



DELIVERABLE

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D3.6 – Report on CARARE aggregator: tools and services

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Authors: D. Gavrillis, C. Dallas, Stavros Angelis, DCU

Contributor: Vassilis Tzouvaras, NTUA

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1 Executive Summary

This report provides an introduction to the tools and services that have been implemented to form the CARARE aggregator, and describes work that has been carried out within the work package 3 of CARARE.

Chapter 2 provides an introduction to the MINT tools and their functionality, which includes:

- Metadata upload
- Mapping and ingestion preparation
- Publishing

Chapter 3 describes the tools and functionalities of MORE, which are structured as follows:

- Metadata harvesting – OAI-PMH
- Metadata harvesting – SIP
- Transformation subsystem
- Indexing subsystem
- Ingest process monitoring
- Content provider interface
- Europeana export

Chapter 4 provides a description of the CARARE data management point of view and the interfaces used to achieve interoperability:

- CARARE and EDM
- Publishing workflow to Europeana

Chapter 5 describes how the CARARE system uses the CARARE and EDM metadata schemas to achieve interoperability between content providers native systems and Europeana. The mapping between CARARE and EDM is provided in Annex 1.

2 Introduction

The CARARE project has established an aggregation service to support the:

- harvesting metadata from the project's content providers
- mapping of native metadata schemas to the CARARE schema
- evaluating and quality checking the content
- ingesting the content to the CARARE repository
- transforming the content from CARARE to EDM
- exposing the content to Europeana

The CARARE aggregation infrastructure consists of the MINT and MORE platforms. These are configured to ensure the seamless mapping and ingestion of content provider metadata to CARARE and its provision to Europeana. The overall system architecture is presented in figure 1 below.

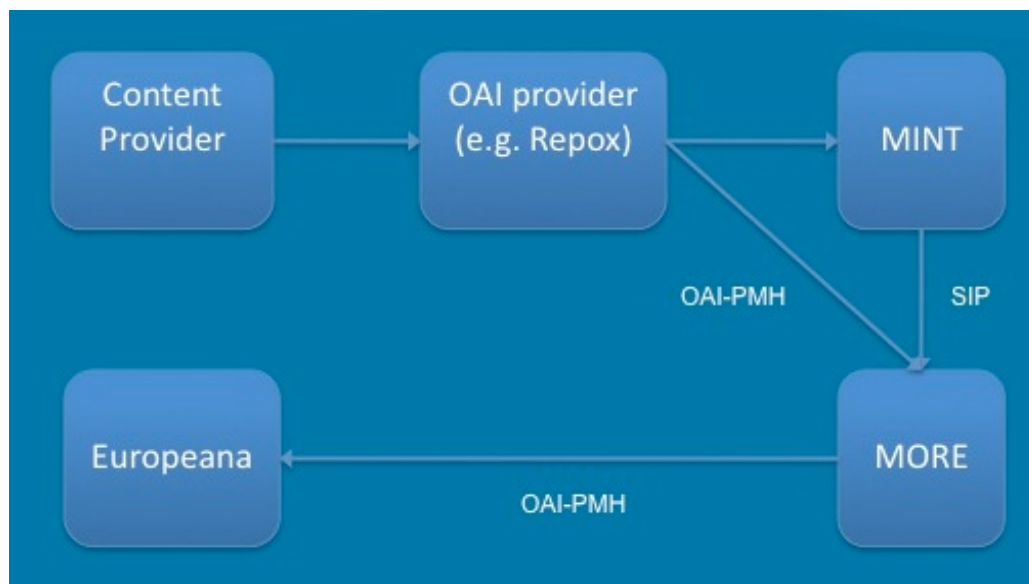


Figure 1: CARARE system architecture

The MINT and MORE systems each consist of various tools and services that are used in order to perform the various functions offered to content providers.

3 MINT tools and functionality

The MINT system is the first interface between the content providers and CARARE. It allows the content providers to upload their content, make the transformation to CARARE and then publish it to MORE – the CARARE repository.

Content providers can upload their native records to the MINT tool directly by using one of the metadata ingestion methods that are provided by the MINT ingestion platform (see below). The MINT tool provides tools for mapping and transforming the native metadata records received to the CARARE Schema, and providing them for ingestion to MORE using the SIP protocol.

Content providers who can export their native records in the CARARE schema format are also offered the option of exposing them for harvesting by either MINT or MORE through OAI-PMH. Content that is harvested by MINT in this way is published directly to MORE without the content provider needing to complete mapping or transformation. Content in exposed via OAI-PMH in CARARE format may also be directly harvested by MORE.

MORE enriches the records, converts them to EDM and exposes them through OAI-PMH for harvesting by Europeana.

3.1 Metadata upload

The metadata upload process involves the upload of the content providers' native XML or CSV records to the MINT tool. This can be achieved through the following procedures:

- Using a remote FTP or HTTP upload of a single XML file. In this case the user is prompted to provide a valid URL using one of the two protocols for remotely uploading metadata records either as a single XML file or as multiple files packaged in a ZIP archive.
- Using a direct HTTP upload of one XML file or a ZIP archive of a whole collection. In this case the user directly uploads the metadata records from his/her local computer. Using this option the user is also able to upload metadata records in CSV format, in that case, the user is also prompted to provide information regarding the field separator and the use of any special character as the “escape character”. However, for interoperability reasons, it is recommended that users provide XML records.
- “FTP Upload” and “Server Filename” options are offered to support providers that do not have direct access to their native records over the Internet or providers who have extremely large datasets that need special handling by the MINT development team; these options are rarely used.
- OAI harvesting. An OAI-PMH V2 compatible harvester is implemented and exposed to the user as a metadata upload option for MINT. In this case the user is prompted to

provide all the appropriate mandatory and optional parameters for the harvester, e.g. the base URL of the OAI-PMH repository, the namespace prefix, an optional set name and appropriate date values for filtering. The user is also able to validate the provided parameters and also fetch information that is provided by the OAI-PMH repository.

During the metadata upload process, the MINT tool analyzes the XML records and performs well-formedness and validation checks.

3.2 Mapping and Ingestion preparation

The MINT mapping and ingestion preparation workflow process describes the process of converting native records to CARARE and packaging them for ingestion to MORE (see figure 2 below).

The content provider uploads their metadata to MINT using the methods that are presented in 2.1. The metadata are analyzed, validated and the native schema is inferred. As part of the schema inference procedure, the user is also prompted to select a structural element of the inferred metadata schema that will act as the wrapper of a unique metadata record. Additionally, the user is given the option to select one of the elements to act as the main label of the records in order to provide better browsing and visualization of the uploaded records. This requires however, that the content provider use representative and complete records so that the full native schema is inferred. Next, the content provider is presented with the native schema along with the CARARE schema and proceeds to create the mapping between the two by establishing connections between elements in the native schema and corresponding elements in the CARARE schema.

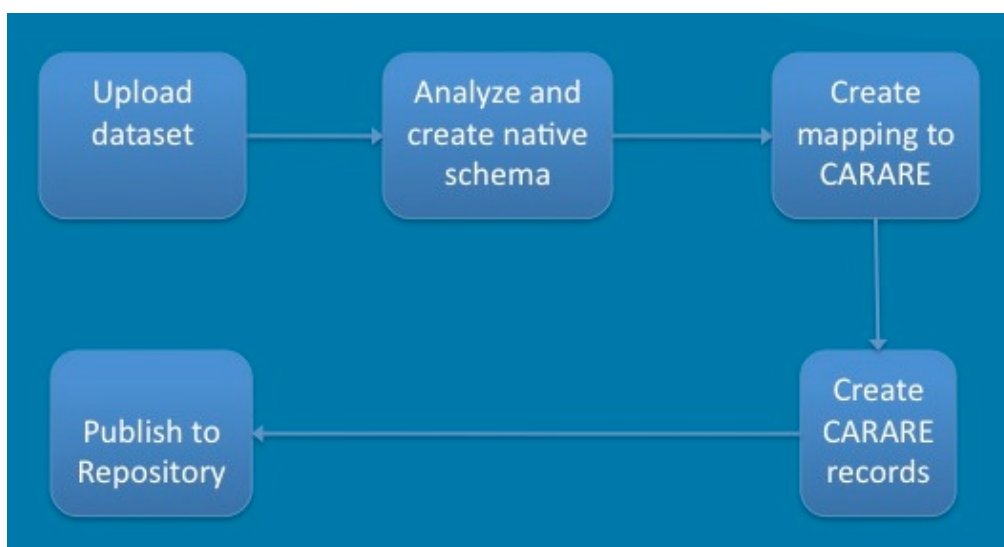


Figure 2: MINT workflow



The mapping tool constitutes the core functionality provided by the MINT platform. It offers the user the ability to map his/her native inferred metadata schema to the CARARE Schema. The user is also supported by functionalities that allow browsing of the values of the various metadata elements, value mappings in cases where data normalization is needed and various functions for manipulating both the structural elements of the inferred Schema and the values these elements contain. The mappings created are validated in the system by sampling the metadata records, instantiating CARARE records and then validating them against the CARARE Schema. In this way users are able to quickly validate the resulting mappings and have an overview of the resulting metadata records that will be published to the MORE repository and to Europeana. This iterative process enables the user to fine-tune the mappings and this also acts a quality assurance mechanism that is integrated on an architectural level to the MINT tool.

After the mapping is finalized, content providers can publish their metadata to MORE. The publication step involves the actual transformation of the ingested metadata to the CARARE schema, packaging to a format that MORE accepts (SIP packages that contain both the native metadata, the CARARE metadata and the mapping definition itself) and finally the ingestion of the SIP package to MORE.

4 MORE tools and functionality

The MORE repository is a Digital Repository System compliant with the OAIS reference model. MORE harvests content either from MINT (using SIP format) or directly (using OAI-PMH) from content providers. Quality assurance checks are performed on the harvested records, which are then transformed to EDM, enriched and then delivered to Europeanana.

MORE consists of various tools whose functionalities are described in the following sections. Briefly, these tools are:

- Harvester (OAI-PMH)
- Harvester (SIP)
- XML transformation engine
- Indexer
- Statistics extraction
- OAI Provider
- Search/Browse engine
- Previewing
- Enrichment

4.1 Harvester (OAI-PMH)

The MORE harvester is capable of harvesting metadata using the OAI-PMH 2.0 protocol. The metadata have to be formatted using the CARARE schema specification. The harvester harvests content, packages it into SIP so that it can then be ingested.

4.2 Harvester (SIP)

The MORE SIP harvester harvests SIP packages (see D2.2.5 – the CARARE technical approach). The harvester is triggered using a REST based web service and after it downloads each package, it performs the following tasks:

- Extracts the package contents
- Verifies their integrity
- Returns the appropriate code (OK, ERROR, etc.)
- Queues the package for ingestion (see figure 3 below).

Object Toolbox

- General info
- Search
- Results list
- Labels
- Stored queries
- Relations
- Ingested Packages
- Ingest console
- Providers Report

Ingest Console



Pending	Ingested	Ingested & Archived	NOT Ingested	
Package No	Received Tstamp	No of Items	Content Provider	StatusActions
220	2012-09-06 16:17:07	473	The_Archaeological_Heritage_Agency_of_Iceland [1009 / cid:1009]	✓
Package No	Received Tstamp	No of Items	Content Provider	StatusActions
219	2012-09-05 12:47:54	100	Heritage_Malta [1005 / cid:1005]	✓
Package No	Received Tstamp	No of Items	Content Provider	StatusActions
218	2012-08-29 09:39:10	3294	Institute_for_Cultural_Memory_CIMEC [1031 / cid:1031]	✓
Package No	Received Tstamp	No of Items	Content Provider	StatusActions
217	2012-08-29 09:36:40	1488	Institute_for_Cultural_Memory_CIMEC [1031 / cid:1031]	✓
Package No	Received Tstamp	No of Items	Content Provider	StatusActions
216	2012-08-29 09:33:19	1806	Institute_for_Cultural_Memory_CIMEC [1031 / cid:1031]	✓
Package No	Received Tstamp	No of Items	Content Provider	StatusActions

Figure 3: Packages pending ingestion to MORE

4.3 XML Transformation engine

The XML transformation engine is responsible for transforming the CARARE metadata records into EDM. This transformation engine performs complicated transformations that contain complicated rules in order to give out the best result. The transformation engine can also support transformations to other metadata formats such as ESE.

CARARE record (XML)
EDM record (XML)
ESE record (XML)
Native record (XML)

```

<carare:carareWrap xmlns:carare="http://www.carare.eu/carareSchema" xmlns:xalan=
  <carare:carare>
    <carare:collectionInformation>
      <carare:title lang="en">The Archaeological Sites and Monuments datab
      <carare:title lang="sv">FMIS (Fornminnesinformationssystemet)</carar
      <carare:keywords lang="sv">arkeologifornlämning</carare:keywords>
      <carare:keywords lang="en">archaeologyancient remain</carare:keyword
      <carare:contacts>
        <carare:organization lang="eng">Swedish National Heritage Board<
        <carare:organization lang="sv">Riksantikvarieämbetet</carare:org
        <carare:phone>+46851918571</carare:phone>
        <carare:email>fornsok@raa.se</carare:email>
      </carare:contacts>
      <carare:source>http://www.raa.se/cms/fornsok/start.html</carare:sour
      <carare:language lang="en">Swedish</carare:language>
      <carare:language lang="sv">Svenska</carare:language>
      <carare:coverage>
        <carare:spatial>
          <carare:locationSet>
            <carare:geopoliticalArea>
              <carare:geopoliticalAreaName lang="en">Sweden</carar
            </carare:geopoliticalArea>
            <carare:geopoliticalArea>
              <carare:geopoliticalAreaName lang="sv">Sverige</cara
            </carare:geopoliticalArea>
          </carare:locationSet>
        </carare:spatial>
      </carare:coverage>
    </carare:collectionInformation>
    <carare:heritageAssetIdentification>
      <carare:recordInformation>
        <carare:id>http://kulturarvsdata.se/raa/fmi/12000000124279</cara
        <carare:source>Riksantikvarieämbetet | Swedish National Heritage
        <carare:country>Sweden</carare:country>
        <carare:creation>
          <carare:date>"2011-05-27"</carare:date>
        </carare:creation>
        <carare:update>
          <carare:date>"2011-06-01"</carare:date>
        </carare:update>
        <carare:language lang="en">Swedish</carare:language>
        <carare:language lang="se">Svenska</carare:language>
        <carare:language lang="en">Swedish</carare:language>
        <carare:keywords lang="sv">"Brott/täkt"</carare:keywords>
        <carare:keywords lang="sv">"475"</carare:keywords>
      </carare:recordInformation>
    
```

Figure 4: CARARE record XML

CARARE record (XML)	EDM record (XML)	ESE record (XML)	Native record (XML)
-------------------------------------	----------------------------------	----------------------------------	-------------------------------------

```

<rdf:RDF>
  <edm:ProvidedCHO rdf:about="HA:http://kulturarvsdata.se/raa/fmi/1200000012427
    <dc:description xml:lang="sv">"Kristallbrott, 2x1,5 m (ÖNÖ-VSV) och intill
      kvar. Runt brottet ligger några stenar med kristaller."
    </dc:description>
    <dc:format>text</dc:format>
    <dc:identifier>http://kulturarvsdata.se/raa/fmi/12000000124279</dc:identif
    <dc:language xml:lang="en">Swedish</dc:language>
    <dc:language xml:lang="se">Svenska</dc:language>
    <dc:language xml:lang="en">Swedish</dc:language>
    <dc:publisher>Riksantikvarieämbetet | Swedish National Heritage Board</dc:
    <dc:source>Riksantikvarieämbetet | Swedish National Heritage Board</dc:sou
    <dc:subject>"Brott/täkt"</dc:subject>
    <dc:title xml:lang="sv">"Alsen 292"</dc:title>
    <dcterms:spatial rdf:resource="iid:3038/SP.1"></dcterms:spatial>
    <edm:type>TEXT</edm:type>
    <edm:isRelatedTo>DR:http://kulturarvsdata.se/raa/fmi/12000000124279</edm:i
  </edm:ProvidedCHO>
  <edm:Place rdf:about="iid:3038/SP.1">
    <wgs84_pos:lat>63.4317683508297</wgs84_pos:lat>
    <wgs84_pos:long>13.8182976546009</wgs84_pos:long>
    <skos:prefLabel xml:lang="sv">"Jämtland"</skos:prefLabel>
    <skos:note>"Jämtland", Sweden</skos:note>
  </edm:Place>
  <ore:Aggregation rdf:about="http://store.carare.eu/uid/iid:3038/HA:http://kul
    <edm:aggregatedCHO rdf:resource="HA:http://kulturarvsdata.se/raa/fmi/12000
    <edm:dataProvider>Riksantikvarieämbetet | Swedish National Heritage Board<
    <edm:provider>CARARE</edm:provider>
    <edm:isShownAt rdf:resource="http://store.carare.eu/uid/iid:3038/HA:http://
    <dc:rights>http://creativecommons.org/licenses/by-sa/3.0/</dc:rights>
  </ore:Aggregation>
  <edm:ProvidedCHO rdf:about="DR:http://kulturarvsdata.se/raa/fmi/1200000012427
    <dc:description xml:lang="sv">"Kristallbrott, 2x1,5 m (ÖNÖ-VSV) och intill
      kvar. Runt brottet ligger några stenar med kristaller."
    </dc:description>
    <dc:format>image/jpeg</dc:format>
    <dc:identifier>http://kulturarvsdata.se/raa/fmi/12000000124279</dc:identif
    <dc:source xml:lang="sv">Riksantikvarieämbetet</dc:source>
    <dc:subject>archaeology</dc:subject>
    <dc:subject xml:lang="sv">"Brott/täkt"</dc:subject>
    <dc:title xml:lang="sv">"Alsen 292"</dc:title>
    <dcterms:spatial rdf:resource="iid:3038/SP.1"></dcterms:spatial>
    <edm:type>IMAGE</edm:type>
    <edm:isRelatedTo>HA:http://kulturarvsdata.se/raa/fmi/12000000124279</edm:i
  </edm:ProvidedCHO>
  
```

Figure 5: EDM record XML

4.4 Indexer

The MORE indexer is responsible for extracting specific indexes from each record ingested into MORE. These indexes are necessary for the fast and efficient search and retrieval of the records in MORE by the content providers.

4.5 Statistics extraction

The statistics extraction engine calculates statistical information per package. This information is CARARE specific and has to do with the completeness of each record. This information is then presented to the user (per package) to allow them to quality assure their content.

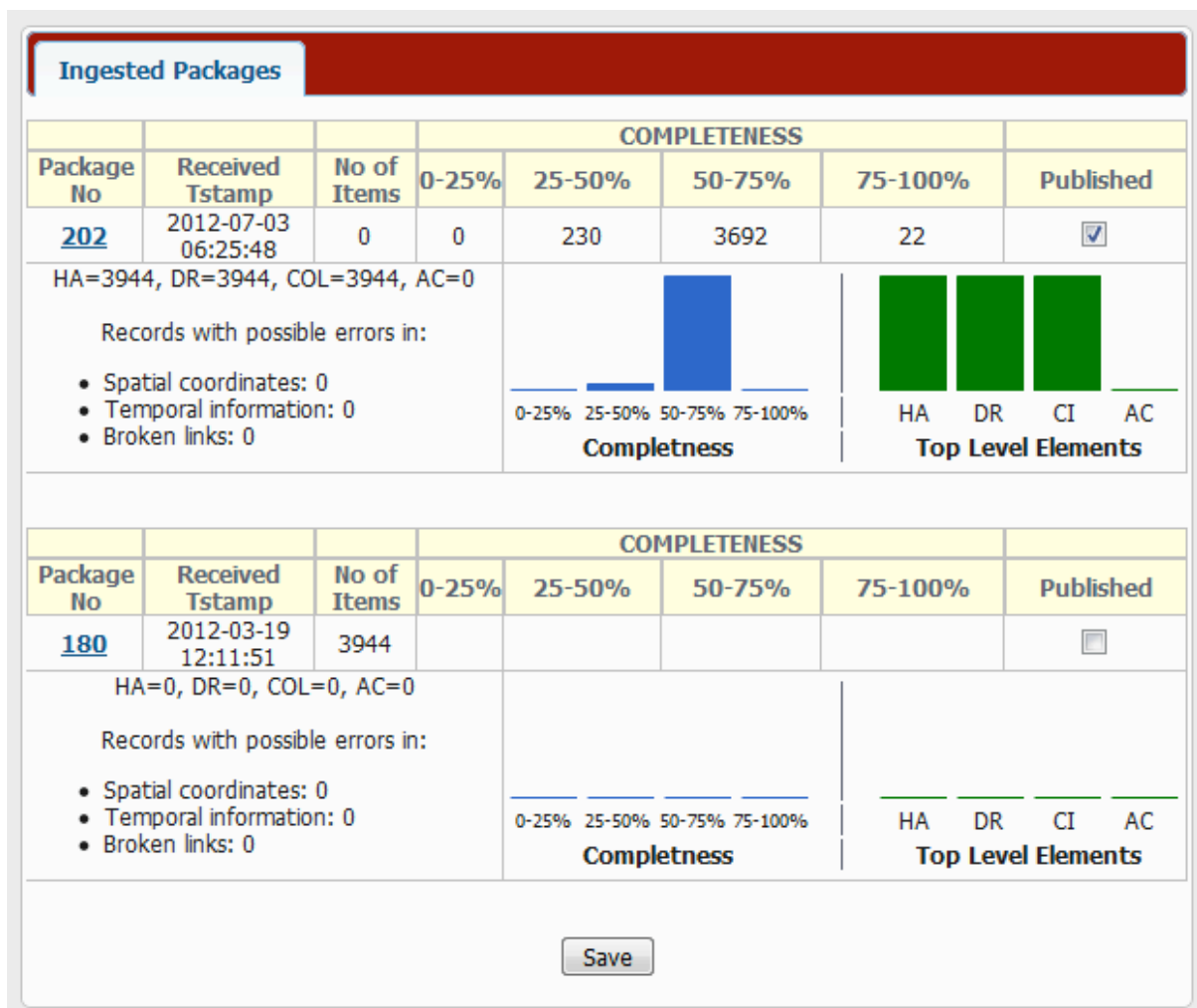


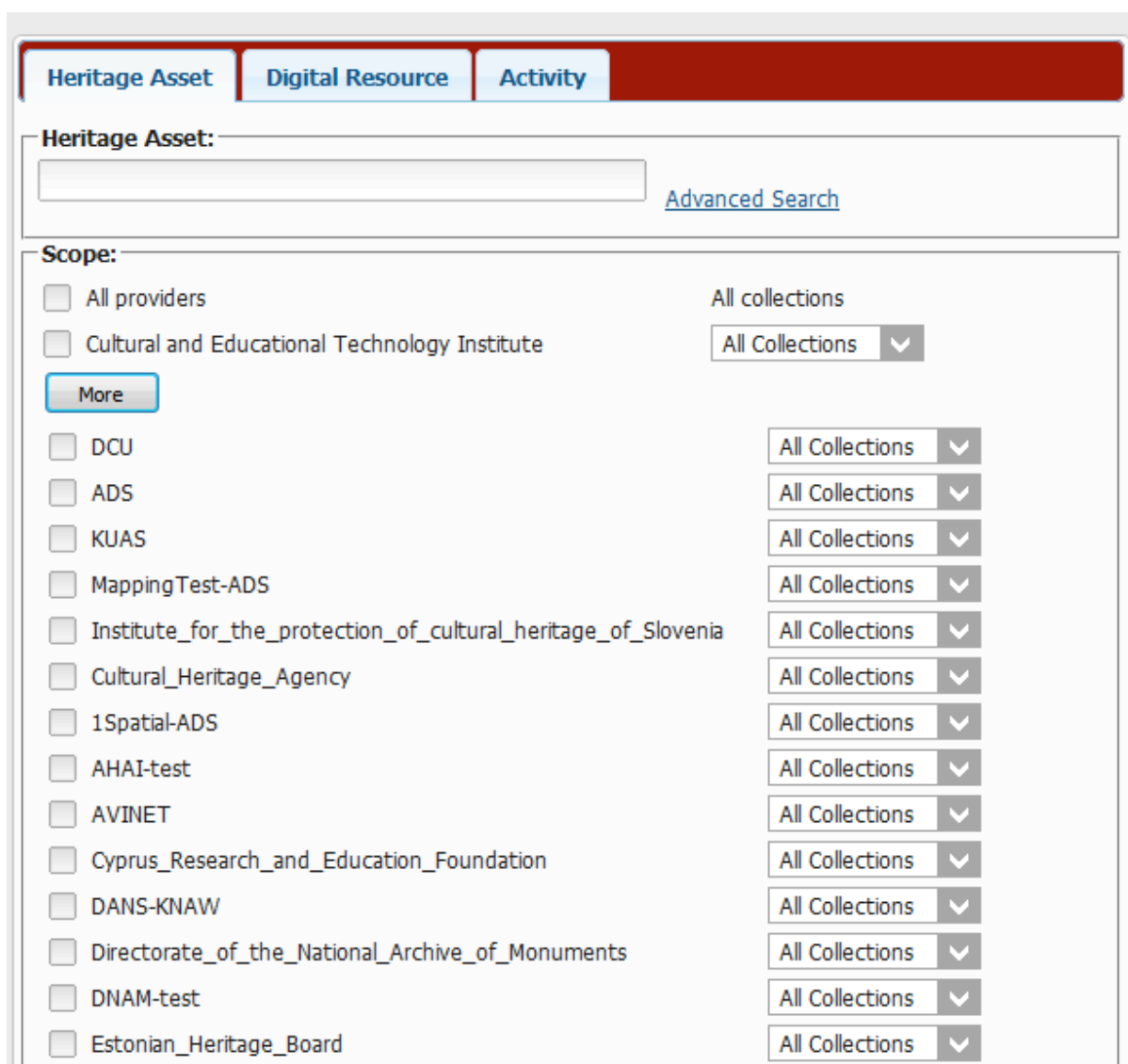
Figure 6: MORE statistics

4.6 OAI Provider

The OAI provider tool is responsible for delivering the appropriate content to Europeana. This tool has to cope with the memory and storage requirements of CARARE. The OAI provider selects for each provider the latest version of the records contained in the packages for publication and delivers them to Europeana. It provides a single URL per provider.

4.7 Search/Browse engine

The Content providers have to be able to search for their content in MORE, browse through it, inspect it and mark it for publication. The search/browse engine provides exactly that and is the main UI component of MORE. It allows the user to perform complex queries that are tailored to the CARARE schema.



Heritage Asset Digital Resource Activity

Heritage Asset: [Advanced Search](#)

Scope:

All providers All collections
 Cultural and Educational Technology Institute All Collections ▾

<input type="checkbox"/> DCU	All Collections ▾
<input type="checkbox"/> ADS	All Collections ▾
<input type="checkbox"/> KUAS	All Collections ▾
<input type="checkbox"/> MappingTest-ADS	All Collections ▾
<input type="checkbox"/> Institute_for_the_protection_of_cultural_heritage_of_Slovenia	All Collections ▾
<input type="checkbox"/> Cultural_Heritage_Agency	All Collections ▾
<input type="checkbox"/> 1Spatial-ADS	All Collections ▾
<input type="checkbox"/> AHAI-test	All Collections ▾
<input type="checkbox"/> AVINET	All Collections ▾
<input type="checkbox"/> Cyprus_Research_and_Education_Foundation	All Collections ▾
<input type="checkbox"/> DANS-KNAW	All Collections ▾
<input type="checkbox"/> Directorate_of_the_National_Archive_of_Monuments	All Collections ▾
<input type="checkbox"/> DNAM-test	All Collections ▾
<input type="checkbox"/> Estonian_Heritage_Board	All Collections ▾

Figure 7: Search

Search results [query: , page: 1, tags:] Store this Query

1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12

PKG	Provider	Object id	Heritage Asset	Labels	Status
121	Swedish National Heritage Board	http://kulturarvsdata.se/raa/fmi/12000000119926	"(1)"		E A
121	Swedish National Heritage Board	http://kulturarvsdata.se/raa/fmi/18000000002235	"525:001"		E A
121	Swedish National Heritage Board	http://kulturarvsdata.se/raa/fmi/18000000050492	"617:002"		E A
121	Swedish National Heritage Board	http://kulturarvsdata.se/raa/fmi/18000000050783	"712:010"		E A
121	Swedish National Heritage Board	http://kulturarvsdata.se/raa/fmi/18000000053042	"719:009"		E A
121	Swedish National Heritage Board	http://kulturarvsdata.se/raa/fmi/18000000069920	"73:013"		E A


Figure 8: Search results

4.8 Previewing engine

The previewing engine allows the content providers to see each individual CARARE and EDM record in a) HTML and b) XML. The user-friendly HTML previewing is the most useful for inspecting the CARARE records.

"525:001"
Label this Object

Brief information	CARARE	CARARE Enriched	EDM	ESE	Native Rec.
-------------------	--------	-----------------	-----	-----	-------------



Heritage asset id: <http://kulturarvsdata.se/raa/fmi/18000000002235>

Heritage asset name: "525:001"

Heritage asset description:
 "Fartygslämning: Bogserbåt ca 23 x 5 meter. Händelseförlopp: Ane bogserades av bogserfartyget David av Ramvik. Det var 20 grader kallt. Ytterligare ett fartyg, Lampis, kopplades med tross till Ane och bogserades sist i släpet. De båda bogserade fartygen belystes kontinuerligt med strålkastare. SV Gran prejades släpet av kustbevakningen, som anmärkte att de bogserade fartygen saknade akterljus och sidoljus. Därefter fortsatte resan. Kl 20:10 observerades att Anes fribord hade minskat oroväckande. Farten saktades ned, varvid Ane satte sig på aktern med babords slagsida. Kl 20:15 kapades bogservajern, varefter man försökte komma ombord på Ane för att lägga loss bogsertrossen till Klampis. Detta företag fick dock avbrytas, då akterdäck redan var under vattenytan. Strax därefter sjönk Ane, varvid trossen till Klampis brast. Olyckan berodde förmodligen på att något rör frusit sönder, och att isproppen lossnat under resans gång, varpå Ane tagit in vatten. Historik: Byggdes 1867 som passagerarfartyg. Ombyggdes till bogserbåt 1917. Var vid olyckstillfället på resa under bogsering till Stockholm för försäljning. Namn: 1867 Kamarsund No 1 1887 Victoria 1917 Viktoria 1920 Husum 1934 Nestor 1975 Ane Ägare: 1867 Ångbåtsbolaget Kalmarsund 1887 Kapten J. O. Bergström 1917 Partrederi från Kramfors 1920 Mo&Domsjö AB 1934 Partrederi (Carl Wilhelm Grundel) 1935 Manne Rönnbäck mfl 1965 Rederi AB Bröderna Rönnbäck & Co 1975 Karl-Erik Söderholm, Haparanda 1981 KB Eriksson Sjötransporter, Ramvik"

Heritage asset spatial/locationSet/NamedLocation:

Figure 9: Record preview

4.9 Enrichment engine

The enrichment engine allows for a) automatic suggestions for enriching records and b) for manually enriching content through the relation editor. The enrichment is performed using semantic relations using predicates taken from EDM itself.

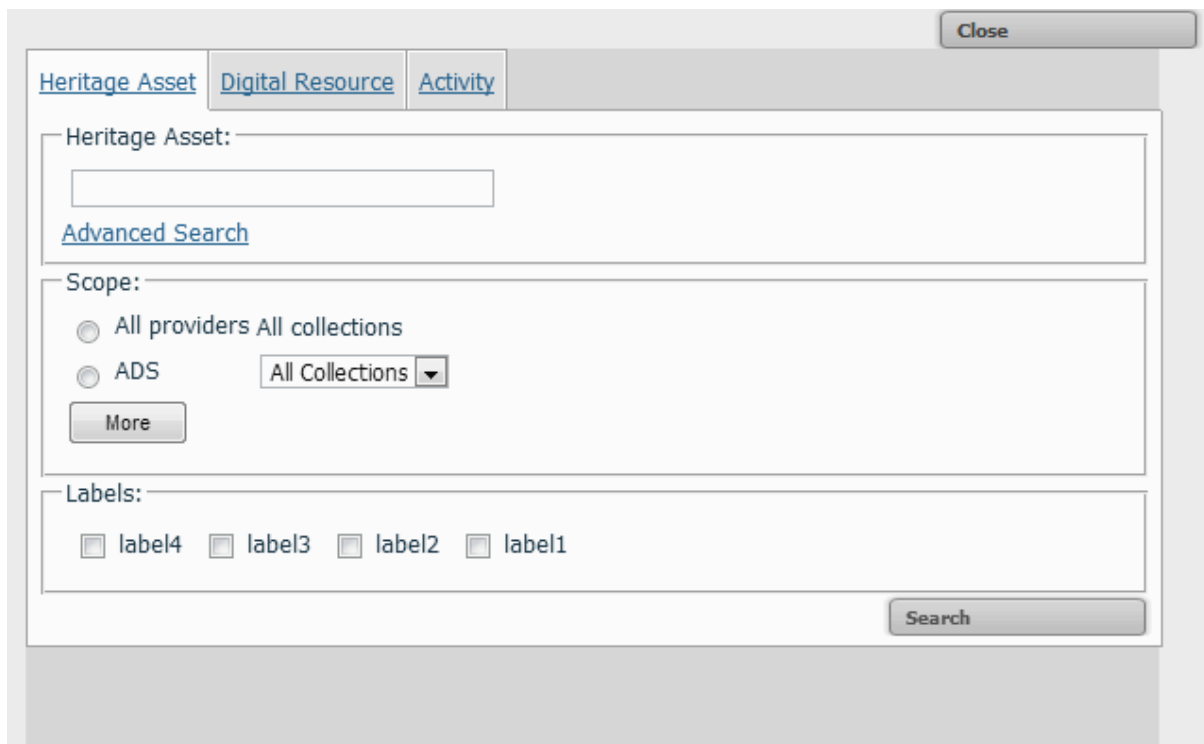


Figure 10: Add a relation

5 CARARE System data management and interoperability

From a data management point of view, the CARARE system uses two main interfaces in order to achieve interoperability: CARARE and EDM.

In the first case, the Content providers have to map their content to a common format: CARARE, which is then used as the main format throughout the CARARE system. The CARARE schema is constant and rich so it can encompass the richness of the diverse set of content CARARE content providers have to offer. MINT and MORE use the CARARE schema as a common format in order to exchange information.

EDM is the common format used to exchange information between MORE and Europeana. Since Europeana is still developing EDM and its implementation in their systems; the schema has been changing, MORE has to cope with these changes and hide the complexity of this work from the Content providers.

There are a number of other data formats used for exchanging information between tools (such as the provider and item xml information files used in SIP). For more information see the CARARE technical approach (D2.5).

The flow of information within the overall CARARE system is best shown in the CARARE mapping and versioning workflow and in the publishing workflow (see figures below):

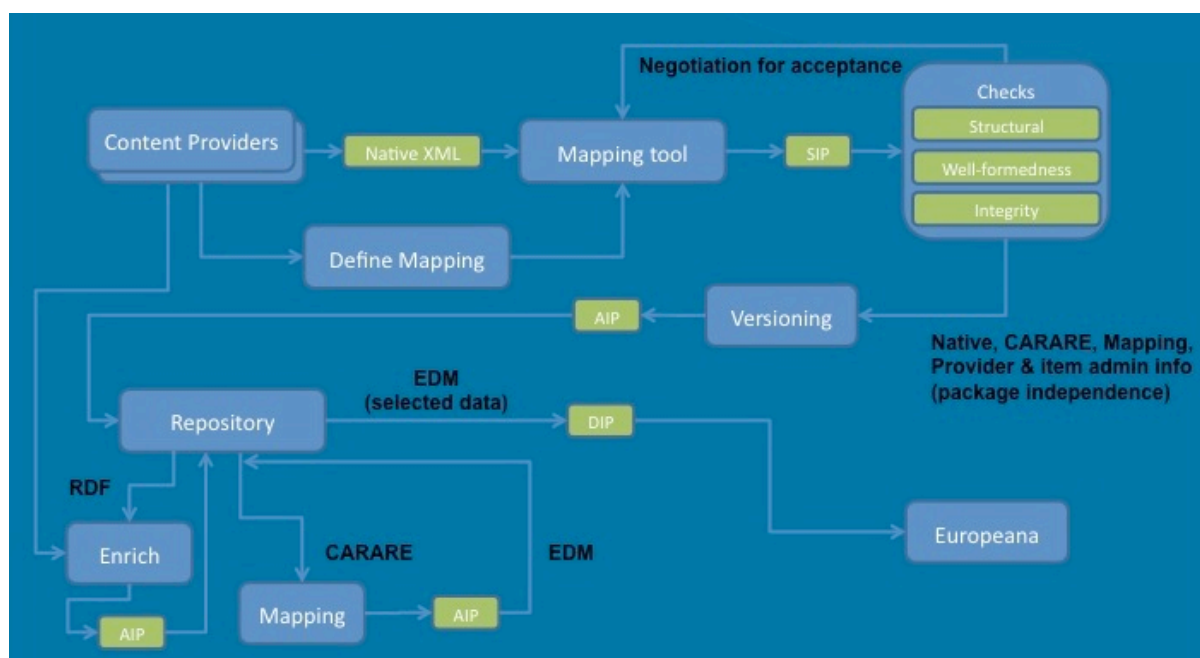


Figure 11: Mapping and versioning workflow

The publishing workflow has been implemented using a REST service, which accepts SIP packages. The workflow for publishing follows the steps below:

1. MINT creates the SIP package and triggers the service by supplying the URL of the SIP package.
2. SIP package is downloaded to MORE's temporary space
3. SIP package is uncompressed and its structure validated. The package must contain an index (xml file containing contents). Content provider is recognized.

For each item:

4. Each item is validated (it must contain three datastreams: a) native record, b) CARARE record, c) XSLT mapping). In the case where the item has been harvested directly as CARARE, the latter two datastreams can be omitted.
5. All XML datastreams are validated.
6. Existing ingest based on the same item is located and if not, a new object is created on the repository.
7. Collection information is extracted and the collection registry is updated.
8. All datastreams are ingested into the repository.

If any errors occur during this process, an XML report is produced and returned to MINT through the associated web service.

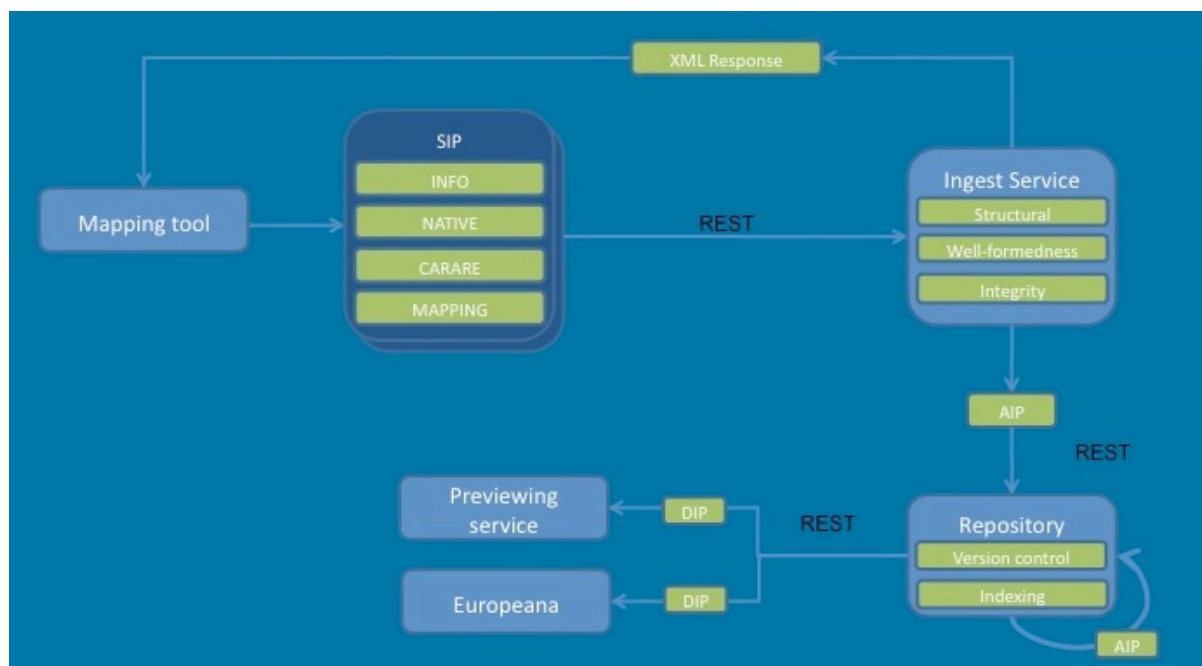


Figure 12: Publishing workflow

6 Conclusions

This deliverable presents the tools used throughout the CARARE system and the functionality they perform. In some cases, the tools were improved (based on the initial design) as the aggregation service has been prototyped, tested and implemented. The evolution of the system has been documented in previous project deliverables:

- D2.5: the CARARE Technical approach
- D3.1: the tested harvesting and ingestion system
- D3.3: the documented workflow
- D3.4: the briefing paper on metadata mapping and the use of the mapping tools

The main improvement to the system described in this report and implemented during the last nine months, has been the handling of CARARE content in packages instead of as individual records in the MORE system. This modification was made, which affected almost all the MORE interfaces, since it proved to be much easier for the content providers to interact with and quality assure packages of content.

In conclusion, the prototyping and testing of tools during the CARARE project enabled the implementation of an aggregation service which offers content providers with a seamless workflow supporting the ingestion of metadata and its provision to Europeana.



References

CARARE Metadata Interoperability Tool: <http://CARARE.image.ntua.gr/CARARE/>

CARARE metadata schema outline 1.0: <http://www.CARARE.eu/eng/Resources>

CARARE Repository: <http://store.CARARE.eu/>

D2.2.3 - Metadata Mappings: <http://www.CARARE.eu/eng/Resources>

D2.2.5 – White paper on the CARARE technical approach:
<http://www.carare.eu/eng/Media/Files/White-paper-on-CARARE-technical-approach>

D3.3.4 - Briefing paper on metadata mapping and the use of mapping tools:
<http://www.CARARE.eu/eng/Media/Files/D3.4-Briefing-paper-on-metadata-mapping-and-the-use-of-mapping-tools>

D4.4.3 – Timetable and implementation plan

D.4.4.4 - Report on the repositories established by each partner

CARARE, 2010, Papatheodorou, C., Carlisle, P., Ertmann-Christiansen, C. and Fernie, K.,
CARARE metadata schema outline, v1.0:
<http://www.CARARE.eu/eng/Resources/CARARE-metadata-schema-outline-v1.0>

Annex I. CARARE Schema to EDM Schema Mapping

In the CARARE schema the main elements is the “Heritage Asset” and the “Digital Resource”. These elements and their sub-elements have been mapped to the appropriate EDM elements as shown in the following table.

EDM	CARARE	CARARE	Notes
	Heritage Asset	Digital Resource	
edm: ProvidedCHO	Heritage Asset Identification/Record Information /ID	Digital Resource/Record information/ID	The value is entered in an rdf:about attribute
dc:contributor		Digital resource/Actors/Name (when in contributor role)	
dc:creator		Digital Resource/Actors/Name (when in creator role)	
dc:date	Heritage Asset Identification/Characters/ Temporal/start date	Digital Resource/Temporal/Time span/start date	
dc:date	Heritage Asset Identification/Characters/ Temporal/end date	Digital Resource/Temporal/Time span/end date	
dc:date	Heritage Asset Identification/Characters/ Temporal/Display date	Digital Resource/Temporal/Displa y date	
dc:date	Heritage Asset Identification/Characters/ Temporal/Scientific date	Digital Resource/Temporal/Scienti fic Date	
dc:date	Heritage Asset Identification/Characters/ Craft/DateofLoss		
dc:description	Heritage Asset Identification/Description	Digital Resource/Description	
dc:description	Heritage Asset Identification/Characters/ Craft/LastJourneyDetails/ MannerofLoss	Digital Resource/Note	

dc:description	Heritage Asset Identification/Characters/ Craft/LastJourneyDetails/ Cargo		
dc:format	Text	Digital Resource/Format	
dc:identifier	Heritage Asset Identification/Appellation /ID	Digital Resource/Appellation/ID	
dc:language	Heritage Asset Identification/Record Information/Language	Digital Resource/Language	
dc:publisher	Heritage Asset Identification/Record Information/Source	Digital Resource/Publication statement/publisher	
dc:publisher		Digital Resource/Publication statement/placeOfPublicati on	
dc:publisher		Digital Resource/Publication statement/date	
dc:relation	Heritage Asset Identification/Relations/T arget of the relation	Digital Resource/Relations/Target of the relation	
dc:rights		Digital Resource/Rights	
dc:source	Heritage Asset Identification/Record Information/Source	Digital Resource/Record Information/Source	
dc:subject	Heritage Asset Identification/Characters/ Heritage asset type	Digital Resource/Subject	
dc:subject	Heritage Asset Identification/Characters/ Craft/Constructionmetho d	Digital Resource/Record Information/Keywords	
dc:subject	Heritage Asset Identification/Characters/ Craft/Propulsion		

dc:subject	Heritage Asset Identification/Record Information/Keywords		
dc:title	Heritage Asset Identification/Appellation/Name	Digital Resource/Appellation/Name	The preferred name is mapped as a dc:title . If a preferred name is not indicated then the first name is mapped as a dc:title and the following is/are mapped as dcterms:alternative .
dc:type	Text	Digital Resource/Type	
dcterms:alternative	Heritage Asset Identification/Appellation/Name (not preferred)	Digital Resource/Appellation/Name	
dcterms:created	Heritage Asset Identification/Record Information/Creation/Date	Digital Resource/Created	
dcterms:extent	Heritage Asset Identification/Characters/Dimensions	Digital Resource/Extent	
dcterms:hasPart	Heritage Asset Identification/Relations/Target of the relation	Digital Resource/Relations/Target of the relation	type of the relation = HasPart
dcterms:isPartOf	Heritage Asset Identification/Relations/Target of the relation	Digital Resource/Relations/Target of the relation	type of the relation = isPartOf
dcterms:isVersionOf	Heritage Asset Identification/Relations/Target of the relation	Digital Resource/Relations/Target of the relation	type of the relation = isDerivativeOf
dcterms:medium	Heritage Asset Identification/Characters/Materials	Digital Resource/Medium	
dcterms:provenance	n/a to heritage asset	Digital Resource/Provenance	

dcterms:references	Heritage Asset Identification/References (Actors>Name + Appellation name)	n/a	
dcterms:replaces	Heritage Asset Identification/Relations/Target of the relation (type of the relation = is Successor Of)	n/a	
dcterms:spatial	Heritage Asset Identification/Spatial/Spatial/Location set/Named location	Digital Resource/Spatial/Spatial/Location set/Named location	
dcterms:spatial	Heritage Asset Identification/Spatial/Location set/Address (includes building name, number in road, road name, town or city, postcode/zipcode, locality, admin area, country)	Digital Resource/Spatial/Location set/Address (includes building name, number in road, road name, town or city, postcode/zipcode, locality, admin area, country)	
dcterms:spatial	Heritage Asset Identification/Spatial/Location set/Geopolitical area	Digital Resource/Spatial/Location set/Geopolitical area	
dcterms:spatial	Heritage Asset Identification/Spatial/Location set/Historical name	Digital Resource/Spatial/Location set/Historical name	
dcterms:spatial	Heritage Asset Identification/Spatial/Cartographic reference/Coordinates	Digital Resource/Spatial/Cartographic reference/Coordinates	
dcterms:spatial	Heritage Asset Identification/Characters/Craft/Place of registration		
dcterms:spatial	Heritage Asset Identification/Characters/Craft/Nationality		

dcterms:spatial	Heritage Asset Identification/Characters/Craft/LastJourneyDetails/Departure		
dcterms:spatial	Heritage Asset Identification/Characters/Craft/LastJourneyDetails/Destination		
dcterms:temporal	Heritage Asset Identification/Characters/Temporal/Period name	Digital Resource/Temporal/Period name	
ens:type	Text	Text, Image, Sound or Video depends on type of resource	
ens:currentLocation	? Heritage Asset Identification/Spatial/Spatial/Location set/Named location	n/a	
ens:isDerivativeOf	Heritage Asset Identification/Relations/Target of the relation (type of the relation = is Derivative Of)	Digital Resource/Relations/Target of the relation	
ens:isNextInSequence	Heritage Asset Identification/Relations/Target of the relation (type of the relation = isNextInSequence)	Digital Resource/Relations/Target of the relation	
ens:isRelatedTo reference	Heritage Asset Identification/Relations/Target of the relation (type of the relation = isRelatedTo)	Digital Resource/Relations/Target of the relation	
ens:isRepresentation Of	Heritage Asset Identification/Relations/Target of the relation digital resource - id	Digital Resource/Relations/Target of the relation	
ens:isSuccessorOf	Heritage Asset Identification/Relations/Target of the relation (type of the relation = isSuccessorOf)	Digital Resource/Relations/Target of the relation	

edm: WebResource	Digital Resource/Link	Digital Resource/Link	
dc:rights	Digital Resource/Rights/Copyright/Rights holder + Rights dates	Digital Resource/Rights/Copyright/Rights holder + Rights dates	
dc:rights	Digital Resource/Rights/Copyright/Credit line	Digital Resource/Rights/Copyright/Credit line	
ore:Aggregation	Heritage Asset Identification/Record Information /ID or Heritage Asset Identification/Appellation /ID (To be determined)	Digital Resource/Record information/ID	
ore:aggregates	?	?	
ens: aggregatedCHO	Heritage Asset Identification/Record Information /ID	Digital Resource/Record information/ID	
ens:dataProvider	Heritage Asset Identification/Record Information/Source	Digital Resource/Record Information/Source	
ens:provider	CARARE	CARARE	
ens:hasView	Digital Resource/Link		
ens:isShownBy	Digital Resource/Link	Digital Resource/Link	
ens:isShownAt	Digital Resource/Link	Digital Resource/IsShownAt	
ens:object	Digital Resource/Object	Digital Resource/Object	
dc:rights	Digital Resource/Rights/Copyright/Credit Line	Digital Resource/Rights/Copyright/Credit Line	