



D3.4 End Users' Platform v2

| Document Identification | | | |
|-------------------------|-------|------------------------|------------|
| Status | Final | Due Date | 30/09/2019 |
| Version | 1.0 | Submission Date | 02/10/2019 |

| | | | |
|-------------------------------|-----------------------|--------------------------------|----------------------------|
| Related WP | WP3 | Document Reference | D3.4 |
| Related Deliverable(s) | D3.2 | Dissemination Level (*) | PU |
| Lead Participant | ATOS FR | Lead Author | HAUGOMMARD Anne |
| Contributors | ATOS, WIRELESSINFO | Reviewers | Tomas Mildorf, PLAN4ALL |
| | | | Marcela Doubkova, PESSL |

Keywords:

Data Analytics, Big Data, e-Infrastructure, Architecture, Design, EUXDAT

This document is issued within the frame and for the purpose of the EUXDAT project. This project has received funding from the European Union's Horizon2020 Framework Programme under Grant Agreement No. 777549. The opinions expressed and arguments employed herein do not necessarily reflect the official views of the European Commission.

This document and its content are the property of the EUXDAT Consortium. All rights relevant to this document are determined by the applicable laws. Access to this document does not grant any right or license on the document or its contents. This document or its contents are not to be used or treated in any manner inconsistent with the rights or interests of the EUXDAT Consortium or the Partners detriment and are not to be disclosed externally without prior written consent from the EUXDAT Partners.

Each EUXDAT Partner may use this document in conformity with the EUXDAT Consortium Grant Agreement provisions.

(*) Dissemination level.-**PU**: Public, fully open, e.g. web; **CO**: Confidential, restricted under conditions set out in Model Grant Agreement; **CI**: Classified, **Int** = Internal Working Document, information as referred to in Commission Decision 2001/844/EC.

Document Information

| List of Contributors | |
|------------------------|--------------|
| Name | Partner |
| Anne Haugommard | ATOS FR |
| Julien Perrin | ATOS FR |
| Michal Kepka | WIRELESSINFO |
| Spiros Michalakopoulos | ATOS ES |
| Daniel Rodera | ATOS ES |

| Document History | | | |
|------------------|------------|------------------|--|
| Version | Date | Change editors | Changes |
| 0.1 | 12/07/2019 | ATOS FR | Table of contents |
| 0.2 | 23/09/2019 | All contributors | First version of the document, for review |
| 0.3 | 30/09/2019 | ATOS FR | Taking into account remarks from reviewers: Keywords, |
| 1.0 | 01/10/2019 | ATOS SP | Final version for quality review |
| FINAL | 01/10/2019 | | FINAL VERSION TO BE SUBMITTED |

| Quality Control | | |
|--------------------|----------------------------|---------------|
| Role | Who (Partner short name) | Approval Date |
| Deliverable leader | Anne Haugommard (ATOS FR) | 01/10/2019 |
| Technical manager | Fabien Castel (ATOS FR) | 01/10/2019 |
| Quality manager | Susana Palomares (ATOS ES) | 01/10/2019 |
| Project Manager | Javier Nieto (ATOS ES) | 01/10/2019 |

| | | | | | | | |
|-----------------------|-----------------------------|-----------------------|----|-----------------|--------------|----------------|-------|
| Document name: | D3.4 End Users' Platform v2 | | | | Page: | 2 of 31 | |
| Reference: | D3.4 | Dissemination: | PU | Version: | 1.0 | Status: | Final |

Table of Contents

| | |
|--|----|
| Document Information | 2 |
| Table of Contents | 3 |
| List of Tables..... | 5 |
| List of Figures | 6 |
| List of Acronyms..... | 7 |
| 1. Executive Summary | 8 |
| 2. Purpose of the document..... | 9 |
| 2.1 Relation to other project work..... | 9 |
| 2.2 Structure of the document | 9 |
| 3. Data connectors..... | 10 |
| 3.1 Digital Elevation Model | 10 |
| 3.2 Open Land Use Database | 11 |
| 3.3 Sentinel data access through Mundi | 11 |
| 3.4 Meteoblue connector | 11 |
| 3.5 Pessl field climate connector..... | 11 |
| 3.6 Hydrology and OpenStreetMap..... | 11 |
| 4. Development environment | 13 |
| 5. Users' frontend..... | 15 |
| 5.1 Main page | 15 |
| 5.2 Catalogue..... | 16 |
| 5.2.1 Introduction | 16 |
| 5.2.2 Deployment | 16 |
| 5.2.3 User interface | 19 |
| 5.3 Implemented scenarios | 23 |
| 5.3.1 Crop Monitoring..... | 24 |
| 5.3.2 Open Land Use | 25 |
| 5.4 Cloudify console..... | 25 |
| 5.5 Marketplace | 26 |
| 6. Users management | 28 |

| | | | | | | |
|-----------------------|-----------------------------|-----------------------|----|-----------------|--------------|----------------------|
| Document name: | D3.4 End Users' Platform v2 | | | | Page: | 3 of 31 |
| Reference: | D3.4 | Dissemination: | PU | Version: | 1.0 | Status: Final |

| | |
|---------------------|----|
| 7. Conclusions..... | 30 |
| 8. References..... | 31 |

| | | | | | | | |
|-----------------------|-----------------------------|-----------------------|----|-----------------|--------------|----------------|-------|
| Document name: | D3.4 End Users' Platform v2 | | | | Page: | 4 of 31 | |
| Reference: | D3.4 | Dissemination: | PU | Version: | 1.0 | Status: | Final |

List of Tables

No table of figures entries found.

| | | | | | | | |
|-----------------------|-----------------------------|-----------------------|----|-----------------|--------------|----------------|-------|
| Document name: | D3.4 End Users' Platform v2 | | | | Page: | 5 of 31 | |
| Reference: | D3.4 | Dissemination: | PU | Version: | 1.0 | Status: | Final |

List of Figures

| | |
|---|----|
| <i>Figure 1 : Overview of data connectors</i> | 10 |
| <i>Figure 2 : Detailed view of the Jupyter notebook content</i> | 13 |
| <i>Figure 3 : Overview of EUXDAT Platform v2</i> | 15 |
| <i>Figure 4: Deployment UML diagram for the (Open)Micka component</i> | 17 |
| <i>Figure 5: Interfaces provided by the (Open)Micka</i> | 18 |
| <i>Figure 6: The (Open)Micka default user interface</i> | 20 |
| <i>Figure 7: Default detailed response in user interface</i> | 21 |
| <i>Figure 8: Populating the catalogue in user interface – manual creation of metadata</i> | 22 |
| <i>Figure 9: Validating the items (metadata records) in the catalogue</i> | 22 |
| <i>Figure 10: Example of RDF encoding as metadata publication</i> | 23 |
| <i>Figure 11 Crop monitoring application and main interactions with the other components.</i> | 24 |
| <i>Figure 12: Open Land Use application and main interactions with the other components.</i> | 25 |
| <i>Figure 13: OLU Orchestrator workflow</i> | 26 |
| <i>Figure 14: Zen Cart subcomponents</i> | 27 |
| <i>Figure 15 : integration status of EndUsers' platform components to centralized users management system</i> | 28 |

| | | | | | | |
|-----------------------|-----------------------------|-----------------------|----|-----------------|--------------|----------------------|
| Document name: | D3.4 End Users' Platform v2 | | | | Page: | 6 of 31 |
| Reference: | D3.4 | Dissemination: | PU | Version: | 1.0 | Status: Final |

List of Acronyms

| Abbreviation / acronym | Description |
|------------------------|--|
| EC | European Commission |
| Dx.y | Deliverable number y belonging to WP x |
| WP | Work Package |
| OSM | Open Street Map |
| DEM | Digital Elevation Model |
| OGC | Open Geospatial Consortium |
| WMS | Web Map Service – OGC standard |
| WFS | Web Feature Service – OGC standard |
| CSW | Catalogue Service for the Web – OGC standard |
| SSO | Single-Sign-On |
| HPC | High Performance Computing |
| GUI | Graphical User Interface |
| API | Application Programming Interface |
| | |

| | | | | | | | |
|-----------------------|-----------------------------|-----------------------|----|-----------------|--------------|----------------|-------|
| Document name: | D3.4 End Users' Platform v2 | | | | Page: | 7 of 31 | |
| Reference: | D3.4 | Dissemination: | PU | Version: | 1.0 | Status: | Final |

1. Executive Summary

This document goes along the second version of the EUXDAT platform, implemented at the current stage of the project implementation (M22). It presents the current status of the ready to use features, in addition to D3.2 that has detailed what has been implemented in the first version of the EUXDAT platform.

This document is focused on the end users' platform components that are deployed and ready to use. These components are deployed on a PaaS layer hosted on a cloud infrastructure. The description of this layer is not part of this document as it is described in the WP4 D4.4 deliverable.

The components described in this document fall into three categories. Firstly, data connectors are described. These components allow users to access specific datasets with easy to use interfaces.

Secondly, components related to the end users' interface are presented. The first set of components implementing an online development environment is described. This environment constitutes the first interface reachable by EUXDAT users to interact with the resources provided by the platform. An overview of the future end users' frontend is also provided.

Lastly, the component related to the management of the EUXDAT users is presented. This component is central to the EUXDAT platform as all other components depend on it to deal with security and authentication matters.

| | | | | | | | |
|-----------------------|-----------------------------|-----------------------|----|-----------------|--------------|----------------|-------|
| Document name: | D3.4 End Users' Platform v2 | | | | Page: | 8 of 31 | |
| Reference: | D3.4 | Dissemination: | PU | Version: | 1.0 | Status: | Final |

2. Purpose of the document

The EUXDAT end user platform gathers a set of components that are directly accessed by the end users. The objective of this document is to provide a clear view of the implementation status of this integrated platform at the end of v2 of the platform (M22).

2.1 Relation to other project work

This document presents the new elements available in End Users' platform since D3.2 "End Users' Platform v1" [8], and a direct follow-up of the D3.3 "Detailed Specification of the End Users' Platform v2" [1], which provides specification and design elements use as a basis to develop the second version of the platform.

It is also articulated with D4.4 "Infrastructure Platform v2" [9] and D5.5 "EUXDAT e-Infrastructure v2" [7] as all together these documents provide insight on the current status of the overall EUXDAT e-infrastructure for v2 :

- D3.4 describes the implementation of the end users' platform
- D4.4 describes the status of the infrastructure platform (for both cloud and HPC resources)
- D5.5 describes the status of the overall e-infrastructure focusing on the user point of view

2.2 Structure of the document

This document is structured in 4 major chapters:

Chapter 3 describes the data connectors deployed on the platform.

Chapter 4 presents the online development environment.

Chapter 5 gives an overview of the future user's frontend.

Chapter 6 describes how users are managed on the platform.

| | | | | | | | |
|----------------|-----------------------------|----------------|----|----------|-------|---------|-------|
| Document name: | D3.4 End Users' Platform v2 | | | | Page: | 9 of 31 | |
| Reference: | D3.4 | Dissemination: | PU | Version: | 1.0 | Status: | Final |

3. Data connectors

The following figure shows the different data connectors available through EUXDAT platform. Each one is described in a dedicated chapter below.

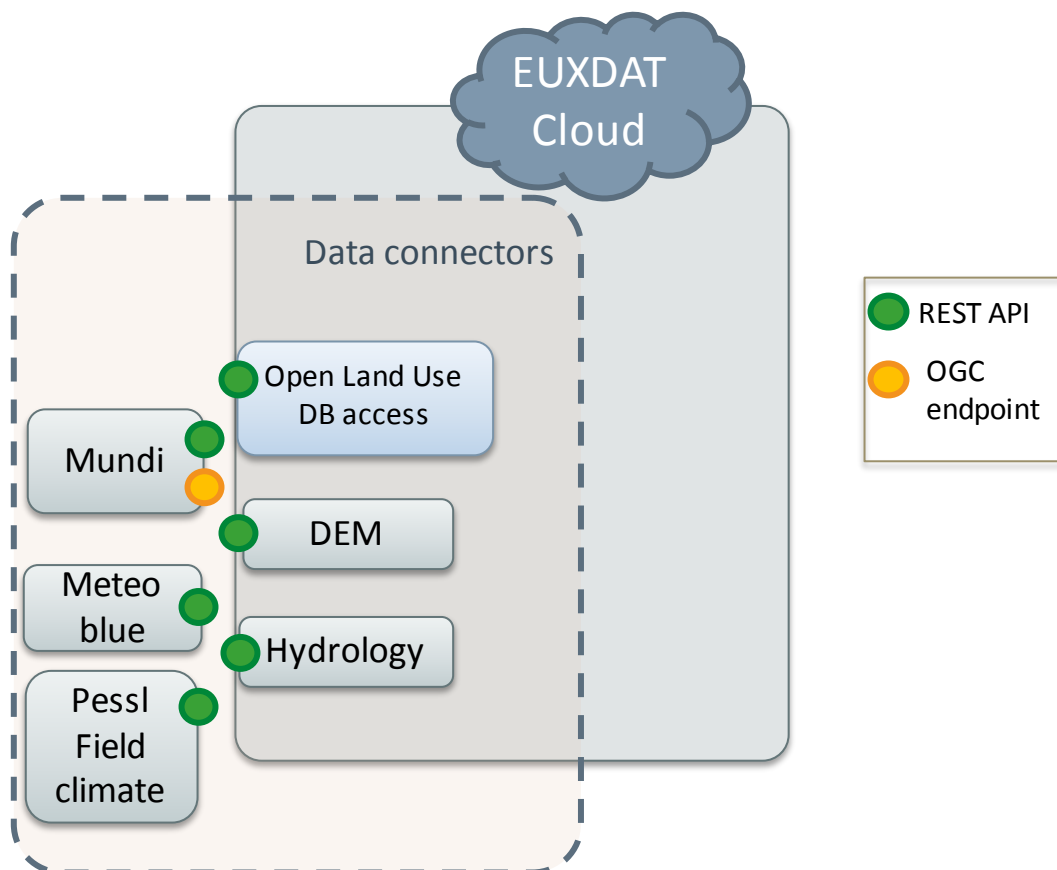


Figure 1 : Overview of data connectors

3.1 Digital Elevation Model

The previous version of the digital elevation model data connector has been described in v1 of this document D3.2 [8].

In End User’s Platform V2, the following elements have been added/modified:

- The API now takes two additional inputs on top of the area of interest. The projection of the area of interest given to the API and the projection wanted for the data returned by the API. [https://en.wikipedia.org/wiki/Map_projection]

| | | | | | | | |
|----------------|-----------------------------|----------------|----|----------|-------|----------|-------|
| Document name: | D3.4 End Users’ Platform v2 | | | | Page: | 10 of 31 | |
| Reference: | D3.4 | Dissemination: | PU | Version: | 1.0 | Status: | Final |

- The API is now capable of returning the data as a downloadable GeoTIFF file as well as a Numpy Array.

The full description of the API will be available in D5.5 [7].

3.2 Open Land Use Database

The access through a REST API to Open Land Use database has already been described in details in D3.3 [1]. No changes have been implemented since.

3.3 Sentinel data access through Mundi

The access through both an OGC endpoint and a REST API to Sentinel data through Mundi web services has already been described in details in D3.3 [1]. No changes have been implemented since.

3.4 Meteoblue connector

This connector to meteoblue REST API has already been described in D3.3 [1]. No changes have been implemented since.

Note: the connector implementation status is partial in EUXDAT platform v2.

Meteoblue API requires a user access token from a Meteoblue commercial user account, and the mapping between a Meteoblue user account and a EUXDAT account is not managed in the connector yet. Currently a generic Meteoblue account for all Euxdat users is used.

3.5 Pessl field climate connector

This connector to Pessl API has already been described in D3.3 [1]. No changes have been implemented since.

Note : the connector implementation status is partial in EUXDAT platform v2.

Pessl API requires a user access token from a Pessl commercial user account, and the mapping between a Pessl user account and a EUXDAT account is not managed in the connector yet. Currently a generic Pessl account for all Euxdat users is used.

3.6 Hydrology and OpenStreetMap

Hydrology data refer to the state of ground, the position and surface of lakes and rivers as well as coastlines and all other water related data.

This data is directly obtained from OpenStreetMap (OSM) data repository [10], or from a third-party server, like the “Geofabrik Download Server” [11]. As OSM can deliver a huge file containing data for the all planet [12], Geofabrik delivers the same data but extracted by continent, country or region.

| | | | | | | | |
|-----------------------|-----------------------------|-----------------------|----|-----------------|--------------|----------------|-------|
| Document name: | D3.4 End Users' Platform v2 | | | | Page: | 11 of 31 | |
| Reference: | D3.4 | Dissemination: | PU | Version: | 1.0 | Status: | Final |

The data can be downloaded in different formats: osm.pbf, osm.bz2 or shp.zip. The osm.pbf format should be favoured as it can be processed quicker than other format using different tools such as Osmium, Osmosis, imposm, osm2pgsql, mkgmap, and others.

The raw downloaded OSM database contains much more than just hydrology data. It includes information about highways, buildings, amenities, shops... and needs to be filtered to only keep water related data. The Osmium tool has been chosen to process the raw database as it can extract a geographic region (from a bounding box or a polygon), filter data by tags and convert data to another format easily and quicker than other tools. Osmium may also daily update the raw downloaded database thanks to replication files to avoid downloading a new version of this database each time it is available. Replication files also called change files or diff files contain all changes between a new state of an OSM database and the previous one. Those files are provided by OSM as well as Geofabrik download server. Lastly, OSM and Geofabrik propose a history version of the databases that contain all versions of all objects that ever existed in the OSM database. This version will be used as it allows to filter the data by time and thus get an OSM database file containing the data as it would have looked at the chosen time.

A history version and an up to date version of the OSM database will be uploaded to the EUXDAT e-Infrastructure and an API will be developed to make an easy access to the data. The API will be coded as the DEM API, using Python and the Flask framework. At the moment, it is designed to take as an input the area of interest, plus the tags [13] and optionally the date from which the data will be filtered. The user will have the choice to use a GET or a POST method with a bounding box or a GeoJSON file respectively, describing the area of interest. The API will return the extracted data as downloadable GeoJSON file.

Such hydrology data can be described as Water Bodies (polygonal features) and Water Lines (linear features) and used for different scenarios if needed.

The full description of the OpenStreetMap connector API and the examples will be provided in D5.5 [7].

| | | | | | | |
|-----------------------|-----------------------------|-----------------------|----|-----------------|--------------|----------------------|
| Document name: | D3.4 End Users' Platform v2 | | | | Page: | 12 of 31 |
| Reference: | D3.4 | Dissemination: | PU | Version: | 1.0 | Status: Final |

4. Development environment

As described in previous deliverables D3.2 [8] and D3.3 [1], the component used for development environment is Jupyter notebook.

As a Service provider, the end user can benefit from this Jupyter notebook during the prototyping phase of the implementation of the service.

The following figure presents the detailed content available from the notebook available within the EUXDAT End Users' platform v2.

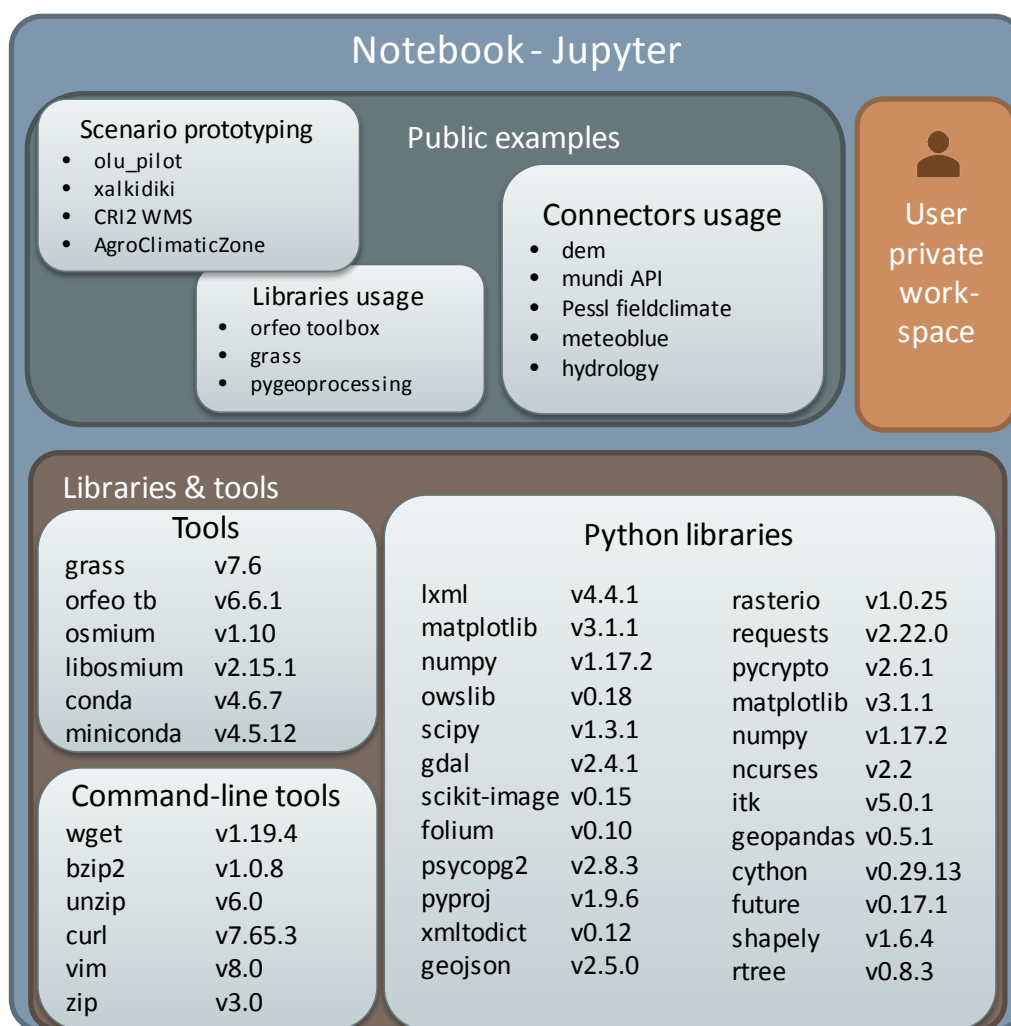


Figure 2 : Detailed view of the Jupyter notebook content

The notebook is connected with Keycloak user management system, and is accessible from the EUXDAT Main page.

| | | | | | | |
|-----------------------|-----------------------------|-----------------------|----|-----------------|--------------|----------------------|
| Document name: | D3.4 End Users' Platform v2 | | | | Page: | 13 of 31 |
| Reference: | D3.4 | Dissemination: | PU | Version: | 1.0 | Status: Final |

Each user benefits from a private workspace.

A set of public examples is accessible:

- Connector usage
- Library usage (orfeo toolbox, pygeoprocessing, grass)
- Scenario prototyping examples

A set of new libraries and tools are available since End Users' platform v1, listed in details in the figure above.

| | | | | | | | |
|-----------------------|-----------------------------|-----------------------|----|-----------------|--------------|----------------|-------|
| Document name: | D3.4 End Users' Platform v2 | | | | Page: | 14 of 31 | |
| Reference: | D3.4 | Dissemination: | PU | Version: | 1.0 | Status: | Final |

5. Users' frontend

EUXDAT users' frontend is composed of a main page, which is an entry point to several components: the metadata catalogue, the implemented scenario dedicated front-ends, and the orchestrator (Cloudify) console.

The market place component is not connected yet to the main page.

A set of data connectors and a centralized user management system are also available.

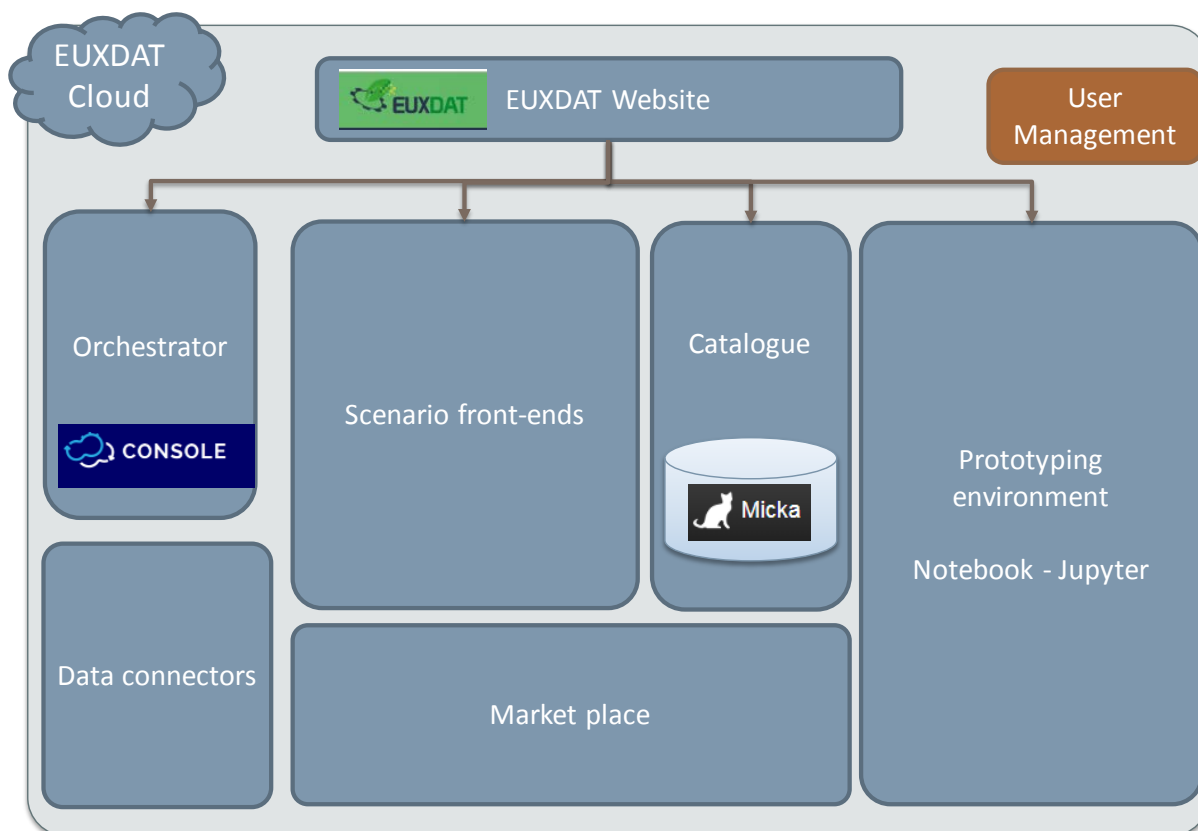


Figure 3 : Overview of EUXDAT Platform v2

5.1 Main page

As described in the D3.2 [8], the frontend is developed using the VueJS framework. The goal of the main page is to bring the user access to all the components in the platform as well as the available scenarios. Following this premise, the main page is presented as a hub where all the links for the different components are presented simply.

The web application is linked with the user management system (Keycloak), presented in the D3.2. The Keycloak provides a Single-Sign-On authentication for all the components in the cluster.

| | | | | | | | |
|----------------|-----------------------------|----------------|----|----------|-------|----------|-------|
| Document name: | D3.4 End Users' Platform v2 | | | | Page: | 15 of 31 | |
| Reference: | D3.4 | Dissemination: | PU | Version: | 1.0 | Status: | Final |

For integrating this functionality in the web application, a plugin was implemented. The Vue-Keycloak plugin provides to the web application all the features needed to connect to the user management system. The plugin uses the Keycloak JS adapter¹ and adds a \$Keycloak property to the Vue instance and can be used as such.

5.2 Catalogue

5.2.1 Introduction

The EUXDAT catalogue is based on the (Open)Micka tool that is a set of libraries and a web application for management and discovery of geospatial (meta)data. It is being offered in two licensing versions. OpenMicka is freely available while Micka is a commercial tool. The designation (Open)Micka is used hereinafter for features similar to both licensing versions. Commercial version of Micka is also available free of charge for the duration of the EUXDAT project. The full documentation of both versions is stored at <https://github.com/hsrs-cz/Micka>.

(Open)Micka provides back-end as well as front-end modular solutions. The main components of the EUXDAT catalogue are presented in section 5.2.2 and Figure 4 respectively. Section 5.2.3 describes the specific strategy for populating the catalogue through the user interface of the EUXDAT catalogue.

5.2.2 Deployment

The following integration modes could be identified regarding the deployment schema:

1. Loose integration: (Open)Micka acts only as a back-end solution that powers the front-end platform/system. Technically, integration is in a form of basic web publication, i.e. a front-end entity receives HTML code (searching results), CSS (formatting) and images (map depicting a spatial extent of the results). All the processing is being performed at (Open)Micka server side.
2. Tight integration: both, back-end as well as front-end (Open)Micka solutions are being used. Front-end in this case means re-using of the (Open)Micka client that also uses JavaScript (see <https://github.com/hslayers/hslayers-ng> for full specification). Such kind of integration is the easiest one, however is customizable only to a certain level given by the technical specifications of the already written client application.
3. Mixed integration: an option derived from the loose integration. (Open)Micka remains a back-end solution, however provides additional web services intended for integration to the defined platform/system. More specifically, highly customizable JSON-based interface supporting OpenSearch is available together with the standardized interface called Catalogue Service for

¹ http://www.keycloak.org/docs/latest/securing_apps/index.html#_javascript_adapter

| | | | | | | | |
|----------------|-----------------------------|----------------|----|----------|-------|----------|-------|
| Document name: | D3.4 End Users' Platform v2 | | | | Page: | 16 of 31 | |
| Reference: | D3.4 | Dissemination: | PU | Version: | 1.0 | Status: | Final |

Web² as defined by the Open Geospatial Consortium with ISO application profile and supported technical modifications as defined by the INSPIRE directive (2007/2/EC).

The EUXDAT's catalogue follows the third integration mode, i.e. a mixed integration as it provides state-of-the-art functionality as well as offers further customisations and developments.

From the technical point of view, (Open)Micka could be integrated to any platform and/or system through Web services as far as the following requirements are met:

- any web server with mod_rewrite enabled,
- PHP 5.6.x with XSL extension,
- PostgreSQL >= 9.2,
- Composer (<https://getcomposer.org/>) - for installation some components.

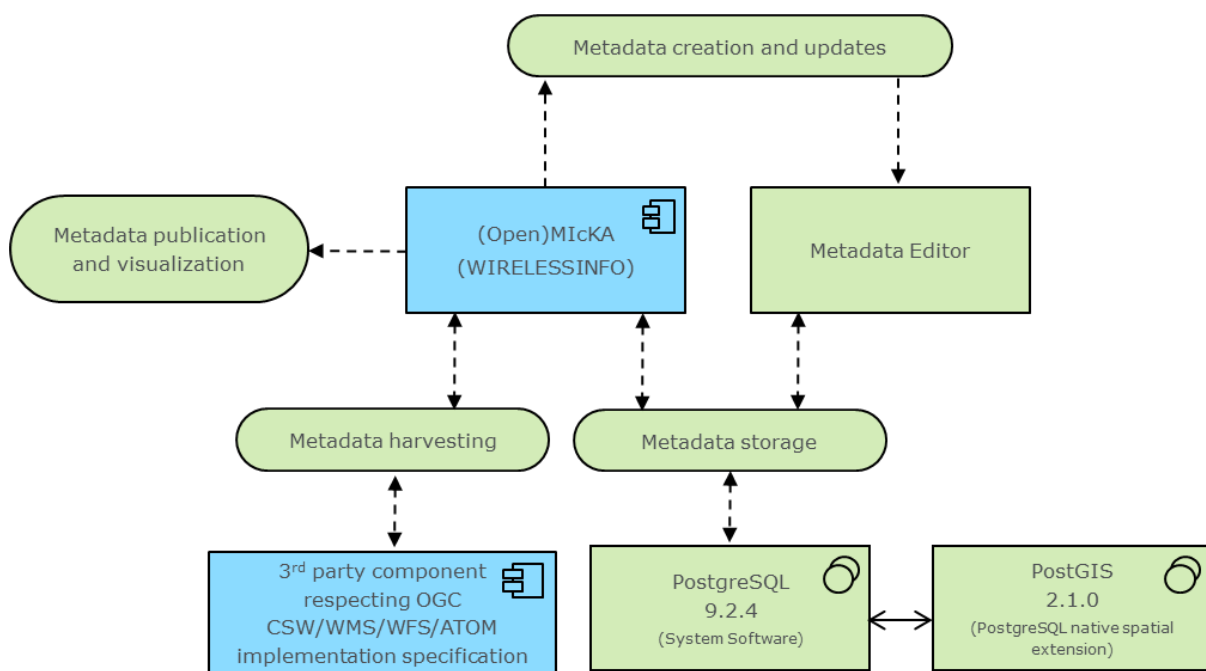


Figure 4: Deployment UML diagram for the (Open)Micka component

The deployment of the EUXDAT catalogue is presented in Figure 4 and Figure 5. Figure 4 depicts the integration of components within the EUXDAT catalogue while Figure 5 aims at definition of the main interfaces. Green classes in the Figure 4 UML diagram present the components that are integral parts of the EUXDAT catalogue and are needed to support all the desired functionality (as described in section 5.2.3.). Blue classes represent the components crucial from the integration perspective, i.e. the core of the (Open)Micka and third party components.

² version 2.0.2; see http://portal.opengeospatial.org/files/?artifact_id=20555

| | | | | | | | |
|----------------|-----------------------------|----------------|----|----------|-------|----------|-------|
| Document name: | D3.4 End Users' Platform v2 | | | | Page: | 17 of 31 | |
| Reference: | D3.4 | Dissemination: | PU | Version: | 1.0 | Status: | Final |

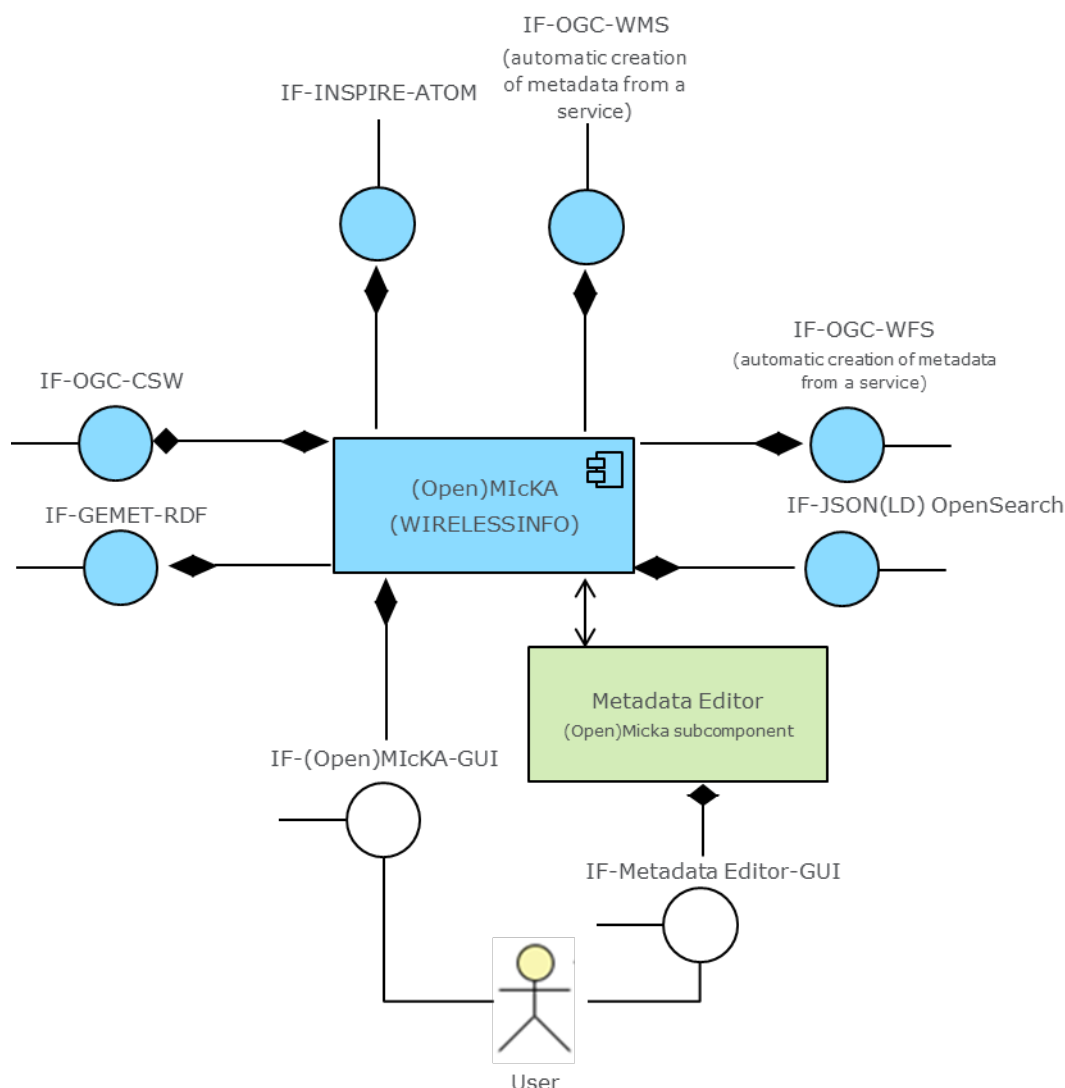


Figure 5: Interfaces provided by the (Open)Micka

The following APIs are defined for the EUXDAT catalogue, as depicted also in Figure 5:

- **(Open)Micka GUI** A user interface for (Open)MicKA. Its basic features are described in section 5.2.3.
- **OGC CSW API** An interface for a communication to other CSW servers and/or clients. The interface follows the full implementation of the OGC CSW 2.0.2 implementation specification including the ISO Application Profile 1.0.
- **OGC WMS API** An interface defined according to the OGC WMS 1.0.0 – 1.3.0 implementation specifications (including INSPIRE modifications) in order to automatically create metadata from a WMS instance.

| | | | | | | | |
|----------------|-----------------------------|----------------|----|----------|-------|----------|-------|
| Document name: | D3.4 End Users' Platform v2 | | | | Page: | 18 of 31 | |
| Reference: | D3.4 | Dissemination: | PU | Version: | 1.0 | Status: | Final |

- **OGC WFS API** An interface defined according to the OGC WFS 1.0.0 – 2.0.0 implementation specifications (including INSPIRE modifications) in order to automatically create metadata from a WFS instance.
- **INSPIRE ATOM API** An object oriented interface for a communication according to the ATOM Syndication format, in a version as defined in the INSPIRE Technical Guidelines for Download services.
- **GEMET RDF API** An interface designed and developed for a communication to the GEMET thesaurus. The implementation follows guidelines for GEMET API as described under the URL: <http://www.eionet.europa.eu/gemet/en/webservices/>.
- **JSON(LD) OpenSearch API** An interface designed and developed to publish of search results in a format suitable for syndication and aggregation.

5.2.3 User interface

The main goal of the EUXDAT catalogue is to connect all the relevant kinds of resources (datasets, web services, sensor measurements, models, maps etc.) within and beyond the project to provide answers, for instance, to the following questions:

- show me all data and (map) visualizations that were developed according to a certain legislation or
- show me what has been done with the certain sensor measurements (derived datasets, policies, link to e-shop selling the raw sensor measurements,...).

As such, the EUXDAT catalogue represents a tool for discovery of various kinds of resources. A general strategy for the EUXDAT catalogue through the user interface may be identified as follows:

1. A user **would like to discover** relevant information regarding his/her area of interest, theme and other preferences. A user e.g. searches for all kind of available information related to European Nitrate Directive in the area on the border of the Czech Republic, Slovakia and Austria.
2. On contrary to Web searching engines, the EUXDAT catalogue enables to define **advanced (multiple) searching criteria**, such as to draw a rectangle in a map to define the area that I am interested in, to define quality of information I am interested in (such as spatial accuracy higher than one meter) or to define the responsible authority. E.g. I would like to obtain only nitrate measurements from official mapping authorities since 2014.
3. A user than **obtains relevant (meta)information** on all the available resources he/she was searching for. He/she may look into details as well as see all the related resources that provides links to other applications. E.g. a user discovers a NitrateDataset that fulfils all his/her criteria and would like to see a preview of such dataset on a map, see the legal act under which the dataset was created, have a link for the sensor measurement that was conducted in order to populate the NitrateDataset or use a link to the e-shop to buy the dataset.
4. From a producer's perspective, a producer may **import** his/her **metadata** from another system or create them manually.
5. A producer than decides which metadata will be **published**, i.e. made available over the internet.

| | | | | | | | |
|----------------|-----------------------------|----------------|----|----------|-------|----------|-------|
| Document name: | D3.4 End Users' Platform v2 | | | | Page: | 19 of 31 | |
| Reference: | D3.4 | Dissemination: | PU | Version: | 1.0 | Status: | Final |

More illustratively, the EUXDAT catalogue allows users to:

1. **Find the relevant information resources** (see also Figure 6)
 - a. Between the following information resources: geospatial and non-geospatial datasets, applications, Web services, sensor measurements, map compositions, models, documents, Web pages, reports, legislation or e-shop. Such list may be customized.
 - b. Define criteria from dozens of so-called queryables as specified in the OGC implementation specification Catalogue Service for Web 2.0.2, including the ISO Application Profile 1.0. The typical examples are freetext search, resource type, area of interest, scale extent, responsible authority, time period etc.
 - c. Since the EUXDAT catalogue provides services, it may be easily connected and powering a third party application.

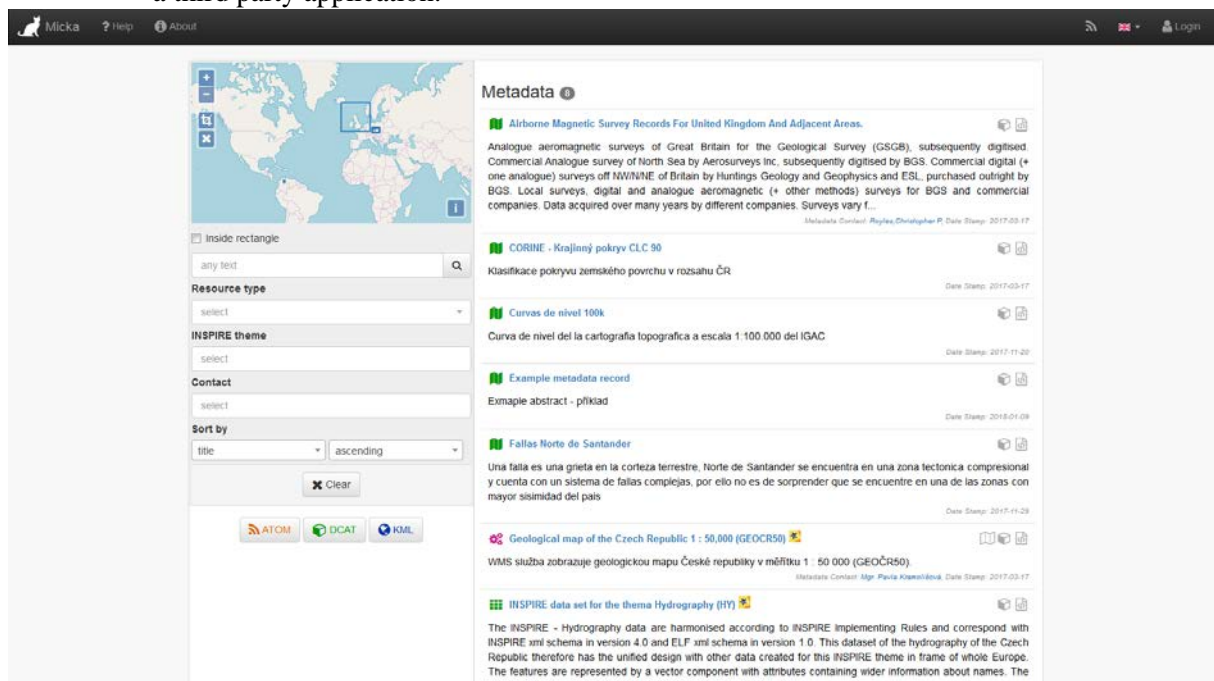


Figure 6: The (Open)Micka default user interface

2. **Display the results** (see also the right side of the Figure 6 for general response of available resources and Figure 7 for the detailed response of one resource)
 - a. In a human friendly way on a Web page and/or in an application for mobile environments.
 - b. In an XML-based source code.
 - c. Through a semantic approach when using the GeoDCAT RDF syntax.
 - d. Through lightweight JSON encoding.

| | | | | | | | |
|----------------|-----------------------------|----------------|----|----------|----------|---------|-------|
| Document name: | D3.4 End Users' Platform v2 | | | Page: | 20 of 31 | | |
| Reference: | D3.4 | Dissemination: | PU | Version: | 1.0 | Status: | Final |

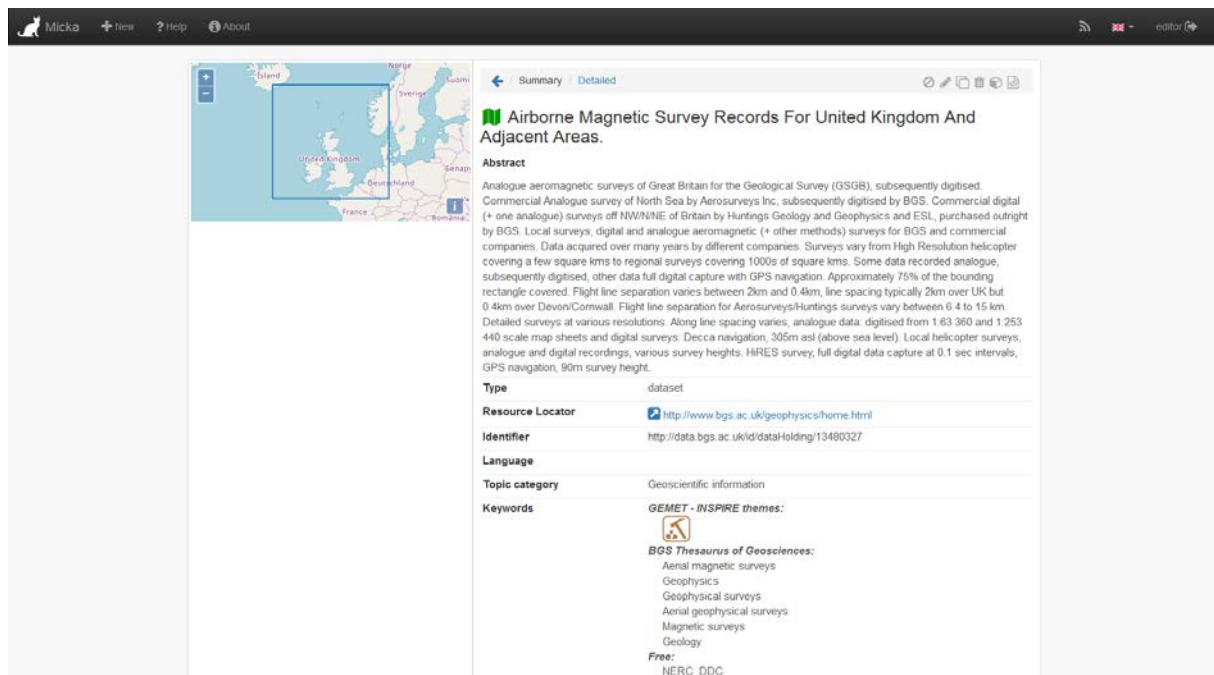


Figure 7: Default detailed response in user interface

3. Import metadata

- From another server having its interface compliant to the OGC implementation specification Catalogue Service for Web 2.0.2.
- From another repository if a connector is developed (for instance, GetCapabilities response of a web service).

4. Create metadata (see also Figure 8)

- According to a currently supported metadata profile: ISO 19115, ISO 19119, INSPIRE, Dublin Core, Feature Catalogue.
- According to a user-defined structure.

| | | | | | | | |
|----------------|-----------------------------|----------------|----|----------|----------|---------|-------|
| Document name: | D3.4 End Users' Platform v2 | | | Page: | 21 of 31 | | |
| Reference: | D3.4 | Dissemination: | PU | Version: | 1.0 | Status: | Final |

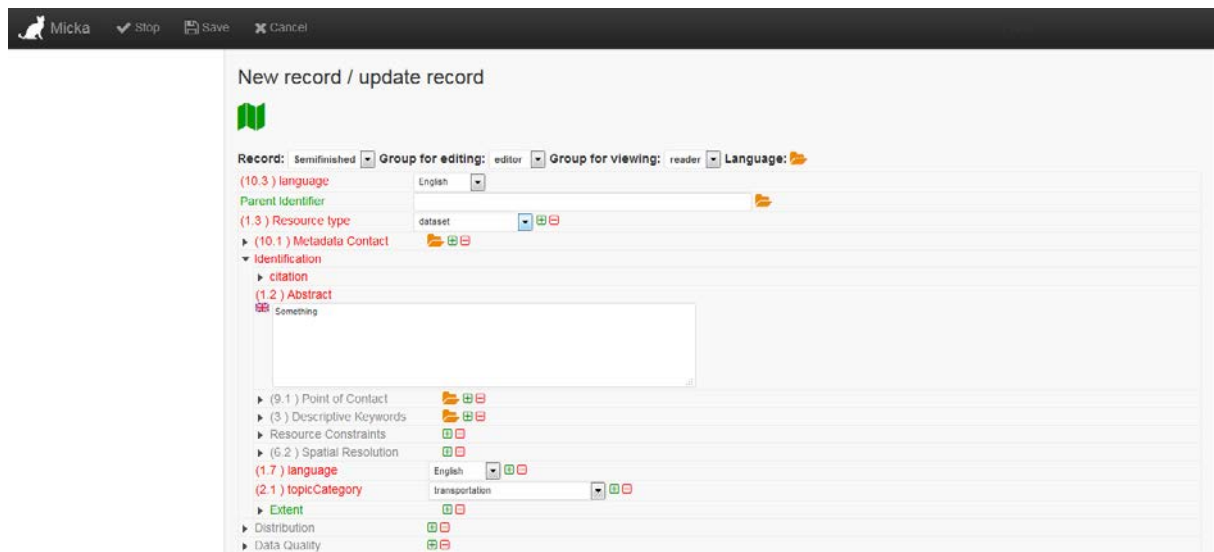


Figure 8: Populating the catalogue in user interface – manual creation of metadata

5. Validate metadata (see also Figure 9)

- a. According to the linked XML schemas.
- b. According to a Schematron pattern.
- c. According to user-defined rules.

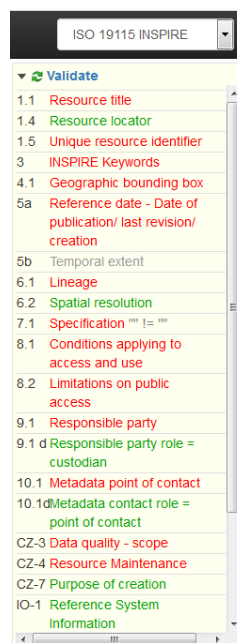


Figure 9: Validating the items (metadata records) in the catalogue

6. Publish metadata (see also Figure 10)

| | | | | | | | |
|----------------|-----------------------------|----------------|----|----------|-------|----------|-------|
| Document name: | D3.4 End Users' Platform v2 | | | | Page: | 22 of 31 | |
| Reference: | D3.4 | Dissemination: | PU | Version: | 1.0 | Status: | Final |

- a. In a user-friendly Web page through XML/RDF/JSON files.
- b. As a Web service, with or without semantics.

```

- <rdf:RDF>
- <rdf:Description rdf:about="/csw/?service=CSW&request=GetRecordById&id=9df8df51-639e-37a8-e044-0003ba9b0d98">
- <foaf:isPrimaryTopicOf>
- <rdf:Description>
  <rdf:type rdf:resource="http://www.w3.org/ns/dcat#CatalogRecord"/>
  <dc:modified rdf:datatype="http://www.w3.org/2001/XMLSchema#date">2016-05-23</dc:modified>
  <dc:language rdf:resource="http://publications.europa.eu/resource/authority/language/ENG"/>
- <dcat:contactPoint>
- <rdf:Description>
  <rdf:type rdf:resource="http://www.w3.org/2006/vcard/ns#Organization"/>
  <vcard:fn xml:lang="en">British Geological Survey</vcard:fn>
  <vcard:hasEmail rdf:resource="mailto:cpr@bgs.ac.uk"/>
- <vcard:hasTelephone rdf:parseType="Resource">
  <vcard:hasValue rdf:resource="tel:+44 115 936 3100 Ex:3389"/>
  <rdf:type rdf:resource="http://www.w3.org/2006/vcard/ns#Voice"/>
</vcard:hasTelephone>
- <vcard:hasAddress>
- <vcard:Address>
  <vcard:street-address>Environmental Science Centre,Keyworth</vcard:street-address>
  <vcard:locality>NOTTINGHAM</vcard:locality>
  <vcard:postal-code>NG12 5GG</vcard:postal-code>
  <vcard:country-name>United Kingdom</vcard:country-name>
</vcard:Address>
</vcard:hasAddress>
</rdf:Description>
</dcat:contactPoint>
- <prov:qualifiedAttribution>
- <prov:Attribution>
- <prov:agent>
- <rdf:Description>
  <rdf:type rdf:resource="http://www.w3.org/2006/vcard/ns#Organization"/>
  <vcard:fn xml:lang="en">British Geological Survey</vcard:fn>
  <vcard:hasEmail rdf:resource="mailto:cpr@bgs.ac.uk"/>
- <vcard:hasTelephone rdf:parseType="Resource">
  <vcard:hasValue rdf:resource="tel:+44 115 936 3100 Ex:3389"/>
  <rdf:type rdf:resource="http://www.w3.org/2006/vcard/ns#Voice"/>
</vcard:hasTelephone>
- <vcard:hasAddress>
- <vcard:Address>
  <vcard:street-address>Environmental Science Centre,Keyworth</vcard:street-address>
  <vcard:locality>NOTTINGHAM</vcard:locality>
  <vcard:postal-code>NG12 5GG</vcard:postal-code>

```

Figure 10: Example of RDF encoding as metadata publication

5.3 Implemented scenarios

Among the 8 scenarios presented in deliverables D2.5 [5] and D5.4 [6], two scenarios have implemented front-ends.

The detailed integration of these scenarios will be presented into future deliverable D5.5 [7] and the following sections describe the components used for the set up of these scenario on the EndUsers' platform side.

| | | | | | | | |
|----------------|-----------------------------|----------------|----|----------|-------|----------|-------|
| Document name: | D3.4 End Users' Platform v2 | | | | Page: | 23 of 31 | |
| Reference: | D3.4 | Dissemination: | PU | Version: | 1.0 | Status: | Final |

5.3.1 Crop Monitoring

Several components are implemented in this scenario, each of this brings different functionalities to the web application. There are three main components:

- Keycloak plugin: is described in the previous section (5.1 Main page). This plugin is implemented in this scenario to keep the user traceability between the different components in the platform.
- Openlayers: this library deals with all the layers showed in the map viewer. Thanks to OpenLayers, the OGC (Open Geospatial Consortium) standards can be used to display and manage the spatial information used in the Crop Monitoring scenario. The main standards used in this scenario are the WFS (Web Feature Service) and the WMS (Web Map Service). This library brings the user the capability to draw and modify polygons in the map, extract the bounding box for each polygon and display the layer's legend as well as other operations.
- Vue-resource plugin: this plugin allows the application to interact with the other components in the cluster through RESTful web services. These services are the key to performing the main functionalities of the application such as run the algorithm or display the user's polygon.

The image below shows the main interactions for each component in the application and the protocols used.

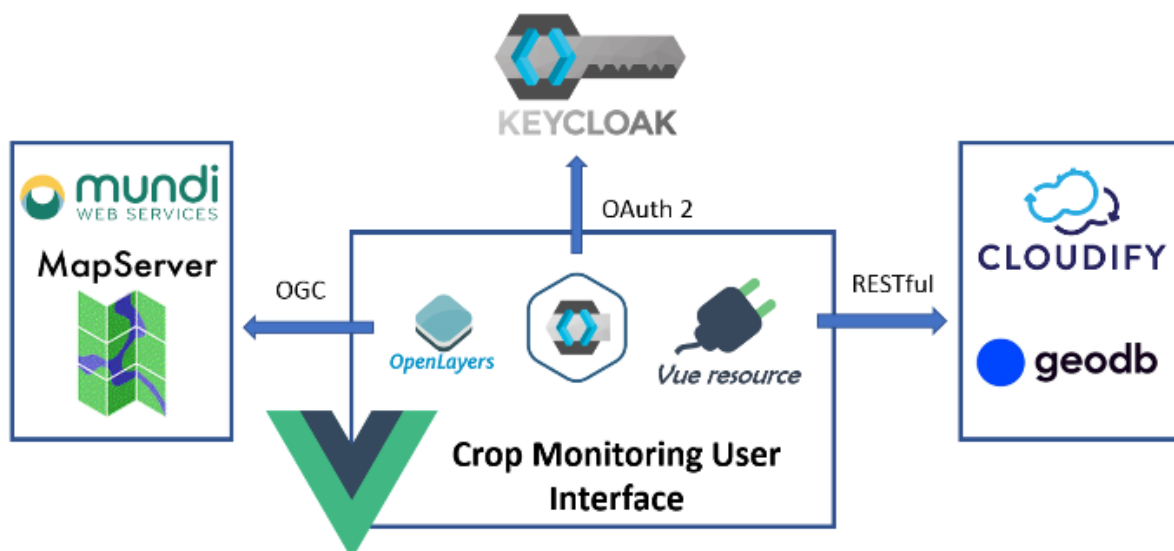


Figure 11 Crop monitoring application and main interactions with the other components.

| | | | | | | | |
|----------------|-----------------------------|----------------|----|----------|-------|----------|-------|
| Document name: | D3.4 End Users' Platform v2 | | | | Page: | 24 of 31 | |
| Reference: | D3.4 | Dissemination: | PU | Version: | 1.0 | Status: | Final |

5.3.2 Open Land Use

The Open Land Use frontend uses the same components described in the scenario above (5.3.1 Crop Monitoring). In this case, the same protocols are used but for interacting with the different components in the platform. A specific API was designed for this scenario and the spatial information shown in the map viewer comes from another server which stores all the data for the Open Land Use dataset. The image below describes the main components as well as the protocols used to retrieve the data.

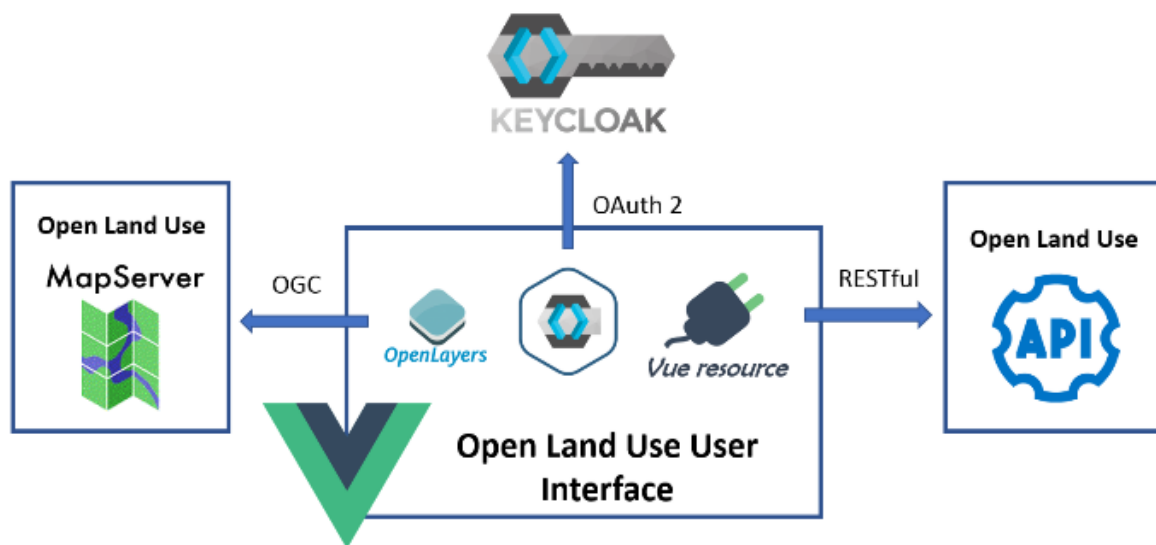


Figure 12: Open Land Use application and main interactions with the other components.

5.4 Cloudfy console

Cloudfy, the solution chosen for orchestration in EUXDAT, was presented in previous deliverables (most notably in D3.3 [1] ad D4.2 [4]). As explained there, the user will not see the Cloudfy console, but will interact with Cloudfy via the EUXDAT Portal. Nevertheless, in D4.2, screenshots and interaction with the console are presented, for completeness. Thus, the reader is directed to those documents for further information.

The reader is also directed to section 3.2 Open Land Use Database of this deliverable, where the Orchestrator operations have been implemented behind the scenes. In Figure 13 the workflow from the Orchestrator’s perspective is presented. The user selects the area they are interested in the Open Land Use UI and steps 1 to 6 are executed. The user can visualize the results, possibly after an email notification that their job has finished executing.

| | | | | | | | |
|----------------|-----------------------------|----------------|----|----------|-------|----------|-------|
| Document name: | D3.4 End Users' Platform v2 | | | | Page: | 25 of 31 | |
| Reference: | D3.4 | Dissemination: | PU | Version: | 1.0 | Status: | Final |

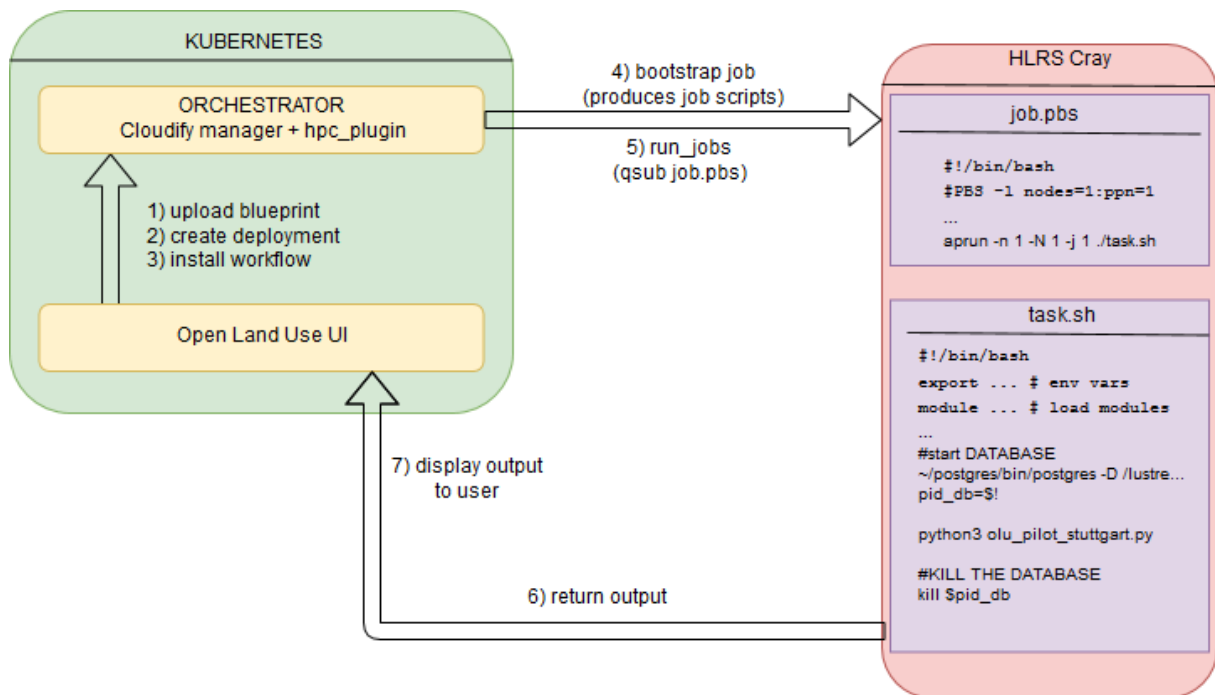


Figure 13: OLU Orchestrator workflow

5.5 Marketplace

In deliverable D3.1[3], various market places were presented, and in D3.3 [1] Zen Cart was detailed to a certain degree and explained why it was selected as the market place for EUXDAT.

Here we present a few more details about the architecture of Zen Cart and how it lives within the EUXDAT setup. Figure 14 shows an overview of Zen Cart and its dependencies.

| | | | | | | | |
|----------------|-----------------------------|----------------|----|----------|-------|----------|-------|
| Document name: | D3.4 End Users' Platform v2 | | | | Page: | 26 of 31 | |
| Reference: | D3.4 | Dissemination: | PU | Version: | 1.0 | Status: | Final |

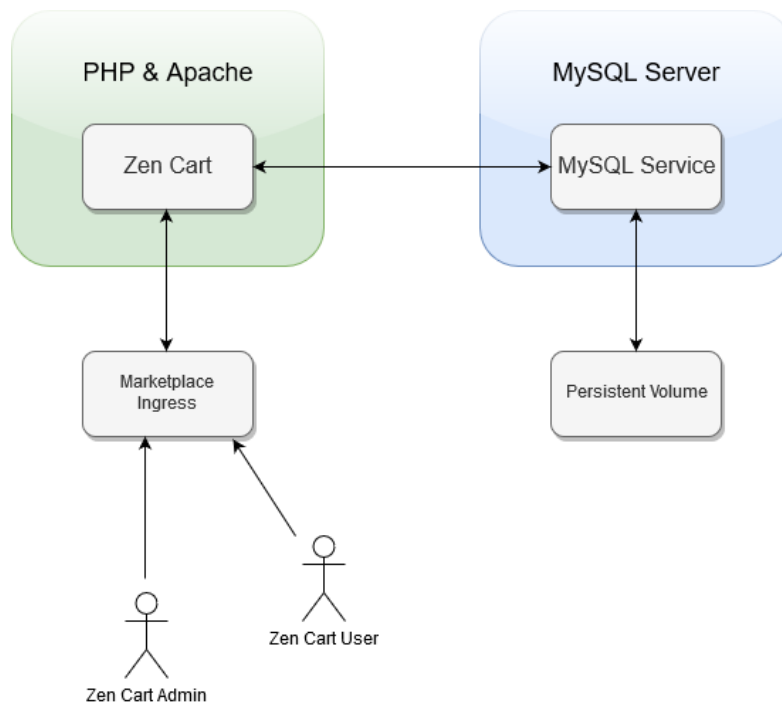


Figure 14: Zen Cart subcomponents

Zen Cart is a PHP Application and runs on an Apache webserver in the EUXDAT setup. This is running in a Kubernetes Pod (euxdat-zencart-php-6f8498c488-t6n42), generated by a Kubernetes Deployment (euxdat-zencart-php), with its associated Service (of the same name: euxdat-zencart-php).

All the information regarding Users, Products, etc., that are necessary for the marketplace are stored and retrieved from a MySQL database. This is running in a Pod (euxdat-zencart-php-6f8498c488-t6n42), generated by a Deployment, with its Service (both named euxdat-zencart-mysql). The database is stored persistently via a PersistentVolume (euxdat-zencart-mysql-pv-volume).

Finally, the users interaction with the marketplace is enabled with a Kubernetes Ingress (marketplace-ingress) at a dedicated address [2].

In EUXDAT EndUsers' platform v2, the Market place component is not yet integrated with the main page, nor the Centralized user management.

| | | | | | | |
|-----------------------|-----------------------------|-----------------------|----|-----------------|--------------|----------------------|
| Document name: | D3.4 End Users' Platform v2 | | | | Page: | 27 of 31 |
| Reference: | D3.4 | Dissemination: | PU | Version: | 1.0 | Status: Final |

6. Users management

The tool used for centralized user management system is Keycloak component. This component has already been described in D3.3 [1].

The following schema presents the level of integration to Keycloak of the different components ready-to-use in EUXDAT End Users' platform V2.

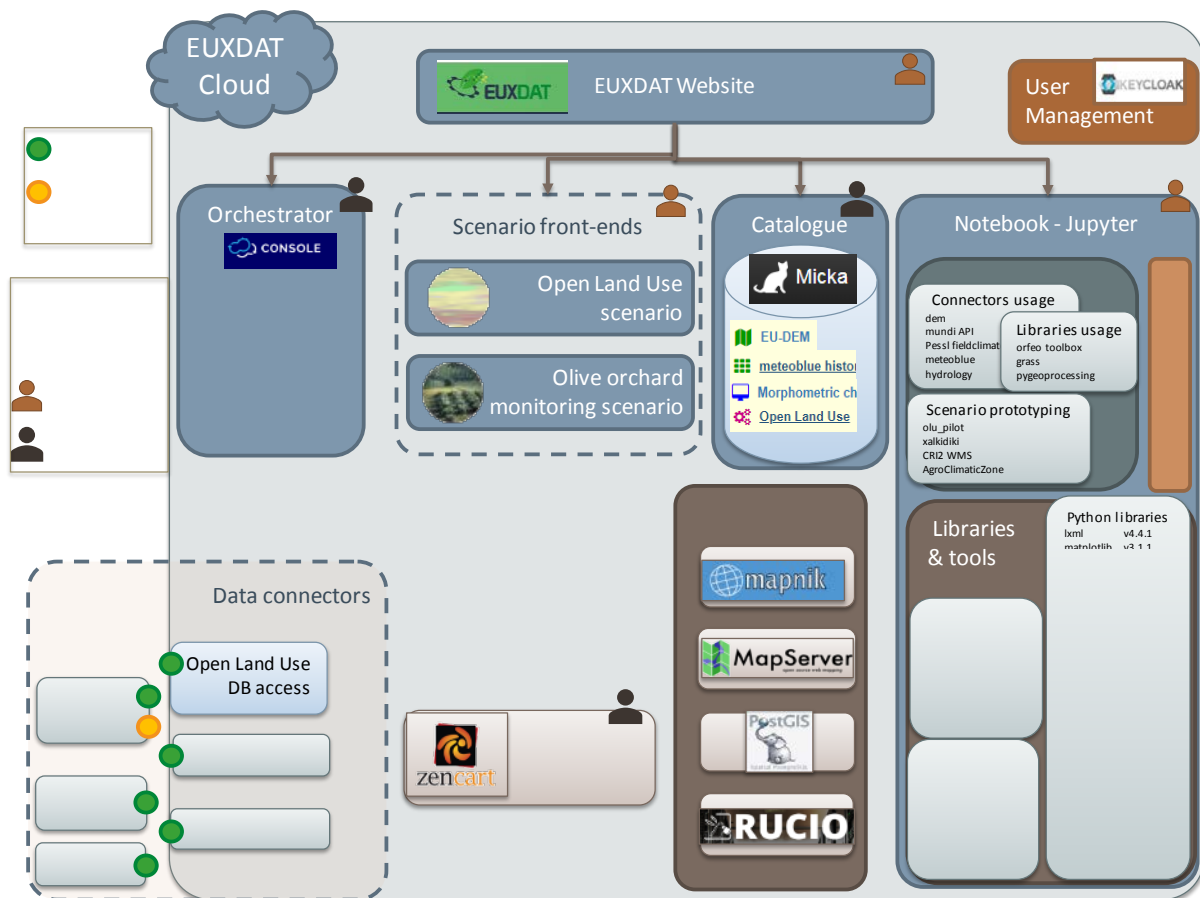


Figure 15 : integration status of EndUsers' platform components to centralized users management system

The following components are already integrated with Keycloak component:

- EUXDAT Website (MainPage)
- Implemented scenario front-ends:
 - Crop Monitoring
 - Enriched Open Land Use
- Development environment – Jupyter notebook

| | | | | | | | |
|----------------|-----------------------------|----------------|----|----------|----------|---------|-------|
| Document name: | D3.4 End Users' Platform v2 | | | Page: | 28 of 31 | | |
| Reference: | D3.4 | Dissemination: | PU | Version: | 1.0 | Status: | Final |

The following components are not integrated with Keycloak yet:

- Orchestrator (Cloudify)
- Catalogue (Micka)
- MarketPlace (ZenCart)

| | | | | | | | |
|-----------------------|-----------------------------|-----------------------|----|-----------------|--------------|----------------|-------|
| Document name: | D3.4 End Users' Platform v2 | | | | Page: | 29 of 31 | |
| Reference: | D3.4 | Dissemination: | PU | Version: | 1.0 | Status: | Final |

7. Conclusions

This document has presented all the components deployed in the second version of the EUXDAT end users' platform.

This second version will serve as a basis for the developments of the new pilots and scenarios. The different components of the End Users platform are already available in Platform V2 and will be more and more interconnected in V3.

The set of data connectors will also be enriched in the platform V3 to access more datasets required by the pilots including soil maps, UAV hyperspectral data, LUCAS and LPIS.

| | | | | | | | |
|-----------------------|-----------------------------|-----------------------|----|-----------------|--------------|----------------|-------|
| Document name: | D3.4 End Users' Platform v2 | | | | Page: | 30 of 31 | |
| Reference: | D3.4 | Dissemination: | PU | Version: | 1.0 | Status: | Final |

8. References

- [1] EUXDAT. *D3.3. Detailed specification of the End Users' platform v2*. 2019
- [2] Market place access : <https://marketplace.test.euxdat.eu/zen-cart-v1.5.5f-12312017b/> (2019)
- [3] EUXDAT. *D3.1. Detailed specification of the End Users' platform v1*. 2018
- [4] EUXDAT. *D4.2. E-Infrastructure platform v1*. 2018
- [5] EUXDAT. *D2.5. Description of Proposed Pilots and-Requirements v2*. 2019
- [6] EUXDAT. *D5.4. Detailed Definition of the EUXDAT Pilots and Qualification Method v2*. 2019
- [7] EUXDAT. *D5.5. EUXDAT_e-Infrastructure_v2*. 2019
- [8] EUXDAT. *D3.2. End User's platform v1*. 2018
- [9] EUXDAT. *D4.4. Infrastructure platform v2*. 2019
- [10] OpenStreetMap (OSM) data repository. <https://www.openstreetmap.org/export>. 2019
- [11] Geofabrik Download Server. <http://download.geofabrik.de/>. 2019
- [12] OpenStreetMap data for the all planet. <https://planet.openstreetmap.org/>. 2019
- [13] Exhaustive list of tags that can be used to filter the data. https://wiki.openstreetmap.org/wiki/Map_Features. 2019

| | | | | | | | |
|----------------|-----------------------------|----------------|----|----------|-------|----------|-------|
| Document name: | D3.4 End Users' Platform v2 | | | | Page: | 31 of 31 | |
| Reference: | D3.4 | Dissemination: | PU | Version: | 1.0 | Status: | Final |