



DELIVERABLE

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Acknowledgement of previously published material and of the work of others has been made through appropriate citation, quotation or both.

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Introduction

This document describes the outcomes of the product development undertaken within the context of Europeana v3. The document includes a summary of the development work as part of Europeana v3 and will include some more brief notions of related development activities in the Europeana context, but formally worked on as part of other projects such as Europeana Creative, Europeana Sounds and Europeana Cloud.

Europeana's developments are grouped into the following categories:

- **Core Services:** services to the core of Europeana, such as its search index and infrastructure. Developments which contribute to the core support all other services.
- **End-user Services:** services which focus on engaging audiences in specific thematic areas by making the collections visible and sharable through social media, platforms such as Pinterest and Wikipedia, and via the revamped and theme-based portal that allows more targeted browsing and promotion to specific customer segments such as fashionistas, art lovers and music buffs.
- **Data Partner Services:** these focus on Europeana's aggregators and data partners. The team is tasked with attracting the very best collections of heritage material, of the highest possible quality, under conditions that allow for wide use and re-use.
- **Re-use Services:** services which focus on developing product to enable use of Europeana data in creative industries, education, and tourism. Development of these services is primarily done within the Europeana Creative project and reported there.

As a general overview of the Europeana Services and components related to product development, the following diagram gives a high-level overview of the Europeana software Architecture and how each of them work together:

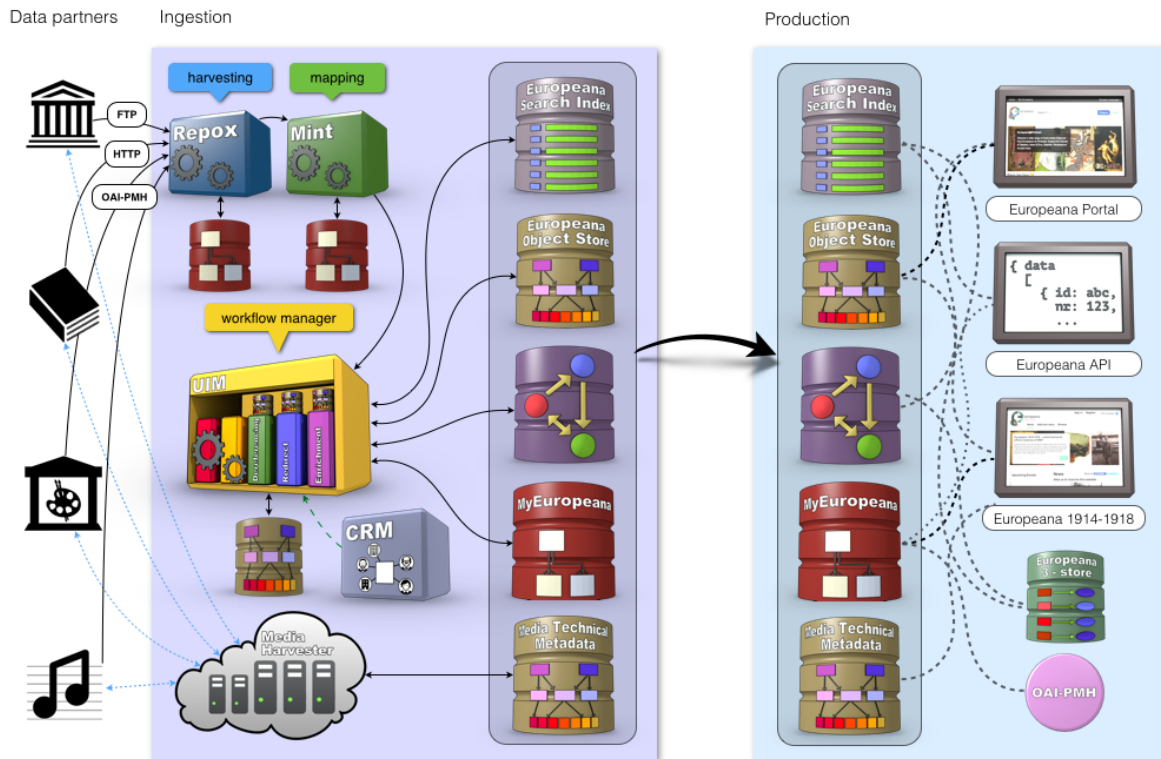


Diagram 1: Overview of the Europeana Software Architecture

Core Services

These services to the core of Europeana, such as its search index and infrastructure. Developments which contribute to the core support all other services.

Index and search

Log-based "learning to rank" BM25f ranking

Most search-engine softwares (e.g. Solr, Elasticsearch) are based on ranking unstructured documents, but the metadata in Europeana is structured and that structure should be taken advantage of in the ranking algorithm. To do this we have developed support for the state of the art [BM25f](#) ranking algorithm.

The ranking is [calculated based on the logs](#) we keep of user activity on the portal¹ which is used to "train" the ranking algorithm (so-called "[Learning to rank](#)").

Examples of improvements in search based on user activity:

- Tour de France (less irrelevant results on first page)
- Paris (more pictures of the city on the first page)
- Mona Lisa (more pictures of the painting on the first page)

Deployed: October 2014.

Roadmap: Fine-tuning and evaluating the algorithm is an ongoing task. See also Search Evaluation Framework below for a development effort to further reinforce our capabilities to continually analyse and improve the Europeana search engine.

Best bets

Best bets² are editorial picks that ensure that the best search result(s) for a given query is returned at the top. No search algorithm can ensure that the best result are always returned first and so best bets is a common industry practice and is also supported by most search engines. In practice it means creating and maintaining a cross-reference between search terms and the results that you want to show up first for them.

A Europeana-based example could be that if a user searches for [Birth of Venus](#) then the record best representing the painting by Botticelli is displayed as the first result. While there are many other works of art depicting this mythological event we can with enough certainty assume that the Botticelli painting is what the majority of users are looking for when entering the keywords Birth of Venus.

Deployed: November 2014.

Roadmap: The Best Bets index will be continuously updated and improved based on search queries by users and changes to the Europeana dataset. Addition of best bets is

¹ Note: Inline with our Privacy Policy no individual personal data is used or tracked. The feature uses the logs in aggregate.

² Sometimes also referred to as "sponsored search" or "editorial boosting".

currently focusing on named artworks, (fine arts) artists with some attention given also to composers³.

Query translation and expansion

The search keywords entered by users are matched with the titles and alternate titles of Wikipedia articles. If there is a match the user's query will be expanded to include the synonyms and translations and the search executed for the original keyword and the translations/synonyms..

The multilingual search capability has been added to the Europeana API and is exploited in the portal.

Deployed: August 2014

Roadmap: No further development is currently planned.

Search Evaluation Framework

To improve search Europeana needs to be able to measure improvements to it. For this the Search Evaluation Framework is currently implemented. The Search Evaluation Framework has two components: improved logging and an offline search evaluation service. Together they will for the first time make it possible for us to regularly measure improvements to our search algorithms. Based on the measurements search improvements can be discarded or retained.

Deployed: The implementation of the logging framework is ongoing and estimated to be implemented in the summer of 2015. The offline evaluation service will be connected to it afterwards.

Roadmap: After deployment the logging framework will be used to measure previous and potential adaptations to the search algorithm and as an ongoing tool to improve search.

Europeana Cloud

Europeana Cloud is a project with a vision of creating a new digital infrastructure for cultural heritage content that will be used by Europeana and other organisations from all over Europe. This infrastructure will provide new capabilities for efficiently storing metadata and content, easily sharing cultural assets between institutions, improving abilities to access these assets and research them using innovative tools.

The system consists of a distributed database for storing technical metadata, a distributed file system for storing metadata records as well as digital objects and several distributed frontend and backend services.

On top of these core services, a number of user services will be developed. They will be used by Europeana and its partners to build aggregation workflows and facilitate

³ In preparation for the planned Art History Channel and Music Channel.

dissemination of content. The ultimate goal is to migrate Europeana's current ingestion and dissemination infrastructure to this service suite.

This work is being done and will be further reported on in the context of the Europeana Cloud project.

Hosting and systems

Over the course of this and previous Europeana core projects, we realized that to fulfill our plans we need a fundamental change in how Europeana's digital assets are hosted. Component-based development, agile methodology and continuous integration - central themes of how Europeana will operate as a platform - require a new approach to hosting. Such an approach will increase the efficiency of Europeana's in-house team and partner teams by allowing them focus on development aspects rather than operational ones.

This approach is realized by the new cloud-based Platform-as-a-Service hosting solutions which are the next evolution of hosting services. In 2014 Europeana ran a European Tender to find a new hosting provider, implementing this approach. The winner was the German company Avarteq, running Anyines PaaS hosting service. After we chose the provider, our systems were adjusted to the new hosting paradigm. Among other advantages of the new hosting, it permits very easy scaling of application to handle fluctuating loads.

By the end of v3, Europeana's systems are already hosted on the hosting infrastructure and by the new partner. The full effect of this move will be fully appreciated in the future when scalability and performance requirements to Europeana, as a platform, will grow.

End-user services

These services focus on engaging audiences in specific thematic areas by making the collections visible and sharable through social media, platforms such as Pinterest and Wikipedia, and via the revamped and theme-based portal that allows more targeted browsing and promotion to specific customer segments such as fashionistas, art lovers and music buffs.

Portal

Focus on the portal has been on improving the underlying search engine (see [Index and Search](#) above) and on the display of complex related content (see Hierarchical objects below). Apart from these major development efforts feature development has otherwise been limited.

Hierarchical objects

The Europeana Data Model allows for data partners to include relationships between individual objects. These relationships typically take the form of hierarchical relationships (“Parent - Child”) and sequential relationships (“Siblings”).

During v3 support was developed to turn this possibility into reality. This was a major development that required modification of the Unified Ingestion Manager software, the addition of a new storage component, [Neo4j](#), and modification of the user interface of the portal. The feature was first used to display newspaper issues in order of publication⁴.

Deployed: October 2014

Roadmap: We plan to add support for unordered siblings (i.e. siblings that share the same parent but have no sequential relationship to each other)

Europeana Newspaper viewer and other viewers

Europeana is a metadata aggregator which doesn't store or cache media larger than thumbnails. Surveys and interviews with users however show that direct media access is at the top of their wishlist. In order to meet that wish, without yet investing in a shared Europeana media storage, we have developed support for embedding commercial and partner-specific viewers on the portal. Commercial viewers supported include Vimeo and SoundCloud and a partner-specific viewer supported is the Newspaper viewer⁵ developed as part of Europeana Newspaper for use on the TEL portal.

Deployed: August 2014

Roadmap: Support for more viewers can be added after consultation and by request from data partners.

⁴ Here exemplified by the [Wiener Zeitung of June 29 1914](#) where at the bottom of the display a user can navigate to earlier and following issues.

⁵ Example [item with embedded newspaper viewer](#).

Out of copyright - non-commercial re-use with expiration dates

Public Domain works digitised as part of Public Private Partnerships are commonly and by contract limited to non-commercial use only for a period of time. During v3 we extended the Europeana Licensing Framework to include the expiration dates of such limitations and the ingestion toolset and portal was accordingly modified to support ingestion and display of them⁶.

Deployed: November 2014

Roadmap: No direct plans. Supported license and rights statements are currently under review in collaboration with the DPLA. Once this review is completed any necessary modifications or additions can be planned in.

Channels prototyping

In light of Europeana's mission to become a platform and based on our experiences with the portal and Europeana 1914-1918 the concept of a portal with multiple thematic channels was conceived and elaborated. The goal is to provide users with clearer access points to content that match their particular interests and to transform the portal managed and marketed by the Europeana office alone into a publication platform where Europeana Network partners can actively contribute to development, maintenance and marketing of specific thematic channels on the portal.

Note that design and development of the channels capable portal take place in both Europeana Sounds and Europeana v3. In the former development is focused on audio related content (primarily sound recordings but also e.g. sheet music) and channels (primarily the now in-development Music Channel). Within Europeana v3 we have focused on the technological infrastructure underpinning *all* channels and the upgraded portal as a whole. Within v3 we have used research, design and prototyping of a Art History Channel⁷ as a second channel case, together with the Music Channel, to drive the development of the new portal and channel infrastructure.


Deployed: None (but a working internal alpha version of the portal has been developed as well as a working Art History Channel prototype)

Roadmap: First public version Music Channel⁸ and upgraded Portal Beta in August 2014.


⁶ Example [item with an explicit expiration date to its non-commercial use only limitation](#).

⁷ When writing the Europeana v3 DoW we had planned to focus on a maps and cartography channel. During the course of the project, based on surveys and interviews with users and stakeholders, we have shifted focus towards a channel focused on art and art history.

⁸ This is a formal deliverable within the Europeana Sounds project


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europa

Add a search term

Explore 42,869,662 items from Europe's libraries, archives and museums.

Insects and Fruit, Jan van Kessel
Public Domain

CHANNEL

MUSIC

CHANNEL

MAPS

CHANNEL

ART

CHANNEL

NATURAL HISTORY

EXHIBITION

EUROPEANA 1914—1918

EXHIBITION

PHOTOGRAPHY ON A SILVER PLATE


EXHIBITION

EUROPEAN FILM AND THE FIRST WORLD WAR

WHAT'S NEW


EUROPEANA MONUMENTS NOW IN GOOGLE FIELD TRIP

EUROPEANA NEWS




The miniature magic of Japanese netsuke

Netsuke, the small sculptural objects worn by men in Japan since the seventeenth century, first shot to fame in Europe with the publication of Edmund de Waal's popular memoir, *The Hare With Amber Eyes* in 2010.



Celebrating World Theatre Day 2015


Today we celebrate World Theatre Day, an annual celebration where all International Theatre Institutes and the international theatre community organises theatre events.



Europeana takes part in #MuseumWeek 2015

Today marks the beginning of #MuseumWeek, an event to celebrate culture on Twitter. Museums from all over the world will be tweeting about their collections or sharing fun facts with their followers.

[More from the Blog](#)



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Concept design for an upgraded portal with multiple channels featured on its landing page.

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EUROPEANA ART HISTORY

The Riding School by Philips Wouwerman
Public Domain

The **Europeana Art History Channel** brings you the lesser known as well as the famous pieces of European art combined with the books, letters, articles, videos and other material collated from our partner libraries, archives, and museums.

Curated by: [National Gallery of Denmark](#) [Rijksmuseum](#)

1,459,423 Images
393,117 Texts
1417 Moving images
1001 3D objects

ADDED RECENTLY:

Prado Museum	100 items	May 2015
Royal Armouries	6480 items	May 2015
British Library	33,326 items	May 2015

All Paintings
190,226
Images

All Sculptures
7,029
Images and video

All Art history publications
2,333
Documents

Spotlight on Botticelli
76
Images and videos

Spotlight on Alexander Roslin
46
Images and documents

Spotlight on Hokusai
240
Images

EXHIBITION

ROYAL BOOK COLLECTIONS

EXHIBITION

FROM DADA TO SURREALISM

EXHIBITION

ART NOUVEAU

EXHIBITION

EXPLORE THE WORLD OF MUSICAL INSTRUMENTS

EXHIBITION

PABLO PICASSO

EXHIBITION

FROM DADA TO SURREALISM

EUROPEANA ART HISTORY NEWS [MORE...](#)

The miniature magic of Japanese netsuke

Netsuke, the small sculptural objects worn by men in Japan since the seventeenth century, first shot to fame in Europe with the publication of Edmund de Waal's popular memoir, *The Hare With Amber Eyes* in 2010.

Celebrating World Theatre Day 2015

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Europeana
think culture

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[New collections](#)
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We transform the world with culture! We want to build on Europe's rich heritage and make it easier for people to use, whether for work, for learning or just for fun.

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Co-funded by the European Union.

Concept design for an Art History Channel landing page featuring different genres of art and art exhibitions..

Europeana 1914-18

The majority of the development work on Europeana 1914-1918 was performed prior to Europeana v3 beginning. However the deployment of the features happened within the Europeana v3 project lifetime. Features deployed included:

- Improved search (canned searches, boolean search, search within a search result)
- Addition of a Subject facet based on a multilingual World War I vocabulary created by EFG 1914-1918 and Europeana Collections 1914-1918
- Vocabulary management solution based on [OpenSKOS](#)
- User annotations (tagging, image annotations) and moderation
- Canadiana added as a source in search
- Statistics page (contributions and use)
- Improved social sharing on Facebook and Twitter
- Functionality to embed stories and items on other pages
- Import of images from Flickr when contributing stories

Deployed: June 2014 with a smaller update in September 2014

Roadmap: Basic functionality for transcribing scanned texts will be researched and prototyped. Existing user annotation functions (tagging, image annotations) will be made more prominent to users.

Open Culture app

In Europeana v2 we developed an application for iOS tablets (and later also Android tablets) for users to be able to browse and download freely reusable and select high-quality objects. While the app has been generally well-received its usage has been fractional compared to the reach of the portal and it has required significant use of contracting resources as Europeana has no in-house app development expertise.

We believe re-developing the portal with an emphasis on thematic browsing, easy to use filters for content quality and explicit functions for downloading content will allow us to focus all our energies on one product in a fashion that is also more economical. For this reason we have decided to deprecate the Open Culture app at the end of v3. The most well received aspects of the app - thematic access and focus high-quality imagery - will be carried over to the development of the new portal with its thematic channels.

Deprecated on: April 30 2014 (Android), May 31 2014 (iOS).

Re-use services

These services focus on developing product to enable use of Europeana data in creative industries, education, and tourism. Development of these services is primarily done within the Europeana Creative project and reported there.

Europeana REST-API

Note that besides the features listed below other features have been developed within Europeana Creative and are not listed.

Query translation

To improve cross-lingual retrieval a feature was developed that translate the search keywords entered by the users into other languages (currently a maximum of seven languages) and then executes the search using the original keyword and the translated keywords. The feature is powered by the Wikipedia API and results in significantly improved retrieval when users search using keywords matching named entities (e.g. subjects, places, periods, events, persons).

The query translation feature was released as an API for developers and the Europeana Portal uses this API to improve the cross-lingual retrieval of records.

Deployed: The first version was deployed in June 2014 with more languages added in the months after.

Roadmap: Gradually more languages will be added and ultimately this functionality will make its way to being a "default" search parameter.

Rich search profile

This feature addition to the REST-API allows developers to build rich and language aware search result displays. Available to all developers using the Europeana REST-API it will be used by Europeana itself in the in-development new portal with channels.

Deployed: August 2014 with an update with improved multilingual handling

Roadmap: None planned but modifications will be made during development of the new portal with channels and based on 3rd party developer feedback.

Data exporter

This tool allows users to create exports of metadata from Europeana for use in their own applications or in analysis. Currently used internally at Europeana it will in the future be integrated also in Europeana Labs and as an option for advanced users of the new portal with channels.

Deployed: April 2014 (internal version)

Roadmap: To be determined as part of the DSI planning

Ruby client library

A Europeana REST-API Ruby client library was initially developed within Europeana 1914-1918 and further refined when prototyping the new portal enabled channels. It is made available as open source for 3rd party developers.

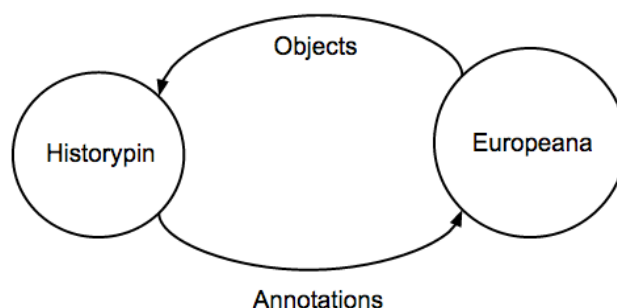
Deployed: Multiple upgraded version deployed during 2014 -15.

Roadmap: None planned but modifications will be made during development of the new portal with channels and based on 3rd party developer feedback.

Roundtripping of Annotations

A strategic goal for Europeana is to be able to act as a hub for metadata where the flow is bidirectional and as automated as possible. The Historypin platform has been designated as the first strategic partner to implement such a flow.

A solution has been developed where objects are imported from Europeana to a Historypin project⁹, annotated by users on Historypin, and the annotations are then imported into Europeana completing the 'roundtrip'. This solution is currently importing tags (such as "church") and object linking (where two objects are marked as similar by a user).



For this project, which focussed on paving the way for a future of annotations in Europeana, the following components have been developed:

- Historypin has developed an API which exposes these annotations in a standardised way.
- Europeana has implemented a first version of its Annotations API, developed in the context of Europeana Sounds. The Annotations API can store new annotations and allows developers to retrieve those annotations. Currently, this API is in a beta stage and its sole purpose is to facilitate this roundtrip of annotations.
- Europeana has set-up a first version of a so-called 'Roundtripping' Daemon, a tool which can import annotations from third party platforms (such as Historypin) and imports them to Europeana using the Annotations API.

These components and modules have been developed in such a way that other providers could also connect to it in the future. The data is modelled in a standardised way using the Open Annotations Model¹⁰ and formatted using JSON-LD, the Linked Data variant of JSON.

⁹ For example [Sound Connections: Birdlife](#) where sound objects from Europeana have been imported for user enrichment on Historypin

¹⁰ <http://www.openannotation.org/spec/core/>

Deployed: A first version of the Annotations API, the Roundtripping Daemon and the Historypin API were put into production in May 2015. The first batches of annotations were imported into Europeana using these tools.

Roadmap: The Annotations API will be further improved and expanded to the point where it can be offered to developers and implemented on the various Europeana websites. The Annotations will also become part of the standard record API response. All this work will be completed in the second half of 2015.

Europeana Labs

Within Europeana Creative the [Europeana Labs website](#) was researched, designed and developed. All documentation for the Europeana APIs is made available on the site.

Data partner services

These services focus on Europeana's aggregators and data partners. The team is tasked with attracting the very best collections of heritage material, of the highest possible quality, under conditions that allow for wide use and re-use.

UIM - Unified Ingestion Manager

During v3, development efforts were focussed on improving the stability and performance of Europeana's ingestion tools.

Improving the performances of UIM

Europeana started using UIM in 2013, enabling itself to ingest EDM metadata. The following year was spent on stabilizing its workflows and processes so that corner-cases as massive collections¹¹ could be handled more efficiently by implementing incremental operations where applicable, and performance optimizations.

Deployed: Monthly deploys of the UIM applications in 2014.

Roadmap: We plan to keep improving the performance of our ingestion toolset as part of our recurrent maintenance.

Records redirection plugin

Making cultural objects accessible via its portal and API in a persistent manner is core to Europeana's activities. In order to ensure that the links to the digital objects remain accessible after several updates of the data, Europeana implemented in UIM a redirection plugin¹².

Deployed: Last version of the plugin was deployed in June 2014.

Hierarchical objects plugin

As described above¹³, display of complex hierarchical data required the creation of an additional data ingestion plugin based on the [Neo4j](#) open-source graph database, where EDM data is stored and relations between objects are analysed and saved.

Deployed: October 2014.

Roadmap: We plan to add support for unordered siblings (i.e. siblings that share the same parent but have no sequential relationship to each other).

EDM schema modifications

Additions to the EDM schema were implemented to support the extension of the Europeana Licensing Framework¹⁴ and to enable better representation of the metadata¹⁵.

¹¹ See the [biggest collection in Europeana](#), delivered by The European Library from the National Library of France, which has been updated several times in 2014

¹² Example of [record with an implemented redirection](#)

¹³ See [Hierarchical objects](#)

¹⁴ See [Out of copyright - non-commercial re-use with expiration dates](#)

¹⁵ See [last version of the EDM schema](#) as implemented in May 2015

Deployed: Last changes were deployed in April 2015.

Roadmap: We plan to keep extending EDM in 2015, with focus on technical metadata for digital objects, data providers representation and collection data.

REPOX refactoring and adaptation to Europeana Cloud

Europeana harvests data using the software tool originally developed by Instituto de Engenharia de Sistemas e Computadores, Investigação e Desenvolvimento em Lisboa (INESC-ID). In 2014, Europeana took the opportunity to re-architect the REPOX project in a more modularised way, as well choosing to provide new features. One of the features already implemented is the new REST API implementation using the latest standards, which will help developers have better control over REPOX from a programming perspective¹⁶.

Deployed: Multiple internal versions; last internal deploy in March 2015.

Roadmap: A final version will be deployed in production in 2015 and the adaptations of this version to work against Europeana Cloud will be completed in the first quarter of 2016.

Enrichment and data quality

Multilingual searchability and discoverability is essential to Europeana. During v3, we focused on improving our automatic enrichments of the metadata.

Improved dereferencing plugin

EDM gives support for contextual resources, including concepts from 'value vocabularies' like thesauri, authority lists, classifications, either coming from the network of Europeana's providers or from third-party data sources. Starting in 2013, we developed a plugin in order to fetch from concepts identifiers all the multilingual and semantic data attached to them and save them back in EDM. The final refactored version of the plugin was implemented the following year¹⁷.

Deployed: June 2014.

Refactored Europeana enrichment framework and entity collection

Europeana's current [enrichment process](#) is based on the [Annocultor tool](#). Europeana enriches all provided data by creating links to contextual resources - places, concepts, agents and time periods. Named entities are found in records using a set of heuristics. Contextual information, known about these entities from external data sources, is appended to the original record in the form of EDM contextual classes.

During v3, Europeana focused on refactoring its enrichment framework to make the process more efficient and precise; we also focused on the creation of a richer set of named entities to be linked to our cultural heritage data. The result of this work is referred

¹⁶ See our [blogpost on Europeana Pro](#)

¹⁷ See an example of dereferencing in our [blogpost on Europeana Pro](#)

to as the Europeana entity collection. In May 2015, this entity collection comprises of artists and concepts selected from the [DBPedia](#) corpus, concepts extracted from [Gemet](#), places extracted from [Geonames](#), and time periods represented in the [Semium](#) ontology.

Deployed: alpha version of the entity collection was deployed in March 2015 and is currently being tested.

Roadmap: In 2015, we plan to keep populating the entity collection by extending our DBPedia language coverage and by investigating on the Wikidata dataset. We will also keep refactoring our framework according to the results of the [Europeana Task Force on Evaluation and enrichments](#).

Network services

Europeana Pro

The new version of [Europeana Pro](#) was developed and released¹⁸. Apart from a rehaul of the content of the site the visual design was also updated. To reduce operational costs and to support much simpler editorial workflows a new CMS was adopted.

Deployed: February 2015.

Statistics Dashboard prototype

Europeana regularly reports statistics of use and content to data partners and other stakeholders. The process is manual and does not scale to meet the need to provide individualised reports to all data partners. In order to begin being able to provide statistics in an automated, transparent and scalable fashion Europeana developer a prototype [Statistics Dashboard](#). The prototype includes basic information about Europeana's content, traffic and overall reach as well as a small number of reports specific to individual data partners.

The prototype was developed to be used as a testbed with the plan to scale it up to a first production version in Europeana's first year as a DSI.

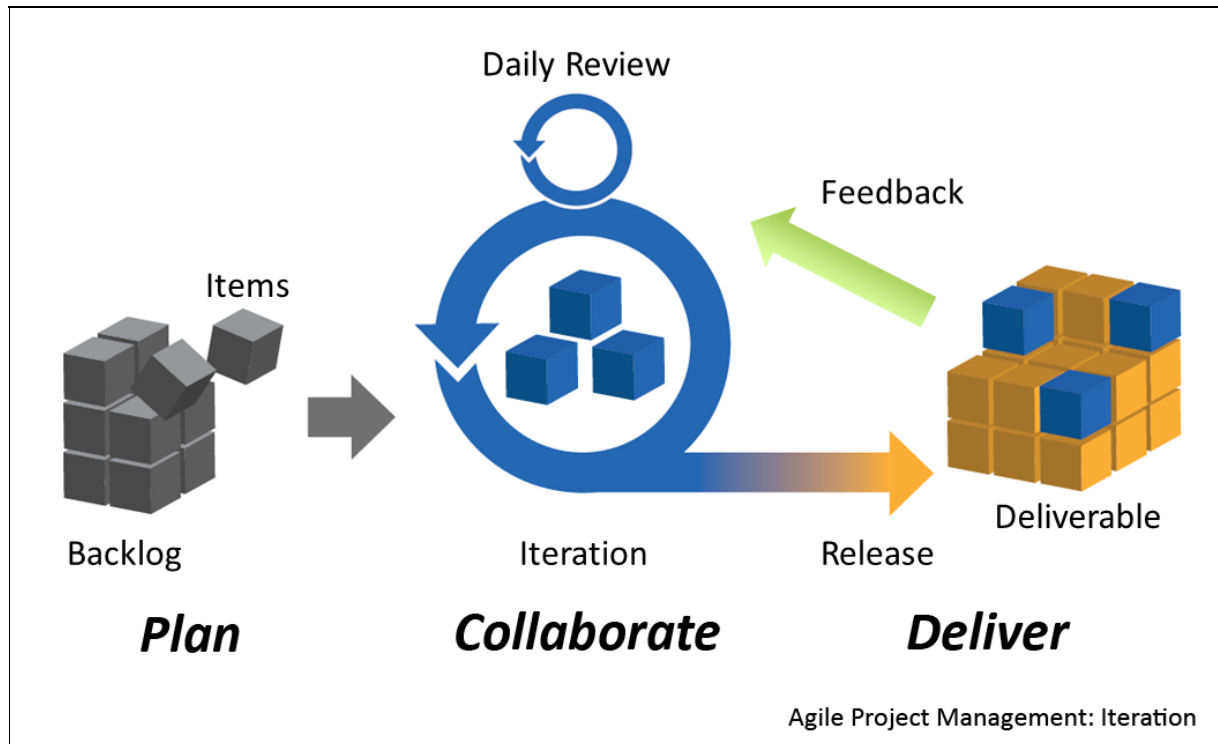
Deployed: October 2014

Roadmap: First production version to be release in October 2015

¹⁸ Research and design was initiated at the end of Europeana v2.

Process and organisation

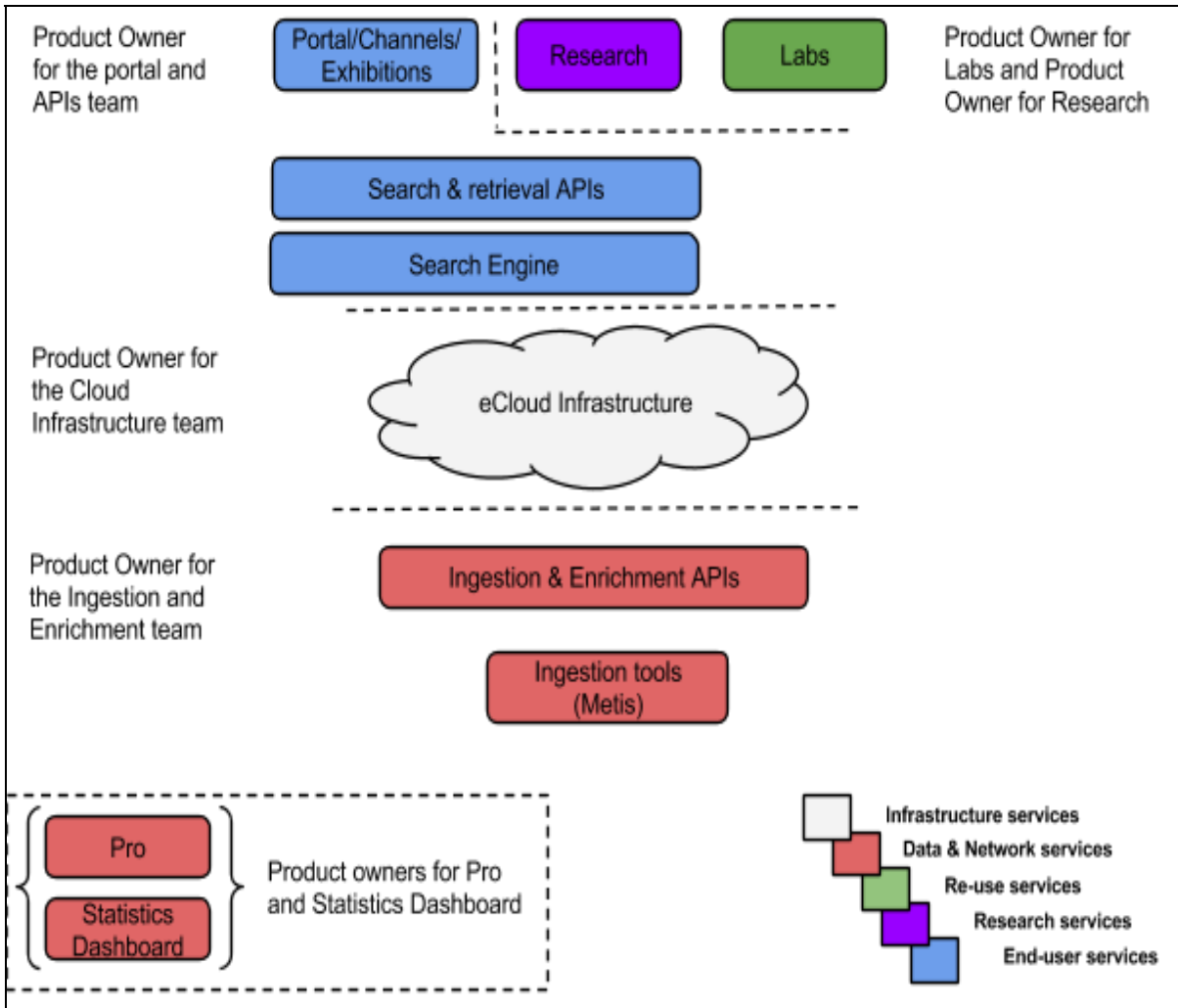
At Europeana we've adopted a combination [User-Centred Design process](#) and the Agile [Scrum development process](#) and strive to live up to its high standards. Both methodologies advocate strong focus on delivering user/business value, short iterations with integral feedback loops and close collaboration between cross-disciplinary teams.



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This means that requirements analysis, design and development are intimately intertwined and performed iteratively rather than linearly as discrete tasks. Organisationally we've set up Scrum teams for the development and operations of services oriented towards different audiences¹⁹. Each team has a Product Owner responsible for ensuring the team delivers value to the business. The various Scrum teams and Product Owners are coordinated by a Chief Product Owner.

¹⁹ Each such audience is typically also served by a specific organisation unit at Europeana.



Outline of the Scrum teams at Europeana.