



DELIVERABLE

Project Acronym: thinkMOTION
Grant Agreement number: 250485
Project Title: Digital Mechanism and Gear Library goes Europeana

D2.3 - Intermediate report on OAI-ORE interface

Revision: 1.0

Authors:

Ulf Döring (Ilmenau University of Technology)

Sascha Falke (Ilmenau University of Technology)

Project co-funded by the European Commission within the ICT Policy Support Programme		
Dissemination Level		
P	Public	x
C	Confidential, only for members of the consortium and the Commission Services	

Revision History

Revision	Date	Author	Organization	Description
0.1	12.12.2012	U. Döring	IUT	Draft
0.2	04.02.2013	S. Falke	IUT	Revised Table of Content, OAI-ORE introduction
0.3	13.02.2013	U. Döring	IUT	Details on ESE-EDM- Mapping
1.0	15.02.2013	S. Falke	IUT	Review & Final Version

Statement of originality:

This deliverable contains original unpublished work except where clearly indicated otherwise. Acknowledgement of previously published material and of the work of others has been made through appropriate citation, quotation or both.

Table of Contents

1	Introduction	4
2	Workflow and results.....	4
2.1	Open Archives Initiative Object Reuse and Exchange (OAI-ORE)	4
2.2	Europeana Data Model (EDM) and OAI-ORE	5
2.3	DMG-Lib and EDM	6
2.4	Outlook.....	6
	ANNEX I – Well-structured XML-data for harvesting of items by Europeana in EDM.....	7

1 Introduction

In June 2010 partners from six European universities started the project thinkMOTION with the main objective of providing content from the field of motion systems via the Europeana online portal. Therefore, the currently available and all the DMG-Lib content collected in the proposed project must become accessible to Europeana - that means to Europeana users as well as to Europeana tools (e.g. the harvester).

For a more detailed understanding of the relationships between the digital objects and the available surrogates an OAI-ORE interface will be added which can be used by Europeana harvesters. The development of such an OAI-ORE interface is part of task 2.3 and described in this document.

Task 2.3 is part of WP2 – Adaptation of interfaces to Europeana – included in the “Description of Work” for thinkMOTION project.

2 Workflow and results

The Europeana Data Model (EDM) recasts the repository-centric notion of digital objects to a bounded aggregation of Web resources that is more integrated with the Web architecture and also more accessible for Web applications and clients. Therefore, EDM is based on OAI-ORE. This deliverable describes the OAI-ORE data model, its integration into EDM, as well as the mapping of the DMG-Lib data records to EDM (and therefore to OAI-ORE).

2.1 Open Archives Initiative Object Reuse and Exchange (OAI-ORE)

*“Open Archives Initiative Object Reuse and Exchange (OAI-ORE) defines standards for the description and exchange of aggregations of Web resources. These aggregations, sometimes called compound digital objects, may combine distributed resources with multiple media types including text, images, data, and video. The goal of these standards is to expose the rich content in these aggregations to applications that support authoring, deposit, exchange, visualization, reuse, and preservation.”*¹

A document can consist of different versions, different formats like PDF or HTML, different parts like chapters, images or files, as well as links to other documents like translations or citations. The basic idea of OAI-ORE is to map this internal structure of a document to a machine-readable Resource Map and to make it available for other Web applications. In this manner, digital library content is more integrated with the Web architecture, and thereby more accessible to Web applications and clients².

In the following, the main concept of the OAI-ORE data model is described in accordance to the ORE User Guide³.

First, so called *Aggregations* are introduced which are sets or collections of any other Web resources. Each Aggregation has a URI for referencing on the Web. Resources in an Aggregation are called *Aggregated Resources*. Because an Aggregation does not have a representation, so called *Resource Maps* are introduced. A Resource Map is a machine-readable representation with a URI that provides details about an Aggregation. A Resource

¹ Open Archives Initiative. (n.d.). *Standards for Web Content Interoperability*. Retrieved February 04, 2013, from <http://www.openarchives.org/ore/>

² Lagoze, C., Van de Sompel, H., Nelson, M. L., Warner, S., Sanderson, R., & Johnston, P. (2008). *Object re-use & exchange: A resource-centric approach*. arXiv preprint arXiv:0804.2273. Retrieved February 04, 2013, from <http://arxiv.org/abs/0804.2273>

³ Open Archives Initiative. 17 October 2008. *ORE User Guide – Primer*. Retrieved February 04, 2013, from <http://www.openarchives.org/ore/1.0/primer.html>

Map expresses which Aggregation it describes, and it lists the resources that are part of the Aggregation. Also, a Resource Map can express relationships between the Aggregation, the Aggregated Resources and other resources, as well as metadata pertaining to the Resource Map itself, e.g. its publisher and its last modified date. Resource Map can be serialized for example in Atom XML, RDF/XML and RDFa. ORE also introduces the notion of Proxy resources which enable the separation of different views for a same resource, in the context of different Aggregations. Figure 1 summarizes the essence of the OAI-ORE data model.

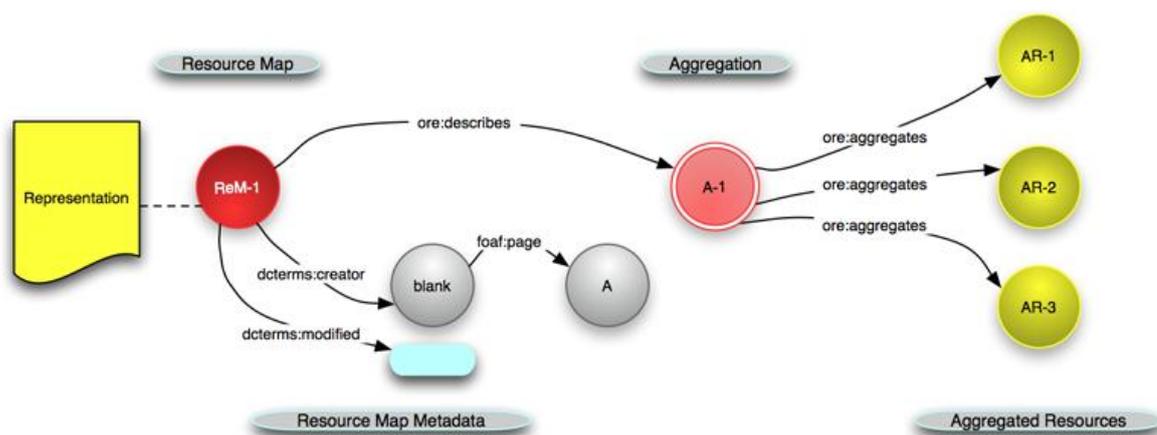


Figure 1. The Aggregation A-1 aggregates three Resources and is described by Resource Map ReM-1³

2.2 Europeana Data Model (EDM) and OAI-ORE

The Europeana Data Model (EDM) is introduced as the new data model for Europeana and therefore shall replace the current Europeana Semantic Element (ESE). From Europeana's point of view, EDM is designed to

- distinguish between a provided item as real-world object and its digital representation(s)
- distinguish between an item and its metadata record
- allow several descriptions of a same item to co-exist.⁴

The EDM “should facilitate Europeana’s transition from a closed data repository to an open information space that integrates with the Web architecture and the Linked Data principles for identifying and exposing resources on the Web.”⁵

To meet these requirements, EDM re-uses and links to elements from existing and established reference vocabularies. The core data structure of EDM is based on OAI-ORE.

ORE Aggregations, introduced as *ore:Aggregation* property, are used to represent a data provider's contribution to Europeana. Each Aggregation consists of one resource that stands for the provided item as real-world object, and of one or more resources as digital representations of the provided item. Descriptive metadata for the provided resources, such as creator, subject, date of creation etc., are attached to proxies to distinguish the original metadata for the item from the metadata that is created by Europeana. The proxies are connected to the item they represent using the *ore:proxyFor* property, and to the Aggregation that contextualises them, using the *ore:proxyIn* property. OAI-ORE Resource Maps are used

⁴ Europeana. 26 October 2011. *Europeana Data Model Primer*. Version 1.0. Retrieved February 04, 2013, from <http://pro.europeana.eu/documents/900548/770bdb58-c60e-4beb-a687-874639312ba5>

⁵ Haslhofer, B.; Isaac, A.: *data. europeana. eu: The Europeana Linked Open Data Pilot*. In: International Conference on Dublin Core and Metadata Applications. 2011. Pages 94-104. Retrieved February 04, 2013, from <http://dcevents.dublincore.org/IntConf/dc-2011/paper/view/55/14>

as a contextualisation mechanism for the Europeana aggregation. They are connected to the related item using the *foaf:primaryTopic* property, and to its corresponding Europeana aggregation using the *ore:describes* property. These Resource Maps sum up the provenance of data using *dc:creator* and *dc:contributor* statements, and also indicate, in a machine-readable way, controlled rights information applying to the connected resources by using the *edm:rights* property.

For a detailed explanation we refer to the EDM Primer⁴ and the OAI-ORE specification⁶.

2.3 DMG-Lib and EDM

The current metadata format used in the European production system is the Europeana Semantic Elements (ESE) schema, which is based on Dublin Core enhanced by Europeana-specific fields. Europeana does not harvest metadata in the EDM format, currently.⁷

Therefore, the DMG-Lib currently provides its data records to Europeana harvesters in ESE metadata format using OAI-PMH. In addition, we aim to provide the DMG-Lib contents to Europeana in EDM, which is based on OAI-ORE, using the OAI-PMH interface to provide a more detailed understanding of the relationships between our digital objects and the available surrogates.

ANNEX I shows a response to a test implementation of OAI-PMH interface at the DMG-Lib server which is able to deliver metadata in EDM format. The returned metadata includes the description of the presented digital object, an interactive animation generated by Michael Reeßing (*edm:ProvidedCHO*). The ORE related parts are the descriptions of the animation as well as an image which is used as thumbnail (*edm:WebResource*), the description of the creator (*edm:Agent*) and finally the mapping (*ore:Aggregation*).

Finally, the EDM data records shall be validated using the EDM XML Schema which is described in the EDM documentation⁸.

2.4 Outlook

Europeana intends to proceed with semantic enrichment on a large scale. Therefore, EDM features a number of classes devoted to the representation of “contextual” entities:

- *edm:Agent*, to be used for representing persons or organizations
- *edm:Event*, for event
- *edm:Place*, for spatial entities
- *edm:TimeSpan*, for time periods or dates
- *skos:Concept*, for all entities from knowledge organization systems like thesauri.⁴

Beyond the “simple” mapping of ESE to EDM, the semantic enrichment of the DMG-Lib data records is an objective of the thinkMOTION project. Cross-links between DMG-Lib items, like connecting a biography with documents or images of the person described, connecting biographies of teacher and trainee, as well as connecting animations, movies or CAx models with related mechanism descriptions, will be expanded. These cross-links are not supported by ESE, but shall be integrated into our EDM data record sets. Furthermore, the SKOSified DMG-Lib thesaurus⁹ could be integrated into EDM.

⁶ Open Archives Initiative. 17 October 2008. *ORE Specification - Vocabulary*. Retrieved February 04, 2013, from <http://www.openarchives.org/ore/1.0/vocabulary.html>

⁷ Europeana. (n.d.). *Technical details*. Retrieved February 04, 2013, from <http://pro.europeana.eu/tech-details>

⁸ Europeana. (n.d.). *Europeana Data Model (EDM) Documentation*. Retrieved February 13, 2013, from <http://pro.europeana.eu/edm-documentation>

⁹ Döring, U.; Falke, S. 14 February 2013. *Intermediate report on DMG-Lib thesaurus via SKOS-format*. thinkMOTION Deliverable 2.4. Retrieved February 15, 2013, from http://www.thinkmotion.eu/wp-content/uploads/D2.4_final.pdf

ANNEX I – Well-structured XML-data for harvesting of items by Europeana in EDM

```
<OAI-PMH xmlns="http://www.openarchives.org/OAI/2.0/"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://www.openarchives.org/OAI/2.0/
http://www.openarchives.org/OAI/2.0/OAI-PMH.xsd">
  <responseDate>2013-01-22T19:17:09Z</responseDate>
  <request verb="GetRecord" identifier="oai:dmglib.org:2022"
    metadataPrefix="edm">http://www.dmg-lib.org/dmglib/OAI-2.0-
Server_V12.4</request>
  <GetRecord>
    <oai:record xmlns:oai="http://www.openarchives.org/OAI/2.0/">
      <header>
        <identifier>oai:dmglib.org:2022</identifier>
        <datestamp>2006-01-12</datestamp>
        <setSpec>doc-type:manim</setSpec>
        <setSpec>doc-type:iactm</setSpec>
      </header>
      <oai:metadata>
        <rdf:RDF xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
          xmlns:dc="http://purl.org/dc/elements/1.1/"
          xmlns:dcterms="http://purl.org/dc/terms/"
          xmlns:edm="http://www.europeana.eu/schemas/edm/"
          xmlns:foaf="http://xmlns.com/foaf/0.1/"
          xmlns:ore="http://www.openarchives.org/ore/terms/"
          xmlns:owl="http://www.w3.org/2002/07/owl#"
          xmlns:rdaGr2="http://RDVocab.info/ElementsGr2/"
          xmlns:skos="http://www.w3.org/2004/02/skos/core#"
          xmlns:wgs84_pos="http://www.w3.org/2003/01/geo/wgs84_pos#"
          xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
          xsi:schemaLocation="http://www.w3.org/1999/02/22-rdf-syntax-ns#
http://europeanalabs.eu/svn/europeana/trunk/ROOT/src/main/webapp/schemas/edm/EDM.
xsd">
          <edm:ProvidedCHO rdf:about="dmg:2022">
            <dc:title>Lenkergeradfuehrung</dc:title>
            <dc:creator rdf:resource="http://www.dmg-
lib.org/dmglib/handler?biogr=313004"/>
            <dc:date>2006-01-12</dc:date>
            <dc:type>animated image sequence</dc:type>
            <dc:identifier>dmg:2022</dc:identifier>
            <dc:identifier>http://www.dmg-
lib.org/dmglib/handler?manim=2022</dc:identifier>
            <edm:type>VIDEO</edm:type>
          </edm:ProvidedCHO>
          <edm:WebResource rdf:about="http://www.dmg-
lib.org/dmglib/main/manimViewer_content.jsp?id=2022&skipSearchBar=1">
            <dc:rights>http://www.dmg-
lib.org/dmglib/main/portal.jsp?mainNaviState=site.oairights</dc:rights>
            <edm:rights resource="http://www.europeana.eu/rights/rr-f"/>
          </edm:WebResource>
          <edm:WebResource rdf:about="http://www.dmg-
lib.org/dmglib/handler?file=manims_001/060112_GSDD_Lenkergeradfuehrung/./lenkerge
radfuehrung.png">
            <dc:rights>http://www.dmg-
lib.org/dmglib/main/portal.jsp?mainNaviState=site.oairights</dc:rights>
            <edm:rights resource="http://www.europeana.eu/rights/rr-f"/>
          </edm:WebResource>
```

```

    <edm:Agent rdf:about="http://www.dmg-
lib.org/dmglib/handler?biogr=313004">
      <skos:prefLabel>Michael Reebing</skos:prefLabel>
      <skos:altLabel>Michael Reessing</skos:altLabel>
      <edm:begin>1976</edm:begin>
      <dc:rights>http://www.dmg-
lib.org/dmglib/main/portal.jsp?mainNaviState=site.oairights</dc:rights>
      <edm:rights resource="http://www.europeana.eu/rights/rr-f/" />
      </edm:WebResource>
      <ore:Aggregation about="http://www.dmg-
lib.org/dmglib/handler?manim=2022">
        <edm:aggregatedCHO resource="dmg:2022" />
        <edm:hasView rdf:resource="http://www.dmg-
lib.org/dmglib/main/manimViewer_content.jsp?id=2022&skipSearchBar=1" />
        <edm:hasView rdf:resource="http://www.dmg-
lib.org/dmglib/handler?file=manims_001/060112_GSDD_Lenkergeradfuehrung/./lenkerge
radfuehrung.png" />
        <edm:rights resource="http://www.europeana.eu/rights/rr-f/" />
        <edm:provider>thinkMOTION</edm:provider>
        <edm:dataProvider>Digital Mechanism and Gear Library - www.dmg-
lib.org</edm:dataProvider>
        <edm:isShownAt rdf:resource="http://www.dmg-
lib.org/dmglib/handler?manim=2022" />
        <edm:isShownBy rdf:resource="http://www.dmg-
lib.org/dmglib/main/manimViewer_content.jsp?id=2022&skipSearchBar=1" />
        <edm:object rdf:resource="http://www.dmg-
lib.org/dmglib/main/manimViewer_content.jsp?id=2022&skipSearchBar=1" />
      </ore:Aggregation>
    </rdf:RDF>
  </oai:metadata>
</oai:record>
</GetRecord>
</OAI-PMH>

```