
**Project title:** European Federation for Cancer Images

**Project acronym:** EUCAIM

**Grant Agreement:** 101100633

**Call identifier:** DIGITAL-2022-CLOUD-AI-02

# D*4.8*: Final EUCAIM Dashboard

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| **Date of delivery:** | 31/12/2025 |
| **Version:** | V0.1 |
| **Due date:** | Month 36 |
| **Actual delivery date:** | 24/12/2025 |
| **Type:** | Demonstrator |
| **Dissemination level:** | Public |

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# Abbreviations

| Terms | Definitions |
|---|---|
| AAI | Authentication and Authorisation Infrastructure |
| API | Application Programming Interface |
| DCAT-AP | Data Catalogue vocabulary Application Profile |
| DICOM | Digital Imaging and Communication In Medicine |
| EUCAIM | European Federation for Cancer Images |
| FAIR | Findable, Accessible, Interoperable, Reusable |
| FDP | FAIR Data Point |
| Guacamole | A clientless remote desktop gateway |
| GUI | Graphical User Interface |
| IdP | Identity Provider |
| LS-AAI | Life Sciences Authentication and Authorisation Infrastructure |

| | |
|---|---|
| MOLGENIS | A modular web application for scientific data, initially focused on molecular genetics research (molecular genetics information system) but expanded to other disciplines. |
| Negotiator | BBMRI-ERIC service for structured negotiator for biomedical resources |
| OpenID | Open standard and decentralised authentication protocol |
| PACS | Picture Archiving and Communication System |
| QUIBIM | Spanish company on AI applied to Image Biomarkers |
| RIS | Radiological Information System |
| UPV | Universitat Politècnica de València (Valencia University of Technology) |
| VO | Virtual Organisation, referring to the EUCAIM Virtual Organisation in the LS-AAI |

# Disclaimer

The opinions stated in this report reflect the opinions of the authors and not the opinion of the European Commission.

# Executive Summary

## 1. Introduction

This report complements the EUCAIM Dashboard[1] (https://dashboard.eucaim.cancerimage.eu/) and jointly constitutes the Deliverable *D4.8 Final EUCAIM Dashboard*. The Dashboard is the entry point to get access to the full functionalities offered by EUCAIM for any data users, data holders, software developers and stakeholders willing to join. The Dashboard integrates all the applications of EUCAIM and provides all stakeholders a portal to manage their requests. The Dashboard includes the landing pages with the instructions and the link to the public catalogue. Through the Dashboard the user can explore the data using the federated search and request access through the negotiator system. The user can get personalised assistance via the Helpdesk. In addition, instructions for other types of users (i.e. data holders, software providers) are included on the landing page.

The improvements performed from D4.7 First EUCAIM Dashboard are the following:

- Landing page:
  - New forms for applying to become a data holder, software developer and stakeholder.
  - Updated statistics showing aggregated information at the level of the node in the catalogue and in the federated search.
  - A documentation area with the main guidelines of the project and a link to the application catalogue.
  - A User's library area with information on the datasets under negotiation and the datasets with access granted.
  - An updated user's profile section with the UUID of the data holder's institution according to the users' credential organization domain.
- Catalogue:
  - Metadata in the catalogue, compliant to the EUCAIM-DCAT-AP model, based on HealthDCAT-AP.
  - Adaption of the catalogue application to the Molgenis EMX2 version.
  - A FAIR Data Point for the datasets
  - A FAIR Data Point harvester.
  - A PID resolving service.
- Federated Search
  - Improved version of Lens User Interface with better performance and reliability.
  - SQL backend support for Spot component.
  - Integration of five providers.
- Negotiator
  - New version of the Negotiator installed (3.19.0).
  - New forms coded for the submission of applications by Data Users, according to the Access Committee final models.
  - Improved support for the evaluation cycle.
  - Improved management of user's permissions.
  - Improved usability of the interface.
- New applications integrated in the Dashboard
  - Federated Processing Dashboard
  - Document server for authenticated users, based on NextCloud.

[1] https://dashboard.eucaim.cancerimage.eu/

# 2. Dashboard Component Description

This document will only outline the differences implemented and described in the previous section. For detailed information of the functionality of the Dashboard, please refer to *D4.14 Final End-user Guide.*

## 2.1. Landing page

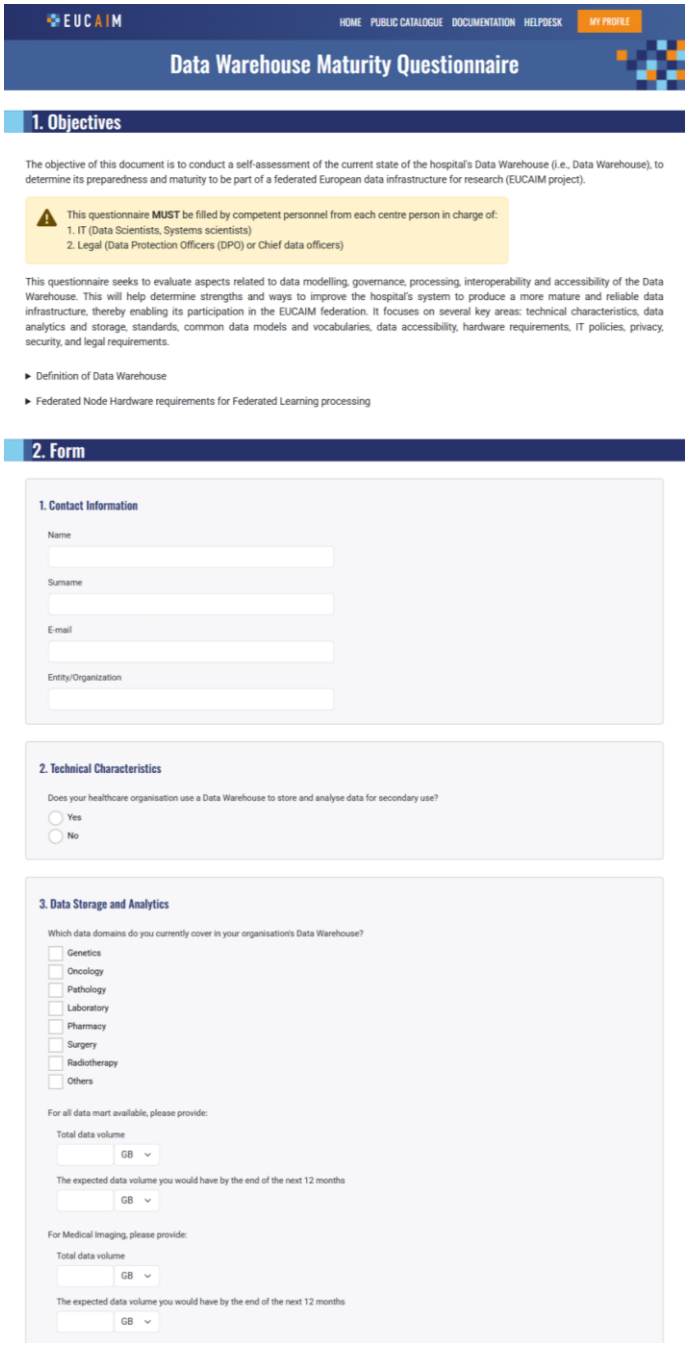
The website's main page uses both Meteor[2] and React[3] frameworks and is deployed on a Node.js[4] server. A MongoDB[5] database is used to store data. All the components are embedded in Docker[6] containers and run on a managed platform based on Kubernetes. The source code of the Dashboard is available in GitHub[7].


*Figure 1: Landing page*

[2] https://www.meteor.com
[3] https://react.dev
[4] https://nodejs.org
[5] https://www.mongodb.com
[6] https://www.docker.com
[7] https://github.com/EUCAIM/dashboard

### 2.1.1. Updated information on the user's profiles

Two new questionnaires for 'Data warehouse maturity' and 'TIER Maturity Level'.



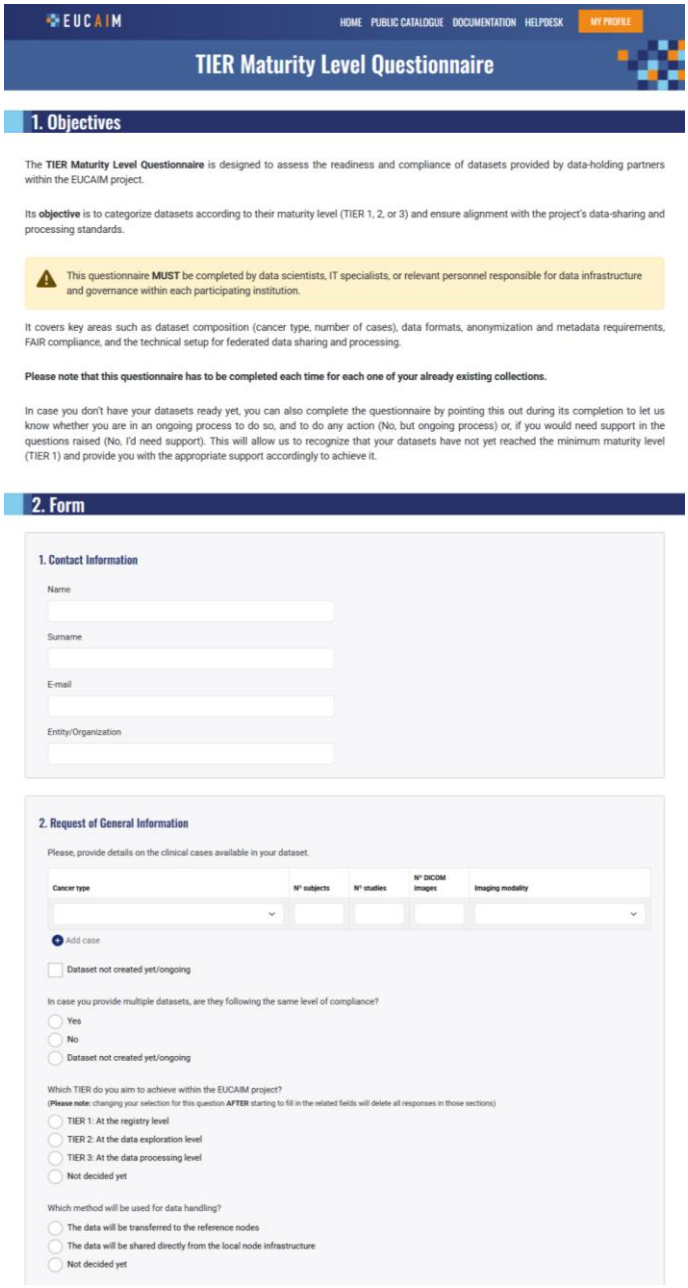




*Figure 2: Datasets that are accessible by the user (left) and API specification (right).*

### 2.1.2. General Statistics

Updated statistics showing aggregated information at the level of the node in the catalogue (TIER 1) and in the federated search (TIER 2). All TIER2 datasets are also available in the catalogue.

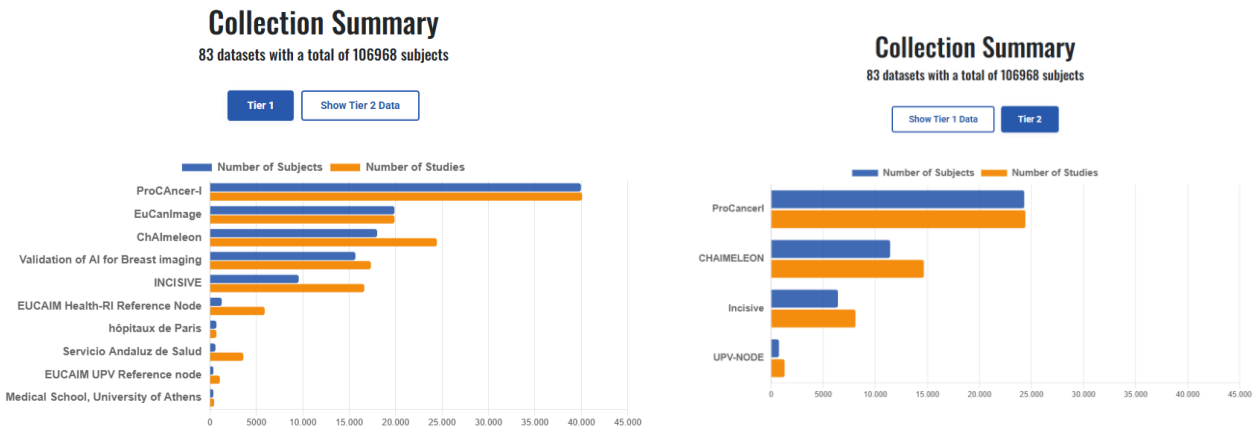



*Figure 3: General statistics*

### 2.1.3. Documentation area

A documentation area with the main guidelines of the project, such as the data holder's handbook, the research software packaging guidelines, the user's guide, the hyperontology of EUCAIM and the platform training site.

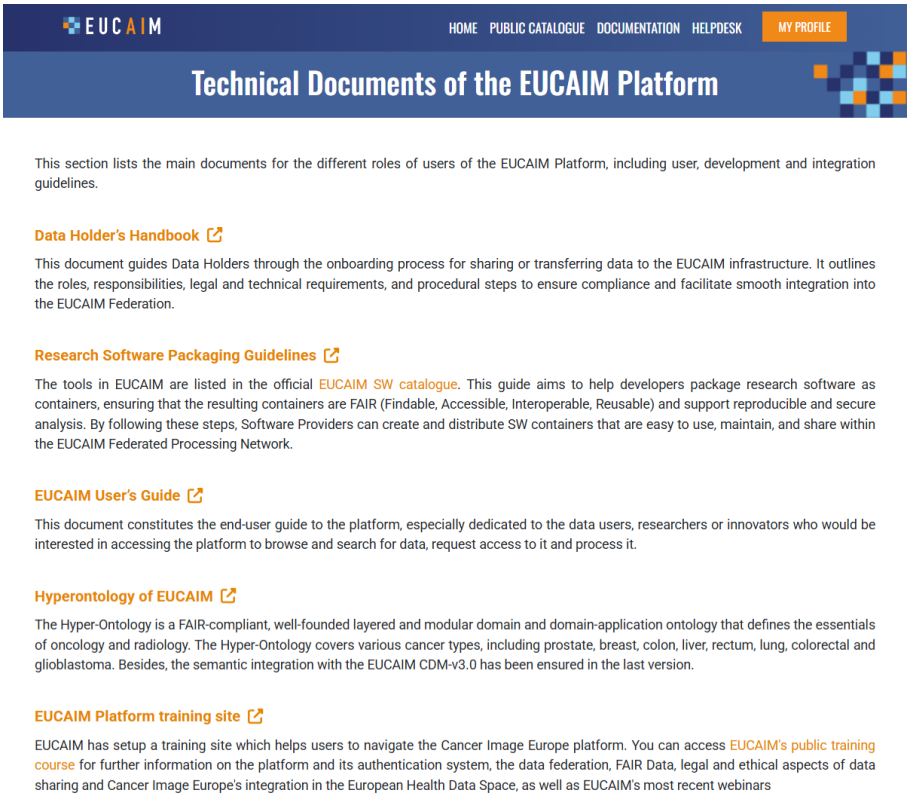



*Figure 4: Documentation area*

### 2.1.4. User's Library

The dashboard integrates a new service[8] that collects the information from the negotiator concerning the datasets whose access is under review (negotiation under the status "IN_PROGRESS" - see section 2.4.2 for more information on the access lifecycle) and the datasets that the user has access granted (negotiation under the status "CONCLUDED" and dataset status "RESOURCE_MADE_AVAILABLE). This service is key for the Federated Processing to check the access permissions, but also provides a shortcut to those datasets to the user. Figure 1 shows a snapshot of the User's Library.

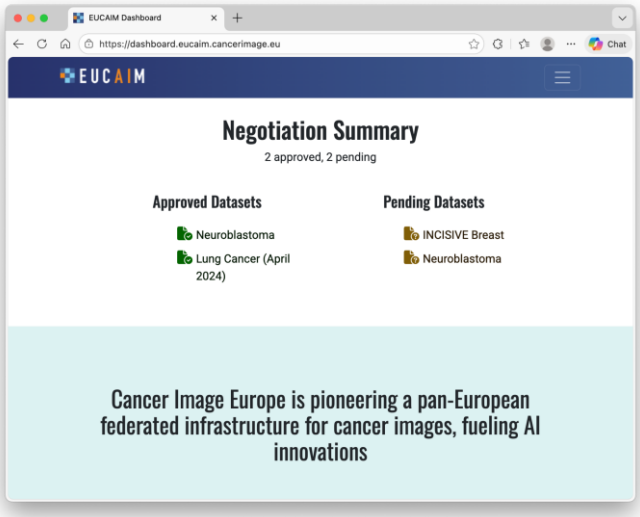



*Figure 5: Negotiation summary showing datasets that are accessible by the user (left) and API specification (right).*

### 2.1.5. Users' Profile

Data holders have to de-identify the organization name when de-identifying the data. For this purpose, the dashboard generates in the user's profile, a UUID obtained from the data holder's institution according to the users' credential organization domain. This guarantees that data holders will use the same UUID and this will not be known by members of other organizations. The information is extracted from the *schac_home_organization* field of the user's credentials. Figure 2, shows a snapshot of this feature.

[8] https://user-negotiations-info.eucaim.cancerimage.eu/api/v1/datasets

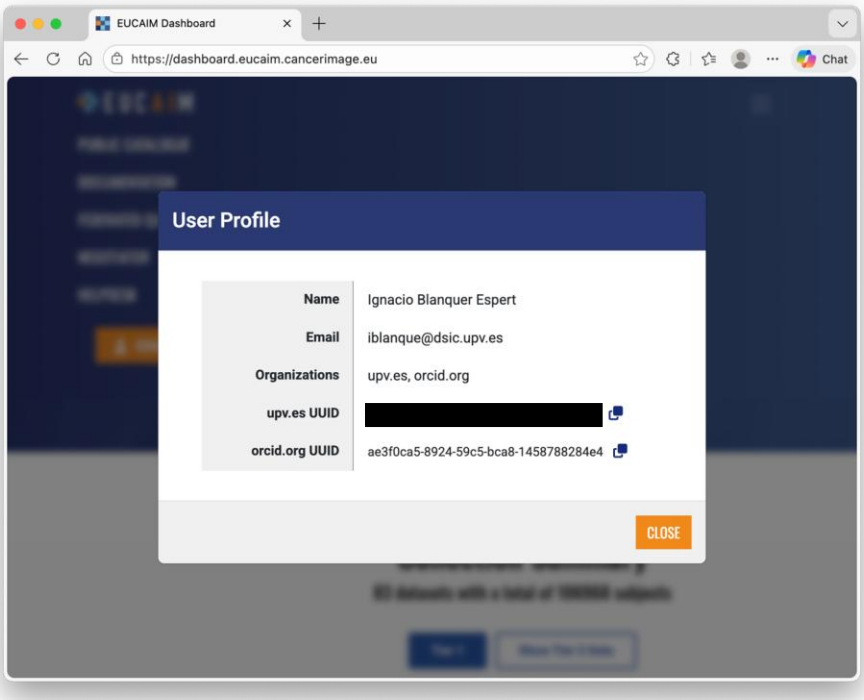



*Figure 6: Data Holder's centre UUID. The application shows the UUIDs for all the domains where the user has access to.*

## 2.2. Catalogue

The catalogue has the information of the metadata of the collections exposed by the federation. The data is registered in the catalogue by the catalogue managers as a request of the Data Holder. The updates performed since the previous deliverable are:

### 2.2.1. Metadata in EUCAIM-DCAT-AP

The metadata in the catalogue are mapped to the EUCAIM-DCAT-AP model, based on HealthDCAT-AP.

### 2.2.2. Molgenis EMX2 version

The catalogue application is based on the Molgenis catalogue. The new version (EMX2) uses a Postgres SQL backend, provides a GraphQL API and uses VueJS for the user's interface. The catalogue application has been migrated to this new environment, which also provides an improved support for the FAIR Data Points. Figure 3 shows a snapshot of the catalogue.

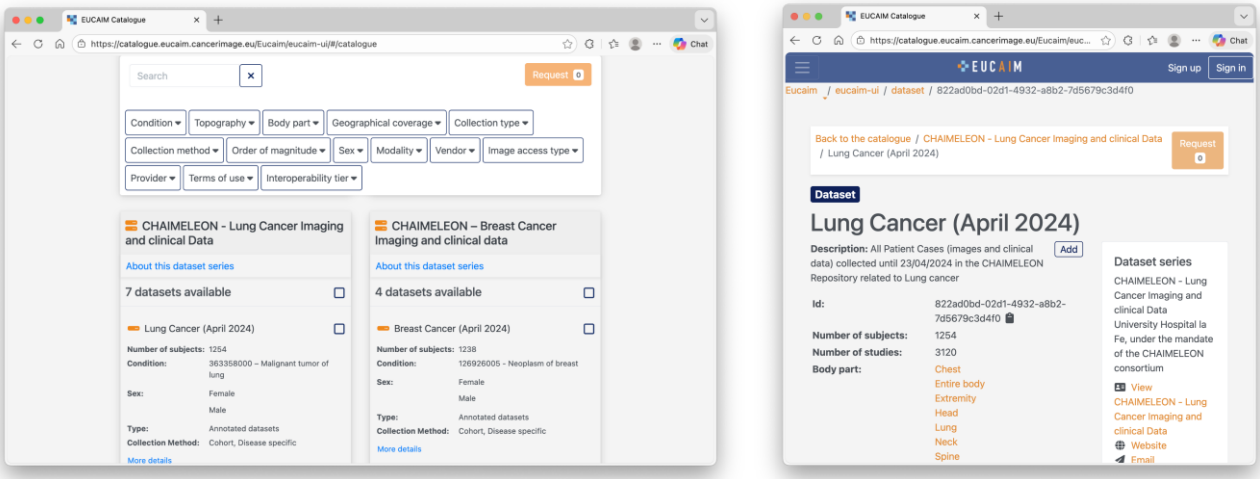



*Figure 3. Snapshots of the Catalogue.*

### 2.2.3. FAIR Data Point

A FAIR Data Point (FDP) is a metadata service that allows digital object owners to publish semantically-rich and machine-actionable metadata in RDF in a way that conforms to the FAIR (Findable, Accessible, Interoperable, Reusable) principles[9]. Formally speaking, a FAIR Data Point adheres to the corresponding API specifications[10]. In Molgenis EMX2 the catalogue metadata is exposed by offering a flat RDF representation, still following best practices in metadata sharing. While different in implementation, the RDF endpoint of EUCAIM's Catalogue follows the FDP philosophy.

The properties of the metadata classes currently implemented in the catalogue have been annotated based on the EUCAIM-DCAT-AP metadata model, to show URIs for each property name, see Figure 4. The values of properties that follow specific vocabularies, are being updated to follow URIs from the EUCAIM Hyperontology. Broadcasting these updated property value URIs is supported in a newer version of Molgenis EMX2. Progress is currently being made to match EUCAIM's Catalogue to this recent version of Molgenis.

```
<http://catalogue.eucaim.cancerimage.eu/Eucaim/api/rdf/Collections?id=2d87741d-77ba-45da-bdc1-71edc82ac557>
  a Eucaim:Collections, qb:Observation, dcat:Dataset;
  qb:dataSet Eucaim:Collections;
  rdfs:label "2d87741d-77ba-45da-bdc1-71edc82ac557";
  dcterms:identifier "2d87741d-77ba-45da-bdc1-71edc82ac557";
  <http://catalogue.eucaim.cancerimage.eu/Eucaim/api/rdf/Collections/column/id> "2d87741d-77ba-45da-bdc1-71edc82
  dcterms:title "Colon Cancer (April 2024)";
  <http://catalogue.eucaim.cancerimage.eu/Eucaim/api/rdf/Collections/column/name> "Colon Cancer (April 2024)";
  dcterms:alternative "CHAI-COLON-2404";
  <http://catalogue.eucaim.cancerimage.eu/Eucaim/api/rdf/Collections/column/acronym>
```

*Figure 4. Example of a dcat:Dataset in the RDF endpoint. Here we see 'dcterms:identifier', and 'dcterms:title' as property URIs according to the EUCAIM-DCAT-AP metadata model.*

The RDF endpoint of EUCAIM's Catalogue can be reached at https://catalogue.eucaim.cancerimage.eu/Eucaim/api/rdf/.

[9] https://www.fairdatapoint.org/
[10] https://specs.fairdatapoint.org/

### 2.2.4. FAIR Data Point (FDP) harvester

To simplify onboarding datasets into EUCAIM's Catalogue from existing sources, a FAIR Data Point (FDP) harvester was developed[11]. With this harvester, metadata exposed in RDF format can be gathered and imported into EUCAIM's Catalogue. These sources can take various forms, for example:

- A local instance of the EUCAIM catalogue, e.g., set up with 'mini-node'[12], offering metadata through an RDF endpoint, after the upgrades mentioned in section 2.2.2 FAIR Data Point have been made
- An instance of the FAIR Data Point reference implementation
- A data storage platform offering metadata exports directly, like the UPV reference node which has an RDF endpoint, or through assisting software, like XNAT in the Health-RI reference node which supports the extraction of metadata and sending it to a FAIR Data Point instance using img2catalog[13].

In the harvester metadata formatted according to EUCAIM-DCAT-AP is retrieved from the configured FDP or RDF endpoint, and mapped to Molgenis EMX2 API calls. Adaptability of the mapping was taken into account during the development, which prepares us for any changes in either the metadata model or internal structure of the catalogue.

In 2026, sustainable deployment of the harvester and procedures surrounding registering and harvesting the endpoints will be fleshed out, allowing EUCAIM's Catalogue to be interconnected in a wider net of metadata sharing, increasing findability.

### 2.2.5. PID resolver

In order to make the UUIDs universally unique PIDs (Persistent Indentifiers), we have created a prefix that redirects (doi-like) the PIDs to the catalogue pages (facilitating dataset referencing) so the ids can be considered totally unique. The redirection is https://pid.eucaim.cancerimage.eu/<<<UID>>, so for example, for the dataset whose UUID is 822ad0bd-02d1-4932-a8b2-7d5679c3d4f0, the PID https://pid.eucaim.cancerimage.eu/822ad0bd-02d1-4932-a8b2-7d5679c3d4f0 will provide a unique an discoverable reference.

## 2.3. Federated Search

### 2.3.1. New Federated Search frontend application

An improved version of the Federated Search User Interface[14] has been developed, based on the new Samply Lens2 library[15] (developed using the Svelte web framework). The Lens backend component Spot has been re-engineered in the Rust programming language[16]. Besides better performance and reliability, that enables defining a custom AND/OR logic between the criteria in the search queries.

### 2.3.2. SQL Backend

For providers adhering to the EUCAIM Common Data Model and using a PostgreSQL database, a query translation from the abstract search tree (AST) containing the search criteria (which is sent by the Federated Search component), into SQL queries corresponding to the EUCAIM CDM schema, has been

[11] https://github.com/Health-RI/molgenis-fdp-harvester
[12] https://github.com/EUCAIM/mini-node
[13] https://github.com/Health-RI/img2catalog
[14] https://github.com/samply/eucaim-frontend
[15] https://github.com/samply/lens
[16] https://github.com/samply/spot

included in the locally ran component Focus[17]. Therefore those providers do not need to develop a query translator / mediator component themselves.

## 2.4. Negotiator

The negotiator application manages the access requests of the Data Users. The last version installed is 3.19. This version includes all the features described in the introduction section and described in this subsection.

### 2.4.1. Application forms

New for the submission of applications by Data Users forms have been coded, according to the Access Committee final models. The forms include 4 sections (Contact Details; Scientific Relevance; Ethic and legal Requirements; and Consent). Figure 4 shows the application environment.

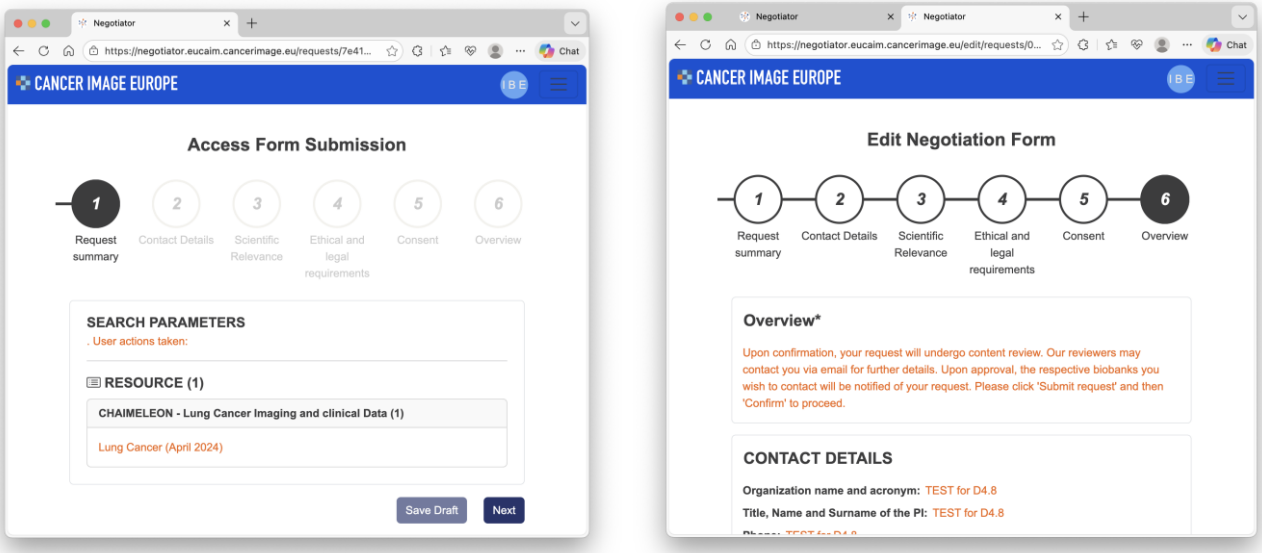



*Figure 7: Snapshots of a request of access and final summary.*

### 2.4.2. User's Permissions

The negotiator application provides an interface for assigning permissions to the individual datasets. There are three roles in the negotiator:

- Data user: The data user that request access to the data.
- Administrators: The persons with capacity of managing the approval of the applications. This permission is assigned in the LS-AAI interface (https://perun.aai.lifescience-ri.eu/organizations/3345/groups/38651)
- Dataset Representatives: The persons that manage the dataset permissions at the Data Holder level.

Figure 5 shows a snapshot of the application interface.

[17] https://github.com/samply/focus

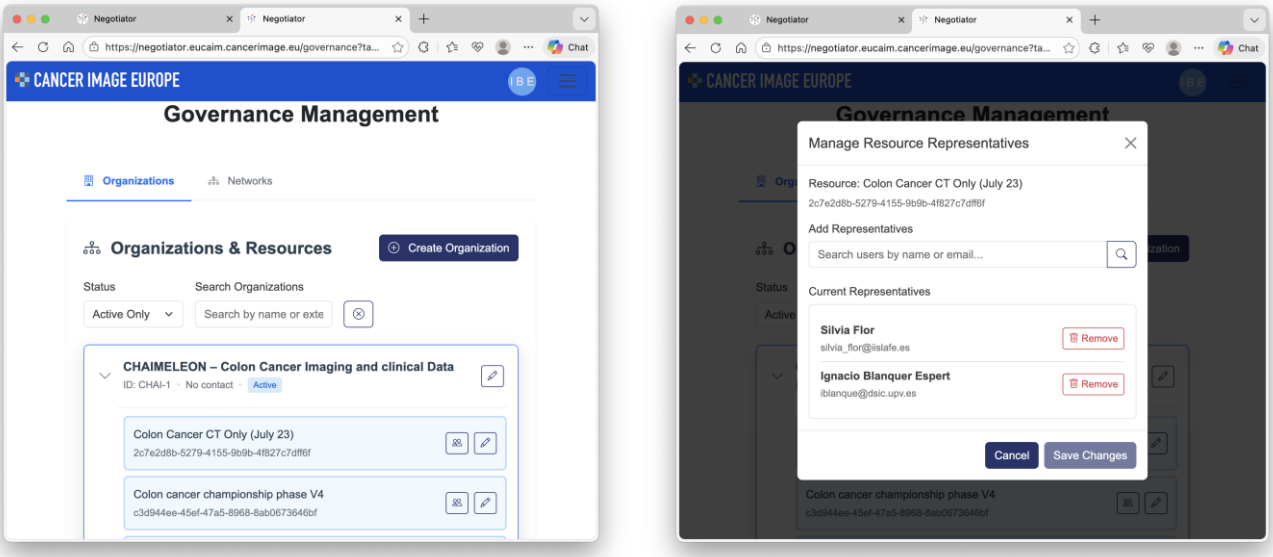



*Figure 8: Management of the user's permissions in the negotiator platform.*

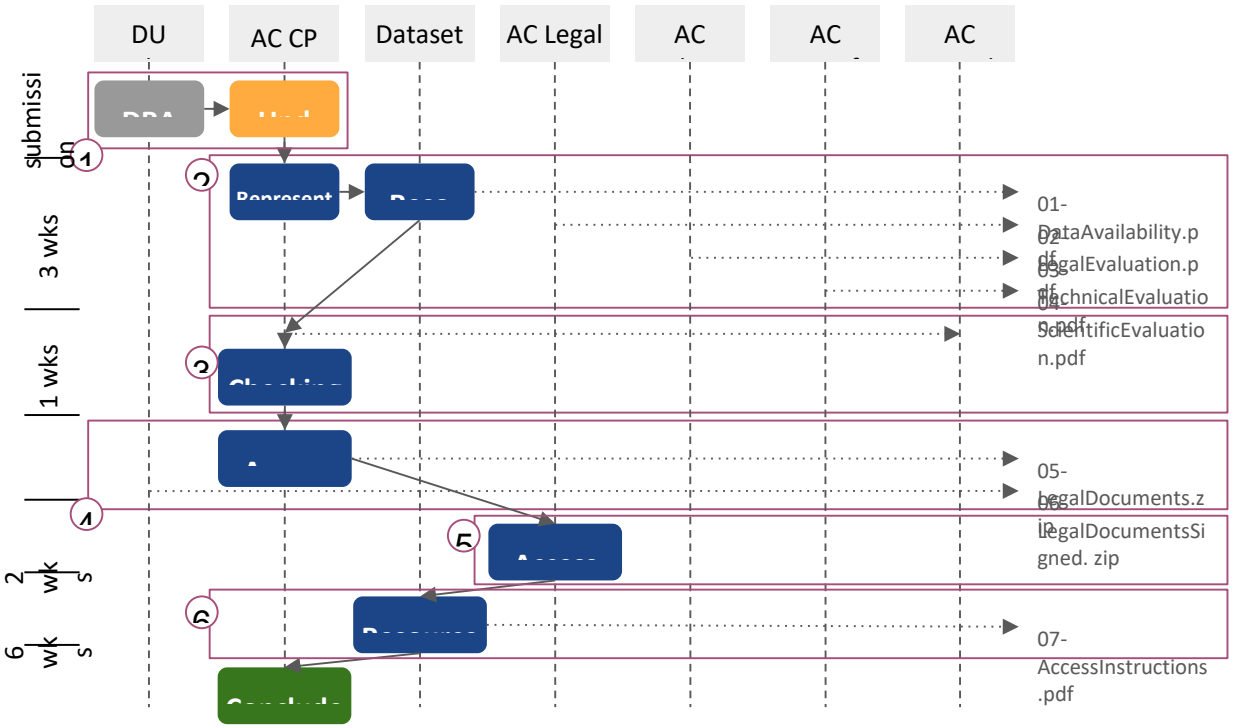
### 2.4.3. Evaluation cycle

This section outlines the steps and interactions that the various experts on the Access Committee should follow during the evaluation of applications.

There are five roles involved in the process:

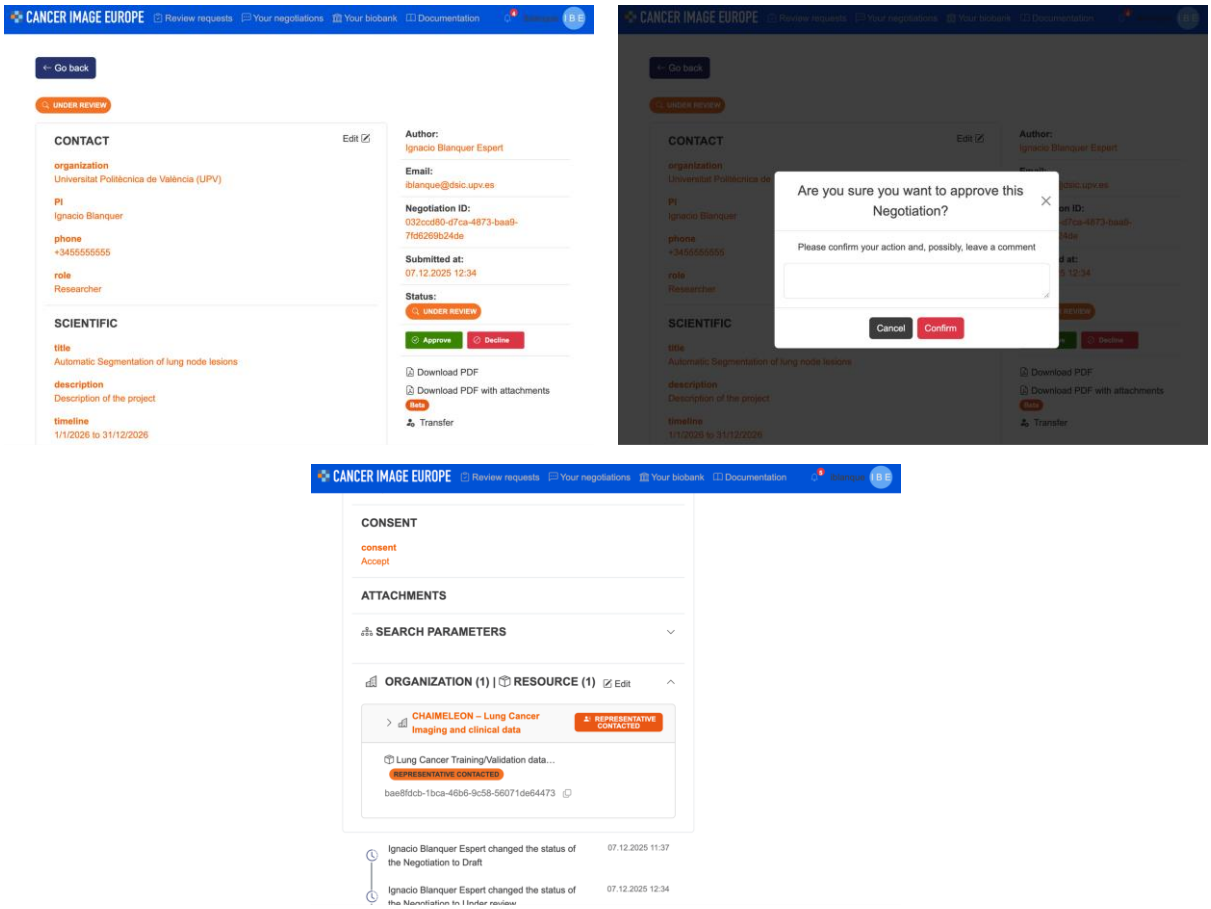
- Data User: The user who submits the application to access data.
- Access Committee Contact Point. The person in charge of managing the coarse statuses of the application in the Negotiator and also serves as the contact point when support is needed.
- Dataset manager. The person in charge of evaluating the availability of the data in the application's request, preparing the data and managing the access requests.
- Access Committee, the team of experts in charge of evaluating the applications.
- Access Committee experts. The Access Committee should appoint, for each application, the following profiles:
    - AC Technical Evaluator(s).
    - AC Legal Evaluator(s).
    - AC Scientific Evaluator(s).

The process is depicted in the following diagram:

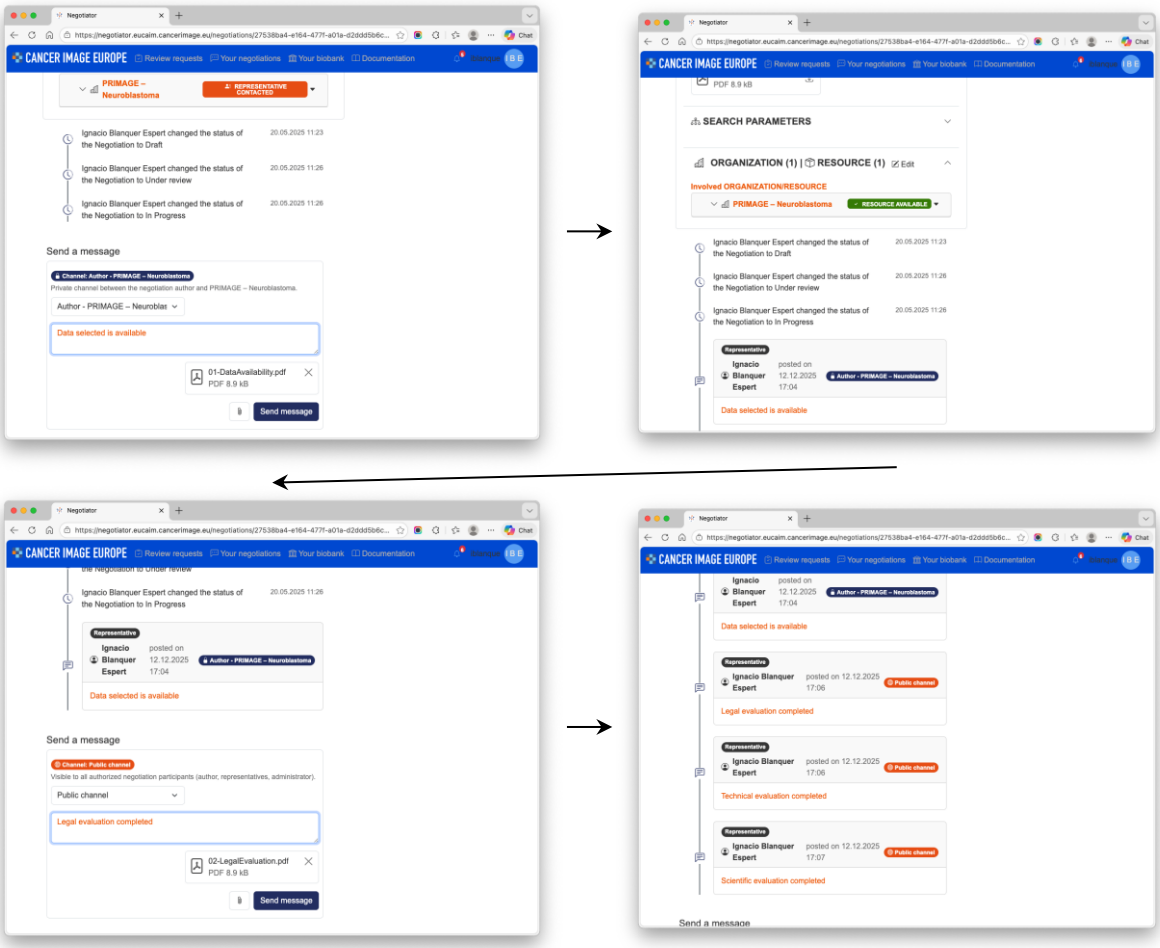



1. When the DU submits an application, an e-mail notification is received by the AC Contact point, who will check the eligibility of the proposal:
    - AC Contact point checks that the information of the different fields are valid.
    - AC Contact point checks that the contact point is correct.

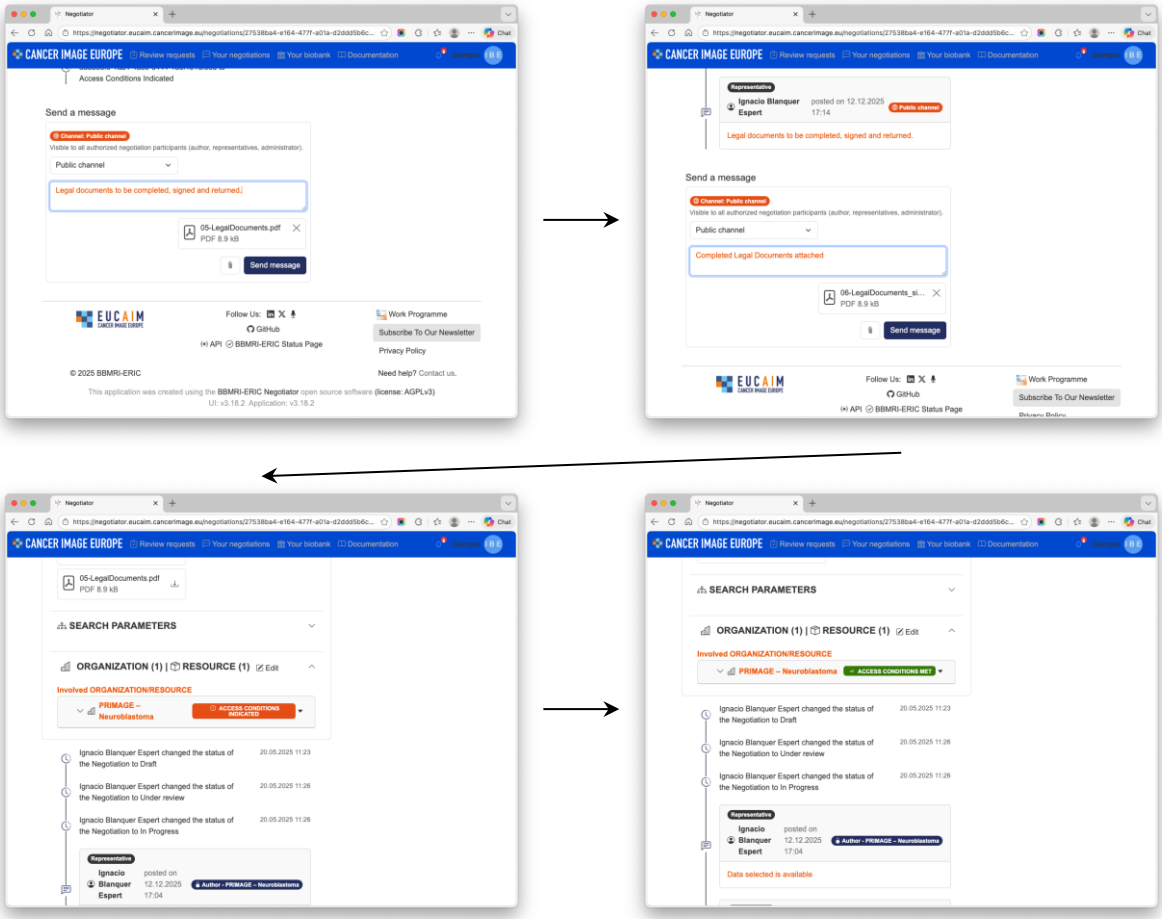
    If the application is correct, the AC contact point clicks on “Approve”. If it were incorrect, the AC contact point will send an internal message through the messaging tool of the negotiator, selecting as channel “Public Channel”, with the request for corrections. If no answer is received, the AC contact point will select “Decline” and the application will reach the “Abandon” status, ending the process. In the positive case, the AC contact point will select the status “Representative Contacted”.



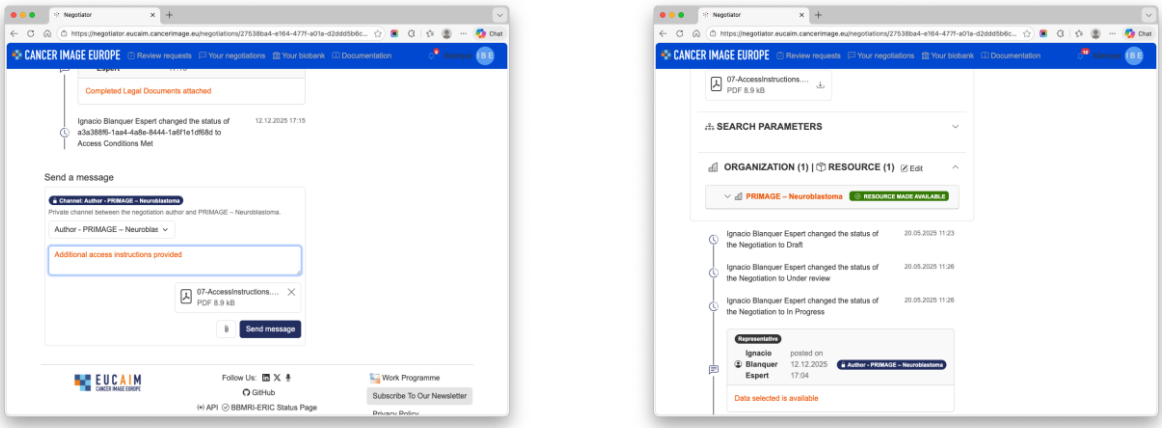

2. The Dataset managers of the datasets requested will receive an automatic e-mail from the negotiator informing that the application is under evaluation. The Dataset managers will check that the data could be made available by selecting “Resource Available”, and selecting “Resource Unavailable” otherwise, using the private channel (the private channel is restricted to the dataset requested). Additionally, a report with the data that could be made available is annexed to the messaging tool (e.g. 01-DataAvailability.pdf). When all the Dataset managers involved in the request have marked the status of “Resource Available”, the AC Contact Point will appoint three reviewers (one legal expert, one technical expert, one scientific expert). Each reviewer will prepare a report that will be uploaded to the public (single evaluation for all the datasets) messaging channel, following a name convention (02-LegalEvaluation.pdf, 03-TechnicalEvaluation.pdf, 04-ScientificEvaluation.pdf). When the three evaluation reports are uploaded, the AC Contact Point will call for approval to the Access Committee by manually sending an e-mail to the Access Committee, including a link to the negotiation info, so it can be reviewed by its members. If no objection is performed, the application is officially endorsed by the AC.




3. The AC Contact Point will provide through the messaging system a link or the templates of the legal documents required (potentially including additional information for each one of the datasets and using the name 05-LegalDocuments.zip). The AC Contact Point will mark the status as “Access conditions indicated” and will wait for the DU to provide the information.
4. The DU will provide the information in the same messaging channel in a file (e.g. 06-LegalDocumentsSigned.zip). If the legal information provided by the DU is valid, the AC legal expert will mark the status as “Access Conditions Met”. If the information is not valid, the AC legal expert can inform the DU through the negotiator messaging box and change the status of the application to “Paused” if the problem is resolvable or “Abandon” if not.




5. The Dataset Manager will receive a message and will start the process of data preparation (data minimisation and setting up the dataset in an available place). The Dataset Manager may have to involve the Data Access Committee of its own repository, using the information provided. When the data is properly prepared, the application is marked in the negotiator as “Resource Made Available”. If additional problems are met, the application can go to a previous status.




6. When all the datasets have reached the status of “Resource Made Available” or “Resource Unavailable”, the AC contact point can conclude the application by clicking on “Conclude”.

## 2.5. Document server for authenticated users, based on NextCloud

A document server has been set up in https://drive.eucaim.cancerimage.eu/. This document server is linked to the pull/push subgroups in LS-AAI, with automatic management of the permissions. The document server provides a way to publish official documents of the EUCAIM platform in a friendly URL and define fine-grain permissions according to the user roles. It has also been targeted as the platform for storing the binaries of the applications that are not containerised. Figure 6 shows the interface of the document server.

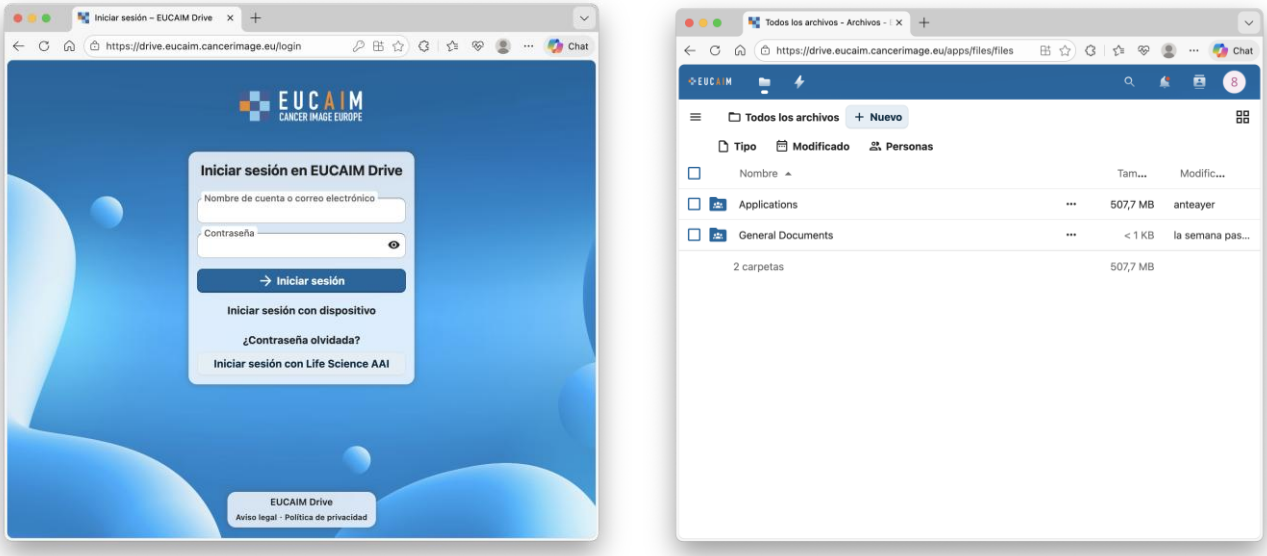



*Figure 6: Document server login (left) and content (right).*