AI REGIO

D4.07 AI REGIO DIH Platform

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Work Package:	WP4 beyond PLATFORMS: AI DIH Open Platforms and DIH platform
Delivery date:	21.10.2021
Due date:	30.09.2021
Classification:	Public
Type:	Other

Status of deliverable

Action/role	Name	Date (dd.mm.yyyy)
Submitted by	ENG	21.10.2021
Responsible (WP leader)	ENG	21.10.2021
Approved by (internal reviewer)	EUT	14.10.2021

Revision History

Date (dd.mm.yyyy)	Version	Author	Comments
10.06.2021	0.1	ENG	Deliverable 1st ToC
16.07.2021	0.2	ENG	First draft
02.08.2021	0.3	ENG	ENG Internal review
30.09.2021	0.4	EUT	Internal Review
19.10.2021	0.5	ENG	Final version based on internal review comments
21.10.2021	1.0	ENG	Final version

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List of Acronyms and Abbreviation

Acronyms	Description
AI	Artificial Intelligence
API	Application Programming Interface
BDVA	Big Data Value Association
CMS	Catalogues Management System
CP	Collaboration Portal
CRUD	Create, Read, Update And Delete
DIH	Digital Innovation Hub
DIH4AI	AI on-demand platform for regional interoperable Digital Innovation Hubs Network
DYMER	DYnamic Information ModElling & Rendering
EDIH	European Digital Innovation Hubs
HTTP	Hypertext Transfer Protocol
I4MS	ICT Innovation for Manufacturing SMEs
IMS	Identity Management System
JSON	JavaScript Object Notation
OIDC	OpenID Connect
RBAC	Role-based access control
REST	REpresentational State Transfer
RODIN	Robotics Digital Innovation Network
SAE	The Smart Anything Everywhere (SAE) Initiative
SCoDIHNet	Smart Connectivity Digital Innovation Hub Network
SPIRE	Sustainable Process Industry through Resource and Energy Efficiency
SSO	Single Sign-On
TEF	Testing and Experimental Facilities
UBAC	User-based access control

Contents

Figures

EXECUTIVE SUMMARY

The AI REGIO goals that could be achieved by using a specific IT tool as the DIHIWARE Platform are: (i) supporting new business models which create value by facilitating exchanges among participants and transactions between users and producers, (ii) helping to highlight the role of a DIH acting as "honest brokers" connecting innovators with technology providers and researchers, and (iii) structuring a federation of services catalogues via a highly secure and user-centric collaboration environment.

The DIHIWARE modular architecture and its customization capabilities, next to a concrete adoption plan of the Platform, will enable the delivery of a specific AI REGIO tailored environment, based on some of the DIHIWARE modules and in line with the project needs and requirements.

Upon the core knowledge-driven and collaboration services of the platform (fruit of the work started previously throughout the MIDIH project[1]), specific AI REGIO customizations (namely environment customization, IoT-Catalogue integration, catalogue and service design, and dedicated user journey) and new developments are being drawn up in order to reach the objectives and requirements set in the AI REGIO Consortium.

The result will be a platform that allows the delivery of a new AI ecosystem of EU-borne Digital assets (people, organizations, services and technologies, experiments and knowledge), overcoming fragmentation and connecting regional actors to make their offers more visible and coherent, and the development of new corridors as an instrument to enable and support DIHs collaboration.

The final aim is to develop, maintain and evolve an Innovation and Collaboration Platform, providing all the core services tailored to the AI REGIO needs and that will be declined at two different levels (to establish an intra-collaboration among AI REGIO DIHs and to exploit the extra-collaboration with other DIHs network) and so deployed in two different interoperable instances: the AI REGIO DIH Service Marketplace expected by WP3.5 and the DIH4INDUSTRY (one of the main pillar of the MIDIH exploitation plan which aims to be an European marketplace of services targeted to DIHs operating in the Manufacturing domain) that AI REGIO will promote under the WP8.6 activities.

The document starts with an overview of the DIHIWARE platform that aims at helping the reader understanding better the architectural project behind and that could be used as a reference in creating a new DIH community or in identifying important areas that could be improved in an existing hub's operations through this IT Platform. Then a focus on the AI REGIO Adoption plan sets out the motivation, needs, environments and the goals that AI REGIO would like to achieve leveraging on the support that the platform is able to offer to the new collaborative business processes that AI REGIO is promoting in order to deliver new value.

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[1] https://www.midih.eu

Introduction

1.1   Scope of the Deliverable

This document describes the first prototype of the AI REGIO DIH Platform design. Under the WP4.4 activities the development, customization and maintenance of the platform will be taken forward with the intention of providing that platform for use and extension for WP3.5 and WP8.6 actions supporting goals and strategies.

The DIHIWARE Platform, which is one of the results of the MIDIH project[2], have been identified as the starting point for the environment. The DIHIWARE knowledge-driven services, harmonized with the collaborative and innovation side of the platform, will be the core on top of which specific customizations and new developments will be drawn up, with the help of the Consortium, carrying out an in-depth study of the objectives that can be achieved through the use of this Platform, also exploiting the connections and interoperability with other systems (e.g. IoT Catalogue and AI4EU portal) and communities.

For the AI REGIO Platform specification and implementation, it was decided to use an approach based on the Stakeholder Requirements that will be turned into software requirements and specifications.

This is why we have started to supervise the process requirements' specifications[3], led by the WP2 by using the AI REGIO Requirements Engineering Methodology[4], intended to guide the design and the release of the DIHIWARE Innovation and Collaboration Platform.

The adoption plan of the Platform aims to map out a strategy to optimize and improve the Platform adoption process in order to address the key challenges of the AI REGIO Community.

This main goal will be reached through the different and integrated systems constituting the overall environment described in the following chapters.

1.2   Document Structure

The document is organized in two main chapters (Section 2 – Section 3), beside the introductive chapter (the current Section 1, where the purpose of document and the structure are described) and the conclusive one summarizing the main achievements and addressing future activities.

Section 2 – The DIHIWARE Overview and Architecture presents the DIHIWARE Platform which is the core of the AI REGIO Platform. It also provides a description of the three main subsystem of the Platform.

Section 3 – AI REGIO Adoption plan presents the two main DIHIWARE instances foreseen by the DIHIWARE adoption strategy in order to support some if the AI REGIO's goals.

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[2] https://www.midih.eu/

[3] D2.03 AI REGIO AI DIH experiments AI Scenarios and D2.05 AI REGIO User Requirements Specification

[4] D2.01 AI REGIO Requirements Engineering Methodology

DIHIWARE Overview and Architecture

The DIHIWARE Platform is an integrated system leveraging on knowledge-driven services that, next to a Catalogues Management System, and harmonized with the collaborative side of the Platform are able to create an environment where providers and consumers of digital technologies related to AI development and adoption cannot just matching assets and needs, but they can collaborate to boost innovation.

The DIHIWARE customization capabilities, next to a concrete adoption plan of the Platform, enables the delivery of specific tailored environments, based on selected DIHIWARE modules and in line with the stakeholders needs and requirements.

Analyzing the current adoption programme of the DIHIWARE, we have identified 3 level of use of the system:

- Level 1: Use DIHIWARE as a tool to manage a single DIH regional ecosystem, connecting local experts and exploiting the technology excellences of their service portfolio. Target: SMEs
- Level 2: Use powered-by-DIHIWARE portal to establish cross-DIH collaboration, usually supported at project level. Target: SMEs
- Level 3: A powered-by-DIHIWARE ecosystem, used to establish cross-DIHs collaboration from DIHs to DIHs. Target: DIHs

All the three levels serve the purpose of overcoming fragmentation and connecting actors to make their offers more visible and coherent, and the desired interoperability among them and versus external systems will enable the connection of ecosystems (Regional/National/European) avoiding vertical silos.

The DIHIWARE Platform is a solution developed by ENG within the MIDIH H2020 EU project (http://midih.eu/) and currently in use in many ecosystems in Europe.

It offers a complete collaboration environment inspired by Enterprise Social Software, realizing a bridge among stakeholders with different experiences and backgrounds, providing access to the latest knowledge and expertise, pulling teams together and supplying a fertile ground for experimentation. These knowledge-driven services are fully integrated with collaborative services in order to create a digital space where all the platform stakeholders can collaborate to boost innovation together, enabling and digital supporting the co-creation methodology envisaged.

The Platform is based on different Open Source components, using a flexible and modular integration and deployment approach to guarantee the possibility to have custom-tailored solutions suitable for the variegated environments. Each component provides a specific function and complements the functionality of the other. The Platform is also adopting state of the art identity management and authorization components in order to ease interoperability with other platforms using well known standards.

The high-level decomposition is shown in Figure 1 and each system (including its core technologies and functionalities) is described in more detail in the following sub-sections.
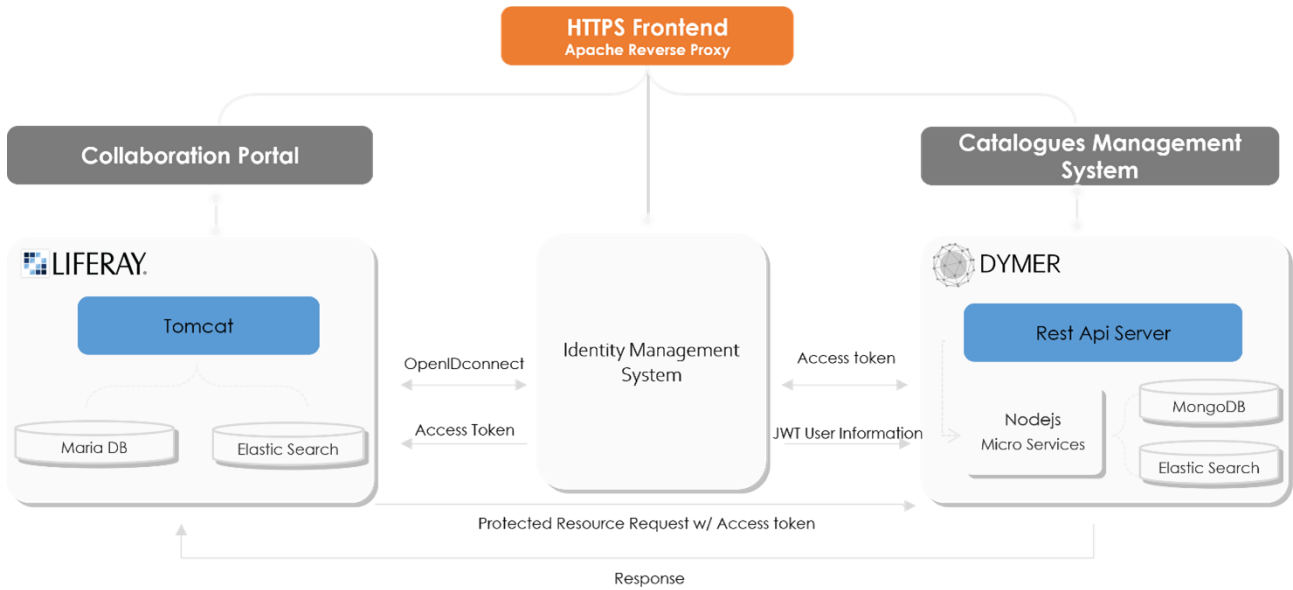

Figure 1 DIHIWARE Architecture

2.1 Modules and Technologies

The DIHIWARE Platform is an integrated environment made of three main systems: Collaboration Portal (CP), Catalogues Management System (CMS), and Identity Management System (IMS). Each system provides a specific function and complements the functionality of other two systems.

2.1.1 The Collaboration Portal

The Collaboration Portal is the main subsystem, offering tools for knowledge management, social activity next to collaboration and innovation capabilities. It links users, processes, resources and acts as a powerful knowledge hub. Most of common community members will access only to this module.

The main purpose of the portal is to use its features to connect companies, people, information and resources (also coming from the other bridged subsystems) in a collaborative space where it is possible to turn conversations and ideas into projects.

The suite of integrated and interconnected solutions of the platform aims to support efficiency, visibility and collaboration processes. The Collaboration portal, in fact, enables and supports the development, integration and delivery of knowledge sharing and collaboration services based on social networking, collective intelligence, collaboration, sharing, transparency and self-empowerment.

The final aim of any collaborative platform is to support knowledge sharing and collaboration in a multi-actor scenario.

Background Components and Technologies

The Collaboration Portal is grounded on Liferay[5] the has been selected since it is a widely used Open Source and state-of-the-art Content Management System. Liferay Portal is a free and Open Source enterprise portal software product written in Java. Liferay includes a built-in web content

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[5] http://www.liferay.com/

management system allowing users to build websites and portals as an assembly of themes, pages, modules/widgets and a common navigation.

We are currently using the Liferay Portal CE 7.3 that includes a wide range of improvements to help us build our site, analyze our traffic, manage documents and knowledge, or create the applications/modules we need to be successful.

Foreground Components and Technologies
DIHIWARE Custom Collaboration Portal modules

Four modules (dymer-viewer, dymer-api, dymer-service, and dymer-web) have been implemented in the Collaboration Portal with the aim of achieving integration with Catalogues Management System (CMS) capable of ensuring the following features:

- visualization of the RCMS resources into the Collaboration Portal
- searching/browsing of RCMS resources
- CRUD transactions on RCMS via the Collaboration Portal

Dymer-viewer

Dymer-viewer is a multi-instance mvc-portlet that, through the configuration of a connection endpoint and the setting of specific parameters (query and display mode), will import the dymerClient library that will be able to render what is required. It can be instantiated in multiple pages of the Collaboration Portal, and it is configurable.

Only the Collaboration Portal Administrator has access to its configuration which allows you to set the search and display mode of the set of Catalogue Management System resources, the so-called catalogs as shown in the following Figure 2.

Figure 2 Dymer-viewer configuration

Both the view and the search for Catalogue Management System resources depend on the configuration.

The search for Catalogue Management System resources depends on the configuration carried out and can be free or depend on some parameters; the search filters displayed in the portlet depend on how the resource model is saved in the Resources Catalogues Management System.

To view and search for resources, it is needed to enter a query in the Dymer-viewer configuration panel, as shown in the following Figure 3.

In this way the system can filter among the resources present in Elasticsearch which is a Catalogue Management System data-source. In fact, in elasticsearch, searching is performed using the search query, which is based on JSON. Elasticsearch provides full query DSL that helps to define queries. The query shown below Figure 3 in the Dymer-viewer is DSL compliant.

Figure 3 Dymer-viewer Query

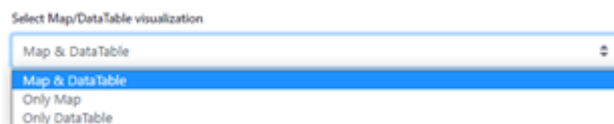Furthermore, the map view can be configured as indicated in the Figure 4.

Figure 4 Dymer-viewer Data Visualization mode - configuration

Specifically, it is possible how to display the data table using an ad hoc json in the configuration. Similarly, the markers on the map depend on a json defined in the configuration phase.

Dymer-api and Dymer-service

Dymer-api and Dymer-service are two modules that expose REST API to manage the persistence of Catalogue Management System resources in Collaboration Portal. In particular, Catalogue Management System resources become Collaboration Portal assets. In this way, it is possible to take advantage of the Collaboration Portal asset framework that is the basis of many of its most powerful features.

In order to connect to the REST API there is an agreement for the connection to a specific service adding a /name_of_the_service to the PATH that is composed as follow:

<PROTOCOL>://<HOST_ADDRESS>:<PORT>/API/JSONWS/<SERVICEMETHOD>

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AI REGIO

/dym.dymerentry/delete	Returns void
	It allows you to delete a Catalogue Management System entry from the Collaboration Portal
/dym.dymerentry/update	Returns a JSON of the DymerEntry object that has been added or updated or null
	It allows you to add a Catalogue Management System entry if it does not exist otherwise to update it in Collaboration Portal

Table: services list

Dymer-web

Dymer-web is an mvc-portlet that allows rendering of Catalogue Management System resources which are Collaboration Portal assets.

Platform authentication

Liferay Portal CE 7.3 complies with the OpenID Connect (OIDC) standard. This protocol is built on the top of OAuth 2.0 and is described in OpenID Connect Core 1.0. In particular, the protocol (graphically represented in Figure 5) delegates authentication to the Identity Manager and provides the requesting application, Collaboration Portal, with an authorization access token. Therefore, for a user registered on the Identity Manager who tries to login to Collaboration Portal, a Collaboration Portal account is created, if it does not exist, followed by confirmation of authentication.
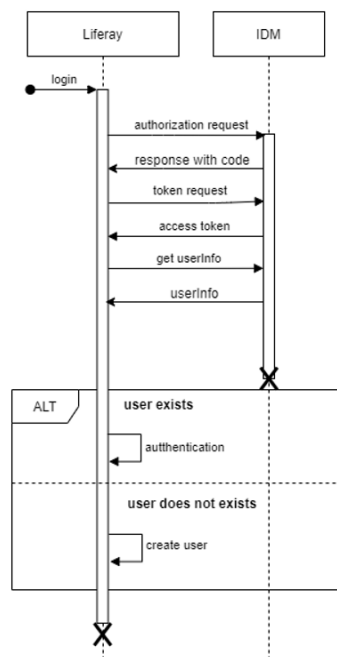

Figure 5 DIHIWARE Platform Authentication

Interoperability among the systems involved is achieved through the authorization token. In particular, a custom Liferay module allows us to intercept the authorization token resulting from the interaction described above and share it with the Resources Catalogues Management System. In

this way, a user registered on Identity Manager, whose account is present in Liferay, can access the functions of Resources Catalogues Management System.

Collaboration Portal and Identity Manager have been appropriately configured to be able to communicate through the OIDC protocol.

2.1.2 The Catalogues Management System

The Catalogues Management System (CMS) is the subsystem of the DIHIWARE that handles the resources organization and cataloguing, being configured according to the platform instance requirements.

The Resources Catalogue Management System acts as a new way of managing information, where the use of taxonomies and the power of metadata enable the organization of product and services besides their dynamic modelling and visualization.

The system offers a single access point for users leveraging on already existing information in different organizations by creating a federation of catalogues for a scalable system (data blending).

The Catalogue Management System is the main pillar of the one-stop-shop business model enabled by the platform that focuses on the value of the honest brokering. Therefore, the platform allows the construction and the management of a showcase of structured data coming from various sources.

DYMER

The Resources Catalogue Management System relies on DYMER – that stands for DYnamic Information ModElling & Rendering – which is a WCM (Web Content Management) made by Engineering.

The DYMER is a suite for resource catalog visualization. DYMER provides advanced mapping capabilities between a data model in JSON format and its graphic template on the one hand, and on the other hand, it provides a JavaScript framework for integrating the DYMER template into a web-based application. The software is flexible because it adopts open technologies and can be used in various environments without considerable requirements.
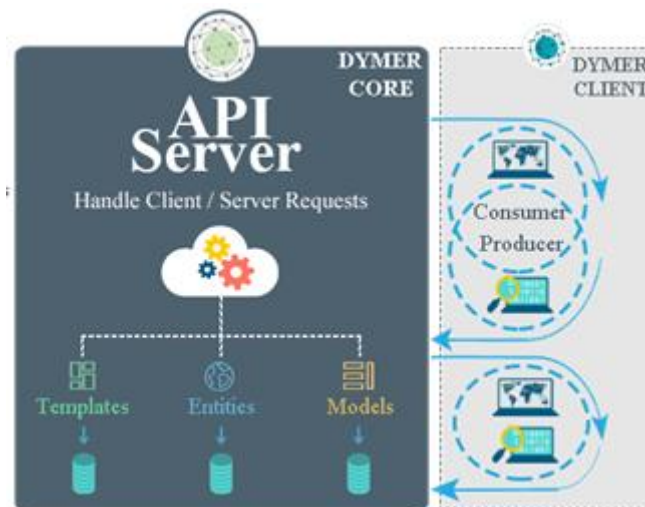

Figure 6 DYMER Architecture

The DYMER consists of two main components:

- **DYMER-Core**
- **DYMER-Client**

DYMER-Core is based on a microservice architectural style with an approach to develop a single application as a suite of small services, each running in its own process and communicating with lightweight mechanisms using HTTP/REST protocols alongside JSON.

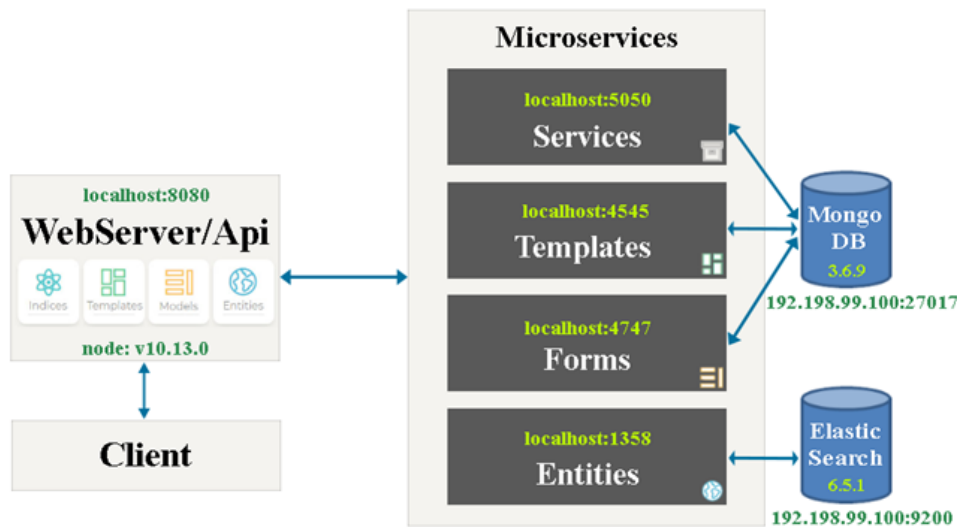The diagram in Figure 7 depicts the building block components:

Figure 7 DYMER Components

Each microservice is developed with a specific role, however among the main ones we can identify four that have most impact:

- Templates microservice is responsible for generating graphic templates that can be used in order to display the assets using logic-less templates.
- Forms microservice is responsible for modelling data and metadata offered.
- Entities microservice is responsible for managing the storage.
- Services microservice includes numerous functions such as the management of user permissions, the interaction with other data sources.

These microservice are developed with Express.js framework for Node.js, designed for building web applications and APIs, released as free and open-source software under the MIT License.

The information is stored in NoSQL Database like MongoDB that provides high performance, high availability, and automatic scaling. Service-Entities use Elasticsearch that is a distributed, Open Source search and analytics engine for all types of data, including textual, numerical, geospatial, structured, and unstructured that stores data in JSON format.

Interaction with the DYMER-Core takes place through the **DYMER-Client** that is a fast, small, and feature-rich JavaScript library. Thanks to it, it is possible to interact with the platform facilitating the user in the use of data by offering a single search point and displaying the results in special graphic templates.

DYMER-Client makes use of two JavaScript libraries, dymer.viewer.js and dymer.map.js, in order to visualize resources in list, map and data table mode.
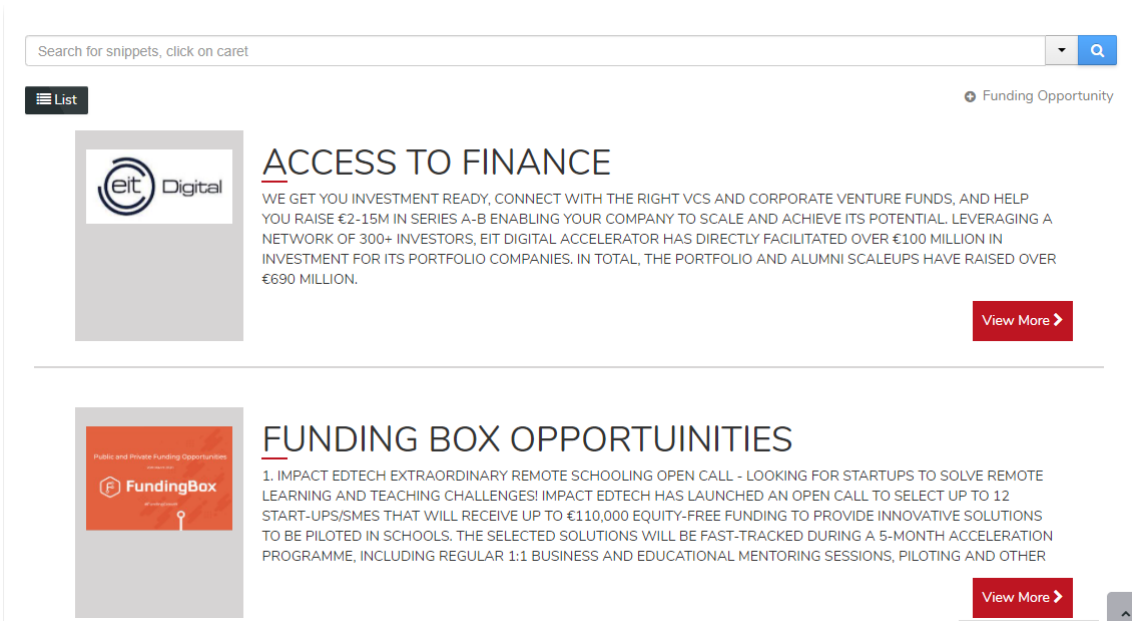
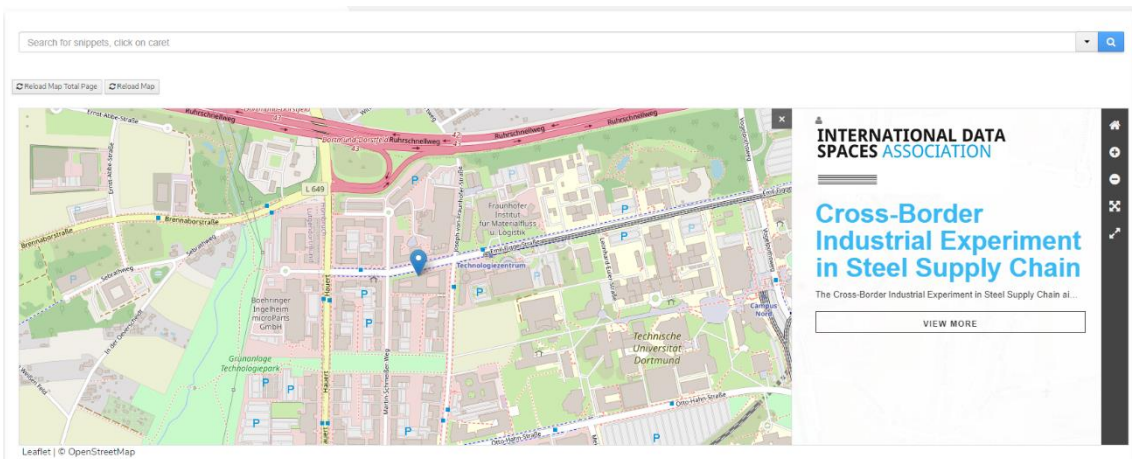*Figure 8 DYMER Resources view in list mode*

Figure 9 DYMER Resources view in map mode

The JavaScript libraries are capable of communicating to DYMER API enabling CRUD (create, read, update and delete) operations on the entities not only in DYMER but also in every external web portal.
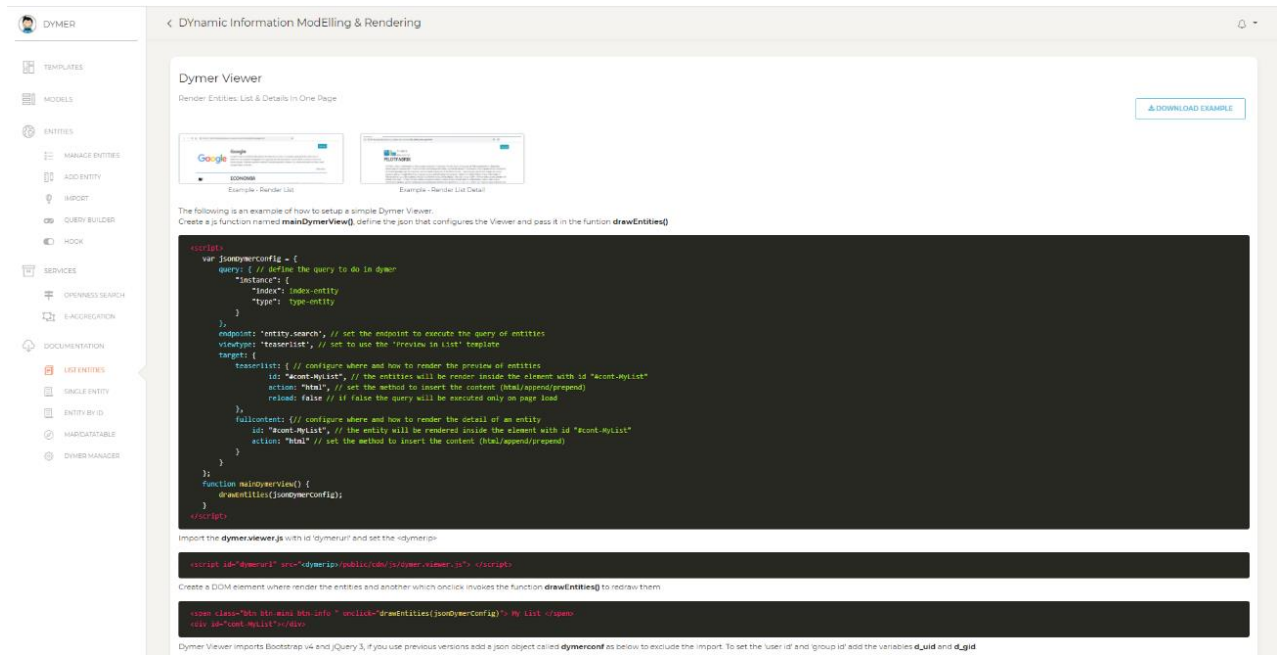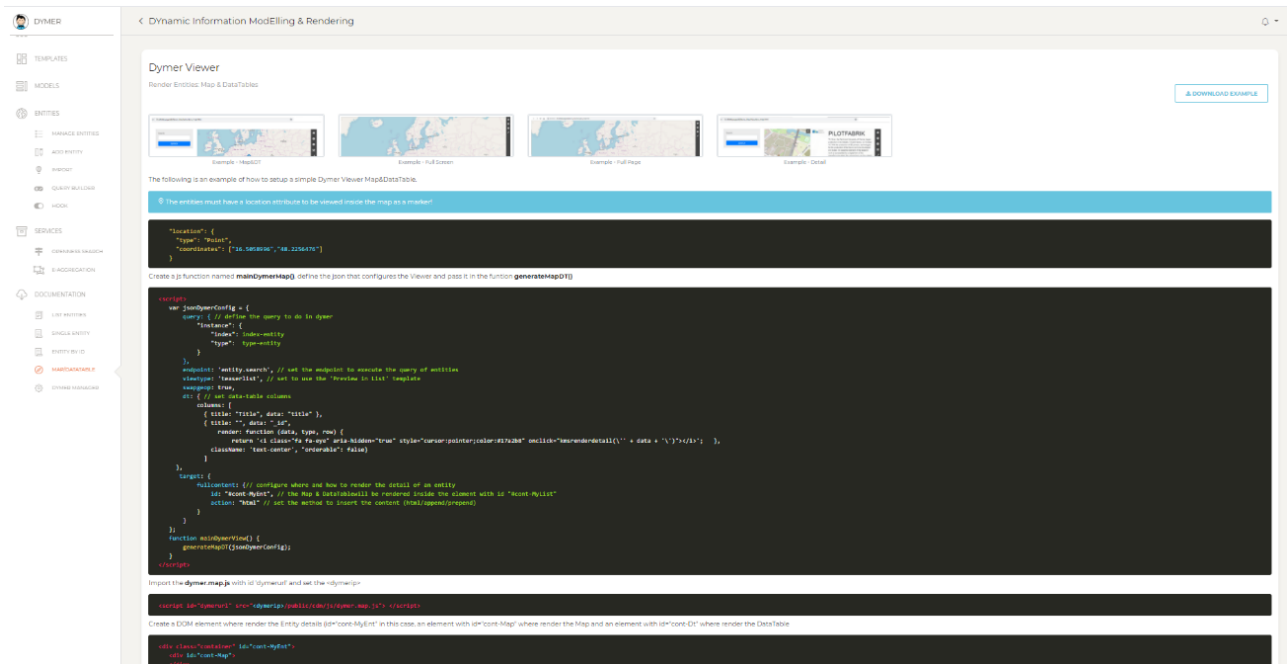
Figure 10 DYMER Viewer set-up - List Entities

Figure 11 DYMER Viewer set-up - Map Entities

DYMER is able to import data from external sources (from JSON files, Excel files and/or API services displaying data) and it can serve as a bridge to visualize external data thanks to DYMER RESTful APIs.

Background Components and Technologies

DYMER is a suite written in Express that is built on top of Node.js. It provides a minimal interface with all the tools required to build a web application. Express.js adds flexibility to an application with a huge range of modules available on npm[6] that you can directly plug into Express as per requirement. It helps in easy management of the flow of data between server and routes in the server-side applications.

The following technologies and components were used together with Express.js: AngularJS, JQuery, Bootstrap, Handlebars, MongoDB and ElasticSearch.

Foreground Components and Technologies

A specific authorization section of the DYMER administration panel allows the definition of the connection parameters for the Identity Management System and the Collaboration Portal.

Moreover, it is possible to manage privileges and roles to control access to DYMER entities and to control the ability to execute system operations. All DYMER resources are regulated by a Role-Based Access Control (RBAC) mechanism and the owner of a DYMER entity can assign specific permissions to other users according to UBAC (User-Based Access Control).

2.1.3 The Identity Management System

The Identity Management System (IMS) is the subsystem in charge of centralizing user authentication, defining their roles and granting their access while using the other applications. Administrators can use it to set specific roles or permissions.

The Identity Management covers a number of aspects involving:

- users' access to networks, services and applications, including secure and private authentication from users to devices, networks and services
- authorization & trust management
- user profile management
- privacy-preserving disposition of personal data
- Single Sign-On (SSO) to service domains
- Identity Federation towards applications

The Identity Manager is the central component that provides a bridge between IdM systems at connectivity-level and application-level. For end users, the IdM provides a convenient solution for registering with applications by giving a mean to re-use attributes like address, email or others, thus allowing an easy and convenient management of profile information

Background Components and Technologies

Keyrock is the FIWARE Generic Enabler component responsible for the DIHIWARE Platform Users Identity Management. It covers a number of aspects involving users' access to networks, services and applications, including secure and private authentication from users to devices, networks and services, authorization & trust management, user profile management, privacy-preserving

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[6] https://docs.npmjs.com/about-npm

disposition of personal data, Single Sign-On (SSO) to service domains and Identity Federation towards applications.

Foreground Components and Technologies

The DIHIWARE Platform implementation is based on different Open Source components, which need to be integrated and harmonised. For granting a unique access point, the Identity Manager has been appropriately configured to sharing and aligning user information between Collaboration Portal, Identity Manager and Catalogues Management System.

Specially, starting from version 8.1.0 the FIWARE IdM complies with the OpenID Connect (OIDC) as Collaboration Portal. In the Figure 12 is shown how to configure to communicate with Collaboration Portal through the OIDC protocol.
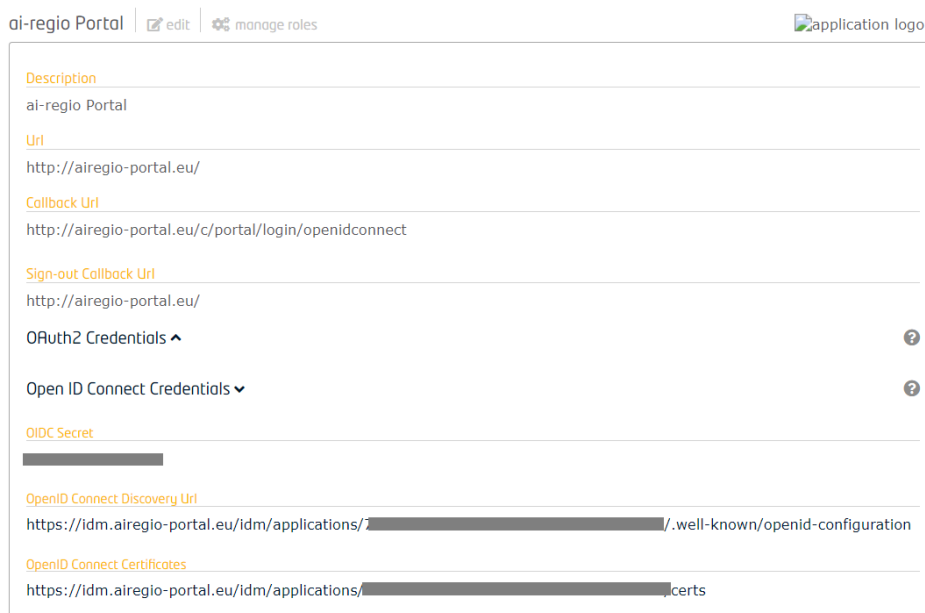

Figure 12 Identity Manager Configuration

Its integration with Collaboration Portal through OpenId Connect will assure that the newly created user on the Identity Manager who try to login to Collaboration Portal will be automatically propagated to the Collaboration Portal. Interoperability among the systems involved is achieved through the authorization token (see Figure 13 for a simplified view of the main interactions).
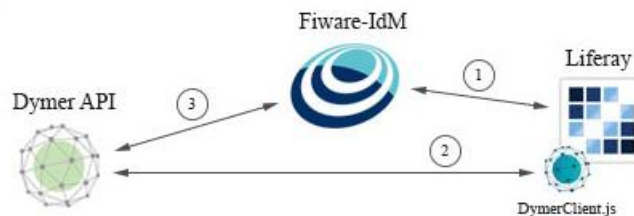

Figure 13 DIHIWARE Subsystems Integration

With simple steps Collaboration Portal Administrator activates and configures the correct integration with FIWARE IdM in the Control Panel, setting up client ID, client Secret, discovery, authorization and token endpoints and other. In particular:

- A new user is created in Identity Manager with a default role;

16

- Thanks to the configuration of Liferay and IDM the user is propagated from Identity Manager to Collaboration Portal and is authenticated in the Collaboration Portal;
- ENGINEERING has integrated a custom module (DYMER Viewer) in the Collaboration Portal to share authentication token with the Resources Catalogues Management System using a Javascript library, so-called DymerClient.js
- so, a user registered on Identity Manager, propagated on Collaboration Portal, can access the functions of Resources Catalogues Management System.

AI REGIO Adoption Plan

The importance of digitalisation and the benefits it can bring in the EU socioeconomic landscape has been extensively analysed and stressed nowadays. It is expected that in the new post-COVID19 era the digital uptake will be further expanded, and societies and economies will be more than ever in need of policy initiatives that will help them accelerate their digital capacities in order to overcome the negative economic consequences of the crisis.

In this context SMEs, the backbone of the EU economy, will need to introduce new innovative ways of working, new business models and more innovative products and Digital Innovation Hubs (DIHs) having by definition the role to support SMEs in benefiting from advanced digital technologies (including Artificial Intelligence, Cybersecurity and digital skills are very powerful policy tools for national/regional policy makers that search ways to support the recovery of their economies.

In Digital Europe Programme a network of European DIHs (EDIHs) will be supported, covering all regions of Europe. Investments are used for strengthening the capacity of the EDIH to deliver services locally, nationally and at a European level.

EDIHs and Digital Innovation Hubs could act as facilitators to bring together industry and administrations that need new digital solutions, with companies that provide these solutions (or have the capacity to develop them).

The DIH could provide a marketplace and serve as a broker that facilitates collaboration and networking between relevant stakeholders, matching firms with customers and provide European connections as well.

in this framework DIHs express an increasing need for having platforms that facilitate transactions between users and producers, by making it easier to find what one is looking for, by gathering a wide range of services and goods in one place. It is also important the collaboration with other DIHs at EU level to create a pan-European network of networks where it is possible to meet, exchange, cooperate, learn, upgrade skills, and identify which of their missing expertise can be found in other DIHs across the EU.

The AI REGIO project, through the DIHIWARE aims to be a response to those needs by providing mechanisms to create secure and trusted environment where Knowledge-driven services next to a Resources Catalogues Management System harmonized with the collaborative and innovation side of the platform can be used by DIHs to serve the purpose of overcoming fragmentation and connecting regional actors to make their offers more visible and coherent, but also to enable collaboration with others DIHs at EU level.

The aim is to develop, maintain and evolve an AI REGIO DIH Platform providing all the core services tailored to the AI REGIO needs and that will be declined at two different levels (and so deployed in different interoperable instances):

- One to establish cross-AI REGIO DIHs collaboration and it is strictly related to the AI REGIO DIH Service Marketplace[7] as part of the work in the WP 3.5
- The second one to exploit the collaboration with other DIHs network that will be enable via the DIH4INDUSTRY[8] instance.

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[7] D3.07 AI REGIO DIH Service Marketplace

[8] https://dih4industry.eu

Innovation Action - This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N. 952003

AI REGIO

3.1 DIHIWARE for AI REGIO DIH Service Marketplace

Supporting the collaboration among DIHs and TEFs communities with a wide range of services, information and tools that will help them to communicate, align, collaborate and synchronize activities: this is the aim that wants to be reached in AI REGIO by using the AI REGIO DIH Service Marketplace.

Every DIH/TEF places high values on innovation. This value is delivered both in their services, as well as how collaborative business processes can be supported by a specific IT Platform.

The AI REGIO DIH Service Marketplace knowledge management capabilities, integrated in a collaborative oriented platform can build a new environment capable of giving rise to a Network of DIHs/TEFs fostering the interaction among hubs, information exchange and peer-learning.

It could be a DIHs/TEFs- wide platform allowing them to become trusted advisors in their relationship with services consumers becoming a vibrant link between consumers and providers, in exploring new opportunities, observing new trends within the industry and beyond, as well as seeing patterns between multiple sectors as well as across industries.

The platform can provide AI REGIO DIHs Network with unprecedented opportunities to work directly with all key players in a highly secure environment and significantly increase their opportunities in maximizing their role.

The portal is being realized through an inclusive DIHIWARE platform installation, on top of which specific customizations (e.g. look&feel, page layouts, site map, catalogue designing and dedicated user journeys) have been put in place.

The DIHIWARE Catalogue Management System could give the possibility to create a federation of services catalogues enabling the birth of the one-stop-shop marketplace that will be a central portal, used to provide access to all the services provided within the AI REGIO federated ecosystem of DIHs/TEFs. Moreover, we start with the exploitation of the connections and potential interoperability with other systems initiating with the IoT-Catalogue whose resources (those that have been identified as relevant for the AI REGIO network) are now searchable and browsable also via the DIHIWARE thanks to a specific plugin (more details on that are available in the D3.7 AI REGIO DIH Service Marketplace, while a screenshot of the developed portal is shown in Figure 14).
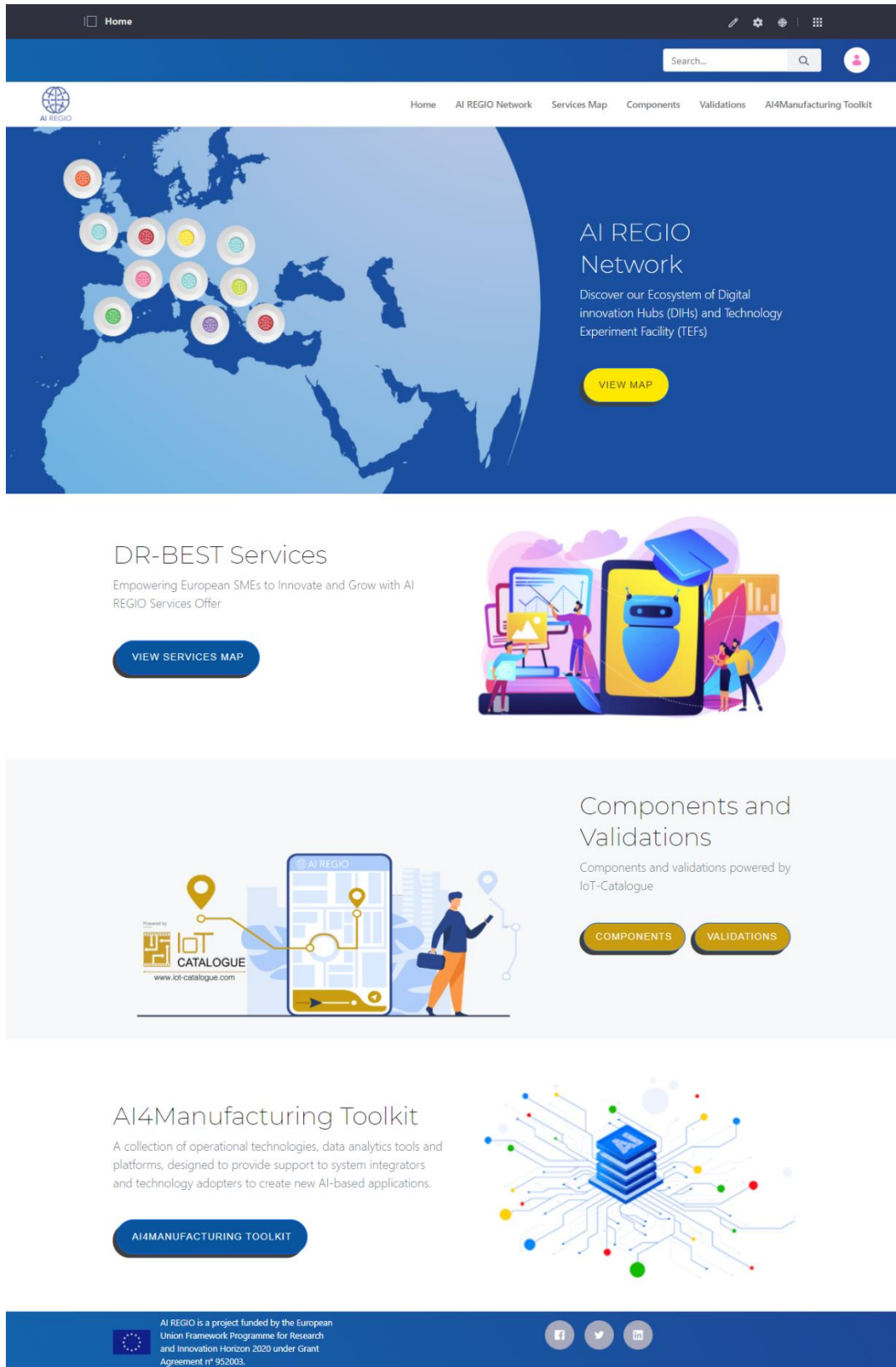
Figure 14 AI REGIO DIH Service Marketplace landing page

Marketplace is not intended to deliver pure e-commerce functionalities, but mainly a user-centric collaboration and match-making environment to:

- Developing a clear overview of the AI DIHs related services provided in Europe and align them.
- Upgrading the DIHs Catalogues by identifying/triggering activities in the AI DIHs communities
- Creating a strategy to reinforce the specialisation of these services, as well as supporting its uptake by relevant DIHs and DIH networks.
- Creating a vision and strategy on a self-sustaining business model for this network of AI DIHs, and to make this operational.

The adoption plan of the Platform aims to map out a strategy to optimize and improve the platform adoption process in order to address the key challenges of the AI REGIO Community.

The current version of the AI REGIO DIH Service Marketplace is already publicly available, even if the user registration is not open.

The first version of the workspace structure has been designed to meet the identified requirements coming from the AI REGIO stakeholders and includes three main areas: One is dedicated to our DIHs and TEFs community with a catalogue that contains the majority of the organizations' general details.
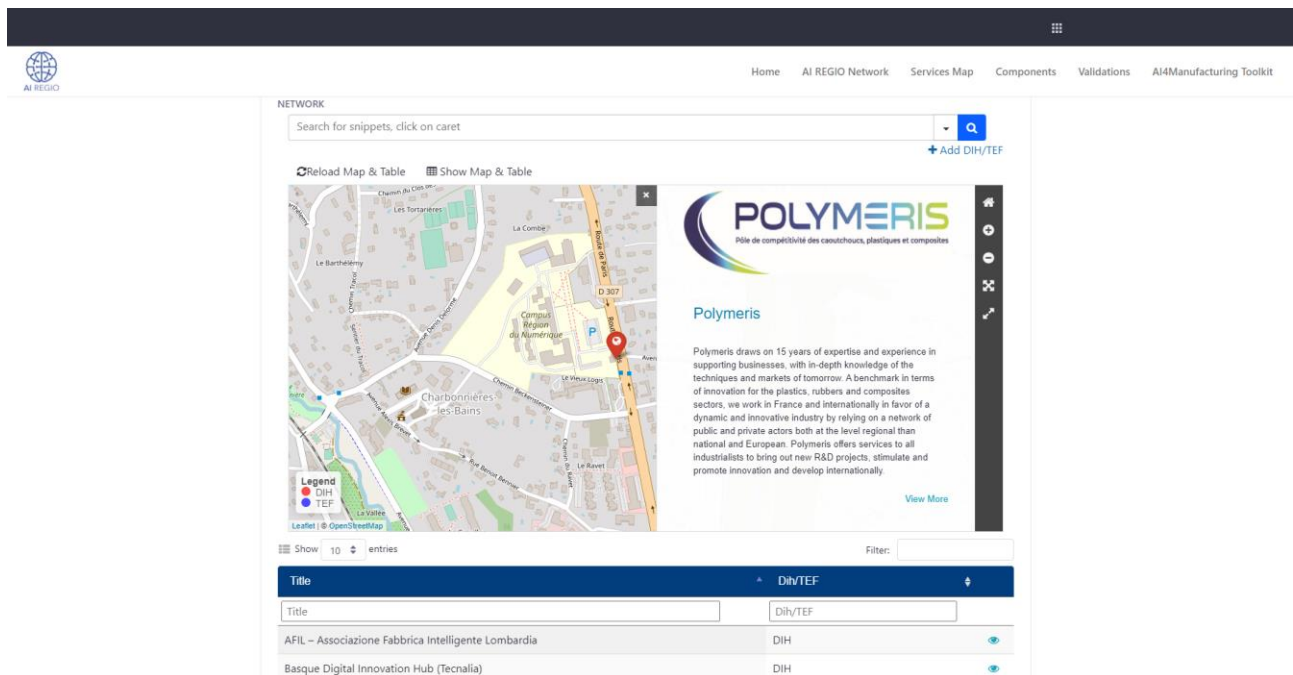

Figure 15 AI REGIO Network Catalogue

Another section deals with the services offered by our DIHs/TEFs community and consists of a map of services categorized as foreseen by the METHODIH[9].
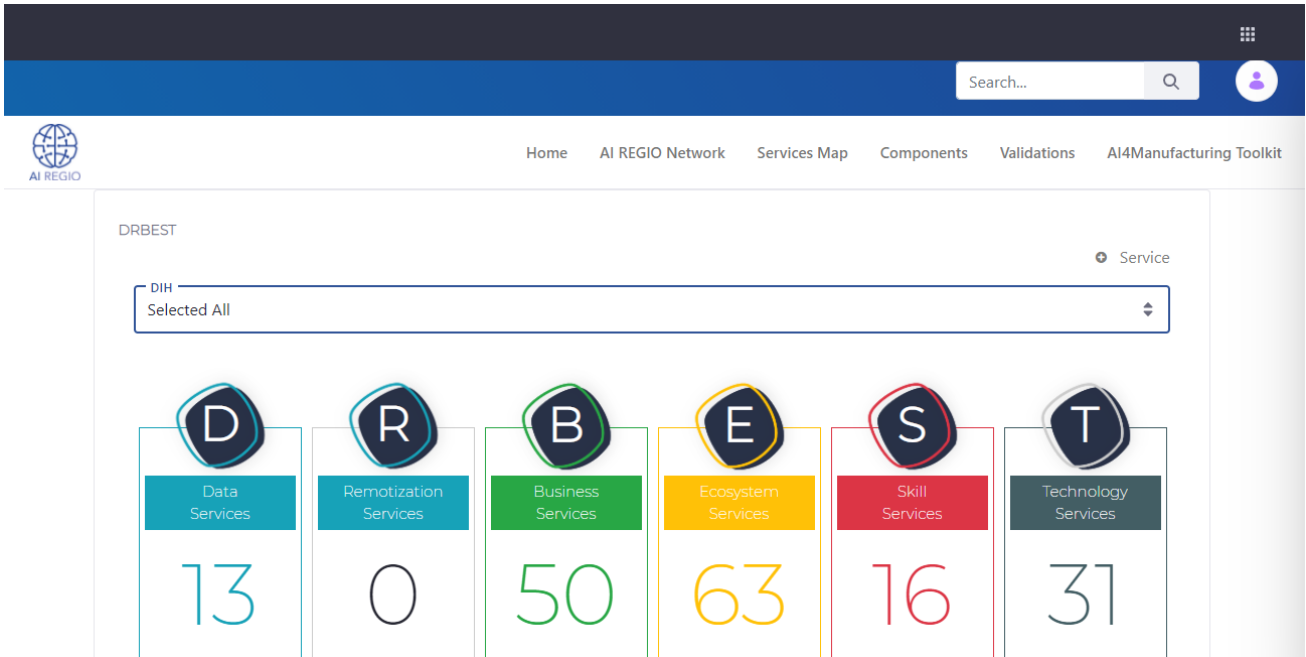

Figure 16 Services Map

Then a section allows access to the resources coming from IoT Catalogues that are now browsable and searchable via the AI REGIO Marketplace.
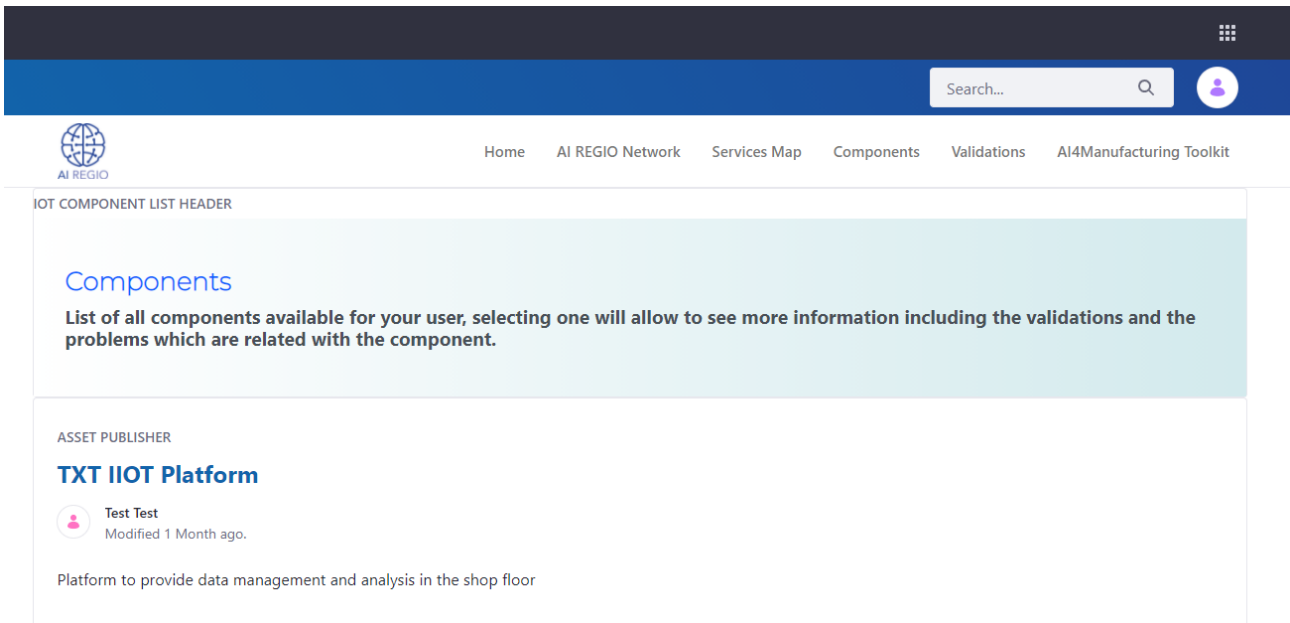

Figure 17 AI REGIO - Components coming from IoT Catalogue

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[9] D3.01 Service Portfolio and Customer Journeys

Among them also the AI4Manufactory toolkit[10] is available with a dashboard designed to displaying the toolkit items organized into the three main identified categories (AI resources, AI pipelines or AI orchestrator).
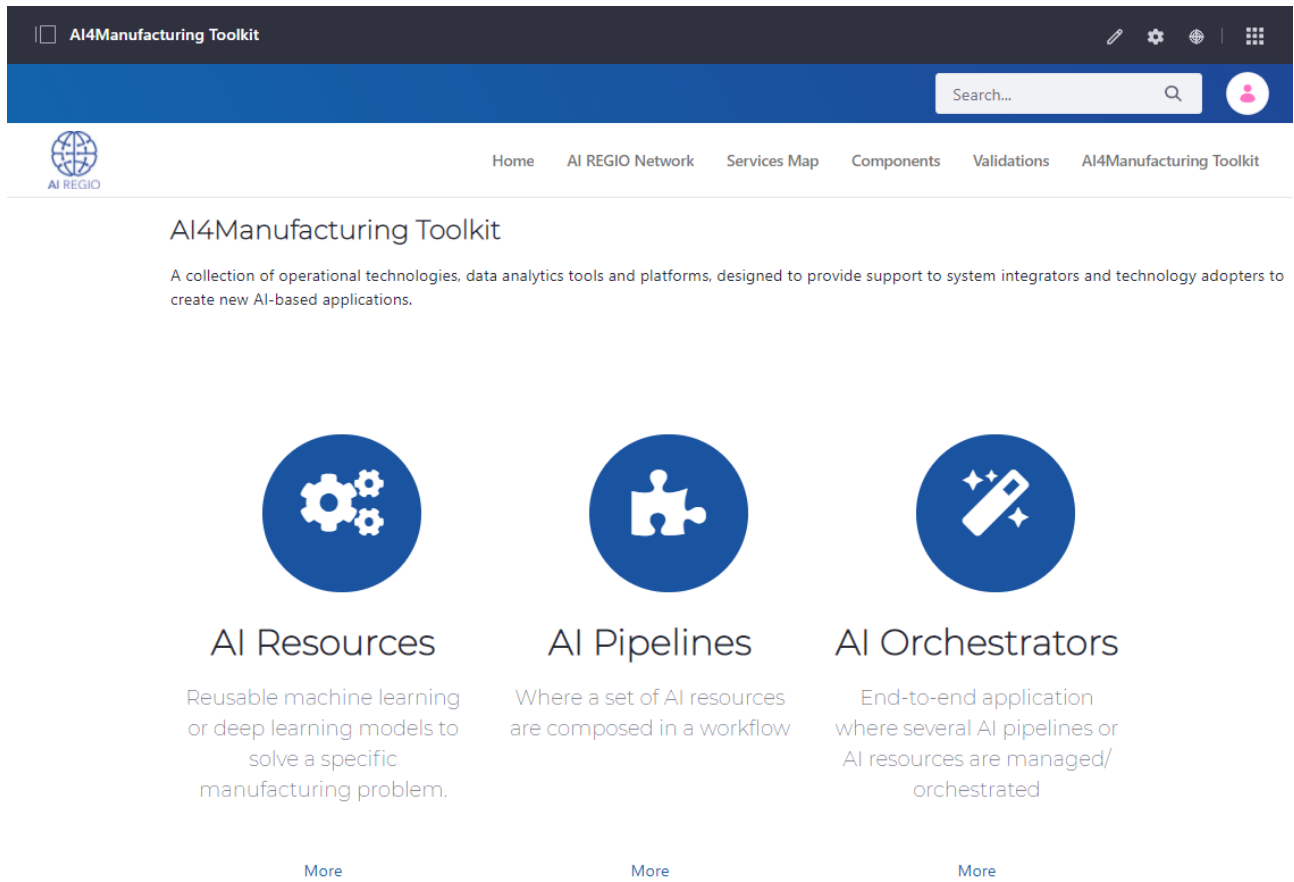

Figure 18 AI4Manufacturing Toolkit Dashboard

Our DIHs and TEFs representatives have received access to the platform in order to start with the content population (in particular with the showcase of theirs as-s services) and the interoperability with the IoT Catalogue has made possible the use of some of IoT Catalogue resources via the AI REGIO Platform.

At a later stage and when the content population will consolidate the initial collections of services, assets and knowledge and the offer is enough to highlight to our final user expectations for the AI REGIO DIH services marketplace future success, we'll open the registration also to our final user. The current prototype is, in any case, available at https://airegio-portal.eu/ and it is possible to request a demo by writing to dihiware@eng.it.

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[10] D4.05 AI4Manufacturing Toolkit

3.2   AI REGIO contribution to DIH4INDUSTRY

DIH4INDUSTRY aims to be a matchmaking platform for European DIHs that allows solutions and services to be shared in the context of manufacturing to support European SMEs in their digital transformation.

The mail goal with DIH4INDUSTRY is to create an extensive and connected network of industrial DIHs enabling interaction through the platform, sharing solutions and services that respond to local needs for industrial digitalization. DIH4INDUSTRY's mission is clear: to facilitate the exchange of skills, assets, knowledge, technologies and data between European DIHs to provide an effective and efficient response to the technological and digital needs of European SMEs.

The DIH4INDUSTRY aims to become a digital platform targeted to European Digital Innovation Hubs that operate in the context of Industry 4.0. For this reason, it is important to attend to Industry 4.0 market data as they have direct influence on DIHs and EDIHs environments.

It is difficult to find relevant offering when it comes to the digitalization of the manufacturing sector. It is also important to mention that the big firms only target multinationals and big deals, so their services and solutions are not accessible for small and medium enterprises.

DIH4INDUSTRY intends to cover this gap by supporting the European Digital Innovation Hubs strategy, providing innovative solutions and services to the DIHs manufacturing network to support small and medium-sized companies in the digitization of their processes, products and services.

It aims to become the essential service provider for Digital Innovation Hubs, where services, solutions and knowledge about Industry 4.0 are provided to support the digital transformation of European industrial SMEs. With this objective and in line with the European strategy on DIHs, DIH4INDUSTRY must promote the engagement with DIHs as potential customers of the platform.

Enhancing the collaboration between the different stakeholders from the European DIH Community with a wide range of services, information and tools that will help DIHs, operating in the manufacturing sector, to communicate, align, collaborate and synchronize activities.

- Developing a clear overview of the DIHs related services provided in Europe exploring how these relate to networks and their service.
- Upgrading the DIH Catalogue, among others, identifying/triggering activities in the DIH Community in coherence with regional, national and EU policies.
- Creating an online community to foster interaction among hubs, information exchange and peer-learning.

Thus, the value of DIH4INDUSTRY for the DIHs to support them in complying with their mission (the digitalization of the manufacturing SMEs) is a sum up of three aspects below:

- Access to a dedicated collaboration space to foster innovation in the DIH. DIH4INDUSTRY offers the DIHs a dedicated digital collaboration space to host the innovation projects developed at the DIH, to share documents and information among DIH members, to open calls for experiments or pilots, in summary a common repository and communication tools for supporting the internal collaboration at the DIH.

- Provisioning a marketplace of assets and services for supporting the digitalization of all SMEs approaching the DIH. DIH4INDUSTRY offers the DIHs a catalogue of assets and services provided by different IT providers to support them in the digitalization of the SMEs engaged to their DIH.
- Engagement with other DIHs of the network and sharing common information. As part of DIH4INDUSTRY, a DIH is member of a network of DIH focused on Industry 4.0, so it can share information and practices with other DIHs with the same focus.

The DIH4INDUSTRY brand has been officially launched at EBDVF2020 on November 2020 as part of the exploitation plan of the MIDIH project and now, under the umbrella of the AI REGIO project, the DIH4IINDUSTRY platform will be supported and promoted.

AI REGIO project and DIH4INDUSTRY platform are completely aligned with the European Digital Strategy in order to set the conditions for the Industry 4.0 ecosystem, supporting European and state policy makers by accelerating innovation, developing future champions and establishing a dynamic digital environment.

DIH4INDUSTRY constitutes a European network of Digital Innovation Hubs that are active in the Industry 4.0 context, providing information about their main activities and direct link to the relevant spaces.
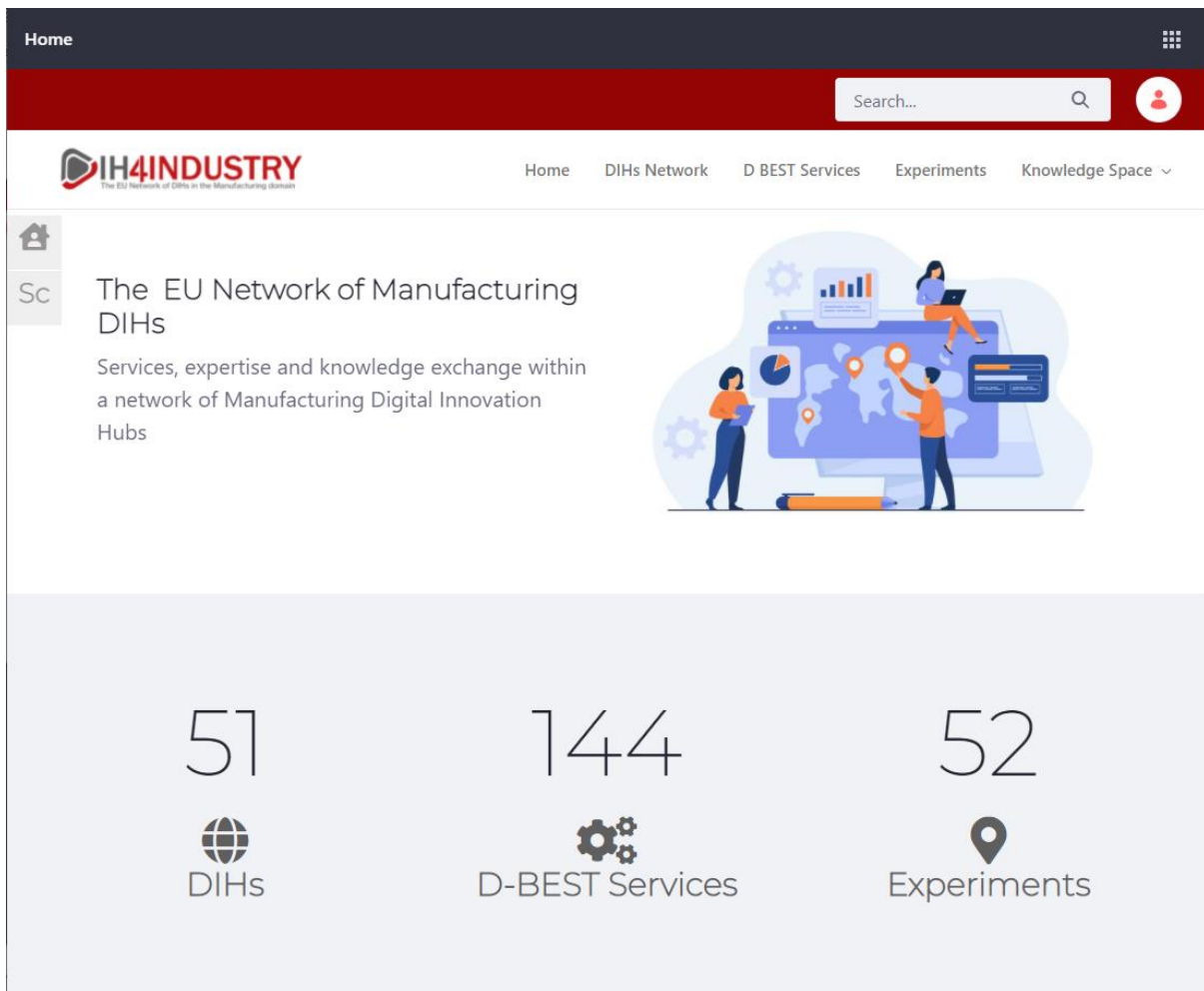

Figure 19 DIH4INDUSTRY Landing page

The focal point of the platform is the Services Map (Figure 20) that, in line with the catagorization specified by the MethoDIH standard, allow our DIHs to showcase their services. In addition, a map with DIH experiments is also available.
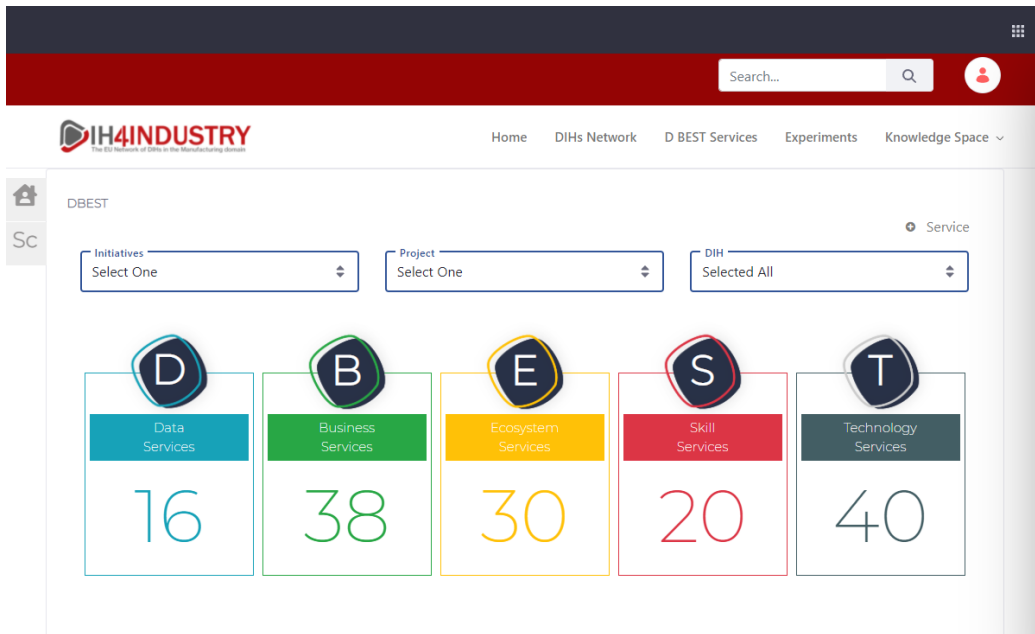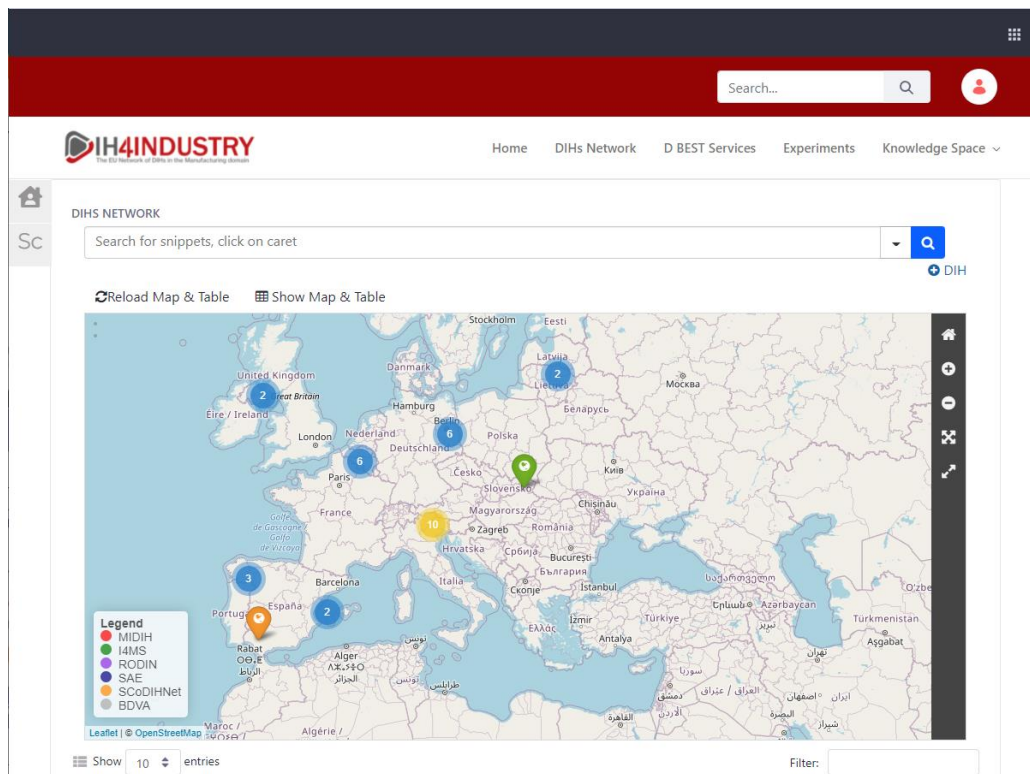

Figure 20 DIH4INDUSTRY Services Map

Figure 21 DIH4INDUSTRY DIHs Map

26

A first version of the DIHINDUSTRY instances is public available at https://dih4industry.eu even if if the user registration is not publicly open yet.

Together with AI REGIO as part of I4MS, different initiatiaves, operating in different domains of the Manufactury sector have been contacted and involved in the DIHINDUSTRY initiative such as SAE, SCoDIHNet, RODIN, BDVA, DIH4AI and SPIRE.

The potential is therefore to put together hundreds of DIHs and give life to a new ecosystem also taking the burden of making it grow proviben not only a showcases of services but also an environment to share knowledge and where collaborate.

The population of the DIH4INDUSTRY has already started and to do that we are leveraging the interoperability mechanisms among the DIHIWARE instances and versus external systems. This is why we have today a limited number of DIHs and services into the platform and that why it is not yet publicly available but the opening is planned by the end of the 2021, covering at least a subset of the engaged initiaves.

Conclusions

This report presents the design of the AI REGIO DIH Platform, based on an already established and well know background platform, extended and adapter to the needs of the digital ecosystem beyond the AI REGIO Project. While the IT tool, described in terms of both backgrounds and foregrounds, has been presented in deep, the cornerstone of the AI REGIO approach is represented by envisaged adoption plan.

In Chapter 2 we have therefore tried to give importance to several technical and functional aspects of platform, also thinking about the possibility of relation with the growing number of similar platforms emerging in the European context, unlocking the power of data and breaking down barriers.

Starting from the distinctive features of AI REGIO DIH Platform and considering the uses being made of it within the Project or even outside, it is possible to say that the AI REGIO DIH Platform could be the virtual environment enabling easy access to leading edge technologies, the creation of new business opportunities to broaden and reinforce research, the exchange of experiences on good practices, the generation of synergies complementary technologies and knowledge, the setting up of pan-EU value chains and the increasing impact of public funding.

On the other side, the adoption plan can be summarized by the Consortium plans to establish and enable a virtual environment for a new AI Ecosystem able to multiply business opportunities and facilitate its sustainability via a specific IT tool enabling the birth of the one-stop-shop marketplace integrated in a collaborative oriented platform and, and on the other hand amplify the impact of the bridges between DIHs communities.

The interaction among Digital Innovation Hubs, the information exchange and peer-learning will be enabled by a designed platform adoption strategy that, using an iterative approach, aiming to establish and reinforce both the platform's capabilities and the emerging ecosystem trust.

Starting for the high level user journey identified for this first prototype it will be necessary to identify more than one persona emerging from the first platform exploitation phase in order to capture and compare the different needs and behaviors of core groups of users and so to align the environment to more specific experience maps in the next releases.

Then the real challenge will be to enable the secure connection of a multitude of heterogeneous environments and establish standardized communication protocols facilitating the sharing of data and services across spaces and across platform-specific sub-ecosystems.

The success of the platform is dependent on the existence of a strong ecosystem. To prosper, the platform, besides performing an essential marketplace function, should be easily interoperable with external systems (powered by DIHIWARE and not) enabling a bottom-up formation of the ecosystem around it. To this end, further functions and APIs will be adopted to empower the IT platform (in strong collaboration with other tasks in WP4 and WP5), as well as further stakeholders analysis will be conducted, both internally and externally, in strong collaboration with WP3 and WP8 in order to strengthen the business offering toward to the target virtual community.