# D5.9 Final packaging of DE4A Components

| Document Identification | | | |
|---|---|---|---|
| **Status** | Final | **Due Date** | 31/03/2023 |
| **Version** | 1.0 | **Submission Date** | 08/05/2023 |

| | | | |
|---|---|---|---|
| **Related WP** | WP5 | **Document Reference** | D5.9 |
| **Related Deliverable(s)** | D2.5, D3.6, D4.1, D4.5, D4.9, D5.2, D5.4, D5.6 | **Dissemination Level (*)** | PU |
| **Lead Participant** | MAETD-SGAD | **Lead Author** | Javier Ferrero Merchán (SGAD, ES) |
| **Contributors** | Javier Ferrero (SGAD) Philip Helger (BRZ) Eduardo Moreno (SGAD) | **Reviewers** | Dennis Reumer (RVO) Muhamed Turkanović (UM) |

| Keywords: |
|---|
| DE4A Connector, Playground, Central IAL, DE4A Directory, intermediation, user-supported intermediation, patterns, feature, functionalities, non-functional aspects |

# Document Information

| List of Contributors | |
|---|---|
| Name | Partner |
| Javier Ferrero Merchán (SGAD) | MAETD-SGAD (Spain) |
| Philip Helger (BRZ) | BRZ (Austria) |
| Eduardo Moreno Alcázar (SGAD) | MAETD-SGAD (Spain) |

| Document History | | | |
|---|---|---|---|
| Version | Date | Change editors | Changes |
| 0.1 | 20/04/2023 | Javier Ferrero (SGAD) | Initial version of the document and preliminary comments. |
| 0.2 | 24/04/2023 | Eduardo Moreno (SGAD) Javier Ferrero (SGAD) | Addition of the components to be released and the guide to join the DE4A network. |
| 0.3 | 26/04/2023 | Philip Helger (BRZ) | Content review. |
| 0.3.1 | 27/04/2023 | Javier Ferrero (SGAD) | Addition of the executive summary and conclusions, and final review. |
| 0.3.2 | 02/05/2023 | Dennis Reumer (RVO) Muhamed Turkanović (UM) | Internal review. |
| 0.4 | 03/05/2023 | Javier Ferrero (SGAD) | Modifications after the internal review. |
| 0.5 | 03/05/2023 | Julia Wells (ATOS) | Quality review for submission |
| 1.0 | 08/05/2023 | Ana Piñuela Marcos (ATOS) | Final for submission |

| Quality Control | | |
|---|---|---|
| Role | Who (Partner short name) | Approval Date |
| Deliverable leader | Javier Ferrero Merchán (SGAD, ES) | 03/05/2023 |
| Quality manager | Julia Wells (ATOS) | 03/05/2023 |
| Project Coordinator | Ana Piñuela Marcos (ATOS) | 08/05/2023 |

# Table of Contents

# List of Tables

# List of Figures

# List of Acronyms

| Abbreviation / acronym | Description |
| --- | --- |
| API | Application Programming Interface |
| AS4 | Applicability Statement 4 |
| DE | Data Evaluator |
| DE4A | Digital Europe for All |
| DNS | Domain Name System |
| DO | Data Owner |
| Dx.y | Deliverable number y, belonging to WP number x |
| ESL | Exchange Service Locator |
| IAL | Issuing Authority Locator |
| IEM | Information Exchange Model |
| MOR | Multilingual Ontology Repository |
| SMP | Service Metadata Publisher |
| SSI | Self-Sovereign Identity |
| WP | Work Package |
| XSD | XML Schema Definition |

# Executive Summary

The present document is written in the context of DE4A work package **"WP5 Common Component Design & Development"** and under the task **T5.5 Support and results packaging**.

DE4A has released a set of common components for the cross-border implementation of the once-only principle that are listed in the deliverable:

▶ Nine software components under Apache 2.0 licence: DE4A Connector (consisting of the de4a-commons library, the DE4A Connector and the Shared DE4A Connector runtime), the Central IAL, the DemoUI, the Mocked DO, the MOR component and the SSI Authority Agent.

▶ A software component under a proprietary licence: the SSI Mobile End-User Agent.

▶ Three components in the form of documents releases under Creative Commons 4.0 licence: the code lists used in DE4A, the Canonical Evidence Type XSDs and the IEM XSDs.

These common components have been packaged and are available at the public GitHub repository "DE4A EU project".

The deliverable also provides a guideline for external stakeholders to join the DE4A network for the cross-border exchange of evidences with other members of the network. Essentially, participants would be required to get their own eDelivery certificates based on the PKI the network is using; to set up, install and configure the eDelivery SMP and the DE4A Connector; and, finally, to develop a final participant (consumer or provider of data) and integrate it with the rest of components to start exchanging messages.

# 1 Introduction

## 1.1 Purpose of the document

The present document is written in the context of DE4A work package **"WP5 Common Component Design & Development"** and under the task **"T5.5 Support and results packaging"**.

The scope of WP5 is the design and development of all new common software components required for the implementation of the DE4A pilots. These components are based on the outputs of "WP2 Architecture vision and framework" and "WP3 Semantic Interoperability Solutions" on architecture and semantic components, respectively.

Task T5.5 involves providing IT design, development, deployment and usage support to the pilots with the necessary common software components defined in WP2 and required within WP5, focusing also on possible MS national specifics and requirements. In this regard, deliverable D5.9 encompasses the identification of the DE4A common components that has been released at the end of the project, along with the licences under which they were released.

Additionally, D5.9 contains a getting started guide for stakeholders that would like to join the DE4A network. This guide describes how to deploy the DE4A common components.

Deliverable D5.9 is related to the following DE4A deliverables:

▸ D3.6 Semantic Toolkit, Final version [7]
▸ D5.4 Final technical design of interfaces and common specifications document [3]
▸ D5.6 Final release of DE4A common components [2]

## 1.2 Structure of the document

This document is divided into four main sections plus two annexes:

▸ Chapter 1: Overview of the document
▸ Chapter 2: Released DE4A common components
▸ Chapter 3: Guide to join the DE4A network
▸ Chapter 4: Conclusions

# 2 DE4A common components

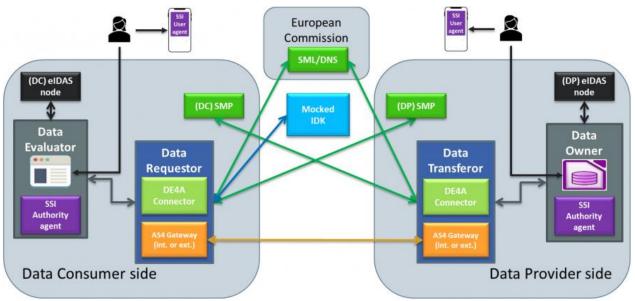The following picture shows the DE4A architecture with all the components.



Figure 1: DE4A Architecture

The common software components released by the DE4A project are listed in the following table as well as the licence under which they are made available. For further information about the components, please see the deliverables D3.6 [7], D5.4 [3] and D5.6 [2].

Table 1: DE4A common components

| Component | Repositories | Licence | Description |
|---|---|---|---|
| de4a-commons | de4a-commons | Apache 2.0 | A common library containing the data models for the Core Schema and Canonical Evidence Type [2] |
| DE4A Connector | de4a | Apache 2.0 | The DE4A Connector application for the evidence exchange [2] [3] |
| Shared DE4A Connector runtime | de4a-connector-ng | Apache 2.0 | A set of shared libraries used by the DE4A Connector application [2][3] |
| Code lists | de4a-codelists | CC-BY | Lists with the set of codes used in the DE4A project [3] |
| IAL Service | ial-service | Apache 2.0 | The Central IAL component [2] [3] |
| DemoUI | wp5-demo-ui | Apache 2.0 | The DemoUI used for testing in the Playground [2] |
| Mocked DO | de4a-connector-mock | Apache 2.0 | The Mocked DO used for testing in the Playground [2] |
| Canonical Evidence Type XSDs | study_abroad moving_abroad doing_business_abroad | CC-BY | The XSD files that define the set of Canonical Evidence Types used in the DE4A project [7] |
| IEM XSDs | xml-schemas | CC-BY | The XSD files that define the Core Schemas used in the DE4A project to exchange messages [7] |

| Component | Repositories | Licence | Description |
|---|---|---|---|
| MOR | MOR | Apache 2.0 | Set of components of the MOR functionality [7] |
| SSI Authority Agent | de4a-ssi-authority-agent-base<br>ssi-authority agent | Apache 2.0 | SSI Authority Agent for the VC pattern [8] |
| SSI Mobile End-User Agent | de4a-mobile-app | Mobile User Agent License (Proprietary) | SSI Mobile Agent for the VC pattern [8] |

DE4A components are available in the public GitHub repository ("**DE4A EU project")** established by the project and is accessible via the following link: https://github.com/de4a-eu.

# 3 "Getting started guide" to join the DE4A network

This guide provides a list of steps to be taken by the organizations to join the DE4A final infrastructure. There are four main activities: getting eDelivery certificates, setting up an SMP for DE4A, setting up a DE4A Connector and the development and integration of the final participant.

## 3.1 Getting eDelivery certificates

The DE4A network makes use of the eDelivery components and infrastructure to support the exchange of evidence and messages.

The organization that operates AS4 Gateways and/or SMP in a Member State and would like to join the DE4A network should deploy and run two eDelivery components: an SMP and an AS4 Gateway (also known as Access Point). Both components must be configured to use a certificate that conforms to the DE4A PKI, following the Trust Management Model established for the DE4A project [9]. DE4A uses a PKI provided by CommisSign-2, which is the Certificate Authority of the European Commission used i.e., for eDelivery.

To obtain the corresponding certificates, the organization that operates the AS4 Gateway and/or SMP in the Member State should request the certificates to the CEF PKI Service of eDelivery. This PKI Service enables issuance and management of digital certificates used to ensure confidentiality, integrity and non-repudiation of the information exchanged between Access Points (AP). Getting the eDelivery certificates is necessary to finish the setup of the SMP and DE4A Connector (which embeds an eDelivery AS4 Gateway called "phase4").

## 3.2 Setting up an SMP for DE4A

Within the DE4A network, at least one eDelivery SMP must be deployed per participating country. There can be more than one SMP per country, although only one is needed. Therefore, the participant to deploy and operate the SMP is usually a public Authority of the Member State or a representative, who will offer the SMP to multiple participants (Data Evaluators (DE) and Data Owners (DO)) within the same Member State.

The SMP must be installed, configured and populated with the right information. To install and configure the SMP, the following two documents are of help:

▸ 2022-04-01 Setting up a Service Metadata Publisher for DE4A [4]
▸ 2022-05-02 Configuring the SMP for the IAL [5]

Once the SMP is set up, the operating entity must populate it with the appropriate information of participants and evidence types that the relevant national DE4A participants are able to provide. Each SMP must only store and manage the information related to the participants of the same Member State as where the SMP is located, so that each country is only responsible for its own information.

## 3.3 Setting up a DE4A Connector

The DE4A Connector (which already integrates the "phase4" eDelivery AS4 Gateway) is needed to be able to exchange messages between the participants in the DE4A network, since the communication (to request for evidence and respond) is realised via this connector. Therefore, each DE and DO need access to DE4A Connector.

There are multiple possible configurations of the national infrastructure [3]. Then, the DE4A Connector may be set up by only one organisation within a Member State and provided as a service to the DEs

and DOs of the same Member State or each DE and DO may set up and operate their own DE4A Connector. A combination of both options is also possible.

The latest release version of the DE4A Connector is available at the GitHub of the DE4A Project [1]. To install the DE4A Connector, an installation and configuration guide of the DE4A Connector it2 is available in the DE4A Wiki [10].

## 3.4 Development and integration of the final participant

DE4A defines two types of the so-called "final participants": Data Evaluators (DE) and Data Owners (DO). These are the entities that request or provide evidence, respectively. Each entity participating in DE4A as a DE or DO must develop its own "final participant", that is, the system, service, web page, etc. to request evidence or send the responses to those requests and integrate it with the rest of components.

The common specifications that a participant needs to follow to properly exchange messages with the rest of the DE4A components are described in the "Common specifications" section of the WP5 part of the DE4A Wiki [6] and in the deliverable D5.4 on interfaces and common specifications [3]. They are the following:

‣ Common behaviour and interactions between components
   Description of the interaction patterns of the second iteration through communication diagrams. Data structures used during exchanges are also described there (section 4 of D5.4).
‣ Central IAL interface
   Description of the software interface of the Central IAL (section 5 of D5.4).
‣ Summary of software interfaces
   Reference information on the software interfaces of the DE4A components (section 6 of D5.4).
‣ DE4A Logs and error messages
   Updated version for the second iteration of the specification of the common error and logs messages used during exchanges (section 7 of D5.4).

Once the Data Evaluator or Data Owner has been developed and deployed, it must be integrated with the DE4A Connector and SMP that will be supporting the communication of that final participant:

‣ The de-do.json file must properly updated to include the endpoint of the new final participant.
‣ The SMP must also be updated with the participant ID and the evidence that the final participant will request (DE) or provide (DO).

## 3.5 Deployment of the DE4A Self-Sovereign Identity (SSI) Framework

The DE4A Self-Sovereign Identity Framework comprises two components: the Authority Agent and the Mobile User Agent.

The Authority agent is responsible for managing the connections between User and authorities (i.e. Data Providers, Data Consumers) and activities related to Verifiable Credentials/Presentations (i.e. proof requests, validation, issuing). It is an enterprise-level solution developed to support the interaction between the student (diploma Holder) and the diploma Issuer or Verifier, managing the overall communication flow in the VC pattern for such endpoints. The SSI Authority Agent is to be deployed on the premises of organizations that act as diploma Issuers (Data Providers) or Verifiers (Data Consumers). The installation guideline is available in the DE4A Wiki [11].

The Mobile User Agent works as standalone mobile device application that runs different components to implement SSI approach. The main goal of this mobile edge agent is to enable users (students) to manage their digital credentials (diplomas on the pilot scope) and to interact with the Issuer's/Verifier's portals, creating cryptographically secure communications for information exchange

with these endpoints based on W3C DID and VC standards and protocols like DIDComm. The installation guideline is available in the DE4A Wiki [11].

# 4  Conclusions

The DE4A common components are the main software building blocks publicly released for anyone wishing to reuse them. Most of them have being released as open source and can be used and modified at will. With these common components, the specific components of the participant and the appropriate governance of the network (considering the complexity of such a project where different organisations from different countries needed to exchange metadata in a coordinated way to interoperate systems), the DE4A network could be replicated.

The common components released are the result of the combined effort of "WP2 Architecture Vision and Framework", "WP3 Semantic Interoperability Solutions" and "WP5 Common Component Design & Development". WP2 has provided the foundation, the reference architecture on which the components implemented by WP5 are based. WP3 has mainly provided the semantic component to allow national systems to interoperate and exchange data, in the form of data schemas (XSDs of the Canonical Evidence Types and the IEM) and semantic functionalities (IAL, ESL and MOR). Finally, WP5 has implemented, deployed and operated the components and data objects resulting from the work of WP2 and WP3 (except the MOR components, which were mostly implemented by WP3).

# References

[1] DE4A Connector GitHub directory https://github.com/de4a-eu/de4a/releases

[2] DE4A D5.6 Final release of the DE4A common components document. Available at the DE4A web page: https://www.de4a.eu/_files/ugd/b332f5_429498092a3e4237955e1bdde1649679.pdf, retrieved on 24.04.2023

[3] DE4A D5.4 Final technical design of interfaces and common specifications document. Available at the DE4A web page: https://www.de4a.eu/_files/ugd/b332f5_c0b236968a3945e8a6e5ef3a20fb4173.pdf retrieved on 24.04.2023

[4] Setting up a Service Metadata Publisher for DE4A. Available at the DE4A Wiki page: https://wiki.de4a.eu/images/2/2c/Setting_up_a_Service_Metadata_Publisher_for_DE4A.pdf, retrieved on 24.04.2023

[5] Configuring an SMP for the DE4A IAL. Available at the DE4A Wiki page: https://wiki.de4a.eu/images/1/1c/Configuring_the_SMP_for_the_IAL.pdf, retrieved on 24.04.2023

[6] DE4A common specifications and components it2. Available at the DE4A Wiki page: https://wiki.de4a.eu/index.php/DE4A_common_specifications_and_components_it2, retrieved on 24.04.2023

[7] DE4A D3.6 Semantic Toolkit- Final Version v1.0. Available at the DE4A web page: https://www.de4a.eu/_files/ugd/2844e6_f84ca136597f40c2922e9a2cfe56f65e.pdf, retrieved on 24.04.2023

[8] DE4A D5.8 Final Release of DE4A Self-Sovereign Identity Supporting Framework v1.0. Available at the DE4A web page: https://www.de4a.eu/_files/ugd/2844e6_9bca028dda934be5ad5ea90a13233d8e.pdf, retrieved on 24.04.2023

[9] DE4A D2.3 Final DE4A Trust Management Models and Self-Sovereign Identity Supporting Framework Design. Available at the DE4A web page: https://www.de4a.eu/_files/ugd/2844e6_dbec2a7b2eb24d8285cf9ca29490703b.pdf, retrieved on 03.05.2023

[10] Installation and configuration guide of the connector https://wiki.de4a.eu/index.php/Installation_and_configuration_guide_of_the_DE4A_Connector_it2

[11] Installation and configuration of the SSI Authority Agent https://wiki.de4a.eu/index.php/Installation_and_configuration_guide_of_the_DE4A_SSI_Authority_Agent_it2

[12] Installation and configuration of the Mobile User Agent https://wiki.de4a.eu/index.php/DE4A_SSI_Edge_Agent#Installation