D13.2 – VREs Operation Mid-term Activity Report

Version 1.0

26 January 2021

Grant Agreement number:	**823914**
Project acronym:	**ARIADNEplus**
Project title:	**Advanced Research Infrastructure for Archaeological Dataset Networking in Europe - plus**
Funding Scheme:	**H2020-INFRAIA-2018-1**
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The research leading to these results has received funding from the European Community's Horizon 2020 Programme (H2020-INFRAIA-2018-1) under grant agreement n° 823914.

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1. Document History

- 04.12.2020 - Draft Version 0.1
- 18.12.2020 - Executive Summary and Introduction
- 04.01.2021 - New Section 1 and Section 2
- 12.01.2021 - New Section 3
- 14.01.2021 - Overall revision
- 26.01.2021 - Quality control check

2. Table of Contents

3. Executive Summary

This deliverable D13.2 - "VREs Operation Mid-term Activity Report" describes the activities carried out during the first 24 months of the ARIADNEplus project within Work Package 13. Specifically, in Task 13.1 Infrastructure Operation (JRA2.1) and Task 13.3 VREs Operation (JRA2.3). It reports the procedures governing the operation of the VREs as well as the status of the aggregated resources at mid-term in the ARIADNEplus infrastructure. Virtual Research Environments (VREs) are "systems" specifically conceived to provide their users with a web-based set of facilities (including services, data and computational facilities) to accomplish a set of tasks by dynamically relying upon the underlying infrastructure. VREs are among the key products to be developed and delivered by the ARIADNEplus project to support the target communities and application scenarios in archaeology.

The development of VREs is based on three main activities: (i) the development of software artefacts that realise a set of functions (including those needed for accessing certain datasets), (ii) the deployment of these artefacts in an operational infrastructure following the release procedures and tools presented in the deliverable D13.1 "Software Release Procedures and Tools JRA2", and (iii) the final deployment and operation of well-defined Virtual Research Environments by exploiting the facilities offered by the underlying D4Science infrastructure and its services[1].

This report documents the last of the above three activities – i.e. the exploitation of the services and technologies offered by the underlying infrastructure to serve the needs of defined scenarios – as implemented in the context of the ARIADNEplus project from January 2019 to December 2020. As of January 2021, 5 VREs were created and operated. Specifically, the ARIADNEplus Project VRE (cf. Sec 3.1) which was created first and prior to the project kick-off. The ARIADNEplus Mappings VRE, to support metadata mappings. (cf. Sec. 3.2). The ARIADNEplus Aggregation Management VRE, where project partners discuss data integration issues and procedures to activate or propose to the whole consortium (cf. Sec. 3.3). The Geoportal Prototype VRE (cf. Sec. 3.4), developed for the integration, validation, harmonisation, visualisation, and access of archaeological georeferenced datasets collected in Italy, and the Archeomar VRE, developed for the visualisation and controlled access of archaeological georeferenced datasets (cf. Sec. 3.5). As of January 2021, these VREs have served the needs of more than 260 users in total spread across 21 countries, and nearly 5.000 user sessions. This required to deal with approximately 100 tickets (59 requests for support, 9 requests for incidents and bugs, 9 requests for Virtual Machine or Container creations)

[1] M. Assante, L. Candela, D. Castelli, R. Cirillo, G. Coro, L. Frosini, L. Lelii, F. Mangiacrapa, P. Pagano, G. Panichi, F. Sinibaldi, *Enacting open science by D4Science*, Future Generation Computer Systems, Volume 101, 2019, Pages 555-563, ISSN 0167-739X, https://doi.org/10.1016/j.future.2019.05.063.

1 Introduction and Objectives

Virtual Research Environments (VREs) are “systems” aiming to provide their users with web-based working environments, offering a spectrum of resources (including services, data, and computational facilities) needed to accomplish a given task, by dynamically relying on the underlying infrastructure. VREs are key products to be delivered by the ARIADNEplus project to meet the needs of its target community, and the VRE developers are dedicated to discussing and developing various approaches and solutions to be applied to concrete cases and scenarios, devised to serve specific communities and practitioners confronting a given research question.

The end-user accesses the VREs through a web component providing access to the ARIADNEplus infrastructure, namely the ARIADNEplus Infrastructure Gateway. This gateway is accessible via the URL https://ariadne.d4science.org/ and is the end-user access point to the ARIADNEplus Virtual Research Environments.

This deliverable – D13.2 ‘VREs Operation Mid-term Activity Report’ – details the activity leading to the deployment and operation of a series of Virtual Research Environments, addressing the needs of the first two years of the ARIADNEplus consortium.

This activity led to the deployment and operation of five VREs in the period from January 2019 to December 2020. Overall, these VREs are serving the needs of more than 260 users, spread across 21 countries and include nearly 5,000 user sessions.

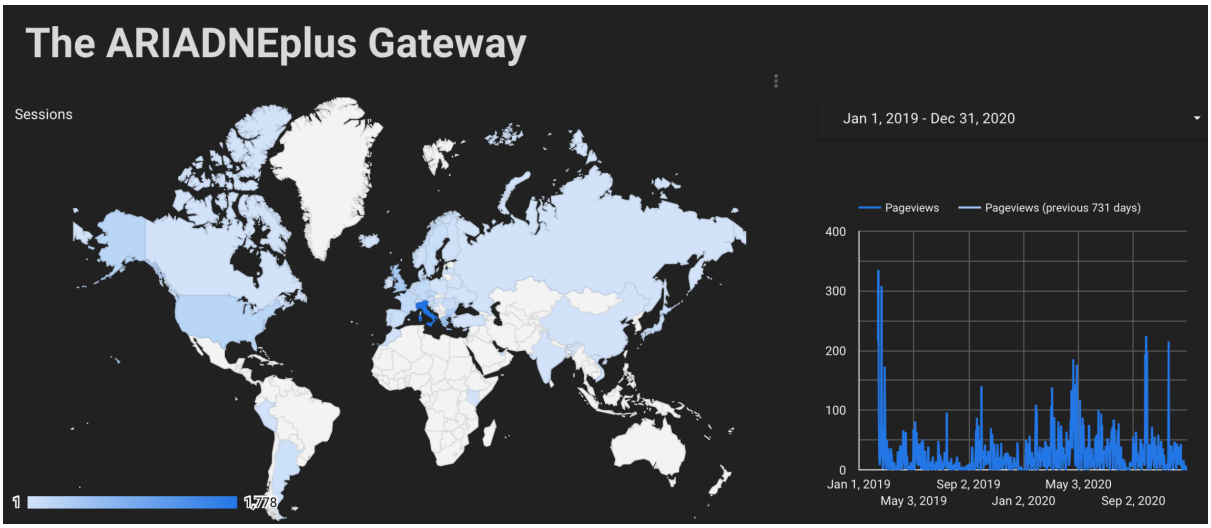

Figure 1. Geo-distribution of user sessions on the ARIADNEplus Infrastructure Gateway in the first 24 months of the project.

The remainder of this report is organised as follows: Section 2 describes the policies and procedures governing the planning and deployment of the Virtual Research Environments and Section 3 describes the Virtual Research Environments that have been deployed and operated during the period. For each Virtual Research Environment, the deliverable describes the goal and the main facilities offered to their users. Section 4 reports conclusions.

2 VREs Procedures

Deployment and operation of VREs is a collaborative effort, involving the WP13 team to deploy and configure the technology as needed for the work described in WP12, WP15 and WP16.

The procedures leading to VRE deployment took a consolidated form, as it was inherited from the D4Science infrastructure and described in the D4Science Wiki:

https://wiki.d4science.org/index.php?title=Virtual_Research_Environments_Deployment_and_Operation

For the needs of ARIADNEplus, it was decided to support this work using the project activity tracker, and a specific VRE tracker was created with the goal of capturing the entire process from specification to operation. The specification of the VRE was produced by the VRE designer/requester. The specification had to contain:

- VRE name and abstract
- Membership policy, i.e. whether the VRE is open or restricted, who is allowed to invite members
- VRE expected datasets
- VRE expected functionalities
- VRE due date

The following statuses were supported:

- ***Planned***: the WP4 team was satisfied with the specification, i.e. the specification contained enough detail to proceed with creation, and acknowledged that the completion of the VRE was feasible by the due date initially requested (or the team liaised with the designer/requester to find a mutually suitable date)
- ***Available***: the VRE was up and running, ready to be validated by the VRE designer/requester
- ***Released***: the VRE was validated and the target community could start using it
- ***Removed***: the VRE was deleted at the request of a manager
- ***Rejected***: the requested VRE could not be created as the requirements outlined for it could not be satisfied

3 VREs Creation, Deployment and Operation

This section briefly describes the facilities used by the VRE creators for the actual deployment of VREs, reports the complete list of deployed and operated VREs, and offers a characterisation of each available VRE.

The act of definition and deployment of a new VRE was supported by a wizard (cf. Figure 2) that enables authorised users to act on requests according to the procedure described in Sec. 2, into an actual specification and then, automatically, into a working VRE made available via the ARIADNEplus gateway.

Through the wizard, the user was requested to specify: (i) the descriptive information characterising the expected VRE (i.e. name, description, duration), and (ii) the functionalities and datasets to be made available in the specific VRE by selecting among those available. The resulting list of functionalities was derived from the range of potential features within the current software version, and services hosted by the underlying D4Science infrastructure.

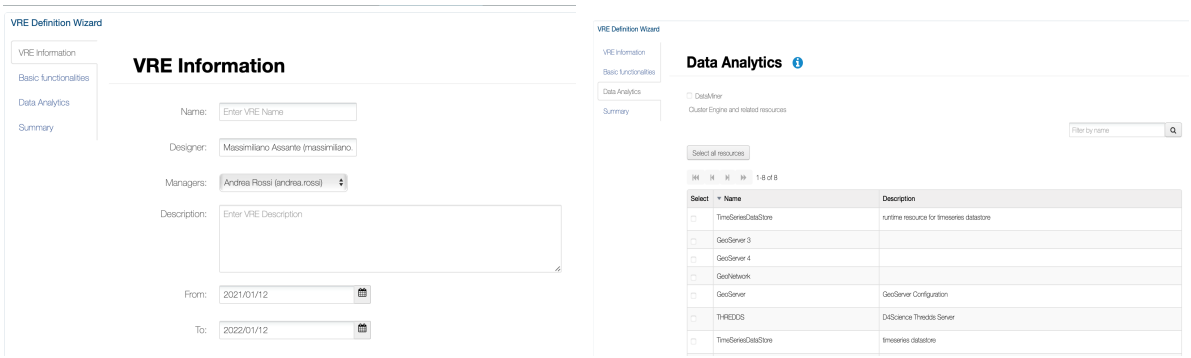

Figure 2. VRE Creation Wizard Screenshots.

In the period from January 2019 to December 2020, a total of 5 VREs were created and/or operated to serve the needs of the ARIADNEplus project. Specifically, the ARIADNEplus Project VRE (cf. Sec 3.1) which was created prior to the project kick-off and was dedicated to Project management and file exchange. The ARIADNEplus Mappings VRE was created after a few months to support the metadata mappings undertaken within the project. (cf. Sec. 3.2). The ARIADNEplus Aggregation Management VRE provided a place where some of the project partners could discuss data integration issues in a controlled environment, and possible procedures to activate or propose to the whole consortium (cf. Sec. 3.3). The Archeomar VRE was developed for the visualisation and controlled access of archaeological georeferenced datasets (cf. Sec. 3.5), and the Geoportal Prototype VRE (cf. Sec. 3.4) was developed for the

integration, validation, harmonisation, visualisation, and access of archaeological georeferenced datasets collected in Italy, to be used as an exemplar for other similar developments.

Figure 3 reports the number of VREs operated per month and their users in the first 18 months of the project. During this period, two VREs were conceived to support project activities and mapping tasks were created and remained active for the entire period, namely ARIADNEplus Project VRE and ARIADNEplus Mappings VRE. Three additional VREs were subsequently created, one during February 2020 (Geoportal Prototype, GeoNa-Prototype in the chart), one during March 2020 (ARIADNEplus Aggregation Management), and finally one in April 2020 (Archeomar).

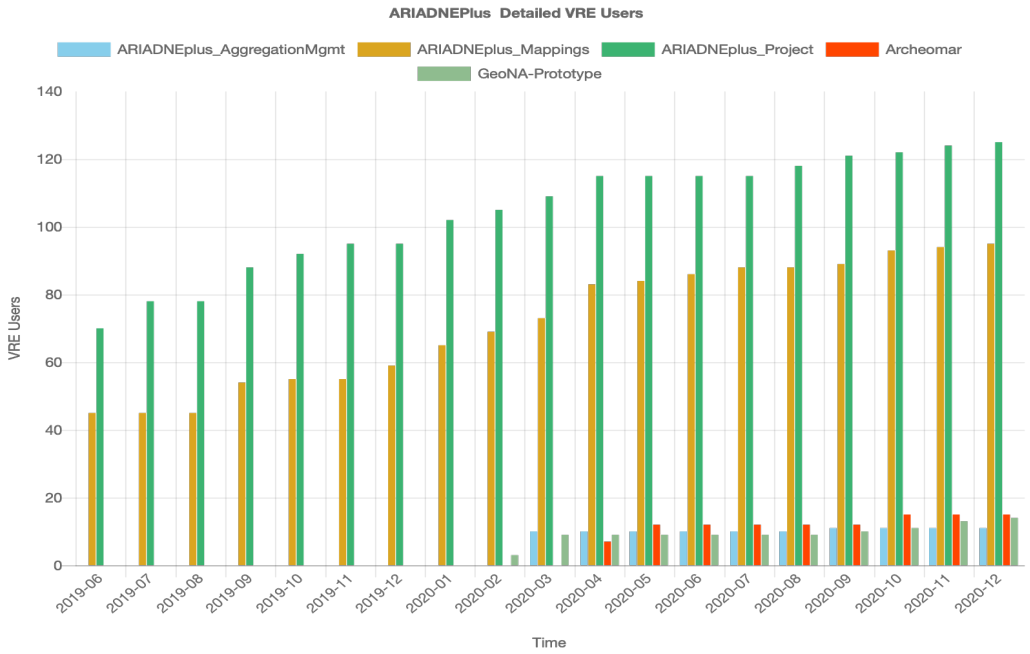

Fig. 3 Number of VREs operated per month and their users's number from June 2019 to December 2020.

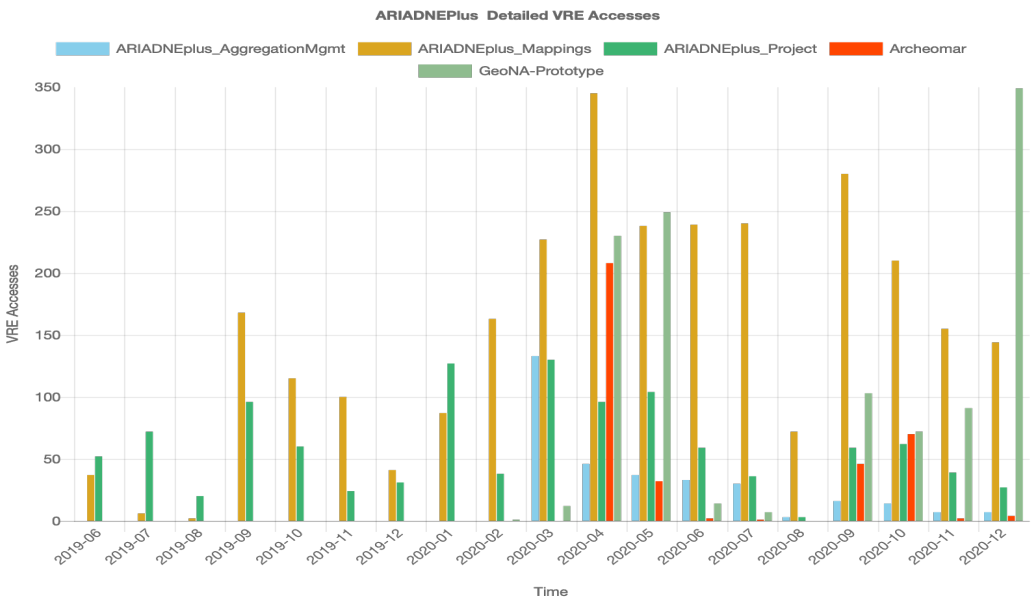

Fig. 4 Number of VRE User Accesses per month from June 2019 to December 2020.

Figure 4 complements Figure 3 by reporting the number of VRE user accesses per month in the first 18 months of the project, hence by showing how often the ARIADNEplus members accessed and exploited these VREs. This chart shows peaks of up to 350 access per month on more than one VRE. Overall, the most accessed VRE in the prior 18 months was the ARIADNEplus Mappings, with an average number of accesses per month of about 150, reflecting the frequent mapping activity that VRE members undertook during the period.

The operation of VREs require the management of requests for support, and the creation of new Virtual Machines and Containers (e.g. Docker). Figure 5 shows a screenshot of the issue tracker reporting the tickets and the various types of tickets. During the reporting period, a total of 98 tickets were resolved (59 requests for support, 9 requests for incidents and bugs, 9 requests for Virtual Machine or Container creations).

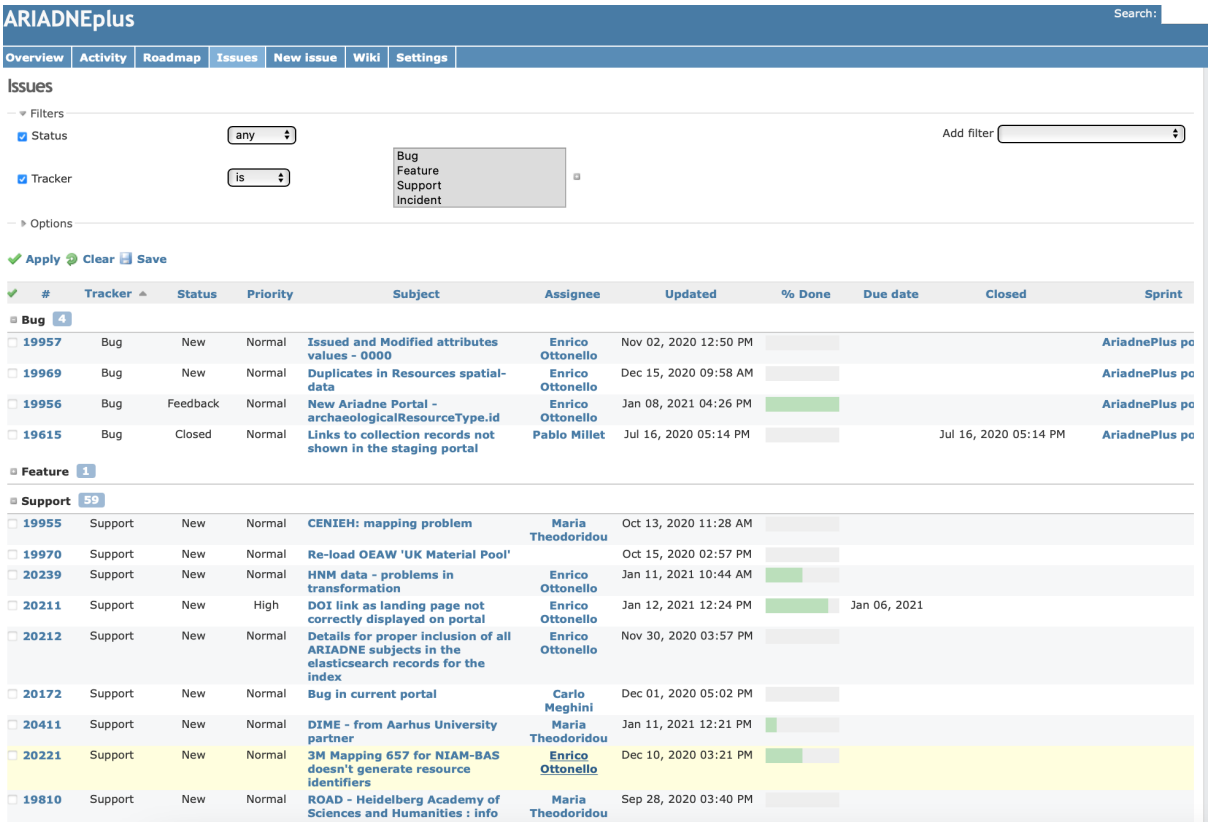

Fig. 5 A Screenshot of the ARIADNEplus issue tracker used for the management of requests for support and malfunctions.

A brief description of each available VRE is reported in the following sections. All the VREs were provided with:

- a ***shared workspace*** to enable every user to store and organise the information objects with which they chose to work. In addition, the user could collaborate with other users by sharing objects and messages;
- a ***VRE Management facility*** to enable authorised users (i.e. VRE Managers) to manage other users needing to access a VRE. VRE Managers can (i) authorise users for access to the VRE, (ii) assign or withdraw roles to users, (iii) remove users, and (iv) send communications to users;
- a ***social networking facility*** to enable users to use the common facilities typical of social networks – e.g., posting news, commenting on posted news – yet adapted to the settings of working environments like those characterised within ARIADNEplus. Users could post news as well as applications;
- a ***notification facility*** to alert users to relevant activities as they happen. These notifications offer a sense of anticipation and create a productivity boost. Users receive an alert (through *a priori* selected channels, e.g., email, web portal, Twitter) notifying them of something of interest within their VRE(s);
- a ***members' facility*** to provide users with a list of of other users within the VRE;

- a ***messaging facility*** to provide users with a common email environment as-a-Service, integrated with the rest of the VRE, e.g., to send any information object residing in the workspace (regardless of how "big" and "complex" it may be) as an attachment without consuming bandwidth.

3.1 ARIADNEplus Project VRE

This VRE was devised to support ARIADNEplus project activities and discussions. Only members of the ARIADNEplus consortium have access to this VRE.

The ARIADNEplus Project VRE is available at:
https://ariadne.d4science.org/group/ariadneplus-gateway/explore?siteId=164842781

This VRE has been in operation since January 2019, and is currently serving 126 users, namely the ARIADNEplus Consortium members. A screenshot of the VRE is provided in Figure 6. It shows the home page and the menu items for accessing the VRE facilities.

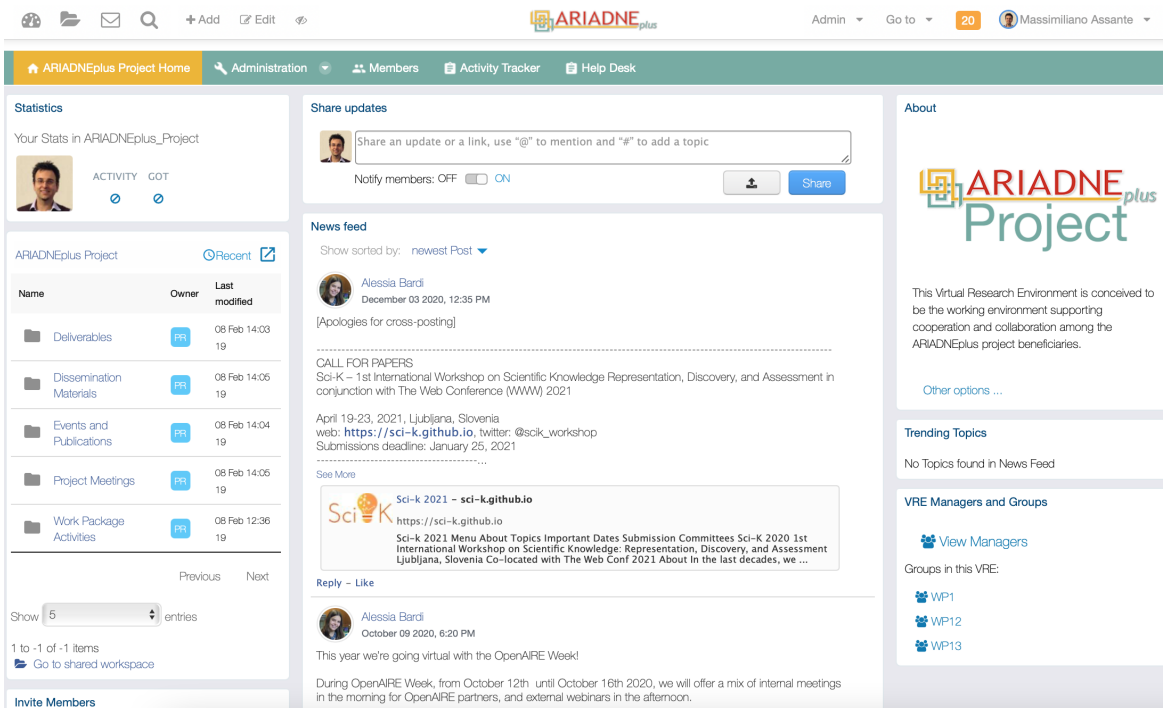

Fig. 6 A Screenshot of the ARIADNEplus Project VRE home page and the menu items for accessing the VRE facilities.

In addition to the basic functionality, it includes a social networking area to support discussions among members, and a user management facility to manage membership. This VRE is specifically equipped with the following capabilities:

- the ARIADNEplus Activity Tracker System: a facility enabling project members to access the project issue tracking system;
- the ARIADNEplus help desk: a facility enabling project members to access the help desk, useful for reporting queries or any features requests/bugs;
- a shared area in the workspace, to make available objects of interests, e.g. project deliverables, presentations, working notes;
- a user management area, to enable authorised users (i.e. VRE Managers) to manage other users needing to access the VRE. VRE Managers can (i) authorise users to access the VRE and its services, (ii) assign or withdraw roles to users, (iii) remove users, and (iv) send communications to current users;
- a Members area, to enable each VRE member to be informed about the activities of the rest of the VRE members and acquire details to contact them.

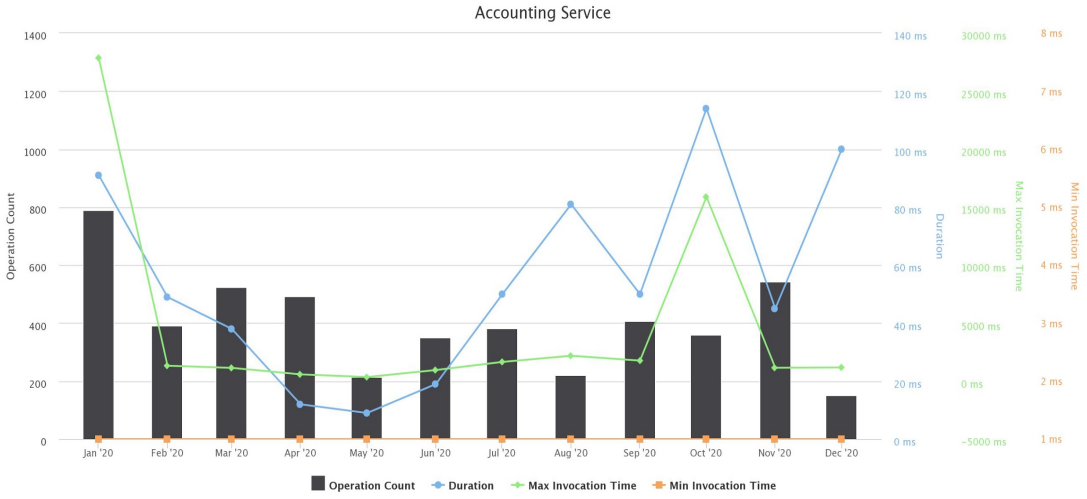

Fig. 7 ARIADNEplus Project VRE Operations per month.

Figure 7 reports the total number of operations performed in the context of this VRE during the whole of 2020. Operations included service tasks needed to maintain the VREs operations, as well as human tasks.

3.2 ARIADNEplus Mappings VRE

This VRE was conceived to be the working environment supporting the metadata mappings in the ARIADNEplus project. Only members of the ARIADNEplus consortium that deal with metadata mappings have access to this VRE.

The ARIADNEplus Mappings VRE is available at
https://ariadne.d4science.org/group/ariadneplus-gateway/explore?siteId=164895341

This VRE has been operational from February 2019 and it is currently serving 96 users. A screenshot of the VRE is provided in Figure 8. It shows the home page and the menu items for accessing the VRE tools, among which we find the tools used by the members to perform their metadata mapping activities. Specifically, the XML3 Mapping Tool, the Vocabulary Matching Tool, and the Activity Dash Tool aimed at tracking the processes (activities) of a workflow that might or might not be executed in a certain order.

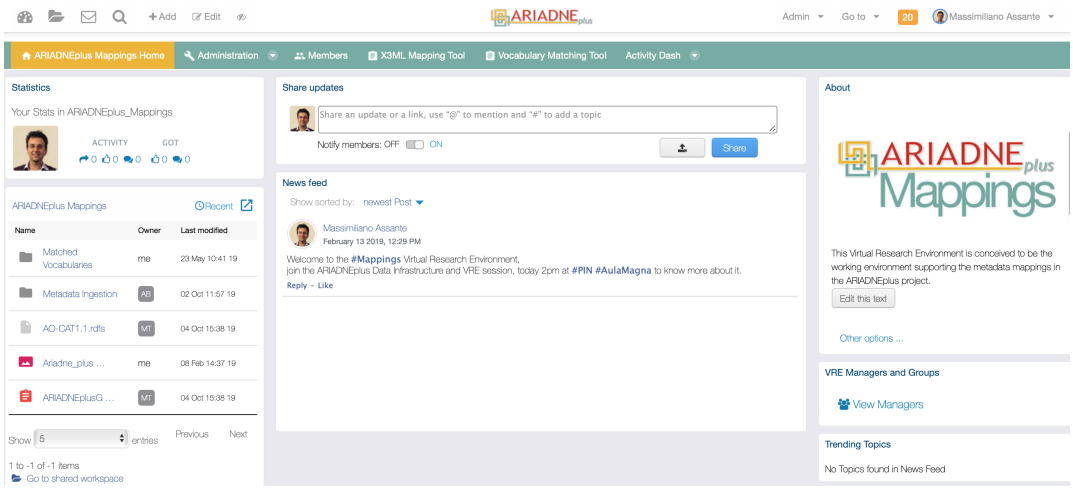

Fig. 8 A Screenshot of the ARIADNEplus Mappings VRE home page and the menu items for the VRE tools.

In addition to the aforementioned VRE tools for metadata mappings, and the basic social communication functionality, this VRE is equipped with the following capabilities:

- a shared area in the workspace, to make available objects of interest, e.g. mappings, vocabularies and working notes;
- a user management area, to enable authorised users (i.e. VRE Managers) to manage other users needing to access the VRE. VRE Managers can (i) authorise users to accessing the VRE and its services, (ii) assign or withdraw roles to users, (iii) remove users, and (iv) send communications to the current users;

- A Members area, enabling each VRE member to be informed of the activities of the rest of the members and contact them.

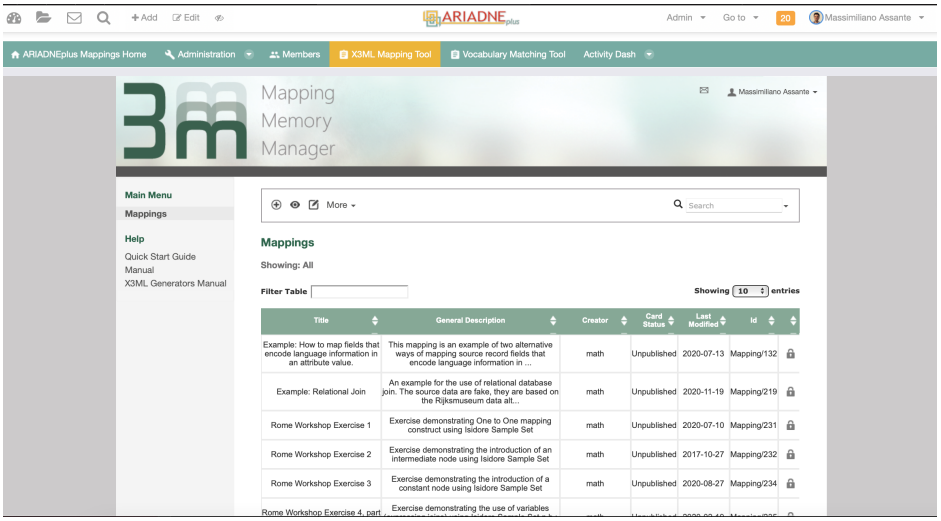

Fig. 9 A Screenshot of one of the ARIADNEplus Mappings VRE tool: the 3M Mapping tool.

Figure 9 shows the 3M Mapping tool available in the VRE. The 3M Mapping tool is provided by the ARIADNEplus partner FORTH-ICS and integrated into the infrastructure. This tool assists users during the mapping definition process, using a human-friendly user interface and set of sub-components that either makes suggestions for or validates the user input.

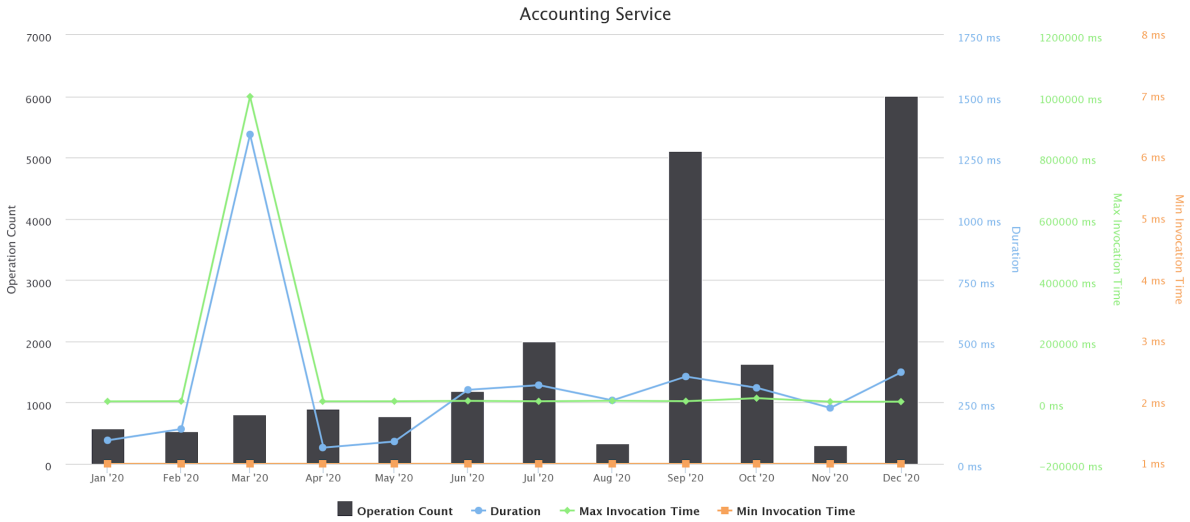

Fig. 10 The ARIADNEplus Mappings VRE Operations per Month.

Figure 10 reports the total number of operations performed in the context of this VRE during 2020. Operations included service tasks needed to maintain the VREs operations as well as human tasks.

3.3 ARIADNEplus Aggregation Management VRE

The goal of the VRE was to have a place where specific project partners could discuss data integration issues in a controlled environment, and possible procedures to activate for the whole consortium. The VRE access is therefore only via manager invitation.

The ARIADNEplus Aggregation Management VRE is available at:
https://ariadne.d4science.org/group/ariadneplus-gateway/explore?siteId=233677541

This VRE has been operational since March 2020 and is currently serving 11 users discussing data integration issues and procedures. A screenshot of the VRE is provided in Figure 11.

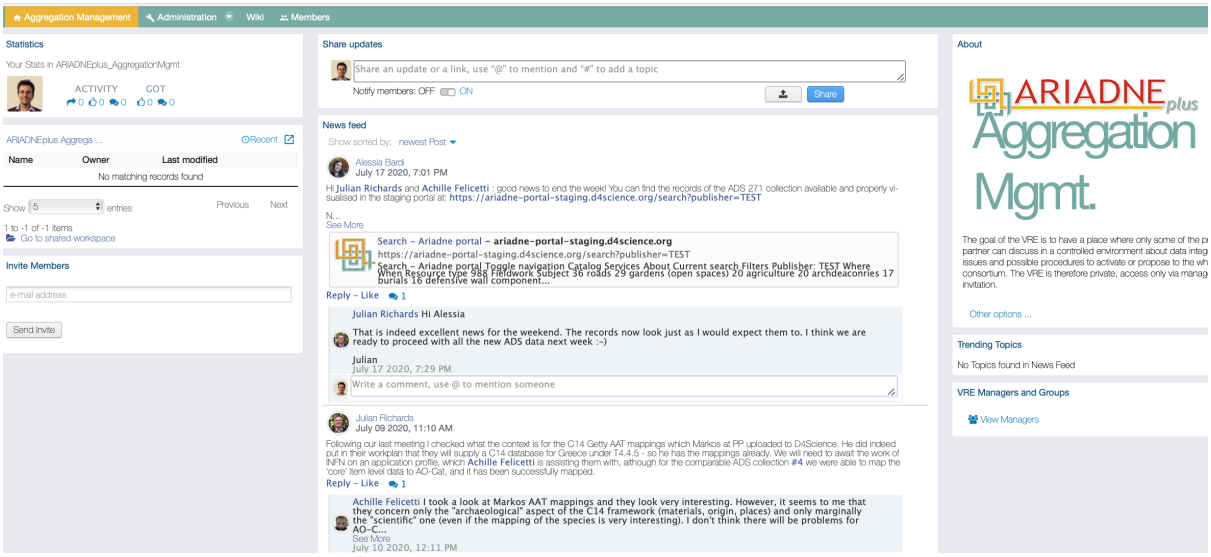

Fig. 11 A Screenshot of the ARIADNEplus Aggregation Management VRE home page.

This VRE features basic functionality only. Specifically, a social networking area to support the discussions among members, which is all that is needed within this VRE, along with a user management facility.

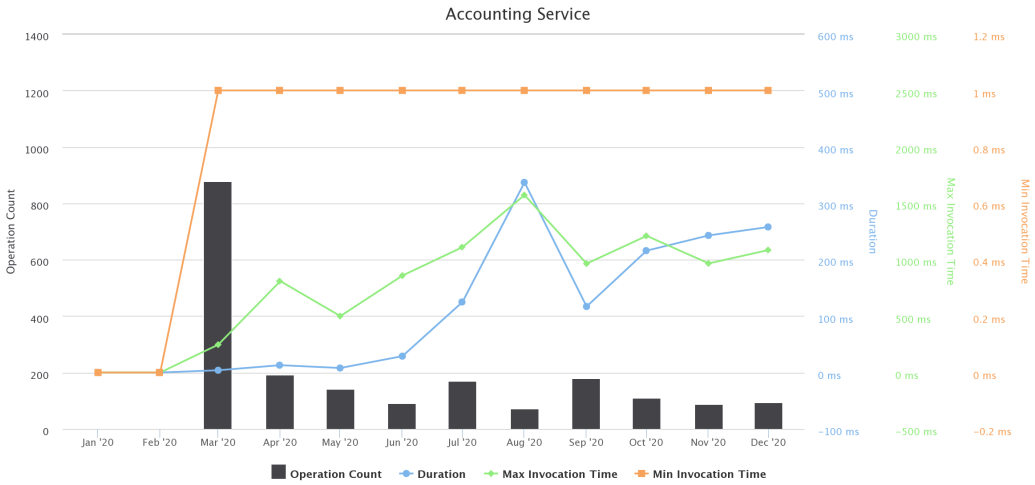

Fig. 12 The ARIADNEplus Aggregation Management VRE Operations per Month.

Figure 12 reports the total number of operations performed in the context of this VRE during 2020 (the VLE was online from March 2020). Operations included service tasks needed to maintain the VRE operations, as well as human tasks.

3.4 Geoportal Prototype VRE

The Geoportal Prototype VRE (also named Geo-NA Prototype) was conceived as a working environment developed for the integration, validation, harmonisation, visualisation, and access of archaeological georeferenced datasets collected in Italy. This prototype was intended to be a pilot for other national archaeological geoportals, to be then integrated into a European geoportal.

As a prototype, the VRE contains data in Italian only, to facilitate the participation of Italian archaeologists who are contributing to its development. The final versions will be bi-lingual, in English and in a range of National languages.

The Geoportal Prototype (Geo-NA Prototype) VRE is available at:
https://ariadne.d4science.org/group/ariadneplus-gateway/explore?siteId=229043941

This VRE has been operational since April 2020 and it is currently serving 14 users who are contributing to its development. A screenshot of the VRE is provided in Figure 13.

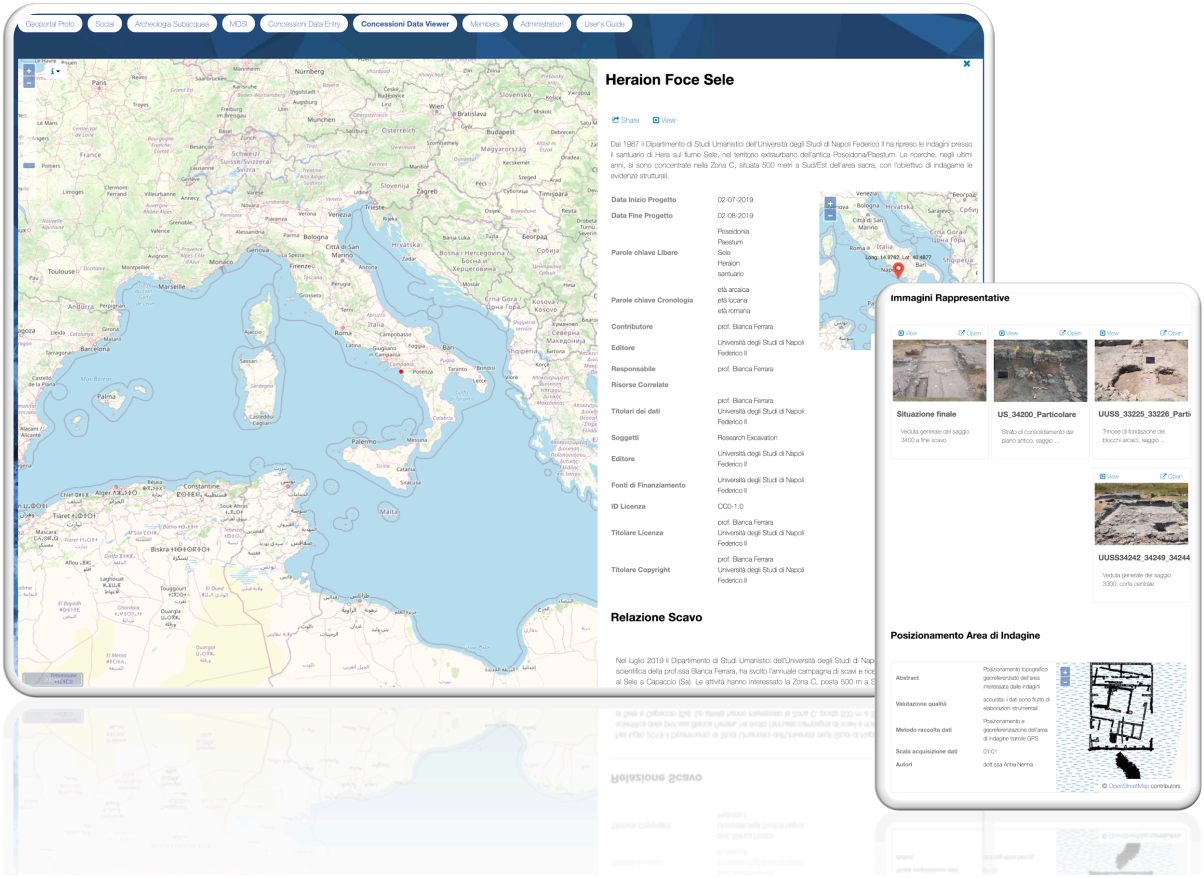

Fig. 13 A Screenshot of the Geoportal Prototype VRE GIS Data Viewer page.

This VRE provides the following Dynamic GUIs:

- ***Data Collection Form*** assisting users in publishing GIS projects
- ***GIS Viewer*** allowing any user to visualise projects on a map
- ***Project Viewer*** assisting users in accessing information, documents, images and datasets associated with GIS projects

These dynamic GUIs exploit the (i) GeoPortal service, managing validation and management of GIS projects, described in D15.1 “Mid-term interim report on ARIADNEplus services”; the (ii) D4Science Workspace to store and access attached documents; and the (iii) D4Science SDI (Spatial Data Infrastructure) to offer OGC Compliant Services (e.g. WMS, WFS, WCS, etc.).

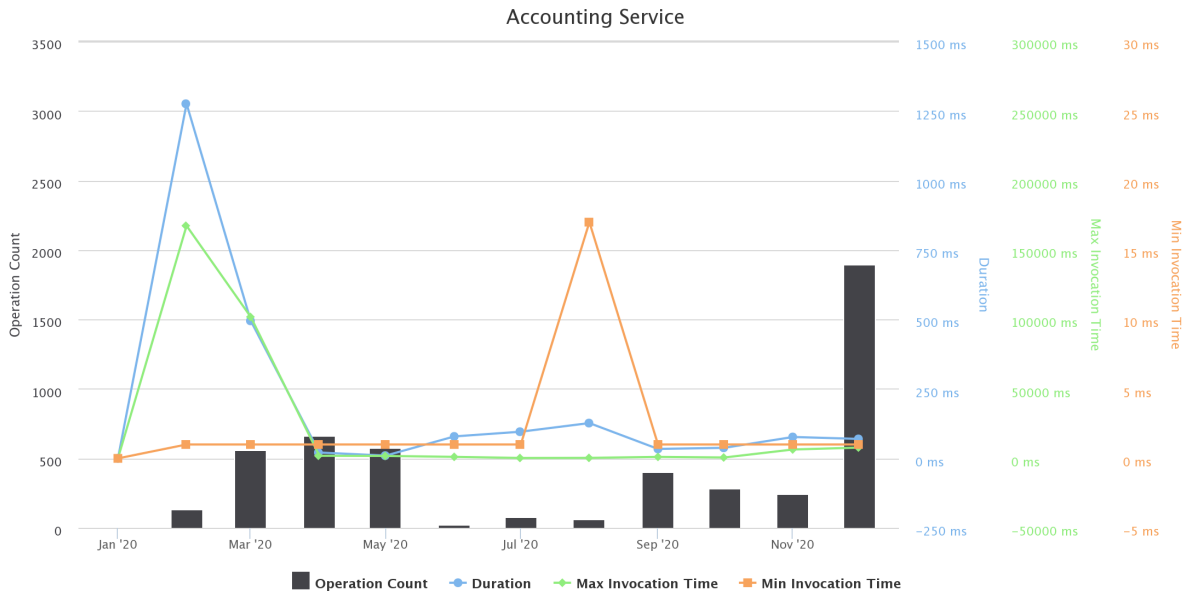

Fig. 14 The Geoportal Prototype VRE Operations per Month.

Figure 14 reports the total number of operations performed in the context of this VRE during 2020 (the VLE was online from February 2020). Operations included service tasks needed to maintain the VRE operations, as well as human tasks.

3.5 Archeomar VRE

The Archeomar VRE was conceived as a working environment developed for the visualisation and controlled access of archaeological georeferenced datasets. These datasets also contribute to the Geoportal Prototype VRE.

This prototype was intended to be a pilot for other national archaeological geoportals, and integrated in a European geoportal.

Currently, the VRE only contains data in Italian, to facilitate the participation of Italian archaeologists who are contributing to its development. The final versions will be bi-lingual, in English and in a range of National languages.

The Archeomar VRE is available at https://archeomar.d4science.org

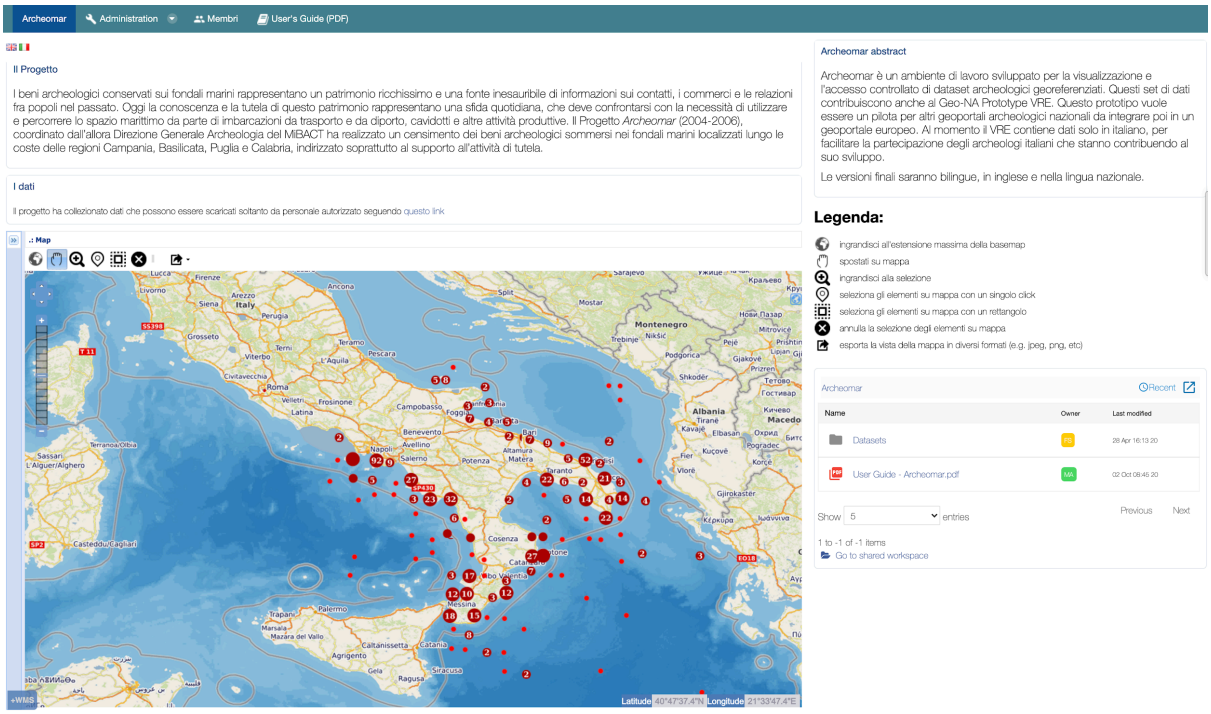

Fig. 15 A Screenshot of the Archeomar VRE home page.

Archeomar (Figure 15) offers an interactive map which contains data that can be visualised through the application GIS viewer. The map displays some of the datasets created by the Archeomar Project (2004-2006). The project, coordinated by the Directorate General of Archeology of the MiBACT[2] Italy, carried out a census of the archaeological assets submerged in the seabed located along the coasts of Campania, Basilicata, Puglia and Calabria regions, mainly aimed at supporting site protection activities.

This VRE has been operational since April 2020 and is currently serving 15 users needing to discuss data integration issues and contributing to its development. A screenshot of the VRE is provided in Figure 15.

[2] https://www.beniculturali.it

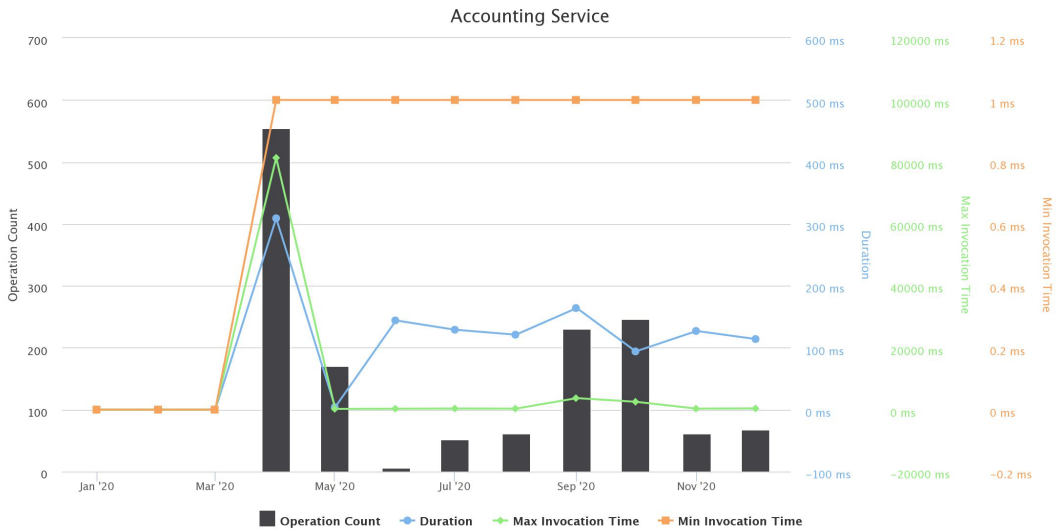

Fig. 16 The Archeomar VRE Operations per Month.

Figure 16 reports the total number of operations performed in the context of this VRE during 2020 (the VLE was online from April 2020). Operations include service tasks needed to maintain the VRE, as well as human tasks.

4 Concluding Remarks

Virtual Research Environments are among the key products to be delivered by the ARIADNEplus project, to meet the needs of its target community and application scenarios. They are “systems” aiming to provide users with web-based working environments that offer the entire spectrum of resources (including services, data and computational facilities) needed to accomplish a given task, by dynamically relying on the underlying infrastructure.

This deliverable has detailed the Virtual Research Environments deployed and operated during the first two years of the ARIADNEplus Project (from January 2019 to December 2020). Overall, five VREs were deployed and operated, two of them at the very beginning of the project, and the remaining three in 2020.

These VREs are serving more than 260 users in total, spread across 21 countries and nearly 5,000 user sessions in the period. The creation and operation of these environments required nearly 100 requests for features and support.