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ASPECT

Infrastructure & Services v2.0

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eContentplus

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¹ OJ L 79, 24.3.2005, p. 1.

Summary

Deliverable D2.6 is aimed at consortium partners on the one hand, and software engineers and developers of content providers on the other hand. It presents an overview of the services that are part of the ASPECT Infrastructure and Services v2.0. Before shortly summarizing those services that have been described in D2.5 “Infrastructure and Services v1.0”, this deliverable presents detailed information on those services that are either new in v2.0 or updated since v1.0. All software components in this deliverable are available under open-source licenses.

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1 Introduction

The ASPECT Service-Oriented Architecture aims at providing a set of standards implementation support services and a platform in which existing and emerging standards and specifications are applied to enable the discovery, exchange and reuse of a diverse range of educational resources. Through this architecture,

- Content providers can offer their learning resources to teachers,
- Teachers will be able to discover and therefore use those resources.

This target group of this deliverable are, on the one hand the consortium partners, and on the other hand software engineers and developers of content providers interested in applying the best practice standards of the ASPECT project.

The actual deliverable of WP2 for the second version of the ASPECT Infrastructure and Services consists of the software components and services that are described below. The purpose of this document is to give an overview on these components.

We start with an overview of all services in the ASPECT infrastructure in section 2. Section 3 presents the services that are deployed in v2.0 of the infrastructure. As we already mentioned in D-2.5, the ASPECT infrastructure is meant to evolve and therefore this document represents the state of the ASPECT services at the time of writing (M18). For an up-to-date description of the ASPECT architecture, please consult deliverable D-2.4 which is a “Wiki with material to support training and dissemination”.

2 The ASPECT Infrastructure & Toolset

Note that this section, which presents an overview of the ASPECT Infrastructure and Services, has already been presented in D2.5 “Infrastructure and services v1.0”. Therefore, we only introduce those v2.0 services that are either new or enhanced since v1.0. A complete overview of all services can be found online at [3].

The ASC includes a number of services, which are added in the overview Figure 1. We distinguish between single services, which are represented in red blocks, and sets of services, which are represented in orange blocks.

2.1 Sets of Services

- A **LOR registry** is a catalog service that provides up-to-date information on learning object repositories. It provides the information necessary for systems to be able to select the appropriate protocols such as OAI-PMH, SQI, SPI, SRU/SRW supported by a given LOR. In this way it facilitates interoperability between learning object repositories.
- A **registry of application profiles** describes the metadata application profiles used by the different LORs to describe their learning resources.
- The **Vocabulary Bank of Education (VBE)** is a repository in which multilingual terms and vocabularies can be published and disseminated.

2.2 Single Services

- A **Validate** service is available for providing validation of metadata instances against multiple application profiles of LOM that exist in various networks.
- An **Enrich** service is provided to enable enrichment of metadata instances that are available in the ASPECT LRE. The goal of this service is to enable better discovery rate of resources.
- A **Transform** service transforms metadata in a format, for example the LRE LOM Metadata application profile, into another format e.g., an application profile of Dublin Core.

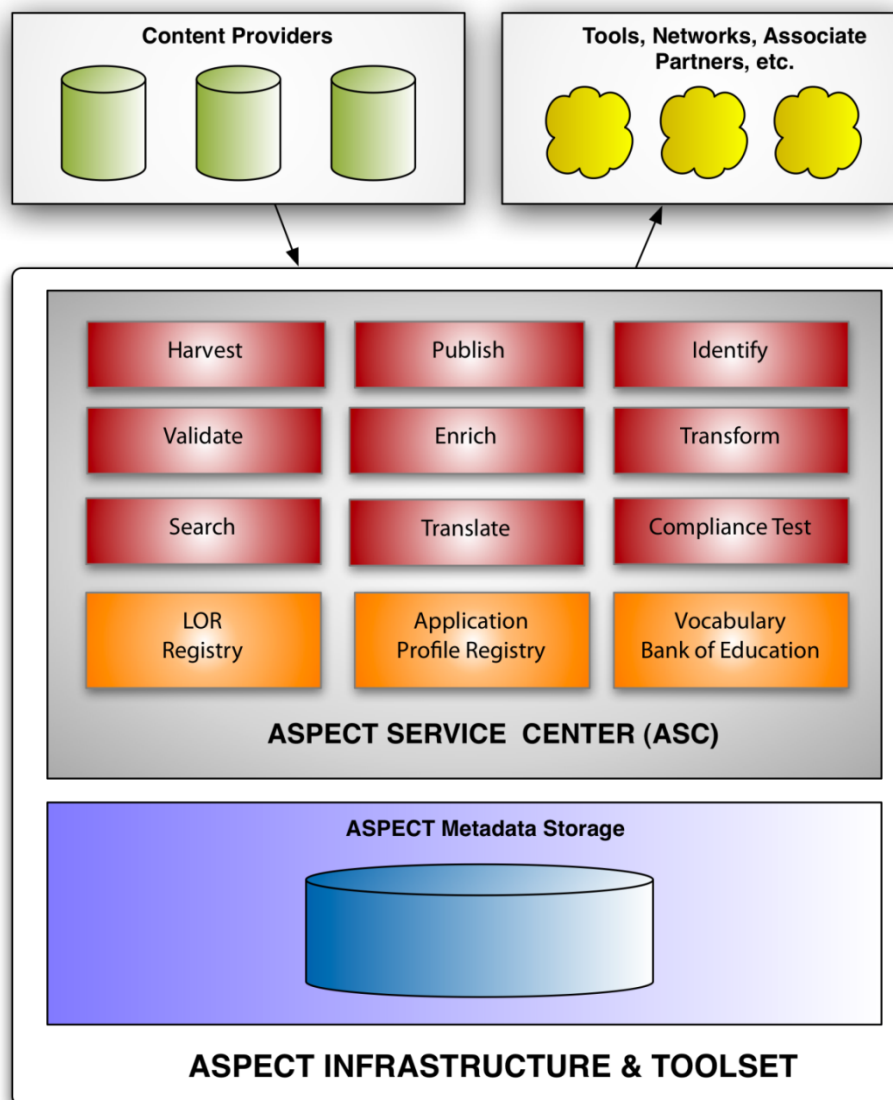


Figure 1: The Aspect Infrastructure

3 Infrastructure & Services v2.0

The following sections present an overview of those services in the second version of the ASC that are either newly added or enhanced since v1.0 (M9).

3.1 LOR Registry Service

A registry is a catalog service that provides up-to-date information about a type of resources. Registries of learning object repositories, such as our LOR Registry Service, i.e., registries that contain the information necessary to enable interoperability between systems, for instance by enabling systems to select relevant, supported protocols such as OAI-PMH, SSI, SPI, SRU/SRW can:

- be consulted by humans (such as developers who want to provide access to the repository, or end users who want to decide whether the repository is relevant to them)
- be accessed by software processes (that can, for example, use the data to forward a federated search to a repository or to initiate its harvesting).

Content providers who want to share their resources, first register their target in the LOR registry. While registering, they provide information among other things about:

- the characteristics of their repository like contact persons, names, URL, etc.
- the characteristics of the content,
- the metadata schemes they use to describe their contents,
- the protocols, standards and specifications they offer to provide access to their content,
- rights of the content,
- etc.

For full details on the information that can be provided, we refer to D2.2. All information about a repository is captured in the registry using the data model that is described in D2.2 as well. This data model is the result of a collaborative work between the ASPECT project, the IMS LODE Working Group and the Global Learning Objects Brokered Exchange (GLOBE) alliance. It is based on current work on the ISO 2146 standard: “Registry Services for Libraries and related organisations” that is developed by ISO TC46 SC4 WG7 and proposes a framework for building registry services for libraries and related organisations.

The current version of the registry is available online at

<http://ariadne.cs.kuleuven.be/ariadne-registry/>

Figure 2 shows the user interface of the registry.

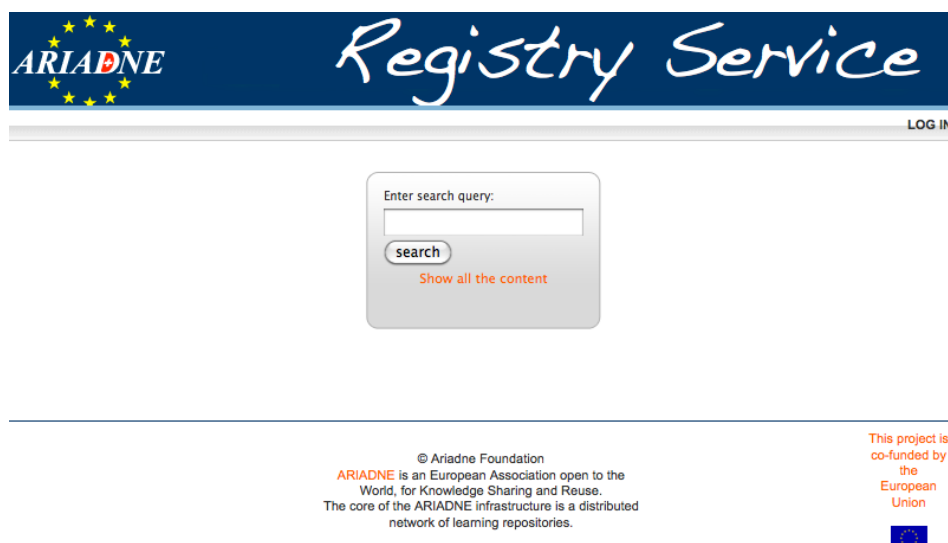


Figure 2: The ASPECT registry

The following section explains the functionality supported by the LOR in the ASC v2.0 by describing key use cases.

3.1.1 Use Cases

3.1.1.1 Add a new repository to the registry via the user interface

Summary:

A person adds a new target repository to the registry. The addition of a new repository into the registry is published as a news item in the rss feed.

Actors:

A registered user.

Trigger:

Triggered by the actor.

Description:

- The user navigates to the login page of the registry web page. If a user is not yet registered, he needs to register first
- The user logs in and navigates to the add repository page.
- The system shows both a form that the user can fill in and an upload field that allows the user to upload a metadata instance that describes the repository to be added. The form contains the necessary fields to enter the information as described in section 3.1.
- The user fills in the form – or uploads metadata instance.
- The system tries to automatically deduct information from the combination of the protocol and the target URL and asks the user for confirmation of the information deducted .
- The system tries to validate the information provided by the user by using the ARIADNE validation service.
- The user validates all information and clicks on a "save in registry" button.
- The system publishes the news story of a new repository.

Result:

A new target has become visible in the registry. Subscribed users are informed about this.

Remark:

The current version of the registry does not yet support validation of user provided information. This will be added in v3.0

3.1.1.2 Search the registry

Summary:

Any actor or person is able to search the contents of the registry.

Actors:

Any Person

Trigger:

Triggered by the actor

Description:

- The user navigates to the registry web page.
- The system shows a list of all repositories that are added to the registry. From that page, a user can issue a simple query to select repositories that are of interest to him.
- The user fills in simple keywords or tags.
- The system displays the list of repositories matching the issued query. The list contains all information that is available in the registry.

Result:

The user is able to find interesting repositories that are available in to the registry.

Remarks:

- Besides basic information about the repositories in the registry, the registry offers the possibility to show the complete metadata instance that describes the repository.
- Figure 3 shows a screenshot of the registry user interface that shows a list of all repositories.

3.1.1.3 Login

Summary:

A user logs on to the registry configuration.

Actors:

A registered user such as a repository owner.

Trigger:

Triggered by the actor

Description:

- A user navigates to the login page of the registry configuration tool.
- The system displays the logon page with 2 fields (username + password) and a "forgot password" link.
- The user fills in his or her credentials.
- The system checks the provided credentials and displays all pages that can be accessed by a logged-in user.

Results:

The user is able to

- add repositories,
- search repositories in the registry,
- remove repositories,
- edit repositories configuration,
- configure a harvester,
- etc.

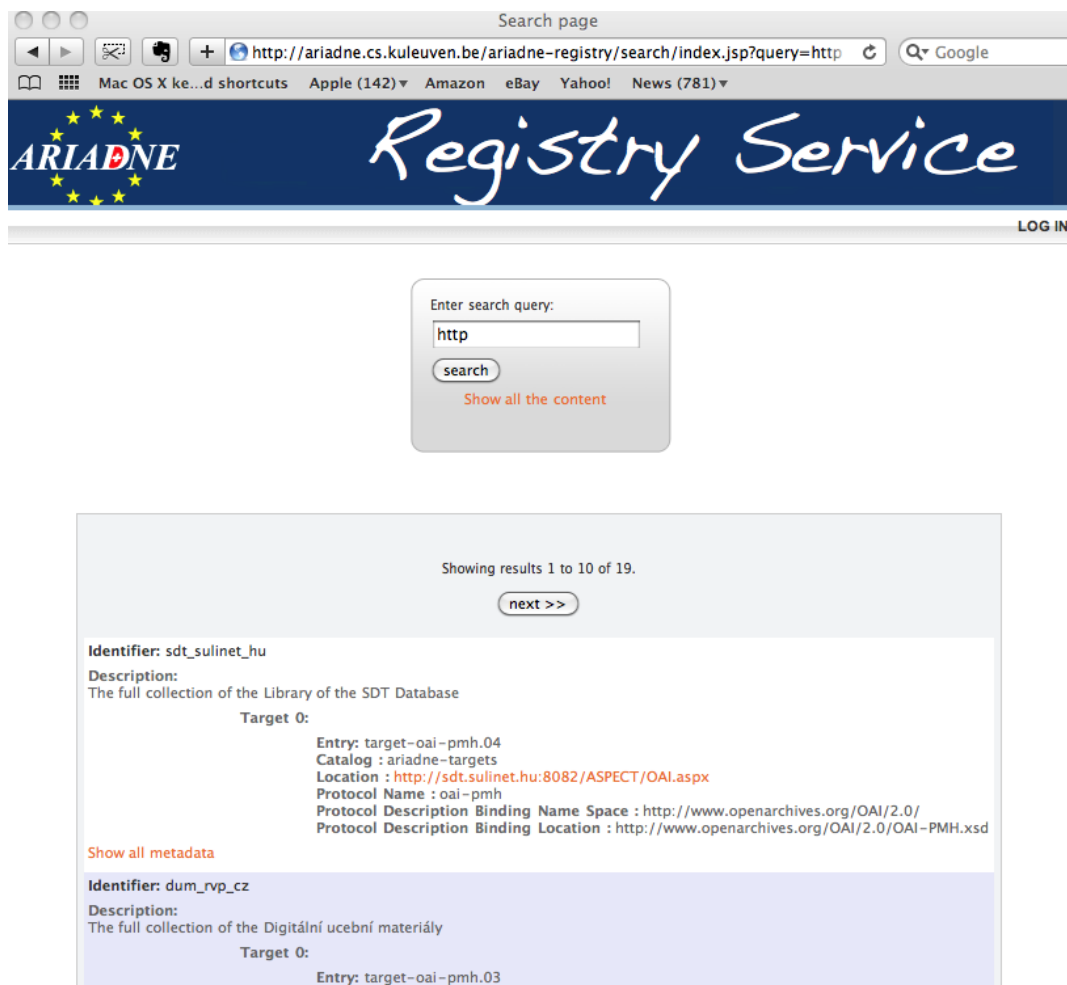


Figure 3: Screenshot of the simple query page

3.1.1.4 Subscribe to News

Summary:

News is provided by a set of RSS feeds to which any person can subscribe.

Actors:

Any Person

Trigger:

Triggered by the actor

Description:

- The user navigates to the registry web page, and can subscribe to the following RSS feeds:
- List of all repositories added:
 - <http://ariadne.cs.kuleuven.be/ariadne-registry/rss/LastTargetAdded.jsp>
- List of all OAI-PMH targets added:
 - <http://ariadne.cs.kuleuven.be/ariadne-registry/rss/LastTargetAddedOai.jsp>
- List of all SQI targets added:
 - <http://ariadne.cs.kuleuven.be/ariadne-registry/rss/LastTargetAddedSqi.jsp>
- List of all SPI targets added:
 - <http://ariadne.cs.kuleuven.be/ariadne-registry/rss/LastTargetAddedSpi.jsp>
- The user adds the feed to his or hers favourite news reader.

Results:

The user is able to get news updates on the registry in his news reader. An example is shown in figure 4 where the reader can see the last added repositories in the Safari Browser.

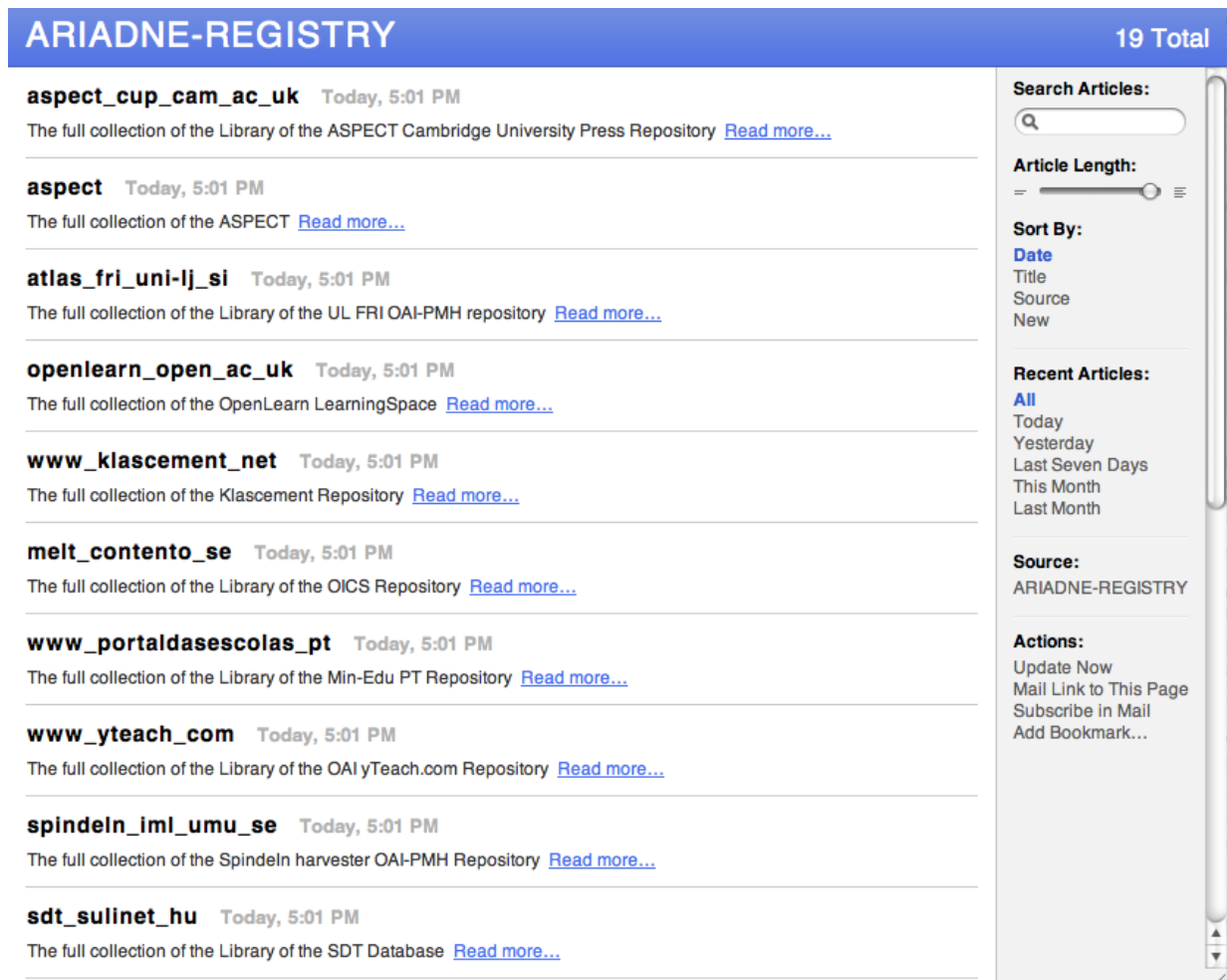


Figure 4: Screenshot of the Safari RSS reader: viewing newly added repositories in the registry.

3.1.1.5 Configure an instance of the ARIADNE harvester

Summary:

A person wants to configure an instance of the ARIADNE harvester. This means selecting a number of repositories in the registry that he wants to harvest into his own collection. One instance of the registry can configure multiple instances of the ARIADNE harvester.

Actors:

A registered user.

Trigger:

Triggered by the actor

Description:

- The user navigates to the "Manage Harvester Configuration" page.

- The system shows the search-page to the user where he or she can (de-)select repositories in the registry that might be of interest.
- The system analyses the selected repositories, and adds them to the harvesters' configuration.
- The system shows a new page with a confirmation message that the configuration succeeded or not.

Result:

A harvester instance has been (re-)configured.

Remarks:

- Figure 5 shows an example how a repository in the registry can either be added or removed from an instance of the harvester.
- This use case shows the first integration of a client tool (i.e. the harvester) and the registry services.

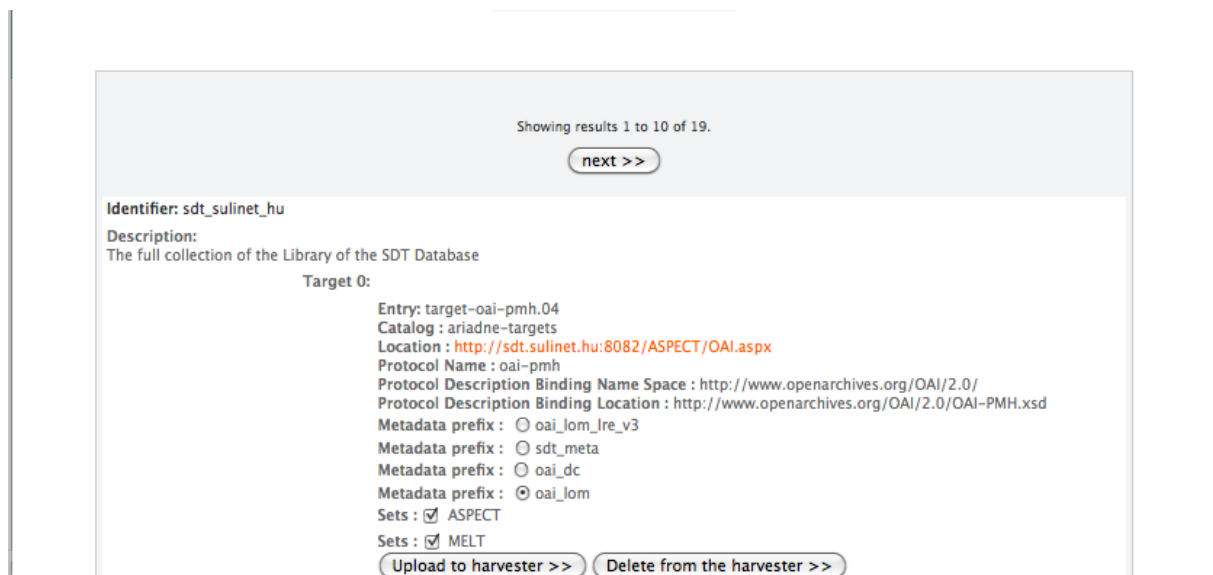


Figure 5: Selecting targets in the registry that should be harvested

3.1.2 Implementation

The registry has been built on top of the ARIADNE repository architecture, which is a standards-based architecture for managing learning objects in an open and scalable way. More information on the ARIADNE repository architecture can be found in [1].

The registry software is open-source and can be found online at:

<http://sourceforge.net/projects/ariadnekps/>

3.1.3 Statistics

At the time of writing, all repositories of the ASPECT content providers have been added to the registry. The goal is to add all providers in the GLOBE (Global Learning Objects Brokered Exchange) consortium in the near future.

3.2 Transform Service

The purpose of the Metadata transformation service is to allow users to transform metadata from one format (i.e. one application profile) such as LOM Strict to another format such as LREv4.0 application profile [2]. Figure 6 shows a screenshot of the online transform service

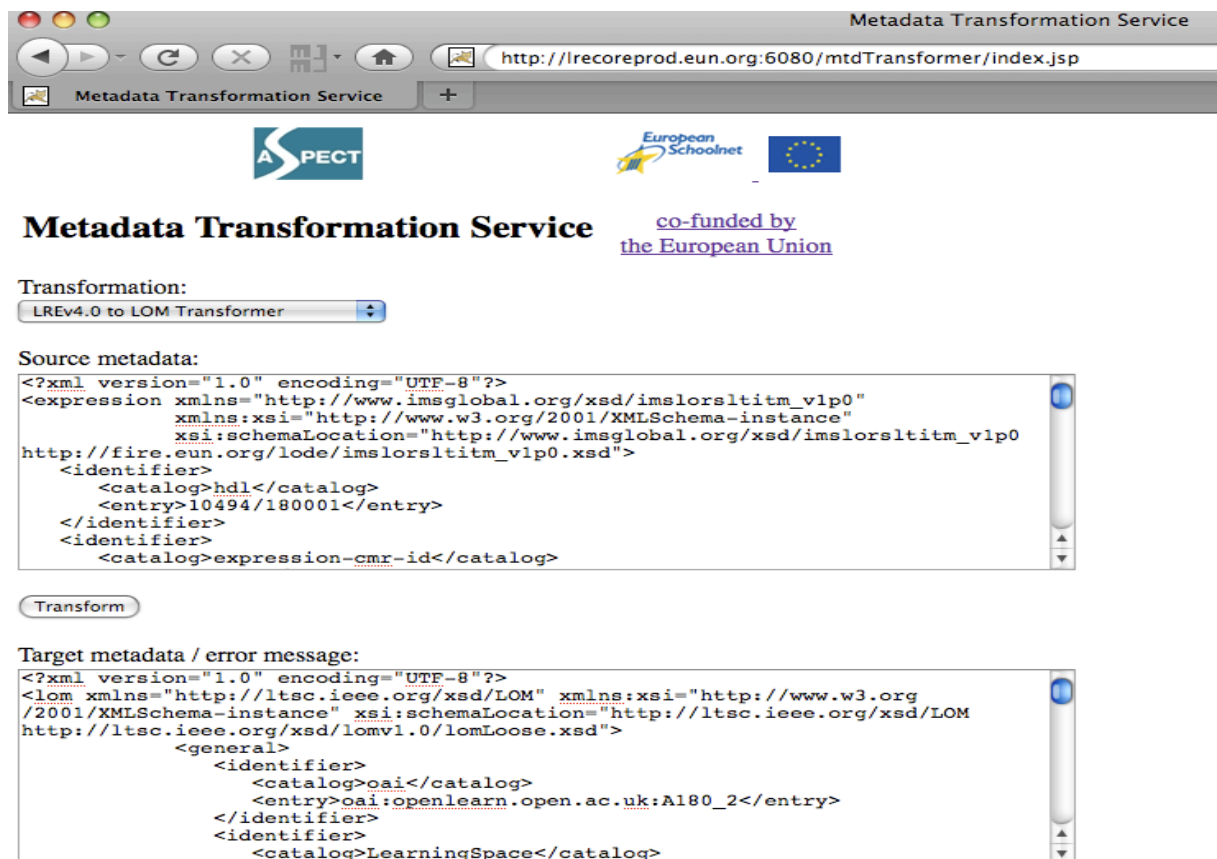


Figure 6: The ASPECT Transform Service

This online version only permits users to transform one metadata instance at a time, which is convenient when you are trying to locate specific problems or to work out how the transformation service will affect specific metadata instances.

If you need to transform a large number of metadata instances, we recommended that you use the transformation library that is available as open source software at <https://lretools.svn.sourceforge.net/svnroot/lretools/trunk/transformation-service>

The following section explains the supported functionality in the ASC v2.0 by describing their its use-case.

3.2.1 Use Case

3.2.1.1 Manually transform a metadata instance

Summary:

An actor wants to transform one metadata instance in a given application profile to a metadata instance in another profile.

Actors:

Any Person

Trigger:

Triggered by the actor

Description:

- The user navigates to transform a web-page or web-pages.
- The system shows the transform page with a select-box. The select-box shows which transformations are possible with the transformation service.
- The user selects the transformation he would like to do and fills in the source metadata in the upper text area.
- The user clicks on the transform button.
- The system transforms the metadata instance into the target application profile. If it succeeds, the lower text area will contain the new metadata instance. If an error occurs, the lower text area will contain the reason why it didn't work.

3.2.2 Implementation

At the time of writing the transform service supports:

- Extensible Stylesheet Language (XSL) transformations,
- Java-based transformation,
- Vocabulary crosswalks from the Vocabulary Bank of Education,
- Metadata validation of the source and target metadata instance by using the validation service in the ASC.

The transform service is based on a plugin architecture where new transformations can be added as plugins, provided as jar files, with no needs for modifying the transformer core.

3.2.3 Statistics

At the moment, the following plugins are available in the transform service:

- LREv3.0 to LREv4.0 transformation
- LREv4.0 to LOM Loose transformation
- LOM Strict to LREv4.0 transformation with "Learning Resource Type" crosswalk
- Hello Java transformation (to demonstrate a Java-based plugin)
- Hello XSL transformation (to demonstrate an XSL plugin)

A number of content providers already support the LRE Metadata Application Profile v3.0. For enabling an easy and rapid migration to the new binding of the profile v4.0, the transform service allows an automatic migration from v3.0 to v4.0. Internally, the transform service uses an XSL-transformer for this. After the automatic migration of the different bindings, content providers are advised to harvest back all their metadata records locally.

3.3 Harvest service

ASPECT uses the Ariadne harvester for harvesting the content from different providers. Compared to the the ASPECT Infrastructure and Services v1.0, the harvester can now be configured by querying the registry service to find repositories that might be interesting to harvest. This use case has already been described in section 3.1. Furthermore, it's now possible to subscribe to an RSS news feed. In ASPECT, every content provider gets harvested every 3 days. At runtime, all resources that are harvested, are validated with the ASPECT

validation service. The results of the validation are published in the RSS news feed. This feed is available at

<http://ariadne.cs.kuleuven.be/aspect-harvester/rss/TargetListRss.jsp>

The software of the harvester can be found on the ASPECT wiki D2.4 that is available at

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

The harvester is also an open-source software that can be downloaded from:

<http://sourceforge.net/projects/ariadnekp/>

3.4 Validate Service

The ASPECT validate service is online available at

<http://ariadne.cs.kuleuven.be/validationService/>

The validate service has been extended since the ASC v1.0 and now also supports validation of the registry data model that has been described in D2.2. Besides that, the validation service has now been integrated with the transform service.

3.5 Enrich Service

ASPECT offers a service to enable enrichment of metadata instances that are available in the LRE. The goal of this service is to enable better discovery rate of resources. The next paragraph shows how ASPECT currently enriches metadata.

3.5.1 Statistics

At the moment, the following enrichment of metadata takes place:

- Addition of ASPECT identifiers using the ASPECT Identifier service which is based on the handle system.
- Addition of descriptors from the LRE thesaurus
- Addition of free text translations. Currently titles, descriptions and keywords are automatically translated.

3.6 Vocabulary Bank of Education (VBE)

The VBE is available at <http://aspect.vocman.com>. Currently, the VBE is populated with the different vocabularies of the LRE Metadata application profile. Since the previous version of the ASC, the VBE is now integrated with the ASPECT validation service and the ASPECT transform service. Table 1 shows the vocabularies that are currently available in the VBE at the time of writing.

3.6.1 Statistics

Vocab	Term Count	Language count	Complete Language count
Actions	83	1	1
IMS Manifestation names	5	1	1
LOM Aggregation Levels	4	1	1
LOM Copyright and other restrictions	2	1	1
LOM Costs	2	1	1
LOM Educational Contexts	4	15	1
LOM Educational Difficulties	5	1	1
LOM General Structures	5	1	1
LOM Intended End User Roles	4	24	24
LOM Interactivity Levels	5	1	1
LOM Interactivity Types	3	1	1
LOM Learning Resource Types	15	24	2
LOM Lifecycle Contributor Roles	15	11	8
LOM Metadata Contributor Roles	2	1	1
LOM Purposes	9	1	1
LOM Relationship Kinds	17	10	10
LOM Semantic Densities	5	1	1
LOM Status	4	1	1
LRE Educational Contexts	12	15	15
LRE Facet	3	11	11
LRE Facet Name	3	11	11
LRE ILOX Expression Description Facets	5	1	1
LRE ILOX Manifestation Names	5	1	1
LRE ILOX Manifestation Package Names	15	1	1
LRE Intended End User Roles	6	24	24
LRE Language List	32	24	24
LRE Learning Principles	10	4	4
LRE Learning Resource Types	34	24	24
LRE Lifecycle Contributor Roles	15	1	1
LRE LOM Resource Type Mapping	47	24	24
LRE Metadata Contributor Roles	4	1	1
LRE MIME formats	42	1	1
LRE Relationship Kinds	17	1	1
LRE Thesaurus	1449	13	12
Total for project accounting	1888		214

Table 1: Vocabulary statistics in the VBE.

4 Conclusion

This deliverable is destined for both consortium partners and software developers of content providers. The software components, i.e., the services that have been described above, are available under open source licenses. Note that only those services have been described that are either changed or new in the second version of the ASPECT Infrastructure and Services.

Up-to-date technical information about the ASPECT Infrastructure and Services can be found in D2.4 [3], which consists of a wiki platform through which training and dissemination materials are made publicly available.

5 References

- [1] S. Ternier, K. Verbert, G. Parra, B. Vandeputte, J. Klerkx, E. Duval, V. Ordonez, and X. Ochoa. The ariadne infrastructure for managing and storing metadata. IEEE Internet Computing, 13(4):pp. 18–25, July/August 2009.
- [2] D. Massart, E. Shulman and F. Van Assche, Learning Resource Exchange Metadata Application Profile version 4.5, European Schoolnet, 2010. Also available at <http://lre.eun.org/node/6>.
- [3] D2.4 ASPECT material to support training and dissemination, <http://wiki.aspect-project.org/>