D13.3 - Software Release Final Activity Report - JRA2

Version 1 *(final)*

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1 Executive Summary

This deliverable D13.3 – "Software Release Final Activity Report - JRA2" documents the software packages produced by the project to implement the functionalities of the ARIADNEplus infrastructure, accessible from https://ariadne.d4science.org. These open-source software releases followed the procedures described in *D13.1 Software Release Procedures and Tools - JRA2* governing the release of software, methods, and tools for the ARIADNEplus infrastructure.

D13.3 reports on *(i)* the ARIADNE VRE software releases, where a total of 29 different release cycles were performed during the project period. Each release contained EUPL licensed software, whose source is accessible on the Code Versioning System (CVS) platform publicly available online at https://code-repo.d4science.org/gCubeCI/gCubeReleases, and reports on *(ii)* the ARIADNE Portal software releases whose source is accessible on the Code Versioning System (CVS) platform publicly available online https://github.com/ARIADNE-Infrastructure/portal.

These activities have been carried out in the context of *Task 13.4 Software integration and release* (JRA2.4) as part of Work Package 13 (WP13). This task managed the process of software maintenance, enhancement, and provisioning in JRA work packages. Thus, it i) defines the release and provisioning procedures; ii) establishes the release plan; iii) coordinates the release process; iv) operates the tools required to support the release and provisioning activities; v) validates the software documentation; vi) takes care of the distribution of the software and its provisioning. This task benefits from the practices established and experience gained within the D4Science infrastructure.

2 ARIADNEplus infrastructure software release report

The ARIADNEplus infrastructure is built on the D4Science infrastructure [1] and gCube open-source technology [2, 3]. From the end-user point of view, ARIADNEplus Virtual Research Environments (VREs) are accessible through the ARIADNEplus gateway.[1]

The development of the ARIADNEplus VREs count on the availability of new versions of the enabling technology that are made available via the software repository accessible at https://code-repo.d4science.org/gCubeCI/gCubeReleases.

These versions are produced by responding to the requirements (according to priority) formulated by the ARIADNEplus community. This includes new facilities to be developed or requests for enhancements of existing facilities, as well as requests for resolving issues with functionality.

As described in project Deliverable *D13.1 - Software Release Procedures and Tools JRA2* [4] the enabling technologies selected to properly support the release process in gCube are: Gitea (a Git hosting service), Jenkins (an automation server) and Maven (a project management and comprehension tool).

The above-mentioned technologies supported the development of the ARIADNEplus infrastructure and enabled the production of the following gCube open-source software releases:

 4.15 (Oct. 2019), 4.16 (Nov. 2019), 4.17 (Dec. 2019), 4.18 (Dec. 2019), 4.19 (Feb. 2020), 4.20 (Feb. 2020), 4.21 (Mar. 2020), 4.22 (May 2020), 4.23 (Jun. 2020), 4.24 (Jul. 2020), 4.25 (Oct. 2020), 4.25.1 (Oct. 2020), 4.26 (Nov. 2020), 4.27 (Dec. 2020), 4.28 (Feb. 2021), 5.0 (Feb. 2021), 5.1 (Mar. 2021), 5.2 (May. 2021), 5.3 (June. 2021), 5.4 (Aug. 2021), 5.5 (Oct. 2021), 5.6 (Nov 2021), 5.7 (Jan. 2022), 5.8 (Mar. 2022), 5.9 (Mar. 2022), 5.10 (Apr. 2022), 5.11 (May. 2022), 5.13 (Jul. 2022), and 5.13.1 (Sep. 2022).

The above mentioned open-source software releases have been deployed into the D4Science production infrastructure powering the VRE, and have undergone the procedures described in the project Deliverable *D13.1 - Software Release Procedures and Tools - JRA2*, governing the release of software, methods and tools for the ARIADNEplus infrastructure.

All the requests have been modelled and managed by an issue tracker operated by D4Science and available at https://support.d4science.org. To meet the needs of the ARIADNEplus community, a specific project was created[2] (figure 1) and configured to allow the creation of tickets for release tasks, requests for support, reporting of incidents, and requests the provisioning of specific services.

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[1] https://ariadne.d4science.org

[2] https://support.d4science.org/projects/ARIADNEplus

Figure 1. A screenshot of the ARIADNEplus issue tracker.

In Figure 2, the ARIADNEplus software packages released in the gCube system are divided into four sub-systems, namely the ARIADNEplus Front-end Framework, the ARIADNEplus VRE Management Framework, the ARIADNEplus Accounting and Authorization Framework and the ARIADNEplus VO Management Framework.

Figure 2 describes how these subsystems are linked together, while Tables 1, 2 and 4 summarise the ARIADNEplus software packages released in the gCube system. It must be noted that all the software released is open source, EUPL licenced and its source code is freely available on the following Git Code Versioning System platform: https://code-repo.d4science.org/gCubeSystem.
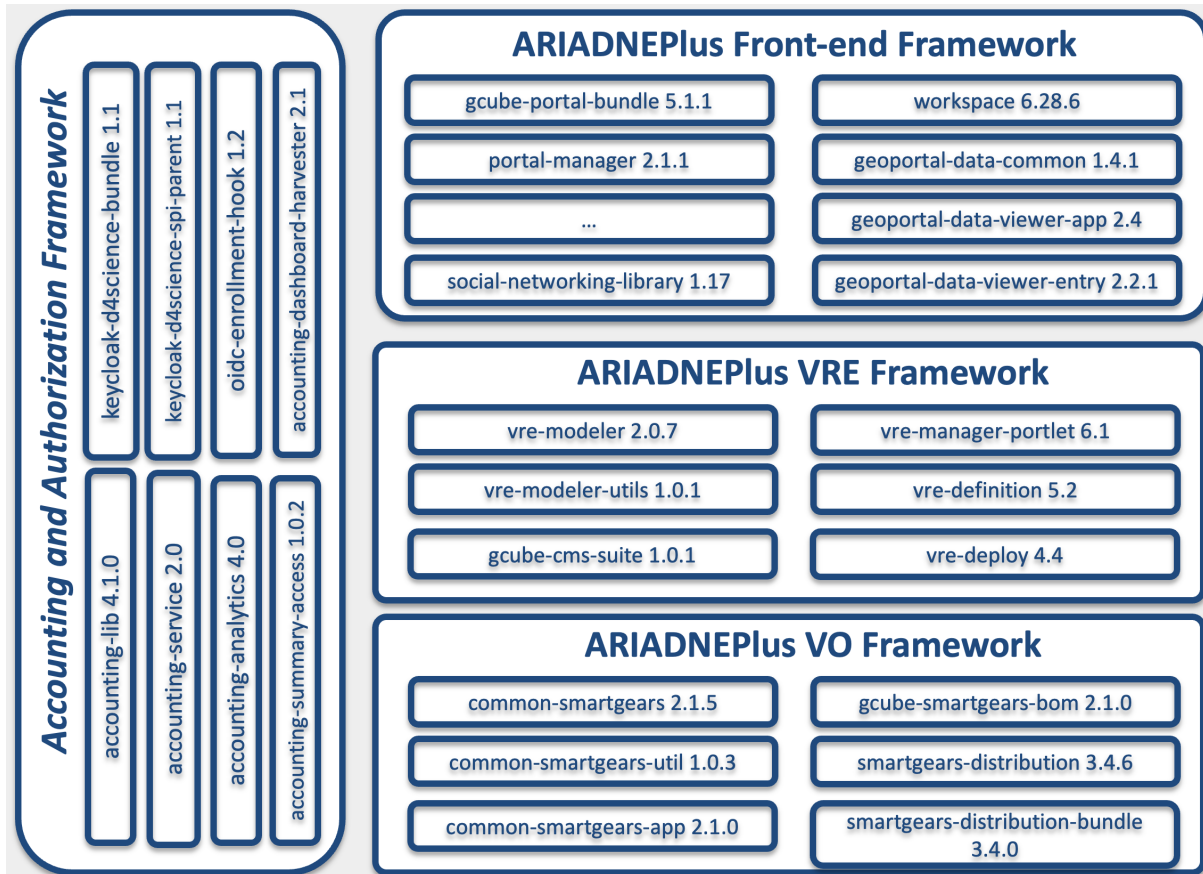
Figure 2. Structure and linking of the software systems.

2.1 Description of VRE Software package releases

2.1.1 ARIADNEplus Front-end Framework software packages

The Frontend framework is realised through a combination of software components (services and libraries) powered by the gCube System. There are three main subsystems in the Framework:

- Portlets User
- Portal
- Distribution

These systems provide consumers with a homogenous abstraction layer over different external technologies, enabling the operation of the framework. The external technologies involved comprise, Apache Cassandra, Apache Jackrabbit, Elasticsearch, MongoDB, GeoNetwork, GeoServer, Liferay Portal and Netflix Conductor.

In particular, the Portlets User subsystem exploits an Apache Cassandra cluster, an Elasticsearch cluster, an Apache Jackrabbit repository (metadata), and a MongoDB cluster (payload) for its backend.

The Portal subsystem exploits Liferay Portal for its backend allowing users to login for personalised services or views, and an Orchestrator (Netflix Conductor) to synchronise with the Authorization System.

Table 1 reports the final versions of the software. During the lifetime of the project the software was enhanced and released multiple times, and the details about these releases is publicly available online at https://code-repo.d4science.org/gCubeCI/gCubeReleases.

The software packages are accessed by users via a Liferay-based web-portal, customised to interface with the D4Science infrastructure, and equipped with gCube portlets. This web-portal acts as the "one stop shop" for the entire ARIADNEplus VRE. Through it, users have access to the resources and Virtual Research Environments created to serve the needs of the ARIADNEplus community across a range of scenarios.

Subsystem	Packages
ARIADNEplus Front-end Framework	**Distribution** • gcube.portal-bundle.5.1.1 **Portal** • portal-manager-2.1.1 • portal.login-hook.1.5.0 • portal.notifications-common-library.1.5.0 • portal.notifications-portlet.2.6.0 • portal.social-mail-servlet.2.5.0 • portal.social-networking-library.1.18.0 • event-publisher-portal 1.1.0 **Portlets-user** • geoportal-data-common 1.4.1 • geoportal-data-viewer-app 2.4 • geoportal-data-viewer-entry 2.2.1 • portlets-user.newsfeed.2.8.4 • portlets-user.myvres.2.5.0 • portlets-user.notifications.2.6.0 • portlets-user.shareupdates.2.8.1 • portlets-user.socialprofile.2.1.0 • portlets-user.vre-members.2.3.1 • portlets-user.user-statistics.2.3.1 • portlets-user.workspace.6.28.6 • portlets-user.join-vre.3.7.3 • portlets-user.data-miner-manager.1.12 • portlets-user-statistical-algorithms-importer.1.15.0

Table 1. Software packages belonging to ARIADNEplus Front-end Framework subsystem contributed by ARIADNEplus and released in the gCube system.

2.1.2 ARIADNEplus Accounting and Authorisation Framework software packages

The framework is realised through a combination of software components consisting of *(i)* services supporting the collection of resource metrics (accounting), i.e., an array of services automatically collecting per-resource usage metrics, integrated into the gCube SmartGears container that enables automatic accounting of user calls and *(ii)* services supporting the authentication and authorisation of users of the ARIADNEplus infrastructure (authorisation), i.e., an array of "security services" based on standard protocols and technologies, providing:

- interoperability with external infrastructures and domains, obtaining, if required, so-called "identity Federation";
- total isolation from the enabling framework and technologies, which means zero dependencies in both the directions;
- an open and extensible architecture.

Table 2 reports the final versions of the software within Framework. During the project lifetime they have been enhanced and released multiple times, and detail is publicly available online at https://code-repo.d4science.org/gCubeCI/gCubeReleases..

The release activities performed in the period aimed at the full adoption of state-of-the-art industry standards for authentication and authorization. In particular, the implementation now fully adopts OIDC (OpenID Connect)[3] for authentication and UMA (User Managed Authorization)[4] for authorization flows. Both protocols are specializations of the generic OAuth 2.0 specification[5].

A new IAM (Identity and Authorisation Manager) was adopted to enhance the gCube architecture after the release of gCube 5.0 in February 2020. The Release Tag report is available at https://code-repo.d4science.org/gCubeCI/gCubeReleases/src/branch/master/closed/5.0.0/tags.136.csv.

Keycloak[6] was chosen for the implementation of the Identity and Access Management service as an industry ready, widely adopted open-source implementation, and provided most of the models and workflows underpinning modern authentication and authorization management.

Subsystem	Packages
ARIADNEplus Accounting and Authorisation Framework	**Accounting** - accounting-lib.4.1 - accounting-service 2.0 - accounting-manager 1.15.0 - accounting-analytics 4.0 - accounting-summary-access.1.0.2 - accounting-dashboard 1.2.2 - accounting-analytics-persistence-postgresql 2.0 - accounting-dashboard-harvester-se-plugin 2.1.0 **Authorization** - ansible-role-conductor-workflows-user-management 1.1

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[3] OIDC (OpenID Connect): https://openid.net/connect/
[4] UMA (User Managed Authorization): https://docs.kantarainitiative.org/uma/wg/rec-oauth-uma-grant-2.0.html
[5] OAuth 2.0 specification: https://oauth.net/2/
[6] Keycloak: https://www.keycloak.org/

Subsystem	Packages
	• keycloak-d4science-bundle 1.1 • keycloak-d4science-spi-parent 1.1 • oidc-enrollment-hook 1.2 • common-authorization 2.5.0 • authorization-control-library 1.1.1 • authorization-utils 2.0.0 • authorization-bridge 1.0.0

Table 2. Software packages belonging to ARIADNEplus Accounting and Authorization Framework subsystem contributed by ARIADNEplus and released in the gCube system.

2.1.3 ARIADNEplus VRE Framework software packages

The framework is a combination of Services supporting the creation and operation of VREs, i.e., a rich array of gCube-based services for the creation and operation of Virtual Research Environments using available resources. These services promote the optimal exploitation of the resources available within the ARIADNEplus Infrastructure, and the integration of technology external to it. They insulate the management of the infrastructure from the data and the data management services that are hosted in or accessible through the infrastructure itself as much as possible. Three main software packages make up the Collaborative Framework:

- VRE-Management: devoted to the dynamic creation of VREs exploiting the resources of the underlying Virtual Organisation;
- Applications: web applications providing simple user interfaces for the definition and deployment of new VREs and for the support to the spatial data resources within the scope of the VREs;
- Data Access: the shared cloud storage solution for VREs, namely StorageHub.

The StorageHub Service, belonging to the Data Access area is replicable and a load balancer (HAProxy[7]) is used for proxying requests to its deployed instances. One high-level feature of the StorageHub Service is that the actual payload can be stored on a number of in-house and commercial storage technologies, for instance in a MongoDB Cluster, but also on other types, including Cloud Storages solutions (e.g., Amazon S3).

Table 3 reports the final versions of the software making up the Framework. During the project lifetime these artifacts were enhanced and released multiple times, and details are publicly available online at https://code-repo.d4science.org/gCubeCI/gCubeReleases.

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[7] http://www.haproxy.org

Subsystem	Packages
ARIADNEplus VRE Management Framework	**VRE-Management** • vre-management.vremodeler.2.0.7 • vre-management.vremodeler-client-library.1.0.1 • vre-management.vremodeler-utils.1.0.1 **Application** • portlets-admin.vre-deploy.4.4 • portlets-admin.vre-definition.5.2 • vre-manager-portlet 6.1 • gcube-cms-suite 1.0.1 **Data Access** • storagehub 1.4 • storagehub-model 1.1.1 • storagehub.client-library 1.1

Table 3. Software packages belonging to the ARIADNEplus VRE Framework subsystem used by ARIADNEplus and released within the gCube system.

2.1.4 ARIADNEplus VO Framework software packages

The framework consists of a combination of Services created and operated within the context of D4Science to serve the needs of ARIADNEplus. This Virtual Organisation (VO) contains the actual operational context for operating the ARIADNEplus Infrastructure and its resources separately from the other communities and initiatives supported by D4Science.

The VO Framework relates to infrastructure resource management, whose pillars are distinguishing features like *publication*, *discovery*, *lifecycle management*, and *controlled sharing*. Relying on humans to compile deployment profiles, publish them within the infrastructure, keep track of and change the status of deployments, or enforce sharing policies is impractical. In some cases, it is impossible.

The SmartGears technology released within this framework is an automated solution that lives alongside every deployment and ensures it is a manageable resource. In particular, SmartGears is a set of Java libraries that turn Servlet-based containers and applications into gCube resources, transparently.

Subsystem	Packages
ARIADNEplus VO Management Framework	**Common** • common-smartgears-utils.1.0.3 • common-smartgears.2.1.5 • common-smartgears-app.2.1.0 **Distribution** • smartgears-distribution-bundle.3.4.0 • smartgears-distribution 3.4.0

Table 4. Software packages belonging to ARIADNEplus VO Framework subsystem, released in the gCube system.

2.2 Description of ARIADNE Portal Software releases

The ARIADNE Portal aggregates the metadata associated with existing archaeological research datasets held by the ARIADNE partners, allowing researchers to browse and access the various distributed datasets for use in their own research. Figure 3 shows the ARIADNE Portal home page.
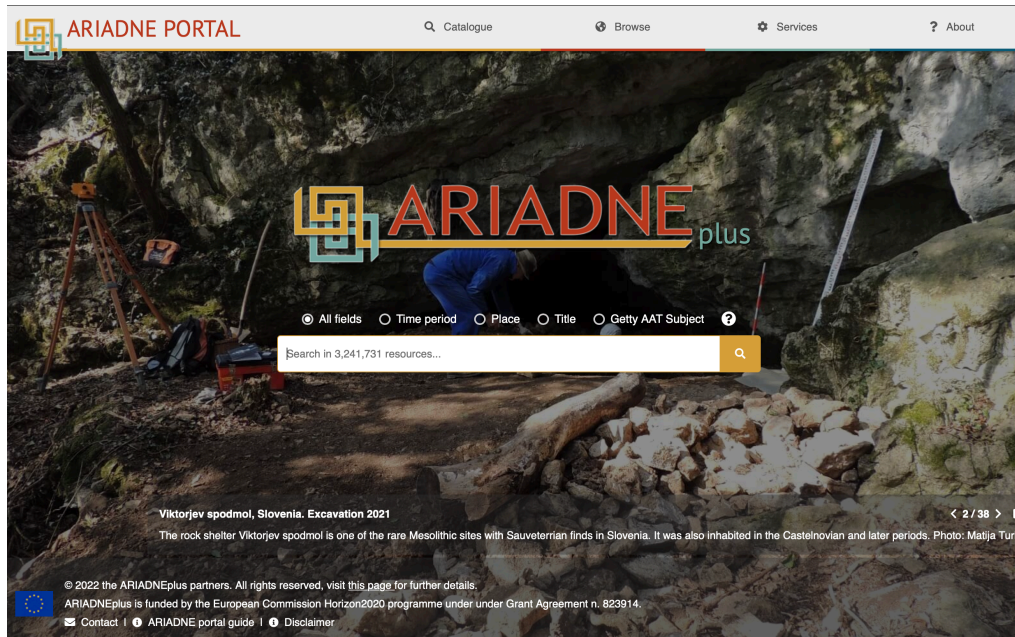

Figure 3 – The ARIADNE Portal home page.

During the project, the ARIADNE Portal has had three releases. Specifically, version 1.0 was released in January 2021, consisting of a revamp of the frontend (complete site SAP - Vue/Vuex, inspired by earlier Laravel platform and functionality), while the backend was refactored for the Elasticsearch mapping and backend layer. For deployment the Docker environment was selected and the Docker Swarm cluster exploited for the hosting of the portal. Version 2.0 was released in September 2022, and included the following major changes:

Backend

- adaptation to OpenSearch. Moved from Elasticsearch
- parts refactored to improve responsiveness and performance

Frontend

- Remake of site menu and navigation
- Improved site view for mobile devices
- General user interface improvements. Navigation, maps, resource page and filters.
- Startpage - added image slider

- Startpage - simplified interface
- Information and tooltips remake and added text information
- Services - Added new info and images
- What search - improved UI and wordcloud showing less plus all horizontal.
- AAT language support. Search Spanish 'cuchillo' and get 'knife' and vv.
- Search logic engine uses AND search
- Filters have scroll and "Show next 20"
- New resource type icons
- Added Core Trust Seal (icon) to those certified
- Period.O filter (DEMO on staging)
- Search input shows total records in OpenSearch
- Landingpage - Title - shows default english if available. If not it tries to match the same title language as the resource language. Random fallback
- Other languages are collapsed and hidden, toggleable by user (show/hide)
- Landingpage - Description - shows default english if available. If not it tries to match the same title language as the resource language. Random fallback
- Other languages are collapsed and hidden, toggleable by user (show/hide)
- Landingpage - Is about - new info section for resource
- Landingpage map size (Smal, medium, full sizer)
- Landingpage breadcrumb navigation. (back button appears when navigating away from resource)
- Landingpage image slider (new API and improved functionality) - Landingpage map. Nearby resources are default shown
- Map - Centroids added to OpenSearch. Heatmaps uses centroids (as workaround for missing OpenSearch geohash functionality)
- Map - search (Where) menu and filters moved to left side of page. - Map - search (Where) - toggle filters (show/hide)
- Map - updated colours for heatmap, and markers
- Map - supports rendering of geoshapes
- Filter - Publishers landing pages (see (i)-icon in filter)
- Filter - Year - Added "Apply" button. More user friendly

Version 2.1 was released in October 2022, and included the adding of a new OpenSearch index for AAT-term descendants in the backend, while in the frontend the AAT-term search was changed to return all term descendants. (e.g. search for parent term 'weapons' results in weapons, knifes, canons etc.) and on the result list that shows primary image for resource if available.

The software releases were deployed in the D4Science production infrastructure powering the ARIADNE Portal and the source code is accessible on the Code Versioning System (CVS) platform and publicly available online at https://github.com/ARIADNE-Infrastructure/portal.

3 Concluding Remarks

This deliverable reported on the software release constituents and the different software release cycles contributing to the development of the ARIADNEplus infrastructure and released in the gCube system. These software release constituents were deployed, exploited, and operated to support the development of the ARIADNEplus VRE, (https://ariadne.d4science.org) and the ARIADNEplus Portal (https://portal.ariadne-infrastructure.eu).

A number of different release cycles were performed during the project for the ARIADNE VRE software releases, each release contained EUPL licensed software, whose source is accessible on the Code Versioning System (CVS) platform publicly available online at https://code-repo.d4science.org/gCubeCI/gCubeReleases and for the ARIADNE Portal software releases, whose source is accessible on the Code Versioning System (CVS) platform publicly available online at https://github.com/ARIADNE-Infrastructure/portal.

These activities have been carried out in the context of Task 13.4 *T13.4 Software integration* and is part of *WP13 ARIADNEplus Infrastructure Operation and Management* and WP12 (Data Integration and Interoperability) for the ARIADNE Portal.

4 References

1. *L. Candela, D. Castelli, P. Pagano* (2013). Virtual Research Environments: An Overview and a Research Agenda. Data Science Journal, Vol. 12

2. *M. Assante, L. Candela, D. Castelli, R. Cirillo, G. Coro, L. Frosini, L. Lelii, F. Mangiacrapa, V. Marioli, P. Pagano, G. Panichi, C. Perciante, F. Sinibaldi* The gCube system: Delivering Virtual Research Environments as-a-Service. *Future Gener. Comput. Syst. 95: 445-453 10.1016/j.future.2018.10.035*

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4. *M. Assante, G. Coro, L. Frosini, P. Pagano, M. Simi, ARIADNEplus D13.1 - Software Release Procedures and Tools JRA2*