Europeana Data Model Primer

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Disclaimer

This document is a companion to the EDM Definition available from the Europeana Professional website (http://pro.europeana.eu/edm-documentation). Both documents reflect the consensus reached in discussions in the Europeana v1.0 Work Package 3 meetings in 2009 and the first half of 2010.

For further information, please contact info@europeana.eu (using "EDM" as subject) or look for more technical details on the EDM Prototyping Wiki at http://www.europeanalabs.eu/wiki/EDMPrototyping.

Credits

This document has been edited by Antoine Isaac.
Carlo Meghini, Makx Dekkers, Stefan Gradmann, Robina Clayphan, Jan Molendijk , Jonathan Purday and Valentine Charles have reviewed it and made valuable improvements.
Martin Doerr provided the Tuthmosis III amphora example, Go Sugimoto provided the Stonehenge one; Victor de Boer and Steffen Hennicke contributed to the EDM representation used as illustration for hierarchical objects. Doug Tudhope, Dan Matei, Go Sugimoto and Herbert Van de Sompel have made a number of contributions, both editorial and conceptual, which helped enhancing the quality of the document.
The many discussions on EDM with other participants of WP3 in Europeana v1.0 have greatly helped to define the motivation, scope and content of this document.
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1 Introduction

1.1 Document Scope

This document is the EDM Primer. It is part of the family of documents about the Europeana Data Model (EDM). It is not necessary to read them all but to select the ones that will give the information you need. The first three of these can be found at http://pro.europeana.eu/edm-documentation, and the object templates at http://europeanalabs.eu/wiki/EDMObjectTemplatesProviders and the XML schema at http://www.europeana.eu/schemas/edm/ .

The EDM Definition – this is the formal specification of the classes and properties that could be used in Europeana. Note that it details all the classes and properties in EDM not only the subset used in the first implementation.

The EDM Primer – this is the "story" of EDM and explains how the classes and properties may be used together to model data and support Europeana functionality.

The EDM Mapping Guidelines – this document gives guidance for providers wanting to map their data to EDM. It contains definitions of the properties, information about the data types that can be used as values and the obligation level of each property. It also has an example of original data, the same data converted to EDM and diagrams showing the distribution of the properties amongst the classes. It is limited to the classes that will be implemented initially in Europeana and is therefore the reference document for the first implementation.

The EDM object templates – this working document is a simple wiki listing that shows which properties apply to which class and states the data types and obligation of the values. It shows more of the classes that are contained in EDM and indicates which will be implemented initially. These templates should be regarded as a work in progress however and may be out of step with the Guidelines.

The EDM XML schema – this is the XML schema for the first implementation of EDM.

The EDM ontology expressed in OWL is accessible through content negotiation at http://www.europeana.eu/schemas/edm/ but it is also directly available at http://europeanalabs.eu/browser/europeana/trunk/ROOT/src/main/webapp/schemas/edm/rdf/

1.2 Overview

The Europeana Data Model (EDM) is a new proposal for structuring the data that Europeana will be ingesting, managing and publishing. The Europeana Data Model is a major improvement on the Europeana Semantic Elements (ESE), the basic data model that Europeana began life with.

Each of the different heritage sectors represented in Europeana uses different data standards, and ESE reduced these to the lowest common denominator. EDM reverses this reductive approach and is an attempt to transcend the respective information perspectives of the sectors that are represented in Europeana – the museums, archives, audiovisual

collections and libraries. EDM is not built on any particular community standard but rather adopts an open, cross-domain Semantic Web-based framework that can accommodate the range and richness of particular community standards such as LIDO [LIDO] for museums, EAD[1] for archives or METS[2] for digital libraries.

EDM not only supports the full richness of the content providers' metadata but also enables data enrichment from a range of third party sources. For example, a digital object from Provider A may be contextually enriched by metadata from Provider B. It may also be enriched by the addition of data from authority files held by Provider C, and a web-based thesaurus offered by Publisher D. EDM supports this richness of linkage, while clearly showing the provenance of all the data that links to the digital object.

EDM also supports more complex objects than ESE is able to. In terms of a digitised book, the individual chapters, illustrations and index can be understood both individually and collectively; in terms of an archival finding aid or *fonds*, the constituent letters, deeds, manuscripts or other items can be similarly understood.

Before, during and after the implementation of EDM, data that is compliant only with ESE will continue to be accepted. EDM is compatible with ESE and no data will need to be resubmitted. Europeana will make available a convertor, and any provider who wishes to resubmit data, in order to increase its richness within Europeana, will be able to do so if they wish but will be under no obligation.

EDM will let users browse Europeana in revealing new ways. It answers the 'Who?', 'What?', 'When?', 'Where?' questions, and makes connections between the networks of stories that will animate Europeana's content. This linking of data is supported by the open structure of the EDM, and will put Europeana in the vanguard of semantic web developments.

1.3 The rationale behind EDM

EDM is a qualitative change in the way Europeana deals with the metadata gathered from data providers and aggregators. It is aimed at solving some of the issues observed with the current ESE, by providing extra expressivity and flexibility.

In particular, it makes a distinction between the intellectual and technical creation that is submitted by a provider (a bundle of resources about an object curated by the provider), the object this structure is about, and the digital representations of this object, which can be accessed over the web.

Also, EDM adheres to the modelling principles that underpin the approach of the Web of Data ("Semantic Web"). In that approach, there is no such thing as a fixed schema that dictates just one way to represent data. A common model like EDM can be seen instead as an anchor to which various finer-grained models can be attached, making them at least partly interoperable at the semantic level, while the data retain their original expressivity and richness. It does not *require* changes in the local approaches, although any changes in local practice that increase the cross-domain usefulness of the data is *encouraged*, such as the use of publicly accessible vocabularies (for persons, places, subjects etc.).

[1] http://www.loc.gov/ead/
[2] http://www.loc.gov/mets/

In this sense, EDM is an attempt to transcend the respective information perspectives of the various communities constituting Europeana, such as museums, archives, audio-visual collections and libraries. EDM is not built on any particular community standard but rather adopts an open, cross-domain Semantic Web-based framework that can accommodate particular community standards such as LIDO, EAD or METS.

1.4 How to read this Primer

EDM is more difficult to grasp than ESE and similar approaches to interoperability. This Primer is a complement to the normative specification of EDM elements [EDM-Definition]. It tries to lay out clearly the main EDM features, and discuss the motivations behind them. It also provides examples illustrating how EDM can be used, either by a provider who submits EDM data to Europeana or by Europeana.eu itself.

In more detail, EDM enables the representation and accessing of objects provided to Europeana, via the packages of digital representations submitted by Europeana providers (sect. 4). In addition, EDM accommodates various description paradigms for the ingested objects and paves the way for enriching objects by connecting them to (networks of) semantically enriched resources (sect. 5.1, 5.2 and 5.3). Crucially, EDM does this while still allowing for different levels of granularity in the descriptions, using the possibilities of semantic mapping (sect. 5.4) This allows Europeana to retain compatibility with existing description approaches, including the simpler Europeana Semantic Elements (ESE) currently used for data submission at Europeana (sect. 5.5). It also provides support for ingesting the descriptive metadata submitted by various providers, possibly for the same object, and representing new information added by Europeana (sect. 6). Advanced EDM features will be discussed in sect. 7.

It is perfectly possible for a reader experienced with EDM matters to jump to a specific section of interest. The reader new to EDM is however recommended to read it in sequential order, as one section tends to elaborate on aspects that are introduced in the previous one, providing a "story" about EDM features. For example, Section 5 presents various aspects related to the representation of descriptive metadata in EDM. Section 6 presents information on more specific or optional details of Europeana, and may thus be considered independently of the rest of the document.

RDF graphs

The Primer features a number of graphs. These graphs have been created to provide the reader with a more intuitive view of examples. The reader should however be aware that these graphs are meant to represent data expressed in RDF, adapting the conventions used, e.g., by the RDF Primer [RDF-Primer]. This implies that they correspond exactly to a set of RDF “statements” (or “assertions”), using the following rules:

- a circled URI in normal font denotes a standard RDF resource. Two URIs’ being in a single circle indicates that one resource has been given two identifiers. Such situation may typically result from asserting an `owl:sameAs` statement between the two URIs.[3]
- a string enclosed with quotes denotes an RDF literal. It can carry a language tag, as for `"Example"@en`.
- an arrow between two resources (or between a resource and a literal) indicates an RDF statement ("triple") between these two resources. The object of the statement is

[3] Cf. http://www.w3.org/TR/owl-ref/#sameAs-def

the origin of the arrow; its subject is the target of the arrow. The predicate of the statement is the property indicated by the URI in normal font next to the arrow

- a URI in italic font denotes:
    - a type for the resource, if appearing in a "resource circle".
    - a super-property of the property, if appearing next to an "property arrow"

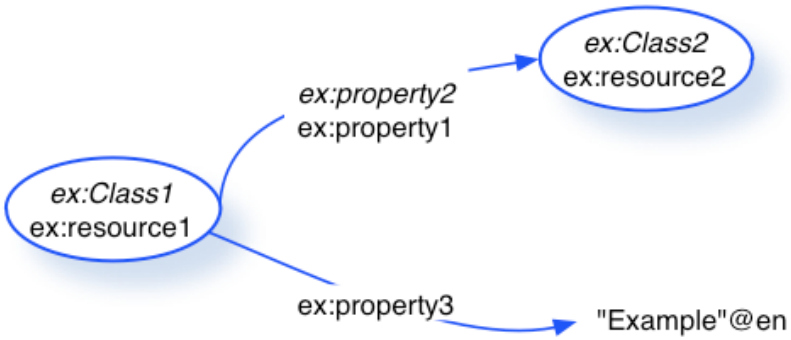

Fig. 1 Simple RDF graph

As an example, the graph above corresponds to the following RDF statements:

```
ex:resource1 rdf:type ex:Class1 .
ex:resource2 rdf:type ex:Class2 .
ex:resource1 ex:property1 ex:resource2 .
ex:resource1 ex:property3 "Example"@en .
ex:property1 rdfs:subPropertyOf ex:property2 .
```

RDF syntaxes

This document often uses the concise Turtle syntax [Turtle] for examples. Readers should be aware that these examples could very well have been given in the normative but much more verbose RDF/XML syntax [RDF/XML]. Interested readers can find a conversion tool at http://www.rdfabout.com/demo/validator/.

URI abbreviations

For the sake of brevity a number of namespace declarations are omitted from the examples. This applies to standard namespaces RDF/RDFS [RDF-PRIMER], OWL [OWL], SKOS [SKOS], and Dublin Core [DC]) and namespaces for other ontologies (ORE [ORE], FOAF [FOAF], EDM-specific elements [EDM-Definition]) but also to namespaces coined for the examples.
Generally, these namespaces could be declared in the preamble of RDF (Turtle) files as in the following code:

```
@prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .
@prefix rdfs: <http://www.w3.org/2000/01/rdf-schema#> .
@prefix owl: <http://www.w3.org/2002/07/owl#> .
@prefix skos: <http://www.w3.org/2004/02/skos/core#> .
@prefix dc: <http://purl.org/dc/elements/1.1> .
@prefix dcterms: <http://purl.org/dc/terms/> .
@prefix ore: <http://www.openarchives.org/ore/terms/> .
@prefix edm: <http://www.europeana.eu/schemas/edm/> .
@prefix foaf: <http://xmlns.com/foaf/0.1/> .
@prefix viaf: <http://viaf.org/viaf/> .
@prefix rdaGr2: <http://RDVocab.info/ElementsGr2/> .
```

```
@prefix ex: <http://www.example.com/> .
@prefix ex1: <http://www.example.com/1/> .
@prefix ex2: <http://www.example.com/2/> .
@prefix ex3: <http://www.example.com/3/> .
@prefix ex-eu: <http://example.europeana.eu/> .
```

Other editorial features
Elements in Courier font, such as `ore:Aggregation`, refer to classes and properties introduced or re-used by EDM. For most of these, the readers can access definitions or documentary notes in the normative specification of EDM elements [EDM-Definition].

2 Reminder on EDM requirements and design principles

A number of requirements and principles have been formulated at various times, which have strongly influenced the design of EDM as it stands now. The reader should be aware of these while trying to figure out the motivation for some modelling choices in EDM.

Noticeable requirements are:
- R1. distinction between "provided objects" (painting, book, movie, archaeology site, archival file, etc.) and their digital representations
- R2. distinction between objects and metadata records describing an object
- R3. multiple records for the same object should be allowed, containing potentially contradictory statements about this object
- R4. support for objects that are composed of other objects
- R5. compatibility with different abstraction levels of description (e.g. if a provider wishes to submit descriptions that follow the distinctions introduced in FRBR Group 1 [FRBR])
- R6. EDM provides a standard metadata format that can be specialized
- R7. support for contextual resources, including concepts from controlled vocabularies.

Also, a basic motivation for EDM is to support the integration of the various models used in Cultural Heritage data, so that all original descriptions could be collected and connected through higher-level concepts. This motivation, derived for the general goal of Europeana to exploit the richness of all available data in order to support the richest possible functionality, justifies three fundamental design principles:
- D1. EDM allows data integration in an *open* environment: it is impossible to anticipate all data contributed
- D2. EDM allows for rich functionality, possibly via extensions
- D3. EDM should re-use existing (standard) models as much as possible

These design principles are the basis for the choice of Semantic Web representation languages—RDF(S), OWL—for EDM. These allow flexible re-use and articulation of existing models, as demonstrated by the conception of the EDM model itself, and by the mapping approach to data integration which underlies the way EDM should be used in practice (cf. Sect. 5.3). Further, the Linked Data approach[4] emphasizes the re-use and linkage of richly described resources over the web. This really fits the EDM ambition of making use of existing resources as well as supporting their enrichment, notably via the establishment of new relations between them. Whether these resources belong to one Europeana provider's information space, to different providers' spaces, or to external spaces used as knowledge references.

[4] http://linkeddata.org/

3 Examples used in this document

This document uses examples from Europeana related to the Mona Lisa painting by Leonardo da Vinci. There are two records that are about the painting itself: one comes from the Joconde database,[5] the other from the Louvre database.[6] The screenshots below show how these objects are on their providers' sites, together with their various digital representations and their metadata. In all cases, the metadata displayed on these screenshots closely reflect the source metadata. Another example is used for event-centric metadata, which is documented further in Annex 1.

Fig. 2. Mona Lisa at the Joconde website

Fig. 3. Mona Lisa at the Louvre website

[5] http://europeana.eu/portal/record/03919/FCD38BDE7A03579F24BEDA5D157943B75BB36F11.html, original record at http://www.culture.gouv.fr/public/mistral/joconde_fr?ACTION=CHERCHER&FIELD_1=REF&VALUE_1=000PE025604

[6] http://cartelfr.louvre.fr/cartelfr/visite?srv=car_not_frame&idNotice=14153

4 Representing provided data as aggregations

The EDM framework will allow different participants to structure their data in a way that suits their original data and their desired functions. Data providers may create simple datasets or more complex ones depending on the structure of their source data. Similarly, Europeana will manipulate the data internally to perform its aggregation and enrichment functions. *This section looks at the basic structures that are likely to be of interest to data providers.* Later sections examine possibilities for structuring data in a more complex fashion and how Europeana will use other aspects of EDM as an aggregator.

EDM has three core classes of resources that will result from the package of data provided to Europeana:

- the "provided cultural heritage object" itself (a painting, a movie, a music score, a book…) (`edm:ProvidedCHO`)
- one or more accessible digital representations of this object, some of which will be used as previews (the digital picture of the painting.) (`edm:WebResource`)
- an aggregation to represent the result of this provider's activity. (`ore:Aggregation`)

The first two allow capturing the distinction between "works", which are expected to be the focus of users' interest, and their digital representations, which are the elements manipulated in information systems like Europeana.

The third, following the ORE approach, demonstrates that the provided object, together with the digital representations from one Europeana data provider can be regarded as one logical whole.

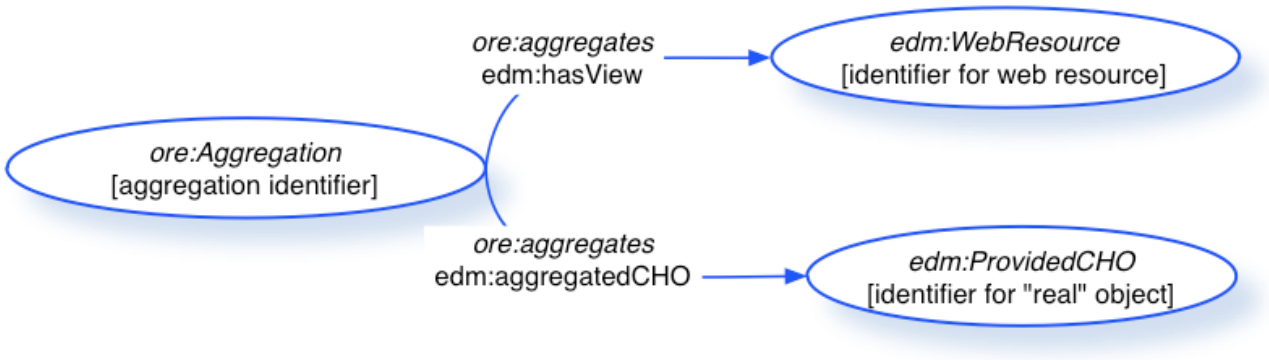

Fig. 4. Visualization of the three core EDM classes for data providers

Using the properties defined in EDM, in the Europeana information space, each instance of `ore:Aggregation` is related to:

- one resource that stands for the provided object, using the `edm:aggregatedCHO` property;
- one or more resources that are digital representations of the provided object, using the `edm:hasView` property.

Both `edm:aggregatedCHO` and `edm:hasView` properties are sub-properties[7] of `ore:aggregates`, representing the fact that the aggregation indeed aggregates the "real" object and its digital views.

[7] For example, for each `ens:hasView` statement between an aggregation and a digital representation, an `ore:aggregates` statement can thus also be inferred between these resources.

As an example, Fig. 5 shows an EDM representation of the Mona Lisa painting, as described in the Joconde database.[8] We see that Joconde, which is maintained by the Direction des musées de France, provides an aggregation that consists of one "real" object, the `edm:ProvidedCHO`, represented by its identifier, and two digital views. These views are declared as instances of the class `edm:WebResource`, as they are digital resources made available over the Web, and connected to the aggregation using the `edm:hasView` property.

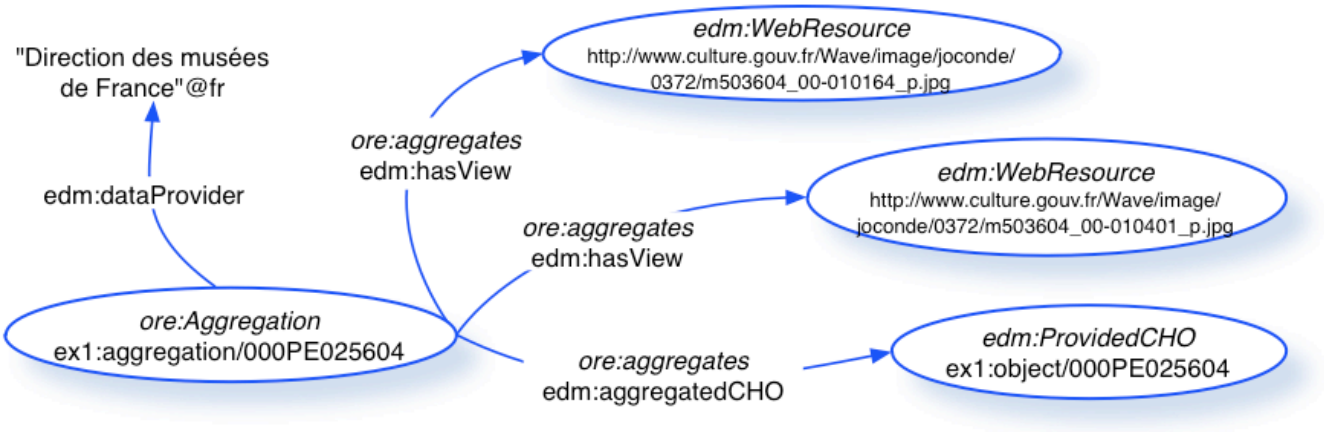

Fig. 5. Provider's aggregation of web resources and provided CHO

This is a high-level view of the core classes and properties linking them. Other sub-properties of `ore:aggregates` may be used to relate the aggregation to these resources and generally it is advisable to use the lowest level sub-property that is suitable in order to give more precision. In this case, providers would use `edm:object`, or one of the mandatory `edm:isShownBy` or `edm:isShownAt` properties in the first instance and only use `edm:hasView` if there are additional web resources. Details of which properties should be used in relation to which class are provided in the EDM Mapping Guidelines [EDM-Guidelines].

Descriptive metadata can be represented for the provided object, e.g., the creator. To represent such descriptions, EDM uses dedicated properties that it either introduces or re-uses, such as `edm:hasMet`, `dcterms:creator` or `dcterms:title`. It also allows use of specializations of these properties, or any other property that providers judge relevant for describing the characteristics of the object. Section 5 further details those description options.

[8] For the sake of readability, we focus on a relevant subset of the whole data contributed by the provider. A complete EDM representation would include more descriptive information as well as more digital resources linked to the aggregation. Please also note that the `ex1:` namespace is a toy namespace, not intended to represent any recommendation on what the actual URIs should be.

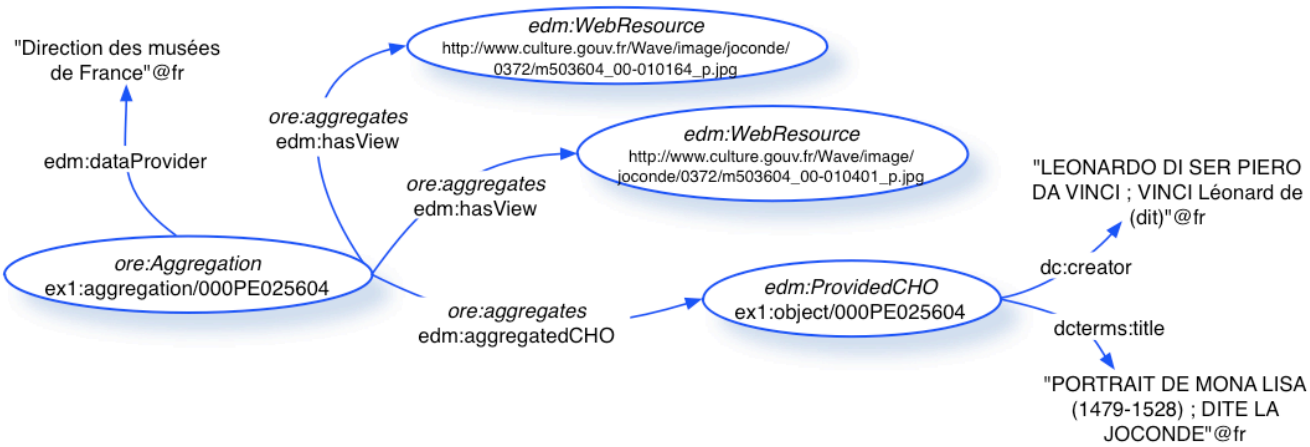

Fig. 6. Provider's aggregation with descriptive metadata.

The reader should finally be aware that though there will very often be a one-to-one relationship between an aggregation, a provided object and a metadata record in the original provider's information system, there is no rule enforcing it. In fact, there are situations where a record can give rise to several aggregations, as in the case of records describing complex, hierarchical digital aggregations (see Section 7).

5 Descriptive metadata in EDM

Aggregations enable capturing a description of the "digital environment" of an object submitted to Europeana, and attaching descriptive information to the various resources that take part in this environment. This mechanism remains however agnostic with regard to *which* descriptive data that should be provided. EDM therefore includes a set of "descriptive" and "contextual" properties that capture the different features of a resource, as well as relate it to the other entities in its context.

Among the possible approaches for descriptive metadata, one can distinguish *"object-centric"* and *"event-centric"* approaches. EDM provides constructs that allow representing metadata to follow either approach. There are also classes in EDM that allow for capturing rich data. This section deals with these in order of complexity starting with the object centric approach, then looking at enriching this data with contextual classes and finally looking at the more complex event-centric approach.

5.1 Object-centric approach

This focuses on the object described: information comes in the form of statements that provide a direct linking between the described object and its features—be they simple strings or more complex resources denoting entities from the real world. Most metadata practices making use of the Dublin Core metadata set [DC] can be seen as an application of such an approach. The records corresponding to the objects in Fig. 6, 7, 8 and 9 correspond to an object-centric approach, too, insofar as they directly relate the provided object to all its features.

Fig. 7 extends the graph of Fig. 6 to provide a more complete example of an object-centric description for the painting in Fig. 2. In this example, the Mona Lisa is directly attached to its creator (represented by a simple string), its title, its creation date(s), its former owner, etc.

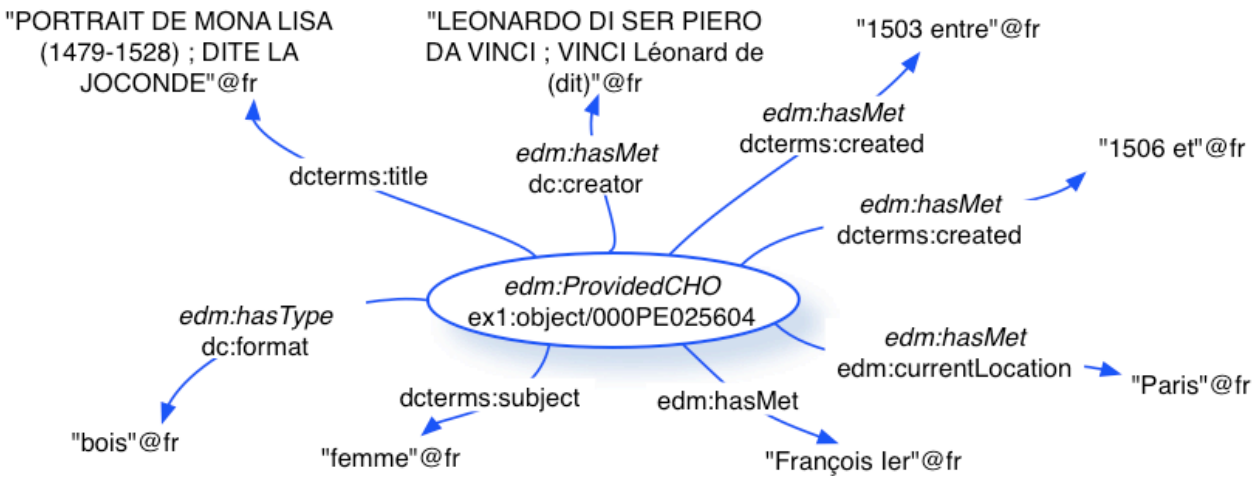

Fig. 7. Mona Lisa – an object-centric description

In this approach the dc and dcterms properties can be used to directly link text values to the object. Fig. 7 shows that these are specializations of `edm:hasMet` and `edm:hasType` (themselves specializations of `edm:isRelatedTo`) which provide anchors via which more specialized properties can be connected to the core EDM model—an issue further discussed in section 5.4. `edm:isRelatedTo` can be used to link an object to virtually any entity that belongs to its "context": agents involved in its life cycle, places it has been associated with, subjects it is about, etc. `edm:hasMet` is used to relate more precisely a given object to the various things (persons, places, etc.) that have participated to the same events as this object. For example, the creator of an object is an agent that participated in the creation event of that object. Note that the current location of an object can be expressed using the specific `edm:currentLocation` property, which is a sub-property of `edm:hasMet`. `edm:hasType` connects an object to a concept from a type system to which that object belongs—excluding "aboutness" annotations, in particular.

Note that the object-centric approach does not dictate one specific level of "semantic richness" for the resources attached to objects or events. An enrichment of Fig. 7 by replacing a number of strings by instances of `edm:Place`, `edm:Agent`, `skos:Concept` or `edm:TimeSpan` (see next sub-section) would still fall in the object-centric category.

5.2 Contextual entities – richer metadata

Some of the values in the descriptive metadata can be seen to be related not to the object but to another resource in the description. For example, in Fig. 2 we can see that there is further detail about Leonardo himself – e.g. his places and dates of birth and death. This information could be captured in EDM by using an entity representing Leonardo himself. To support the modelling of such semantic enrichment and to support further enrichment, 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 events
- `edm:Place`, for spatial entities
- `edm:TimeSpan`, for time periods or dates
- `skos:Concept`, for all entities from knowledge organization systems like thesauri, classification schemes (including some place gazetteers or person authority files)…

Let us consider the Mona Lisa example again. The Joconde database provides for this painting one single string value as the creator: "`Leonardo di ser Piero da Vinci ; Vinci, dit Léonard de (dit)`". This is valuable, but there is no direct way to get full information about the artist. This can be enhanced by creating an explicit link between Mona Lisa and a carefully curated resource that stands for Leonardo as a person, and provides much more information about him: the VIAF authority record for Leonardo, identified by http://viaf.org/viaf/24604287.

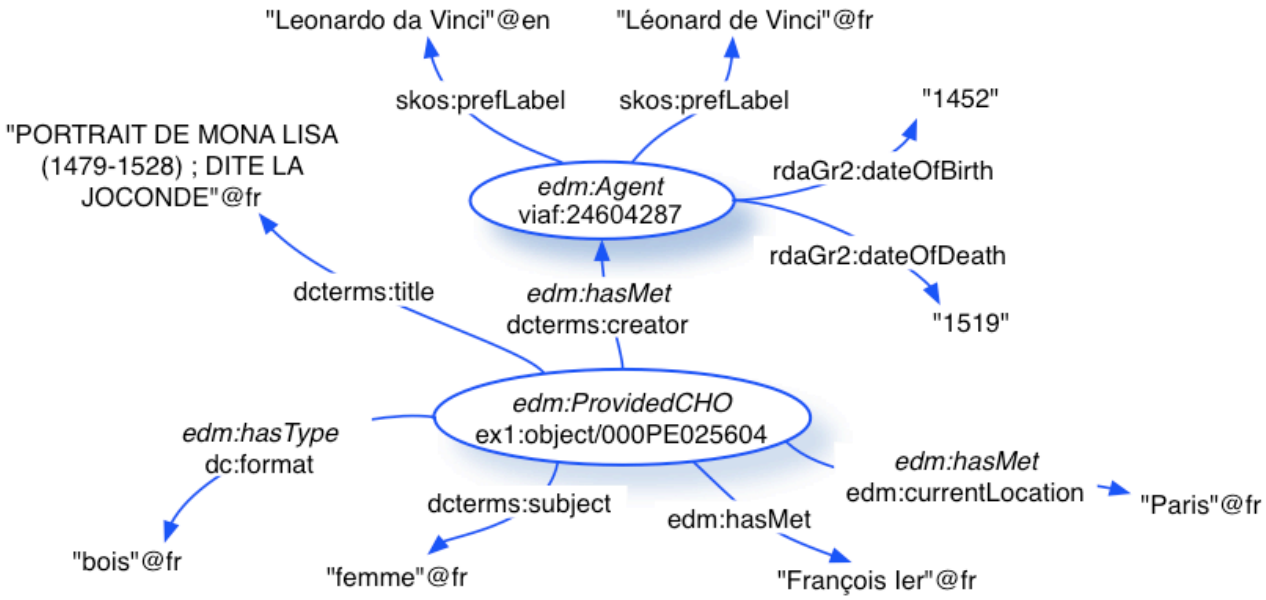

Fig. 8. Mona Lisa – an object-centric description enriched with an Agent contextual entity

Such semantic enrichment can bring huge benefits to current search processes. Many providers already use values that would allow such entities to be created in data submitted to Europeana. Europeana itself intends to proceed with it on a large scale by adding data where possible. It will use a "proxy" mechanism to support this function without distorting the data from providers. This is explained in Section 6.

To fully represent rich provider data and support further enrichment, Providers can use controlled vocabularies curated by themselves or other organizations where they are available for them. The example of Fig. 7 could lead to a new representation, as in Fig. 9 below.

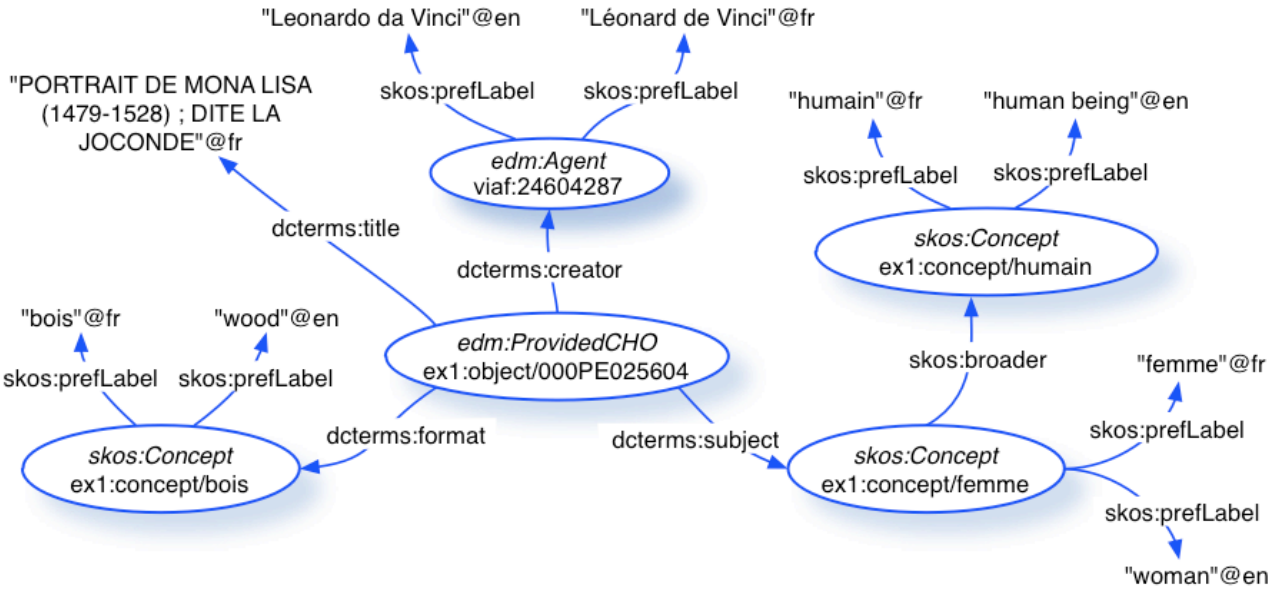

Fig. 9. Mona Lisa – enriched using contextual entities

Note here the various contextual statements, including the links from the specific concept of *femme* to the more general one of *human being*. Note also that once they are represented as fully-fledged resources, the entities linked to the objects can be themselves connected to other entities from other contexts, as a result of *semantic alignment*. For instance, `ex1:concept/femme` could be matched to `http://dbpedia.org/resource/Femme`, enabling to use (possibly in a Linked-Data fashion) all the information available on Wikipedia for this specific subject, including a quite rich description of the topic and translations for the term as well as that description.

These crucial features allow bringing in more information to enhance access to the original objects. They can also enable a complete change of paradigm in the way these objects are accessed, by allowing the user to browse through a semantic space of contextual entities before getting to the actual objects.

5.3 Event-centric approach

Event-centric approaches consider that descriptions of objects should focus on characterizing the various events in which objects have been involved. The idea is that it will lead to establishing richer networks of entities—by representing the events that constitute an object's history—than with the object-centric approach. This approach underlies models such CIDOC-CRM[9] and may suit the data of some (but of course not all) Europeana providers. A typical example of event-centred description, which shows how different places and actors can be unambiguously related to one object via the events these entities participated in, can be found in Annex 1.

Fig. 10 provides an example of how the Mona Lisa example could be represented in an event-centric fashion.[10] Two new events related to the object's lifecycle—`000PE025604-c` denoting the creation of the painting and `000PE025604-a` denoting its acquisition—have

[9] http://www.cidoc-crm.org/

[10] For the sake of simplicity, we omit a number of statements that should apply to resources attached to the event, such as the link between `ex1:person/francoisI` and the string `"François Ier"`.

been introduced, using the class `edm:Event`. These events are now the "hubs" that relate the object to other entities that were directly connected to it in the previous object-centric approach. These relations are represented in EDM using the three following properties:

- `edm:wasPresentAt`, holding between any resource and an event it is involved in;
- `edm:happenedAt`, holding between an event and a place;
- `edm:occurredAt`, holding between events and the time spans during which they occurred.

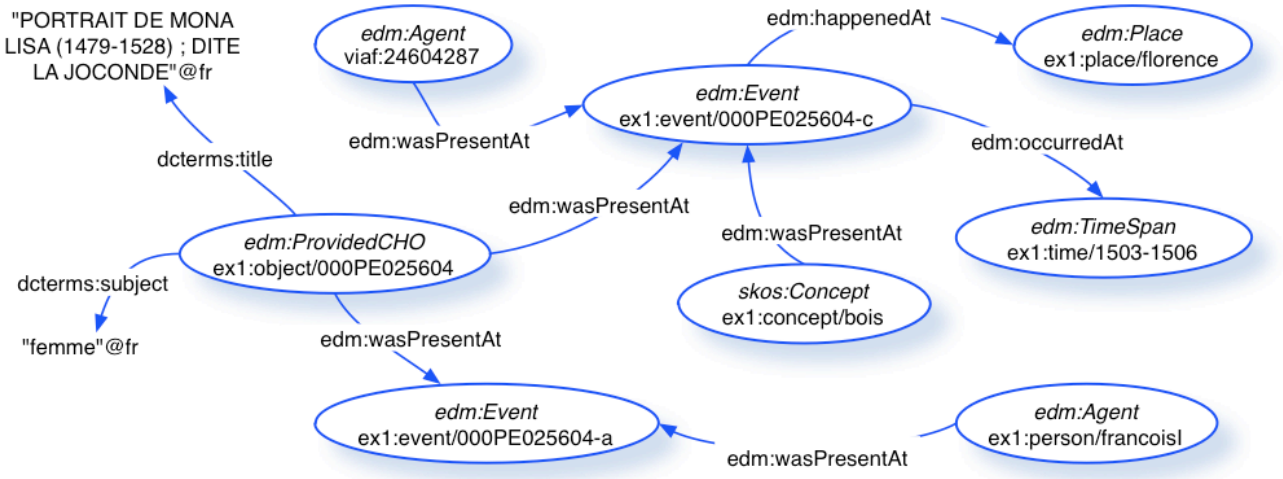

Fig. 10. Mona Lisa – an event-centric description

Fig. 11 (below) shows how this approach to using EDM can be used for representing the more complex, real example of Annex 1. While Fig. 10 is a straightforward adaptation of a simple example, Fig. 11 hints that more can be achieved with event-based representations. This is especially true when these events are related together, e.g., through happening in a same location, or if events help distinguishing between the different contexts, e.g., dates, that can be related to one same object.

Fig. 11. Amphora of Tuthmosis III – an event-centric description (without aggregation and related digital representation entities)

The reader should be aware that EDM perfectly allows both object-centric and event-centric approaches to co-exist seamlessly for the same object. As a matter of fact, taking benefit of the RDF approach, EDM allows any kind of network to be attached to a provided object, be it event-centric, person-centric, place-centric, etc.

Note finally that it is not the aim of EDM to capture the full complexity of a model like CIDOC-CRM. Nor can it capture the full diversity of all object-centric models. Rather, it provides a small set of properties and classes to which more specialized constructs can be "attached," following the approach discussed in the next section.

One can however notice that the "core" corresponding to the event-centric approach (`Event`, `happenedAt`, `occurredAt` and `wasPresentAt`) is much less developed than the object-centric "core", which is based on Dublin Core elements [DC] as detailed in the EDM specification [EDM-Definition].

This basically boils down to two reasons. First, the object-centric approach is much more widespread. Second, there is a simple, commonly used standard for object-centric approach—Dublin Core. This standard can be re-used almost out-of-the-box without forcing providers to adopt a whole new conceptual framework.

In fact, while event-centric descriptions will be ingested and exploited as much as possible, it is likely that Europeana will still request the submission of a basic, object-centric core next to it. This will allow full compatibility of the new model with the legacy ESE data, and supporting consistent and coherent indexing for elementary search functionalities at a relatively low cost and risk.

Yet, by introducing basic compatibility between EDM and event-centric representations now, we hope to accommodate initiatives such as CIDOC-CRM and LIDO [LIDO], which are aimed at making descriptions of events more interoperable and more widespread. If a simple "event-centric core" gets widely used by Europeana providers and gives clear added value over the current simple core, it may be considered as a refinement to be included in a next version of EDM. Future versions of this document will include corresponding examples.

5.4 EDM as a flexible data model

As presented in the previous sections, EDM provides a number of constructs (classes and properties) that can be used by providers when submitting metadata to Europeana. ***It is however expected that often these constructs will be used indirectly, via assertions using more specialized constructs.***

EDM is indeed aimed at providing a much more flexible description framework than the existing ESE. We expect that many providers, while submitting data to Europeana, will be interested in submitting descriptions that fit their own specific level of interest. The key to ensure interoperability at the semantic level is *mappings*, following common practice in the Semantic Web framework.

Let's consider an example. Joconde provides an historical note for the Mona Lisa painting. A straightforward representation of it in RDF could yield the following statements:

```
ex1:object/000PE025604 ex1:schema/historicalNote "commandé par le florentin Francesco del Giocondo, époux de Mona Lisa entre 1503 et 1506"@fr .
```

As such, however, this information cannot be fully exploited in an environment like Europeana, which has to deal with hundreds such specific schemas. Mapping to a semantic interoperability core is required to ensure that a general tool can exploit at least a part of the intended semantics for these specific properties. Such mappings are typically achieved in RDF by asserting semantic relationships between the specific constructs and the core ones. Those can take the form of statements using `rdfs:subClassOf` or `rdfs:subPropertyOf`, as in the following:

```
ex1:schema/historicalNote rdfs:subPropertyOf dcterms:description .
```

If the provider submitting the above Mona Lisa metadata also provides this mapping, then a tool able to exploit the mapping will be able to derive from the original description a new generalized statement:

```
ex1:object/000PE025604 dcterms:description "commandé par le florentin Francesco del Giocondo, époux de Mona Lisa entre 1503 et 1506"fr .
```

This co-existence between the generic and the specific level allows for example:

- to search for the painting using a generic description-based index
- to display the information for that painting using the finer-grained distinctions made by the provider.

This mechanism is in fact already at play within the various levels of descriptive data of EDM. `edm:hasMet`, for instance, is meant as a super-property of various other properties re-used in EDM, such as `dcterms:creator`, `dcterms:contributor` and `dcterms:publisher`. This property will thus allow users to find the objects that are related to a given person, whether they have “met” this person as their main creator, a secondary contributor, or a publisher.

To sum up, using the full potential of EDM requires providers to provide descriptive data according to their most specific interest, but also at the more general interoperability level EDM defines. The Mona Lisa metadata as expressed in the object-centric view of Fig. 7 should thus be submitted in the more complete form expressed in Fig. 12, following the original metadata presented at the Joconde site. Note that the object itself can be typed using a `Painting` class from an internal vocabulary or a domain-specific standard.

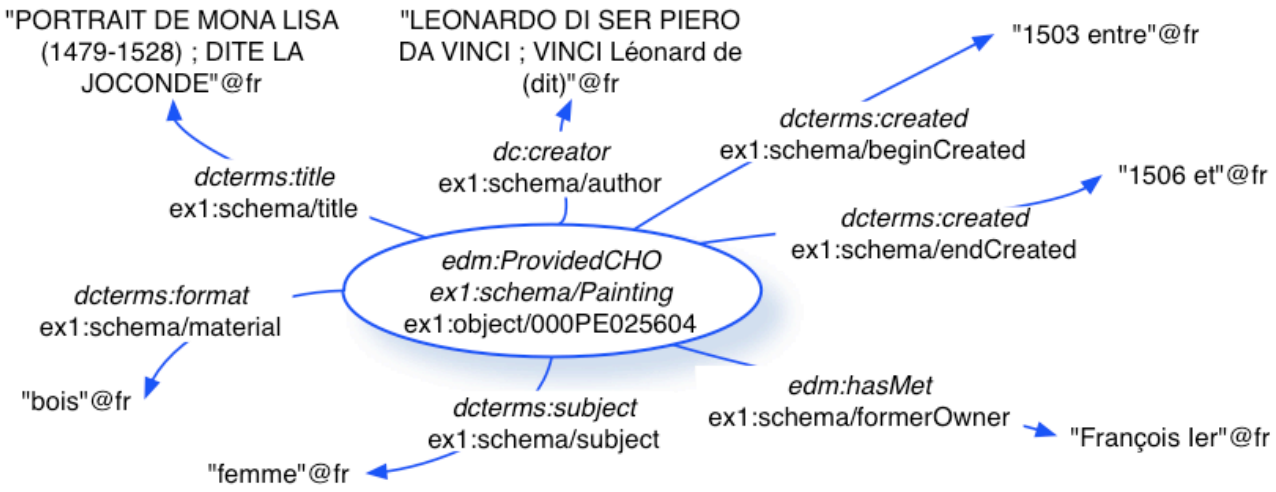

Fig. 12. Mona Lisa – object-centric description at both specific and interoperability levels

Fig. 13 (below) shows how a more precise description could also be provided for the event-centric view of Mona Lisa in Fig. 10.

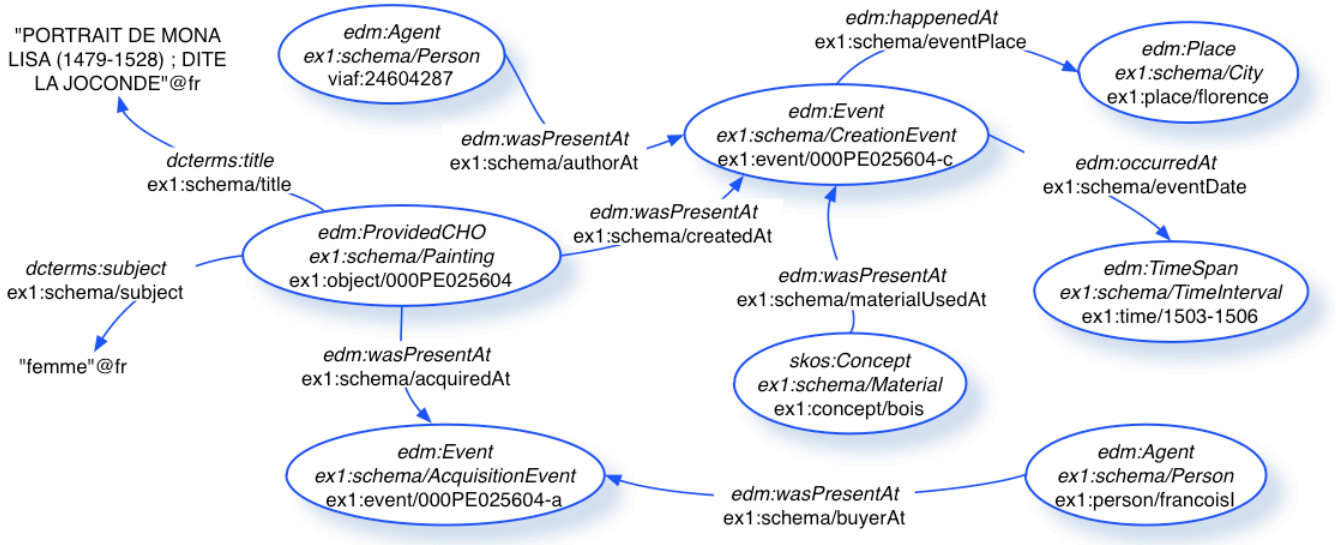

Fig. 13. Mona Lisa – event-centric description at both specific and interoperability levels

The reader should notice that at the time of writing, the practical details on how to organize the submission of precise metadata together with its mappings are still to be worked out.

Finally, one may argue that presently some of these required mappings may bridge too wide a conceptual gap to be useful. Consider for instance the sub-property link between `ex1:schema/buyerAt` and `edm:hasMet` in Fig. 13. In that case, EDM only allows capturing a minimalistic part of the original property's meaning.

This highlights the value of "interoperability cores", such as Dublin Core, which allow to better capture the intended semantics of metadata fields in a cost-effective way.[11] As was already hinted in the previous section, it could be that a large number of providers agree on a

[11] This is of course caused by the mass of data available in Dublin Core format, which maximizes the return on implementing functions that exploit this data.

common set of other interoperability-level constructs that provides the basis for richer functionality. Europeana will then naturally consider including that set as a "reference extension" to EDM, and implementing functions that exploit it properly.

5.5 Relationship between Europeana Semantic Elements (ESE) and EDM

Most of the properties used in ESE (the Dublin Core ones) actually constitute the "semantic interoperability core" of EDM, as presented in the section of the EDM Definitions presenting the mappings between ESE properties and EDM ones.

The first difference lies in the way these properties can be used. To remain compatible with legacy data, and data that will come in "not enriched" ways, ESE/DC properties can be used with simple strings as values. But EDM recommends, for the properties that can be used that way (e.g., `dcterms:creator`, etc.) to use fully-fledged resources, as with the VIAF example first introduced in Fig. 8.

The reader should be aware, as already noted, that one should use `dcterms:` namespace whenever it features a property with appropriate semantics and for which there is no constraint that conflicts with our intended usage. Otherwise, the "corresponding" property from the legacy `dc:` namespace should be used. For example, `dcterms:creator` does not fit well cases where the creator is given as a mere string, and not as a fully-fledged resource. For such cases we use `dc:creator`.

Another difference between the way ESE and EDM exploit the same properties, lies in the application of the "one-to-one principle". In ESE, all fields come bundled in a same record. Despite our efforts in the ESE Mapping Guidelines [ESE-Guidelines], this makes it difficult to distinguish whether a given field applies to the "real-world" object, its digital representation(s) or a property of any other entity that is related to the object, e.g., its creator. EDM allows such distinctions to be made, as already explained. This is especially visible in the mapping from ESE to EDM that was made in the course of prototyping EDM—especially, for the creation of the Europeana Linked Data prototype [Data-Europeana-Eu]. We refer to the EDM Mapping Guidelines [EDM-Guidelines], where we present in further detail this mapping. Note that this mapping also constitute the very first step by which Europeana will move its legacy ESE metadata to refined and enriched EDM data.

6 EDM and proxies

Requirement R3 raises the need for handling cases where Europeana takes data from many providers and this data may be about the same real world resource, thus giving multiple views on the same resource.[12] In addition, Europeana will attempt to add its own data about that resource giving yet another view on the same resource.

These views will not be merged however. In such cases, it is indeed very likely that the metadata will differ, e.g., different names may be used for the same creator. So mechanisms

[12] This situation is of course very unlikely to happen for many providers when they submit data to Europeana, which reflects only one perspective on any given object—see Section 6.5.

are needed to keep the different views distinct. To this end, Europeana leverages the *proxy*[13] mechanism from the Object Re-use and Exchange (ORE) model, which is meant to enable the representation of resources in the context of aggregations, thus enabling different views on the same resource.

6.1 Introducing proxies

Let us consider our Mona Lisa example. We have two records available for it, respectively from the Joconde database and the Louvre. As represented in Fig. 4-6 each data submission to Europeana will give rise to a specific instance of the `ore:Aggregation` class, used to group all the elements related to one resource that come from one provider. Both providers indeed contribute a different set of digital representations, e.g., different resolutions, different file types and, of course, different locations for the representations. Remember, an aggregation can be seen as one provider's contribution for an object, the (digital) *context* that it creates for that object.

But each metadata record provided to Europeana also gives raise to one specific *proxy* for the object described, modelled using the `ore:Proxy` resource. A proxy is specific to one given aggregation, and is used to represent the description of the provided object, *as seen from the perspective of that specific aggregation and therefore its provider*. With proxies it is possible to represent different, possibly conflicting pieces of information on provided objects, while still keeping track of the provenance of this information. For instance, the title of Mona Lisa for Joconde could be "Portrait de Mona Lisa" while for Louvre it could be "Portrait de Lisa Ghirardini."[14]

A proxy is connected to the one resource it is a proxy for, using the `ore:proxyFor` property. It is connected to its provider's aggregation using `ore:proxyIn`, as in Fig. 14.

An aggregation can have only one proxy per provided object (the `edm:ProvidedCHO`) that it aggregates, since it results from the activity of only one provider. Where two providers have submitted data about the same "real" object a proxy will be generated for each set of data and both proxies would ideally be linked to the same `edm:ProvidedCHO`. This `ProvidedCHO` can therefore be seen as a resource that represents the object independently of either description context. Proxies are thus essential for representing and relating the different views of the same resource from various providers, including Europeana itself, as will be shown in the next section.

At this stage, how and when identical objects should be recognized remains open. Fig. 15 reflects that two providers may well have contributed two different URIs for the same resource. In such cases, some identification mechanism has to be applied to infer an `owl:sameAs` link between the two URIs, which enables the "merging" of the resource. In the Mona Lisa case, the Louvre inventory number ("INV 779") may be exploited for this.

[13] http://www.openarchives.org/ore/1.0/datamodel#Proxy

[14] Note that in our examples we use the `dcterms:` namespace whenever it features a property with appropriate semantics and for which there is no constraint that conflicts with our intended usage. Otherwise, we use the "corresponding" property from the legacy `dc:` namespace. For example, `dcterms:creator` does not fit well cases where the creator is given as a mere string, and not as a fully-fledge resource. For such cases we use `dc:creator`.

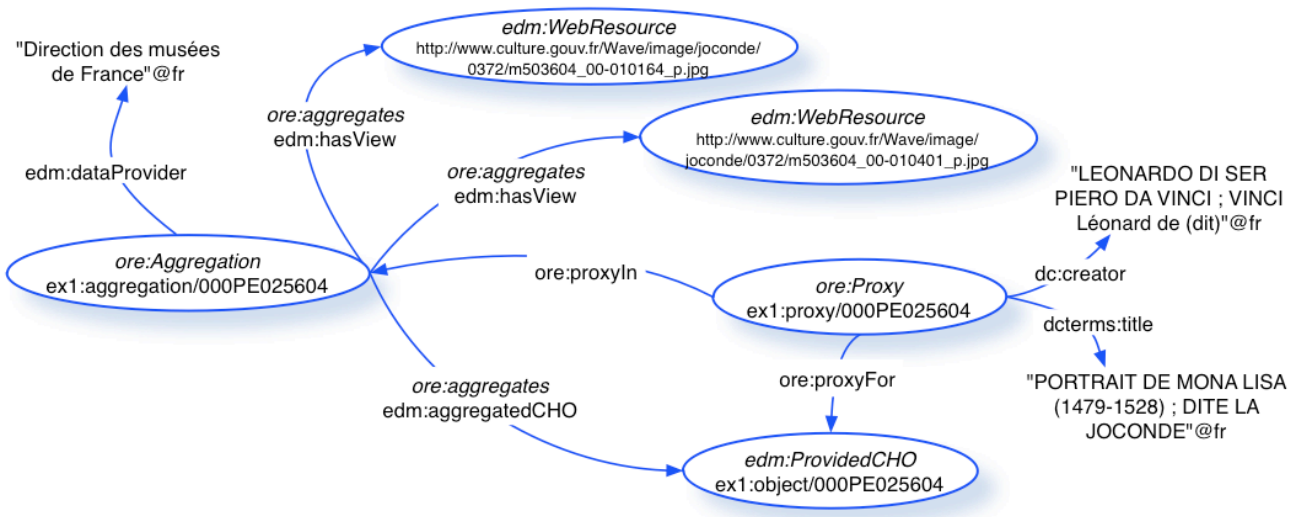

Fig. 14. Provider's aggregation, provided object and proxy—simple case with only one provider for the object

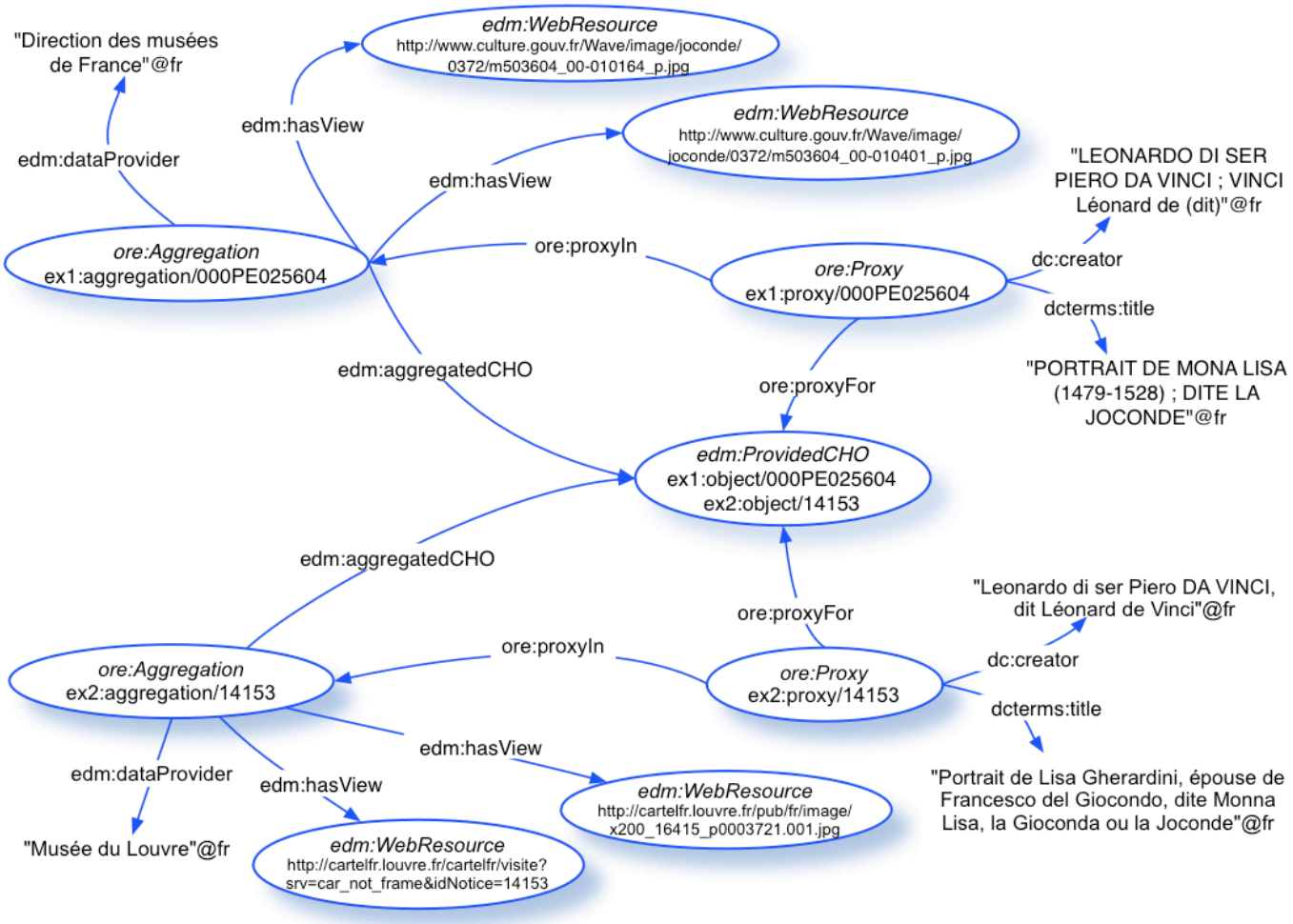

Fig. 15. Providers' aggregations, provided object and proxies—complex case with two providers for the object

One can expect cases where two providers submit data on a same object to be relatively numerous, once Europeana receives data from a complex network of providers. Moreover, such cases are very difficult to anticipate: Europeana aggregators cannot readily know whether the providers they aggregate data for are already providing data through another aggregator. Additionally, there is always a second information source on the provided object beyond its original provider: Europeana itself.

6.2 Europeana proxies and data enrichment

Europeana creates new data for the object it ingests so as to provide more value to its users. At the time of writing, this information results from the processes of *normalizing* data formatted using the Europeana Semantic Elements (ESE) and *semantically enriching* object descriptions with links to contextual entities. Europeana massages some of the metadata fields, so that they can be used seamlessly for specific purposes. Europeana also updates that information by linking objects to fully-fledged resources from selected vocabularies (e.g., GeoNames[15] and GEMET[16]) that are thoroughly described and are themselves connected to other resources, such as authority files for places and persons and thesauri for subjects. These resources enable richer functions, such as query expansion (e.g., using alternatives for a creator's name), recommendation of objects using semantic relations between them (objects created by connected artists), etc. This is a crucial aspect, and Europeana intends to proceed with such semantic enrichment on a large scale, using classes that EDM introduces for this specific purpose (see section 5.2).

The bottom part of Fig. 16 shows how the result of such enrichment can be represented using EDM proxies, for the Mona Lisa example. This is shown by the presence of the `edm:Agent` resource attached to the Europeana proxy. Thanks to the proxy mechanism, Europeana can maintain the original metadata alongside the new, richer metadata that it generates, allowing it to serve (or display) one or the other, depending on a given information need. Note that the `ore:aggregates` link between the two aggregations will be explained in the next section.

[15] http://geonames.org
[16] http:// www.eionet.europa.eu/gemet

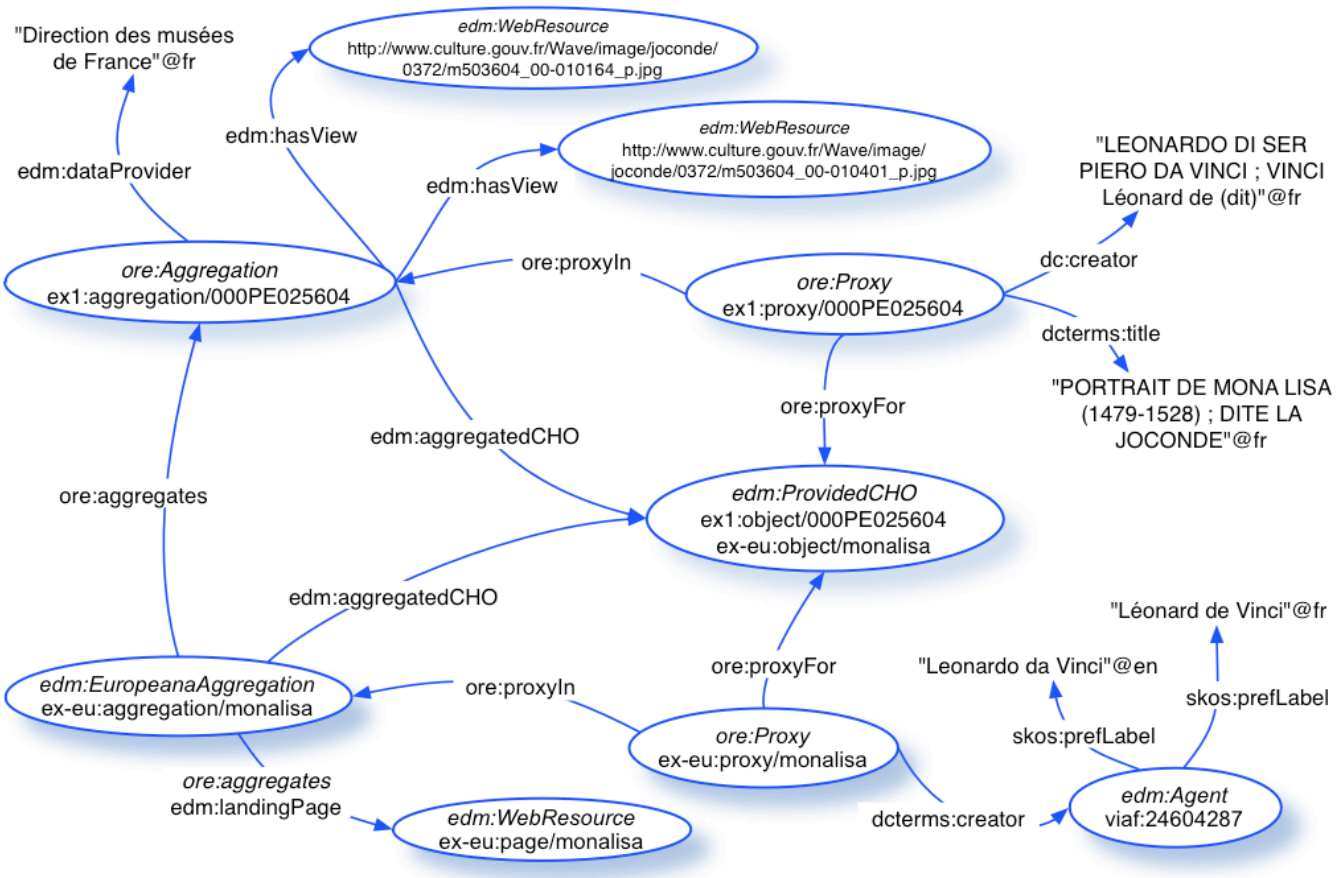

Fig. 16. Europeana aggregation—simple case with only one provider for the object

6.3 Europeana aggregations and proxies

As illustrated in Fig. 16, Europeana creates its own aggregation and proxy for any provided object. This enables the connection of new information (derived from normalization or enrichment) to the original object description, while still keeping the distinction between what is provided and what is added.

This new Europeana aggregation is modelled using `edm:EuropeanaAggregation`, a specific subclass of `ore:Aggregation`. It captures the fact that such aggregations are the result of Europeana's own work. Europeana can use them to manage its own IPR, access restrictions, and so on. They also hint that an extra aggregation layer is being introduced here.

Like providers' aggregations, a Europeana aggregation is indeed currently linked to the provided object using `ore:aggregates`. It can also aggregate other resources, especially digital representations of the object, or a reference landing page for it, using the `edm:landingPage` property. One crucial point, though, is that in EDM the Europeana aggregation is considered to aggregate each specific provider's aggregation that is about the same object. Fig. 17 extends the example of Fig. 16 by introducing a more complete version of this extra aggregation layer, which enables the introduction of new descriptive information via the Europeana proxy but also reflects Europeana's crucial role of bundling (digital) resources together.

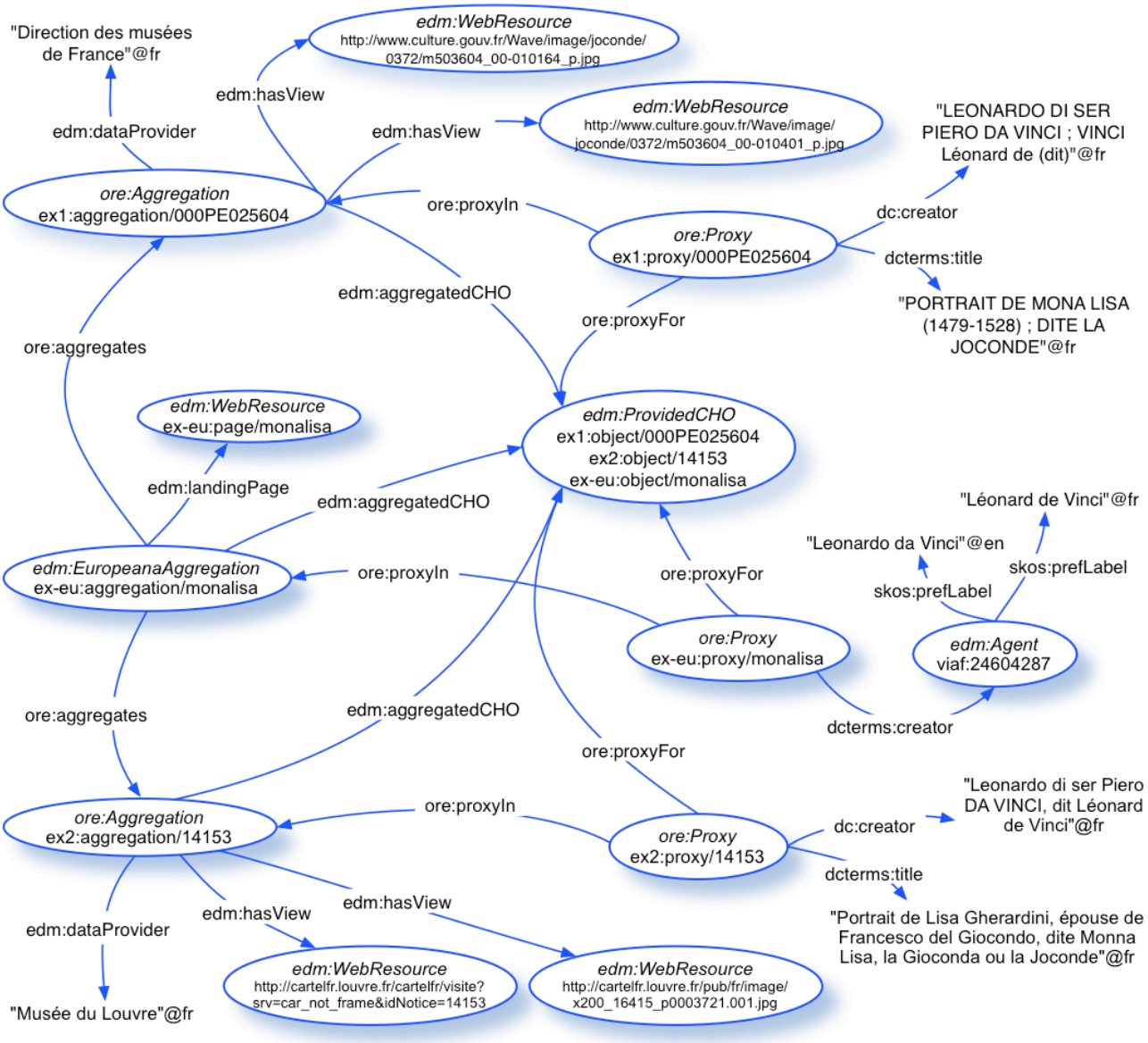

Fig. 17. Europeana aggregation—complex case with two providers for the object

6.4 Why manage central nodes for provided objects?

A question the reader will possibly ask is: why would Europeana care about the "central" resource that denotes the provided object? After all, proxies seem to be enough to carry the descriptive metadata. And the Europeana aggregations are enough to glue together all digital representations and data contributed by various providers.

The first answer simply derives from technical motivations: according to the ORE model, an ORE proxy must be a proxy *for* some "view-independent" resource that is aggregated by the aggregation. But this constraint corresponds itself to general data access strategies. Consider a user who needs to access information for a provided object, say, the Mona Lisa painting. It is very likely that this user cannot anticipate which are the specific views that apply to it, or even if there are any such views. In most cases, users would not even require

to access a specific view. They will rather be interested in getting data for "real" objects—in Europeana, a painting, a book, etc.

This is exemplified by Linked Data scenarios, as being prototyped in data.europeana.eu, the Europeana Linked Open Data pilot. In the Linked Data context, data consumers will expect to access data via the HTTP URIs of real objects. Proxies make less ideal data access points, without prior knowledge of the resource they stand for. Europeana thus needs to manage resources for the real objects that are at the core of its users' interests—as well as of its providers' business.

6.5 What parts of the EDM core pattern should providers provide?

The proxy pattern presented in the previous sections is quite complex, compared to the existing ESE practice. In particular, it is clear that this complexity arises from requirements that are not shared by all Europeana data providers. One of the most important pieces of information expected from providers is the distinction between the metadata that applies to the object itself, and the metadata that applies to the digital representations (and the package that holds them together). Proxies are not strictly necessary for this.

This is why in a first stage, Europeana will focus on ingesting *simple* EDM data without proxies, as reflected in Section 5 of this Primer. The only proxies that are required are the ones created by Europeana, in relation with its semantic enrichment efforts. But this will only have consequences on Europeana internal data management architecture, and the implementation of data dissemination functions, e.g., the Europeana OpenSearch API[17] or data.europeana.eu.

However, the submission of proxy-based representations could be useful for:

- aggregators (organizations performing a data aggregation role similar to Europeana's but with a more focused scope) who already own several records pointing to a same item.
- providers that want to link their data submission to objects already ingested in Europeana or curated by other institutions, when they know they have records about these objects as well, and wish to help Europeana to detect this by stating that their proxies are connected to `edm:ProvidedCHO` resources already identified by Europeana.

To accommodate situations that require data providers to submit proxy-level data, Europeana will seek to develop a suitable data ingestion option.

The next issue regards the provision of (URI) identifiers for the various objects that appear in the pattern. In the previous sections, we assumed that all resources have been provided (HTTP) URIs. Providers may not be expected to provide all this, though.

A first suggestion is that providers will submit URIs for web-accessible digital representations (e.g., pictures) and for the provided objects or aggregations that already have permanent identifiers. Europeana itself would take care of assigning (or re-assigning) URIs for the proxies and aggregations it creates. It will also create URIs for all `edm:ProvidedCHO` resources, so as to implement a linked data publication strategy that relies on Europeana's own (HTTP) services.

[17] http://pro.europeana.eu/api

6.6 Proxies vs. named graphs

A question we were often asked while prototyping EDM, was why we had been considering ORE proxies to represent specific views on resources, when RDF provides the notion of "named graphs" to meet a similar requirement. The answer is quite simple, and matches the motivation for which proxies were introduced in ORE in the first place: as of the time EDM was created, named graphs were not a standard W3C recommendation, and still are not at the time this document is being written. However, the notion of graph will be present in the next version of RDF, currently being drafted by the W3C RDF Working Group.[18] At that point, Europeana will of course consider fitting graphs into the EDM architecture.

7 Advanced EDM

EDM allows for even more complex representations—still in a flexible fashion, as discussed in Section 5.4. The following are especially of interest:

- hierarchies of objects;
- relations between provided objects, for instance representation relationships or artistic derivation between works;
- explicit representation of data packages via ORE resource maps.

In this document we only present examples of the hierarchical objects and representation links. Other aspects will be detailed in a future version.

7.1 Representing hierarchical objects

To illustrate how EDM enables representing hierarchical (part-of) links between objects, we consider an example from the archive domain—an atlas from Holland.[19] This object can be considered as a simple one: it has some physical unity, and its content is addressing to one general subject. However, it can also be considered as a grouping of individual pages, each of them being digitized and potentially answering a user's information need, for instance, a request for information over a specific town. This complex situation is appropriately described in the metadata Europeana aims at harvesting. These archive objects are indeed described in EAD files, which can represent hierarchical containment between different "levels" of archive resources.

EDM aims at tackling this sort of relation, by allowing one to use:

- `dcterms:hasPart` and `dcterms:isPartOf` for representing inclusion links between the represented objects;
- `edm:isNextInSequence` to express order among the parts of the object, when such ordering is applicable.

[18] http://www.w3.org/2011/rdf-wg/

[19] The object was provided by the APEnet project (http://apenet.nac.kei.pl/) and is accessible from the site of the Dutch National Archives at http://proxy.handle.net/10648/af8fcd68-d0b4-102d-bcf8-003048976d84
Individual pages are also available at Europeana, for example
http://europeana.eu/portal/record/09002/56A504A68C5EA7CE9AAC2527AEC1EC2C90ADAF77.html

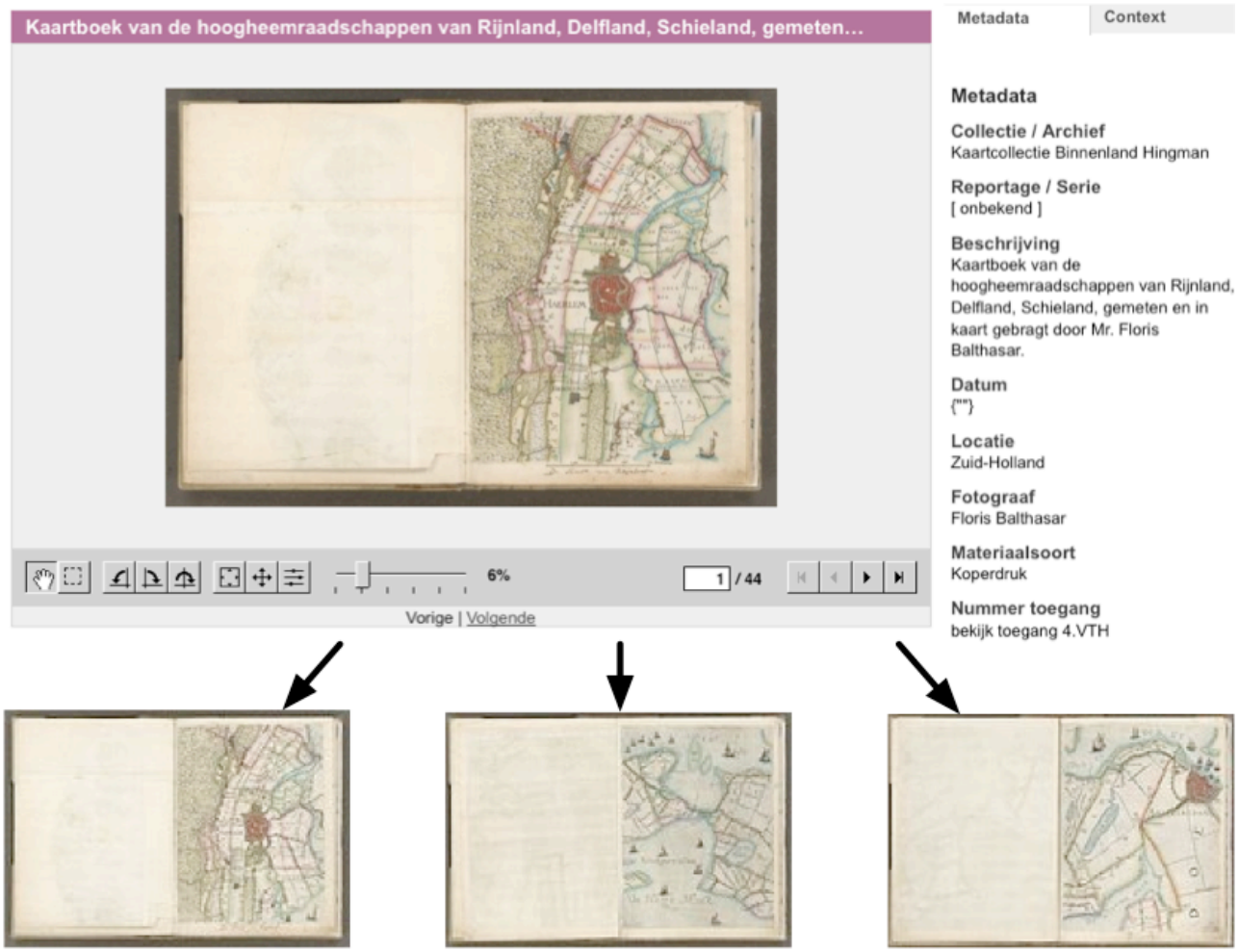

Fig. 18. An atlas made of individual pages at the National Archives of the Netherlands

A possible representation of the first two pages of the above example, using only the more general properties EDM recommends and a subset of available metadata[20] is shown in Fig. 19.

Note that the proxy mechanism allows several hierarchical views to be deployed on the same objects. One book may be viewed as a set of component pages for one provider, while it would remain one simple entity for another, or even be decomposed in a different way. This will be especially useful when Europeana has to aggregate such different views, producing new hierarchies without messing up the original ones.

[20] A more complete version is available through the EuropeanaConnect semantic layer at http://semanticweb.cs.vu.nl/europeana/browse/list_resource?r=http://purl.org/collections/apenet/proxy-4_VTH-ATLASSEN_EN_KAARTBOEKEN-F&raw=true .

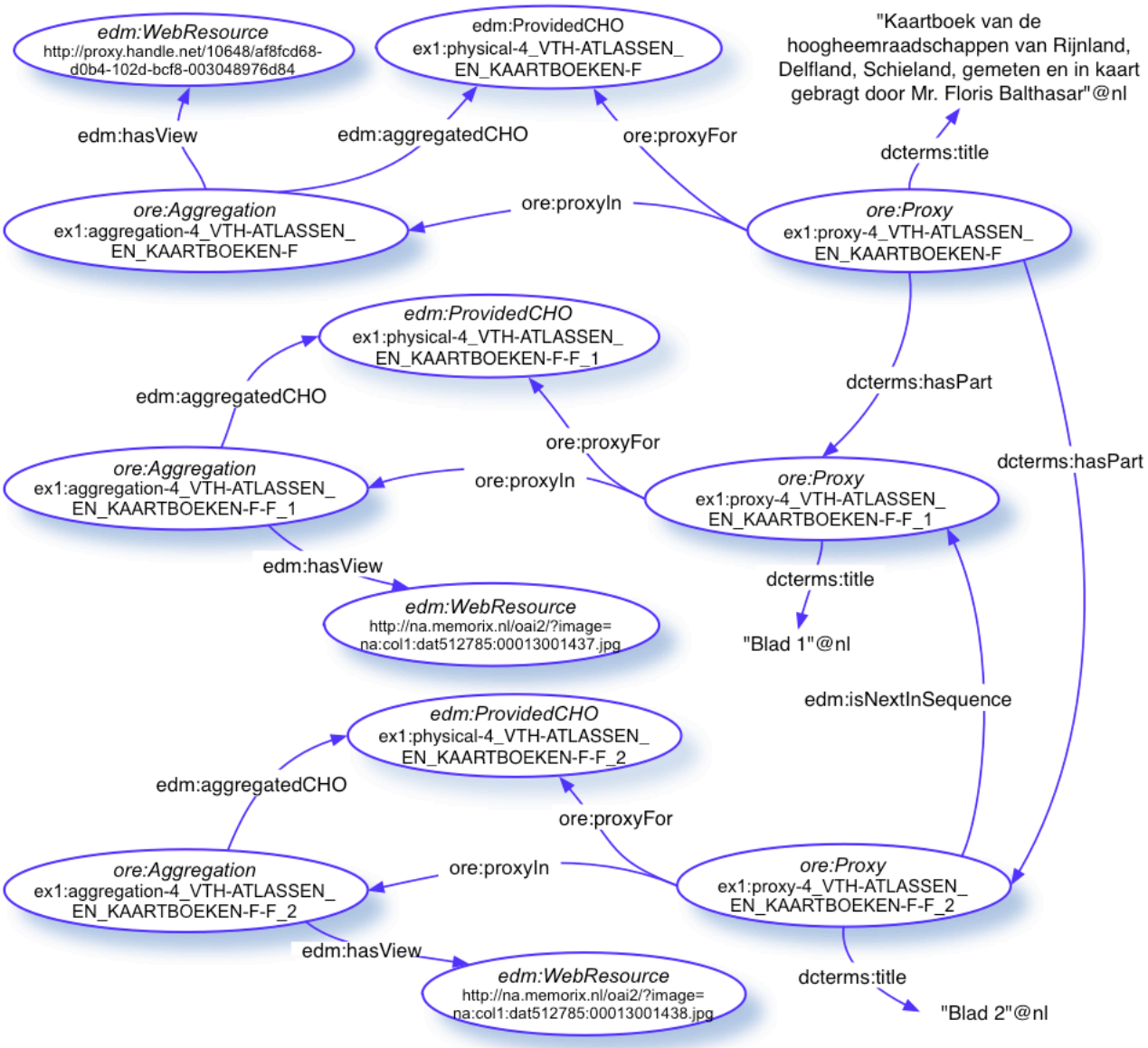

Fig. 19. Representation of the first components of a hierarchically structured object

7.2 Other types of linking between objects

In this section we briefly mention how other relationships between provided objects could be represented. First we consider a case where two objects depict the same place, with the two representations of Stonehenge below:[21]

[21] These two objects are accessible through Europeana at: http://europeana.eu/portal/record/92037/E465D54FAC30FF54AA7FC9C9584E7FCA21AB6926.html (original at http://www.bl.uk/onlinegallery/onlineex/kinggeorge/a/003ktop00000043u058b0000.html) http://europeana.eu/portal/record/2022317/07B357E5EBD7F51DFC77DE21FB9D8A817BE8583C.html (original at http://viewfinder.english-heritage.org.uk/search/detail.aspx?uid=76157)

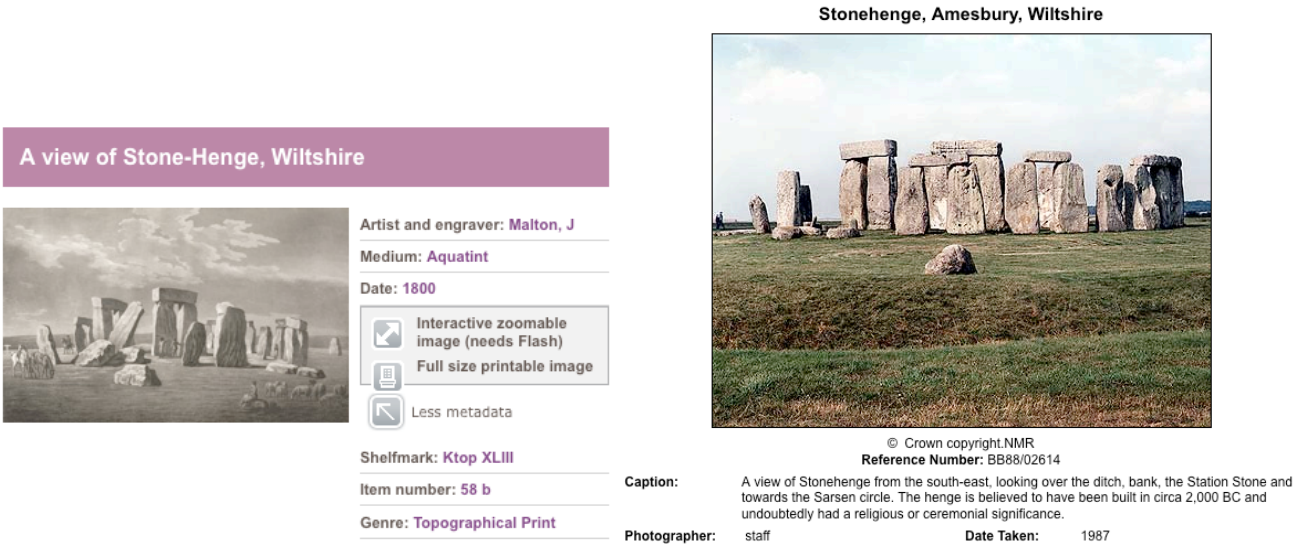

Fig. 20. Stonehenge – an aquatint (British Library) and a photograph (English Heritage)

In this case, it is possible to *directly* connect the two pictures together, allowing a user to browse from one object to the other—the data could be used, e.g., to feed Europeana's current "Explore further!" function with very precise information. One can use for this the generic property `edm:isRelatedTo` or a specialization of it (possibly, a domain-specific property) depending on the level of precision in the data at hand—the next example illustrates this.

It is also possible to relate the objects *indirectly*, by stating that they are linked to one same resource. For instance, one can assert that they both have Stonehenge (as a place) as their spatial coverage.

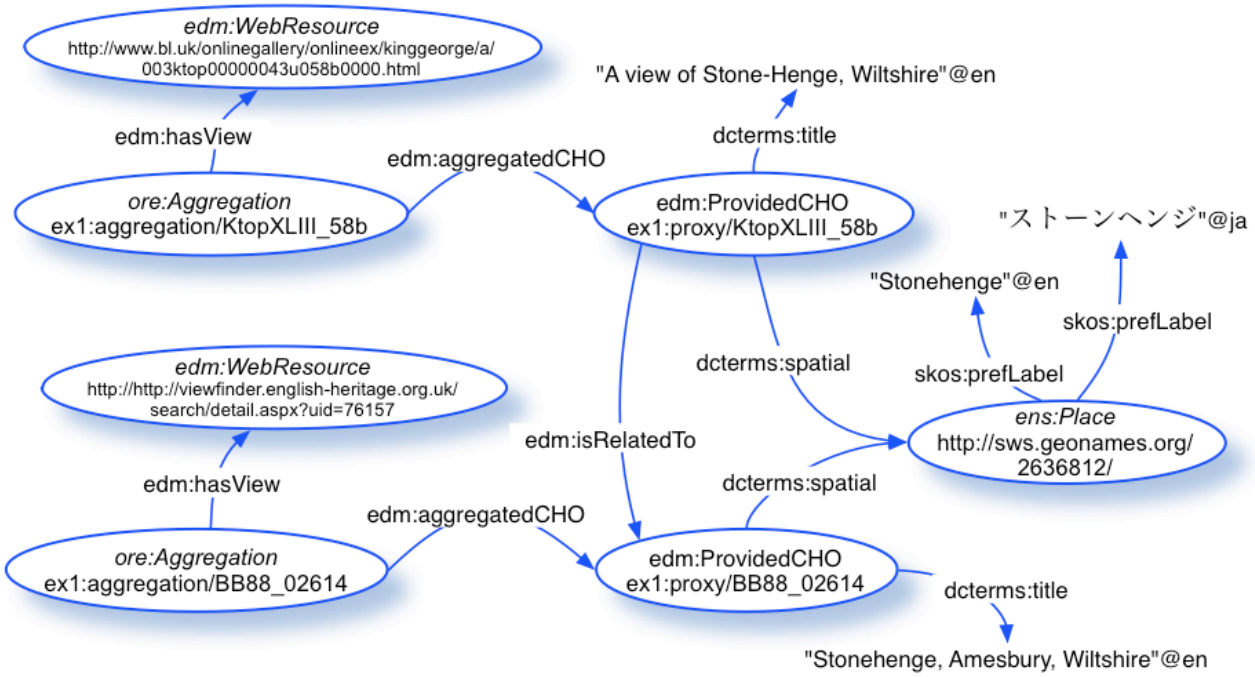

Fig. 21. Representation of two objects covering the same place

Note that Fig. 21 illustrates both of the two alternatives at once: in reality, it could be that we only have the information that both objects cover the same location, or that they are related together, but not both. Also, it takes a simplified view, where objects come to Europeana already provided with all necessary information. In practice it is likely that this data would be obtained after enriching and reconciling data from different providers. Hence, the connecting statements may be instead attached to the different proxies that represent the objects from the perspective of various data providers, including Europeana's proxies.

Our second example goes back to Mona Lisa. Europeana has received a third record that describes a work inspired by the Mona Lisa painting, "Mona Lisa – 2000".[22] This work, a collage, derives from Da Vinci's painting. As shown in Fig. 24, to connect this new object to the original painting we can use the `edm:isDerivativeOf` property, a specialization of `edm:isSimilarTo`, itself a sub-property of the `edm:isRelatedTo` used in the previous example.

Fig. 22. Mona Lisa - 2000 at the Deutsche Fotothek website

In addition, Europeana has also harvested a record describing a photograph of Mona Lisa of historical interest—the French photographer Gustave Le Gray took it in the 19th century.[23] Fig. 23 shows how an `edm:isRepresentationOf` statement can be used to connect the resource that stands for this historical picture to the one that stands for the original painting.

[22] http://europeana.eu/portal/record/01004/AC2B3AA843934B18E804DD40BF6E7BDD9C04067F.html (original record at http://www.deutschefotothek.de/obj30131760.html)
[23] http://europeana.eu/portal/record/03919/71ACB47978A33793534074A02F2DBF9531FAC0B5.html (original record at http://www.culture.gouv.fr/public/mistral/joconde_fr?ACTION=CHERCHER&FIELD_1=REF&VALUE_1=50410005060)

Fig. 23. La Joconde by Le Gray at the Joconde website

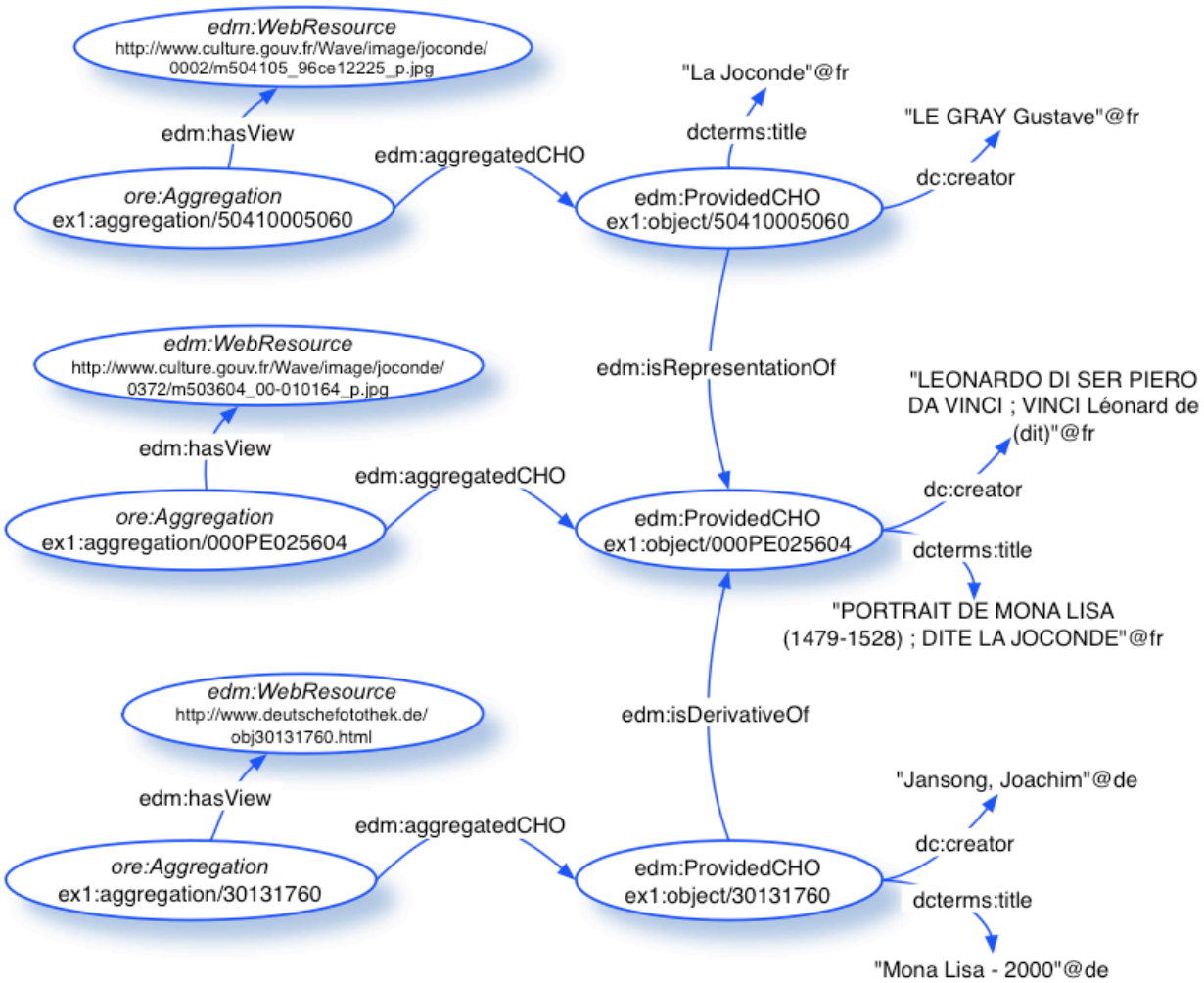

Fig. 24. Representation of two works related to the Mona Lisa

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Change history from first version (05/08/2010)

Date	Change	Author
10/02/2011	Corrections following comments from Paul Hermans: • changed into dc:format the occurrences of dcterms:medium with literal as object • removed dcterms:created with an ens:TimeSpan as object Corrections following comments by Doug Tudhope: • p.11: precision on the provider-supplied class Painting • p.13: precision on link between proxies for a same object • p.14: added note on expectation of cases where two providers submit data on a same object. • p.15: precision in the text about Fig. 8 • p.20: precision in the text about the two events in Fig. 12, added note on the potential benefits of event-based representation. • p.22: added a note on using skos:Concept to represent person or location authority files • p.23: added some extra motivation for mapping to dbPedia Minor editorial modifications and updates	Antoine Isaac
26/10/2011	• Re-organized the entire document following comments from Herbert Van de Sompel, introducing edm:ProvidedCHO and the perspective of Europeana data providers sooner, and pushing the first occurrence of proxies back in section 7. Updated figures accordingly. • Update of EAD example • Changed ens: namespace into edm: • Changed dc:creator statements for aggregations into edm:dataProvider • Added examples of linking between objects • Minor editorial modifications and updates	Antoine Isaac, Robina Clayphan
14/07/2013	• Updated URLs and References	Antoine Isaac

Annex 1

Amphora of Tuthmosis III

Identifier: Λ2409

Classification: Amphora

Event: Type: Excavation

Agent: Stylianos Alexiou

Date: 1951, October

Place: Katsampas, Tomb of the ”blue coffin”, Heraklion

Event: Type: Deposition

Place: Katsampas, Tomb of the “blue coffin”, Heraklion

Period: LMIII A1 (14th century BC)

Event: Type: Production

Place: Egypt

Period: 18th Dynasty, reign of Tuthmosis III (15th century BC)

Current Location: Archaeological Museum of Heraklion Crete

Current Owner: Archaeological Museum of Heraklion Crete

Description: Intact, veined, Egyptian alabaster jar. It has a piriform body, short neck, flat everted rim, foot of biconcave profile, defined by a ring with hollow underside, imitating a slightly asymmetrical base. Two vertical strap handles separate the shoulder from the top of the belly. On one side of the belly is a rectangular frame enclosing a hieroglyphic inscription with the name of Tuthmosis in two cartouches. The inscription reads:

“1.The virtuous god
2. Men-Heper-Re
3. Son of the Sun
4. Tuthmosis, the Fair One in the transformations
5. Blessed with eternal life”.

This imported Egyptian vase of the 18th Dynasty was found at Katsampas, in the tomb of the “blue coffin”, together with other Egyptian stone vessels. The name Men-Heper-Re refers to the pharaoh of the dynasty of Tuthmosis III, who reigned from about the beginning to the middle of the 15th century BC. The vase was probably imported to Crete in the years when Egypt was strongest at sea. […]