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EUROPEANA INSIDE

Recommendations for Technical Standards

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This deliverable contains original unpublished work except where clearly indicated otherwise.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

Contents

1 Introduction

1.1 Background

Work package 2 (WP 2) is the key stage in making sure that the subsequent work packages, starting with WP 3, create a Europeana Connection Kit which is suitable for prototyping, evaluation and development. The tasks to be carried out are:

- Analysis of the requirements of Europeana Inside;
- Modelling of use cases and scenarios for application 'in the wild';
- Integration of the Europeana Data Exchange Agreement (DEA) into the ECK;
- Auditing of the standards requirements of Europeana;
- Development of a full Functional Requirement;
- Development of a full Technical Specification.

1.2 Role of the deliverable in the project

This deliverable is part of a set of four (D2.1-D2.4) which will inform its *Technical Specification* (D2.5). It is the result of task 2.3 – *Technical Audit (Standards)* which deals with a central task in the specification of the ECK i.e. the implementation of Europeana's core structural and other standards specifications and requirements. The purpose of Task 2.3 is to work with Europeana, building on the work carried out in the ATHENA project, to create a clear specification of the standards which need to be integrated into or represented within the project.

1.3 Approach

We are basing our approach on that which was developed for the ATHENA project, and used in Europeana Local, and later in Linked Heritage. In outline this is a five step process:

1. ***Carry out research*** – What exists, survey;
2. ***Make an analysis*** – Look for patterns and trends;
3. ***Give simple advice*** – practical and implementable;
4. ***Reuse or create tools*** – Easy to use, audience relevant, adaptable open licence (e.g. multilingual versions possible). 'Tools' here refers to resources which help to make the standards more understandable, e.g. guides, glossaries, and training;
5. ***Identify further needs*** – Leading to further work, if needed.

However, the aim of this deliverable is not to 're-invent the wheel', but build on the best of the work carried out by earlier projects. These projects included:

- ATHENA (**http://www.athenaeurope.org**);
- Europeana Local (**http://www.europeanalocal.eu**);
- Linked Heritage (**http://www.linkedheritage.org**);
- Europeana v1.0 (see **http://pro.europeana.eu/web/europeana-v1.0**);
- Minerva (**http://www.minervaeurope.org**);
- EMII-DCF[1].

Using input from these projects accelerated the creation of the deliverable. This was because it was possible to take advantage of the research and tools already available, and already tested by external technical review.

As a result we were able to use the research and work carried out for these projects to define a 'standards landscape' for Europeana Inside, and the ECK in particular, see *Appendix I*.

[1] *European Museum Information Institute – Distributed Content Framework*. Website no longer available.

However further research led us to add descriptions and links for other standards that were identified by researching the Europeana Group projects[2]. The results of this research can be found in *Appendix II*.

We have identified and added information about the standards, where needed, on the standards needed for the ECK covering:

- Metadata (including persistent identifiers);
- Data transmission and harvesting.

Finally the requirements of Europeana are covered, particularly in the areas of:

- Preview size;
- Metadata.

1.4 Structure of the deliverable

The deliverable is divided into:

- ***Standards concepts***: Standards; interoperability; metadata
- ***Europeana standards environment***: Technical standards; metadata standards; requirements for the ECK and the project in general.
- ***Technical standards requirements***: Basic advice; content creation standards advice; ECK requirements; Europeana requirements.
- ***Metadata standards requirements:*** Basic advice; Metadata standards advice; ECK requirements
- ***Appendix I – Standards landscape***
- ***Appendix II – Use of standards in Europeana Group projects***

[2] See: **http://pro.europeana.eu**

2 Standards concepts

This section looks at three key concepts related to standards. Having a clear understanding of these will help inform the general reader about the advice given later.

2.1 Standards

The British Standards Institution (BSI), the world's oldest standards setting organisation (1901), says:

> "*Put at its simplest, a standard is an agreed, repeatable way of doing something. It is a published document that contains a technical specification or other precise criteria designed to be used consistently as a rule, guideline, or definition. Standards help to make life simpler and to increase the reliability and the effectiveness of many goods and services we use. Standards are created by bringing together the experience and expertise of all interested parties such as the producers, sellers, buyers, users and regulators of a particular material, product, process or service*."

From the above it is possible to extract the key advantages of a good standard:

- A published document;
- They are used consistently as a rule, guideline, or definition;
- They help to make life simpler;
- They bring together the experience and expertise of all interested parties.

To the advantages given above can be added:

- They deliver interoperability.

In terms of typology we suggest a typology based on how the standard is developed:

- ***In-house***
  Standards developed and used in a particular organisation, for a particular purpose. An example of this is a local place name terminology. This would extend an existing national which only covers geography at a level of granularity too coarse to be useful at the local level;
- ***Community***
  Standards developed by a set of organisations in the same sector for use within that sector. The UK collections management standard *SPECTRUM* was developed with domain experts with the aim to benefit from their experience;
- ***National***
  Standards developed for use within a single country and recognised at a national level. Nationally recognised terminologies are examples of such standards;
- ***International***
  Standards recognised and used throughout the world, nearly always approved by an international standards setting body, e.g. ISO 8601 is an international standard for date and time.

Some standards begin their 'life' as one type and then, with further work and taking part in an approval process, become another type. For example the cultural heritage ontology the *CIDOC Conceptual Reference Model (CRM)*, was originally developed by the CIDOC Documentation Standards Working Group as a community standard, but is now an international ISO standard (ISO 21127:2006).

The 'ideal' would be to use a formally internationally recognised standard. However the cultural heritage community uses standards that are not formal recognised. Therefore such standards have to be chosen.

Another typology of standards that is worth examining is the idea of ***open standard***.

Kenneth Krechmer[3] gives the possible requirements for open standards as:

1. ***Open Meeting*** – all may participate in the standards development process.
2. ***Consensus*** – all interests are discussed and agreement found, no domination.
3. ***Due Process*** – balloting and an appeals process may be used to find resolution.
4. ***Open IPR*** – how holders of IPR related to the standard make available their IPR.
5. ***One World*** – same standard for the same capability, world-wide.
6. ***Open Change*** – all changes are presented and agreed in a forum supporting the five requirements above.
7. ***Open Documents*** – committee drafts and completed standards documents are easily available for implementation and use.
8. ***Open Interface*** – supports proprietary advantage (implementation); each interface is not hidden or controlled (implementation); each interface of the implementation supports migration (use).
9. ***Open Access*** – objective conformance mechanisms for implementation testing and user evaluation.
10. ***On-going Support*** – standards are supported until user interest ceases rather than when implementer interest declines.

Most of the requirements are about the development of a standard. The aim is to make the process transparent and democratic. It is not clear if any standards conform to all the requirements. However formal national and international standards are more likely to adhere to most of them. *Open IPR*, *Open Access and On-going Support* are the most important considerations for a potential user of a standard. Therefore in our advice we have given standards that adhere to these.

2.2 Interoperability

Interoperability has been defined as:

> *"The ability of the systems, procedures and culture of an organisation to be managed in such a way as to maximised opportunities for exchange and re-use of information, whether internally or externally"*[4]

This definition was written in the context of maximising the sharing of the collective knowledge of an organisation. Here we are attempting to maximise the opportunities for European cultural organisations to give access to their content via Europeana, and other targets like aggregators.

Paul Miller divides interoperability into[5]:

- ***Technical interoperability*** – facilitated by using common technical standards (e.g. file types, metadata, etc.);
- ***Semantic interoperability*** – facilitated by using common vocabularies for the terminologies used in data (e.g. thesauri);
- ***Political/ Human interoperability*** – facilitated by understanding and overcoming the barriers caused by the different experiences and agendas of users and information providers;

[3] **Krechmer, Kenneth**. "Open Standards Requirements" in *The International Journal of IT Standards and Standardization Research*, Vol. 4 No. 1, January – June 2006. See: **http://www.csrstds.com/openstds.pdf**
[4] **Ashby, Helen, McKenna, Gordon and Stiff, Matthew**. *SPECTRUM Knowledge*. mda. 2001, p63
[5] **Miller, Paul** 'Interoperability. What is it and Why should I want it?' in *Ariadne*, 21. UK Office for Library and Information Networking (UKOLN). June 2000. See: **http://www.ariadne.ac.uk/issue24/interoperability**

- ***Inter-community interoperability*** – facilitated by recognising differences between discipline communities and overcoming them by working together (e.g. museums, archives and libraries);
- ***Legal interoperability*** – facilitated by following the legal restraints imposed on information providers (e.g. *Freedom of Information* and *Data Protection* legislation);
- ***International Interoperability*** – facilitated by recognising and overcoming the barriers caused by cultural and linguistic differences.

This deliverable is concerned with the facilitation of technical interoperability by setting out the technical standards required.

2.3 Metadata

Metadata has become such a popular term it is worth examining its use in more detail. An often quoted definition is that it is:

Data about data. [6]

This implies that metadata is concerned solely with world of text and multimedia on the Internet or on computers. However metadata has emerged in recent years as a new 'buzz-word' for information professionals, causing confusion and/or unease in some quarters. For example Tony Gill writes:

> *"… the term 'metadata' is now increasingly used in contexts where the term 'data' would have sufficed just a few short years ago (for example, descriptions of people, objects and events).."*[7]

In this wider context metadata can be data usually known in the cultural heritage sector as:

- Collections management data,
- Catalogue records;
- Exhibition texts.

So any 'data' can be thought of as 'metadata'. This leads to the question: Why use the term 'metadata' at all? Perhaps by looking at some of the aspects of metadata give an answer.

A key idea in metadata is that of a 'resource'. This is the entity that the metadata is describing. The danger is to restrict the idea of a resource to texts and multimedia 'objects' accessible over the Internet and in particular on the Web. A resource is anything one wishes to describe and give access to in some way. A resource can be:

- Texts (electronic or paper-based);
- Physical objects;
- Multimedia (e.g. image, sound, and video);
- Software;
- Persons;
- Organisations;
- Places;
- Events;
- Concepts;
- Collections of all the above.

Also some resources are 'surrogates' for another resource. A surrogate is a representation of resource in some other form, for example:

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[6] See: **http://www.webopedia.com/TERM/m/metadata.html**

[7] **Gill, Tony**. 'Metadata and the Web', in Baca, M. (ed.) *Introduction to Metadata: Pathways to Digital Information. 3rd rev*. Getty Information Institute. 2008.
See: **http://www.getty.edu/research/publications/electronic_publications/intrometadata/index.html**

- A digital image or photograph of an artwork;
- A virtual reality representation of a place;
- A facsimile of an object.

It is important to distinguish between a resource and its surrogate when creating metadata for the two entities. Metadata for a surrogate should not describe the original resource. For example, an original artwork might be out of copyright, but a photograph of it might not be.

Resources can also be related to each in ways other than of original and surrogate. Examples include: creation, making available (e.g. publication), and use.

A number of different typologies for metadata have been proposed. For example Anne Gilliland[8] gives:

- ***Administrative*** – Managing and administering resources (e.g. acquisition, rights, location);
- ***Descriptive*** – Describing or identifying resources (e.g. catalogue records);
- ***Preservation*** – Preservation management of resources (condition, and migration data);
- ***Technical*** – How a system functions or metadata behave (e.g. formats, encryption, passwords);
- ***Use*** – The level and type of use of resources (user and use tracking information).

The relationships between different resources and their associated metadata can be summarised in the diagram below:

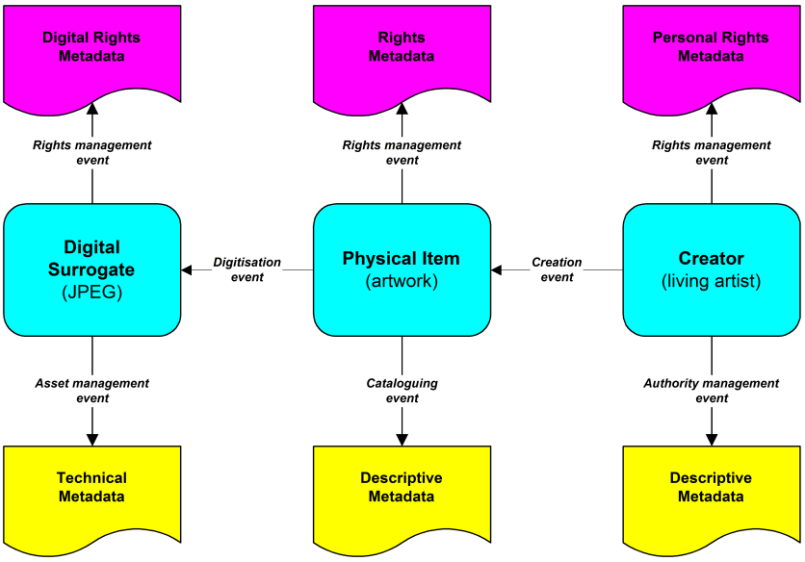

Figure 1: Simplified cultural metadata heritage environment

Another type of metadata is that of resource discovery. This is metadata aimed at allowing a potential user of a resource to find information they need in order to decide whether or not they want to have access to a resource itself. This is a similar situation to putting a term into a Web search engine, viewing the results, and deciding to 'click' on the link. The aim of resource discovery is to give a more accurate and relevant search result for the user.

The most well know resource discovery metadata is Dublin Core. This gives information on a resource, gives its identifier, and uses the identifier to give access to that resource. Access is direct if the identifier is a maintained URL, or indirect in the case of an ISBN (for example).

[8] **Gilliland, Anne J**. 'Setting the stage', in Baca, M. (ed.) *Introduction to Metadata: Pathways to Digital Information. 3rd rev*. Getty Information Institute. 2008.
See: **http://www.getty.edu/research/publications/electronic_publications/intrometadata/setting.html**

Finally there is a sense of there being a metadata movement taking place with large effort being put into the open development of metadata 'schemas'. Schemas are the description of a metadata element set, together with a description of how the elements are structured. In turn these schemas are being tested and indeed adopted by organisations and governments. Metadata is impossible to ignore!

Metadata is much more than the simple definition given above. Perhaps a more comprehensive one is:

Structured information about any kind of resource,
which is used to identify, describe, manage or give access to that resource.

3 Europeana standards environments

Here we look at the use environments for technical and metadata standards in order to inform our suggestions for standards selection. We particularly focus on the Europeana environment.

3.1 Technical standards

In broad terms there are three 'use environments':

Master

This is where the digital surrogate is usually created from an analogue original. Sometimes this is described as creating an archival master. This can be done by a number of techniques including:

- Photography;
- Scanning;
- Sampling;
- OCR (optical character recognition),
- 3D model creation;
- Born digital (content here will be archival by default).

The activity usually takes place at the collection holding organisation and in their systems.

Key concepts for digital content in this environment are:

- Maximum quality (e.g. no lossy compression);
- Preservation;
- Open standards.

Service

This is where users of the material are given **meaningful access** to a **single** piece of digital content. Delivery usually includes relevant metadata describing the significance of the material being accessed.

Keywords for digital content in this environment are:

- Usable quality (for service being offered);
- Reasonable speed of delivery;
- Rights protection (either by size restriction or other means).

Discovery

This is where users are given access to a set of thumbnails of digital content. The aim here is to review the results and move on to more detailed information. Delivery is usually part of the result set of a search and includes discovery metadata.

Keywords for digital content in this environment are:

- Maximum speed of delivery;
- Minimal size;
- Recognisability.

The service and discovery often appear together on the part of an organisation's website where they display their collections online. Portals do the same when they aggregate and deliver digital content. Portals can also only implement the discovery environment. They point to the service environment on the collections holder's website. Europeana is unusual in that it really only implements the discovery environment but uses a link, if available, to appear to give access to content in the service environment.

3.2 Metadata standards

As with technical standards there are three use environments which can be summarised in the following diagram:

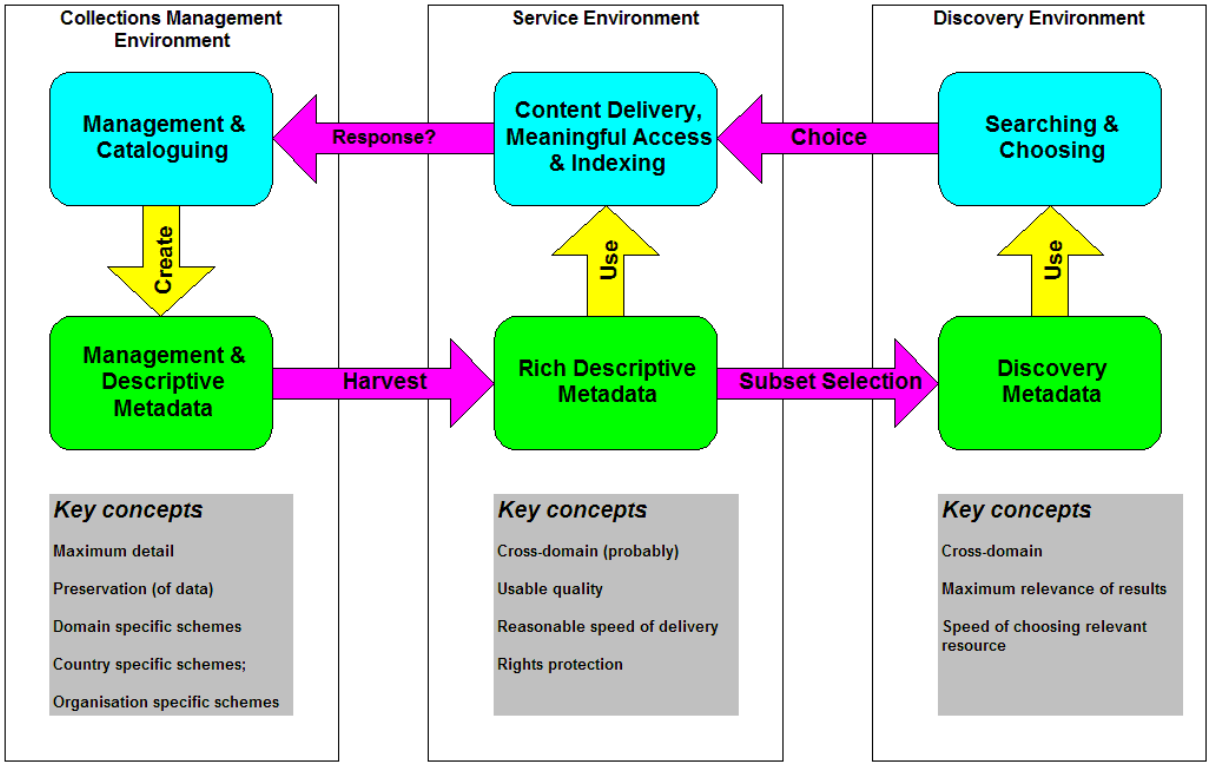

Figure 2: Cultural metadata heritage metadata use environments

Collections management

This is where metadata is created. The information recorded comes from a number of sources:

- Collections management activities of the organisation (for example: acquisition; loans; conservation, rights management and use);
- Descriptions of the object itself (for example: type; title; material; dimensions; subject of intellectual and visual content);
- Connections to events during its existence (for example: creation; field collection; use and association);
- Connections to persons, organisations, and places during its existence (these are often intimately connected to the events mentioned above).

Usually takes place at the collection holding organisation, within their own systems, and with a lot of human effort.

Key concepts for metadata in this environment are:

- Maximum detail (all the relevant data);
- Preservation (of data);
- Domain specific schemes (museums, libraries and archives use different metadata schemes);
- Country specific schemes;
- Organisation specific schemes (these might be in-house or adaptations of standards).

Service

This is where users are given meaningful access to a single piece of metadata describing an object or other piece of cultural material. Delivery usually includes a digital surrogate for the material.

Key concepts for metadata in this environment are:

- Cross-domain (probably contains material from more than one)
- Usable quality (for service being offered – often audience specific);
- Reasonable speed of delivery;
- Rights protection (copyright statement or technical means).

Metadata here is a subset of the metadata in the collections management environment and should ideally be harvested from there.

This environment should also provide a means for collecting a user's response to the object which could feed back information into the collections management environment. For example additional information about the content of a photograph might be provided by the user of the service which was unknown to its owning organisation.

Discovery

This is where users are given access to a set of metadata from many objects. Delivery is usually part of the result set of a search together with a thumbnail of some kind. Users choose a content they want to look at in the service environment.

Key concepts for metadata in this environment are:

- Cross-domain;
- Maximum relevance of results;
- Speed of choosing relevant resource by users (limited set of metadata elements).

Metadata here is a subset of the metadata in the service or collections management environments.

The appearance of the service and discovery environments in an organisation's website, portals, aggregators and Europeana is the same as that for the digital content.

3.3 Requirements for the ECK and the project in general

Requirements for ECK

The Europeana Connection Kit (ECK) will support procedures in the *Collections management environment* and the connection between it and the *Service environment*. The ECK must conform to standards related to the 'action arrows' in the Figure 2 (above): *Harvest* and *Response*. These standards concern those for:

- The way the metadata is transferred (technical standards). These include specific requirements for metadata from Europeana.
- The metadata to be transferred (metadata standards).

Requirements for project

As well as the requirements for standards to be used for the creation ECK itself, content partners should also conform to a set of technical requirements for the content they have created and aim to give access to (i.e. file types and quality in different environments). Similarly there are descriptive metadata standards that should be used in the different environments. These requirements have been defined in the other projects mentioned above, and are included in the sections following for completeness.

4 Technical standards requirements

4.1 Basic advice

The first and most basic advice on technical standards is:

Use open standard formats when creating, describing, and delivering digital content.

Doing this will:

- Maximise access;
- Ensure that content is reusable and therefore sustainable. It can be created and changed by more than one piece of software;
- Avoid dependency on a single supplier with possible licensing restrictions.

Following this advice is easy for all of the common types of digital content. Therefore there must be a very good reason not to follow it. Even where a proprietary standard has been used it is good practice to have a plan to migrate to an open standard when one becomes available.

4.2 Content creation standards advice

This section gives recommendations about which standards should be used, and at what qualities[9] for the use environments described above, for the content standards described in *Appendix I*. This appendix also has links to the standard and information about it. *Appendix II* details which projects use these standards, as far as we could find out[10].

4.2.1 *Image – Camera*

Parameter	**Use Environment**		
	Master	***Service***	***Discovery***
File Format	RAW; DNG; TIFF	JPEG; PNG	JPEG; PNG
Colour Quality	8 bit greyscale 24 bit colour	8 bit greyscale 24 bit colour	8 bit greyscale 24 bit colour
Resolution	[maximum for equipment]	150-200	72
Maximum dimension (pixels)	[not applicable]	600	100-200

4.2.2 *Image – Scanning*

Parameter	**Use Environment**		
	Master	***Service***	***Discovery***
File Format	TIFF	JPEG; PNG	JPEG; PNG
Colour Quality	8 bit greyscale 24 bit colour	8 bit greyscale 24 bit colour	8 bit greyscale 24 bit colour
Resolution (dpi)	600 (photographs) 2400 (slides)	150-200	72
Maximum dimension (pixels)	[not applicable]	600	100-200

[9] Based on advice given in earlier projects, most recently *Partage Plus* (See: **http://www.partage-plus.eu**).
[10] The appendix is the result of desk research into the websites and publications of the projects listed on Europeana Professional website (See: **http://pro.europeana.eu**)

4.2.3 *Audio*

Parameter	Master Use Environment
File Format[11]	Uncompressed [preferred]: WAV; AIFF Compressed [alternative]: MP3; WMA; RealAudio; AU
Creation quality	24-bit stereo and 48/96 KHz sample rate

Parameter	Service Use Environment
File Format	Compressed [preferred]: MP3; RealAudio; WMA Uncompressed [alternative]: WAV; AIFF; AU
Delivery quality	256 Kbps (near CD quality); 160 Kbps (good quality)

	Discovery Use Environment
Note	The discovery of audio content will be enhanced by a relevant image preview, e.g. a photograph illustrating the subject of the audio file.

4.2.4 *Video*

Parameter	Master Use Environment
File Format	Uncompressed [preferred]: RAW; AVI Compressed [alternative]: MPEG (MPEG-1, MPEG-2 or MPEG-4); WMV; ASF; Quicktime.
Creation quality	Frame size of 720x576 pixels; Frame size of (HDTV) 1280x720 pixels; Frame rate of 25 frames per second; 24-bit colour; PAL colour encoding

Parameter	Service Use Environment
File Format – for downloading	MPEG-1; AVI; WMV; Quicktime
File Format – for streaming	ASF; WMV; Quicktime

	Discovery Use Environment
Note	The discovery of video content will be enhanced by a relevant preview image (still) taken from the video file.

[11] Partners may also consider a lossless format like FLAC. See: **http://xiph.org/flac/format.html**

4.3 ECK requirements

The technical standards recommended here for the creation on the ECK follow those of the well-regarded *Minerva Guidelines*[12] which have been used in a great many content provision projects. They are in two areas:

- ***Web services*** – The creation of the ECK should ***demonstrate awareness*** of the web services family of specifications:
    - REST;
    - SOAP version 1.2;
    - Web Services Description Language (WSDL).
- ***Data transmission and harvesting*** – The ECK should ***support*** one or more of the following for the transmission of data:
    - OAI-PMH;
    - FTP;
    - HTTP upload.

  Please note Europeana's preference for OAI-PMH (see next section).

4.4 Europeana requirements

There are a few requirements related to the technical aspects of Europeana, although they are not directly related to standards:

- The content that a provider is giving access to must be available on the Web. This may be via a webpage (**`europeana:IsShownAt`** URL) or as a media file (**`europeana:IsShownBy`** URL). Usually content on the website of the provider, but is also possible for the content to be available on an aggregator's website. Also if only as a **`europeana:IsShownBy`** link is given then Europeana will act as the portal to the content. See Section 5.3 for more information about this.
- It is highly recommended that a preview file (nearly always a thumbnail image file) is made available to Europeana. This may be via a **`europeana:IsShownBy`** or **`europeana:object`** URL. Again this implies that the content is available on the Web. There is also a minimum dimension requirement for the preview file, i.e. it must have a width of at least 200 pixels. Note that thumbnails can be created from a PDF, but not from DjVu.
- The preferred method of data transfer to Europeana is OAI-PMH. However other methods may be possible, on request. OAI-PMH is usually enabled by the aggregators Europeana works with.

[12] This follows the wording of the guidance given by the *Technical Guidelines for Digital Cultural Content Creation Programmes*, *Technologies* section.
See: **http://www.minervaeurope.org/interoperability/technicalguidelines.htm** for links to various versions.

5 Metadata standards requirements

5.1 Basic advice

The first and most basic advice on metadata standards is:

Use standards for creating and delivering metadata.

Doing this will:

- Maximise interoperability between systems;
- Ensure that metadata is reusable. It can be created and used in more than one system;
- Avoid dependency on a single system supplier or a limited set of staff familiar with your system.

5.2 Metadata standards advice

This section gives recommendations about which standards to use for the use environments described above, for the content standards described in *Appendix I*. This appendix also has links to the standard and information about it. *Appendix II* details which projects use these standards, as far as we could find out[13].

5.2.1 *Collections management*

The choice of a collections management standard depends on the domain that your collection belongs to:

Domain	Recommended standard
Museums	*SPECTRUM*
Libraries	*MARC* [various]
Archives	*ISAD(G)*; *EAD*

An in-house system should be able to map to the metadata elements of these standards. It should be possible able to export from the rich metadata in a collections management system into the schemas given in the next section.

5.2.2 *Service*

This use environment is where an aggregator's and Europeana system resides:

Richness of metadata	Recommended standard
High	*LIDO; EDM*
Low	*ESE*

5.2.3 *Discovery*

The metadata here will either be a subset of *LIDO*, *EDM*, *ESE or perhaps DC*.

5.3 ECK requirements

Here are the ECK metadata technical requirements for the ECK:

- The ECK must be able to take as its input the metadata created in SPECTRUM, MARC, ISAD(G); EAD. Therefore it must be possible for a content provider to map to them. If a technical partner has a system which is *SPECTRUM Compliant* then this process should be simpler.
- The ECK must be able to output and transfer to Europeana metadata as EDM. In addition the EDM must comply with Europeana's requirements for metadata. (See the next section).

[13] *Op cit.*

5.4 Europeana requirements

Europeana has various requirements with regard to metadata. These are set out in the *Europeana Semantic Elements specifications v3.4.1*, found on the Europeana Professional website[14].

Namespace:Element	***Definition and notes***	***Data requirements***
`europeana:isShownBy`	An unambiguous URL reference to the digital object on the content provider's web site in the best available resolution/quality, i.e. a link to the content as a text, image, sound, or video file **not** to the webpage with it on. Data here will allow the full functionality of *Europeana* and the automatic generation of a thumbnail by them. If this cannot be given then you **must** provide data for **`europeana:object`**.	Must be a valid URI (e.g. URL).
`europeana:isShownAt`	An unambiguous URL reference to the digital object on the content provider's website in its full information context. If this cannot be given then you **must** provide data for **`isShownBy`**.	Must be a valid URI (e.g. URL).
`europeana:type`	The *Europeana* material type of the resource.	Must be: TEXT or IMAGE or SOUND or VIDEO or 3D.
`europeana:provider`	Name of the organisation that is delivering content directly to *Europeana*. In most cases this will be the name of an aggregator although some individual content holders will also fall under this definition.	*Europeana* maintains a standard list of organisations.

[14] See: **http://pro.europeana.eu/web/guest/technical-requirements**

Namespace:Element	***Definition and notes***	***Data requirements***
`europeana:dataProvider`	Name of the organisation that is delivering content to the aggregator who is the providing directly metadata to *Europeana*. In *Europeana Inside* this will be the partners. If an organisation sends data directly to Europeana (i.e. not via an aggregator) then the name should appear in both **`europeana:dataProvider`** and **`europeana:provider`**.	*Europeana* maintains a standard list of organisations.
`dc:title` or **`dc:description`**	A provider must supply data in one (or both) of these elements. Partners may use the refinement **`dcterms:alternative`** for any title variants, translations etc.	
`dc:language`	If the content being described is of **`europeana:type`** TEXT then the provider must supply data in this element. It is also strongly recommended for other objects that have a language component, such as a sound recording. **Note:** the **`dc:language`** element should **not** be used to indicate the language of the metadata.	Use *ISO 639-2* (the three character code).
`dc:subject` or **`dc:type`** or **`dc:coverage`** or **`dcterms:spatial`**	A provider must supply data in one of these elements.	It is suggested that providers use a set of standard terms.
`europeana:UGC`	A value should be provided for this element only if the object is user generated. (Also called user created content).	

Namespace:Element	***Definition and notes***	***Data requirements***
`europeana:rights`	A value must be provided for this element. The value in this element will indicate the usage and access rights that apply to the digital object described in the metadata and to the small portal images used in Europeana. The value is a URL in a controlled form and is used in the portal to generate an appropriate badge for display beneath the preview of the object and as a search refinement.	The URLs should be constructed according to the specifications in the **"Rights Guidelines"** at http://pro.europeana.eu/technical-requirements. They are constructed by adding a code indicating the copyright status of an object to the domain name where that status is defined. The domains specified are europeana.eu and creativecommons.org.

When submitting descriptive metadata to Europeana they will be validated against these requirements. Therefore the ECK should be able to detect any variances, and report this to the user for them to make corrections.

6 Conclusions

This deliverable has set out technical and metadata requirements that need to be followed during the creation of the Europeana Connection Kit. These are in the areas of:

- Data transmission and harvesting;
- Web services.

The requirements in these areas are not prescriptive. This follows the advice given in the *Minerva Guidelines*.

It also gives Europeana's requirements and preferences in the areas of:

- Content previews
- Metadata elements, which are need for the portal to work both efficiently, and with maximum user friendliness.

Finally the deliverable gives advice and basic information on a wide range of technical and metadata standards that content providers should consider as part of their practise.

Appendix I – Standards Landscape

Technical Standards

Image content

Standard	Description	Identifier / Related material link
JPG	JPEG is a still image compression algorithm based on the fact that the human eye cannot detect subtle differences in colour or contrast. JPEG is a lossy algorithm: the higher the compression factor the more information gets lost. An image that has been compressed using the JPEG algorithm cannot be completely reconstructed. The file format for JPEG compressed images is called JFIF. This file format is what people generally mean when they refer to "JPEG".	ISO/IEC 10918-1:1994
PNG	*Portable Network Graphics* PNG is an extensible format for the lossless, portable, well-compressed storage of raster images. PNG provides a patent-free replacement for GIF and can also replace many common uses of TIFF. Indexed-colour, grayscale, and Truecolor images are supported, plus an optional alpha channel for transparency. Sample depths range from 1 to 32 bits.	ISO/IEC 15948:2003 (E)
JPG2000	An image coding system that using compression techniques based on wavelet technology. Its aim is to replace JPEG's discrete cosine transform methods.	http://tools.ietf.org/html/rfc3745 (ISO/IEC 15444)
TIFF	*Tagged Image File Format* TIFF provides a general purpose data format and is compatible with a wide range of scanners and image-processing applications. It is device independent and is used in most operating environments. This non-proprietary industry standard for data communication has been implemented by most scanner manufacturers and desktop publishing applications.	http://partners.adobe.com/public/developer/en/tiff/TIFF6.pdf [Version 6.0]
RAW	This is the file type is most flexible as the camera only records and stores the original image recorded. Post processing is always necessary. A disadvantage is that it is proprietary for each manufacturer.	[Not applicable]

Standard	Description	Identifier / Related material link
DNG	*Digital Negative* A format which includes the RAW files, and which has become a more widely accepted format. DNG is proprietary to Adobe, but the company has made the format open, and is trying to have it become a standard.	[Not applicable]

Audio content

Standard	Description	Identifier / Related material link
AIFF	*Audio Interchange File Format* A non-compressed audio format most widely found on Apple Macintosh computers. Lossless, it is commonly used with professional-level audio and video software and systems.	http://www-mmsp.ece.mcgill.ca/Documents/AudioFormats/AIFF/Docs/AIFF-1.3.pdf [Version 1.3]
MP3	An audio compression format common on the Internet. Part of the MPEG standards, it can take larger audio recordings and shrink them down to a fraction of their size while losing little if any fidelity of the sound.	ISO/IEC 11172:1993, Part 3: Audio; ISO/IEC 13818, Part 3: Audio; ISO/IEC 14496, Part 3: Audio (Amendement 1: Audio extensions).
WAV	Contain sampled audio. The sound information itself it stored in a container using the Resource Interchange File Format. The RIFF file stores data in chunks, including metadata. A WAV file can contain sound clips with different sample rates, number of channels etc.	http://partners.adobe.com/asn/developer/pdfs/tn/TIFF6.pdf
WMA	*Windows Media Audio* Microsoft's proprietary competition to MP3. Optimised to deliver audio over the Web, particularly streaming, and using Microsoft products. Has integrated rights management, the advantages of a smaller file size and therefore transfer rates over other formats, including MP3. In addition the sound quality is said to be better.	[Not available]
RealAudio	Format optimised for delivery of audio over the Web.	[Not available]
AU	A sound format for Unix systems. It is the 'standard' audio file format for Java.	[Not available]
Ogg Vorbis	A free audio compression format, comparable to other digital audio format.	http://www.xiph.org/vorbis/doc/Vorbis_I_spec.html

Video content

Standard	Description	Identifier / Related material link
AVI	*Audio Video Interleave* The earliest video format for PCs. The size of image that can be displayed is dependent on the hardware being used. As compression and decompression functionality is part of Microsoft's Video for Windows package, there is support for this format in a range of hardware and software configurations. File sizes are high and therefore this format ill-suited for delivery over the Internet.	[not available]
FLV	*Flash Video Format* Used for the delivery of video over the Internet. It is viewed either using separate 'player' software or using a web browser 'plug-in'. It is becoming the de facto standard of video embedded on web pages.	http://www.adobe.com/devnet/flv/pdf/video_file_format_spec_v10.pdf [Version 10]
MOV	*Quicktime* Apple's proprietary video (and virtual reality) format and system. Built into the Mac's operating system, can be viewed on a PC by using a free to download player. Some of its technology was used in the development of MPEG-4.	[not available]
MP4	*MPEG-4* A high compression version of MPEG-2. Version 2 has data protection and IPR.	ISO/IEC 14496 (Parts 1 to 10)
MPG	*MPEG-1* Designed to be the equivalent of a video recorder format in the digital world, and to make use of the early model CD-ROMs as a delivery method. Standard television quality images, with a compression ratio of 50 to 1.	ISO/IEC 11172:1993 (Parts 1 to 5)
	MPEG-2 An improvement to MPEG-1, with encoding techniques to allow for higher quality video and audio, and delivery from DVDs. High definition television quality images, with a compression ratio of 150 to 1.	ISO/IEC 13818:2000 (Parts 1 to 11)

Standard	Description	Identifier / Related material link
SWF	*Flash Movie* Originally just for the delivery of animated vector graphics it is now used for interactive audio and video. It can be viewed using a standalone player or via a web browser plug in.	http://www.adobe.com/devnet/swf/pdf/swf_file_format_spec_v10.pdf [version 10]
WMV	*Windows Media Video* Microsoft's proprietary competition to MPEG-4. Optimised to deliver video over the Web, particularly streaming, and using Microsoft products.	[not available]
ASF	*Advanced Streaming Format* A proprietary format, designed to deliver, compressed, streaming video / audio content over the Internet.	http://www.microsoft.com/windows/windowsmedia/forpros/format/asfspec.aspx [Revision 01.20.03]

Text

Standard	Description	Identifier / Related material link
PDF	*Portable Document Format* The portable document format was designed by Adobe as a device independent way to represent document structure and lay-out. It is based on the Postscript page rendering standard. The PDF format is widely used to publish documents on the World Wide Web and CD-ROM.	http://www.adobe.com/content/dam/Adobe/en/devnet/acrobat/pdfs/pdf_reference_1-7.pdf
DjVU	Designed mainly to store scanned images, especially those containing text and line drawings. It offers advanced compression technology.	http://djvu.org/docs/DjVu3Spec.djvu [a DjVu plug-in is needed]
XML	*eXtensible Markup Language* XML started as 'SGML light', to overcome some of its complexities and terseness. Soon if overhauled its ancestor in popularity and is now the most widely used structuring language for electronic documents. XML structures a document by 'tagging' texts. The tags can be freely defined, but can be controlled by a Document Type Definition (DTD) or an XML-schema. XML usually uses the Unicode character set, so that it is very usable in multi-lingual and international applications. Several XML derivates have been standardised, such as XSLT (eXtensible Style Language and Transformation) and the XPath query syntax.	http://www.w3.org/TR/xhtml1/ [revised 1 August 2002]
XHTML	*Extensible HyperText Markup Language* XHTML is part of XML markup languages, and is also connected to HTML.	http://www.w3.org/TR/xhtml1/

Multimedia

Standard	Description	Identifier / Related material link
MPEG7	Multimedia content description standard.	ISO/IEC JTC1/SC29/WG11N6828
MPEG-21	MPEG 21 is an open framework for multimedia delivery and consumption.	ISO/IEC JTC1/SC29/WG11/N5231

Virtual Reality / 3D

Standard	Description	Identifier / Related material link
QuickTime VR	Apple's proprietary virtual reality format and system for creation of content. Built into the Mac's operating system, can be viewed on a PC by using a free to download player. Part of the QuickTime system, it 'stitches' individual photographs together to create panoramas, 3-D views of objects, and allows the linking of them into 'scenes'.	[not available]
X3D	*Extensible 3D* An XML-based format expressing the functionality of VRM97. Currently being developed as an ISO standard.	ISO/IEC FDIS 19775-1.2:2008
3D PDF	An application of Universal 3D (U3D), by Adobe, a compressed file format standard for 3D computer graphics data. Being used to give access to 3D material over the Web.	http://www.ecma-international.org/publications/standards/Ecma-363.htm [U3D specification]

Data transmission and harvesting

Standard	Description	Identifier / Related material link
OAI-PMH	*Open Archives Initiative Protocol for Metadata Harvesting* This protocol provides access for harvesting programs to data stored in databases or repositories that cannot be harvested using 'standard' http/html parsing. The protocol is based on http requests and responds in the form of XML. Different record syntaxes can be used, but Dublin Core support is mandatory.	http://www.openarchives.org/OAI/openarchivesprotocol.html [Version 2.0]
FTP	*File Transfer Protocol* A machine / operating system independent protocol for the transfer of files. Its origins are from the beginning of the Internet and the FTP protocol can be considered one of the foundations of the Internet.	http://www.ietf.org/rfc/rfc542.txt
HTTP upload	An extension to HTML which allows the uniform expression of file upload requests, together with a MIME compatible representation for file upload responses.	http://www.ietf.org/rfc/rfc1867.txt

Web services

Standard	Description	Identifier / Related material link
REST	*REpresentational State Transfer* An architecture which has become the most dominant Web service design model. When something conforms to the REST constrains, this is called being 'RESTful'. It defines how Web standards such as HTTP and URIs should be used. Conforming to the REST constraints will ensure a stable and beneficial architecture.	[not a standard as such but see: http://en.wikipedia.org/wiki/Representational_state_transfer For an overview]
SOAP	*Simple Object Access Protocol* Provides access to remote objects. Dependent on XML for message formats. It also uses HTTP and SMTP for the transmission of messages. It is a protocol specification for exchanging structured information in the implementation of web services in computer networks	http://www.w3.org/TR/soap12-part1 [Version 1.2 Part 1: Messaging Framework]

Standard	Description	Identifier / Related material link
WSDL	*Web Services Description Language* An XML-based language that is used for describing the functionality offered by a Web service. The document sets out: how the service can be called; what parameters it expects; and what data structures it returns.	http://www.w3.org/TR/wsdl20/ [Core] http://www.w3.org/TR/wsdl20-primer/ http://www.w3.org/TR/wsdl20-adjuncts/

Metadata Standards

Museum specific

Standard	Description	Identifier / Related material link
CDWA	*Categories for the Description of works of Art* Describes the content of art databases by articulating a conceptual framework for describing and accessing information about objects and images. They identify vocabulary resources and descriptive practices that will make information residing in diverse systems both more compatible and more accessible. They also provide a framework to which existing art information systems can be mapped and upon which new systems can be developed.	http://www.getty.edu/research/institute/standards/cdwa/index.html
DarwinCore	A set of standards (Dublin Core like), including a 'glossary of terms' (i.e. properties, elements, fields, columns, attributes, or concepts), which aim to share information about biological diversity. It is based on the occurrence of taxa in nature by observations, specimens, and samples, and related information.	http://rs.tdwg.org/dwc
SPECTRUM	Standard for the collections management documentation. Built around 21 procedures that commonly occur in museums. Supported by definitions of 'units of information' – the data needed to support the procedures. There are Dutch language versions for Flanders and the Netherlands, and a German version. An XML schema is available.	1 900642 14 X (ISBN)

Archive specific

Standard	Description	Identifier / Related material link
EAD	*Encoded Archival Description* DTD and schema for the encoding archival finding aids. Also used to describe collections (collection description).	ftp://ftp.loc.gov/pub/ead/ead.dtd (DTD) http://www.loc.gov/ead/ead.xsd (W3C schema)
ISAD (G)	General rules for archival description that may be applied irrespective of the form or medium of the archival material. The rules accomplish these purposes by identifying and defining twenty-six (26) elements that may be combined to constitute the description of an archival entity.	0-9696035-5-X (ISBN) http://www.icacds.org.uk/eng/ISAD(G).pdf

Library specific

Standard	Description	Identifier / Related material link
ISBD 2007	The ISBD is useful and applicable for descriptions of bibliographic resources in any type of catalogue. The consolidated edition merges the texts of the seven specialized ISBDs (for books, maps, serials, sound recordings, computer files and other electronic resources) into a single text.	http://archive.ifla.org/VII/s13/pubs/ISBD_consolidated_2007.pdf
MARC/MARC 21	*MAchine-Readable Cataloguing* *MARC 21: Concise Format for Bibliographic Data* Standard for the representation and communication of bibliographic information in machine-readable form.	http://www.loc.gov/marc/bibliographic/ecbdhome.html
MAB2	Maschinelles Austauschformat für Bibliotheken [Automated Library Exchange Format] The machine exchange all data generated within a library environment (bibliographic, authority and local data).	http://www.dnb.de/EN/Standardisierung/Formate/MAB/mab_node.html [bibliographic data (MAB-TITEL)]
METS	Metadata Encoding and Transmission Standard XML schema is a standard for encoding descriptive, administrative, and structural metadata regarding objects within a digital library and archive.	http://www.loc.gov/standards/mets/mets.xsd
MODS	Metadata Object Description Schema XML schema for a bibliographic element set that may be used for a variety of purposes, and particularly for library applications.	http://www.loc.gov/standards/mods/v3/mods-3-3.xsd
RDA	*Resource Description and Access* A standard for resource description and access designed for the digital world. Built on the foundations established by AACR2, RDA provides a comprehensive set of guidelines and instructions on resource description and access covering all types of content and media. The content of RDA has been developed in a collaborative process led by the Joint Steering Committee for the Development of RDA.	http://www.rdatoolkit.org

Historic environment specific

Standard	Description	Identifier / Related material link
MIDAS Heritage	The UK data standard for information about the historic environment. It states what information should be recorded to support effective sharing of the knowledge of the historic environment, and the long-term preservation of those records. It covers: the individual assets that form the historic environment (buildings, archaeological sites, shipwrecks, areas of interest and artefacts); the work that is undertaken to understand, protect and manage change to those assets.	http://www.english-heritage.org.uk/content/publications/publicationsNew/guidelines-standards/midas-heritage/midasheritagepartone.pdf http://www.english-heritage.org.uk/content/publications/publicationsNew/guidelines-standards/midas-heritage/midasheritageparttwo.pdf http://www.english-heritage.org.uk/content/publications/publicationsNew/guidelines-standards/midas-heritage/midasheritagepartthree.pdf
POLIS DTD	This DTD, derived from CIDOC-CRM which is used to describe historic monument inventories.	http://www.cidoc-crm.org/xsd/POLIS(ver1.0).xsd

General heritage

Standard	Description	Identifier / Related material link
CIDOC CRM	CIDOC Conceptual Reference Model A conceptual object-oriented model that provides the extensible ontology for concepts and information in cultural heritage and museum documentation.	ISO 21127:2006
VRA CORE	A metadata element set (units of information such as title, location, date, etc.), as well as an initial blueprint for how those elements can be hierarchically structured. The element set provides a categorical organisation for the description of works of visual culture as well as the images that document them.	http://www.vraweb.org/projects/vracore4

Text encoding

Standard	Description	Identifier / Related material link
TEI P5 / TEI	Guidelines for Electronic Text Encoding and Interchange Defines a set of tags (markers) for inserting into the electronic form of a document (a text) in order to identify the structure and other features of that document. The aim of these tags is to allow the processing of the text by computer. They are aimed at use with texts in any 'natural' language, of any date and of any genre. This version is XML-compatible.	http://www.tei-c.org/Guidelines/P5/

Harvesting

Standard	Description	Identifier / Related material link
LIDO	*Light Information Describing Objects* LIDO is an XML harvesting schema. The schema is intended for delivering potentially multilingual metadata, for use in a variety of online services, from an organisation's online collections database to portals of aggregated resources, as well as exposing, sharing and connecting data on the web. It is not intended to be used as a basis for a collection management system or to support loan and acquisition activities.	www.lido-schema.org/schema/v1.0/lido-v1.0.xsd [schema] www.lido-schema.org/schema/v1.0/lido-v1.0-specification.pdf [specification] www.lido-schema.org/schema/v1.0/lido-v1.0-schema-listing.html [html reference]
Dublin Core (DC)	Dublin Core is included here because it is mandatory to be able harvest, using OAI-PMH, this format. A fuller description is given above.	http://dublincore.org/documents/1999/07/02/dces

Europeana standards

Standard	Description	Identifier / Related material link
ESE	*Europeana Semantic Elements* A Dublin Core-based set of fields for the description of cultural items in Europeana ('beta' version). It has twelve Europeana-specific elements, which are necessary for records to display correctly in Europeana. It is a subset of EDM and can therefore be mapped directly to it.	http://www.europeana.eu/schemas/ese/ESE-V3.4.xsd
EDM	*Europeana Data Model* A framework for collecting, connecting and enriching metadata. It does this by adhering to the modelling principles that underpin the approach of the Web of Data ('Semantic Web') connecting to generate new knowledge between nodes in the cultural heritage sector.	http://www.europeana.eu/schemas/edm [schema] http://pro.europeana.eu/web/guest/edm-documentation [links to full documentation, including *Primer*]

Resource discovery

Standard	Description	Identifier / Related material link
Dublin Core (DC)	*Dublin Core Element Set Version 1.1* A simple metadata element set intended to facilitate discovery of electronic resources. Elements can be grouped into those having data on: Content – Coverage, Description, Type, Relation, Source, Subject, Title; Intellectual Property – Contributor, Creator, Publisher, Rights; Instantiation – Date, Format, Identifier, Language. Its use has been mandated by several	http://dublincore.org/documents/1999/07/02/dces

	governments in Europe (e.g. UK) and throughout the world (e.g. Australia).	

Appendix II – Use of standards in Europeana Group projects

Technical Standards

Image content

Standard	Projects used in
JPG	• ATHENA; • Digitised Manuscripts to Europeana; • EFG; • Partage Plus;
PNG	• ATHENA; • Digitised Manuscripts to Europeana; • Partage Plus.
JPG2000	• Digitised Manuscripts to Europeana; • EFG1914.
TIFF	• ATHENA; • BHL-Europe; • Digitised Manuscripts to Europeana; • EFG; • Partage Plus.
RAW	• Partage Plus.
DNG	• Partage Plus.

Audio content

Standard	Projects used in
AIFF	• ATHENA.
MP3	• ASSETS; • ATHENA; • Digitised Manuscripts to Europeana.
WAV	• ASSETS; • ATHENA; • EFG; • EFG1914.
WMA	• ATHENA.
RealAudio	• ATHENA.
AU	• ATHENA.
Ogg Vorbis	• ASSETS.

Video content

Standard	Projects used in
AVI	• ATHENA; • EFG.
FLV	• ASSETS; • EFG.
MOV	• ATHENA; • Digitised Manuscripts to Europeana.
MP4	• ASSETS; • ATHENA; • Digitised Manuscripts to Europeana; • EFG.
MPG (1)	• ASSETS; • ATHENA; • EFG.
MPG (2)	• ATHENA; • Digitised Manuscripts to Europeana; • EFG.
SWF	• ATHENA.
WMV	• ATHENA.
ASF	• ATHENA.

Text

Standard	Projects used in
PDF	• ATHENA; • Digitised Manuscripts to Europeana; • EFG.
DjVU	• ATHENA; • BHL-Europe.
XML	• ASSETS; • ATHENA; • CARARE; • Digitised Manuscripts to Europeana; • Digitising Contemporary Art; • EFG; • EFG1914; • Europeana Awareness; • Europeana Local.
XHTML	• Europeana Awareness.

Multimedia

Standard	Projects used in
MPEG7	• ASSETS • EUscreen
MPEG-21	• EUscreen

Virtual Reality / 3D

Standard	Projects used in
QuickTime VR	• ATHENA.
X3D	• ATHENA.
3D PDF	• CARARE; • Partage Plus.

Metadata Standards

Museum specific

Standard	Projects used in
CDWA	• EUscreen.
DarwinCore	• Natural Europe.
SPECTRUM	• EUscreen; • HOPE.

Archive specific

Standard	Projects used in
EAD	• APENet; • Digitising Contemporary Art; • Digitised Manuscripts to Europeana; • Europeana Collections 1914-1918; • Europeana Regia; • HOPE.
ISAD (G)	• Digitising Contemporary Art

Library specific

Standard	Projects used in
ISBD 2007	• HOPE.
MARC /MARC 21	• BHL-Europe; • Digitising Contemporary Art; • Digitised Manuscripts to Europeana; • Europeana Collections 1914-1918; • Europeana Regia; • Europeana Libraries; • EUscreen; • HOPE; • The European Library; • (part of Europeana Libraries).
MAB2	• Digitised Manuscripts to Europeana
METS	• APENet; • Digitising Contemporary Art; • Digitised Manuscripts to Europeana; • Europeana Collections 1914-1918.
MODS	• BHL-Europe; • Digitised Manuscripts to Europeana; • Europeana Collections 1914-1918.
RDA	• Europeana Libraries; • The European Library; • (part of Europeana Libraries).

Historic environment specific

Standard	Projects used in
MIDAS Heritage	• CARARE.
POLIS DTD	• CARARE.

General heritage

Standard	Projects used in
CIDOC CRM	• CARARE; • EUscreen.
VRA CORE	• EUscreen.

Harvesting

Standard	Projects used in
LIDO	• CARARE; • Digitising Contemporary Art; • Europeana Photography; • HOPE; • Judaica Europeana; • Linked Heritage; • MIMO.

Europeana standards

Standard	Projects used in
ESE	• CARARE; • EFG; • Europeana Awareness; • Europeana Collections 1914-1918; • Europeana Local; • Europeana v1.0; • Europeana v2.0; • Judaica Europeana; • Natural Europe; • ThinkMOTION.
EDM	• APENet; • CARARE; • Digitised Manuscripts to Europeana; • Europeana Awareness; • Europeana Collections 1914-1918; • Europeana Libraries; • Europeana v2.0; • Europeana Libraries; • Europeana Collections 1914-1918; • HOPE; • The European Library (part of Europeana Libraries); • Europeana Photography.

Resource discovery

Standard	Projects used in
Dublin Core (DC)	• BHL-Europe; • CARARE; • Digitised Manuscripts to Europeana; • ECLAP; • Europeana Awareness; • Europeana Travel; • Europeana Local; • Europeana Libraries; • Europeana Collections 1914-1918; • EUscreen; • HOPE; • Natural Europe; • OpenUp!; • The European Library (part of Europeana Libraries).