

ECP 2007 EDU 417008

ASPECT

First Release of the Integrated System

Deliverable number	<i>D5.3</i>
Dissemination level	<i>Public</i>
Delivery date	<i>November 2009</i>
Status	<i>Final</i>
Author(s)	<i>David Massart (EUN)</i>



eContentplus

This project is funded under the *eContentplus* programme¹,
a multiannual Community programme to make digital content in Europe more accessible, usable and exploitable.

¹ OJ L 79, 24.3.2005, p. 1.



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0 Introduction

ASPECT is a Best Practice Network that aims to improve the adoption of two categories of learning technology standards and specifications: specifications for content use (e.g., content packaging formats) and specifications for content discovery (e.g., metadata, vocabularies, protocols, and registries).

As part of its activities, ASPECT produces recommendations and best practices for an efficient use of these standards and specifications; it provides components (i.e., tools and services) from different partners for supporting these practices¹; and integrates these components with European Schoolnet's Learning Resource Exchange (LRE) so that the recommendations of the project can be tested and validated in a real-world setting.

This document describes the first release of this integrated system. It is structured as follows: Section 1 introduces the workflows of content and metadata (from their creation to their use) and Section 2 described the integration work that was carried out to support these workflows.

¹ The LRE Service Centre supported by ASPECT is used to collect this material and make it available to interested stakeholders outside the project. It can be found at <http://servicecenter.aspect-project.org>.

1 Workflows

1.1 Content Workflow

Figure 1 illustrates the content workflow.

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 consists of multiple components (e.g., text, images,

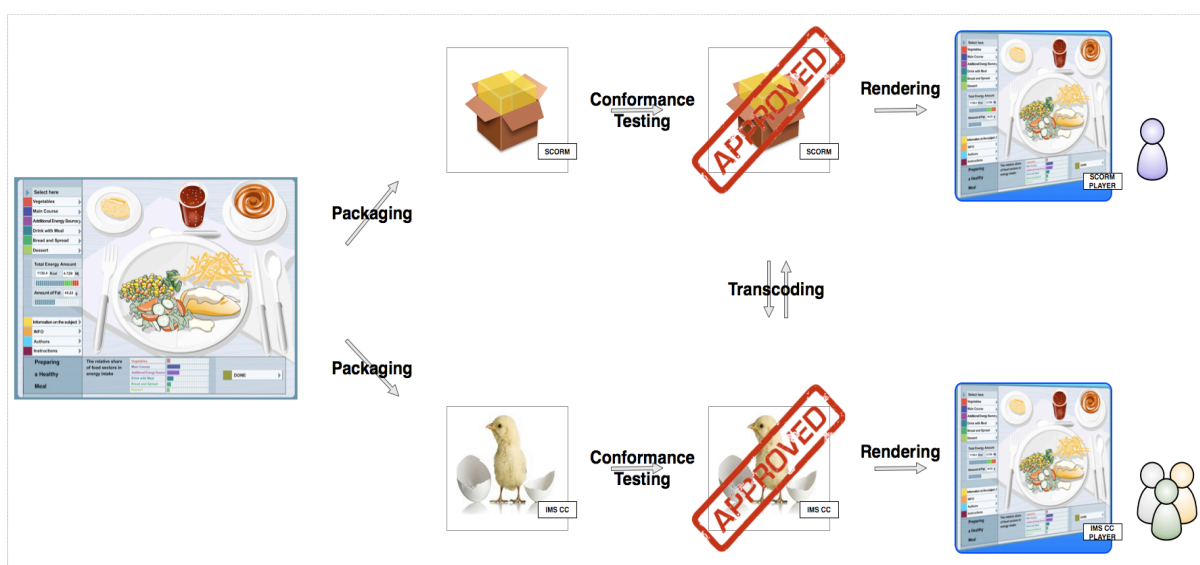


Figure 1 - Content workflow.

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. 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 “content packaging” 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 Virtual Learning Environments (like Moodle) or commercial VLEs or learning platforms that comply with the relevant content packaging standards.

Until now, ASPECT has been looking at two packaging specifications that differ in terms of the kinds of interactions they make possible between the content and its users: ADL SCORM (SCORM) and IMS Common Cartridge (CC). The SCORM specification is particularly well adapted to self-paced, training situations where a single learner works independently with no instructor intervention. Work in ASPECT, however, is beginning to confirm that the more recent CC specification lends itself more to blended learning situations where traditional teaching is combined with web-based e-learning¹.

¹ 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>.

Once content has been packaged, 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).

Finally, packaged content can be loaded in specialized players that are capable of appropriately rendering them.

Note that different scenarios derived from this generic workflow and tools necessary to support them are described on the ASPECT website at <http://aspect-project.org/node/40>.

1.2 Metadata Workflow

Once new ASPECT content is produced and properly packaged, it is described according to the LRE Metadata Application Profile v4.0 (LRE MAP v4.0 - <http://fire.eun.org/LREMAPv4p0.pdf>) or another application profile and the resulting metadata is stored in repositories.

Thanks to protocols for exposing metadata such as the Open Archives Initiative – Protocol for Metadata Harvesting (OAI-PMH), the Simple Query Interface (SQI), or the Simple Publishing Interface (SPI), it is possible to collect metadata stored in repositories.

Collected metadata is then validated to make sure it conforms to its application profile and, when needed, turned into LRE MAP v4.0 format.

Content described in the metadata is then uniquely and persistently identified and the identifiers generated this way are added to the metadata.

Then, metadata are translated before it is used to build indexes. The latter are used by different application such as the ASPECT PORTAL and make it possible for users to retrieve content.

This workflow is described in details in:

D. Massart. Towards a pan-European learning resource exchange infrastructure. In Y. Feldman, D. Kraft, and T. Kuflik, editors, *Proceedings of the 7th conference on Next Generation Information Technologies and Systems (NGITS'2009)*, LNCS 5831, pages 121—132, Haifa, Israel, June 2009. Springer. Also available online as <http://lre.eun.org/node/4>.

2 Integration

The way the different ASPECT tools and services have been integrated to support the content and metadata workflows described in Section 1 is shown on Figure 2. 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 LODE ILOX). Finally, solid bold arrows represent data flows / exchanges between components.

The LRE Metadata Application Profile version 4 (LRE MAP v4.0), which is based on a combination of IMS LODE ILOX and IEEE LOM, is used to describe ASPECT learning resources. This application profile relies on the VOCABULARY BANK for EDUCATION (VBE) to represent controlled vocabularies entries. This means, for example, that, to be valid, metadata instances of this application profile must refer to vocabulary terms using their VBE identifiers. Similarly, the LRE MAP v4.0 was designed to use persistent identifiers generated by the ASPECT HANDLE SERVER.

Once the ASPECT content providers have described their learning objects, they store the resulting metadata in repositories where it can be collected using the ARIADNE harvester. The latter uses:

- The VALIDATION SERVICE to check metadata instances for correctness, and
- The METADATA TRANSFORMATION SERVICE to turn non-LRE MAP v4.0 metadata into LRE MAP v4.0

The VALIDATION SERVICE itself uses the VBE to obtain the controlled vocabularies used by the LRE MAP v4.0 and check that these vocabularies are correctly used.

The METADATA TRANSFORMATION SERVICE also relies on the crosswalks between vocabularies stored in the VBE for correctly handling controlled vocabulary differences between application profiles.

Once all the collected metadata is in valid LRE MAP v4.0 format, an IDENTIFIER SERVICE compares the newly collected metadata instances to the ones already stored in the LRE in order to identify learning resources that were unknown in the LRE and uses the HANDLE SERVER to allot each of them a persistent identifier.

Once correctly identified, the new metadata instances are turned into an internal LRE format using the METADATA TRANSFORMATION SERVICE (for simplicity, this step is not represented on the Figure 2) and translated using an AUTOMATIC METADATA TRANSLATOR. The latter relies on SYSTRAN software to translate free text metadata elements and on the VBE to translate controlled vocabulary elements.

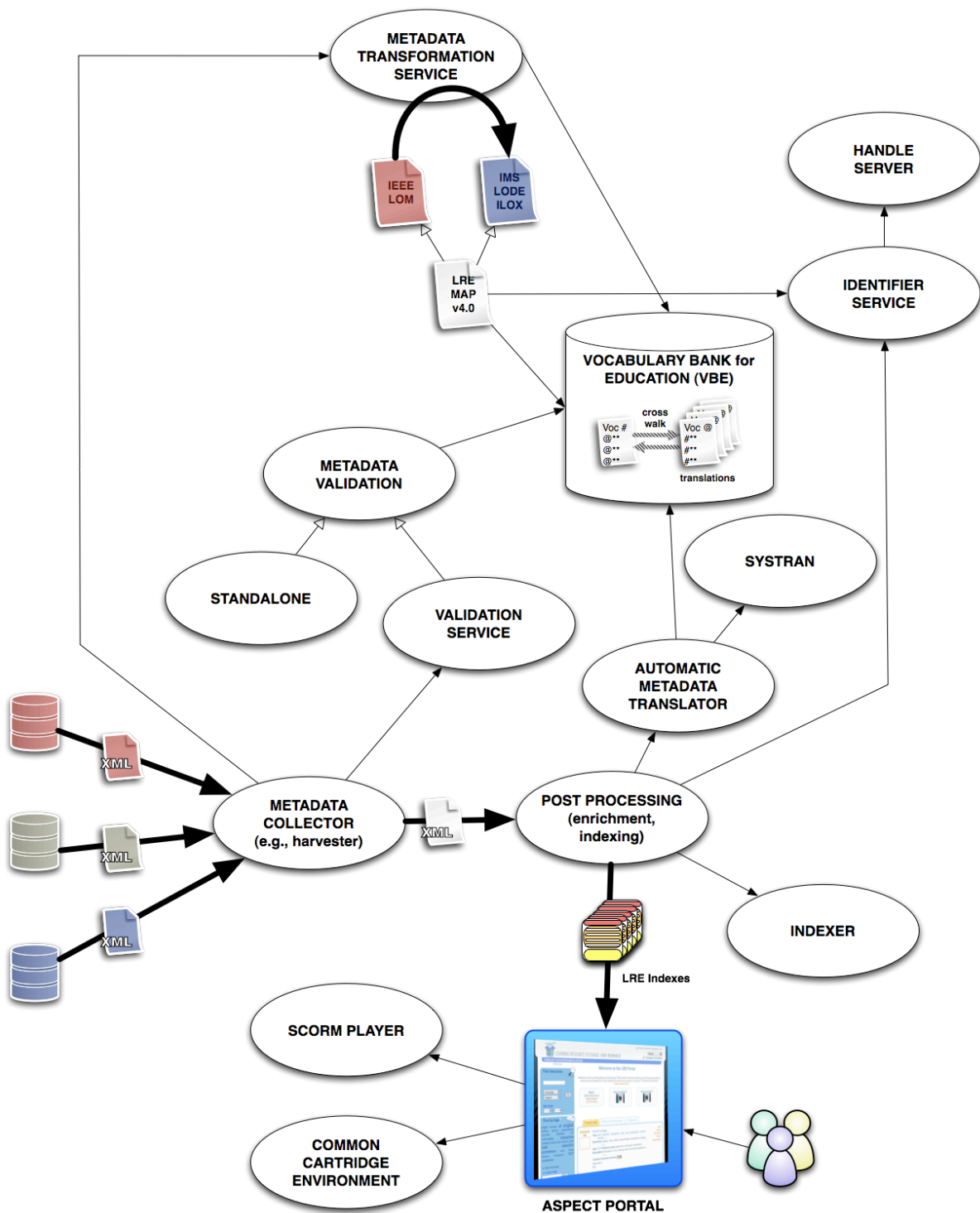


Figure 2 - The ASPECT integrated system.

Then, the enriched metadata is indexed and the ASPECT PORTAL indexes are updated which allows end-users to search and retrieve learning objects in different formats. The ASPECT PORTAL has been updated to support the LRE MAP v4.0 and integrated with instances of the Icodeon SCORM PLAYER and Icodeon COMMON CARTRIDGE ENVIRONMENT. As a result, the ASPECT PORTAL is now able to automatically detect and render content in SCORM and IMS CC format.



3 Conclusion

This deliverable describes the ASPECT Integrated System as it is in November 2009. As the project moves forward, new tools and services will be integrated into the overall system. Future plans include among others:

- Support for additional metadata transformations (e.g., from Dublin Core to LOM and ILOX);
- Integration of a Learning Object Repository Registry to automate the discovery of, selection of, and connection to learning object repositories;
- Integration of an Application Profile Registry to simplify the management of metadata application profiles and their documentations.
- Integration of an Access Control Mechanism that will allow for exchanging non-open content.