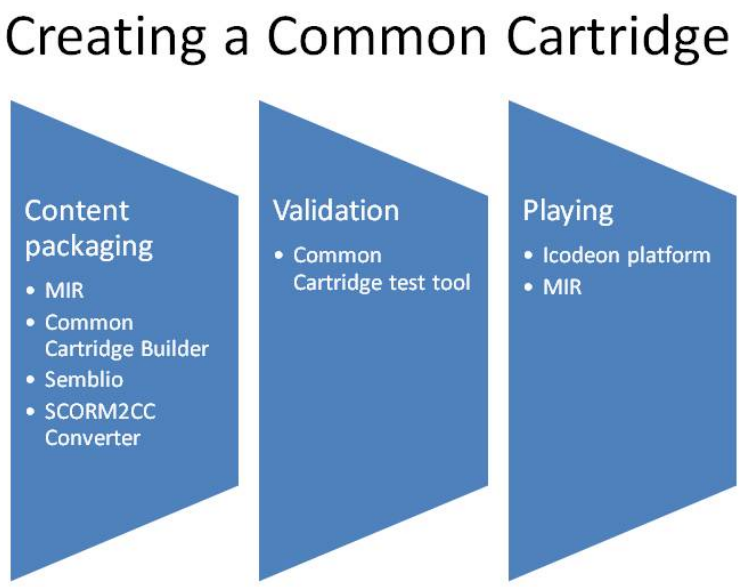


Figure 3: Workflow for Common Cartridge

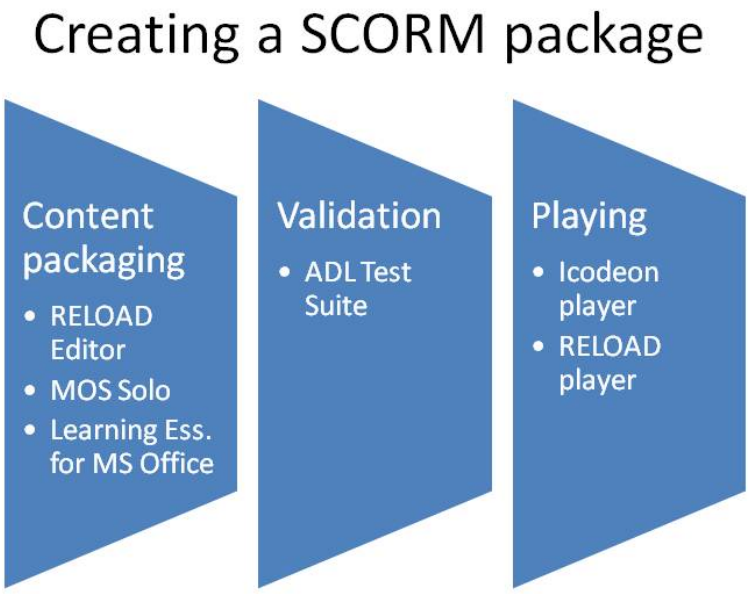


Figure 4: Workflow for SCORM packages

2.1 *Starting Position*

The first report of content use evaluated the used formats for content packages. 16 content providers participated in the first content audit survey and 12 content providers responded to the second content audit survey.

The most used and known standard for content packaging was SCORM (often CAM and RTE). The IMS content packaging format was used by four content providers. Only one user applied QTI. An application profile of the IEEE LOM specification was used by one content provider because of the need for a specific vocabulary.

The target systems that were supposed to import or render the content are mostly LMS like Moodle or Blackboard. Most content providers deliver complete content packages to their users as well as individual resources. The download of content is web-based. Access control mechanisms are used by four providers, the others do not have an access control.

Common Cartridge as an new specification was not known and not used, only one content provider tested the specification.

After working a year on standards and specifications, ASPECT content partners have gained important new experience concerning the use of SCORM and Common Cartridge.

2.2 *State of the Art*

CNDP :

CNDP is a publisher and produces content, but does not use existing standards at the moment. They are in principle interested in exploring standards, but they have no experts to help out with the work. The focus is on the vocabulary work and identifiers. Concerning unique identifiers (handle), all the resources referenced in the LRE have now received unique identifiers. Currently, the only way for content providers to get these identifiers consists of harvesting back their metadata using the LRE target. EUN is waiting for suggestions from content partners on how EUN could provide a better access to these handles. The 350 resources mentioned in the DoW are ready and will be made available through the LRE once the connection is working correctly.

DGIDC:

They have information material for teachers on Creative Commons licensing. The focus on developing the 120 lessons mentioned in the DoW. DGIDC has hired two teachers to write the materials and a company to produce the Flash objects. A part of these resources will be ready soon and will then be accessible both on Portuguese portal and the LRE for schools repository. There are currently about 1200 resources in the Portuguese schools' portal that can be made part of the LRE. Apart from that, DGIDC will be creating resources that explain more about Creative Commons licenses.

INDIRE:

INDIRE does not use SCORM or other content packaging specifications, but are looking at the Common Cartridge specification. Basically, the specifications for packaged content do not go well with their learning model which is based on group work. The main focus is on vocabulary implementation and interoperability issues related to this. In terms of resources Indire has provided the 100 learning objects mentioned in the DoW. Furthermore, Indire is interested in the work on access controls.

ITC:

They have converted 49 SCORM packages to Common Cartridge packages using the SCORM2CC converter.

2.3 *Conclusion*

Use of Content Packaging Standards by ASPECT Content Providers

The ASPECT consortium includes 13 providers of educational content from both the public and private sectors. Among these, SIVECO, Cambridge University Press, Young Digital Planet, ITC, EDUC/KlasCement, FWU, University of Ljubljana, and the Open University/OpenLearn are using SCORM. The Open University is a major ASPECT partner that has developed processes to also produce Common Cartridges. A second group of partners in ASPECT - University of Ljubljana, KlasCement, FWU and YDP – are experimenting with and exploring the potential of the Common Cartridge specification in the

project. Further providers are beginning to see the benefits of these specifications and intend to explore them in detail but have not started yet. Finally there are content providers, e.g. Indire, DGIDC and CNDP (all from the public sector) that currently remain unconvinced that content packaging specifications are of interest or will provide added value to their organisations.

Following two workshops explaining the specifics and the potential of the specifications in the first year of the project, Work Package 3 focused on providing additional support to content providers for ongoing trials with SCORM and Common Cartridge where content providers were asked to build SCORM and Common Cartridge packages from their own content.

As many providers already had SCORM packages, the Microsoft/Icodeon converter from SCORM to Common Cartridge could be exploited in order to rapidly produce a number of Common Cartridges on the content providers' sites. Currently we have some 200 CC packages as a result of our work with the conversion utility. A workshop in December 2009, held in Aarhus, was useful in enabling content providers to exchange the experiences from these activities and to demonstrate the tools that can be used to further develop the initial set of cartridges.

In most cases the converter worked successfully and proved to be a very useful tool. Resulting cartridges then have been tested for conformance with the Common Cartridge specification using the Common Cartridge Validation Tool provided by the Common Cartridge Alliance. A few issues have been noted from this practice:

1. While SCORM packages that have all content included and correctly referenced in the package convert well, references to remote web content were not handled correctly. SCORM packages refer to such content by just giving its URL; however, the Common Cartridge specification requests that another small file exists per reference which defines how the referenced web content is to be displayed, for example the size of the target window. It is recommended that future versions of the converter create respective default files with this information.

2. The IMS Content Packaging specification, which forms the basis of both SCORM and Common Cartridge, requests that every file in a package – except for the file imsmanifest.xml itself – is referenced in the imsmanifest.xml file. Also every file referenced – either within the package or on the web – must exist. Unfortunately the ADL SCORM Conformance Test Suite does not catch violations of these requirements. This leads to apparently correct SCORM packages which either cannot be converted or, if they can be converted, do not pass the IMS Common Cartridge Conformance test.

3. A third issue arises from the fact that the converter outputs all of the imsmanifest.xml content in a single line. As a consequence, possible error reports of a succeeding run of the IMS Common Cartridge Validator are hard to interpret, since they use the line number to direct the user to the location of an error.

These issues have been brought to the attention of the developers of the SCORM2Common Cartridge Converter and the ADL Test Suite respectively where they have been put on the agenda for discussion.

In order to help content providers to overcome the second and third issue, the University of Koblenz has implemented a new tool which corrects content packages (i.e. SCORM packages as well as Common Cartridges) by adding missing references and by pretty printing imsmanifest.xml files, i.e. by making them better readable and enabling more precise error reporting. Work on this tool will be reported in another Deliverable (D3.2.2).

The central tool in the project to explore the benefits of the Common Cartridge specifications is the Icodeon Common Cartridge Framework. It is a software toolkit for building online education tools, apps and websites. Technically, the Icodeon Common Cartridge Platform is a RESTful Web API for IMS Common Cartridge. The Platform provides a set of "Web Services" that enable developers to build online education tools. Once a cartridge is added to the Icodeon Common Cartridge Platform, the Platform assigns a URL to each resource in the cartridge - every page, link, question, tool launch, discussion comment - so that each educational resource can be added into web pages, blogs, wikis and social networking sites.

The accessibility of specific parts of the content of a Common Cartridge from any web site through the Icodeon Common Cartridge framework, together with a certain level of protection for the content, already adds value to a converted SCORM package. It allows the teacher, as well as licensed online communities, to provide learners with exactly the content that is needed for a specific learning project. More benefits can be obtained if assessments, question banks and discussion forums are added. In order to demonstrate these benefits as well as to demonstrate experience from the Cartridge production process in SMEs, a showcase project was launched by the end of January 2010 as a result of a collaboration between WP3 and WP5 (see section 4 above).

Misunderstandings Related to SCORM and Common Cartridge

Those content providers in the Consortium that do not see an added value in using content packaging specifications offer the following arguments in support of their case.

Argument: *SCORM has been developed for Computer Based Training. Therefore it is assumed that it pre-defines the way of learning: "since SCORM was born in the USA for the training of soldiers, it is not a learning paradigm that can be imported in the school environment. (ANSAS)". "SCORM ... is surely useful for organisations which believe in a structured, behaviourist transmission of knowledge, from teacher or trainer to student or trainee. (DGIDC)"*

These views probably arise from a misinterpretation of the role of SCORM. SCORM is, in fact, a content packaging format and not a learning paradigm. While it is correct, that individual, computer guided learning is best supported by SCORM, the inverse conclusion that SCORM packages are unsuited for the school environment is as unjustified as would be the claim that books are unsuited for schools since they have been written for the individual reader.

This similarity is not as remote as it may seem. In fact a SCORM package appears in a learning environment similar to a book with a table of contents, which the user can browse. Unlike a book, a SCORM package can contain interactive content which can provide information on the learner interaction back to the learning environment, the teacher and the learner. There are many examples of pedagogically valuable use of the interactivity of SCORM packages.

While SCORM 2004 provides the content author with the possibility to predefine one or many learning paths, it does not enforce this in any way. The Simple Sequencing parts of the SCORM 2004 specification allow hiding or disabling parts of the content for a learner until he meets certain requirements. From pedagogic research [Schunk1, Schunk2, Steffens, Boekaerts], it is well known that this possibility of guiding the learner is useful in many pedagogic contexts including K12. For example, beginners in a subject often benefit from a more strict guidance while experienced learners can make better use of many degrees of freedom. Also it has often a strong motivational effect for the learner to know that certain resources only become accessible after particular learning goals have been achieved. In short, there is a potential value of the learner guidance enabled by SCORM and it is important to stress once more that free exploratory learning with free learner access to the content is not restricted in any way by the SCORM specification.

The general views on SCORM, as only offering a very restricted "drill and practice" diet, may be a result of the poor quality of a lot of SCORM packages. The practice of how content providers have implemented the standard has clearly confused many K-12 practitioners (at least in Europe). This clearly confirms the importance of the information and training provided by Work Package 3.

For collaborative and self-paced learning, the Common Cartridge specification, together with the Icodeon Platform, open up new possibilities for content use. As Icodeon has demonstrated by embedding Common Cartridge packaged content into pages from Facebook and blogs, it becomes technically possible to turn any Web 2.0 community system into a learning environment with access to high-quality interactive content.

Argument: *SCORM and Common Cartridge are closing off content: "These two standards may be useful for enterprises which want their content to be "sealed". However, …, what seems to make sense is to open content available… to everyone who may, …, to benefit from its use (DGIDC)."*

First of all, from a technical perspective, neither SCORM packages nor Common Cartridges are necessarily "sealed". They are zipped packages where all content in the package is accessible after unzipping. In fact SCORM does not foresee any mechanism to prevent this access. Cartridges *allow* content providers to keep content on their own server and to provide access only to authorized learners. Content providers can also specify credentials that conformant Cartridge Players have to check before importing a cartridge.

From a pedagogic perspective the use of these features is not prescribed by the standard but is at the sole discretion of the author, teacher and content provider. In the case of SCORM, the author can (but does not have to!) make access to specific content dependent on the successful completion of specific learning tasks. In the case of a Common Cartridge, the content provider can (but does not have to!) restrict access to licensed users and the teacher can (but

does not have to!) select only specific parts of a cartridge for his course. Therefore, the mere possibility to restrict access is as little an argument against the use of SCORM or Common Cartridge as the existence of locks is an argument against building houses or schools.

In fact, the Icodeon Common Cartridge Platform demonstrates the potential of Common Cartridge to access interactive content with a flexibility that is not supported by any other standard, thus illustrating the Common Cartridge Alliance slogan *"Free the Content!"*. As demonstrated during the ASPECT workshops, it is now feasible to access protected or unprotected packaged content, not only through an institution's web site, but from anywhere were learners may benefit from its use.

Argument: *Platform does not support packaged content. This seems to be a particularly French problem: "Nowadays, the French ENT's [an officially supported form of a restricted Learning Content Management System – ID] do not deal with packaged content. The content packaging standards are not very well known in the school context. The content provided by public institutions is available in the institutions' websites. The private publishers of digital educational content are mainly working on the access control and protection of the content. The content exchange between ENT's is not yet the main priority. (CDNP)" In a much milder form this is also reported for Lithuania by ITC.*

This indeed restricts the possibilities of using packaged content. In particular, it makes it impossible for the content to send information back to the Learning Management System. However this does not exclude utilizing other features of SCORM and Common Cartridge.

Depending on the configuration of the institutions' website, it may be possible to embed and run SCORM players. In fact, the web site of KlasCement – an ASPECT member – demonstrates this. Also the Icodeon Common Cartridge Explorer can be accessed from an institution's web site, even providing some access control features as may be required by the content providers. In a similar way, particular parts of a cartridge can be accessed from a web site through the Icodeon Platform.

A natural reaction to limitations of existing platforms is the request for a standards' conformant, freely available, stand-alone player. We strongly support this and believe that it is a project worth funding. Currently the development of Common Cartridge and SCORM players is mostly considered as a way for adding value to existing free or commercial environments which are designed as a server application with only a browser running on the user's computer. The owners of those environments have a legitimate interest in tying their player products to their environment. From a market perspective, content providers should have the biggest interest in the creation of cheap standard's conformant players since it might open up new markets for them. Note, however, that with decreasing costs for bandwidth and with the increasing possibility to be always online, the need for a stand-alone player may be decreasing, since it can be offered online as a service. While a stand-alone player would be helpful for content distribution and self-tests, a hosted service can offer clear additional benefits, in particular in the realm of collaborative learning.

It certainly deserves to be discussed how much of content packaging standards *should* be known in a school context. We believe that authors that are writing content for schools should be aware of the potential of the standards so that they can select the standard that is best suited for the intended use of their content. Similarly, teachers should be made aware of good examples of SCORM and Common Cartridge packages. A deeper understanding will be required for content providers and system administrators who also need to know of the

restrictions of existing systems in order to foresee what will play on a particular customer's system and what will not.

The 'playability' of content of different systems can be considerably simplified by using SCORM certified systems and systems with a Common Cartridge Conformance Mark. For these systems and for conformance marked content, schools can expect that they shall be interoperable. If, nevertheless, incompatibilities should be found, test systems are available to help decide whether the problem is on the side of the content or on the side of the playing system. It can be expected that system and content providers will support their customers by fixing any problem that might emerge before running the risk of losing a conformance mark.

The argument that content exchange between Learning Management Systems does not play an important role seems again to point to a misunderstanding. Most Learning Management Systems have only fairly restricted possibilities for authoring content. Often there are even fewer possibilities to export content authored in an LMS in a non-proprietary format[1]. Therefore it is not a good idea to author content of any complexity in an LMS. Best practice rather suggests using a SCORM or Common Cartridge editor, as recommended on the ASPECT demonstrator site and then sending the packaged content to any LMS which can run it. This holds even more for Web 2.0 learning where teachers and learners act as authors. These are mostly used to the tools they find in their respective platforms.

[1] The ILIAS Learning Management System, which has a built-in SCORM editor, is a noteworthy exception.

3 Showcases

WP5 and WP3 decided that it would be useful to produce a small 'showcase' containing a few SCORM packages and Common Cartridges.

The intention was for these showcases to demonstrate the added value that can be achieved by using the specific features provided by those specifications, beyond content distribution, in realistic use cases from one or more of the ASPECT content providers. The aim was that the showcases should include, not only the content but also a description of the didactic problems addressed by the resources.

Development of a showcase required:

- the participation of personnel that were well acquainted with the needs for support in the learning scenarios where the content is used. It also required
- that relevant content for those scenarios was available or could be produced with little effort (for example static content may be available but appropriate assessments have to be produced).
- expertise in the respective learning domain was also needed as well as authors or educators and non-technical personnel that are very well-acquainted with the end users needs.
- that the packages should be produced at the content provider's site with support from WP3 which would usually require involvement of technical staff.

The University of Ljubljana(UL) and KlasCement agreed to participate in developing the showcases. Teleconferences took place for discussing the procedure and problems. WP3 and ICODEON supported the ongoing work.

Timeline for the showcases:

- 11 January 2010 , UNI-C sent out an invitation to all WP5 partners to contribute to showcases and contacted CUP directly in parallel to discuss their possible role
- Week of January 18th, first teleconference with those interested in contributing
- Mid February, Virtual Classroom session to present experiences of participating content providers to other ASPECT members. Koblenz provides Virtual Classroom.
- 2nd half of March, Workshop to discuss experience of showcases and how other content providers might realize the achieved added value in their business context.

Workflow:

It was decided to store the material on the Educanext platform used by project partners. UL started with creating a SCORM package "Thermodynamics.zip" that would will use for the showcase. The materials are available in Slovenian and in English. The uploaded version is English and the topic is Science. The materials consist of html pages and applets and the navigation part on each page is removed. This is a simple SCORM 2004 package created with the Reload Editor.

The SCORM package was successfully imported into the LMS Ilias which then re-created the navigation. Also the animations and tests are working. Koblenz imported the package successfully in the Blackboard LMS, as illustrated in Figure 5.

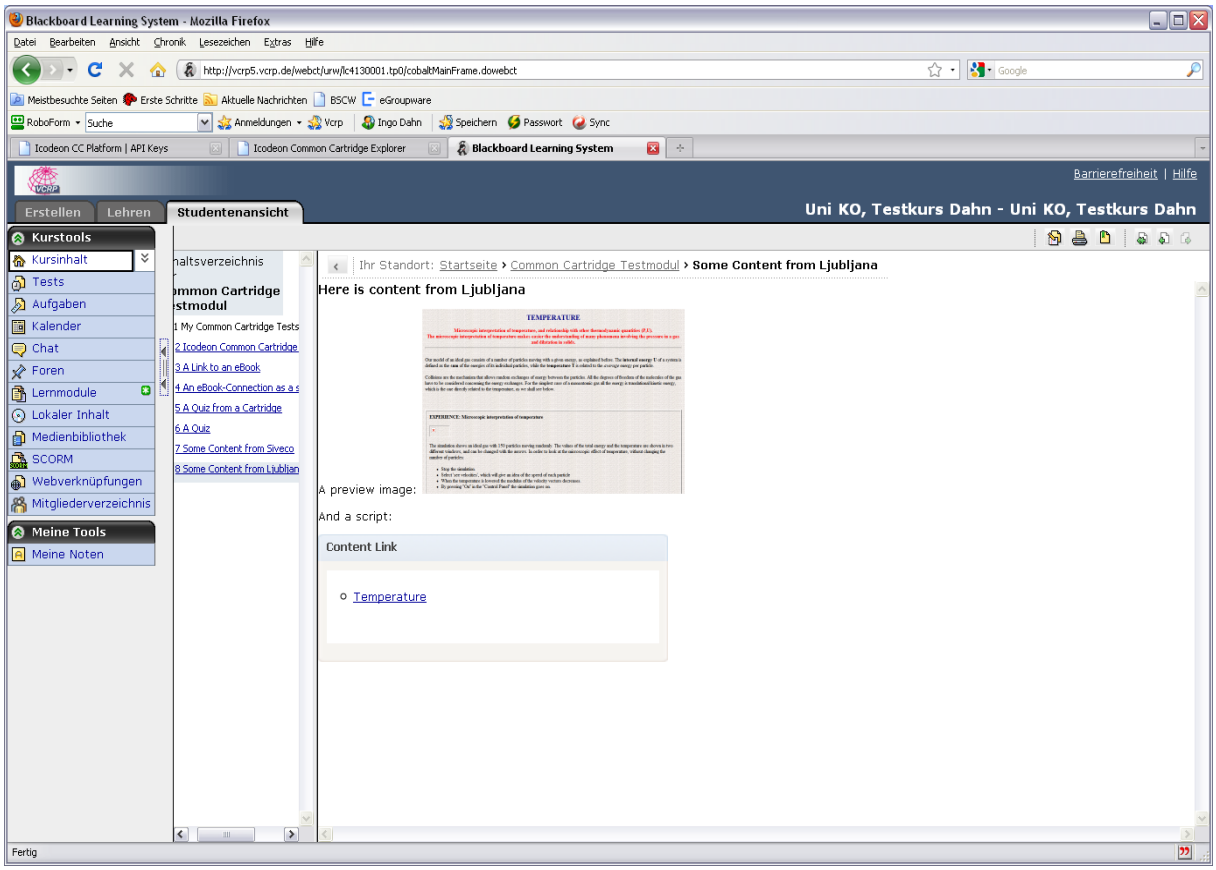


Figure 5: Blackboard

Also the same material was converted to a Common Cartridge package. The validation tool found some problems with incorrect references in the packages. SCORM packages do not need those references but in Common Cartridge they are required.

The missing path in the SCORM package was an error. A new tool, developed in Koblenz, repairs incorrect references. The repaired SCORM package was converted to Common Cartridge and a successful validation text was run.

The cartridge was successful uploaded to the Icodeon Common Cartridge platform. Figure 4 shows an interactive working animation of the lesson.

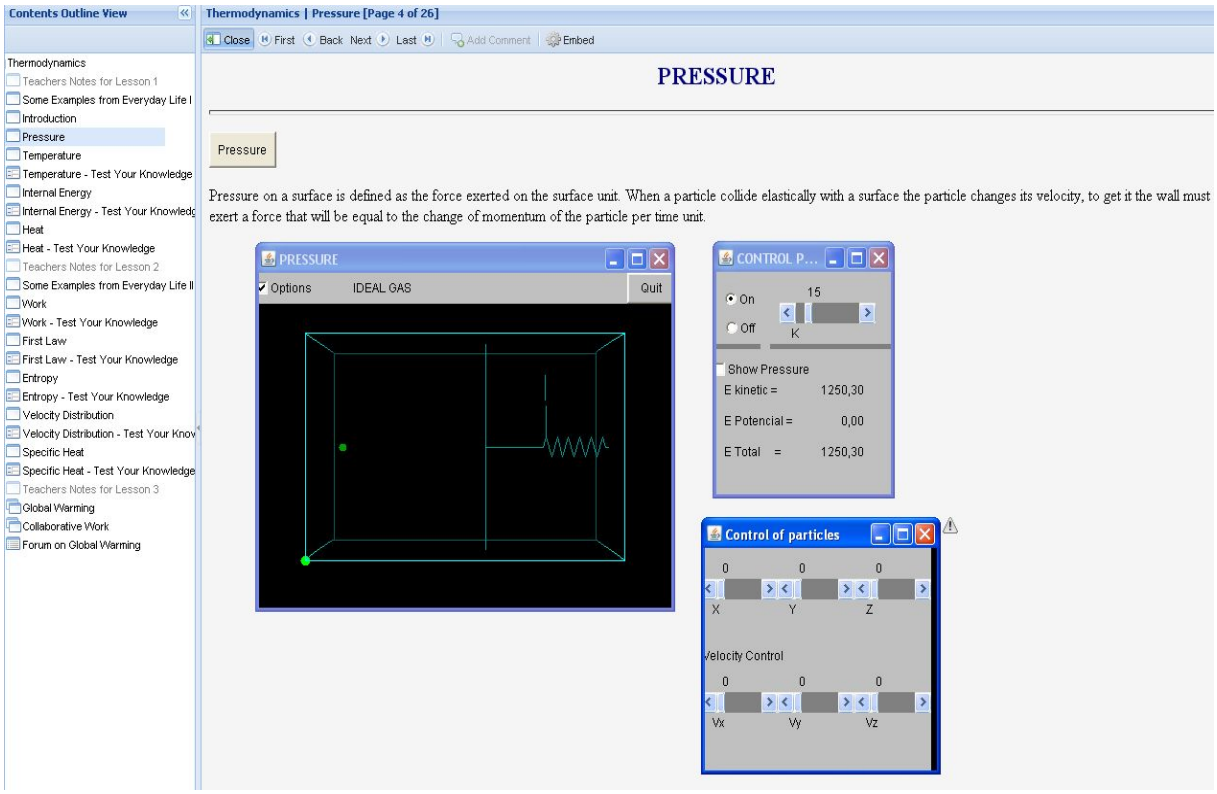


Figure 6: Icodeon platform with a launched Common Cartridge

The MIR platform allows registered users to upload, launch and author Common Cartridges. The Thermodynamics Cartridge was successfully uploaded there and played. The authentification is not implemented yet. Figure 7 screenshot illustrates this. The part of "teachers notes for lesson 1" is visible for everybody.

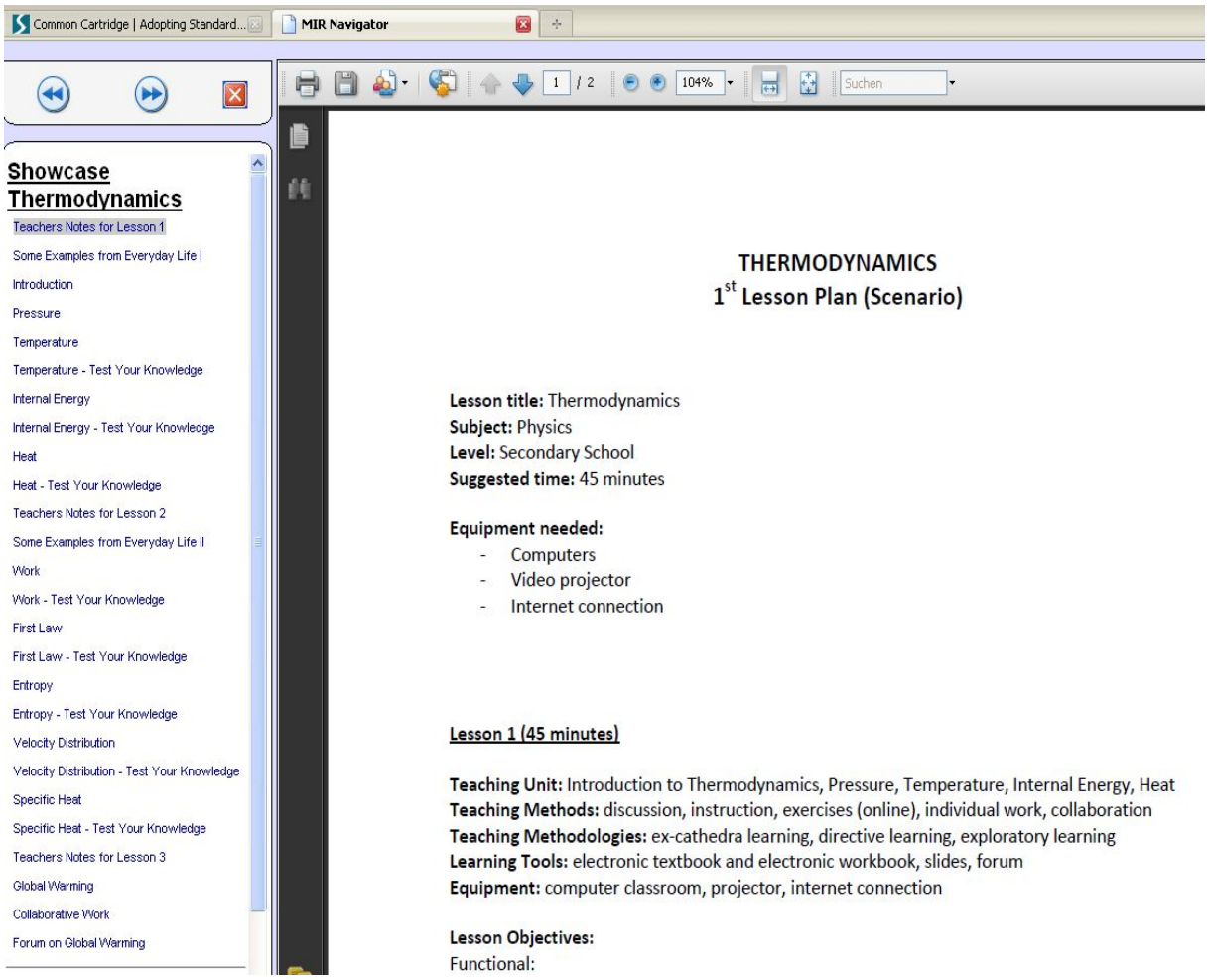


Figure 7: MIR platform with a launched Common Cartridge

Regarding further work on the CC package, the content providers discussed separating content from questions and also add some additional questions (preferably of different types: MCQ, essay, fill in the blanks etc.).

In a teleconference in February 2010 editing Common Cartridges with the tool "MIR" was demonstrated. After choosing a cartridge at the MIR platform a click on "Edit cartridge" opens the authoring tool.

Figure 8 shows the authoring tool of the MIR platform with the possibilities to add some new content to the cartridge. Web Content, LTI, Web Link, Forum Assessment and Question Bank are available choices.

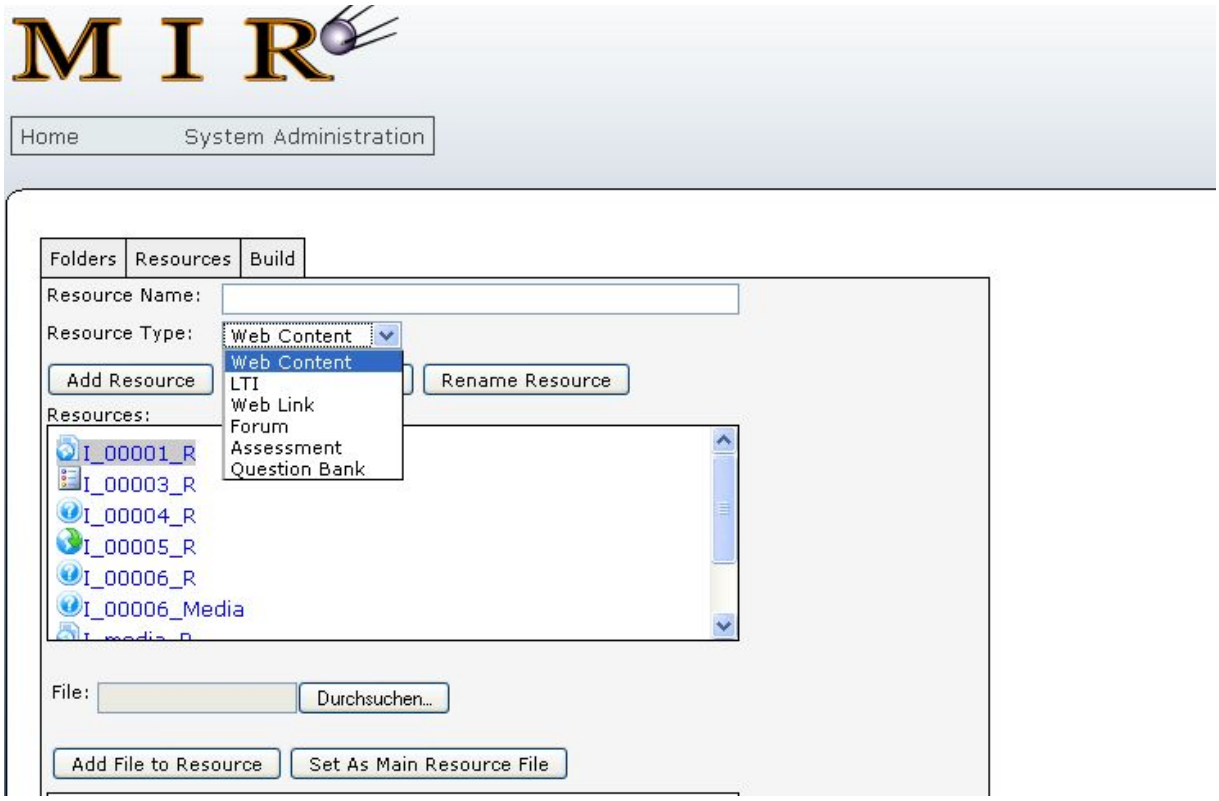


Figure 8: MIR authoring tool

Question types are:

- Multiple Choice Single Answer
- Fill in the blank
- Multiple Choice Multiple Answer
- True False
- Pattern Match
- Essay

Feedback and answers can be added to the questions. After completion, the manifest file must be updated (to find under “Build”). An export function is also implemented.

KlasCement uploaded a Common Cartridge in March which is running well at the MIR platform. The topic is “Great Britain – Land and Culture”. Figure 9s hows a part of the cartridge.

Figure 9: MIR with course from KlasCement

QTI allows a broad range of question types including hotspots and Common Cartridge uses a restricted profile of QTI which allows only the following question types: multiple choice, multiple response, true-false, fill-in-blank, pattern match and free text. These seem to cover more than 90% of what is in actual use. In particular they seem to be for the Ljubljana material. It covers also those question types which are produced by teachers without special software and dedicated support.

For example LMS Blackboard does not support hot spot questions unless it is extended with Question Mark Perception software.

Beyond this, any type of question can be embedded into a cartridge as web content, for example as Flash. (The Biology cartridge from Siveco has some Flash drag-and-drop tests.)

So far this means only that those types can be packaged in the respective formats. It means also that any CC compliant player must support all these types, giving the user the guarantee that he can use all content in any purchased cartridge.

The Icodeon Cartridge Explorer is designed only to explore the content of cartridges. It has no learner registration and therefore cannot assign grades. An LMS like Moodle, has other possibilities. It can put questions from a cartridge into its question bank where teachers can select them and use them in their exams to grade students. However, even if the LMS is Cartridge compliant, this may not be the case for hotspot questions.

Currently QTI players which support advanced question types are still rare, as is advanced content in QTI format. Common Cartridge, unlike QTI, is determined to support practices currently used in a wide market and it will evolve as this practice evolves. In our practice, what we do in Koblenz when we need advanced tests, we custom build a SCORM package with Flash content which can pass assessment results back to Blackboard. However this is done only in rare cases and it requires considerable support.

Next teleconferences are planed to go on working on the showcases. The intention is to present showcases in Lisbon in March 2010 at the 4th consortium meeting.

4 Authoring Tool Microsoft Semblio

Microsoft Semblio is a new authoring tool that makes it easy to assemble a variety of learning materials and then publish them in a single digital file that can display multimedia activities and lessons. Semblio files can be exported to Common Cartridges.

Content can be added in many common file formats, such as Microsoft Office files, audio files, video files, animations, pictures, and other multimedia and document formats. Adding a quiz makes the file more interactive and helps to assess comprehension.

Content can be dynamic by adding a custom object into a Semblio file. Custom objects are materials created by a third-party and are not included with Semblio. This tool is easy to handle, just pull the objects into the working area.

To view Semblio files (.semblio), students need Microsoft Semblio Player and the free add-ins used in Web browsers.

With Semblio the following can be created:

- Multiple reading assignments
- Recorded lectures and speeches
- Demonstrations
- Step-by-step photographic instructions
- Simulations
- Science labs
- Historical primary source materials
- Geography and history travel logs
- Language dialog and word pronunciations
- Recorded performances
- Art shows
- Interactive assessments

This nonofficial version of the tool is a beta version with bugs but provides an insight into the potential of Semblio. The official release is planned for end February 2010. Figure 10 shows the working area of Semblio.

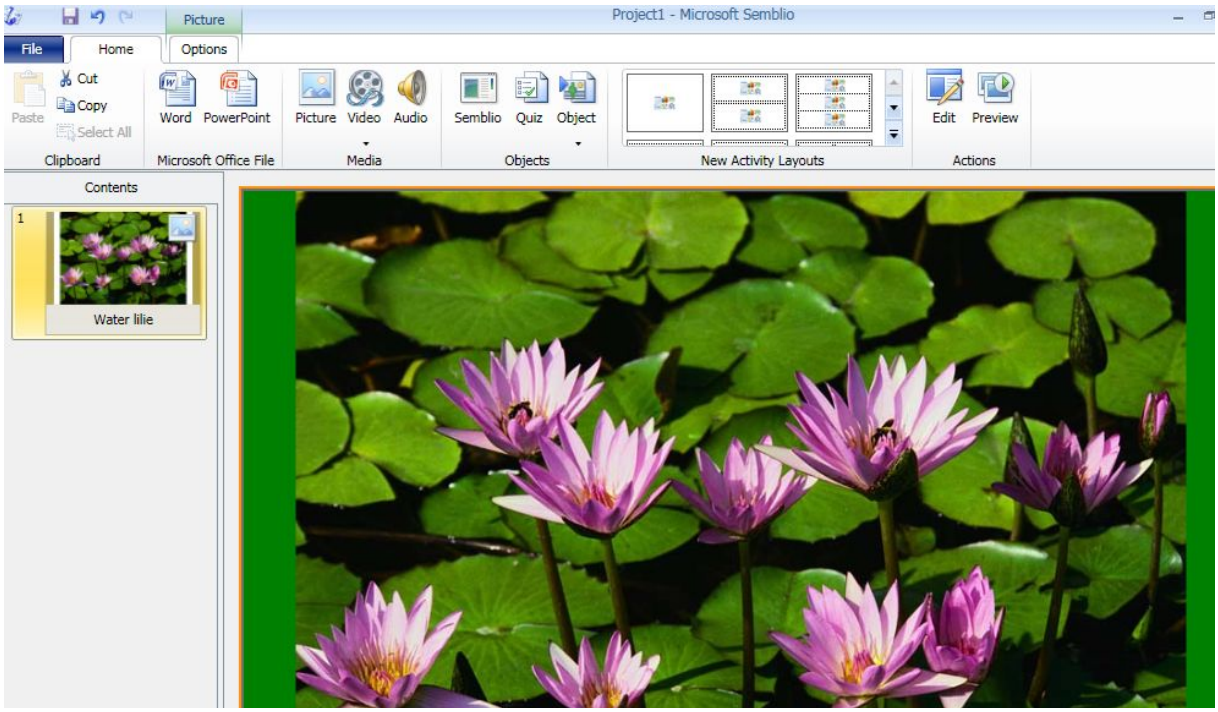


Figure 10: Screenshot Microsoft Semblio working area

The development of educational software can be done with a Microsoft Semblio SDK running with Visual Studio.

The Microsoft Semblio SDK is built on the NET Framework 3.5, and provides developers with tools for packaging and distribution of rich interactive learning material, such as e-books containing images, audio, and video. Version 1.0 of the SDK can be downloaded from Microsoft website.

The SDK is the first of three components that will make up the Semblio Platform. The other two includes an assembly tool and a media player.

The Semblio file format (.semblio) is based on ISO/IEC 29500-2:2008 Open Packaging Convention. The export function let the file to be saved as a Common Cartridge.

5 Conclusion

Looking forward, the aim is now to involve more ASPECT content providers in developing new showcases. WP3 will present these showcases to content providers who did not attend the showcase workshop and help them to get started with their own content packaging. Creating lessons and content packages with their own material will allow content providers to gain more experience and develop best practices with standards and specifications. Hands on content packaging is actually the best form of training and regular teleconferences will ensure that problems can be solved in a timely maneer.

WP2 (lead by KU Leuven) set up a Moodle system in preparation of the ASPECT Summer School and provided access to the project partners. New content packages will be uploaded to the Moodle LCMS and tested with support from WP3. WP6 will use these content packages for the tests with teachers in the school pilots.

Once the final version of the Microsoft tool “Semblio” is available, WP3 will test and support it. This self-explanatory tool can be used “just another Office application” and works using well known symbols and functions. Content providers can easily create Common Cartridge content packages with Semblio. WP3 will add it to the demonstrator website as soon as possible.

WP3 is starting to prepare a plugfest in Koblenz to test interoperability in August 2010. All content providers will be invited to participate in the plugfest where problems and uses of packaged content will be discussed. Content providers will have further opportunities here to discuss why they believe that packaged content may not be appropriate for their learning model. Examples and showcases will present the variety of scenarios in which packaged content can be used.

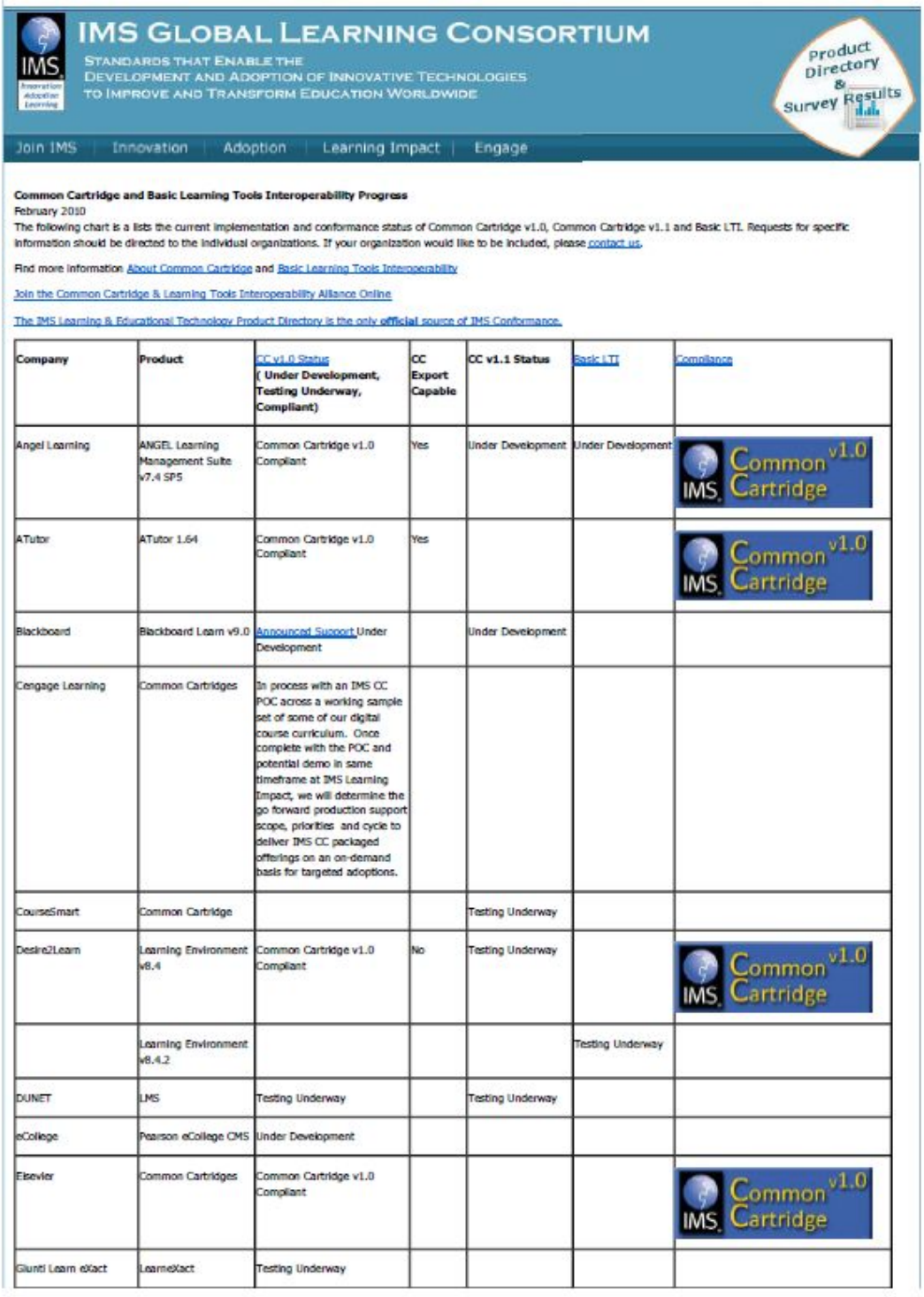
The ASPECT Access Control is flexible enough to accommodate content providers’ specific requirements in term of distribution models. An investigation will be carried out into a platform that supports both Access Control and existing LMS environments.

6 References

I.GLC	I. Global Learning Consortium. IMS Common Cartridge Authorisation Web Service, available at http://www.imsglobal.org/cc/authv1p0/imscc_authv1p0.html.
ADLW	Advanced Distributed Learning Web Site (http://adlnet.gov/)
AICCG	AICC CMI Guidelines for Interoperability (AICC CMI001 V4.0), Aviation Industry CBT Consortium, 2004
Boekaerts	Boekaerts M., Pintrich P., Zeidner M.: Handbook of Self-Regulation
IEEECS	IEEE Computer Society (Learning Technology Standards Committee), 2005
IEEELOM1	IEEE Standard for Learning Object Metadata (IEEE Std 1484.12.1-2002), IEEE Computer Society (Learning Technology Standards Committee), 2002
IEEELOM2	IEEE Standard for Learning Object Metadata (IEEE Std 1484.12.1-2002), IEEE Computer Society (Learning Technology Standards Committee), 2002
IEEELTD	IEEE Standard for Learning Technology-Data Model for Content to Learning Management System Communication (IEEE Std 1484.11.1-2004), IEEE Computer Society (Learning Technology Standards Committee), 2004
IEEELTE	IEEE Standard for Learning Technology-ECMAScript Application Programming Interface for Content to Runtime Services Communication (IEEE Std 1484.11.2-2003), IEEE Computer Society (Learning Technology Standards Committee), 2003
IEEEXML	IEEE Standard for Learning Technology-Extensible Mark-up Language (XML) Schema Definition Language Binding for Learning Object Metadata (IEEE Std 1484.12.3-2005),
IMSCP	IMS Content Packaging Specification (IMS CP 1.1.4), IMS Global Learning Consortium, 2004
Schunk1	Schunk, D., Zimmerman, B.,: Self regulated Learning: From Teaching to Self-Reflective Practice 1998
Schunk2	Schunk D., Zimmerman B.,: Self regulated Learning and Academic Achievement 2001
Steffens	Steffens, K. 2006 Self regulated Learning in Technology Enhanced Learning Environments: Lessons of an European peer review. European Journal of Education

7 Appendix

7.1 *Status of Common Cartridge tools*



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Common Cartridge and Basic Learning Tools Interoperability Progress

February 2010

The following chart is a lists the current implementation and conformance status of Common Cartridge v1.0, Common Cartridge v1.1 and Basic LTI. Requests for specific information should be directed to the individual organizations. If your organization would like to be included, please contact us.

Find more information About Common Cartridge and Basic Learning Tools Interoperability

Join the Common Cartridge & Learning Tools Interoperability Alliance Online

The IMS Learning & Educational Technology Product Directory is the only official source of IMS Conformance.

Company	Product	CC v1.0 Status (Under Development, Testing Underway, Compliant)	CC Export Capable	CC v1.1 Status	Basic LTI	Compliance
Angel Learning	ANGEL Learning Management Suite v7.4 SP5	Common Cartridge v1.0 Compliant	Yes	Under Development	Under Development	IMS Common Cartridge v1.0
ATutor	ATutor 1.64	Common Cartridge v1.0 Compliant	Yes			IMS Common Cartridge v1.0
Blackboard	Blackboard Learn v9.0	Announced Support Under Development		Under Development		
Cengage Learning	Common Cartridges	In process with an IMS CC POC across a working sample set of some of our digital course curriculum. Once complete with the POC and potential demo in same timeframe at IMS Learning Impact, we will determine the go forward production support scope, priorities and cycle to deliver IMS CC packaged offerings on an on-demand basis for targeted adoptions.				
CourseSmart	Common Cartridge			Testing Underway		
Desire2Learn	Learning Environment v8.4	Common Cartridge v1.0 Compliant	No	Testing Underway		IMS Common Cartridge v1.0
	Learning Environment v8.4.2				Testing Underway	
DUNET	LMS	Testing Underway		Testing Underway		
eCollege	Pearson eCollege CMS	Under Development				
Elsevier	Common Cartridges	Common Cartridge v1.0 Compliant				IMS Common Cartridge v1.0
Giunti Learn eXact	LearneXact	Testing Underway				

Fronter	Fronter 2.9	Under Development				
Icodeon	Icodeon Content Player			Testing in Progress		
Jenzabar		Testing Underway		Under Development		
LAMS				Under Development		
Learning Objects				Under Development		
Moodle	Moodle 1.9	Testing Underway			Under Development	
	Moodle 2.0				Under Development	
OLAT					Under Development	
Open Source Plugins	Blackboard 8 Building Block				Under Development	
	Blackboard 9 Building Block				Under Development	
	WebCT				Under Development	
Open University	Common Cartridges	Common Cartridge v1.0 Compliant				IMS Common Cartridge v1.0
Pearson Education	Common Cartridges	Produces content in Common Cartridge format on demand. Export in CC format from WPS system (in house web publishing system).			Under Development	
Sakai	Sakai v2.5.x	Under Development - Anticipate Import/Export support in July 2010.		Under Development		
	Sakai 2.7 - Sakai BasicLTI Consumer Portlet				Under Development	
	Sakai/Melete 2.7				Under Development	
	Sakai BasicLTI Tool Provider in Sakai 2.7				Under Development	
SoftChalk	SoftChalk v5	Under Development				
SunGard HE				Under Development		

For more information, contact us.

7.2 *Common Cartridge is not SCORM:*

A Note1

By Ingo Dahn, University Koblenz-Landau, Germany; dahn@uni-koblenz.de, September 20, 2009

The Common Cartridge specification explains in detail the structure of a common cartridge and the conditions for conformance with the specification. An extensive set of frequently asked questions on the IMS web site also compares Common Cartridge with SCORM. In particular it explains that Common Cartridge targets a usage different from that of SCORM: While SCORM mainly addresses computer based training, where a learner is learning on her own interacting with a computer, Common Cartridge addresses blended learning scenarios where a teacher (or a community) plans a course.

These different target scenarios imply profound differences for the kind of support both specifications require from a learning management system (LMS). The adequate support for using SCORM content is the integration of a SCORM player into the LMS which emulates the computer the learner would interact with if she were on her own.

The same kind of support – integration of a Common Cartridge player into an LMS – is possible, but it would miss the specific points of the Common Cartridge. In fact a major motivation for the development of the Common Cartridge specification was the experience that prefabricated sets of content are rarely optimal for the needs of teachers or learners in blended learning scenarios and that it takes the pedagogic and didactic competence of the teacher to make best use of them in his course.

In a blended learning scenario the prime addressee of a common cartridge is not the learner but the teacher. The LMS should give a teacher or instructional designer the possibility to select from a common cartridge the content items that are appropriate for his course design and to make them available to the learners. This is very similar to the use of textbooks in teaching where teachers usually select and recommend what to read, combining content from a variety of textbooks (cartridges) as they find appropriate.

Most current LMS already provide the teacher with tools to render web content, to discuss topics in forums and to select questions from a question bank for building tests. Therefore all that is required to make full use of Common Cartridges is an import function which puts the content of a cartridge into the appropriate places where these items are stored internally and to aid the teacher in finding them, making use of the organization element that comes with the cartridge. Even where the LMS does not support QTI 1.2 natively, it may convert the QTI

[1] This work was supported by the ASPECT project. ASPECT is a Best Practice Network co-funded by the European Commission under contract ECP 417008. The author is a member of the IMS Global Learning Technical Advisory Board. All views expressed in this document are solely that of the author. They do not express any view of the European Commission or of IMS Global Learning.

questions from the cartridge during import into its internal format before making them accessible for the users.

Note that the Common Cartridge access control concept offers the possibility to restrict access for individual resources. This is very much in line with the intention that a user may be interested only in some of the resources of a cartridge. Admittedly, the Common Cartridge access control alone does not offer serious protection for the content; it is not a Digital Rights Management. However for the main intended scenario – blended learning – this is not a major issue according to the discussion with content owners in the Common Cartridge Specification Group: When content is delivered for import into an LMS, this is usually accompanied by a legal contract between the content owner and the provider of the LMS. Experience shows that institutions reasonably try to protect the content they purchased. Where content is delivered to individuals using stand-alone players for their own studies, further DRM measures might be appropriate, but, as said before, this is rather the realm of SCORM than of Common Cartridge – and even SCORM does not include DRM so far.

The Common Cartridge specification intentionally avoids specifying anything which LMSs are good at. Its sole purpose is the delivery of content as raw material for building complex interactive course experience with whatever tool is appropriate. It is assumed that teachers and instructional designers will use the tools they are used to, in particular the LMS, to add such features like sequencing or tests. It is also perfectly in line with the intention of Common Cartridge to mix cartridge content with specialized content that utilizes particular strengths of the particular LMS in order to deliver a learning experience that is better than can be obtained by just providing a cartridge in a player.

The difference in purpose between SCORM and Common Cartridge becomes particularly clear when we consider their potential use in connection with the IMS Learning Design (LD) specification. A learning design will consider a SCORM module as one resource. It will reference it in the design at the appropriate place and an LD player will have to call a SCORM player with this SCORM module at runtime when reaching this place in the design. Hence, in case of SCORM, all interaction with the SCORM module will happen at runtime.

While this is possible as well with a Common Cartridge, it is not its main intended usage. In order to enable the instructional designer to build better courses with a Common Cartridge, the LD editor must provide him/her with access to the individual items of the cartridge so that he/she can select them for inclusion into the course design. Once selected, they must be used to configure the required resources, for example a discussion forum for a particular discussion topic for use in the LD player. At runtime the LD player will use these resources. Hence in case of Common Cartridge the primary interaction with the cartridge will not be at runtime but at the time when the course is designed.

Summary

Both, SCORM and Common Cartridge, can be used to deliver content. However, beyond that, they are tailored to support different learning scenarios and different roles of users. In this note we discussed how this suggests a different usage of content and inherently different forms of support for these specifications by learning tools.