

**ECP 2007 EDU 417008**

**ASPECT**

# **Intermediate Public Report**

**September 2008 – November 2009**

**<http://aspect-project.org>**

<b>Deliverable number/name</b>	<i>D-1.3.1</i>
<b>Dissemination level</b>	<i>Public</i>
<b>Delivery date</b>	<i>November 2009</i>
<b>Status</b>	<i>Final</i>
<b>Author(s)</b>	<i>David Massart (EUN)</i> <i>Jim Ayre (EUN)</i>



***eContentplus***

This project is funded under the *eContentplus* programme<sup>1</sup>,  
a multiannual Community programme to make digital content in Europe more accessible, usable and exploitable.

---

<sup>1</sup> OJ L 79, 24.3.2005, p. 1.

## 1 Table of content

<b>1</b>	<b>TABLE OF CONTENT .....</b>	<b>2</b>
<b>2</b>	<b>PROJECT OBJECTIVES .....</b>	<b>3</b>
<b>3</b>	<b>CONSORTIUM.....</b>	<b>5</b>
<b>4</b>	<b>PROJECT RESULTS/ACHIEVEMENTS .....</b>	<b>7</b>
<b>5</b>	<b>TARGET USERS &amp; THEIR NEEDS.....</b>	<b>8</b>
<b>6</b>	<b>UNDERLYING CONTENT .....</b>	<b>9</b>
<b>7</b>	<b>SUMMARY OF ACTIVITIES .....</b>	<b>10</b>
7.1	CONTENT PACKAGING IN ASPECT .....	10
7.2	THE ASPECT APPROACH TO METADATA .....	12
<b>8</b>	<b>IMPACT &amp; SUSTAINABILITY .....</b>	<b>15</b>

## 2 Project Objectives

ASPECT is a 30-month, Best Practice Network (BPN) supported by the European Commission's eContent<sup>2</sup> programme and coordinated by European Schoolnet<sup>3</sup> (EUN). It aims to improve the adoption of learning technology standards and specifications, including by feeding into the pre-standardisation debate and ensuring that the needs of the European school sector is sufficiently taken into account in this debate. More specifically, ASPECT is exploring two categories of specifications: specifications for content use (e.g., content packaging formats, access control, and licensing); and specifications for content discovery (e.g., metadata, vocabularies, protocols, and registries).

ASPECT involves 22 partners from 15 countries, including 9 Ministries of Education (MoE), four commercial content developers and leading technology providers. For the first time, experts from all international standardisation bodies and consortia active in e-learning (CEN/ISSS, IEEE, ISO, IMS, ADL) are working together in order to improve the adoption of learning technology standards and specifications.

Initially, 14 content providers add additional content (both professionally produced and user-generated by teachers/pupils) to a critical mass of educational resources in an existing Learning Resource Exchange<sup>4</sup> (LRE) for schools. This is a federated network of 30 learning content repositories that has been developed by European Schoolnet and its supporting MoE together with other partners that include the ARIADNE Foundation. It was launched as a public service for schools<sup>5</sup> in December 2008.

Technology providers and standards' experts in the project work with ASPECT content providers to develop best practice approaches to implementing standards for both educational content discovery and use. Content providers apply these best practice approaches to a critical mass of resources in an expanded version of the LRE. These resources are then validated with up to 40 schools in four countries (using a customised and password protected version of the LRE) in order to determine how the implementation of standards and specifications in the project leads to greater usability of LRE content.

Based on this practical implementation of standards, which are independently evaluated in the project, ASPECT partners will feed the project's experience into pre-standardisation activities and run an extensive set of dissemination actions that include international workshops, plugfests, regional events and an award. The aim is to involve a wider group of organisations in ASPECT BPN activities and to develop a unique co-operation framework for all stakeholders who will also benefit from a set of new support services that include: a registry of learning object repositories; a vocabulary bank for education; an application profile registry; an automatic translation service for metadata; compliance testing; transformer services; and access to known interoperability issues.

---

<sup>2</sup> [http://ec.europa.eu/information\\_society/activities/econtentplus/](http://ec.europa.eu/information_society/activities/econtentplus/)

<sup>3</sup> <http://www.europeanschoolnet.org>

<sup>4</sup> <http://lre.eun.org/>

<sup>5</sup> <http://lreforschools.eun.org>

As a result of its work, the ASPECT project will have a strategic impact on pre-standardisation activities and the ability of partners to submit and support proposals to European and international standardisation bodies. After the CALIBRATE (<http://calibrate.eun.org/>) and MELT (<http://info.melt-project.eu/>) projects, ASPECT will help European Schoolnet and its supporting 31 MoE and partners to implement a strategic development plan for the LRE and provide standards-based, high quality learning resources both to schools in Europe and globally.

### 3 Consortium

ASPECT involves 22 partners from 15 countries, including 9 Ministries of Education (MoE), four commercial content developers and leading technology providers.

The ASPECT partners are representatives of the different categories of stakeholders involved with specifications for learning content discovery and use: learning content providers (both commercial and non-commercial); repository builders and organisations federating repositories and learning resources; learning technology platform and tools' providers; users (i.e., teachers and their pupils); and e-learning standards' specialists.

Participant name	Country	Role in the project <sup>6</sup>
EUN Partnership a.i.s.b.l.	BE	Coordinator/content provider/technology provider/dissemination
Katholieke Universiteit Leuven	BE	Technology provider
Siveco Romania SA	RO	Content provider/school pilot
Cambridge University Press (Holdings) Ltd.	UK	Content provider
Universität Koblenz-Landau	DE	Technology provider
Instituto Nazionale di Documentazione per L'Innovazione e la Ricerca Educativa	IT	Content provider
RWCS Limited	UK	Technology provider
Vocabulary Management Group	UK	Technology provider
Association EIfEL, European Institute for E-Learning	FR	Dissemination
Universidad Vigo	ES	Dissemination
Icodeon	UK	Technology provider
Young Digital Planet S.A.	PL	Content provider
Svietimo Informaciniu Technologiju Centras Valstybes Biudzetine Istaiga	LT	Content provider/school pilot
EduCentrum	BE	Content provider/school pilot
UNI•C Danmarks EDB-Center for Uddan	DK	Coordination of content providers
FWU Institut für Film und Bild in Wissenschaft und Unterricht GmbH.	DE	Content provider
DG Innovation and curriculum	PT	Content provider/school pilot

<sup>6</sup> The main operational role(s) that the participant plays in the project. For example: content provider, technology provider, pedagogical expert, standardisation body, evaluation, dissemination etc.

development (Ministry of Education)		
Univerza v Ljubljani	SI	Content provider
EDUCATIO Tarsadalmi Szolgaltato Koz	HU	Content provider
The Open University	UK	Content provider
Jyvaskylan Yliopisto, University of Jyvaskylan	FI	Evaluation
Centre National de Documentation Pdagogique	FR	Content provider

## 4 Project Results/Achievements

ASPECT main results are described in detail in Section 7. After 12 months' work, a number of important results and services have already been made available to stakeholders outside the project consortium:

- An IMS Common Cartridge & ADL SCORM Demonstrator (<http://aspect-project.org/node/40>)
- The LRE Metadata Application Profile v4.0 (LREMAP4 - <http://fire.eun.org/LREMAPv4p0.pdf>)
- Standalone conformance tests for LREMAP4 (<http://files.eun.org/ASPECT/tools/test-system/>)
- Online conformance tests for OAI-PMH and the LREMAP4 (<http://ariadne.cs.kuleuven.be/validationService/validateMetadata.jsp>)
- A Vocabulary Bank for Education (VBE – <http://aspect.vocman.com/vbe/home>)
- Material to support training and dissemination, including an OAI-PMH harvester integrated with a validation service and instructions on how to use them (<http://wiki.aspect-project.org>)
- A Data Model for a Learning Object Repository Registry and its XML binding<sup>7</sup>.
- A new version of the Learning Technology Standard Observatory (LTSO - <http://www.cen-ltso.net/>) and a LTSO+ (<http://www.cen-ltsoplus.net/>)
- Research workshops such as SE@M'09 (<http://www.learningstandards.eu/seam2009/>)
- Developer workshops such as the Technical Course on Federation of Learning Repositories for Agriculture, Food & Environment (<http://aglr.aua.gr/node/27>)
- Public workshops for stakeholders such as the one organized at the BETT Show in London in January 2009 that was attended by approximately nearly 30 organisations including leading publishers, content developers and learning platform providers.

---

<sup>7</sup> This work was carried out in collaboration with the IMS LODE workgroup in the framework of a Memorandum of Understanding signed between the ASPECT project and the IMS Global Learning Consortium.

## 5 Target Users & their Needs

The following stakeholders will benefit directly or indirectly from the best practices related to the implementation of standards and specifications for content discovery and use:

- Educators will have an easy way to discover learning content that addresses the needs of their students, making their jobs easier, and maximizing re-use and minimizing the cost of repurposing materials.
- Students benefit from having access to high-quality learning resources available, making a significant impact on the quality of their learning experience and their learning outcomes.
- Content providers will be able to more easily make their products interoperable and to promote/market them by making them globally discoverable.
- System vendors will only need to support a limited set of specifications to make their systems compliant with learning resources from major federations.
- Finally, repository and federation builders will secure and maximise their investment by developing infrastructures based on standard specifications.

Within ASPECT, there is a specific work package (WP7) dedicated to examining stakeholder requirements, including those of: (i) teachers directly involved in the school pilots; (ii) content providers (including both MoE and commercial providers) that are members of the ASPECT Consortium; and (iii) organisations that have declared an interest in ASPECT's work and that have registered as ASPECT Associate Partners. Some initial deliverables from this work package can already be accessed on the project web site<sup>8</sup> (D7.1 Evaluation Plan, D7.2 Quality Assurance Plan, D7.3.1 Evaluation Plan v1).

Work in ASPECT also leverages and draws on the user requirements and needs that are continually being identified in the context of European Schoolnet's Learning Resource Exchange service. Of particular note here are the activities of the EUN LRE Working Group that includes 12 Ministries of Education. This group was set up in 2008 by the EUN Steering Committee (consisting of 31 Ministries) in order to manage the development of the public LRE service and to ensure that it is properly aligned with national content strategies for schools. ASPECT progress and results are presented and discussed with Ministries at each LRE WG meeting (at least two per year) and, at these meetings, Ministries themselves also report on how the content requirements and needs of their teachers and schools are developing.

A key trend already identified as a result of discussions with MoE is the growing interest in, and demand for, user-generated content (UGC). This has been fuelled by the explosion of Web 2.0 content authoring and collaboration tools that have become available over the last few years including some that have been developed in EUN projects.<sup>9</sup> A first seminar for policy-makers and innovative teachers working on UGC is being organised at EUN on 10 December 2009 and, in 2010, the ASPECT project will examine how its results can feed into UGC initiatives in different countries and at European level.

---

<sup>8</sup> <http://aspect-project.org>.

<sup>9</sup> The LeMill web community for finding, authoring and sharing learning resources was developed in the EUN CALIBRATE project, <http://lemill.net/>

## 6 Underlying Content

A critical mass on content has already been brought together in earlier projects (such as CALIBRATE and MELT), leading to the launch of the publicly available LRE service for schools. At the time of writing, the LRE federates 30 repositories, thereby providing access to more than 175,000 learning resources and assets and their metadata.

Where necessary, ASPECT content partners will add new content to which standards have been applied (e.g. SCORM and Common Cartridge content packages) to a customised and password protected version of the LRE portal that will be used by the 40 schools in the pilots (<http://portal.aspect-project.net/Aspect-Portal>). However, the main aim in ASPECT is not to increase the quantity of resources available to schools in the project but rather to explore the best ways to apply specifications and standards to LRE content and metadata in order to make it easier to:

- Create re-usable content,
- Test its conformance,
- Describe it with metadata,
- Manage metadata, and
- Discover content.

An extremely important dimension in ASPECT is that it will bring together content developers from both the public and private sectors and enable them to explore the potential of the new Common Cartridge specification and provide some of the first examples of CC resources for schools in Europe.

## 7 Summary of Activities

As a best practice network, the ASPECT project is designed to produce best practices for digital educational content discovery and use and tools and services to demonstrate and support these practices. This section provides an overview of the different tools and practices put in place by ASPECT to maximize the benefits of standards for learning content discovery and use.

### 7.1 Content packaging in ASPECT

Figure 1 illustrates some of the work already carried out by ASPECT on content specifications.

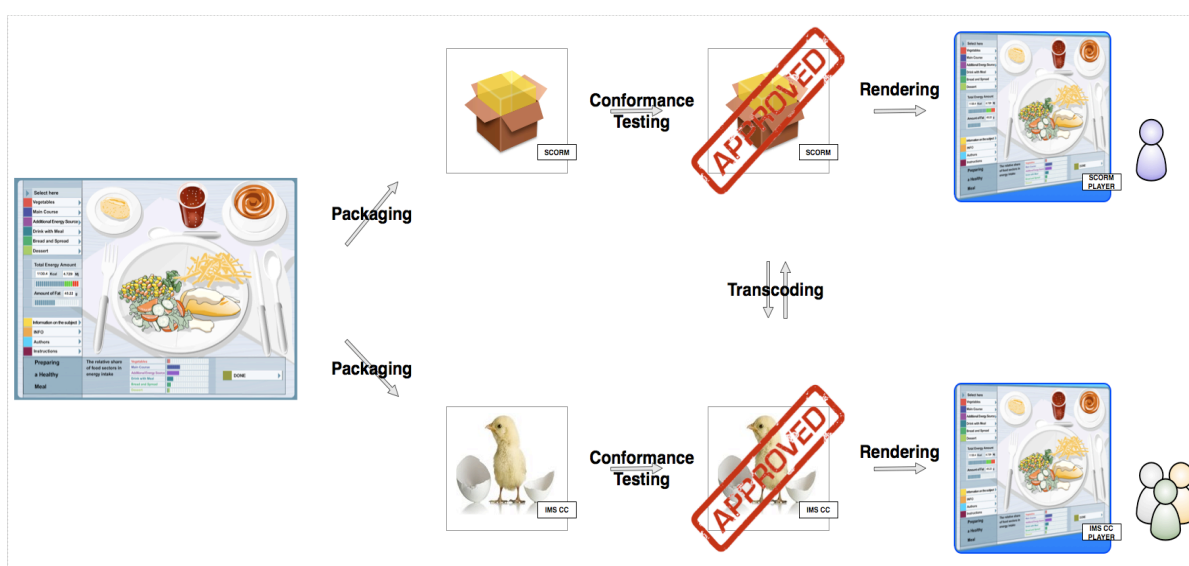


Figure 1 - Digital Educational Content.

E-learning content used in the classroom can consist of simple assets (text, images, short videos) but teachers are also regularly looking for more complex resources to teach a particular curriculum topic; these usually consist of multiple components (e.g., text, images, simulations, videos, assessment exercises etc.) that need to be combined in a precise way in order to provide end-users with a meaningful learning experience. Learning content specifications such as ADL SCORM (SCORM) and IMS Common Cartridge (CC) make it possible for such content to be reused in different learning systems. This is achieved by packaging all the required components in a zip file together with metadata describing how these components have to be rendered. As a result of this process where standards have been applied, the content becomes more 'interoperable' and can be more easily exchanged and reused in learning platforms from different commercial vendors or in open source VLEs (like Moodle) that comply with the relevant content packaging standards.

Currently, there are several content packaging specifications that differ in terms of the kinds of interactions they make possible between the content and its users. For example, the SCORM specification is particularly well adapted to self-paced, training situations where a single learner works independently with no instructor intervention. The more recent CC

specification, however, lends itself more to blended learning situations where traditional teaching is combined with web-based e-learning (two videos illustrating these differences between SCORM and Common Cartridge have been produced by ASPECT and are available on the ASPECT website at: <http://aspect-project.org/node/40>).

Compliance tests are a way of ensuring that content is packaged correctly according to a given specification. These tests are key to ensure that content is interoperable (i.e., that it can be correctly rendered by different learning platforms).

In addition, there is a category of tools called transcoders that can be used to turn content in a given packaging format (e.g., SCORM) into another format (e.g., CC).

In ASPECT, tools and procedures for packaging content, testing package compliance, and transcoding content are all being evaluated. Content packaged in different formats is created and made available in the LRE where it can be discovered and used by teachers thanks to a SCORM player and a Common Cartridge environment that have been integrated with the ASPECT portal for teachers. The experience gained during these experiments is used to:

1. Better understand under what learning circumstance it is preferable to use one specific content packaging format rather than another (e.g., SCORM may be more appropriate for self-paced training).
2. Better understand the scope and limitations of the different tools available and to possibly identify needs for better and/or other tools (e.g., some packaging/authoring tools are user-friendly enough to be used by teachers who want to author their own content, certain transcoders have limitations, etc.).
3. Provide feedback to standard organisations:  
IMS Common Cartridge is a new specification; version 1.0 was released in October 2008 and version 1.1 is currently under development. Thanks to a Memorandum of Understanding signed between the ASPECT project and the IMS Global Learning Consortium, the two organisations are cooperating on the dissemination and best practice related to implementing Common Cartridge<sup>10</sup>.

During the SE@M'09 workshop (<http://www.learningstandards.eu/seam2009/>) organised by ASPECT in Budapest on Nov. 4-5, 2009, ADL announced that it “has committed to engage with stakeholders and key community members and to lead the way to a harmonized and enhanced version of SCORM by 4<sup>th</sup> quarter 2011”. This announcement was followed by discussions between ADL and ASPECT that is now examining how its work can best contribute to this ADL SCORM harmonization effort.

---

<sup>10</sup> In addition, this Memorandum of Understanding also covers cooperation in developing region-specific application profiles of IMS specifications and developing conformance tests and cooperation in the development of the IMS Learning Object Discovery & Exchange (LODE) specification.

## 7.2 The ASPECT approach to metadata

As a consequence of ASPECT work on content, a given learning object is available in different formats, a situation that is difficult to adequately capture using existing metadata specifications such as the IEEE Learning Object Metadata (LOM) standard or Dublin Core (DC).

This issue is one of the things addressed by the new LRE Metadata Application Profile version 4.0 (LREMAP4 - <http://fire.eun.org/LREMAPv4p0.pdf>) that makes it simpler to describe learning objects in different formats.

Metadata specifications can be profiled (i.e., customized) to suit the needs of a particular community. As suggested by Figure 2, the LREMAP4 is based on the combination of two specifications: IEEE LOM and the Information for Learning Object eXchange (ILOX) specification, which is currently developed by the IMS Learning Object Discovery & Exchange (LODE) group in collaboration with ASPECT.

In order to better manage the application profiles created by different communities, ASPECT has started to develop a Metadata Application Profile Registry. When ready, this tool will make it possible to reference and document existing application profiles. This will have the following advantages:

- Providing consistent documentation of application profiles will enable system providers to more easily build products and services that span multiple communities with simple configuration settings for localization.
- The growing number of publicly documented application profiles will allow subsequent adopting communities to select and reuse elements of existing application profiles, rather than develop new application profiles from scratch.

One kind of customization of LOM introduced by the LREMAP4 consists in the use of controlled vocabularies tailored to the needs of the schools' sector in Europe. In order to adequately manage these vocabularies, ASPECT has developed a vocabulary bank for education (VBE - <http://aspect.vocman.com/vbe/home>). This bank is used to store controlled vocabularies, their translations and crosswalks between them. In the VBE, each vocabulary and vocabulary term is uniquely identified. Using the VBE term and vocabulary identifiers as the LREMAP4 neutral language makes it easier to deal with multilingualism issues: identifiers are stored in metadata and requested translations can be looked up in the VBE.

When the LREMAP4 was introduced, the LRE already counted more than 130,000 learning object descriptions in a LOM-based format. Thanks to the metadata transformation service, another metadata management tool developed by ASPECT, it was possible to turn all the legacy metadata of the LRE into the new application profile. Note that this metadata transformer only deals with structural metadata transformation. In a future release, it will rely on the crosswalks stored in the VBE to map controlled vocabulary terms.

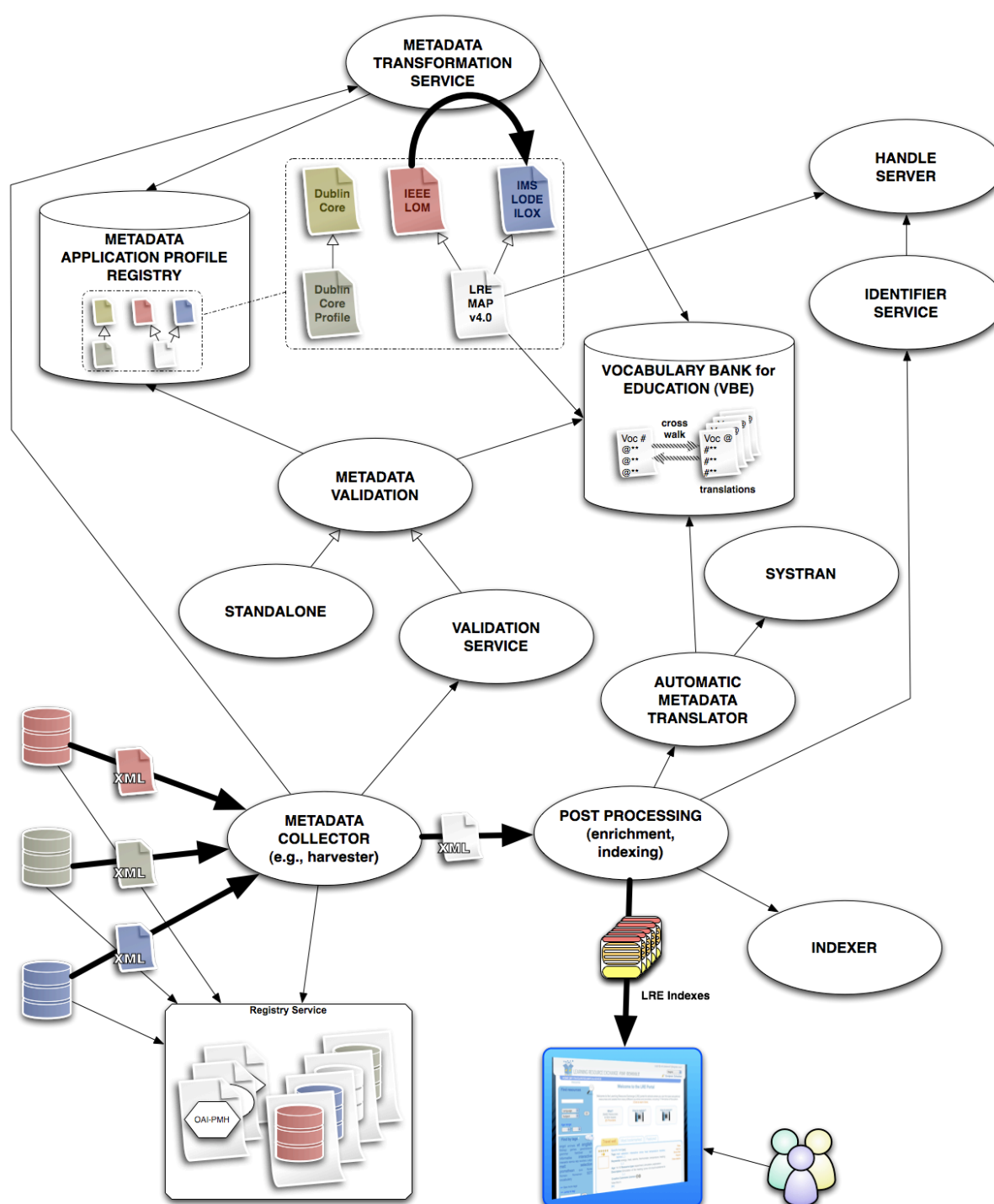


Figure 2 – Metadata management in ASPECT. Tools and Services are represented by ovals. Thin solid arrows are used to show dependencies between services (e.g., the METADATA VALIDATION “uses” the VOCABULARY BANK for EDUCATION). Thin hollow arrows are used to express special relationships between components (e.g., the VALIDATION SERVICE is a specialized service derived from the METADATA VALIDATION or LRE MAP v4.0 is a profile derived from IEEE LOM and IMS LOE ILOX). Finally, solid bold arrows represent data flows / exchanges between components.

A metadata application profile such as the LREMAP4 is key to meet technical and other requirements and preferences specific to a community (in the case of ASPECT, the European

school sector), to address ambiguity and generality in a specification or standard and to foster semantic interoperability, e.g., through the use of commonly understood vocabularies.

However, successful interoperability is only possible if metadata conforms to the chosen application profile. This is why ASPECT has put in place metadata validation tools that can be used either as a standalone application (that content providers can use to check the quality of the metadata that they have produced) or as a service that can be integrated with other applications. The metadata validation tools rely on:

1. The metadata application profile registry to identify profiles and their corresponding tests and
2. The vocabulary bank for education, in order to get access to the canonical versions of the controlled vocabularies used by the profiles to be tested.

Content providers use the LREMAP4 to describe their learning objects and store the metadata produced in repositories from where it can be collected using metadata collector software such as the ARIADNE harvester. In ASPECT, the ARIADNE harvester is integrated with:

- A metadata validation service<sup>11</sup> to ensure the good quality of the collected metadata and
- A metadata transformation service that turns non-LREMAP4 metadata semi-automatically into the correct format.
- A notification service (RSS feed) that notifies content providers if there are problems with their metadata.

Once it has been confirmed that the collected metadata is in the valid LREMAP4 format, an identity service can compare the new learning object descriptions to the existing ones in order to identify descriptions of new objects and to stamp each of them with a persistent handle identifier<sup>12</sup>. Then, each new learning object description is translated using an automatic translation service. This ASPECT service relies on SYSTRAN for translating free text metadata elements (e.g., title, description) and on the vocabulary bank for education for translating controlled vocabularies. Once translated, metadata is indexed and indexes are provided to applications, such as the ASPECT portal, that allows end-users to search and use learning objects.

Currently, when collecting metadata stored in content providers' repositories, it is necessary to know a priori where these repositories are and how to obtain access to their collections. However, ASPECT is also working with IMS LODE, ARIADNE and GLOBE on a specification for describing learning object repositories, their collections, and protocol registries that will make it possible to build active registries of learning object repositories. These active registries will be used to make repositories and their collections globally discoverable and to automate the construction of federations such as the LRE.

---

<sup>11</sup> The validation service itself has been integrated with the VBE for validation.

<sup>12</sup> By persistently identifying with handles all the learning objects referenced in the LRE and by sharing these identifiers with both the content providers and users, ASPECT seeks to establish a European identity card for learning objects in order to improve the management of learning objects and their metadata.

## 8 Impact & Sustainability

By working directly with standardization bodies such as the IMS Global Learning Consortium, the CEN/ISSS Workshop on Learning Technologies and the Advanced Distribution Learning initiative, the experience gained by ASPECT has already had a direct influence on the following emerging specifications:

- IMS Common Cartridge version 1.1
- IMS LODE version 1.0
- The Simple Publishing Interface (SPI) CEN Workshop Agreement

ASPECT has also been instrumental in defining the activity of a new CEN WSLT expert team who will work on registry interoperability.

Most best practices developed by ASPECT require supporting tools whose role is effectively to 'hide' the technical complexities of the considered standards and to allow users of the standards to reap their benefits. For example, the goal of the learning object repository registry developed in ASPECT is to dramatically simplify the management of learning object federations by automating the discovery and access to repositories, two time-consuming tasks that have to be performed manually in current state-of-the-art federations.

However ASPECT is not only producing such tools (often as open source software) but is also actively promoting their use, for example via its LRE Service Centre – <http://servicecenter.aspect-project.org>). The ARIADNE harvester and metadata validator, the vocabulary bank for education and the identity service are a few examples of such services. ASPECT has also proved instrumental in testing, improving or informing the development of numerous other tools - both commercial and open source - such as IMS schemaprof, the Icodeon Common Cartridge environment, or the new version of the ADL test suite.

Finally, ASPECT is actively disseminating its best practices. This includes organising training for developers of learning object repositories from other communities; an example here is the technical workshop for agricultural repository developers co-organised by ASPECT, the Organic.Edunet project and the FAO that was held in Budapest in November 2009 (<http://aglr.aua.gr/node/4>). Similarly, ASPECT public workshops, such as those organised at the annual BETT Show, are enabling the project to reach both large and small European publishers and content developers. Special briefings (such as those for the European Educational Publishers Group in January 2009) are also helping the project to extend the number of ASPECT Associate Partners.

By the end of the project, a key measure of its success will be the extent to which ASPECT best practices have impacted on the national content development strategies of European Ministries of Education, nine of which are directly involved in the project. In the first year of the project it has been particularly useful to present ASPECT's work on content packaging and the new Common Cartridge specification to Ministries in the LRE Working Group (see also section 5). Ongoing discussions with the LRE WG concerning the services that are now emerging as part of the LRE Service Centre provided by ASPECT will also be very important



in terms of ensuring that project results meet the needs of schools across Europe and directly feed into national policy making related to the adoption of content standards.