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D3.3 Cloud infrastructure final

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Author:
Ignacio Lamata Martínez (EGI)

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EXECUTIVE SUMMARY

This document accompanies the Deliverable 3.3 “Cloud infrastructure final“ in order to provide documentation on the implemented final version of the project’s cloud infrastructure. It outlines the basic design principles, the different systems involved and the operational processes as an evolution of the initial beta deployment. It is the updated version of the D3.2 Cloud Infrastructure beta, released in October 2025.

The Prototype itself is illustrated in a showcase video, accessible at:

https://youtu.be/QEMqC-fSqHc (April 2026)

The final cloud infrastructure has been developed in alignment with the project’s core objectives of scalability, security, and cost-efficiency, and consistency of experience across tools and services, enabling flexibility around the resources needed by the different tools while ensuring a coherent and reliable operational environment. The deployment is based on container technology, automated provisioning, dynamic resource management, and continuous deployment pipelines. To secure the access to all underlying systems and the tools’ features that require some user authorisation, the authentication and authorisation layer has been implemented accordingly.

This deliverable also corresponds to the accomplished Milestone 10 “Cloud Infrastructure Final Release”.

1. INTRODUCTION

The EUreka3D-XR project has developed various XR tools to enrich the existing ecosystem of the EUreka3D Data Hub[1], the cloud solution available to Cultural Heritage Institutions to store, manage, share and publish their 3D cultural collections in the data space for cultural heritage. These XR tools aim to facilitate the reuse of 3D and 2D digital cultural content by Cultural Heritage Institutions in compelling XR storytelling and, as such, engage their onsite and online audiences. The tools, AR TOUR BUILDER, AR TOUR EXPERIENCE, AI 3D BUILDER, 3D XR STUDIO and AVATAR BUILDER, have been developed by three different teams of developers according to technical requirements illustrated in D3.1 "Technical Requirements"[2], and tested in the three pilot scenarios documented in Deliverable D2.1 "Pilot Specification and Planning"[3]. These tools require servers to execute, and auxiliary systems to operate, which is the purpose of the **cloud infrastructure**.

The general overview provided in Figure 1.1 shows that the EUreka3D-XR tools execute on dedicated project infrastructure that is accessed by three different actors:

- The **Cultural Heritage Community** accesses the different tools to use them.
- The "**editors**" are a special type of users that are authenticated and authorised to perform restricted actions in the system.
- The **EUreka3D-XR developers and operators** create the tools and deploy them in the infrastructure.

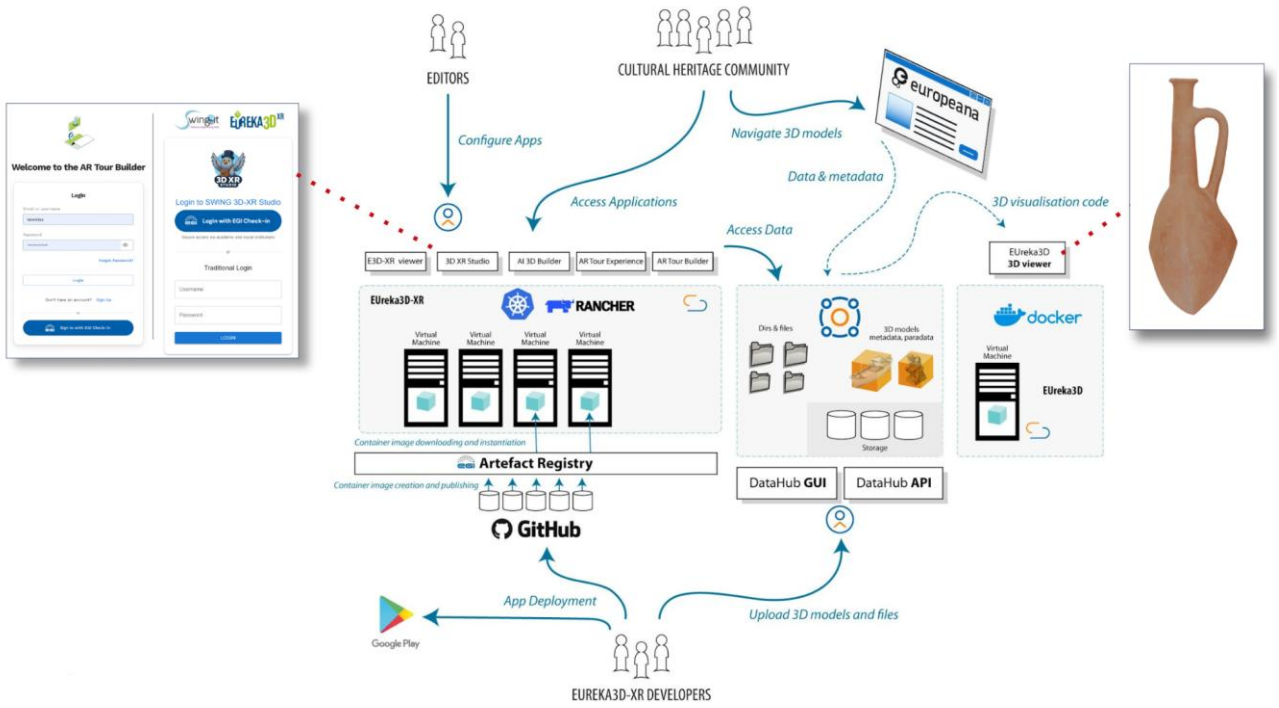

Figure 1.1: General view of the EUreka3D Data Hub ecosystem.

[1] https://eureka3d.eu/eureka3d-data-hub/ The user manual to access the EUreka3D Data Hub can be found at https://go.egi.eu/eureka3d_handbook

[2] https://eureka3d.eu/wp-content/uploads/2025/07/EUreka3D-XR-D3.1-Technical-Requirements.pdf

[3] https://eureka3d.eu/wp-content/uploads/2025/07/EUreka3D-XR-D2.1-Pilot-specification-and-planning.pdf

On the right side, the EUreka3D 3D viewer is depicted, which is the application in charge of rendering the 3D models stored in DataHub. On the left side, screenshots of a couple of XR tools, the AR Tour Builder and the 3D-XR Studio, are shown.

The infrastructure is a dynamic part of the system, which has to be rescaled according to the project's computational needs. The servers provide the computation layer required by the tools, which are packaged and deployed in *containers*. Containers offer a full ecosystem, but in essence allow the application of different Operating System features to pack software and all its dependencies together and run them in isolation.

A dynamic development environment is necessary to enhance the efficiency of the software development lifecycle. This is supported by Continuous Integration and Continuous Deployment (CI/CD) pipelines, which enable automation for rapid, iterative software delivery. Combined with the scalability and portability of containers, this approach enables reproducible builds and more efficient use of resources. Figure 1.2 illustrates the deployment process, from the time the developers make a software update until the time the software is "compiled" or packed and deployed in the final infrastructure.

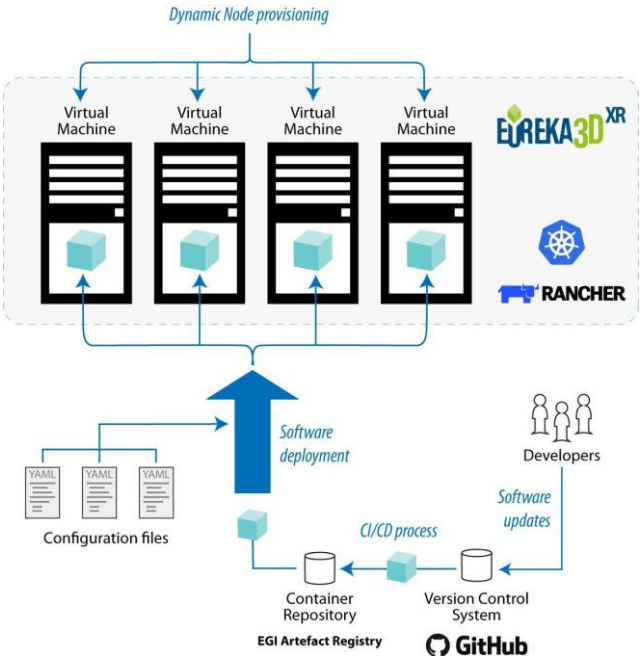

Figure 1.2: Continuous deployment process

Both the tools and the underlying infrastructure in which they run require secure access. Different measures like the authentication and authorisation provided by Check-in[4], the use of TLS certificates for Web applications and network access controls, provide some layers of security, which are essential to protect critical components, prevent unauthorised access, and maintain the integrity and confidentiality of the data.

[4] EGI Check-in is a solution for identity and access management. Detailed information can be found in EUreka3D's Deliverable D3.2 "The EUreka3D AAI architecture", available at https://eureka3d.eu/wp-content/uploads/2024/11/EUreka3D-D3.2-V1.0.pdf

2. Overview of the Final Infrastructure

The final infrastructure consists of the following main elements:

- The **authentication and authorisation infrastructure**, described in Section 2.1.
- The **compute power**, running in a Kubernetes cluster in the *EGI Cloud Container Compute*, discussed in Section 2.2.
- The **tool publication process**, supported by the *source code* and the *EGI Artefact Repository*, discussed in Section 2.3.
- The **tool deployment process**, supported by the *EGI Artefact Repository* and the *EGI Cloud Container Compute*, explained in Section 2.4.

2.1 The Authentication and Authorisation Infrastructure

A system has been put in place to meet the requirements described in D3.1 "Technical Requirements"[5], specifically AAI-01, AAI-02, AAI-03 and AAI-04. Some groups have been created to facilitate the implementation of AAI-05 by the tools.

The organisation of the project's users is done through a **Virtual Organisation** (VO)[6], which also provides the basis for assigning user permissions and applying authorisation rules. EUreka3D-XR uses two different Virtual Organisations, as graphically shown in Figure 2.1:

- **culturalheritage.vo.egi.eu**, which is the VO used in EUreka3D to organise the different CHIs. This is still used for the data management conducted in EGI DataHub.
- **eureka3d-xr.vo.egi.eu**, which is a VO specific for the project that is mainly focused on permissions related to the infrastructure and the tools.

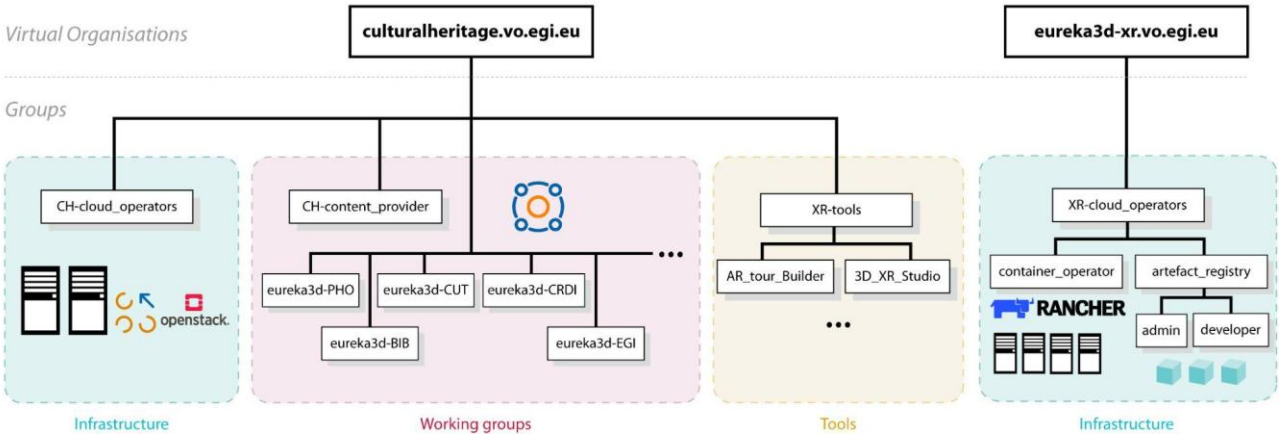

Figure 2.1: Virtual Organisations in EUreka3D-XR

[5] https://eureka3d.eu/wp-content/uploads/2025/07/EUreka3D-XR-D3.1-Technical-Requirements.pdf
[6] https://docs.egi.eu/users/aai/check-in/vos/

Although the beta version of the AAI used the **eureka3d-xr.vo.egi.eu** VO for the users of the XR tools, it has been finally decided to use **culturalheritage.vo.egi.eu** instead. This was already contemplated at the time the beta version of the infrastructure was implemented. The reason for this change is that it was decided that users of XR tools should be regarded as part of the EUreka3D community itself, rather than as a separate user group. Consequently, XR users can join the EUreka3D community by following the same onboarding process as that used for cultural heritage institutions.

2.2 Compute Power

As explained in Section 1, the XR tools need to run in computers, and be exposed through the network, allowing the end users to access them. Determined by the nature of the tools, EUreka3D-XR uses a more sophisticated approach than the one used in EUreka3D, which also brings multiple benefits.

Whereas EUreka3D uses simple container technology to run its only application - a 3D viewer, the XR tools require a more robust solution based on a Kubernetes cluster managed over Rancher (see Figure 2.2). This cluster has the benefit of "container orchestration", with the following advantages:

- Two separated environments, Staging and Production, are run in the cluster.
- Applications can be replicated, which means that multiple instances of the same application run simultaneously, enabling load balancing and ensuring fault tolerance.
- Several servers are responsible for running the applications, ensuring hardware redundancy. These servers can be scaled up dynamically if user demand requires it.
- The applications are continuously monitored by the cluster, and are automatically restarted if one of them crashes or misbehaves.

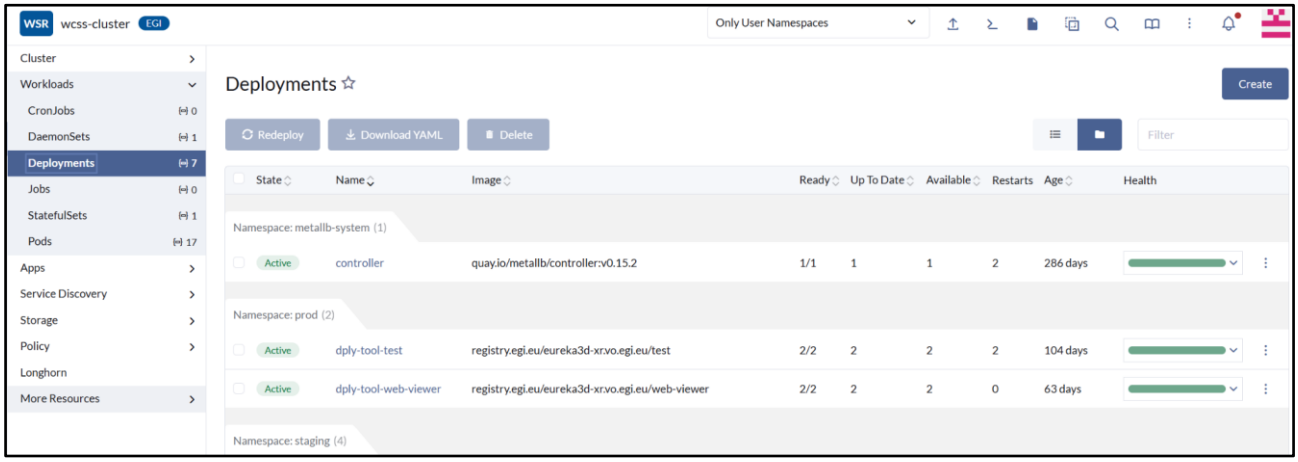

Figure 2.2: The EUreka3D-XR cluster in the Rancher dashboard

The final allocation of hardware has been: 56 vCPU, 32 GB RAM and 500 GB Storage. This is less than initially estimated, motivated by the tool optimisation for low use of resources. The allocation serves two purposes:

- It does not waste resources that are not needed and that can be dynamically increased if the load requires it.
- It enables the project to run for a longer period of time, after the project ends. In this respect, the provider has agreed to establish an SLA until the end of 2027.

2.3 TOOL PUBLICATION PROCESS

The tools are expected to run in *containers*, a technology that allows developers to run and pack software together with all their dependencies. These containers are created from container images that are published in a repository. In EUreka3D-XR, this repository is provided by the **EGI Artefact Registry**[7]. The artefacts remain private but accessible for authorised users.

In order to publish the artefacts, automation has been implemented through a CI/CD pipeline (see Figure 2.3). Developers use GitHub[8] (a version control system) to upload code, with each tool having its own dedicated code repository[9]. Once they commit code changes, the code is automatically "compiled" and packaged in a container image by the pipeline. Finally, this image is automatically published into the EGI Artefact Registry, which makes it available for deployment. The entire process is automatically triggered by changes in the tools' code, so that the latest changes are continuously integrated and deployed with minimal manual effort.

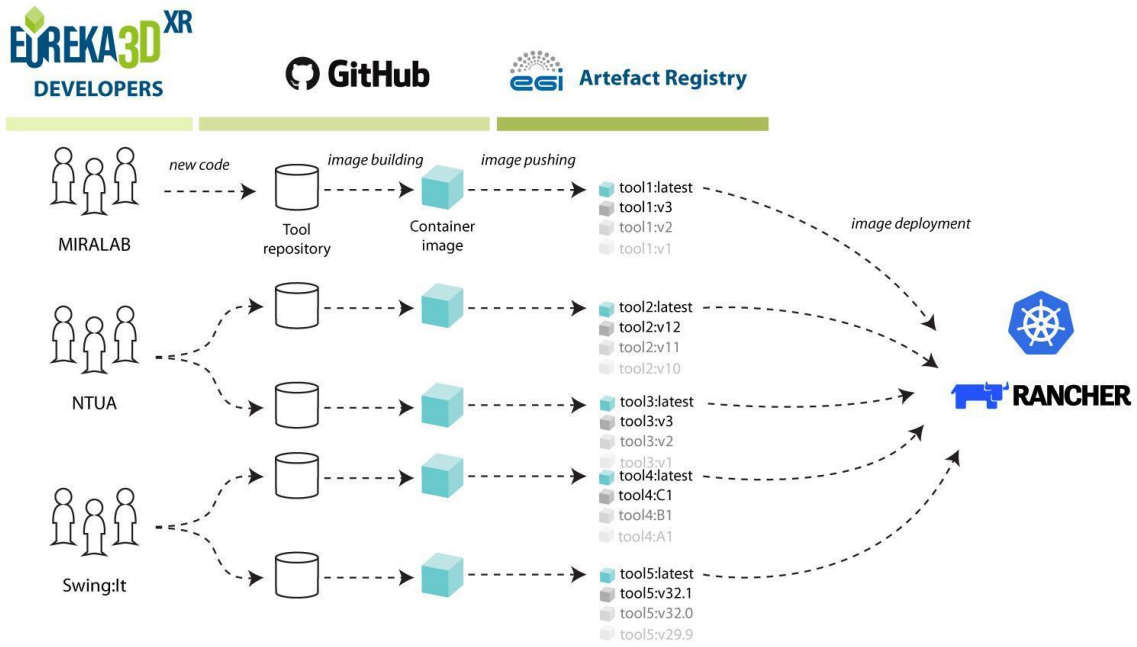

Figure 2.3: CI/CD pipeline from developers to deployment

[7] https://registry.egi.eu/
[8] https://github.com/EUreka3D-XR
[9] https://github.com/orgs/EUreka3D-XR/repositories

Figure 2.4 shows some of the container images published for EUreka3D-XR. Whereas the software remains open source and is publicly accessible, these images are securely stored and can be installed from the cluster by using a security token.

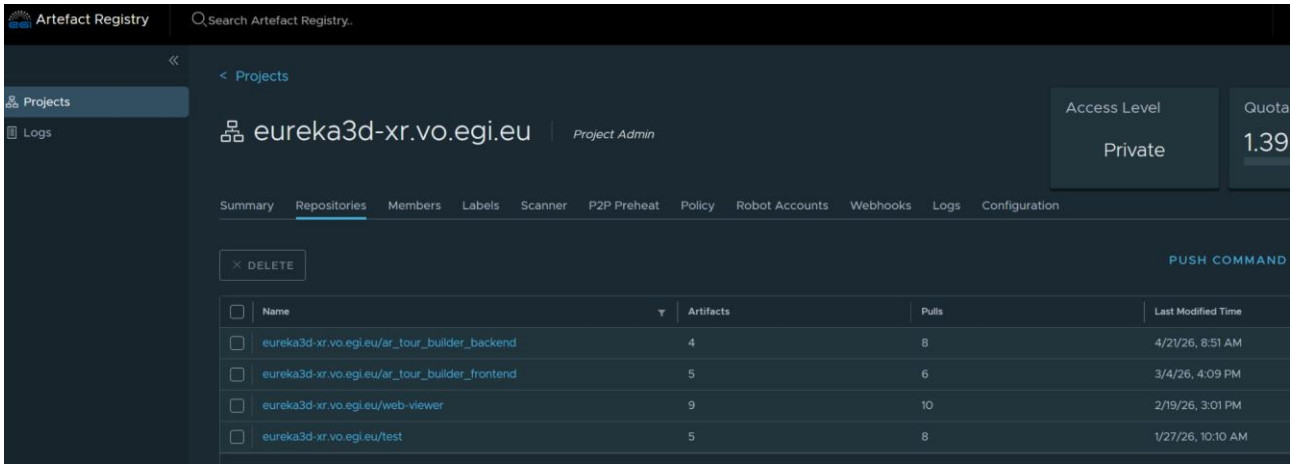

Figure 2.4: Some artefacts of EUreka3D-XR visualised in EGI's Artefact Registry Dashboard

2.4 Tool Deployment process

The deployment process depends on the images created during the publication process, but it is independent of it. The container images produced by the source code are deployed in *Kubernetes*, which is an application to run and manage containers. Kubernetes operates in clusters, which are a set of nodes or machines whose number can be dynamically adapted to application demand.

A Kubernetes cluster has been allocated in *Rancher*[10], part of the **EGI Cloud Container Compute**[11]. The final cluster has four nodes allocated, which have demonstrated to work correctly up to now during the tests of the pilot activities of the project.

Two different environments have been foreseen for deployment: Staging and Production. Changes to the tools will be reflected in the EGI Artefact Repository, which can be detected by the cluster to trigger an automatic deployment in the Staging environment. The transition to Production is in any case triggered manually.

The design of the deployment phase is one of the most demanding, as it involves various aspects that must be taken into account, such as the deployment and configuration of the tools in the different environments, the Dynamic DNS, the request and configuration of TLS certificates, the network routing, the provisioning of volumes and persistent storage, the security aspects, etc.

[10] https://containers.egi.eu/
[11] https://www.egi.eu/service/cloud-container-compute/

In summary, the deployment process has been carefully designed to ensure flexibility, efficiency, and scalability, implementing mechanisms to validate tool implementations in a controlled environment before moving to Production. This approach not only ensures the stability of the deployed tools but also provides a solid foundation for scaling and adapting future updates and functionalities as the project evolves.

3. IMPROVEMENTS ON EUREKA3D DATA HUB

During the project, multiple improvements have been implemented in the EUreka3D Data Hub, which consist of:

- A playground of the platform, described in Section 3.1.
- A new list of materials, discussed in Section 3.2.
- Support for the extension of EDM for 3D, explained in Section 3.3.
- A Catalogue, described in Section 3.4.

3.1 PLATFORM TRY-OUT ENVIRONMENT

During the project capacity building events, many representative users of Cultural Heritage Institutions have approached our project team to express interest in the EUreka3D Data Hub. The onboarding process of EUreka3D normally involves the signing of a Cooperation Agreement to establish the basis of the relationship between the CHI and the EUreka3D Community, as depicted in Figure 3.1. After signing this agreement, the CHI officially becomes part of the EUreka3D Community: a specific group is created for the CHI, which grant them access to the Data Hub and to be referenced for data sharing within the community, and the user manual is shared with them, which contains detailed explanations on how to use the system (the manual is accessible at https://go.egi.eu/eureka3d_handbook and can be found in Annex C).

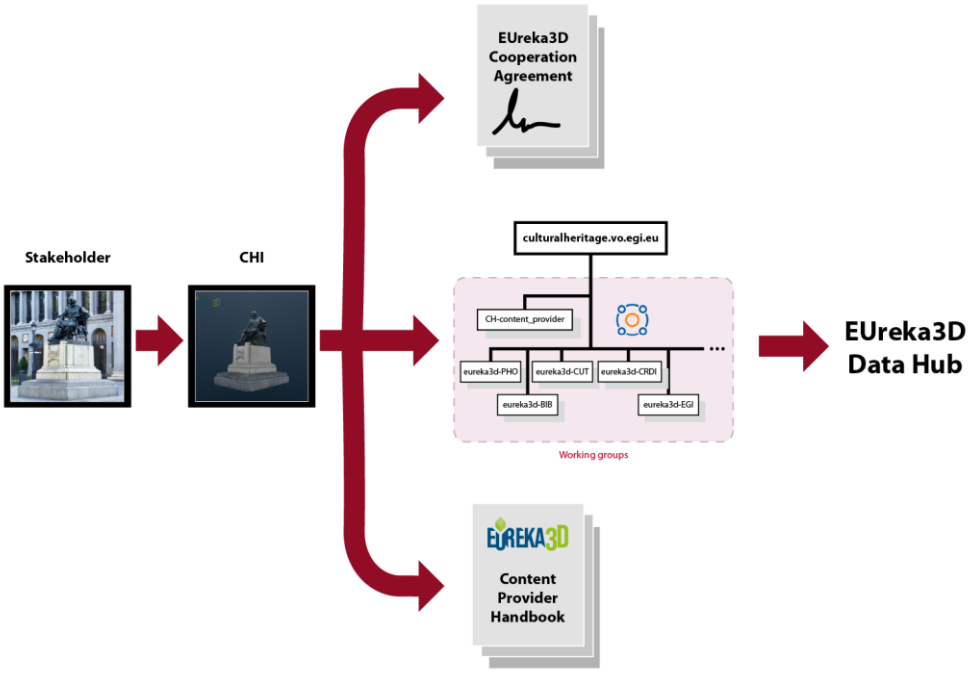

Figure 3.1: Onboarding process in the EUreka3D Community

To support users who have expressed a desire to test the system beforehand to see if it suits their own purposes, a "Try-out" environment has been created (see Figure 3.2). The try-out environment acts as a "playground", working in the same way as the real environment with a few key differences:

- It is in an isolated data environment, so data from the real EUreka3D cannot be accessed from it.
- It does not allow publication in Europeana.
- It does not retrieve real PIDs from B2Handle.

However, all the rest of functionalities, including the data management, metadata, and 3D previsualisation can be tested before joining the actual community.

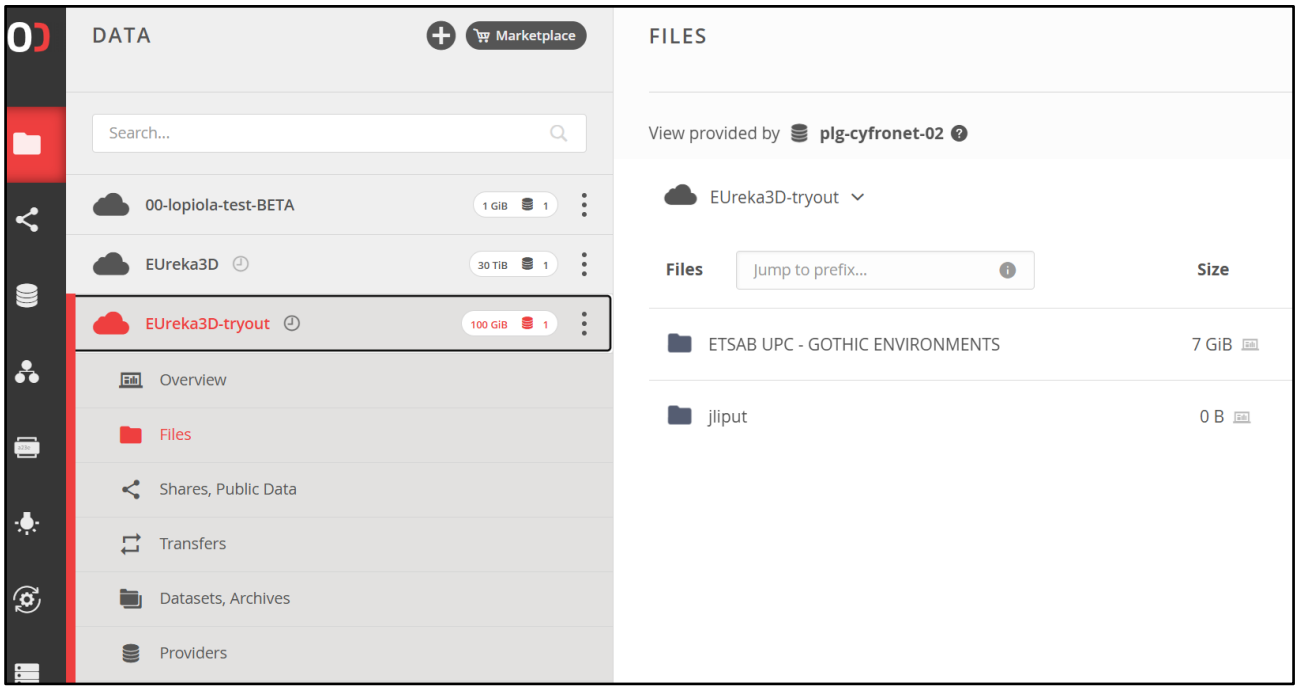

Figure 3.2: Tryout space in DataHub

3.2 New list of material

The EUreka3D Data Hub's form for entering EDM metadata provides a list of predefined materials to make it easier for users to enter the object's materials. The initial list was rather limited, with only a few generic elements contemplated: Bone, Ceramic, Clay, Concrete, Glass, Leather, Metal, Mortar, Paper, Papyrus, Plaster, Stone, Textile and Wood. This served as a first classification, but it has proved to be insufficient for a more detailed description of an object materials. Although the EUreka3D Data Hub contains an advanced XML editor, where any material can be manually added, it was considered a useful addition to include a more detailed predefined list of materials.

As is often the case with this sort of task, the definition of the vocabulary terms and their relations has led to frequent and long discussions within the consortium, including domain experts, who eventually agreed to a refined list. This list is not closed and will grow with time, according to the experience of users and the type of content that is uploaded in the platform, which is always monitored by the project.

Note that the objective of this list is **NOT** to create an accurate taxonomy and does not try to replicate the real world as an ontology would do it. Therefore, some material categories are classified or expressed in a different way as a material engineer would do in a strict and precise manner. The objective of this list is just to **assist** Content Providers and support the input of metadata. Advanced users can use Getty URIs directly, without the need for this list.

The new list uses a two level hierarchy, which can be found in Annex A. The project worked on something simplified that covers the majority of the end user needs. It is possible that a list with more levels may be considered in the future, but the detriment of the User Experience would need to be taken into account, as more levels may drastically complicate the input of information, which is the opposite of the objective of this predefined list. Such a change will require more detailed study, not only for the scientific part but especially with regard to how the information is presented to the user in the interface.

A screenshot of the new two-level material list, as presented in the graphical user interface of DataHub, can be found in Figure 3.3.

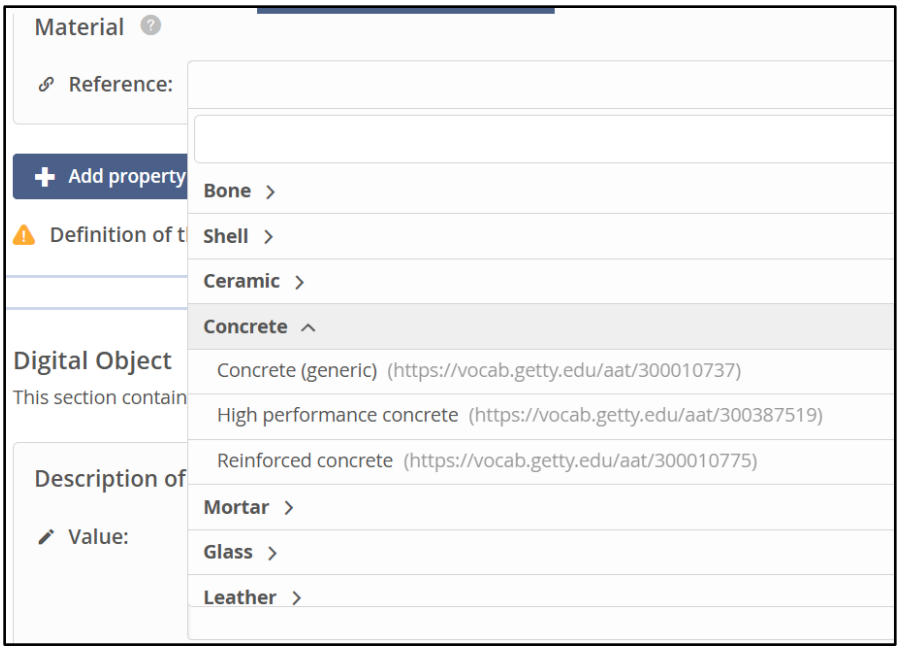

Fig. 3.3: EUreka3D Data Hub form with the new material taxonomy

3.3 Support for new EDM extension for 3D

During the time of the project, the Europeana Data Model (EDM) has been changed to cover the need of 3D digital heritage objects. This extension changes substantially some of the metadata attributes and relations that existed up to now. To accommodate for these changes, different activities have been done by the project, including:

- Participation in discussions with Europeana about the new extension, such as the meetings of the Europeana 3D Working Group.

- Modification of some validations and restrictions in DataHub, to enable the use of new EDM elements that were not allowed before. This allows Content Providers to make the necessary changes in the XML data sent to Europeana via OAI-PMH, adapted to the new EDM extension.
- Creation of a document to support the changes required in the XML for the new EDM. This can be applied by using the advanced metadata XML editor of DataHub. For the time being, the modifications need to be applied manually, and verified with the Europeana Data Ingestion service team. For the models aggregated in April 2026, accredited aggregators Photoconsortium provided the changes in the metadata, following the guidance of the aforementioned document, which can be found in Annex B. Future work will consider the automation of the process and re-apply the automatic validation of datasets.

More details about the EDM extensions and the impact this change had on the project's tasks are described in D2.8 "Publication of content in Europeana" and D3.8 "Paradata Guidelines and Sustainability", both delivered in April 2026.

3.4 3D Model catalogue

As the project serves more and more Cultural Heritage Institutions, it becomes more important to understand what digital heritage content is hosted in EUreka3D Data Hub. One way to do this is through Europeana, which serves as the primary user interface for the EUreka3D Data Hub.

However, the EUreka3D Data Hub has been designed in such a way that its use is not limited to Europeana; it can also be used by any external system wishing to consult and access the cultural heritage resources offered by the EUreka3D ecosystem and its community.

To test some of these capabilities, a Catalogue of public 3D objects has been created (see Figure 3.4). Its operation is similar to Europeana: it collects public metadata and presents a list of heritage content to the end user. At present, this catalogue is just a pilot application serving as a proof of concept, but it highlights the usefulness of this type of application and lays the groundwork for the implementation of a more complex solution.

The current pilot can be accessed at:

https://eureka3d.vm.fedcloud.eu/catalogue

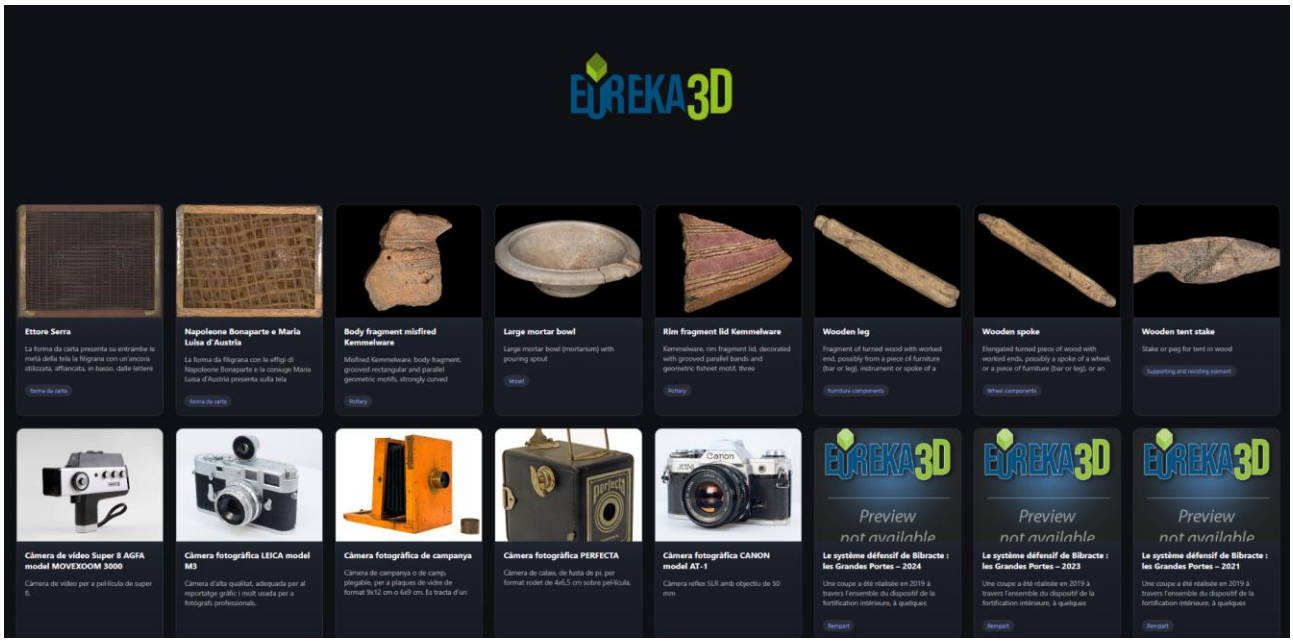

Figure 3.4: Screenshot of the catalogue

4. CONCLUSIONS

This deliverable provides information about the final version of the infrastructure and how it is used by the XR tools. It is a means of verification for MS10 “Cloud infrastructure final release”.

The Prototype itself is illustrated in a showcase video, accessible at:

https://youtu.be/QEMqC-fSqHc (April 2026)

This document offered context on the environment used in the project, including technologies such as Kubernetes, Rancher, containers, and version control systems. Instead of merely outlining the initial hardware specifications, the document has presented a comprehensive overview of the infrastructure by structuring it around four key pillars: the authentication and authorisation, the compute power, the publication of software artefacts, and their subsequent deployment.

The final infrastructure is key to achieve the project’s objectives and provides an operational basis for consistency of experience across the EUreka3D-XR tools, supporting reproducible deployment, consistent access experience, and interoperability with Europeana. As it is a dynamic set of components, it can adapt to future requirements of the existing tools and accommodate new applications that may become part of the EUreka3D Data Hub ecosystem.

ANNEX A. NEW MATERIAL TAXONOMY

Category	Name	Reference
Bone		
	Bone (generic)	http://vocab.getty.edu/aat/300011798
	Antler	http://vocab.getty.edu/aat/300011796
	Horn	http://vocab.getty.edu/aat/300011826
	Ivory	http://vocab.getty.edu/aat/300011857
	Tortoise shell	http://vocab.getty.edu/aat/300011837
Shell		
	Shell (generic)	http://vocab.getty.edu/aat/300011829
	Coral (material)	http://vocab.getty.edu/aat/300011800
	Mother of pearl	http://vocab.getty.edu/aat/300011835
	Pearl (animal material)	http://vocab.getty.edu/aat/300011827
Ceramic		
	Ceramic (generic)	http://vocab.getty.edu/aat/300235507
	Adobe (bricks material)	http://vocab.getty.edu/aat/300081138
	Biscuit	http://vocab.getty.edu/aat/300242297
	Clay	http://vocab.getty.edu/aat/300010439
	Earthenware	http://vocab.getty.edu/aat/300140803
	Kaolin	http://vocab.getty.edu/aat/300010445
	Porcelain	http://vocab.getty.edu/aat/300010662
	Stoneware (pottery)	http://vocab.getty.edu/aat/300010672
	Terracotta	http://vocab.getty.edu/aat/300010669
Concrete		
	Concrete (generic)	http://vocab.getty.edu/aat/300010737
	High performance concrete	http://vocab.getty.edu/aat/300387519

	Reinforced concrete	http://vocab.getty.edu/aat/300010775
Mortar		
	Mortar (generic)	http://vocab.getty.edu/aat/300014741
Glass		
	Glass (generic)	http://vocab.getty.edu/aat/300010797
	Baked enamel	http://vocab.getty.edu/aat/300183632
	Blown glass	http://vocab.getty.edu/aat/300010832
	Borosilicate glass	http://vocab.getty.edu/aat/300010800
	Crystal (lead glass)	http://vocab.getty.edu/aat/300010814
	Drawn glass	http://vocab.getty.edu/aat/300010844
	Mold-blown glass	http://vocab.getty.edu/aat/300233433
	Optical glass	http://vocab.getty.edu/aat/300010877
	Paste (glass)	http://vocab.getty.edu/aat/300010803
	Pressed glass	http://vocab.getty.edu/aat/300210941
Leather		
	Leather (generic)	http://vocab.getty.edu/aat/300011845
Metal		
	Metal (generic)	http://vocab.getty.edu/aat/300010900
	Alloy	http://vocab.getty.edu/aat/300010902
	Aluminum	http://vocab.getty.edu/aat/300011015
	Aluminum alloy	http://vocab.getty.edu/aat/300010936
	Brass	http://vocab.getty.edu/aat/300010946
	Bronze	http://vocab.getty.edu/aat/300010957
	Cast iron	http://vocab.getty.edu/aat/300011004
	Copper	http://vocab.getty.edu/aat/300010942
	Gold	http://vocab.getty.edu/aat/300011021

	Iron	http://vocab.getty.edu/aat/300011002
	Lead	http://vocab.getty.edu/aat/300011022
	Mercury	http://vocab.getty.edu/aat/300011026
	Nickel	http://vocab.getty.edu/aat/300011028
	Orichalcum	http://vocab.getty.edu/aat/300195994
	Silver	http://vocab.getty.edu/aat/300011029
	Steel	http://vocab.getty.edu/aat/300133751
	Tin	http://vocab.getty.edu/aat/300133748
	Titanium	http://vocab.getty.edu/aat/300011033
	Uranium	http://vocab.getty.edu/aat/300011035
	Zinc	http://vocab.getty.edu/aat/300011037
Paper		
	Paper (generic)	http://vocab.getty.edu/aat/300014109
	Albumen paper	http://vocab.getty.edu/aat/300411855
	Carbon paper	http://vocab.getty.edu/aat/300014156
	Cardboard	http://vocab.getty.edu/aat/300014224
	Coated paper	http://vocab.getty.edu/aat/300312356
	Drawing paper	http://vocab.getty.edu/aat/300014157
	Photographic paper	http://vocab.getty.edu/aat/300014190
	Printing paper	http://vocab.getty.edu/aat/300014172
	Rag paper	http://vocab.getty.edu/aat/300014130
	Tissue paper	http://vocab.getty.edu/aat/300014145
	Tracing paper	http://vocab.getty.edu/aat/300014161
Papyrus		
	Papyrus (generic)	http://vocab.getty.edu/aat/300014127
Plaster		

	Plaster (generic)	http://vocab.getty.edu/aat/300014922
Stone		
	Stone (generic)	http://vocab.getty.edu/aat/300011692
	Agate (chalcedony)	http://vocab.getty.edu/aat/300011135
	Alabaster (mineral)	http://vocab.getty.edu/aat/300011101
	Amethyst (mineral)	http://vocab.getty.edu/aat/300011133
	Aquamarine (mineral)	http://vocab.getty.edu/aat/300011073
	Aventurine (quartz)	http://vocab.getty.edu/aat/300011154
	Basalt (basic igneous rock)	http://vocab.getty.edu/aat/300011222
	Carnelian	http://vocab.getty.edu/aat/300133223
	Chalk	http://vocab.getty.edu/aat/300011727
	Citrine	http://vocab.getty.edu/aat/300209734
	Diamond	http://vocab.getty.edu/aat/300011084
	Emerald (mineral)	http://vocab.getty.edu/aat/300011074
	Flint (rock)	http://vocab.getty.edu/aat/300011143
	Garnet (mineral)	http://vocab.getty.edu/aat/300011097
	Gemstone (generic)	http://vocab.getty.edu/aat/300201964
	Granite (rock)	http://vocab.getty.edu/aat/300011183
	Gypsum	http://vocab.getty.edu/aat/300011099
	Hematite (mineral)	http://vocab.getty.edu/aat/300011105
	Jadeite	http://vocab.getty.edu/aat/300011121
	Jasper	http://vocab.getty.edu/aat/300011151
	Lapis lazuli (rock)	http://vocab.getty.edu/aat/300011122
	Limestone	http://vocab.getty.edu/aat/300011286
	Malachite (mineral)	http://vocab.getty.edu/aat/300011123

	Marble (rock)	http://vocab.getty.edu/aat/300011443
	Obsidian	http://vocab.getty.edu/aat/300011254
	Onyx (mineral)	http://vocab.getty.edu/aat/300011136
	Quartz (mineral)	http://vocab.getty.edu/aat/300011132
	Ruby (mineral)	http://vocab.getty.edu/aat/300011082
	Sandstone	http://vocab.getty.edu/aat/300011376
	Sapphire (mineral)	http://vocab.getty.edu/aat/300011083
	Schist	http://vocab.getty.edu/aat/300011626
	Soapstone (metamorphic rock)	http://vocab.getty.edu/aat/300011665
	Topaz (mineral)	http://vocab.getty.edu/aat/300011162
	Turquoise (mineral)	http://vocab.getty.edu/aat/300011164
Textile		
	Textile (generic)	http://vocab.getty.edu/aat/300231565
	Acrylic (fiber)	http://vocab.getty.edu/aat/300386559
	Cotton (textile)	http://vocab.getty.edu/aat/300014067
	Kevlar (tm)	http://vocab.getty.edu/aat/300014467
	Linens (textile works)	http://vocab.getty.edu/aat/300257519
	Nylon	http://vocab.getty.edu/aat/300014462
	Polyester (fiber)	http://vocab.getty.edu/aat/300379829
	Silk (textile)	http://vocab.getty.edu/aat/300243428
	Wool (textile)	http://vocab.getty.edu/aat/300243430
Wood		
	Wood (generic)	http://vocab.getty.edu/aat/300011914
	Ash	http://vocab.getty.edu/aat/300164025
	Beech	http://vocab.getty.edu/aat/300011948

	Boxwood	http://vocab.getty.edu/aat/300012002
	Chestnut	http://vocab.getty.edu/aat/300012039
	Ebony	http://vocab.getty.edu/aat/300012055
	Elm	http://vocab.getty.edu/aat/300012070
	Eucalyptus	http://vocab.getty.edu/aat/300012093
	Fir	http://vocab.getty.edu/aat/300012558
	Mahogany	http://vocab.getty.edu/aat/300012221
	Maple	http://vocab.getty.edu/aat/300012236
	Oak	http://vocab.getty.edu/aat/300012264
	Pine	http://vocab.getty.edu/aat/300012620
	Plywood	http://vocab.getty.edu/aat/300012849
	Poplar	http://vocab.getty.edu/aat/300012363
	Rosewood	http://vocab.getty.edu/aat/300012424
	Teak	http://vocab.getty.edu/aat/300012453
	Walnut	http://vocab.getty.edu/aat/300012476
Bamboo		
	Bamboo (generic)	http://vocab.getty.edu/aat/300011873
Charcoal		
	Charcoal (generic)	http://vocab.getty.edu/aat/300012862
	Wood charcoal	http://vocab.getty.edu/aat/300012864
Polymer		
	Polymer (generic)	http://vocab.getty.edu/aat/300218300
	Amber (fossil resin)	http://vocab.getty.edu/aat/300012934
	Bakelite (tm)	http://vocab.getty.edu/aat/300014544
	Bioplastics	http://vocab.getty.edu/aat/300393229
	Celluloid (cellulosic)	http://vocab.getty.edu/aat/300014447

	Geopolymers	http://vocab.getty.edu/aat/300390596
	Plastic	http://vocab.getty.edu/aat/300014570
	Polylactic acid	http://vocab.getty.edu/aat/300389999
	Rubber	http://vocab.getty.edu/aat/300012941
	Synthetic resin	http://vocab.getty.edu/aat/300378967
Paint/Pigment		
	Paint/Colour (generic)	http://vocab.getty.edu/aat/300015029
	Animal pigment (generic)	http://vocab.getty.edu/aat/300013122
	Azurite (pigment)	http://vocab.getty.edu/aat/300013184
	Chinese purple	http://vocab.getty.edu/aat/300380026
	Cinnabar (pigment)	http://vocab.getty.edu/aat/300400883
	Cobalt blue (pigment)	http://vocab.getty.edu/aat/300013266
	Cochineal (colorant)	http://vocab.getty.edu/aat/300013597
	Earth color (pigment)	http://vocab.getty.edu/aat/300311362
	Egyptian blue	http://vocab.getty.edu/aat/300013280
	Green earth (pigment)	http://vocab.getty.edu/aat/300013423
	Indigo	http://vocab.getty.edu/aat/300013055
	Kermes (colorant)	http://vocab.getty.edu/aat/300013085
	Lead white	http://vocab.getty.edu/aat/300013754
	Lead-tin yellow (lead compound)	http://vocab.getty.edu/aat/300311443
	Madder (colorant)	http://vocab.getty.edu/aat/300013062
	Malachite (pigment)	http://vocab.getty.edu/aat/300013438
	Manganese oxide	http://vocab.getty.edu/aat/300238624
	Maya blue (pigment)	http://vocab.getty.edu/aat/300013198
	Mineral pigment (generic)	http://vocab.getty.edu/aat/300375550

	Natural inorganic pigment (generic)	http://vocab.getty.edu/aat/300013115
	Natural organic pigment (generic)	http://vocab.getty.edu/aat/300013121
	Ocher (pigment)	http://vocab.getty.edu/aat/300152219
	Orpiment (pigment)	http://vocab.getty.edu/aat/300013834
	Plant pigment (generic)	http://vocab.getty.edu/aat/300013123
	Prussian blue (pigment)	http://vocab.getty.edu/aat/300013315
	Red lead (pigment)	http://vocab.getty.edu/aat/300013647
	Red ocher (pigment)	http://vocab.getty.edu/aat/300013554
	Saffron	http://vocab.getty.edu/aat/300013073
	Sepia (ink)	http://vocab.getty.edu/aat/300015025
	Sienna (pigment)	http://vocab.getty.edu/aat/300013390
	Smalt (pigment)	http://vocab.getty.edu/aat/300013293
	Synthetic inorganic pigment (generic)	http://vocab.getty.edu/aat/300013113
	Synthetic organic pigment (generic)	http://vocab.getty.edu/aat/300013129
	Tyrian purple (colorant)	http://vocab.getty.edu/aat/300013087
	Ultramarine blue (pigment)	http://vocab.getty.edu/aat/300013200
	Umber (pigment)	http://vocab.getty.edu/aat/300013402
	Vermilion (pigment)	http://vocab.getty.edu/aat/300013568
	Weld (dye)	http://vocab.getty.edu/aat/300013077
	Woad (colorant)	http://vocab.getty.edu/aat/300013080
	Yellow ocher (pigment)	http://vocab.getty.edu/aat/300013967

ANNEX B. HELP PROCEDURE FOR NEW EDM STRUCTURE

New EDM extension

Manual changes

Ignacio Lamata Martinez

2026

TLP: GREEN Limited disclosure

Legend

Old EDM, no need to be changed

New data that has to be added as it is written (never changes)

New data that has to be added but varies from object to object

Optional data to be added as it is written (never changes)

Optional data that varies from object to object

Data that must be removed

Headers

```
<?xml version="1.0" encoding="utf-8"?>
<rdf:RDF
   xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
   xmlns:dc="http://purl.org/dc/elements/1.1/"
   xmlns:dcterms="http://purl.org/dc/terms/"
   xmlns:edm="http://www.europeana.eu/schemas/edm/"
   xmlns:ore="http://www.openarchives.org/ore/terms/"
   xmlns:svcs="http://rdfs.org/sioc/services#"
   xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#"
   xmlns:schema="https://schema.org/"
>
```

edm:ProvidedCHO

```
<edm:ProvidedCHO rdf:about="http://hdl.handle.net/21.15123/qeoqUbO00">
   …
   <edm:pid>hdl:21.15123/qeoqUbO00</edm:pid>
</edm:ProvidedCHO>
```

Service

....
</edm:ProvidedCHO>

```
<svcs:Service rdf:about="https://eureka3d.vm.fedcloud.eu/oembed">
        <dcterms:conformsTo rdf:resource="https://oembed.com/"/>
        <rdfs:label xml:lang="en">EUreka3D Viewer</rdfs:label>
</svcs:Service>
```

oEmbed

....
</svcs:Service>

<edm:WebResource
rdf:about="https://eureka3d.vm.fedcloud.eu/oembed?url=https%3A%2F%2Feureka3d.vm.fedcloud.eu%2F3d%2F00000000007EF26173686172654775696423343132653535666332323638653938383535373565323932333839616339613963683836393823366566363735636632313434366132636665623565386634613939323333316563686566326523333437653830666465333963653062356133383634666135313037366434383336863653836">
<svcs:has_service rdf:resource="https://eureka3d.vm.fedcloud.eu/oembed"/>
<dcterms:isFormatOf
rdf:resource="https://datahub.egi.eu/api/v3/onezone/shares/data/00000000007E54DA736861726547756964233766376566653434303161633263643762663934366334306464643035353736363832363230233665663637356366323134343661326366656235653866346139393233333165636866566326523338313631333/content"/
>
</edm:WebResource>

If a 3D model exists for download, use the download URL here

Previous Web Resource

```
<edm:WebResource
rdf:about="https://datahub.egi.eu/api/v3/onezone/shares/data/00000000007EA98773686172654775696423343132653535666332323638653938383535373565323932333839616396139636838363938233665663637356366323134343661326366656235653866346139393233333165636865663265236231323831363765663165663462623365333365373937383435316530303062636837326562/content">
    …
        <dc:type xml:lang="en">3D NURBS Model, Photogrammetric point cloud and TLS point cloud</dc:type>
        <dcterms:extent>11.9 MB</dcterms:extent>
        <dc:type rdf:resource="http://data.europeana.eu/vocabulary/modelType/3DMesh"/>
        <edm:type>3D</edm:type>
        <edm:intendedUsage rdf:resource="http://data.europeana.eu/vocabulary/usageArea/Curation"/>
        <edm:polygonCount>148183</edm:polygonCount>
        <edm:vertexCount>74146</edm:vertexCount>
        <schema:digitalSourceType
rdf:resource="https://cv.iptc.org/newscodes/digitalsourcetype/digitalCapture"/>
        <edm:rights rdf:resource="http://creativecommons.org/licenses/by/4.0/"/>
        <dc:rights>Museo del Prado</dc:rights>
</edm:WebResource>
```

Note that we already use “dcterms:isFormatOf” for RAW data. To be asked to Lianne if this should be removed

Paradata

If paradata exists, use the download URL in the item.
NOTE: Every file must have one of these XML elements, a single element *cannot be used* to point to a directory full of files - i.e. if there are four paradata PDFs, then four individual XML elements must be created

```
<edm:WebResource
rdf:about="https://datahub.egi.eu/api/v3/onezone/shares/data/00…1234/content">
   <dcterms:conformsTo>application/pdf</dcterms:conformsTo>
</edm:WebResource>
```

Note that we already use “dcterms:isReferencedBy” for paradata. This can probably be removed

Aggregation

```
<ore:Aggregation rdf:about="http://hdl.handle.net/21.15123/qeoqUbO00_AGG">
    <edm:aggregatedCHO rdf:resource="http://hdl.handle.net/21.15123/qeoqUbO00"/>
    <edm:isShownBy
rdf:resource="https://eureka3d.vm.fedcloud.eu/oembed?url=https%3A%2F%2Feureka3d.vm.fedcloud.eu%2F3d%2F00000000007EF261736861726547756964233431326535356663232363865393838353537356532393233383961633961396368383639382336656636373563663231343436613263663656235653866346139393233333165636865663265233334376538306664653339636530623561333836346661353130373664343833636863653836"/>
    ...
</ore:Aggregation>
```

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ANNEX C. CONTENT PROVIDER HANDBOOK

Co-funded by
the European Union

Content Provider Handbook

v1.4

Dissemination level: Public

Authors:
Ignacio Lamata Martinez (EGI Foundation)
Łukasz Opioła, Katarzyna Such (Cyfronet)

HISTORY OF CHANGES			
Version	Date	Author	Comments
0.1	20/03/2024	Ignacio Lamata Martinez	First draft
1.0	18/07/2024	Łukasz Opioła, Katarzyna Such, Ignacio Lamata Martinez	Version ready for distribution
1.1	10/09/2024	Ignacio Lamata Martinez, Łukasz Opioła	Some changes in Section 3.6. Added VIGIE Study references and short description of directories. Added changes for v21.02.6. Other improvements based on user feedback
1.2	19/10/2024	Ignacio Lamata Martinez	Added comment about materials. Content updated. Cosmetic changes on Notes. Added section to test 3D visualisation before publishing.
1.3	28/10/2024	Ignacio Lamata Martinez, Łukasz Opioła	Added API section (automated upload), Annex A and Annex B.
1.4	20/03/2024	Ignacio Lamata Martinez	Updated to reflect Keycloak migration changes in Section 2

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1. Introduction

This **informal** document explains in a **practical** way the steps required to use EGI DataHub, focusing especially on the upload of 3D models by content providers. This can be considered as a manual for the upload of data that complements the official deliverables of the project.

1.1 Structure of the document

The rest of this document is organised as follows:

- **Section 2** explains how you can prepare your access to the applications available for the EUreka3D community.
- **Section 3** explains how you can upload and publish your 3D models through EUreka3D.
- **Section 4** discusses how to automate the process of uploading and publishing 3D objects, which is useful when hundreds of objects have to be uploaded and is unfeasible to do the work manually.
- Finally, **Section** 5 provides some conclusions.

1.2 Where to find additional information

If you need more context and information about the technologies used in EUreka3D, please refer to the official deliverables of the project, in particular:

- **Deliverable 3.2** "*The EUreka3D AAI architecture*" (October 2024), which describes the infrastructure and technologies implemented to perform the authentication and authorisation of users in EUreka3D.
- **Deliverable 3.3** "*Final report on the EUreka3D services and resource hub*" (October 2024), which describes the configuration of the cloud and data technologies used in the project, giving a deeper understanding of EGI DataHub, the applications and the compute side of the project.

2. Configuring your access

The access to applications and data in EUreka3D must be protected from unauthorised users. In order to implement this security mechanism, EUreka3D data hub and services are supported by **EGI Check-in**[1]. This section will explain to you the actions you need to take to configure your access to EUreka3D, which mainly consist of:

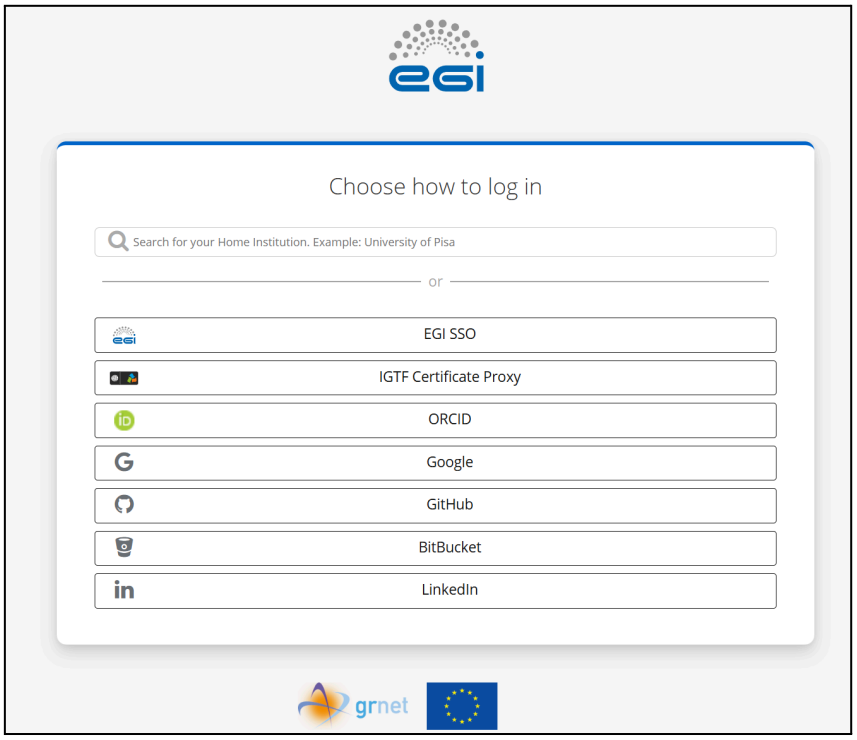
- **Register in Check-in**. You will need to register your account in Check-in. This is discussed in Section 2.1.
- **Join the EUreka3D community**. To obtain the required permissions to access EUreka3D applications and data, you will need to join the EUreka3D community. This is discussed in Section 2.2.

2.1 Registering an account in Check-in

Registering an account is a simple process. Just visit:

https://aai.egi.eu/signup

The process to register your account is as simple as just logging in with your usual account. As can be seen in the image below, Check-in offers multiple options to log in:



[1] https://www.egi.eu/service/check-in/

It is recommended that you use the account of your Home Organisation (your research institute, University, etc) by looking for it in the search box. If your institution is not listed here, you can use one of the social accounts available: Google, LinkedIn, ORCID, GitHub, etc. All of these have a specific button that will redirect you to the corresponding login page. Once you have completed the login process with your preferred account, you will be registered in Check-in.

Additional documentation:

- https://docs.egi.eu/users/aai/check-in/signup/

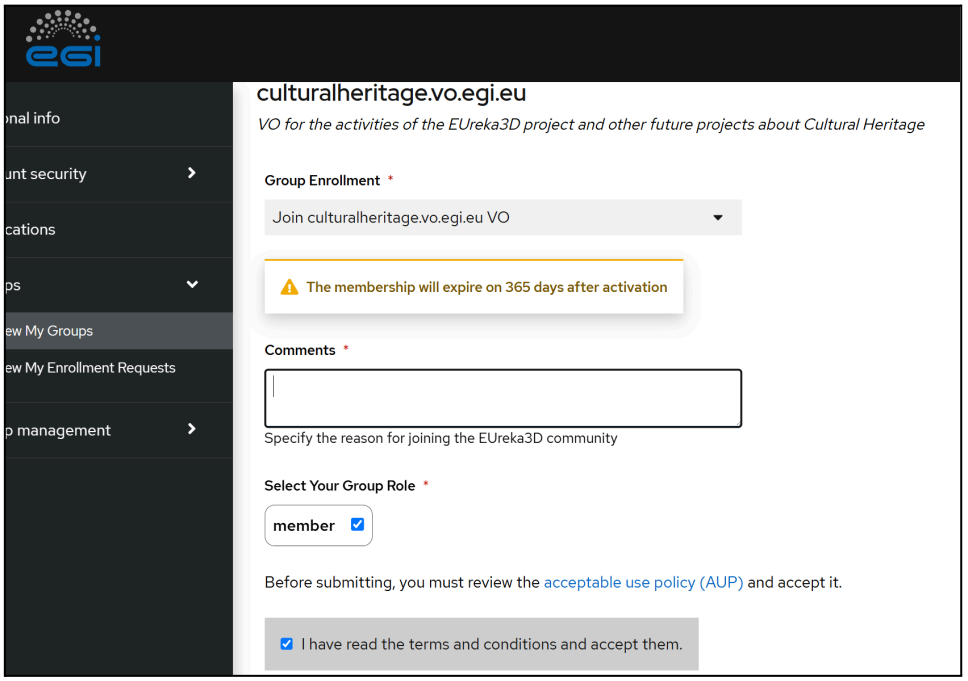
2.2 Joining the EUreka3D community

Once you are registered in Check-in you need to ask to be included in the EUreka3D community. This is done by requesting membership in a *Virtual Organisation* (VO), which is a group of users that belong to a community and have specific permissions assigned to access some resources. The VO of EUreka3D is called: **culturalheritage.vo.egi.eu**.

To ask for membership in the EUreka3D VO you need to visit the following link:

https://go.egi.eu/join_eureka3d

which will present you with the following page:



Note that **you will need to be logged in** in Check-in, otherwise you will be requested to log in first.

In this page you can provide some comments about why you need to request access to EUreka3D. Then, select the Group Role "*member*" and review the Acceptable Use Policy and accept the terms and conditions if this is the case. Click "*Submit*" to finish the request.

Your application will be received by an administrator who will evaluate it and manually accept or reject it. This process should only take a few hours, but please consider that this is a manual process and therefore subject to longer processing times. If you are also publishing in Europeana, some extra configuration is necessary: either create a specific group for your institution in the platform or assign you to an existing group. If the creation is necessary consider that the process to grant you access will take some extra time.

Membership in this VO **must be renewed every year**. This means that every year you will receive a notification email to remind you to renovate your membership. The process is exactly the same as when you join the VO for the first time: visit a link and follow the instructions.

Additional documentation:

- https://docs.egi.eu/users/aai/check-in/joining-virtual-organisation/

3. The data platform — DataHub

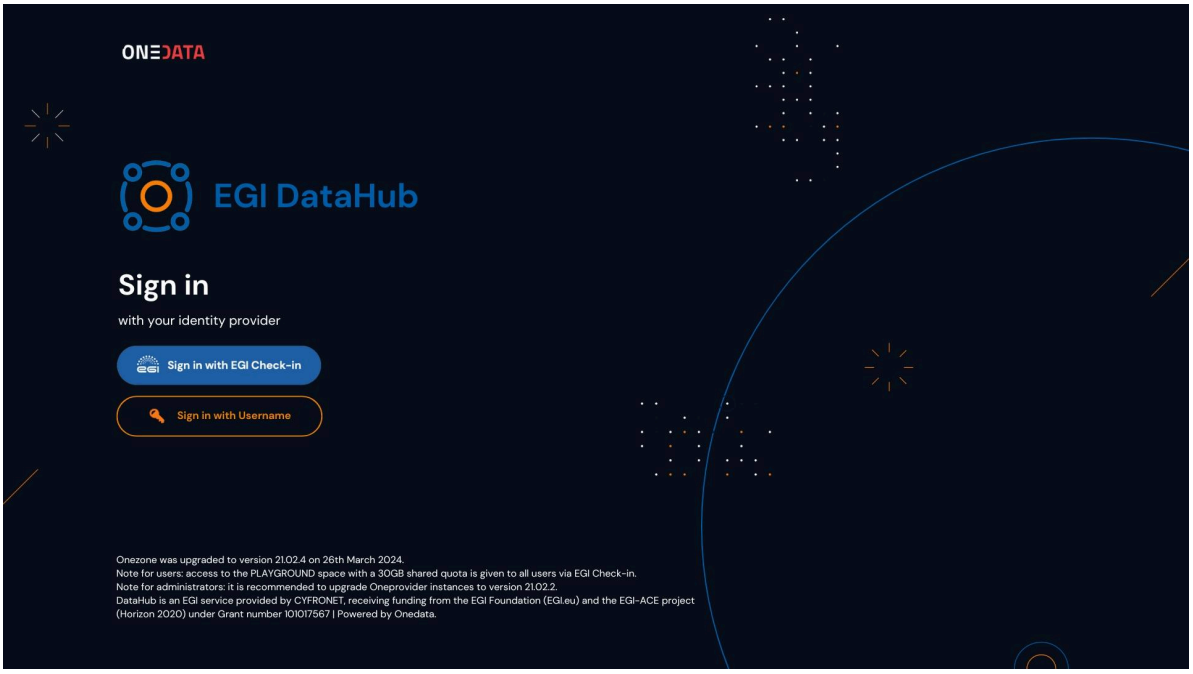
Once you have registered your account in Check-in and become a member of the EUreka3D community you will be able to access the data platform. The data management platform in EUreka3D is implemented with **EGI DataHub**[2].

3.1 Accessing the DataHub

To access the data platform you just need to visit:

https://datahub.egi.eu

which will present the following login screen:



Click on the EGI button (

) to be redirected to Check-in, and proceed with the login process as usual.

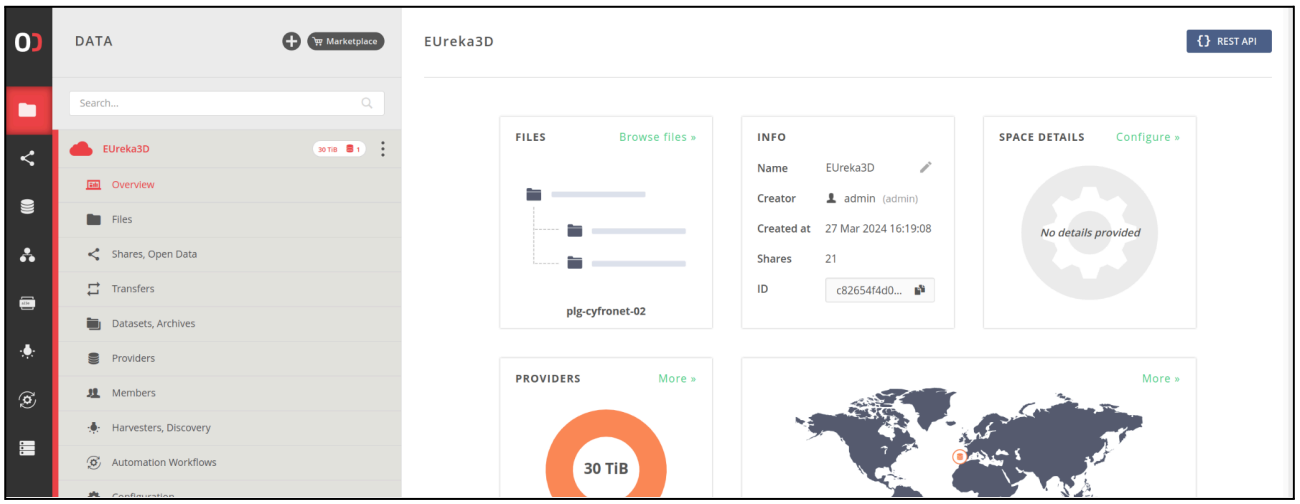
NOTES:

1. The login page will not appear if you are already logged in (then simply go to Section 3.2).
2. If this is the first login via Check-in, you will be asked to accept the terms and conditions and agree to release your basic user information to DataHub. Follow the instructions on the screen.

[2] https://www.egi.eu/service/datahub/

3.2 DataHub overview

After you have logged in, you will be presented with DataHub's home screen, where you can see a data space called "EUreka3D" in the left menu.



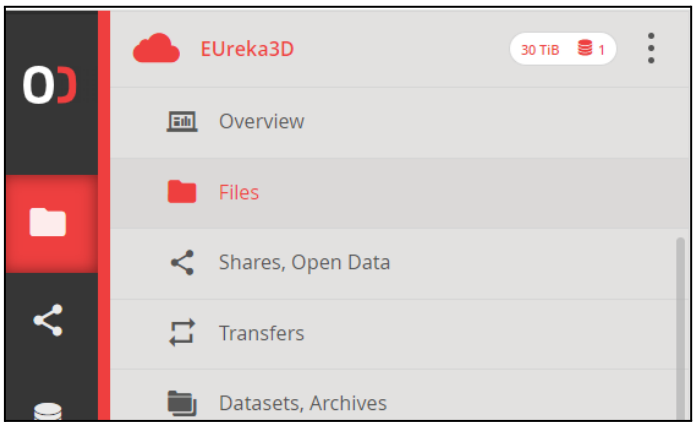
NOTE: If you do not see the EUreka3D data space depicted above, then:

1. Make sure you have completed the process described in Section 2.1.

2. If you had logged in before being accepted to the EUreka3D community, **you will have to log out and log in again**, so that your group memberships can be updated. Use the menu with the user icon in the bottom left corner to log out.

3. It is possible that you have not been accepted in the EUreka3D community or that you have not been assigned permission to access DataHub. If this is the case, contact an EUreka3D administrator via email.

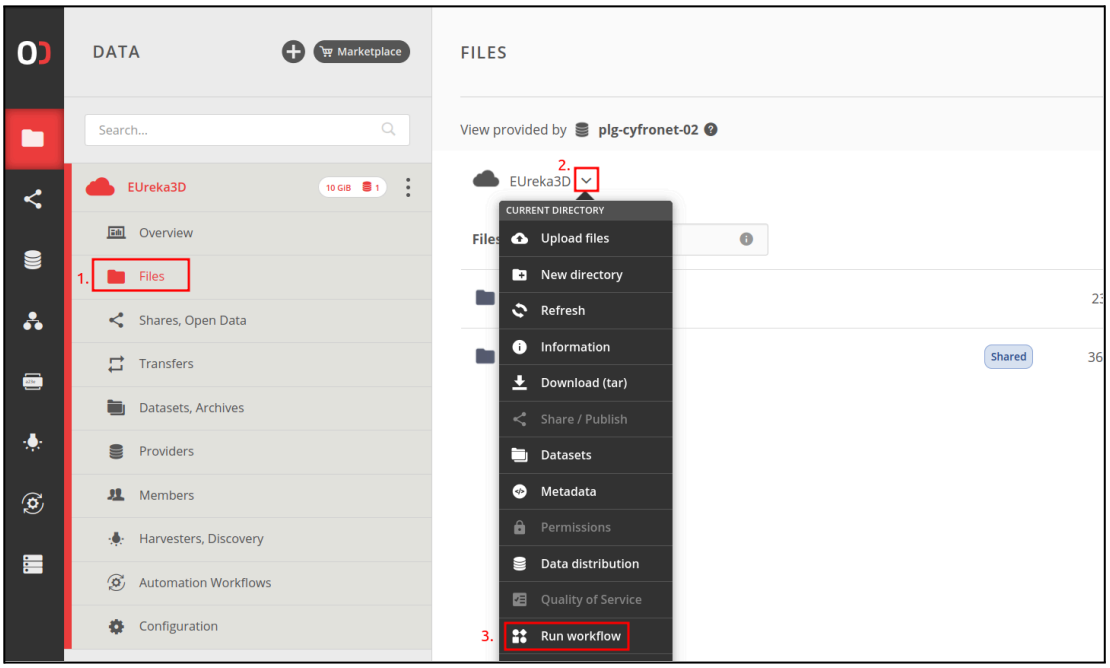
Every project in EUreka3D is organised into a single directory that lies directly in the root of the EUreka3D data space and has a predefined structure. Go to the left menu and click on the **Files** tab to open the file browser:



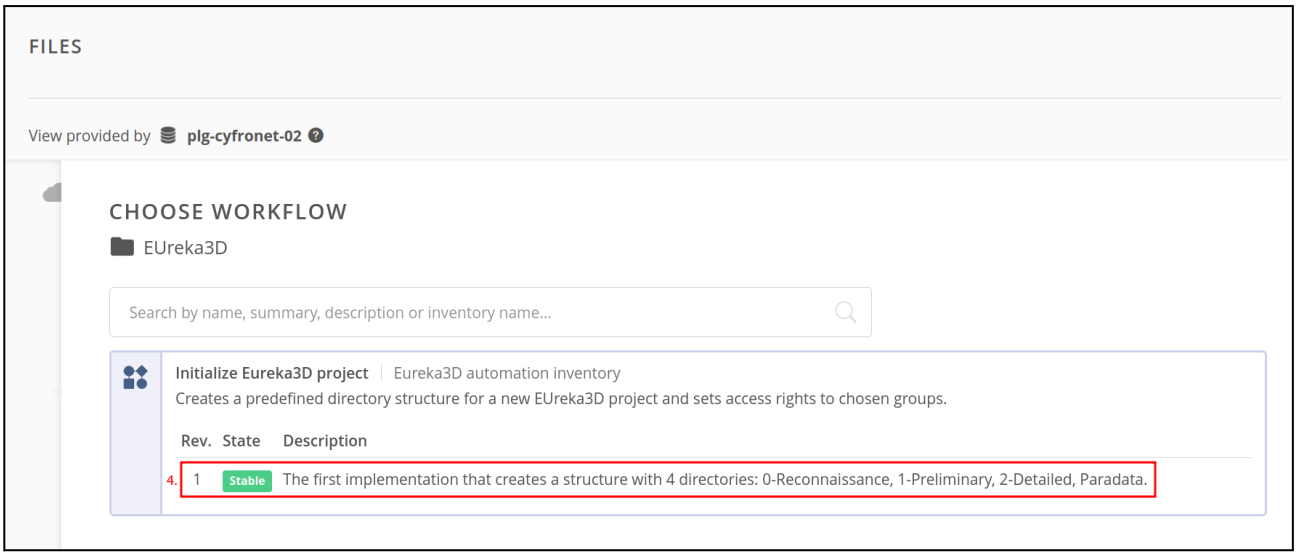
3.3 Creating a new project

To facilitate the creation of a project and its underlying directory structure, an automated procedure called "workflow" must be run. To do so, follow these steps:

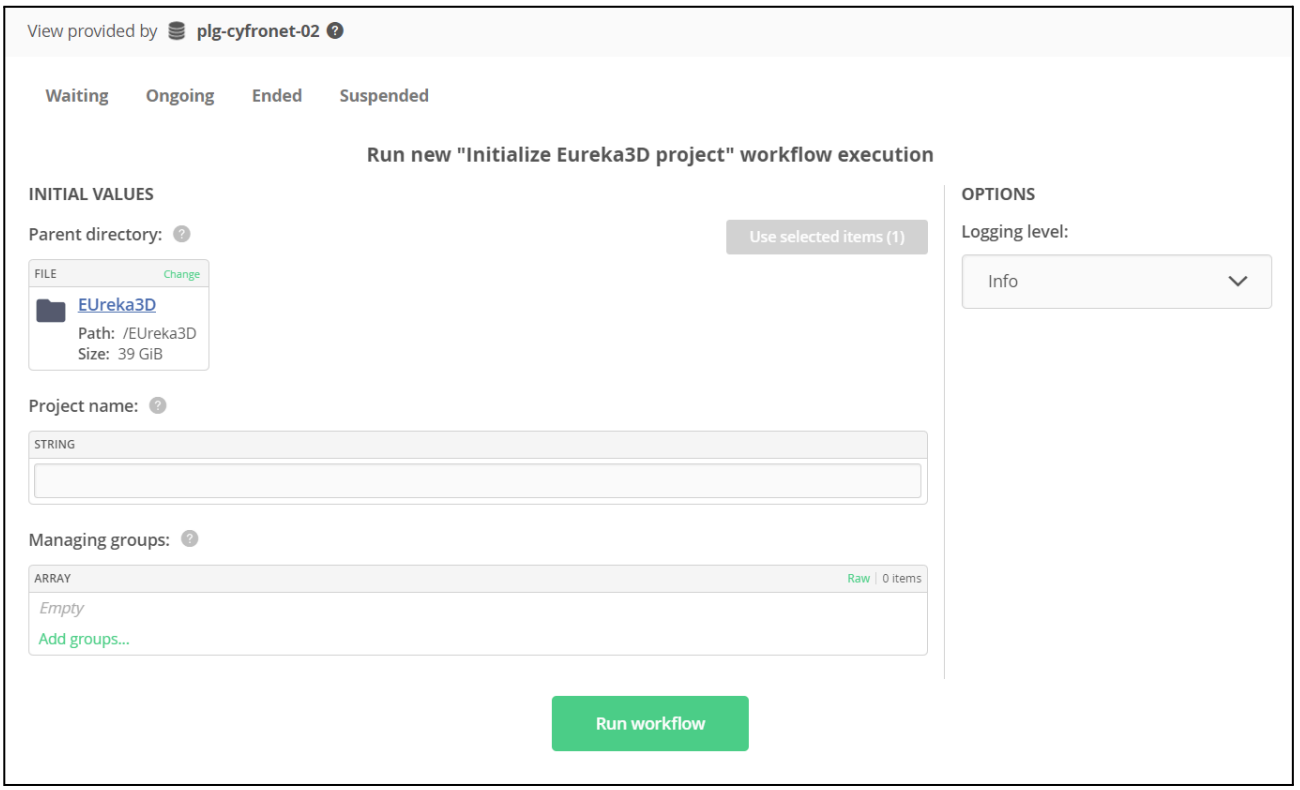
1. Click on the **Files** tab of the left menu, located in the **EUreka3D** space sidebar.
2. Open the **dropdown menu** for the main directory of the EUreka3D space by clicking on the button next to **EUreka3D**, as shown in the figure below.
3. Choose the **Run workflow** action.



4. Locate the "**Initialize EUreka3D project**" workflow and click on the newest stable revision (e.g. Rev. 1), as shown in the figure below:



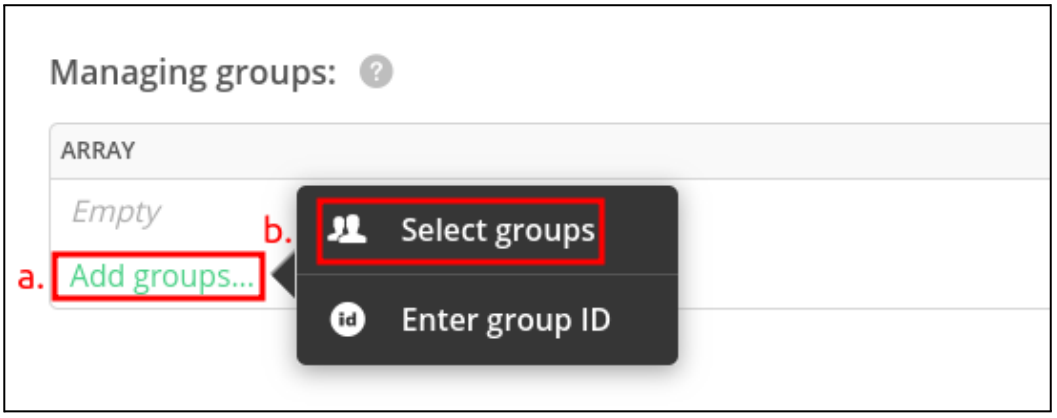
This will open the following screen:



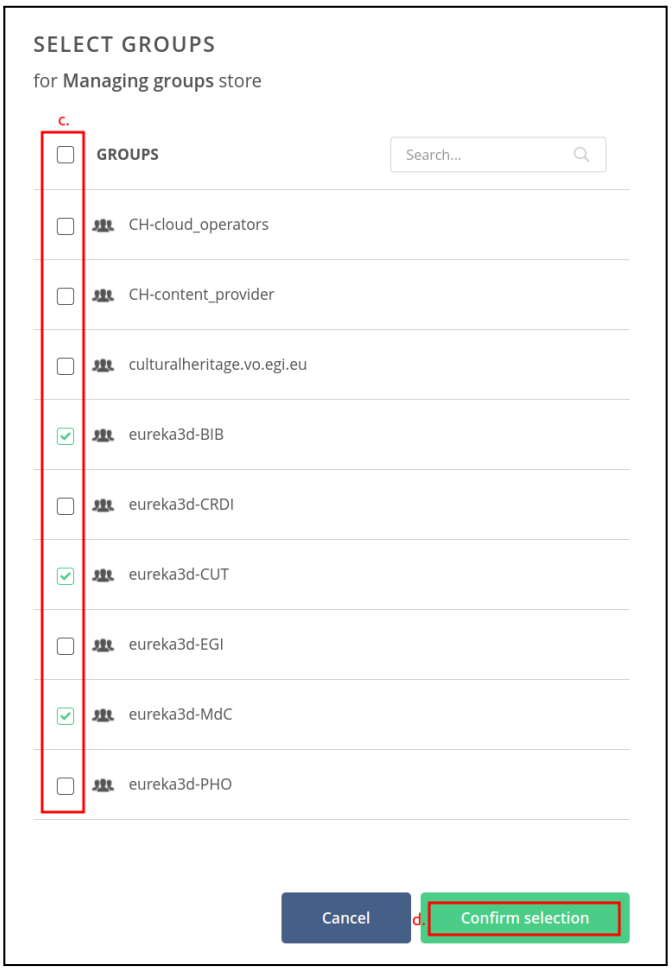
5. Enter the desired **project name**. Avoid using your institution name. Instead, use a meaningful name for the objects that will be stored.

6. The section "**Managing groups**" lets you specify the groups inside EUreka3D that will have access to this project. For example, the "eureka3d-CUT" group represents the members of the Cyprus University of Technology, the "eureka3d-PHO" group represents the members of the Photocosortium, and so on. By default, no ACL will be established and **everyone in the EUreka3D community** will have access to your data so, if this is a problem, it is recommended that you limit the access to your data at this initial stage. Note that you do not need to assign access permissions to other groups at this time - you can also modify these permissions at any time after the project has been created.

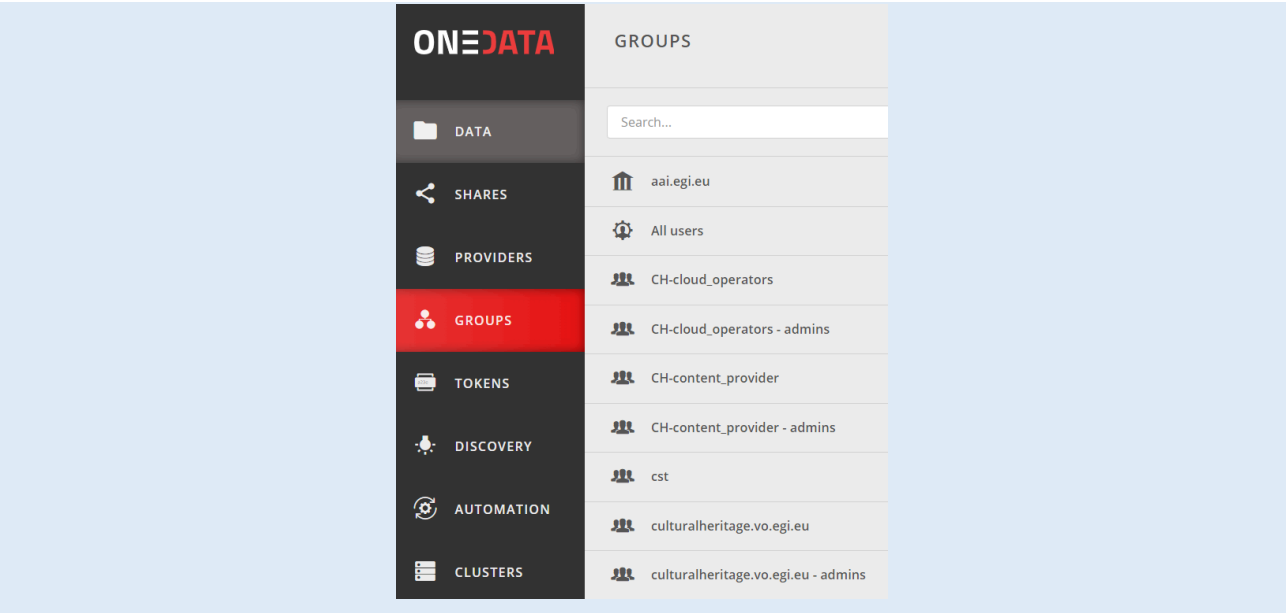
   To specify the managing group(s):



   a. click the **Add groups…** button,
   b. click the **Select groups** action,
   c. select the groups by checking the boxes,
   d. click the **Confirm selection** button.

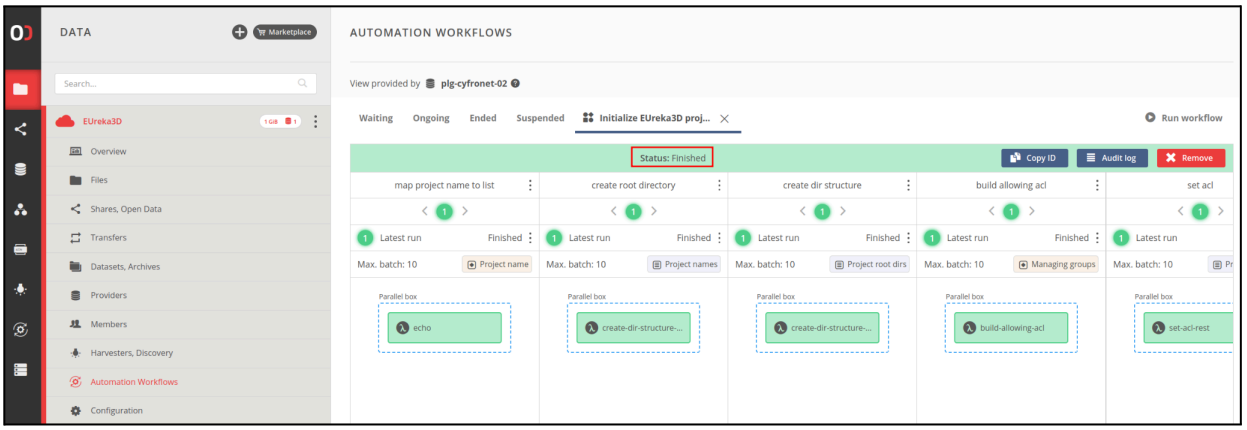


WARNING: If you configure an ACL, make sure you choose at least one group to which you belong or you will not be allowed to access the newly created project. If necessary, consult the **GROUPS** section in the left menu to check to which groups you belong — the list of your groups will be shown in the sidebar:



7. Click the **Run workflow** button.

8. Wait a moment for the workflow to finish.



9. Proceed to the **Files** tab in the **EUreka3D** space sidebar to see that the project directory was successfully created.

The new project will contain an initial structure where your data can be uploaded:

- 0-Reconnaissance
- 1-Preliminary

- 2-Detailed
- Paradata
- Viewer

Directories *0-Reconnaissance*, *1-Preliminary* and *2-Detailed* are intended for data in different quality levels:

- **0-Reconnaissance** is for data produced from a quick and easy digitisation, no complex and no expensive: (a) Very quick 2D/3D digitisation, (b) Not so accurate data set, when objects materials and their condition are not considered much, (c) Not expensive data acquisition and preprocessing of the data sets (when the most primitive equipment has been used), (d) The interest is only in the data formats used for your applications (and not about standards), (e) Data preservation and geometrical accuracy are not interesting.
- **2-Detailed** should contain the highest possible and most accurate digitisation, in order to achieve an outstanding record of data sets in the top possible quality. For example when you have high requirements in place, such as: (a) Enough time, (b) Enough budget, (c) The best infrastructure and professionals in place (for surveying and pre-processing), (d) No IPR issues, (e) You want to acquire all the information and data from the scanned objects (including accurate 2D textures/images, object's temperature and humidity/pixel, and 3D geometry, materials and their conditions, etc.), (f) Data long-term preservation is a must, (g) Data sets in standard formats is a precondition, (h) The availability of the unique results to be in Europeana.
- **1-Preliminary** is the intersection between Levels (0) and (2).

For more information about quality levels, refer to the EC's VIGIE Study[3].

Paradata is a directory intended to store all relevant paradata information (information about the digitisation process).

Viewer is a convenient directory for the storage of the 3D models that will be rendered by a viewer, such as those objects published in Europeana. This directory is intended to contain mainly public data that will be consumed by a 3D viewer.

3.4 Uploading files

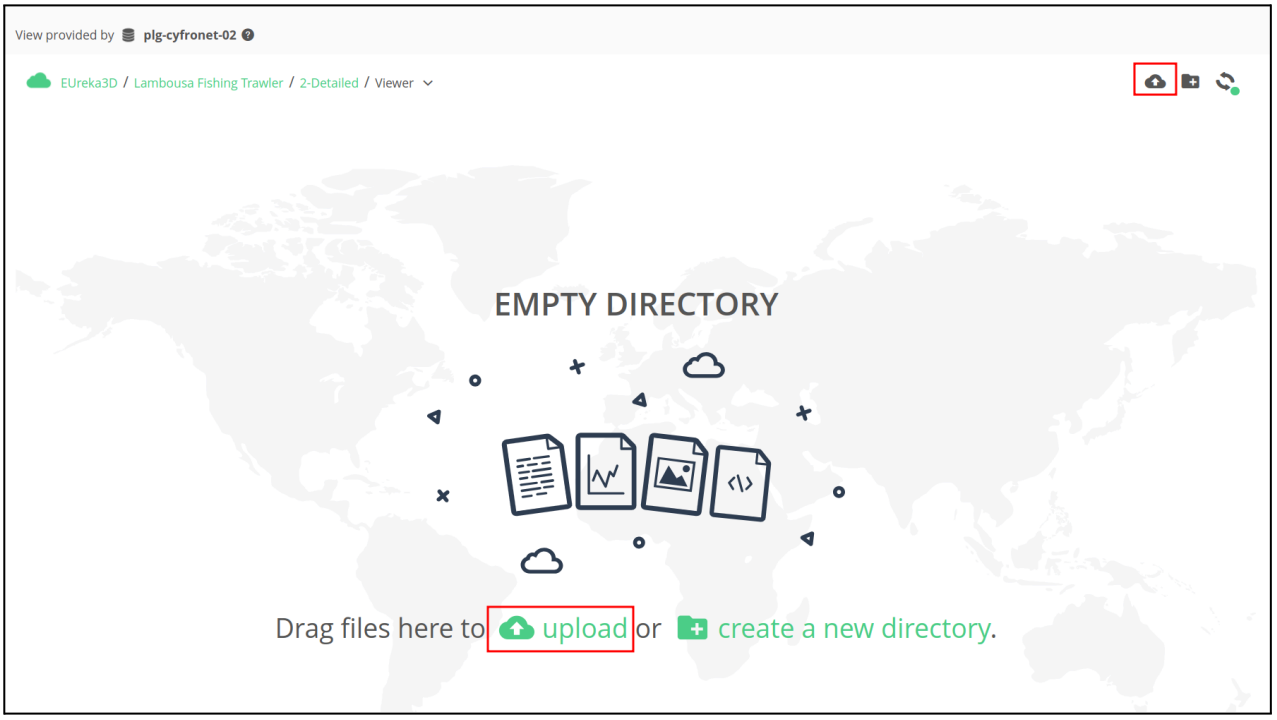
The process of uploading files is very easy, thanks to the user-friendly graphical interface.

To upload files, navigate to the target directory. Use **double-click** to enter a directory or the **breadcrumb navigator**, located on the top, to move back:

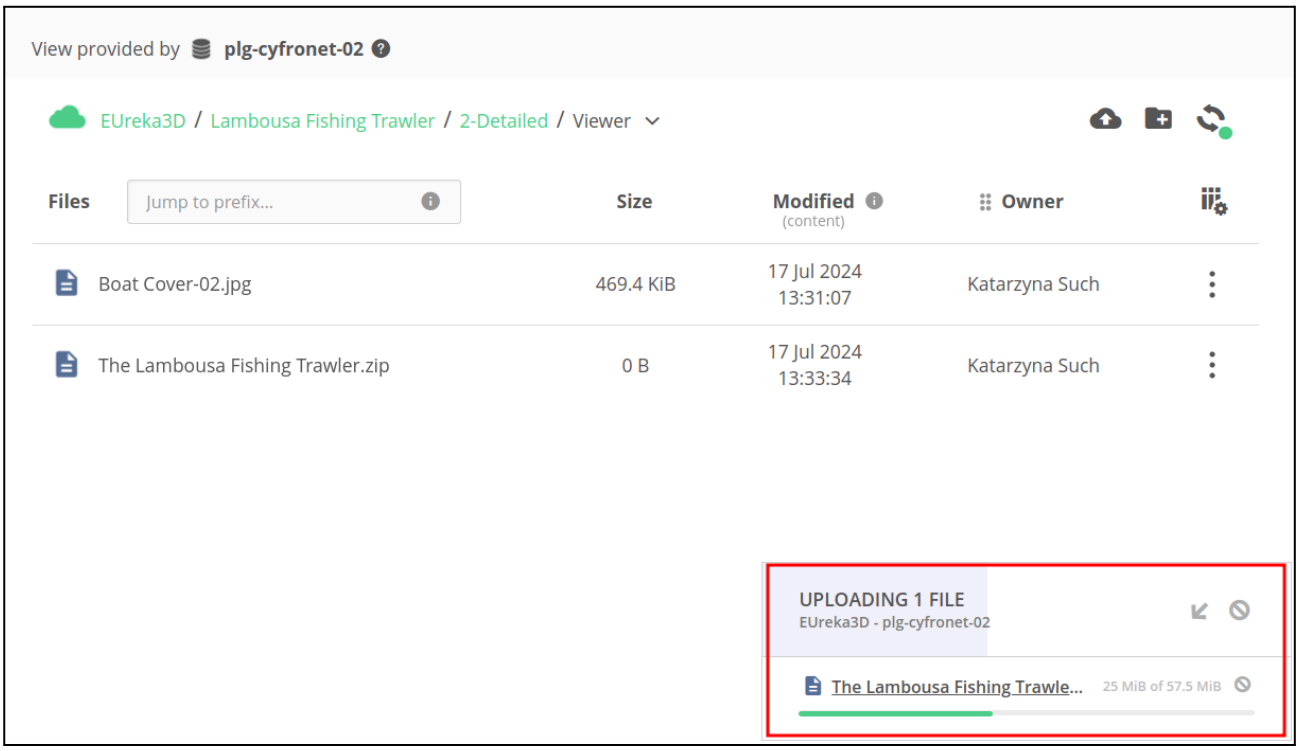
There are two main ways to upload files:

[3] *Study on quality in 3D digitisation of tangible cultural heritage*. Available at https://go.egi.eu/vigie

1. Files can be **dragged and dropped** over the directory and they will be uploaded
2. Alternatively, you can use the **upload action**, either in the centre of the page (if the directory is empty), in the top right corner, or invoking the context menu with a **right-click**.



Finally, choose the desired file from the computer. The upload progress bar is shown in the bottom right corner of the page.



3.5 Uploading 3D models for visualisation

3D models that are intended to be visualised by the EUreka3D viewer must be stored in a compressed ZIP file. You must pack your 3D model files in **a single ZIP file**. If the model has several files, such as an MTL, JPG and OBJ files, the three will be packed in a single ZIP file. If the model has only one file, such as a PLY, only this file should be packed in the ZIP file.

After the model has been packed, you should upload the ZIP file inside the "Viewer" directory.

IMPORTANT: Make sure that the initial view of the 3D model is in **its most natural position**, so the camera does not initially show the model in a strange position. If you are unsure, you can follow the steps of Section 3.7.2 to pre visualise the 3D model.

3.6 Sharing data

Once your data are uploaded, there are three main ways to share your data:

- Share data with other members of **the EUreka3D community**. All members of the community have access to DataHub, and you can grant them permissions to access your directories and data. These permissions are normally assigned to whole groups within the community. For example, the

"eureka3d-CUT" group represents all members of the Cyprus University of Technology. To understand how to share data with other community members, refer to **Section 3.6.1**.

- Share data **publicly**. Data can be shared with any person that is not part of the EUreka3D community. This is a convenient way to provide specific files and even whole directories for users that have noy been allowed to use DataHub. This is explained in **Section 3.6.2**.
- Publish 3D models in **Europeana**. Another way to share data is to use Europeana, the European initiative that aims at facilitating cultural heritage for education, research, creation and recreation. This publishing process is discussed in **Section 3.7**.

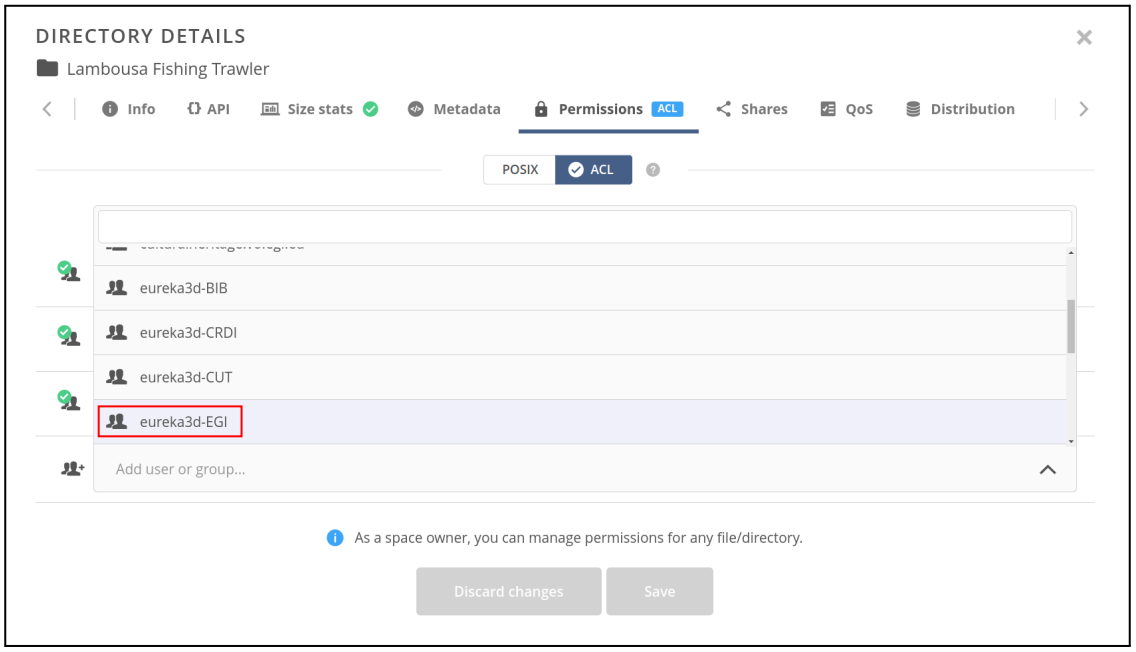
3.6.1 Configuring permissions: Collaboration with other members of EUreka3D

In order to configure the access of other users to your data, Access Control Lists (ACL) are used. These lists specify the permissions that each group of users have over the data (directories and files). Normally, permissions are assigned to preconfigured groups of users, rather than to individual users. If a new group is required, please contact an administrator (a "VO Manager") of the EUreka3D community.

The first configuration of access permissions is done during the creation of a new project, as explained in Section 3.3. The managing groups that are specified during the workflow execution grant rights to view and modify the project directory according to the specified ACL. Users who do not belong to any of the configured groups will not be allowed to view or modify the files inside the project.

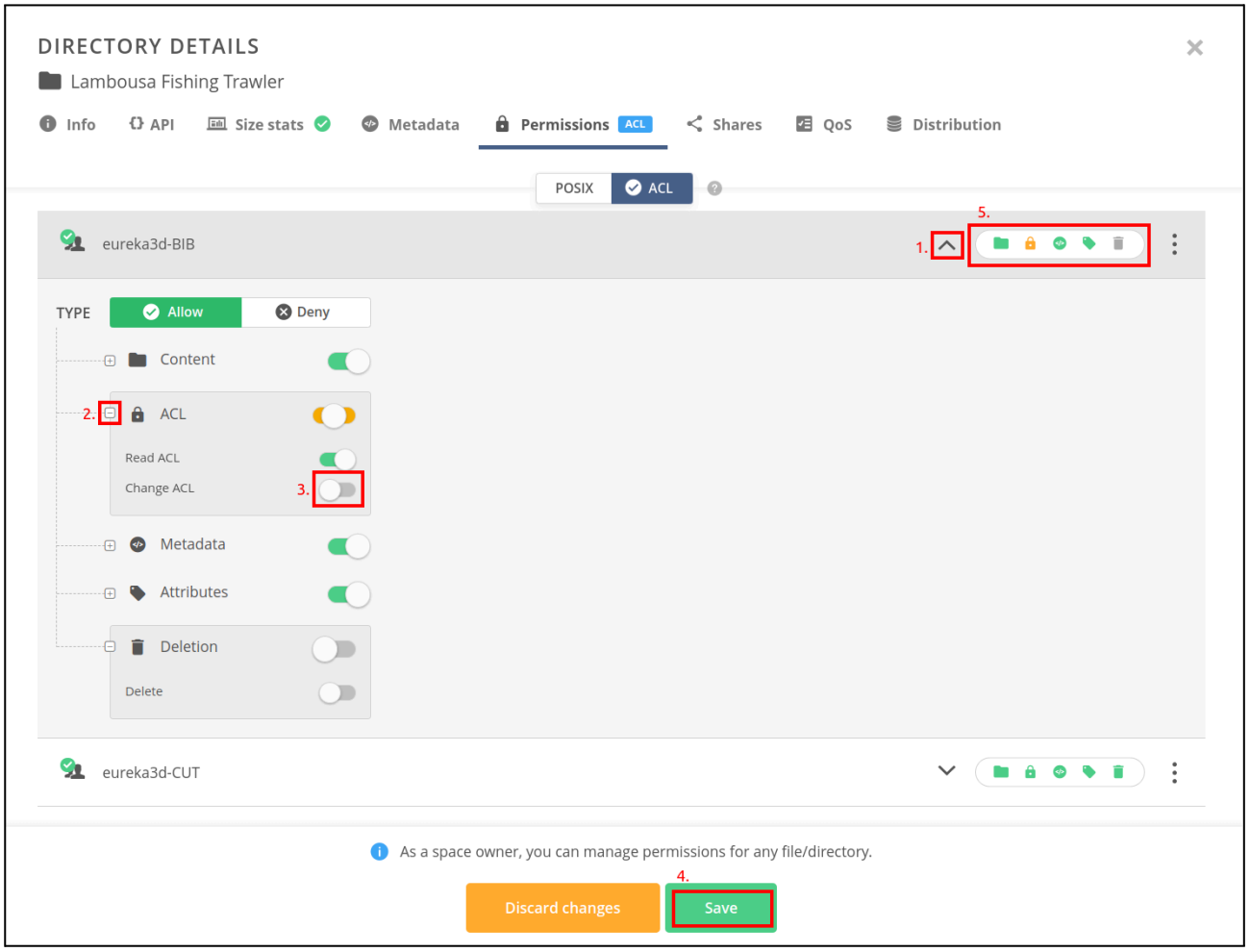
At any other time, the ACL can be modified to add or remove groups, or to configure specific aspects of the access to some data. Use the **ACL** badge or the **Permissions** action to view the ACL set for any directory:

The default ACL can be adjusted as needed. Use the editor to remove entries or add new ones, adding rules for a space member (user or a group of users).



To grant or deny granular operations for a specific user or group:

1. Open the drop-down menu on an Access Control Entry (ACE) for the user or group. The **TYPE** of the entry indicates if the permissions listed below will be allowed (green) or denied (red).
2. The permissions are grouped by category (Content, ACL, etc.). Use the **+/-** button to expand or collapse the list of permissions.
3. Toggle right to select a permission that will be impacted by this ACE. Inactive permissions (marked as grey) are neither allowed nor denied by this ACE.
4. Click the **Save** button to save the changes.
5. At the right end of the principal row, you can see icons indicating the status of the groups: green (fully granted), yellow (partially granted), or grey (not granted).



ACL provides control of access to such resources as:

Permissions	Description	Applies to
Read	Allows opening the file for reading	File
Write	Allows opening the file for writing	File
List files	Allows listing directory content (see files inside a directory)	Directory
Add files	Allows adding a file inside the directory	Directory
Add subdirectory	Allows creating a subdirectory inside this directory	Directory
Traverse directory	Allows navigating through a directory structure	Directory
Delete child	Allows deleting files or subdirectories inside a directory	Directory

Read ACL	Allows reading file/directory permissions	File/Directory
Change ACL	Allows writing file/directory ACL	File/Directory
Read metadata	Allows reading file/directory metadata	File/Directory
Write metadata	Allows writing file/directory metadata	File/Directory
Read attributes	Allows reading metadata associated with file/directory attributes	File/Directory
Write attributes	Allows writing metadata associated with file/directory attributes	File/Directory
Delete	Allows deleting the file/directory	File/Directory

Additional documentation:

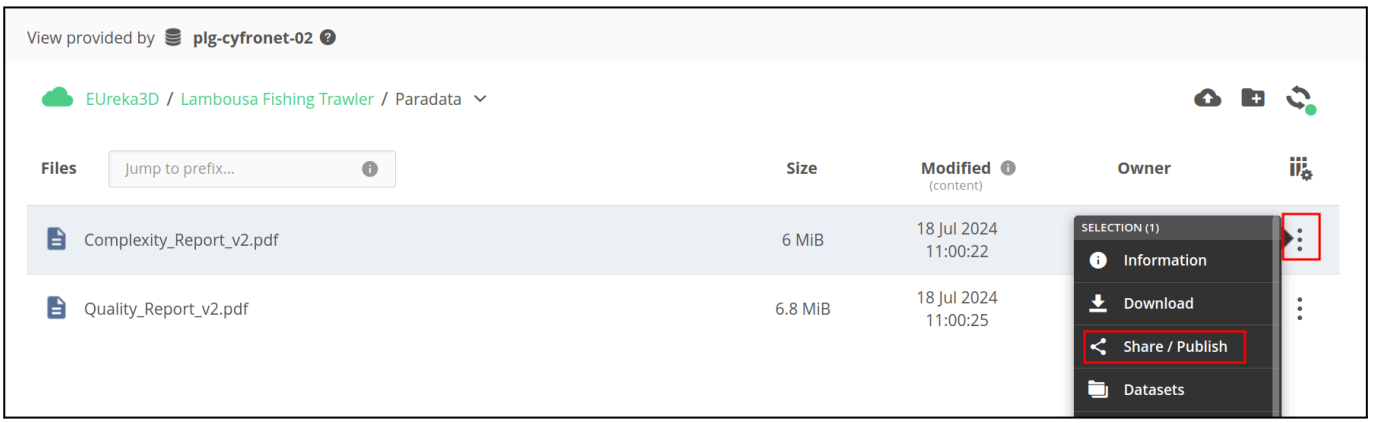
- https://onedata.org/#/home/documentation/21.02/user-guide/data[access-control-lists].html

3.6.2 Sharing data publicly

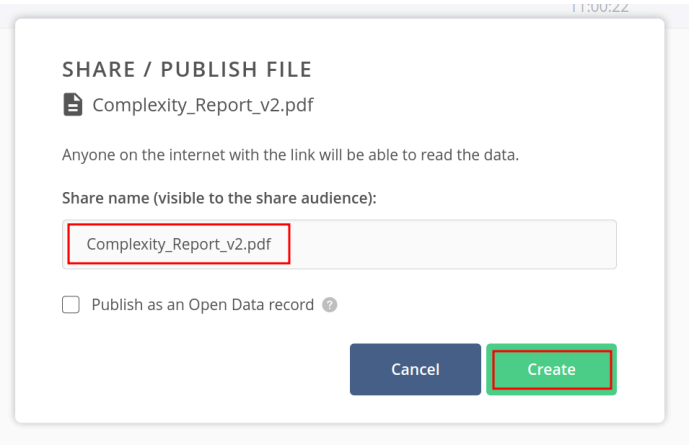
Sometimes it is useful to share data with other people, such as a paradata PDF, a raw 3D model or different interesting objects that have been produced during the digitisation process. For these cases, a **Share** can be created. Shares can be created on a single file, if only the file is to be shared, or on directories, if the whole content inside the directory is to be shared. Sharing directories is useful when many files have to be shared.

NOTE: Shares are semi-public, which means that anyone knowing the link to a share can access it. However, in practice, guessing the link is unfeasible in a timely manner.

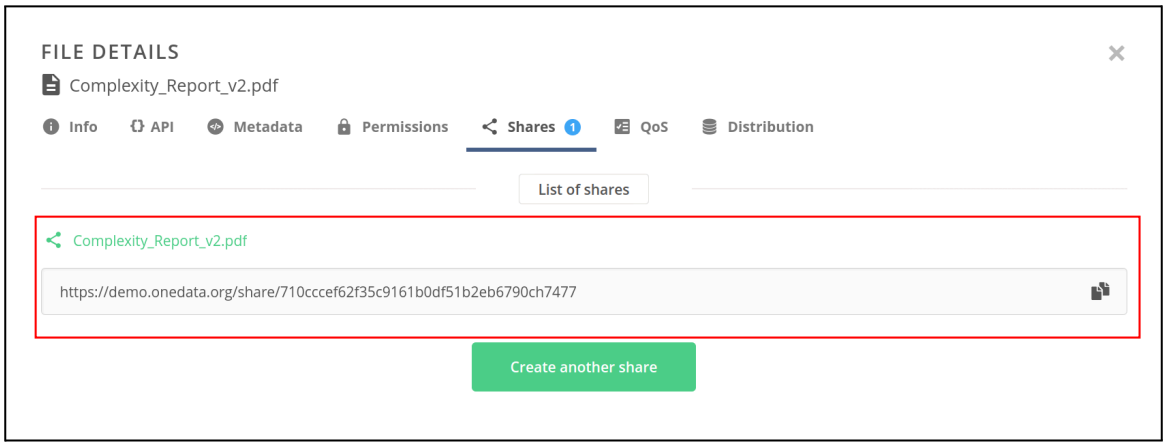
To create a Share click on the three dots button at the far right of the file or directory, and choose the **Share/Publish** option.



Enter a Share name that will be visible to other users and click the **Create** button.



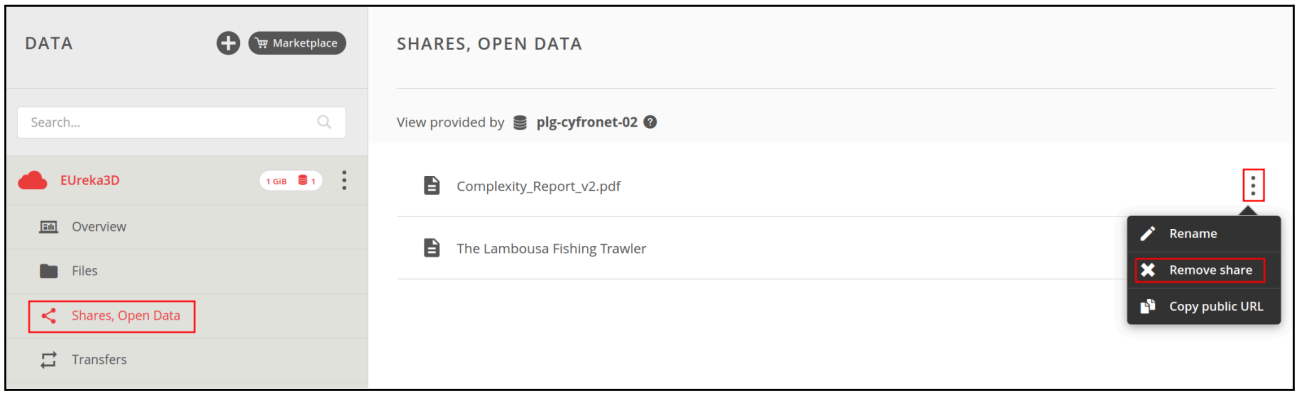
After the successful Share creation, a right-side details panel with the **Shares** tab will appear containing a list of Shares created for a selected file or directory.

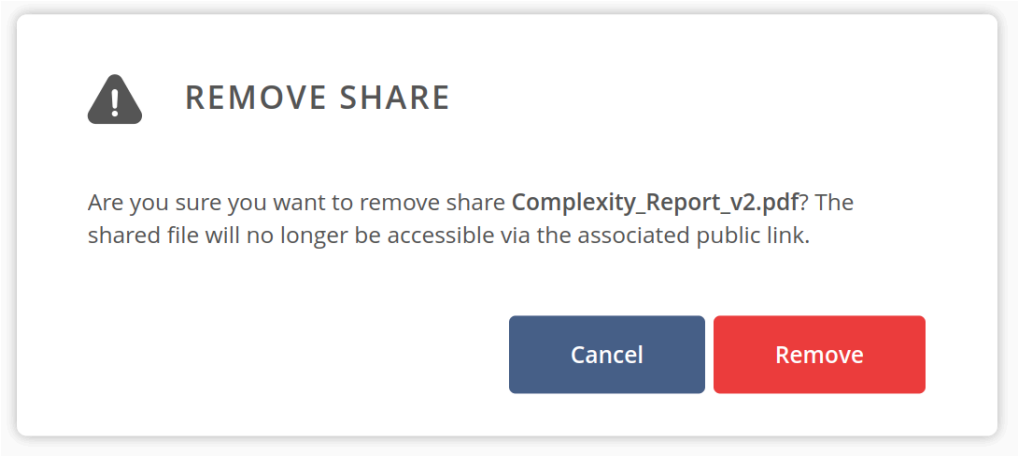


You can click on the green link (with the share icon and name) to navigate to the share details page (private view for share managers). Below you will find the public link for accessing the share (public view for anyone with the link). You can share this public URL with people interested in accessing this data.

To list all shares created in the space, navigate to the **Shares, Open Data** view. To open the action menu click the three dots button at the far right of the share row. The actions menu for Share provides the following operations: **Rename**, **Remove share**, and **Copy public URL**.

To remove a share, choose the **Remove share** option from the action menu and click the **Remove** button in the **Remove Share** modal.





Additional documentation:

- https://onedata.org/#/home/documentation/21.02/user-guide/shares.html

3.7 Publishing in Europeana

Updated 3D models can be published in Europeana through the EUreka3D platform. This process consists of three steps:

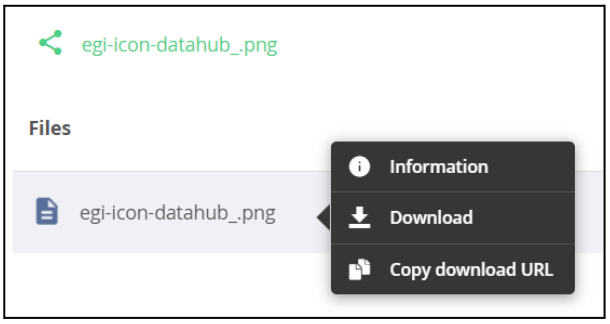
- **The request of a Persistent Identifier** (PID), which is a long-lasting reference to a digital object, a well-rooted standard in Open Data publishing. A PID is also a valid URL that can be visited to view the Open Data record in the public DataHub Web interface (publicly accessible without authentication). EUreka3D obtains PIDs from the external B2HANDLE service[4].
- **Creation of metadata**. A vital part of publishing is to include rich metadata that will make the record discoverable and meaningful for its consumers. All CH objects in EUreka3D use the EDM (Europeana Data Model) metadata format.
- **Data sharing with Europeana**. After a record is published, the Europeana service will automatically harvest its information (via the OAI-PMH protocol) and expose it in the Europeana Portal. The EDM metadata is ingested by Europeana and used to compile information about the CH object, so it must be well-curated.

The request of the PID and the data sharing are automatically done by DataHub, but content providers must provide the metadata for each object to be published. The following sections will guide you through the process of preparation of the data and their publishing in the Europeana Portal.

3.7.1 Preparing the model thumbnail

3D models can have a representative image that is used to give a first visual impression of the 3D object they will be seen in the 3D viewer. Herein, it is convenient to upload and share this static image of the 3D model before publishing it, by following these steps:

1. Create a representative image of the 3D model in JPG or PNG format.
2. Upload it in DataHub in the same directory as the ZIP file of the 3D model (directory **/Viewer** inside the project folder). Use the same file name suffixed by “thumbnail” for clarity.
3. Share the file publicly as explained in Section 3.6.2.
4. Go to the Share details.
5. Right-click on the file and click on “Copy download URL”. This will copy the necessary URL to your clipboard.



[4] https://www.eudat.eu/service-catalogue/b2handle

6. Note that you will need to use this URL for the “Representative image” attribute of the metadata.

NOTE: If the image is not shown in the metadata page once you publish the model, verify that **you are using the right URL** of the image. A simple test is to open the URL and see that you can visualise the image. One common error is to skip Step (4), so the right menu is not shown in Step (5).

It is **strongly suggested** to upload this thumbnail as, not only DataHub, but other systems will use it to provide a first overview of the object. This is, for example, the listing of two EUreka3D objects where their corresponding images are shown:

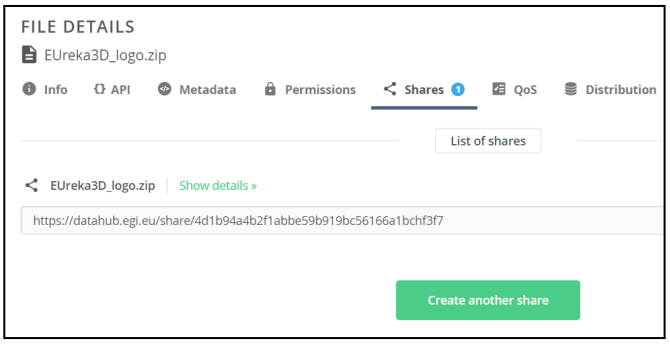
3.7.2 Test the correct visualisation of your 3D model before publishing it

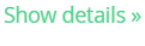
It is quite useful to test if a 3D model is visualised correctly before publishing it. If you need to do so, you can take a few steps:

1. Upload the model normally, as explained in Section 3.5.
2. Then, provisionally share it as explained in Section 3.6.2. The file will present a “Shared” tag:

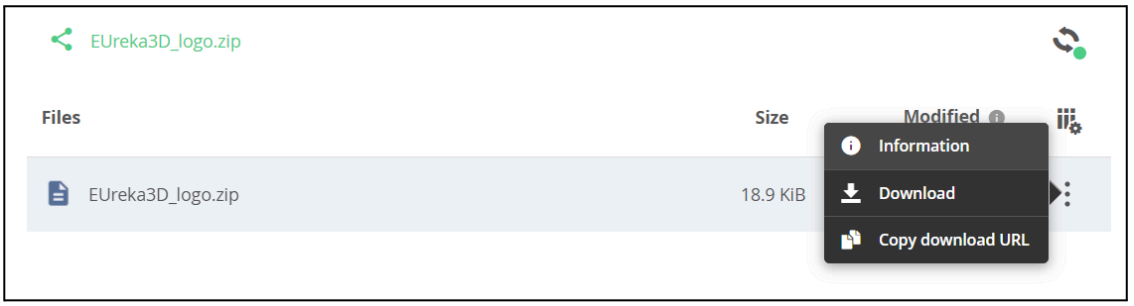
3. Click on the "**Shared**" tag: 

This will open a screen like this one:

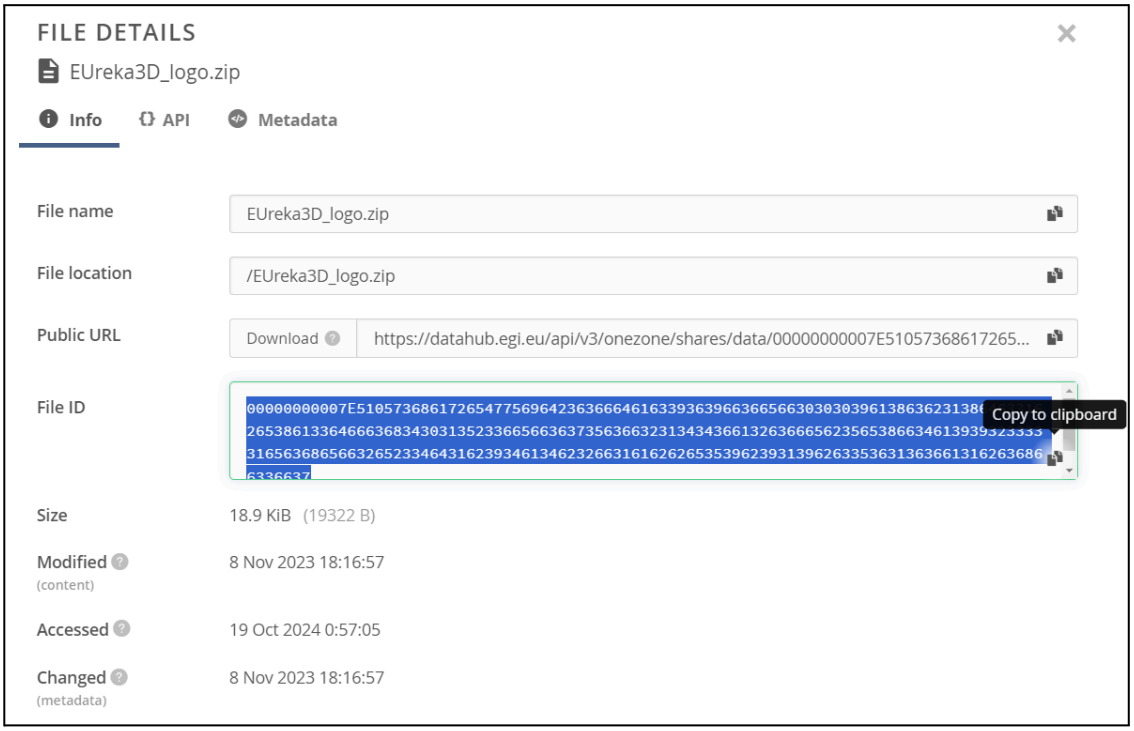


4. Click on "**Show details**": 

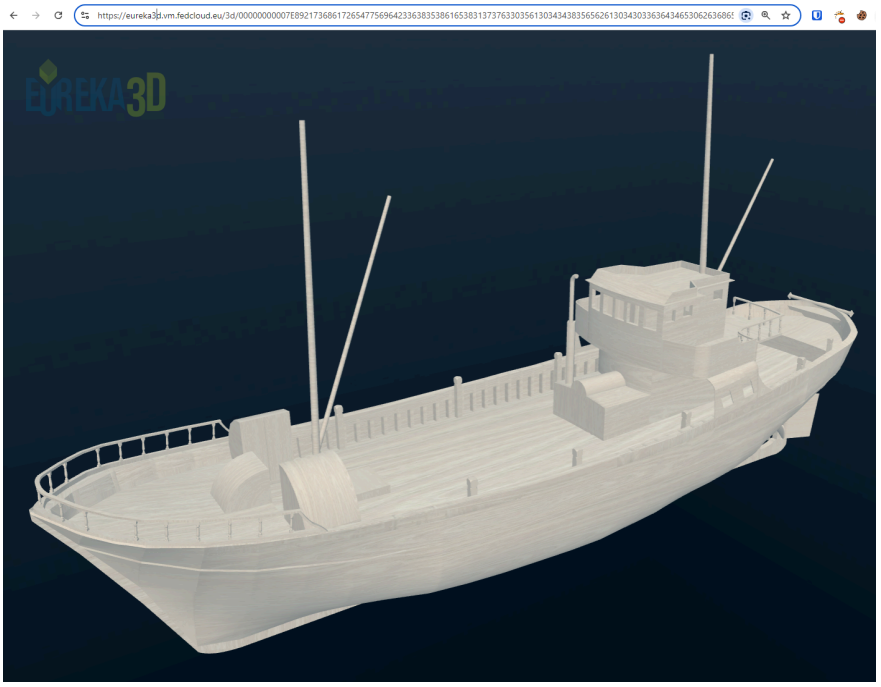
5. In the next screen click on the **three dots** (⋮) on the right side of the share to open the context menu, and then click on "**Information**"



6. In the next screen, copy the long number for the **File ID**:

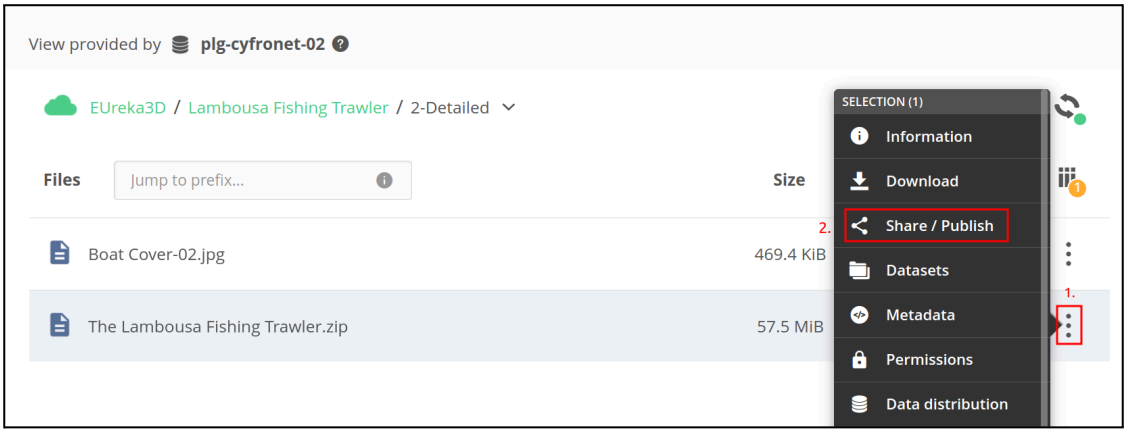


7. Finally, visit this URL:
   https://eureka3d.vm.fedcloud.eu/3d/<File ID>
   Where <File ID> is the long number you just copied.
   Example: *https://eureka3d.vm.fedcloud.eu/3d/000000000052762867756964236366646163393…*
8. If the 3D file is correct, this page will render the 3D model, so you can check how it looks. Once you finish your review, you can remove the Share you created in Step 2, as explained at the end of Section 3.6.2.

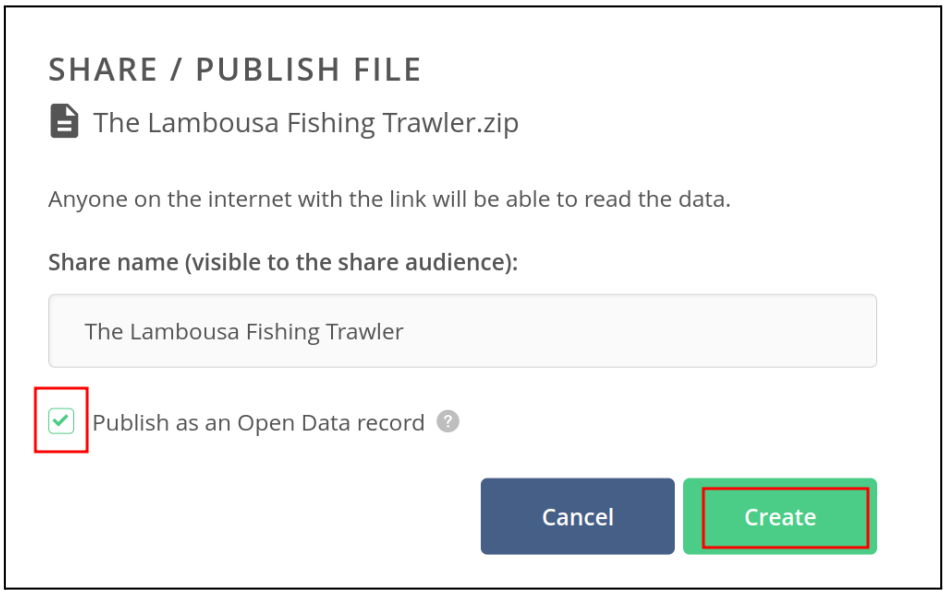


3.7.3 Create an Open Data record

To publish a 3D model click on the three dots button at the far right of the file and click on **Share/Publish** from the dropdown menu, as shown below:

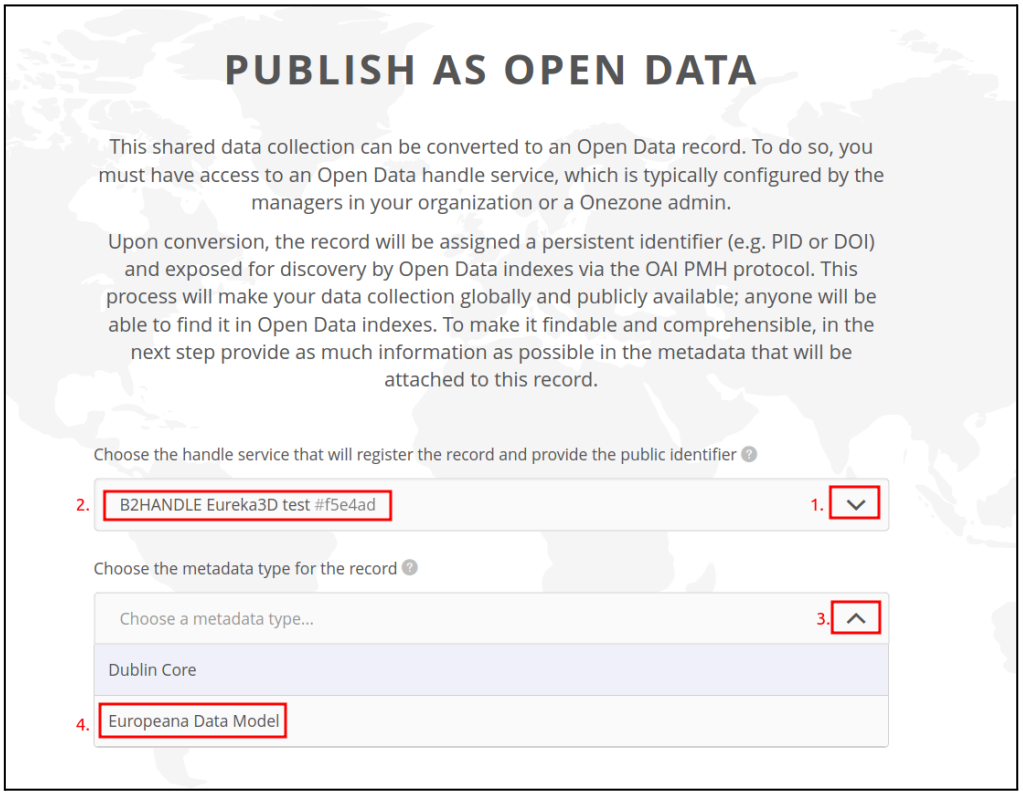


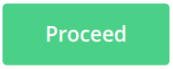
The process is similar to creating a share, but this time use the **Publish as Open Data record** option to create a share and convert it to an Open Data record in one go. Click the **Create** button to proceed:



NOTE: You can also take an existing Share and publish it as an Open Data record. Follow the instructions in Section 3.6.2 to open the share details. There, you will find the **Publish as Open Data** tab that will take you through the process, as described below. This way you can resume the Share+Publish procedure if you have not finished it, but the Share has already been created.

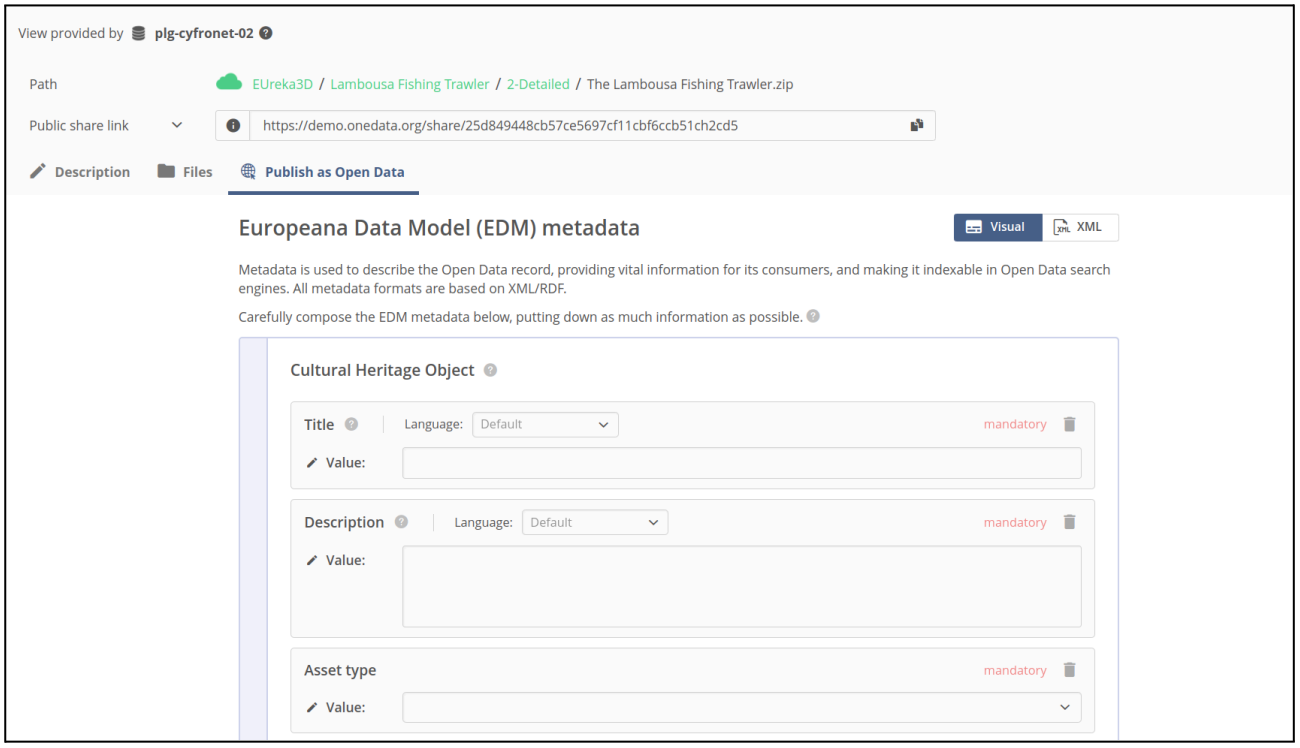
On the next page choose the **B2HANDLE** service. Next, select the **Europeana Data Model** as the metadata type:



Click on the Proceed button  .

IMPORTANT: This process will request a real PID (Persistent Identifier) from B2HANDLE. These identifiers are meant to be long-lasting references. If you want to do a test or you are not sure that the 3D model is correct, **do not publish it** in Europeana yet. For tests, ask a EUreka3D administrator to use the Testing environment. To verify the 3D model, you can proceed as explained in Section 3.7.2 to check its visualisation.

Pressing the Proceed button will lead you to a form to input metadata in EDM format.



There are two options to add the EDM metadata:

- By using a user-friendly **form**, which contains different fields for the different EDM attributes.
- By using **XML** directly to encode RDF data, which is a more advanced way to introduce EDM data.

To swap between these two modes, use the button at the top right of the form:

See Section 3.7.4 for a brief guide about the visual form and 3.7.5 for a brief guide about the XML editor.

NOTE: This document does not describe or explain EDM (Europeana Data Model). If you need to obtain more knowledge about this model, refer to the official documentation at: https://pro.europeana.eu/page/metadata

3.7.4 Adding metadata with the form

The form is a user-friendly way to introduce metadata, without needing any technical knowledge of EDM. Carefully complete the fields in the form, providing as much information as possible. Some fields are marked as mandatory and must be filled, but it is a good practice to consider and fill optional fields too.

The form is divided into three main sections to add metadata information, according to EDM:

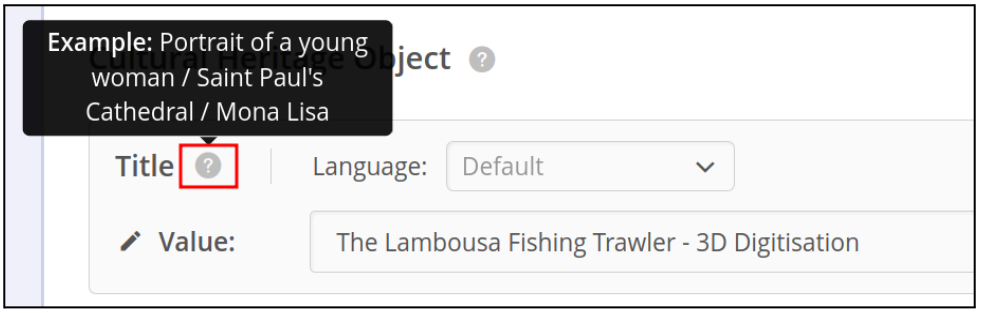
- **Cultural Heritage Object** (corresponding to *edm:ProvidedCHO* in EDM), which refers to information about the physical object in the real world.
- **Digital Object** (corresponding to *edm:WebResource* in EDM), which refers to information about the digitised 3D model of the object.
- **Aggregation** (corresponding to *ore:Aggregation* in EDM), which refers to information about the publication in Europeana and other external systems.

These three sections are mandatory to create a valid EDM record in EUreka3D.

A table with the current metadata fields can be found in Annex A.

The form presents the following features:

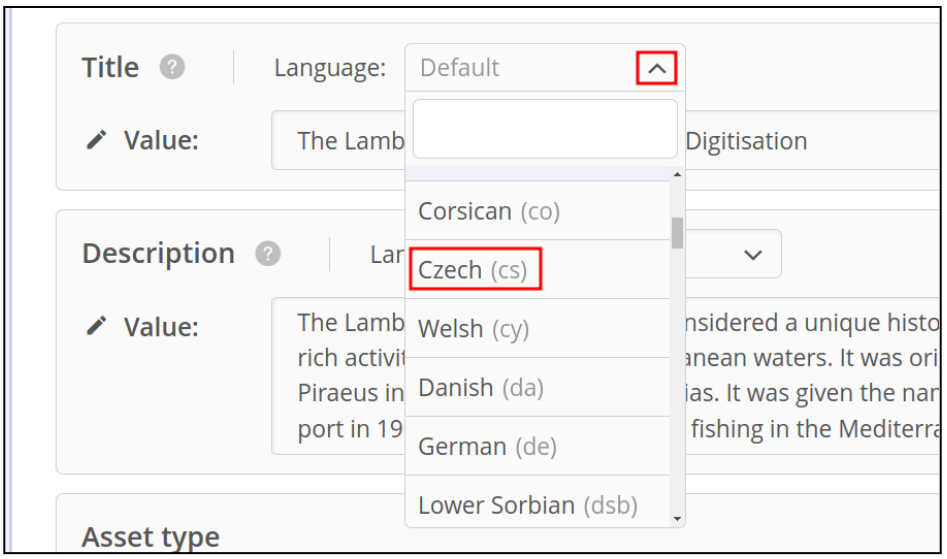
- If you do not know what a field means, you can access the field help, which may provide some examples. Just click on the question mark icon near the field name.



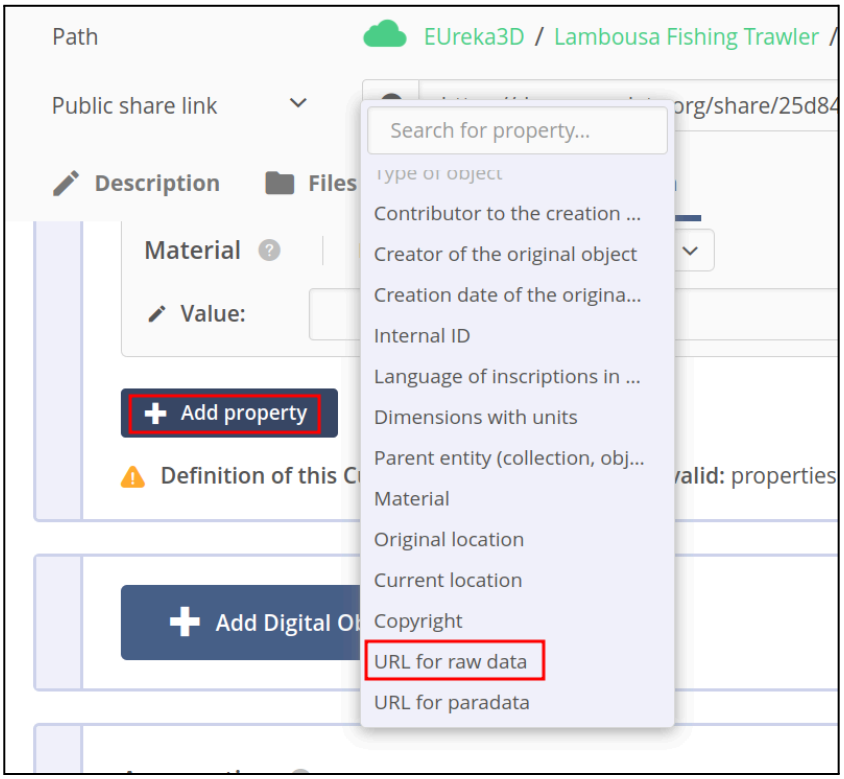
- Additionally, some fields will present an example to guide you about the sort of information that is expected for that attribute.

- To choose between **Literal value** and **Reference**, click the button near the field name. Literals represent text, such as “St. Paul's Cathedral”, whereas references refer to URIs. References can be used when a vocabulary is used (e.g. Getty) and is a convenient way to express interoperable data. It is suggested you use well-established references whenever possible.

- Some attributes allow information about the language in which they are written. For example, the name of an object (its "Title") can be expressed in English or its original language (e.g. Greek). To change the field's language, open the drop-down menu and select the desired language. By default, the language will be **English**.

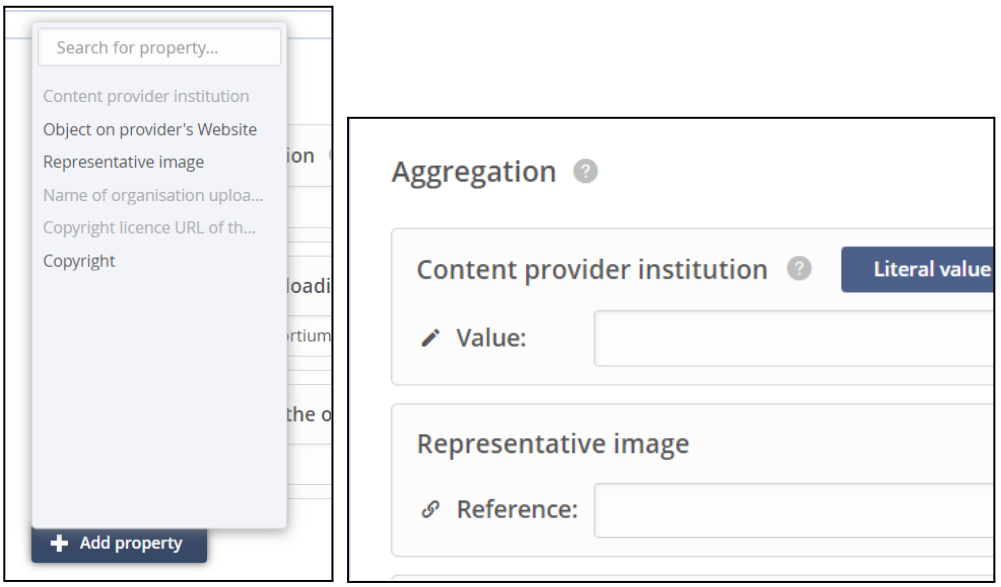


- Initially, not all fields are shown, only mandatory fields. This is done to simplify the form. To add optional fields, click the **Add property** button and choose the desired attribute.

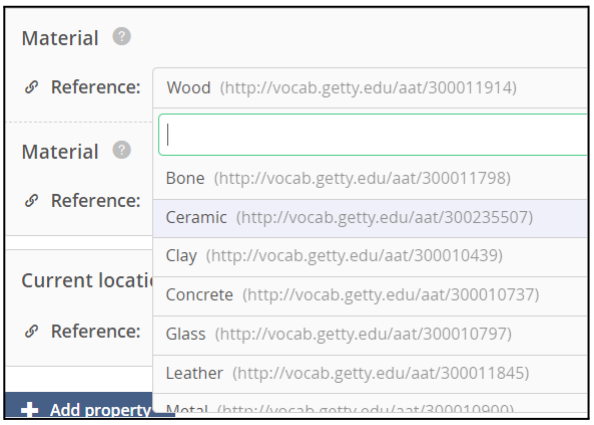


This option can be used to add existing attributes, in order to duplicate them. This allows, for example, the creation of multiple object titles that can have different languages (one in English and one in the original language).

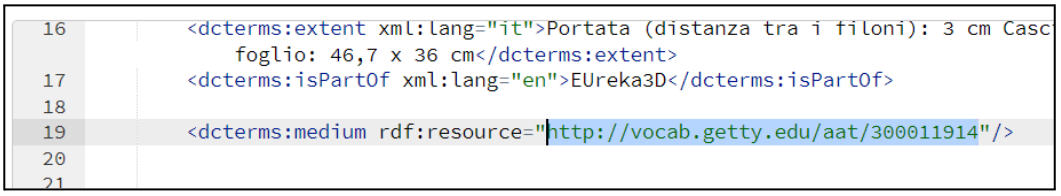
- To add a representative image of the model, go to the **Aggregation** section and add a property **Representative image**. This field is optional, but it is **strongly recommended** you use it. To fill in the attribute, follow the steps listed in Section 3.7.1 and use the image public URL.



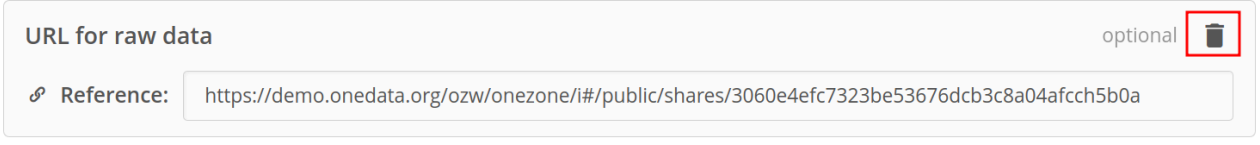
- The definition of Materials uses a predefined list of general groups (Bone, Ceramic, Clay, Concrete, Glass, Leather, Metal, etc):



Note that if you need to be more specific and use a material that is not in the predefined list, you can add it manually by using the RDF/XML editor (described in Section 3.7.5):



- To remove a field, click on the trash icon in the right corner.



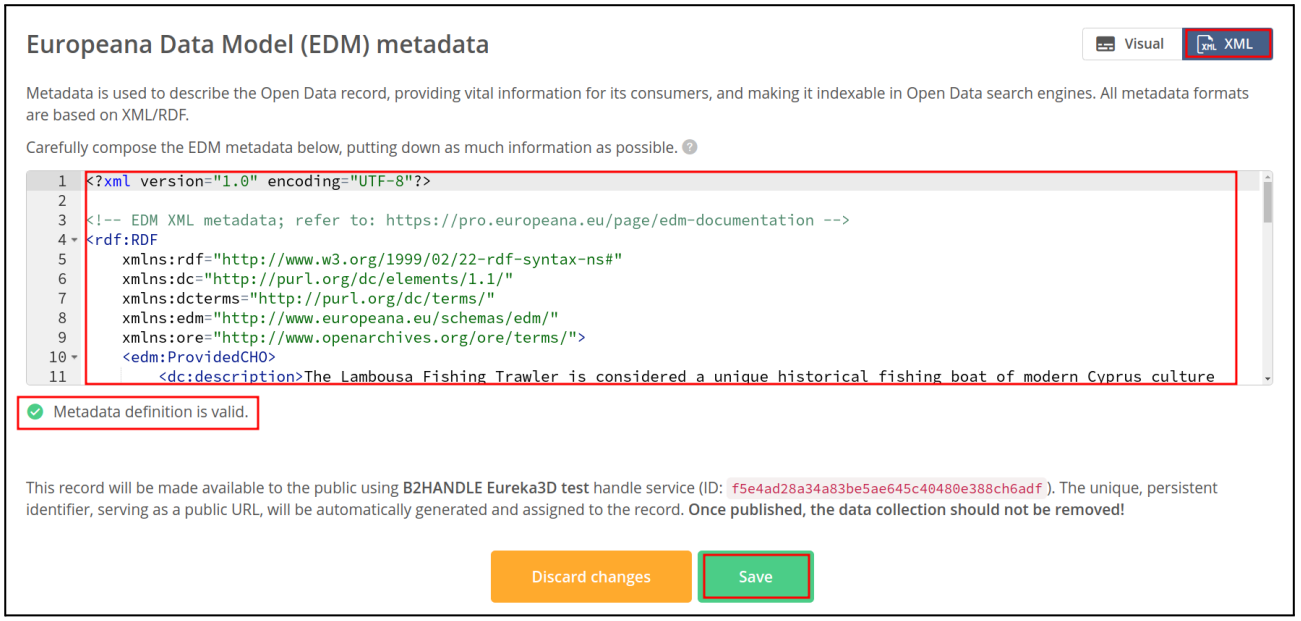
When you finish adding information, click on the **Save** button at the bottom of the page.

3.7.5 Adding metadata in RDF/XML

The XML editor mode displays the metadata expressed in the RDF/XML syntax. The carried information is equivalent to the information entered via the visual form, and is synchronised when the modes are switched.

You may edit and extend the metadata by inserting valid XML into the text field. It is also possible to paste in a whole XML document, as long as it is valid EDM metadata expressed in XML. The confirmation that the XML is valid will be shown on the page. See the Europeana documentation for detailed information about the EDM format and metadata mapping guidelines[5] [6] [7].

The XML mode lets you add extra fields that are not recognised in the visual form. They will be retained upon switching the modes — the visual form will display a note that the XML contains some extra information.



Once you finish editing the XML, click on the **Save** button at the bottom of the page.

[5] https://europeana.atlassian.net/wiki/spaces/EF/pages/987791389/EDM+-+Mapping+guidelines
[6] https://europeana.atlassian.net/wiki/spaces/EF/pages/1969258498/Metadata+Tier+A
[7] https://europeana.atlassian.net/wiki/spaces/EF/pages/2238447617/Examples+of+high+quality+data

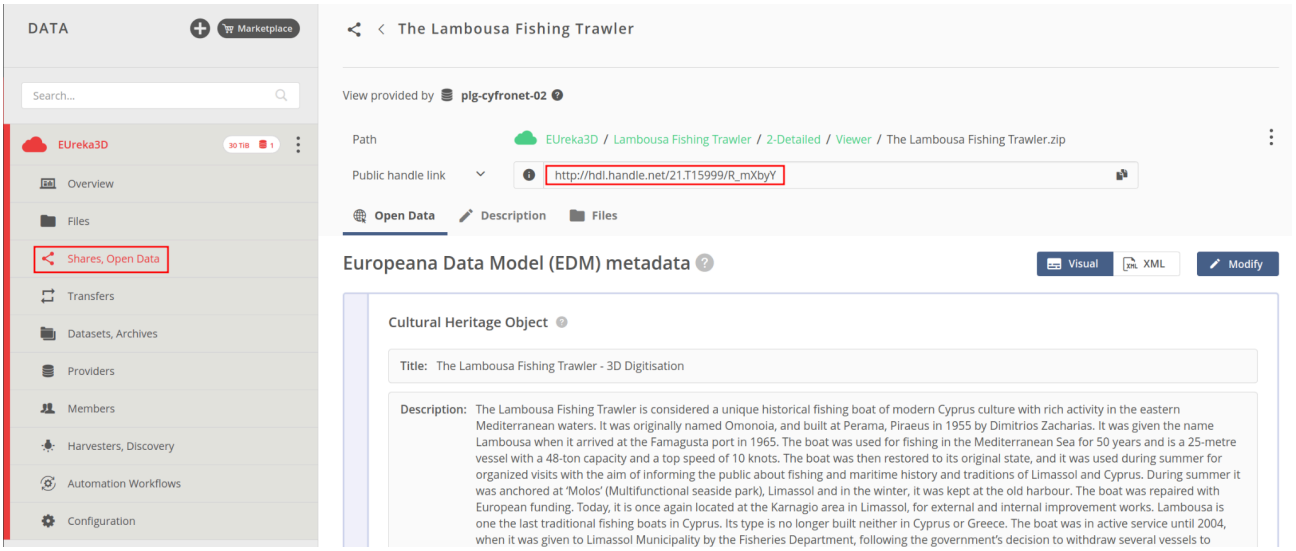
NOTE: Data introduced in the form will be shown in the XML, and vice versa. If the form does not accept some specific EDM attribute that you want to specify, use the XML mode to add it. The attribute will not be shown in the form but it will be sent to Europeana.

3.7.6 Publishing in the Europeana Portal

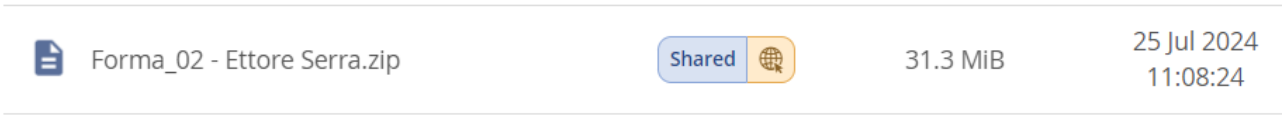
After you create the metadata, your model is published as Open Data with a PID, and it can be discovered by Europeana. Now, the Europeana systems will access your metadata at some point and ingest it in its database to be shown in its Web Portal.

NOTE: Europeana has not yet automated the process of detecting changes in the source systems, so they do some manual work to update their database Herein, **you may need to contact an EUreka3D administrator** to inform them that you have uploaded new models for publication in Europeana, so that they can contact Europeana administrators to trigger the updating process.

The metadata of the 3D model and its 3D visualisation will be public (no authorisation will be needed), and are accessible using the public handle link:



Published files will show a special icon next to the "Shared" tag to mark this situation:



You can use the **Shares, Open Data** menu in the sidebar to see the list of all shared data collections and Open Data records (an Open Data record is essentially a public Share that has been assigned a PID, metadata, and exposed to Europeana).

4. AUTOMATED PUBLISHING

The previous section has explained the process of managing your data with the GUI (Graphical User Interface) of DataHub, including uploading and sharing of models. However, when you have to upload many models (*e.g.* 500 models), working with the GUI to manually upload them one by one is a very tedious process. To solve this issue, you can use **DataHub's REST API** (Application Programming Interface). In simple terms, an API provides a way for a program to interact with a system, such as DataHub.

Using the API requires you to have some IT knowledge, at least to do some programming and understand basic Web concepts.

The process to use the API requires first to obtain a token, for security reasons. This is simply a string that gives your program permissions to do operations in DataHub in your name. This is discussed in Section 4.1.

Then, there are five steps that your program can conduct to upload and publish a model:

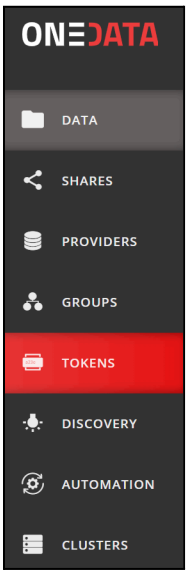
1. Create a project.
2. Check for the project creation before continuing with the rest of the steps.
3. Upload a 3D model.
4. Create a Share for the 3D model file.
5. Obtain a PID and upload the metadata.

Each of these steps will be discussed in Sections 4.2 to 4.6. Note that, strictly speaking, you do not need to perform all the steps with the API. You could for example create the project with the GUI, as explained in Section 3.3, and then automate the upload and publication of the models with the API.

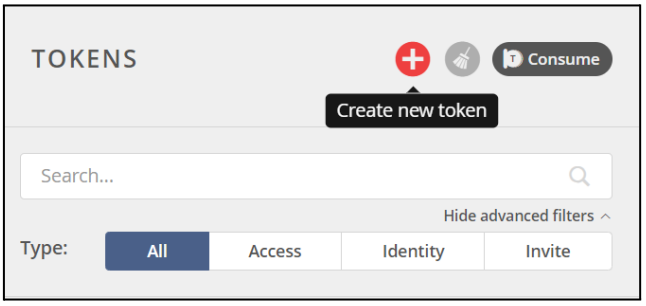
NOTE: For convenience, the examples given in this section use *curl*, but you are not expected to execute this manually. In real life, you will need to create a program or script in Python, Go, Java, Bash or any other programming language.

4.1 OBTAINING ACCESS WITH THE CREATION OF A TOKEN

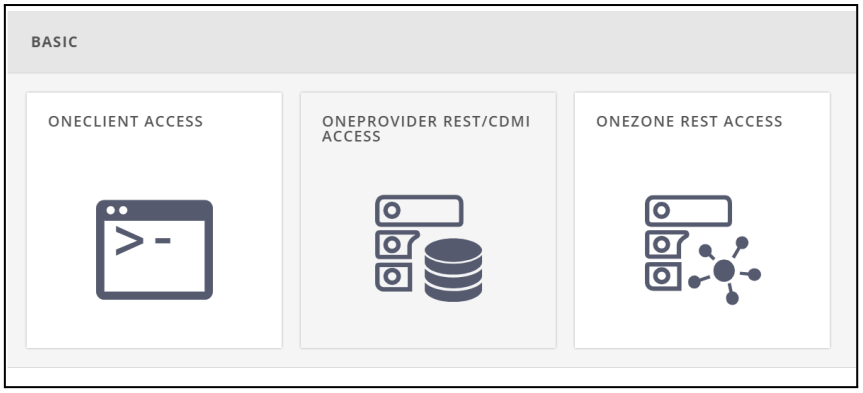
Log in to https://datahub.egi.eu and go to the menu option "Tokens":



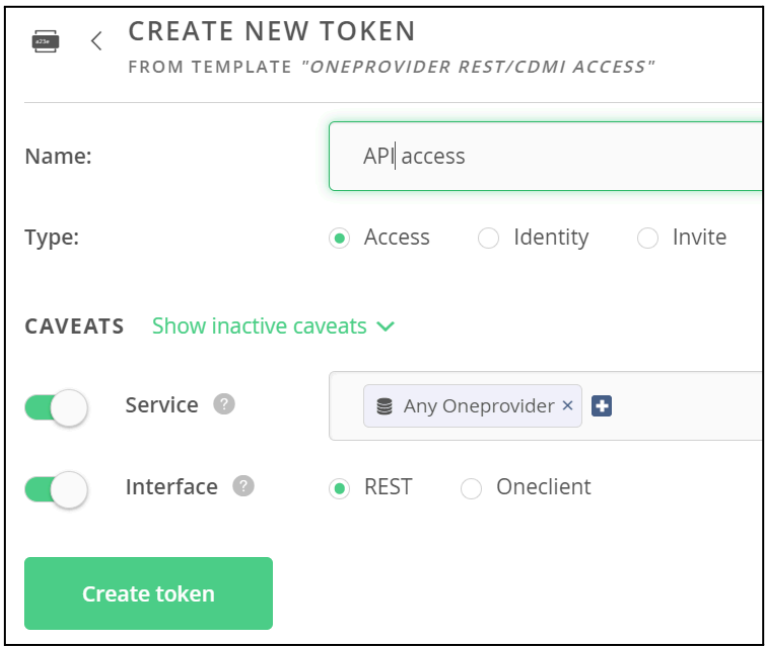
Click on the “+” sign to create a new token:



Choose the option “Oneprovider REST/CDMI access”:



Give it a name, such as “API access” and click on “Create token”:



The token is created:

You will need this token to call the different methods of the API.

4.2 Creation of a project

Similarly to what is explained in Section 3.3, you can create a project with the API.

Documentation:
https://onedata.org/#/home/api/stable/oneprovider?anchor=operation/schedule_workflow_execution

Example:

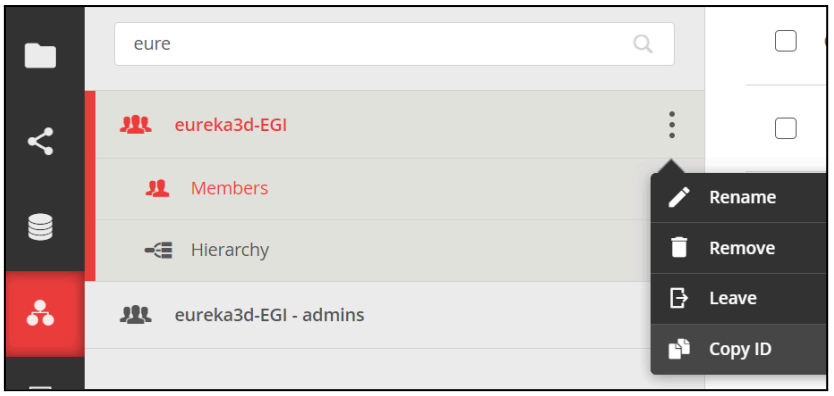
```
curl -H "X-Auth-Token: $TOKEN" -X POST
"https://plg-cyfronet-02.datahub.egi.eu/api/v3/oneprovider/automation/execution/wo
rkflows" -H "Content-Type: application/json" -d '{ "spaceId":
"6ef675cf21446a2cfeb5e8f4a992331echef2e", "atmWorkflowSchemaId":
"99ddd10bc160b73f65cb93af8444d465chb2ff", "atmWorkflowSchemaRevisionNumber": 1,
"storeInitialContentOverlay": { "cac81938bc14eb80041fe4ac51f13677abd874": "Example
project", "0fb9d0c480c2e5dbce39bc861b73ce6f53e4ca": { "fileId":
"00000000005855E5677569642373706163655F3665663637356366323134343661326366656235653
8663461393932333331656368656632652336656636373563663231343436613263666562356538663
4613939323333316563686566326" }, "bb5c588454d4d79792964d18f019d478e596b3": [
{"groupId": "7ae89b417cf97219abe41c76a9a00f25chf972"}, {"groupId":
"13a7cc86a43e84328f74276a9a06b10031809"} ]}}'
```

Answer (you need this value for the next call):

```
{"atmWorkflowExecutionId":"fb15f9813710b2a62d1d621a85150860ch0cda"}
```

Notes:

- Marked in green are the values that you need to provide, in this case the name of the project and the "group ID" of the group(s) that you want to use for the ACL (see the part about "Managing Groups" in Section 3.3). To collect the group ID of one of your groups, you can access the GUI left menu: `Groups > click the three dots of the group > Copy ID`



- Currently, "atmWorkflowSchemaId" is always "99ddd10bc160b73f65cb93af8444d465chb2ff". This should stay like this, but you can always check the ID of a new workflow in the GUI left menu: `Automation > EUreka3D inventory > click the three dots of the workflow > Copy ID`
- Similarly, "atmWorkflowSchemaRevisionNumber" is currently "1". If a new version is released you can find the revision number on the inventory page, through the GUI left menu: `Automation > EUreka3D inventory`

4.3 Checking the project has been created

Before moving to the upload of the 3D model you need to make sure that the step of Section 4.2 has finished successfully. This is necessary because running these steps in a program may run too fast, while the project creation workflow is run asynchronously in the background. This API call needs the "atmWorkflowExecutionId" value returned in the previous API call. You should periodically check for the *status*, and once it is "finished", your program can proceed to the next call.

Documentation:

https://onedata.org/#/home/api/stable/oneprovider?anchor=operation/get_workflow_execution_details

Example:

```
curl -H "X-Auth-Token: $TOKEN " -X GET
"https://plg-cyfronet-02.datahub.egi.eu/api/v3/oneprovider/automation/execution/wo
rkflows/$WORKFLOW_ID" | jq .status
```

Answer:

```
"Finished"
```

Notes:

- WORKFLOW_ID is the value "atmWorkflowExecutionId" that was obtained in the previous step.

4.4 Uploading a 3D model

The next step is to upload the 3D model to the "Viewer" directory.

Documentation:

https://onedata.org/#/home/api/stable/oneprovider?anchor=operation/create_file_at_path

Example:

```
curl -H "X-Auth-Token: $TOKEN" -X PUT
"https://plg-cyfronet-02.datahub.egi.eu/api/v3/oneprovider/data/
6ef675cf21446a2cfeb5e8f4a992331echef2e/project_name/Viewer/file_name" -H
"Content-Type: application/octet-stream" -d "@model.zip"
```

Answer:

```
{"fileId":"00000000005855E56775696423737061636555F366566..."}
```

The file ID that is necessary for the next call.

Notes:

- The space ID for EUreka3D is always "6ef675cf21446a2cfeb5e8f4a992331echef2e"

4.5 Create a share for the 3D model

Once the file is uploaded, a share must be created.

Documentation:

https://onedata.org/#/home/api/stable/oneprovider?anchor=operation/create_share

Example:

```
curl -H "X-Auth-Token: $TOKEN" -X POST "https://
plg-cyfronet-02.datahub.egi.eu/api/v3/oneprovider/shares" \

-H "Content-Type: application/json" -d '{"name": "Example of share name",
"rootFileId": "'$FILE_ID'"}'
```

Answer:

```
{"shareId":"8f4a99221446a2cfe336ef675cfb5e1echef2e"}
```

The share ID that is necessary for the next call.

Notes:

- The share must have a meaningful name, which can be similar to the model name.
- "rootFileId" should have the *fileID* that was obtained in the previous step, for example: "rootFileId": "00000000005855E56775696423737061636555F366566..."} (Note that the simple quotes are not necessary when a Bash variable is not used).

4.6 Publish the 3D model

Similarly to what is explained in Section 3.3, you can create a project with the API.

Documentation:

https://onedata.org/#/home/api/stable/onezone?anchor=operation/handle_service_register_handle

Example:

```
curl -H "x-auth-token: $TOKEN" -H "content-type: application/json" -X POST
https://datahub.egi.eu/api/v3/onezone/handles -d '{ "handleServiceId":
"'$HANDLE_SERV_ID'",  "resourceType": "Share",  "resourceId": "'$SHARE_ID'",
"metadataPrefix": "edm",  "metadata": "<?xml version=\"1.0\" encoding=\"utf-8\"
?>..."  }'
```

Notes:

- HANDLE_SERV_ID for the “handleServiceId” should contain the specific value of your EUreka3D group, for example: f5f5e13338851b6866b085fee019276ech038f.
  You can find your ID by calling: https://datahub.egi.eu/oai_pmh?verb=ListSets and looking for your group name (*e.g.* eureka-EGI for the EGI group).
- SHARE_ID for the “resourceId” is the *shareId* that was obtained in the previous API call.
- “metadata” should contain the EDM data in RDF/XML format. A draft for this template can be found in Annex B. Please check Annex A to see the list of metadata attributes that currently exist.

4.7 Final suggestions

The API is a very powerful feature that has to be used with care:

- When you work with the API, it is convenient to test your program with a single object first.
- Up to the last step (after you create the share as explained in Section 4.5), it is easy to revert what was created in case of any error, but the last step retrieves a PID from B2HANDLE, so it should not be executed for testing purposes.
- It may be appropriate to test the 3D visualisation after the share has been created, in a similar way as explained in Section 3.7.2.
- It is useful to use the XML Editor of the GUI (see Section 3.7.5) to validate your metadata RDF/XML. However, remember **NOT to save it**, as this step will request a real PID.
- Additionally, it is useful to publish one object with the GUI, so that you can see what metadata RDF/XML is generated, and what sort of data can be added.
- Once everything has been verified to work well, you can run your program to upload and publish multiple objects.

5. CONCLUSIONS

This handbook has explained the basics for Content Providers to upload, manage and share data in the EUreka3D platform. It first described the required steps to join the EUreka3D community through EGI Check-in, in order to gain access to the different services provided by the project. This consists mainly of two tasks:

- Registering an account in Check-in.
- Joining the EUreka3D Community.

Then, the handbook explained the DataHub service and the different tasks involved, including:

- Creation of new projects for 3D models.
- Upload of data.
- Assignment of permissions for data access.
- Sharing of data publicly.
- Introduction of metadata, through a user-friendly form and a more advanced RDF/XML editor.
- Final publishing in Europeana.

Thanks to the graphical user interface of DataHub, uploading data to the cloud is a simple process. In case multiple objects have to be uploaded at once, the API provides an efficient mechanism to tackle the task. The main basic steps have been explained in this handbook, with references to documentation for extended functionality.

Although the services supporting EUreka3D, such as EGI Check-in and DataHub, have been successfully used by many scientific communities in production for a long time, they are under continuous Improvements. Only the provisioning of a good user experience that remains useful for the Cultural Heritage community will determine the success of the EUreka3D platform.

Annex A. Metadata Fields

Note that this table may be outdated. Always refer to the metadata form found in DataHub and to the latest EDM version.

Name	Section	Literal/Reference	Cardinality	RDF mapping	Lang att	Notes
Title	Cultural Heritage Object	Literal	1..n	dc:title	yes	Lang attribute is mandatory in Europeana
Description / Caption	Cultural Heritage Object	Literal	1..n	dc:description	yes	Lang attribute is mandatory in Europeana
Category	Cultural Heritage Object	Literal	1	edm:type		
Subject	Cultural Heritage Object	Literal	1..n	dc:subject	yes	Lang attribute is mandatory in Europeana
Type of object	Cultural Heritage Object	Either	1	dc:type	yes	
Contributor to the creation of the original object	Cultural Heritage Object	Either	0..n	dc:contributor	yes	
Creator of the original object	Cultural Heritage Object	Either	0..n	dc:creator	yes	
Creation date of the original object	Cultural Heritage Object	Either	0..n	dcterms:created	yes	
Language of inscriptions in the object	Cultural Heritage Object	Literal	0..n	dc:language		
Dimensions with units	Cultural Heritage Object	Literal	0..n	dcterms:extent		

Parent entity (collection, object, site...)	Cultural Heritage Object	Either	0..n	dcterms:isPartOf	yes	
Material	Cultural Heritage Object	Reference	1..n	dcterms:medium		
Original location	Cultural Heritage Object	Either	0..n	dcterms:spatial		Entries of geonames vocabulary must end in a "/" for Europeana to accept it. Example: <dcterms:spatial rdf:resource="https://sws.geonames.org/2794576/"/>
Current location	Cultural Heritage Object	Either	0..1	edm:currentLocation		
Description of digital object	Digital Object	Literal	1..n	dc:description	yes	Lang attribute is mandatory in Europeana
Type of digital object	Digital Object	Literal	1	dc:type	yes	
Creator of the model	Digital Object	Either	0..n	dc:creator	yes	
Digitisation date	Digital Object	Either	0..1	dcterms:created	yes	
3D format	Digital Object	Literal	0..n	dc:format		
Internal ID	Digital Object	Literal	0..1	dc:identifier		
File size	Digital Object	Literal	0..1	dcterms:extent		
URL for raw data	Digital Object	Reference	0..1	dcterms:isFormatOf		
URL for paradata	Digital Object	Reference	0..1	dcterms:isReferencedBy		
Content provider institution	Aggregation	Either	1	edm:dataProvider	yes	

Object on provider's Website	Aggregation	Reference	0..1	edm:isShownAt		
Representative image	Aggregation	Reference	1	edm:object		
Copyright licence URL of the digital object	Aggregation	Reference	1	edm:rights		
Additional copyright information	Aggregation	Literal	0..n	dc:rights	yes	

ANNEX B. EXAMPLE OF EDM TEMPLATE

```
<?xml version="1.0" encoding="utf-8"?>
<rdf:RDF xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
xmlns:dc="http://purl.org/dc/elements/1.1/" xmlns:dcterms="http://purl.org/dc/terms/"
xmlns:edm="http://www.europeana.eu/schemas/edm/"
xmlns:ore="http://www.openarchives.org/ore/terms/">
   <edm:ProvidedCHO rdf:about="">
       <dc:contributor>....</dc:contributor>
       <dc:creator>...</dc:creator>
       <dc:description>...</dc:description>
       <dc:language>...</dc:language>
       <dc:relation
rdf:resource="https://datahub.egi.eu/share/60261548ca50a1658ee35b1416f236c8ch9454"/>
       <dc:subject>...</dc:subject>
       <dc:title>...</dc:title>
       <dc:title xml:lang="it">....</dc:title>
       <dc:type>...</dc:type>
       <dcterms:created>...</dcterms:created>
       <dcterms:extent>...</dcterms:extent>
       <dcterms:isFormatOf rdf:resource="..."/>
       <dcterms:isPartOf>EUreka3D</dcterms:isPartOf>
       <dcterms:medium rdf:resource="http://vocab.getty.edu/aat/300235507"/>
       <dcterms:spatial rdf:resource="https://sws.geonames.org/2794576/"/>
       <edm:currentLocation rdf:resource="http://...."/>
       <edm:type>3D</edm:type>
   </edm:ProvidedCHO>
   <edm:WebResource rdf:about="">
       <dc:creator>...</dc:creator>
       <dc:description>...</dc:description>
       <dc:format>OBJ</dc:format>
       <dc:identifier>...</dc:identifier>
       <dc:type>3D</dc:type>
       <dcterms:created>...</dcterms:created>
       <dcterms:extent>1.5 MB</dcterms:extent>
       <dcterms:isFormatOf rdf:resource="http://...."/>
       <dcterms:isReferencedBy rdf:resource="http://...."/>
       <edm:rights rdf:resource="http://creativecommons.org/licenses/by-sa/4.0/"/>
   </edm:WebResource>
   <ore:Aggregation rdf:about="">
       <dc:rights>...</dc:rights>
       <edm:aggregatedCHO rdf:resource=""/>
       <edm:isShownAt rdf:resource="https://...."/>
       <edm:dataProvider>...</edm:dataProvider>
       <edm:object rdf:resource="https://datahub.egi.eu….">
       <edm:provider>Photoconsortium</edm:provider>
       <edm:rights rdf:resource="http://creativecommons.org/licenses/by-sa/4.0/"/>
   </ore:Aggregation>
</rdf:RDF>
```