D4.2 Studying Abroad – Pilot Planning

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Lead Participant	JSI	**Lead Author**	T. Klobučar (JSI)
Contributors	A. Crespo (Atos), D. Marjetič (MIZŠ), F.J. Aragó (UJI), H. Metselaar (ICTU), J. Baena (MPTFP-SGAD), J. Presa (Atos), M. Šestak (UM), M. Correia (INESC), M. Turkanović (UM), Ž. Stepančič (JSI)	**Reviewers**	Thashmee Karunaratne (SU) Ioannis Konstantinidis (IHU)

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Document Information

List of Contributors	
Name	Partner
Alberto Crespo	Atos
Duša Marjetič	MIZŠ
Francisco José Aragó	UJI
Harold Metselaar	ICTU
Javier Baena	MPTFP-SGAD
Javier Presa	Atos
Martina Šestak	UM
Miguel Correia	INESC
Muhamed Turkanović	UM
Tomaž Klobučar	JSI
Živa Stepančič	JSI

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Quality manager	Julia Wells (ATOS)	21/04/2021
Project Coordinator	Ana Piñuela Marcos (ATOS)	21/04/2021

Table of Contents

List of Tables

List of Figures

List of Acronyms

Abbreviation / acronym	Description
API	Application programming interface
APK	Android Package
AS4	Applicability Statement 4
CA	Certification Authority
CEF	Connecting Europe Facility
DC	Data consumer
DE	Data evaluator
DE4A	Digital Europe for All
DID	Decentralized identifier
DNS	Domain name system
DO	Data owner
DP	Data provider
DR	Data requestor
DT	Data transferor
EBSI	European Blockchain Services Infrastructure
EC	European Commission
ECTS	European Credit Transfer and Accumulation System
EDCI	European Digital Credential Infrastructure
eID	Electronic identity
eIDAS	Regulation (EU) No 910/2014 of the European Parliament and of the Council of 23 July 2014 on electronic identification and trust services for electronic transactions in the internal market and repealing Directive 1999/93/EC
ESL	Evidence service locator
ESSIF	European Self-sovereign Identity Framework
eVŠ	Central evidence system for higher education in Slovenia
IAL	Issuing authority locator
IDK	Information Desk
IRO	International relations office
IST	Instituto Superior Técnico
JSON	JavaScript Object Notation
MDS	Mandatory data set
MS	Member State
MVP	Minimum viable product
NUTS	Nomenclature of Territorial Units for Statistics
OOP	Once-only Principle

Abbreviation / acronym	Description
OOP TS	Once-only technical system for evidence exchange in the DE4A project
PKI	Public-key infrastructure
PMG	Pilot Management Group
REST	Representational state transfer
SA	Studying abroad
SAML	Security Assertion Markup Language
SDGR	Single digital gateway regulation
SMART	Specific, measurable, achievable, realistic, time-bound
SML	Service metadata locator
SMP	Service metadata publisher
SSI	Self-sovereign identity
SSO	Single sign-on
TIR	Trusted Issuer Registry
TLS	Transport Layer Security
TS	Technical system
TSR	Trusted schema registry
UC	Use case
UI	User interface
USI	User-supported intermediation
UX	User experience
VA	Verifiable attestation
VC	Verifiable credential
VP	Verifiable presentation
WP	Work package
WP2	DE4A Architecture vision and framework WP
WP3	DE4A Semantic interoperability solutions WP
WP5	DE4A Common component design & development WP
WP6	Sustainability impact and new governance models
XSD	XML Schema Definition

Executive Summary

The Studying Abroad (SA) pilot of the "Digital Europe for All" (DE4A) project focuses on Higher Education students with virtual or physical mobility needs in the European Higher Education area. By piloting three use cases (UC#1 - Application to public higher education, UC#2 - Applying for study grant, and UC#3 - Diploma recognition) it aims to prove the optimal process/procedure for students from the three participating Member States (Portugal, Slovenia, and Spain) for registration to higher education and eventually applying for a student grant as well as for studies recognition. The pilot will run in two iterations, the first from October 2021 to the end of January 2022, and the second from May 2022 to the end of October 2022.

This document provides a detailed plan of all pilot activities leading to the pilot launch and the activities to undertake during the pilot's running in both iterations. It includes the activities, such as the customization and integration of online procedure portals, evidence portals and data services (see Section 3.7) for their connection to the common technical system layer (see Section 3.6), as well as the testing (see Section 4.3) and the user engagement (see Section 4.4) necessary to successfully implement and bring pilot services into cross-border operational status allowing the cross-border evidence exchange of real evidence for real users in the different pilot use cases, considering in particular milestones and indicators to assess the execution of these plans and interdependencies with other work packages. The plan has been aligned with the DE4A WP3 and WP5 development plans.

The main characteristics of the SA pilot management are summarised below:

- Two interaction patterns (User-supported intermediation - USI, Verifiable credentials - VC) will be piloted in both iterations, the first pattern in UC#1 and UC#2 and the second in UC#3. For the USI pattern, solution architecture (see Annex A) was created in close collaboration with WP2 to ensure full alignment with the DE4A architecture. The implementation of the USI pattern will enable the validation of the DE4A OOP technical system for the exchange of evidence, while the VC pattern will help the pilot (as a member of the EBSI Early Adopters Programme) to evaluate the Self-sovereign identity approach, including its benefits, for the recognition of diplomas.
- The DE4A project has adopted an Agile approach. In the SA pilot this is reflected in the way the pilot partners collaborate in stand-ups, reviews, refinement meetings, use of JIRA, etc. In addition, several increments for the Minimum viable product (MVP; a solution that will be validated in the first iteration) were defined: four for the USI pattern and six for the VC pattern. The MVP simplifies the approach that will be piloted in the second, final iteration in some aspects, e.g. by implementing two-country scenarios, assuming one type of evidence and one data provider per Member State, and using routing information from configuration files in the DE4A Connector. Such major decisions are described and justified (see Section 3.3).
- The existing eIDAS infrastructure (regular pre-production eIDAS nodes) will be used to authenticate the users of the three higher education procedures. The pre-production nodes are considered to ensure interoperability with non-notified eIDs from Slovenia.
- The eDelivery infrastructure has been identified as a priority for the realization of evidence exchange in the two use cases implementing the USI pattern. Its complexity was largely abstracted to the pilot partners by the DE4A Connector developed by WP5 (see Section 3.6). Similarly, the SSI Authority agent, which is also being developed by WP5, will abstract the SSI approach in Use case 3, which implements the VC pattern (see Section 3.6).

- The data model of higher education evidence to be exchanged between participating Member States has been defined in detail and refined in collaboration with DE4A WP3 (see Annex B for the XSD). Examples of the canonical evidence following the data model were generated for DE4A WP5 to prepare the mock of the DE4A Connector.
- Quantitative and qualitative metrics have been defined for 11 success criteria and 5 pilot goals in Chapter 2, as well as the sources for collecting the required data (competent authorities, Member States and students). Their main purpose is to objectively assess the fulfilment of the pilot goals. Draft questionnaires, which have been designed in relation to the metrics for different stakeholders, are included in Annex C.
- Eligible pilot users of the customized and integrated procedures are the students, whose data are available at the participating providers and can be exchanged through the DE4A OOP technical system or with Verifiable credentials. This includes for the first iteration all students with the 1st Bologna degree diploma from University Jaume I, Instituto superior Técnico (University of Lisbon) and any Slovenian university. Based on the test phases, four user groups are considered: local users, focus group users, unknown but reachable users, and unknown users.

The document will serve as a reference to monitor progress of the pilot for customization of national endpoints and their integration with common components. The pilot results will also be used by other DE4A activities, in particular WP2 – Architecture vision and framework (validation of the project start architecture, the User-supported intermediation pattern and the Verifiable credentials pattern), WP3 - Semantic interoperability solutions (validation of data models for higher education), WP5 - Common component design & development (validation of the common components such as DE4A Connector and SSI Authority agent, and the underlying evidence exchange infrastructure - DE4A OOP Technical system and the EBSI infrastructure), WP6 – Sustainability impact and new governance models (business models and new models for shared delivery of common services), and WP8 – Stakeholder dialogue, dissemination and communication (dissemination and communication activities).

1 Introduction

The Studying Abroad (SA) pilot of the "Digital Europe for All" (DE4A) project aims at demonstrating in practice the benefits for different European Higher Education Area stakeholders of realizing across borders the principles of once only and digital-by-default. By the combination of three use cases (UC#1 - Application to public higher education, UC#2 - Applying for study grant, and UC#3 - Diploma recognition) it will prove the optimal process/procedure for students of the three participating Member States (Portugal, Slovenia, and Spain) for registration to higher education and eventually applying for a student grant as well as for studies recognition.

In the project phase 'use case definition and requirements', the SA pilot's use cases and their requirements were defined and analysed. The results were documented in deliverable D4.1 [1]. In the current project phase ('pilot planning'), the goal was to use D4.1 as a starting point to create a detailed plan for the successful customization, integration and testing of the components needed to pilot the three use cases ('customization and integration' phase), as well as a high-level plan for the running phase of the pilot.

1.1 Purpose of the document

The main purpose of this deliverable is to describe the detailed planning of the SA pilot activities leading to pilot launch as well as the activities to be carried out during the pilot's running in the first and the final iterations and to collect necessary results both for the pilot evaluation and for the public reporting of progress and benefits. The document covers all activities (e.g. preparation and integration of pilot services suitable for their connection to the common technical system layer and testing of this connection, involvement of users) necessary to successfully implement and bring the pilot services into cross-border operational status allowing the cross-border evidence exchange of real evidence for real users in the different pilot use cases, considering in particular milestones and indicators to evaluate execution of these plans and interdependencies with other work packages, in particular WP5. All activities are planned following the overall Agile methodology approach that is applied by all DE4A technical WPs, where User Stories are created that belong to larger Epics, and are assigned to specific partners and monitored using the Jira tool.

These plans address multiple aspects like:

- MVP (including working assumptions, agreed simplifications and increments aligned between pilots and with WP5) and second iteration scoping
- MS infrastructures (AS4 gateways and SMPs, trust infrastructure elements, e.g. PKI certificates)
- DC and DP services customization and integration following a common approach based on commonly identified activities to be undertaken respectively by DCs and DPs and release plans of the WP5 DE4A common components, such as the DE4A Connector or the SSI Authority agent
- Pilot general test strategy (different phases and scopes of testing)
- Implementation of agreed UI Guidelines (including usability and accessibility and how to test them) e.g. for Explicit Request, Preview
- User engagement plans to try to ensure sufficient users to validate the pilot
- Governance of the SA pilot, to adequately manage different circumstances that can arise during the running phase and require interaction with other WPs and swift reaction at different levels

The document has been prepared in close cooperation with all SA pilot partners. In the current project phase, the pilot partners attended weekly pilot meetings, analysed MS-specific gaps,

composed solution architecture, created a detailed Member State specific planning for the customization and integration activities, and actively participated in multiple project-wide alignment meetings and the alignment meetings with other initiatives, like EBSI/eSSIF [2]. As a result of these alignment meetings, the DE4A project has been, for example, accepted in the EBSI Early adopters programme [3].

The pilot partners are confident the plan as presented in this document provides a solid basis for continued collaboration within the DE4A project and beyond, for customization & integration, as well as the pilot running activities.

1.2 Structure of the document

This document is divided into eight main sections and three annexes:

- Chapter 1 – The current section that describes the purpose and structure of the document and provides a glossary.
- Chapter 2 – It describes the pilot benefits logic, the criteria to meet, and metrics.
- Chapter 3 – Here, the design of the pilot is described, including the pilot use cases, scenarios and patterns, scope of the first pilot iteration and the final scope, the major design decisions that guide the functionality and the scoping of the MVP as well as the interaction patterns and data models used by the pilot. The chapter also introduces the solution architecture for the MVP and describes the common components needed for implementing the authentication and evidence exchange infrastructure, and the specific implementation and integration activities planned at the data consumer and the data provider side.
- Chapter 4 – This chapter specifies all activities needed to implement and run the pilot, including development, customization, deployment, configuration, testing and user involvement.
- Chapter 5 – This chapter addresses the planning for the customization & integration, testing and user involvement activities to be taken by all pilot participants in order to launch the pilots. It specifies the milestones and due dates for the activities specified in Chapter 4, as well as prerequisites and dependencies for performing these activities. The due dates are the finalization dates for agreed increments and serve to align all pilot partners from the different Member States for important common milestones.
- Chapter 6 – Here, the Member States' specific customization and integration plans are presented. Each Member State specific section includes national design decisions that impact the pilot, the gaps that have been identified (defining the amount of work to be done for customization and integration), the planning of the tasks to perform and the identification of Member State specific risks to be mitigated.
- Chapter 7 – In this chapter, a management plan for the running phase is described, including go-live launching criteria, and the governance structure.
- Chapter 8 – The main body of the document concludes with an overview of the achievements during previous months to this deliverable.
- Annex A – First annex provides solution architecture for UC#1 and UC#2.
- Annex B – The XML schema definition is described for the pilot evidence type.
- Annex C – At the end, user feedback forms for competent authorities, students and Member States are drafted for the evaluation purposes.

1.3 Glossary adopted in this document

Term	Description
Activity	Work to be done by partners involved in the Studying Abroad pilot to customize & integrate the components, test, involve users and run the pilot. Activities have been defined in a generic (meaning non-Member State specific) manner.
Common component	A component used by multiple Member States for piloting Studying Abroad, for example the DE4A connector, the SSI authority agent, and the eIDAS node.
Competent authority	Any Member State authority or body established at national, regional or local level with specific responsibilities relating to the information, procedures, assistance and problem-solving services covered by the SDG Regulation
Component	Software used for implementing a coherent set of features required for piloting Studying Abroad.
Credential	A set of one or more claims made by an issuer
Cross-border user	A user in a situation which is not confined in all respects within a single Member State
Data Consumer	The role played by an organisation/administration that is in demand of the evidence in order to fulfil its mission to society.
Data Consumer country	A country where Data Consumer is located
Data Evaluator	Business entity that evaluates the evidence data at the Data Consumer side. It is the authority of the procedure processing. Other naming: service provider
Data Owner	Business entity that holds data evidence at the Data Provider side
Data Provider	The legal entity that is in charge of the evidence provision
Data Provider country	A country where Data Provider is located
Data Requestor	Technical entity that requests evidence data on behalf of Data Evaluators at the Data Consumer side
Data Transferor	Technical entity that sends the evidence data on behalf of Data Owners at the Data Provider side
DE4A OOP Technical System	The set of components to exchange (request and provide) the evidence in use cases 1 and 2 of the Studying Abroad pilot
Decentralized Identifier	In the sense of VCs, a DID is a portable URL-based identifier associated with an entity (e.g. person, organisation). The association between the DID and the entity is provided through entity's public key (e.g. eID). They are primarily based on decentralized digital identities. Thus, they enable the controller of a DID to prove control over it and to be implemented independently of any centralized registry, identity provider, or certificate authority. DIDs are associated to a DID document and are used to establish a DID connection between two entities.
Electronic identification	The process of using person identification data in electronic form uniquely representing either a natural or legal person, or a natural person representing a legal person

Term	Description
eProcedure portal	A website presenting the user with one or more eProcedures for higher education students (also known as Online Procedure Portal)
Evidence	Any document or data, including text or sound, visual or audio-visual recording, irrespective of the medium used, required by a competent authority to prove facts or compliance with procedural requirements referred to in point (b) of Article 2(2) of the SDG Regulation
Explicit Request	SDGR: The competent authorities responsible for the online procedures referred to in paragraph 1 shall, upon an explicit, freely given, specific, informed and unambiguous request of the user concerned, request evidence directly from competent authorities issuing evidence in other Member States through the technical system (2018/1724 Art. 14 point 7).
Higher Education Institution	An establishment providing higher education and recognised by the competent authority of a Member State as belonging to its system of higher education
Holder	In the sense of VC, it is the entity, which holds the VC or to whom the VC is issued (e.g. a student from a higher education institution in the case of the SA pilot).
Issuer	In the sense of VC, it is the entity, which created the VC, stating with it that the future holder of it has some competences. The Issuer digitally signs the VC, thus proving its validity.
Minimum viable product	Solution that implements the smallest possible functionality needed to run the pilots
Once Only Principle	The public administrations should ensure that citizens and business can supply the same information only once to a public administration and administrations should be able to retrieve and share this data to serve the user, in accordance with data protection rules
Person, Natural	A natural person is a citizen of the Union or a human residing in a Member State
Preview	SDGR: The technical system shall enable the possibility for the user to preview the evidence to be used by the requesting competent authority and to choose whether or not to proceed with the exchange of evidence (2018/1724, art. 14 point 3.f).
Procedure	A sequence of actions that must be taken by users to satisfy the requirements, or to obtain from a competent authority a decision, in order to be able to exercise their rights as referred to in point (a) of Article 2(2) of SDGR
Public service	It embraces both the bodies providing services and the services of general interest they provide
Scenario	One typical way in which a system is used or in which a user carries out some activity
Self-sovereign identity	A concept for managing user identity where a user owns and controls her identity without the intervening administrative authorities. The identity is transportable and allows the user to make claims which can include personal data or attributes, and even information about the user which was asserted by others
Specific	A component used by one Member State specifically for the configuration of that

Term	Description
component	Member State
SSI Authority agent	A software component enabling a Legal entity (e.g., Higher Education Institution) to create its DID, as well as to control, issue and receive VC. The software component is integrated in the legal entity's IT infrastructure.
SSI-Wallet	An entity capable of securely storing data that belongs to a single natural person, legal person, or thing – the "owner" of both the data and the wallet. Also known as edge or mobile agent.
Use case	A specification of one type of interaction with a system. One use case may involve several scenarios (usually a main success scenario and alternative scenarios)
User	User is anyone who is a citizen of the Union, a natural person residing in a Member State or a legal person having its registered office in a Member State, and who accesses the information, the procedures, or the assistance or problem-solving services, referred to in Article 2(2) of the SDGR, through the gateway
Verifiable attestation	Type of a verifiable credential, which holds digitally signed information (i.e., claims) about an entity (i.e., credential subject).
Verifiable credential	A digital representation of a physical credential (e.g. higher education diploma) with the addition of cryptographic material such as digital signatures, which makes the credentials more tamper resistant and trustworthy. Verifiable credentials (VCs) based on their type, as their physical counterpart, hold several claims about the holder (e.g. can drive a car), stated by a competent authority (e.g. formal institution). VCs are based on the W3C standards (https://www.w3.org/TR/vc-data-model/)
Verifiable presentation	Something an entity can put forward as evidence of certain attributes or properties, or as evidence of a permit, attestation, or authorization he/she/it received from one or more issuers
Verifier	In the sense of VC, it is the entity, which verifies the claims of the VC, for example a higher education institution that requested student's diploma.

2 Pilot benefits logic and Metrics

2.1 Final version of success criteria and connection to common pilot criteria

The previous deliverable DE4A D4.1 (Studying Abroad - Use Case Definition and Requirements) [1] described a first set of the Studying Abroad pilot goals and success criteria, as well as the relationship to the Technical Common Criteria (Efficiency and Effectivity, Openness etc.) and the piloting principles (Use, Value, Learning and Adoption), which are here understood as follows:

Use: measurable results related to the use of the procedures piloted and usability of the implemented cross-border once-only procedures (e.g. does the interoperability model/solution work; which barriers are being encountered);

Learning: whether the pilot helps to prepare the stakeholders for the future (i.e. collecting and distributing lessons learned/ creating feedback loops);

Value: whether the pilot improves efficiency or effectiveness of the students and organizations involved (e.g. do the data consumers and data providers experience added values, such as administrative burden reduction);

Adoption: whether the pilot facilitates the process where a Service Provider (Data Consumer) or Data Provider introduces new IT tools provided by the pilot to support a (new) way of working. Adoption is limited to the adoption by service and data providers that will be part of the pilot. Adoption is not merely focused on whether a provider was finally able to introduce/integrate with DE4A but rather on all the possible lessons to be learned from this process.

Chapter 2 revisits this topic by refining and updating the goals and success criteria based on newly established insights and knowledge, but also progresses by defining qualitative and quantitative metrics for each success criterion with objective thresholds, as well as the sources for collecting the required data (competent authorities, Member States and students). Furthermore, the fact that DE4A is a research project is emphasized in the goals and success criteria. The updated goals and success criteria as well as the proposed metrics have been agreed between the pilot partners. The result has been to confirm the completeness of the Benefits Logic approach which creates a complete trail from objectives to SMART results (success criteria objectively substantiated on objective metrics).

2.1.1 Pilot goals

The Studying Abroad pilot's main objective is to facilitate the mobility of European students across the European Higher Education Area, based on paperless cross-border procedures that support the once-only principle and the use of electronic identities. While the students can already use eIDAS-based identities to authenticate to most of the existing cross-border procedures, such as application to higher education, they currently have to provide evidence and fill the required electronic forms by themselves. It is envisaged that different actors (students, data providers, data consumers, Member States) will benefit from the once-only principle, the use of trusted sources of electronic evidence and the system for exchange of evidence between competent authorities.

The goals that were first described in D4.1 have been refined in D4.2 and are displayed in the table below:

Table 1: Studying Abroad pilot goals

Actor	ID	Goal
Public authorities	A	Reduce administrative burdens through improvement of the quality of student data and data processing effort within the eProcedures by re-using data from authentic sources
	B	Improve the processing effort of evidence provision
Students	C	Satisfaction of the students and effort and time reduction
Project	D	Evaluate the OOP-components supporting the cross-border information flow: ▸ Assess technical impact on national services already in place ▸ Evaluate connections of national systems to the DE4A OOP TS ▸ Evaluate deployment of DE4A OOP TS ▸ Define (functional) requirements for the OOP-infrastructure, different functional service patterns and semantic interoperability as well as technical requirements for national services that must connect to the OOP-infrastructure ▸ Promote the OOP within the Member States (higher education institutions and public administration).
	E	Evaluate use of the self-sovereign identities approach in higher education, based on innovative vendor independent blockchain framework
	F	Evaluate whether the once-only solutions designed to the SA specific challenges have proven adequate in piloting the SA eProcedures: ▸ Usability of harmonised higher education evidence model ▸ Usability and correct implementation and use of explicit request and preview ▸ Record matching on natural persons in the context of direct interaction of the user with the evidence providing authority

The pilot exists to learn on the usability as well as the level of adequacy of the solutions that are set up in the DE4A project, in the perspective of fulfilling the objective and goals of the SA pilot as stated above.

2.1.2 Success criteria

The criteria and metrics for the pilot should be Specific, Measurable, Achievable, Realistic and Time-bound (SMART) [4]. Their main purpose is to objectively assess the fulfilment of the pilot goals. They are a key component in making the link from the pilot results back to the fulfilment of the pilot goals. On the other hand, the success criteria should allow as much learning as possible about the objective and goals for the SA pilot, meaning that they should not be restrictive and limit/control (qualitative) feedback from users and processes and allow an objective assessment of the fulfilment of the pilot goals. To account for learning (more than proving), success criteria will often be set up as a combination of a quantitative measurement or appreciation, and a free-form observation that allows for unstructured qualitative feedback.

In some cases, the criteria should also be applicable to the baseline situation (without using the DE4A OOP TS or the SSI approach), so that outcomes can be compared, and impact properly determined. This is true for the DE perspective and to some extent also for the DO perspective.

A final consideration on the criteria, is that the eProcedures to be piloted with the participating partners are generally low volume, for example there are a limited number of students from Slovenia who are considering enrolling in a Master's programme at two universities participating in UC#1 (UJI and University of Lisbon). The value of quantitative feedback should therefore not be overestimated, which makes the combination with qualitative feedback even more important.

To avoid complex evaluation of the pilot, it is important not to make the criteria and the related (quantitative) measurements too detailed. A limited, carefully prepared set of criteria and metrics has been selected that target the core value of the SA pilot and respect the research objective of the DE4A project. Success Criteria are intended to act as pilot-wide Key Performance Indicators that facilitate measurement of pilot success (without leaning into defining self-fulfilling objectives that might give a limited view of pilot's success) and to orient the pilot towards maximization of its output in relation to Common Pilot's Principles of use, value, learning and adoption.

The next tables display how the pilot goals are decomposed into success criteria that will be used for the SA pilot, and maps these criteria to:

- the Common Pilot Principles (Use, Learning, Value and Adoption)
- the Technical Common Criteria (Openness, Transparency, Reusability, Technical Neutrality and Data Portability, User Centricity, Inclusion and accessibility, Security & Privacy, Administrative simplification, Effectiveness & Efficiency).

This mapping makes it possible to combine the results of the SA pilot with the results of other pilots (Doing Business Abroad, Moving Abroad) in the DE4A project, which also have goals that are demonstrably achieved thanks to the targeted SMART Success Criteria. The aforementioned success criteria help to assess the degree of achievement of these objectives in each case, and are focused on the key stakeholders who benefit from the overall success of the pilot: public authorities, students.

Success Criteria for Public Authorities

Table 2: Criteria for Data evaluators

ID	Criterion	Technical Common Criteria	Principles
Pilot goal A: Reduce administrative burdens through improvement of the quality of student data and data processing time within the eProcedures by re-using data from authentic sources			
A1	The DE recognizes the student data as of higher quality (e.g. student data is guaranteed to be valid, is more reliable, is in structured electronic format, is more meaningful, is more complete).	Reusability, Transparency, Effectiveness & Efficiency, Administrative Simplification	U, L, V, A
A2	The DE recognizes the student data as easier to process.	Reusability, Transparency, Effectiveness &	U, L, V, A

		Efficiency, Administrative Simplification	

Table 3: Criteria for Data owners

ID	Criterion	Technical Common Criteria	Principles
Pilot goal B: Improve the processing time of evidence provision			
B1	The DO recognizes the requests for evidence as easier to process.	Reusability, Transparency, Effectiveness & Efficiency, Administrative Simplification	U, L, V, A

Success Criteria for Students Applying for a Service

Table 4: Criteria for students

ID	Criterion	Technical Common Criteria	Principles
Pilot goal C: Satisfaction of the students and effort and time reduction			
C1	The user acknowledges the procedure for applying for a service as efficient, effective and secure (e.g. the procedure requires acceptable effort, the procedure is not complex, is reliable, is secure, is established with simple and effective communication, has no language barriers, the user experiences no errors during the eProcedure, control given when managing his/her evidence).	Reusability, Effectiveness & Efficiency, Administrative Simplification, Transparency, Security and Privacy	U, L, V, A

Success Criteria for Pilot Technical Goals

Table 5: Criteria for evaluation of common components

ID	Criterion	Technical Common Criteria	Principles
Pilot goal D: Evaluate the OOP-components supporting the cross-border information flow: ▸ Assess technical impact on national services already in place ▸ Evaluate connections of national systems to the DE4A OOP TS ▸ Evaluate deployment of DE4A OOP TS			
D1	The DO believes the cost and effort for customizing the Evidence portal and data service and integrating to the DE4A Connector will eventually be outweighed by the benefits.	Openness, Technological Neutrality and Data Portability	V, A
D2	The DE believes the cost and effort for customizing	Openness,	V, A

	the eProcedure portal and integrating to the DE4A Connector will eventually be outweighed by the benefits.	Technological Neutrality and Data Portability	
D3	The participating Member State believes the cost and effort for setting up and deploying the AS4 gateway, the SMP and the DE4A Connector will eventually be outweighed by the benefits.	Openness, Technological Neutrality and Data Portability	U, L
Pilot goal E: Evaluate use of the self-sovereign identities approach in higher education, based on innovative vendor independent blockchain framework			
E1	The DO believes the cost and effort for integrating the SSI Authority agent will eventually be outweighed by the benefits.	Openness, Technological Neutrality and Data Portability, User Centricity	V, A
E2	The DE believes the cost and effort for integrating the SSI Authority agent will eventually be outweighed by the benefits.	Openness, Technological Neutrality and Data Portability, User Centricity	V, A
Pilot goal F: Evaluate whether the once-only solutions designed to the SA specific challenges have proven adequate in piloting the SA eProcedures			
F1	Real education services are developed, successfully connected, and piloted as fully online cross-border procedures to the DE4A interoperability infrastructure by the respective pilot partners	Openness, Technological Neutrality and Data Portability	U, A
F2	The Higher Education Evidence Models have proven adequate for cross-border exchange of information on students for the SA eProcedures.	Openness, Technological Neutrality and Data Portability, Reusability	U, L, V
F3	The Explicit Request and Preview requirements as specified in the SDGR have proven suitable for higher education eProcedures.	Administrative Simplification, User Centricity, Inclusion and Accessibility	U, L
F4	The mechanisms for record matching at the DO have proven adequate for the SA eProcedures.	Administrative Simplicity, Effectiveness & Efficiency	U, L

2.2 Qualitative and quantitative metrics

In order to learn about the success criteria (and determine if the goals are being met), one or more items per success criterion must be measured during the pilot runs. This section addresses these metrics. Most of the metrics are associated with a process step to determine when the measurement

should be executed. Draft questionnaires are included in Annex C. Given the number of potential respondents to the questionnaires, it is planned to conduct interviews with representatives from DEs, DOs and Member States to collect feedback that would be useful to other Member States, and to publish a questionnaire for students online. The metrics are defined in the tables below.

In many cases, a metric concerns a valuation by the user (DE, DO), expressed in a Likert scale with 5 values. Since DE4A is a research project, each metric of this type will be accompanied by a query of a qualitative nature, allowing the user to share his/her observations, considerations on the subject, which can be used to motivate the expressed appreciation on the topic/metric. These qualitative responses can be used to determine the direction in which the DE4A solution can be improved. The qualitative queries are not listed as their own metric in the tables below, but will allow for a detailed understanding of other metrics where a value is provided.

Table 6: Criteria and metrics for goals A-E

ID	Description of criteria and metric
Criterion A1	The DE recognizes the student data as of higher quality.
A1.1	The appreciation the DE expresses on quality of student data.
Criterion A2	The DE recognizes the student data as easier to process.
A2.1	The appreciation the DE expresses on the effort required for processing the student data.
Criterion B1	The DO recognizes the requests for evidence as easier to process.
B1.1	The appreciation the DO expresses on the effort required for processing requests for evidence.
Criterion C1	The user acknowledges the procedure for applying for a service as efficient, effective and secure
C1.1	The satisfaction the user expresses on effectively completing the eProcedure.
C1.2	The satisfaction the user expresses on the eProcedure as being time-efficient.
C1.3	The appreciation the user expresses on the eProcedure security and protection of his/her privacy.
C1.4	Control is given to students when managing their education credentials
Criterion D1	The DO believes the cost and effort for customizing the Evidence portal and data service and integrating to the DE4A Connector will eventually be outweighed by the benefits.
D1.1	The estimate of the DO on the benefits of the DE4A OOP TS usage in comparison with the effort and cost spent to customize the Evidence portal and integrate with the DE4A Connector.
D1.2	The effort (measured in person days) for customizing and integrating the Evidence portal to the DE4A Connector.
Criterion D2	The DE believes the cost and effort for customizing the eProcedure portal and integrating to the DE4A Connector will eventually be outweighed by the benefits.
D2.1	The estimate of the DE on the benefits of the DE4A OOP TS in comparison with the effort and cost spent to customize the eProcedure portal and integrate with the

	DE4A Connector.
D2.2	The effort (measured in person days) for customizing and integrating the eProcedure portal to the DE4A Connector.
Criterion D3	The participating Member State believes the cost and effort for setting up and deploying the AS4 gateway, the SMP and the DE4A Connector will eventually be outweighed by the benefits.
D3.1	The appreciation the Member State expresses on the effort, cost and time needed for deploying the AS4 gateway (if separate from the DE4A Connector), the SMP and the DE4A Connector.
D3.2	The effort (measured in person days) for deploying the OOP TS.
Criterion E1	The DO believes the cost and effort for integrating the SSI Authority agent will eventually be outweighed by the benefits.
E1.1	The estimate of the DO on the benefits of the SSI Authority agent usage in comparison with the effort and cost spent to integrate the SSI Authority agent.
E1.2	The effort (measured in person days) for integrating of the SSI Authority agent in the Evidence portal.
Criterion E2	The DE believes the cost and effort for integrating the SSI Authority agent will eventually be outweighed by the benefits.
E2.1	The estimate of the DE on the benefits of the SSI Authority agent usage in comparison with the effort and cost spent to integrate the SSI Authority agent.
E2.2	The effort (measured in person days) for integrating the SSI Authority agent in the eProcedure portal.

The next table concerns project-oriented criteria.

Table 7: Criteria and metrics for goal F

ID	Description of project criteria and metric
Criterion F1	Real education services are developed, successfully connected, and piloted as fully online cross-border procedures to the DE4A interoperability infrastructure by the respective pilot partners.
F1.1	The functional tests are successful, the cross-border services are in use, and the evidence is provided in electronic structured format from trustworthy sources
Criterion F2	The Higher Education Evidence Models have proven adequate for cross-border exchange of information on students for the SA eProcedures.
F2.1	The appreciation of the DE on the extent to which the Higher Education Evidence Model fits their needs.
Criterion F3	The explicit request and preview requirements as specified in the SDGR proven suitable for higher education eProcedures.
F3.1	The users' appreciation on clarity of the explicit request and preview steps.
Criterion F4	The mechanisms for record matching at the DO proven adequate for the SA

	eProcedures.
F4.1	The appreciation of the DO on the effectiveness and difficulties of record matching on students.

2.2.1 Pilot Goal A: Reduce administrative burdens through improvement of the quality of student data and data processing effort within the eProcedures by re-using data from authentic sources

In this and the following subsections, the metrics for each criterion are defined in detail. The metrics are aligned with the questionnaires in Annex C.

Table 8: Metric A1.1

Criterion A1	The DE recognizes the student data as of higher quality.		
Metric A1.1	The appreciation the DE expresses on quality of student data.		
What	The appreciation the DE expresses on the quality of student data, judging from the following perspectives: ▸ Availability in electronic format ▸ Availability in structured format ▸ Completeness of available data ▸ Correctness of available data ▸ Reliability of available data ▸ Meaningfulness of available data	**Unit/scale**	Very high High Neutral Low Very low (Negative answers are further investigated through open questions)
Responsible	Data Evaluator	**Process step**	Submit eProcedure
Type	Quantitative/Qualitative	**Method to gather results**	Questionnaire for DE
Target	More than 50% of respondents appreciate the quality (average of all perspectives) of student data when using the DE4A solution compared to the traditional situation where the DE4A solution is not used.		

Table 9: Metric A2.1

Criterion A2	The DE recognizes the student data as easier to process.		
Metric A2.1	The appreciation the DE expresses on the effort required for processing the student data.		
What	The appreciation the DE expresses on the effort required to process student data during the approval of the application for a service, judging from the following perspectives: ▸ Amount of work ▸ Interpretation of data	**Unit/scale**	Scale ▸ Considerably more effort ▸ More effort ▸ Same effort ▸ Less effort ▸ Considerably less effort

Criterion A2	The DE recognizes the student data as easier to process.		
	▸ Solving transcription and translation errors, missing data and exceptions		(Negative answers are further investigated through open questions) Unit: estimated effort change (average time saved per application)
Responsible	Data Evaluator	**Process step**	Submit eProcedure
Type	Quantitative	**Method to gather results**	Questionnaire for DE
Target	More than 50% of respondents appreciate the effort required for processing student data when using the DE4A solution compared to the traditional situation where the DE4A solution is not used.		

2.2.2 Pilot goal B: Improve the processing effort of evidence provision

Table 10: Metric B1.1

Criterion B1	The DO recognizes the requests for evidence as easier to process.		
Metric B1.1	The appreciation the DO expresses on the effort required for processing requests for evidence.		
What	The appreciation the DO expresses on the effort required to process requests for evidence	**Unit/scale**	Scale: ▸ Considerably more effort ▸ More effort ▸ Same effort ▸ Less effort ▸ Considerably less effort (Negative answers are further investigated through open questions) Unit: estimated effort change (average time saved per request)
Responsible	Data Owner	**Process step**	Submit eProcedure
Type	Quantitative	**Method to gather results**	Questionnaire for DO
Target	More than 50% of respondents appreciate the effort required for processing student data when using the DE4A solution compared to the traditional situation where the DE4A solution is not used.		

2.2.3 Pilot goal C: Satisfaction of the students and effort reduction

Table 11: Metric C1.1

Criterion C1	The user acknowledges the procedure for applying for a service as efficient, effective and secure.		
Metric C1.1	The satisfaction the user expresses on effectively completing the eProcedure.		
What	The satisfaction the user expresses on completing the eProcedure, judging from the following perspectives: language barriers, communication, required effort, clarity, simplicity, number of errors and interruptions, overall user experience.	**Unit/scale**	Very satisfied Satisfied Neutral Dissatisfied Very dissatisfied (Negative answers are further investigated through open questions)
Responsible	Student	**Process step**	Submit eProcedure
Type	Quantitative/Qualitative	**Method to gather results**	Questionnaire for students
Target	More than 50% of respondents are satisfied with the implemented procedure.		

Table 12: Metric C1.2

Criterion C1	The user acknowledges the procedure for applying for a service as efficient, effective and secure.		
Metric C1.2	The satisfaction the user expresses on the eProcedure as being time-efficient.		
What	The satisfaction the user expresses on duration of the eProcedure.	**Unit/scale**	Very satisfied Satisfied Neutral Dissatisfied Very dissatisfied (Negative answers are further investigated through open questions)
Responsible	Student	**Process step**	N/A
Type	Quantitative/Qualitative	**Method to gather results**	Questionnaire for students
Target	More than 50% of respondents are satisfied with the duration of the procedure.		

Table 13: Metric C1.3

Criterion C1	The user acknowledges the procedure for applying for a service as efficient, effective and secure.		
Metric C1.3	The appreciation the user expresses on the eProcedure security and protection of his/her privacy.		
What	The appreciation the user expresses on the eProcedure security and protection of his/her privacy (protection of personal data).	**Unit/scale**	Very satisfied Satisfied Neutral Dissatisfied Very dissatisfied (Negative answers are further investigated through open questions)
Responsible	Student	**Process step**	N/A
Type	Quantitative/Qualitative	**Method to gather results**	Questionnaire for students
Target	More than 50% of respondents are satisfied with the security and privacy protection.		

Table 14: Metric C1.4

Criterion C1	The user acknowledges the procedure for applying for a service as efficient, effective and secure.		
Metric C1.4	Control is given to students when managing their education credentials		
What	The appreciation the user expresses on the control they have when managing their education credentials.	**Unit/scale**	Very satisfied Satisfied Neutral Dissatisfied Very dissatisfied (Negative answers are further investigated through open questions)
Responsible	Student	**Process step**	N/A
Type	Quantitative/Qualitative	**Method to gather results**	Questionnaire for students
Target	More than 50% of respondents are satisfied with the control they have when managing their education credentials.		

2.2.4 Pilot goal D: Evaluate the OOP-components supporting the cross-border information flow

Table 15: Metric D1.1

Criterion D1	The DO believes the cost and effort for customizing the Evidence portal and data service and integrating to the DE4A Connector will eventually be outweighed by the benefits.		
Metric D1.1	The estimate of the DO on the benefits of the DE4A OOP TS usage in comparison with the effort and cost spent to customize the Evidence portal and integrate with the DE4A Connector.		
What	The estimate expressed by the DO on the benefits compared to the cost and effort that is required to integrate the Evidence portal with the DE4A Connector, considering the following expected benefits for the DO: ▸ Less manual effort for processing ▸ Lower communication cost ▸ Lower risk for error due to manual processing and language challenges ▸ Shorter duration for processing	**Unit/scale**	Scale ▸ Considerably exceeding cost and effort ▸ Exceeding cost and effort ▸ On par with cost and effort ▸ Less than cost and effort ▸ Considerably less than cost and effort (Negative answers are further investigated through open questions) Unit: change of duration of evidence request processing in minutes per request
Responsible	Data Owner	**Process step**	N/A
Type	Quantitative/Qualitative	**Method to gather results**	Questionnaire for DO
Target	More than 50% of respondents estimate that the benefits of using the DE4A OOP TS will exceed the costs and effort required to integrate the Evidence portal with the DE4A Connector.		

Table 16: Metric D1.2

Criterion D1	The DO believes the cost and effort for customizing the Evidence portal and data service and integrating to the DE4A Connector will eventually be outweighed by the benefits.		
Metric D1.2	The effort (measured in person days) for customizing and integrating the Evidence portal to the DE4A Connector.		
What	A rough indication of the effort needed for completing the following activities when customizing and integrating the DO service to the	**Unit/scale**	Person days

Criterion D1	The DO believes the cost and effort for customizing the Evidence portal and data service and integrating to the DE4A Connector will eventually be outweighed by the benefits.		
	DE4A Connector: ▸ Integration with an eIDAS node ▸ Integration with the DE4A Connector ▸ Implementation of Preview ▸ Transformation to canonical format and provision of the requested evidence ▸ UI internationalization		
Responsible	Data Owner	**Process step**	N/A
Type	Quantitative	**Method to gather results**	Questionnaire for DO
Target	None		

Table 17: Metric D2.1

Criterion D2	The DE believes the cost and effort for integrating to the DE4A Connector will eventually be outweighed by the benefits.		First Pilot iteration
Metric D2.1	The estimate of the DE on the benefits of the DE4A OOP TS in comparison with the effort and cost spent to customize the eProcedure portal and integrate with the DE4A Connector.		
What	The estimate expressed by the DE on the benefits compared to the cost and effort that is required to customize the eProcedure portal and integrate it with the DE4A Connector, considering the following expected benefits for the DE: ▸ Less manual effort for processing during evaluation of the application, as well as fulfilment of the service requested ▸ Lower communication cost ▸ Lower risk of errors that result from manual processing and language challenges ▸ Shorter duration of application processing ▸ More complete, valuable, consistent and correct data	**Unit/scale**	Scale: ▸ Considerably exceeding cost and effort ▸ Exceeding cost and effort ▸ On par with cost and effort ▸ Less than cost and effort ▸ Considerably less than cost and effort (Negative answers are further investigated through open questions) Unit: change of duration of application processing in minutes per application

Criterion D2	The DE believes the cost and effort for integrating to the DE4A Connector will eventually be outweighed by the benefits.		First Pilot iteration
	available ▸ Trustworthiness of the data		
Responsible	Data Evaluator	**Process step**	N/A
Type	Quantitative/Qualitative	**Method to gather results**	Questionnaire for DE
Target	More than 50% of respondents estimate that the benefits of using the DE4A OOP TS will exceed the costs and effort required to integrate the eProcedure portal with the DE4A Connector.		

Table 18: Metric D2.2

Criterion D2	The DE believes the cost and effort for customizing the eProcedure portal and integrating to the DE4A Connector will eventually be outweighed by the benefits.		
Metric D2.2	The effort (measured in person days) for customizing and integrating the eProcedure portal to the DE4A Connector.		
What	A rough indication of the effort needed for completing the following activities when customizing and integrating the DE eProcedure portal to the DE4A Connector: ▸ Integration of the portal with an eIDAS node ▸ Integration of the portal with the DE4A Connector ▸ Implementation of explicit request ▸ Transformation from canonical format and use of the received evidence ▸ UI internationalization	**Unit/scale**	Person days
Responsible	Data Evaluator	**Process step**	N/A
Type	Quantitative	**Method to gather results**	Questionnaire for DE
Target	None		

Table 19: Metric D3.1

Criterion D3	The participating Member State believes the cost and effort for setting up and deploying the AS4 gateway, the SMP and the DE4A Connector will eventually be outweighed by the benefits.		First Pilot iteration
Metric D3.1	The appreciation the Member State expresses on the effort, cost and time needed for deploying the AS4 gateway (if separate from the DE4A Connector), the SMP DE4A Connector.		
What	The perception of the Member State on the effort, cost (cost of implementation, cost of integration, cost of training, cost of maintenance) and time involved in setting up the nodes (AS4 gateway, if separate from the DE4A Connector, SMP) and deploying the DE4A Connector.	**Unit/scale**	Scale: ▸ Considerably exceeding cost, effort and time ▸ Exceeding cost, effort and time ▸ On par with cost, effort and time ▸ Less than cost, effort and time ▸ Considerably less than cost, effort and time (Negative answers are further investigated through open questions)
Responsible	Member State	**Process step**	N/A
Type	Quantitative	**Method to gather results**	Questionnaire for Member States
Target	More than 50% of respondents believe the cost and effort for setting up and deploying the AS4 gateway, the SMP and the DE4A Connector will eventually be outweighed by the benefits.		

Table 20: Metric D3.2

Criterion D3	The participating Member State believes the cost and effort for setting up and deploying the AS4 gateway, the SMP and the DE4A Connector will eventually be outweighed by the benefits.		First Pilot iteration
Metric D3.2	The effort (measured in person days) for deploying the DE4A OOP TS.		
What	A rough indication of the effort involved to set up and deploy the AS4 gateway (if separate from the DE4A Connector), the SMP, and the DE4A Connector.	**Unit/scale**	Person days
Responsible	Member State	**Process step**	N/A
Type	Quantitative	**Method to gather results**	Questionnaire for Member States

Criterion D3	The participating Member State believes the cost and effort for setting up and deploying the AS4 gateway, the SMP and the DE4A Connector will eventually be outweighed by the benefits.	First Pilot iteration
Target	None	

2.2.5 Pilot goal E: Evaluate use of the self-sovereign identities approach in higher education, based on innovative vendor independent blockchain framework

Table 21: Metric E1.1

Criterion E1	The DO believes the cost and effort for integrating the SSI Authority agent will eventually be outweighed by the benefits.		
Metric E1.1	The estimate of the DO on the benefits of the SSI Authority agent usage in comparison with the effort and cost spent to customize the Evidence portal and integrate it with the SSI Authority agent.		
What	The estimate expressed by the DO on the benefits compared to the cost and effort that is required to customize and integrate the Evidence portal with the SSI Authority agent, considering the following expected benefits for the DO: ▸ Less manual effort for processing ▸ Lower communication cost ▸ Lower risk for error due to manual processing and language challenges ▸ Shorter duration for processing	**Unit/scale**	Scale: ▸ Considerably exceeding cost and effort ▸ Exceeding cost and effort ▸ On par with cost and effort ▸ Less than cost and effort ▸ Considerably less than cost and effort (Negative answers are further investigated through open questions) Unit: change of duration of processing requests for evidence in minutes per application
Responsible	Data Owner	**Process step**	N/A
Type	Quantitative/Qualitative	**Method to gather results**	Questionnaire for DO
Target	More than 50% of respondents estimate that the benefits of using the SSI Authority agent will exceed the costs and effort required to integrate the Evidence portal and data service with the SSI Authority agent.		

Table 22: Metric E1.2

Criterion E1	The DO believes the cost and effort for integrating the SSI Authority agent will eventually be outweighed by the benefits.
Metric E1.2	The effort (measured in person days) for integrating of the SSI Authority agent in the Evidence portal.

Criterion E1	The DO believes the cost and effort for integrating the SSI Authority agent will eventually be outweighed by the benefits.		
What	A rough indication of the effort needed to complete the following activities when customizing the eVidence portal and the data service and integrating them with the SSI Authority agent: ▸ Integration of the SSI Authority agent with the portal and data service ▸ Customization of the portal ▸ Transformation to canonical format and provision of evidence ▸ UI internationalization	**Unit/scale**	Person days
Responsible	Data Owner	**Process step**	N/A
Type	Quantitative	**Method to gather results**	Questionnaire for DO
Target	None		

Table 23: Metric E2.1

Criterion E2	The DE believes the cost and effort for integrating the SSI Authority agent will eventually be outweighed by the benefits.		
Metric E2.1	The estimate of the DE on the benefits of the SSI Authority agent usage in comparison with the effort and cost spent to customize the eProcedure portal and integrate it with the SSI Authority agent.		
What	The estimate expressed by the DE on the benefits compared to the cost and effort that is required to customize the eProcedure portal and integrate it with the SSI Authority agent, considering the following expected benefits for the DE: ▸ Less manual effort for processing during evaluation of the application, as well as fulfilment of the service requested ▸ Lower communication cost ▸ Lower risk for error due to manual processing and language challenges ▸ Shorter duration for processing	**Unit/scale**	Scale: ▸ Considerably exceeding cost and effort ▸ Exceeding cost and effort ▸ On par with cost and effort ▸ Less than cost and effort ▸ Considerably less than cost and effort (Negative answers are further investigated through open questions) Unit: change of duration of application processing in minutes per application

Criterion E2	The DE believes the cost and effort for integrating the SSI Authority agent will eventually be outweighed by the benefits.		
	▸ More complete, valuable, consistent and correct data available ▸ Trustworthiness of the data		
Responsible	Data Evaluator	**Process step**	N/A
Type	Quantitative/Qualitative	**Method to gather results**	Questionnaire for DE
Target	More than 50% of respondents estimate that the benefits of using the SSI Authority agent will exceed the costs and effort required to integrate the eProcedure portal with the SSI Authority agent.		

Table 24: Metric E2.2

Criterion E2	The DE believes the cost and effort for integrating the SSI Authority agent will eventually be outweighed by the benefits.		
Metric E2.2	The effort (measured in person days) for integrating the SSI Authority agent in the eProcedure portal.		
What	A rough indication of the effort needed for completing the following activities when customizing the DE eProcedure portal and integrating it with the SSI Authority agent with: ▸ Integration of the SSI Authority agent with the portal ▸ Customization of the portal ▸ Data transformation from canonical format and use of evidence ▸ UI internationalization	**Unit/scale**	Person days
Responsible	Data Evaluator	**Process step**	N/A
Type	Quantitative	**Method to gather results**	Questionnaire for DE
Target	None		

2.2.6 Pilot goal F: Evaluate whether the solutions designed to the SA specific challenges have proven adequate in piloting the SA eProcedures

Table 25: Metric F1.1

Criterion F1	Real education services are developed, successfully connected, and piloted as fully online cross-border procedures to the DE4A interoperability infrastructure by the respective pilot partners		
Metric F1.1	The functional tests are successful, the cross-border services are in use, and the evidence is provided in electronic structured format from trustworthy sources.		
What	The tests are successfully performed, the students are able to use the services with their data	**Unit/scale**	Yes/No
Responsible	Data Consumer/Data Provider	**Process step**	N/A
Type	Qualitative	**Method to gather results**	Test results
Target	All tests are performed successfully		

Table 26: Metric F2.1

Criterion F2	The Higher Education Evidence Models have proven adequate for cross-border exchange of information on students for the SA eProcedures		
Metric F2.1	The appreciation of the DE on the extent to which the Higher Education Evidence Model fits their needs.		
What	The appreciation the DE expresses on the extent to which the Higher Education Evidence models (Diploma in the first iteration and other data models in the second iteration) satisfy their needs for information on the students, in order to process the request for service adequately	**Unit/scale**	Perfectly adequate Adequate Sufficient Inadequate Absolutely inadequate (Negative answers are further investigated through open questions)
Responsible	Data Evaluator	**Process step**	N/A
Type	Quantitative/Qualitative	**Method to gather results**	Questionnaire for DE
Target	None (research topic)		

Table 27: Metric F3.1

Criterion F3	The explicit request and preview requirements as specified in the SDGR have proven suitable for higher education eProcedures		
Metric F3.1	The users' appreciation on clarity of the explicit request and preview steps.		
What	The thoughts and considerations of the students on the clarity of using Explicit Request and Preview in the basic scenario (in the first iteration) and multiple countries/data providers scenario (in the final iteration).	**Unit/scale**	Yes/why No/why
Responsible	Student	**Process step**	N/A
Type	Qualitative	**Method to gather results**	Questionnaire for students
Target	None (research topic)		

Table 28: Metric F4.1

Criterion F4	The mechanisms for record matching at the DO have proven adequate for the SA eProcedures		
Metric F4.1	The appreciation of the DO on the effectiveness and difficulties of record matching on students.		
What	The thoughts and considerations of the DE on the effectiveness and difficulties of record matching on students within their processes.	**Unit/scale**	Yes/why No/why Percentage of cases with doubts about the identity of the data subject
Responsible	Data Owner	**Process step**	N/A
Type	Qualitative/Quantitative	**Method to gather results**	Questionnaire for DO
Target	None		

3 Pilot design

In the "use case definition and requirements" project phase the SA pilot's use cases were defined and analysed and requirements were defined. The results were documented in deliverable D4.1. In the current project phase ('pilot planning') the project formulated working assumptions, addressed common topics, designed the higher education data evidence type, designed the pilot processes per Member State, identified gaps to bridge by the Member States and constructed the solution architecture (see Annex A) for the first two use cases that implement the USI pattern.

This chapter specifies the design of the SA pilot:

- The pilot scenarios, use cases and patterns (Section 3.1)
- The scope of the first iteration to specify the MVP and the final scope (Section 3.2)
- The major design decisions at pilot level that guide the functionality and technology needed to pilot (Section 3.3)
- The generic pilot process, based on the reference USI and VC patterns of the project start architecture (Section 3.4).
- The data model design that specifies the higher education data evidence type (Section 3.5)
- The common components that are needed for implementing the eIDAS network [5], the OOP TS, and the blockchain service infrastructure (Section 3.6)
- The specific implementation and integration planned at the data evaluator (eProcedure portal) and the data owner (data service) (Section 3.7)

3.1 Pilot scenarios, use cases and patterns

This section provides a quick recapitulation of the use cases from D4.1, interaction patterns that will be used for implementing the use cases, and pilot scenarios.

3.1.1 Use cases

D4.1 defines three use cases:

- Use case 1: The first use case focuses on the procedure of applying for admission to public higher education institutions. This procedure corresponds to the "Submitting an initial application for admission to public tertiary education institution" procedure from Annex II of the SDGR [6]. Portugal, Slovenia and Spain are involved in this use case.
- Use case 2: The second use case focuses on the procedure of applying for a study grant abroad. This procedure corresponds to the "Applying for a tertiary education study financing, such as study grants and loans from a public body or institution" procedure from Annex II of the SDGR [6]. Slovenia and Spain are involved in this use case.
- Use case 3: The third case focuses on diploma recognition in order to facilitate the use of such information by government and other sectors. This procedure corresponds to the "Requesting academic recognition of diplomas, certificates or other proof of studies or courses" procedure from Annex II of the SDGR [6]. Portugal, Slovenia and Spain are involved in this use case.

Respective roles of partners from the participating Member States can be found in section 3.3.1.

3.1.2 Interaction patterns

The use cases implement two interaction patterns described in Deliverable D2.4 [7]:

- USI (User-supported intermediation) – This pattern will be implemented in UC#1 and UC#2. The main reason for selecting this pattern were legal requirements of the participating Member States (Slovenia and Portugal). The national data protection legislation requires users' approval of evidence transfer before the evidence crosses the border. The user's interaction with DP also facilitates record matching, as the user can provide the DP with any additional required information, if needed.
- VC (Verifiable credentials) – UC#3 will implement this pattern.

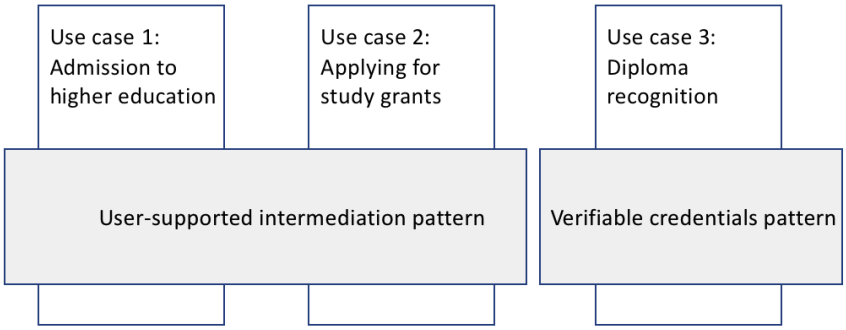

Figure 1: Mapping of use cases to interaction patterns

3.1.3 Pilot scenarios

The three use cases and interaction patterns will be validated in several pilot scenarios with the participants from Portugal, Slovenia and Spain:

- UC#1 – Slovenia: All candidates wishing to enrol in the Slovenian higher education system must apply online through the eVŠ system at the Ministry of Education, Science and Sport. This scenario will pilot the submission of applications for studies at the 2nd Bologna level (Master's degree) in Slovenia by Portuguese and Spanish students. Currently, students have to manually enter the required data in the application form at eVŠ and provide the required evidence themselves. In the pilot, the information on the applicants' diploma will be retrieved from the trusted data providers in Portugal and Spain through the automated exchange mechanisms enabled by the DE4A OOP TS. The Spanish and Portuguese students will authenticate at the eVŠ system with their eIDAS eIDs, they will explicitly request to use the DE4A OOTS to retrieve the required evidence from their home countries and will then be redirected to the evidence issuing competent authority where they will Preview the evidence before being redirected back to the requesting competent authority in Slovenia.
- UC#1 – Spain: The second pilot scenario involves the submission of applications to study at the 2nd Bologna level (Master's degree) at Universitat Jaume I (UJI) in Spain by Portuguese and Slovenian students. Similar to the previous scenario, the information about the applicants' diploma is retrieved from the trusted data providers in Portugal and Slovenia through the DE4A OOP TS. The Slovenian and Portuguese students will authenticate at UJI with their eIDAS eIDs, they will explicitly request to use the DE4A OOTS to retrieve the required evidence from their home countries and will then be redirected to the evidence issuing competent authority where they will Preview the evidence before being redirected back to the requesting competent authority in Spain.
- UC#1 – Portugal: The third pilot scenario from Use case 1 covers submission of applications to study at the 2nd Bologna level (Master's degree studies) at University of Lisbon in Portugal by

Spanish and Slovenian students. Similar to the previous scenario, the applicants' diploma information will be retrieved from the trusted data providers in Portugal and Slovenia through the DE4A OOP TS. The Slovenian and Spanish students will authenticate at University of Lisbon with their eIDAS eIDs, they will explicitly request to use the DE4A OOTS to retrieve the required evidence from their home countries, and will then be redirected to the evidence issuing competent authority where they will Preview the evidence before being redirected back to the requesting competent authority in Portugal.

- UC#2 – Slovenia: Currently, no study grant application services exist in production in Slovenia that are suitable to Spanish users. Therefore, a service will be set up at JSI for the project purposes where the students from Universitat Jaume I will be able to submit applications for study grants. The applicants' evidence will be retrieved from a trusted data provider in Spain via the DE4A OOP TS. The Spanish students will authenticate at the JSI system using their eIDAS eIDs, they will explicitly request the use of the DE4A OOTS to retrieve the required evidence from their home countries, and will then be redirected to the competent authority responsible for issuing the evidence, where they will Preview the evidence before being redirected back to the requesting competent authority in Slovenia.
- UC#3 – DE4A: The pilot scenario in Use case 3 involves the SSI approach for requesting diploma recognition in the eVŠ system in Slovenia and at the University of Lisbon in Portugal. Students will request their diploma evidence in the form of verifiable credentials from the data providers (issuers) in Portugal, Slovenia and Spain, store them in their mobile digital wallets, and present them in the form of verifiable presentations to the two data consumers (verifiers) in Slovenia and Portugal. The data consumers will be able to check the validity of the verifiable presentations using the EBSI infrastructure, in particular that they correspond to a registered schema, that the issuers are also registered as such in EBSI and that the identity of the student in the diploma matches the authentication data of the student authenticated at the DE.

3.2 Minimum Viable Product (first iteration) and final scope (second iteration)

In order to be able to develop and implement the SA pilot process (per participant) and to carry out the necessary tasks, the pilot process has been designed and described in detail.

3.2.1 First iteration (MVP) scope

The description of action defines two pilot runs: the initial pilot run and the final pilot run. In order to respect timelines and to allow for swift piloting, the DE4A project interpreted the initial pilot run as the piloting of the minimum viable product (MVP). The MVP implements the smallest possible functionality needed to run the SA pilot.

Below, the first iteration scope is presented for each of the three use cases, including the MVP simplifications, Member States that will be involved in this iteration and their specifics, and planned limitations. The three use cases will be piloted in a controlled piloting environment, aiming at piloting with real users and real data.

3.2.1.1 Use case 1 – Application to public higher education

The first pilot run includes student's application to master studies in a digital-by-default and once-only manner, as described in Deliverable D4.1.

The following simplifications have been done for the first iteration:

- Two-country scenario will be validated, i.e. a student applying to higher education will come from the Data Provider country;
- Only Applications to Master studies (2nd Bologna level) will be validated;
- One type of evidence ('higher education diploma') will be used by the DCs and DPs involved;
- There will be one Data Provider per Member State;
- Configuration files in the DE4A Connector will be used for the Information Desk information.

Table 29: Specifics of UC#1 MVP per Member State

	MVP for data consumer	MVP for data provider
ES	No specifics for this case.	The Spanish Intermediation platform operated by SGAD has access to all nationally issued diplomas, but given that some extra required data (not all data for canonical evidence is available at SGAD) will be taken from UJI, the participating university, only diplomas issued for students from that university can be considered as part of the scope
SI	No specifics for this case.	No specifics for this case.
PT	In Portugal 2nd Bologna level applications are handled at the universities, so the MVP will consider execution in a university, not at country level.	In Portugal diplomas are managed by universities so the data provider will also be a university. The Preview will be managed by IST in the first iteration and at national level in the second.

3.2.1.2 Use case 2 – Applying for Study Grant

The first pilot run includes a study grant application in a digital-by-default and once-only manner, as described in Deliverable D4.1.

The following simplifications have been done for the first iteration:

- Two-country scenario will be validated, i.e. a student applying for study grant will come from the Data Provider country;
- Just one type of academic evidence ('higher education diploma') will be used by the DCs and DPs involved;
- There will be just one data provider per Member State;
- Configuration files in the DE4A Connector will be used for the Information Desk information.

Table 30: Specifics of UC#2 MVP per Member State

	MVP for data consumer	MVP for data provider
ES	Not involved as DC	The Spanish Intermediation platform operated by SGAD has access to all nationally issued diplomas, but given that some extra required data (not all data for canonical evidence is available at SGAD) will be taken from UJI, the participating university, only diplomas issued for students from that university can be considered as part of the scope
SI	A dedicated portal will be set up for	No specifics for this case.

	MVP for data consumer	MVP for data provider
	piloting purposes, as there are currently no real grant application services (in production) in Slovenia for Spanish users.	

3.2.1.3 Use case 3 – Diploma recognition

The first pilot run includes the technical verification of the basic building blocks of the VC pattern (i.e., SSI authority and edge agents) in a pilot environment of the involved MS acting as DC and DP and integrating with EBSI-ESSIF v2.0 pre-production environment.

It implements the Verifiable credentials pattern, as described in Deliverable D2.4 [7].

The following simplifications have been done for the first iteration:

- Two-country scenario will be validated, i.e. a student for which the verifiable credentials will be issued and verified will come from the Data Provider country;
- Just one type of academic evidence ('higher education diploma') will be used by the DCs and DPs involved. The canonical evidence is a subset of the Europass-EDCI data model, also including the eIDAS Minimum Data Set attributes of the student to enable the matching with the eIDAS authenticated user by the DE/DO.
- There will be just one data provider per Member State;
- The public DID identifiers of the issuing organizations will be anchored manually to the Trusted Issuer Registry (TIR) on the EBSI infrastructure.
- The exchange of the Diploma evidence in the form of Verifiable Credential (i.e., Verifiable attestation) will be validated in technical terms and not content wise.
  - The Data Consumer's (Verifier) SSI agent will perform a verification of the VC(VA) in terms of issuer's signature correctness, issuer's DID existence in the TIR, VC(VA) schema correctness based on the TSR, subject's identity based on eIDAS MDS.
  - After receiving the VC(VA) by the Student, the DC eProcedure Portal (Verifier) will not display the VC(VA) to the Student in the portal.
  - The verification of the revocation of the VC(VA) by the DC is out of scope.
- The VP presented to the DC (Verifier) by the Student will hold the whole VC(VA) and not consider partial disclosure.
- The DC portal (Verifier) will not provide the Student with the Information Desk functionality i.e., a list of DPs, which can provide him his/her VC(VA) i.e., the Student will navigate between DC/DP (Verifier/Issuer) portals manually.
- Only a single interaction between DC/DP (Verifier/Issuer) and Student is foreseen.
  - The Student communicates only with 1 DID.
    - The Student does not yet have a DID connection with the DC/DP (Verifier/Issuer) and creates a new one.
    - The Student performs the procedure with the DC/DP (Verifier/Issuer) in 1 session.
    - The receiving and sending of VC/VP by the Student is limited to one evidence i.e., one VC(VA), even if multiple are available. The Student will accept the VC(VA) from the DP (Issuer) i.e., not decline it. The student will be able to preview the VC with the Edge Agent.

Table 31: Specifics of UC#3 MVP per Member State

	MVP for data consumer	MVP for data provider
ES	Not involved as DC	The Ministry of Economic Affairs and Digital Transformation acts as the Data provider, not the universities
SI	No specifics for this case.	The Ministry of Education, Science and Sport acts as the Data Provider, not the universities
PT	In Portugal 2nd Bologna level applications are handled at the universities, so the MVP will consider execution in a university, not at country level.	In Portugal diplomas are managed by universities so the data provider will also be a university.

3.2.2 Second iteration scope

Scope of the second iteration will be broadened in several ways. Here, the second iteration scope is presented for each of the three use cases. Additional details about the final iteration are available in Section 5.7. All three Member States (Portugal, Slovenia, Spain) will be part of the final iteration in the same roles as in the first iteration.

3.2.2.1 Use case 1

The final pilot run will include the following additional functionalities:

- Three-country scenario will be validated, i.e. a student applying to higher education will come from the third country (different from the Data provider or Data Consumer country);
- Application to Bachelor studies (1st Bologna level) will be enabled;
- The IDK service will be used instead of the configuration files;
- If possible, evidence retrieval from two different providers in two different countries will be considered (if there exist students at participating institutions who have evidence at two DPs).

It will implement the User-supported intermediation pattern, as described in Deliverable D2.4 [7].

3.2.2.2 Use case 2

The final pilot run will include the following additional functionalities:

- More than one type of evidence will be used by the DCs and DPs involved;
- The IDK service will be used instead of the configuration files.

It will implement the User-supported intermediation pattern, as described in Deliverable D2.4 [7].

3.2.2.3 Use case 3

The final pilot run will include the following additional functionalities:

- Three-country scenario will be validated, i.e. a student for which the verifiable credentials will be issued and verified will come from the third (not DP or DC) country;
- If possible, evidence retrieval from two different providers in two different countries will be considered (if there exist students at participating institutions who have diplomas at two DPs).
- The public DID identifiers of the issuing organizations will be anchored automatically to the Trusted Issuer Registry (TIR) on the EBSI infrastructure (note: presuming this option will be available given the stage of development of EBSI).

- The student's Verifiable Credential (i.e., Verifiable attestation) will be validated both in technical terms and content-wise (structure and content validation).
- The DC portal will provide the Student with the Information Desk functionality, where he/she can find accredited DPs from which he/she can request his/her diploma.
- The student will be able to decline the Verifiable Credential offered by the DP.
- More than one interaction between DC/DP and Student will be supported.
  - The Student communicates with more than one DID.
  - The Student already has an existing DID connection with the DC/DP (Verifier/Issuer) but would like to create a new one.
  - The Student's procedure with the DC/DP (Verifier/Issuer) does not have to be carried out within a single session.

It will implement the Verifiable credentials pattern, as described in Deliverable D2.4 [7].

Please note that the remainder of this document details the first pilot iteration (MVP), except where stated otherwise.

3.3 Major design decisions at pilot level

As part of this project phase, the pilot team concluded on several important topics. This section presents these topics and the main conclusions. Major design decisions, the affected iterations (first or final) and motivation for the decisions taken are summarized in Table 32.

Table 32: Design decisions for the SA pilot

#	Application component	Design choice for pilot iterations	Motivation	Release
1	eProcedure portal – Session management	The application service 'eProcedure save and resume' will not be implemented.	The Studying Abroad pilot only implements an uninterrupted process (not 'save and return later to continue' but 'abort and return later to restart').	First Final
2	Information desk – Data service lookup	The application service 'Inquire routing information' will be replaced by a configuration file.	The service will not be implemented by WP3 as the configuration file will be stored in the DE4A Connector.	First
3	Information desk – Evidence type translator	The application service 'Cross-border evidence matching' will not be implemented.	To reduce complexity, the canonical evidence has been agreed for the pilot that all participants can exchange. In the processes of evidence exchange, each Member State refers to this commonly accepted	First Final

#	Application component	Design choice for pilot iterations	Motivation	Release
			evidence identification. Goals of this design choice is to avoid matching different names / concepts used by different Member States (translation to and from canonical evidence will still be needed).	
4	Information desk – Authorization controller	The application services 'Authority check' and 'Legal basis check' will not be implemented. It is assumed that the SA evidence can be requested by all connected participants in the pilot use of the USI without further authorization or legal basis checks. The pattern further contributes to make this unnecessary.	Reduce complexity.	First Final
5	Evidence Interchange Management – front end	The application service 'Evidence status overview' will be simplified: because of the uninterrupted process and user redirection (USI pattern) only the statuses failed or success are communicated to the user; no statuses in between (like 'pending') are communicated.	Fits with the SA scope to only pilot an uninterrupted process and implement the USI pattern.	First Final
6	Trust Architecture - Record matching	'Identity/record matching' for student IDs is done by the Evidence portal. As the eProcedures are not recurring, there will be no record matching at the Data Consumer.	Reduce complexity.	First Final
7	Trust Architecture - Data encryption/decryption	'Data encryption/decryption' is implemented between the OOP-nodes (eDelivery Access Points) of the participating members states.	Conform to the DE4A standards	First Final
8	SSI Agent Infrastructure - VC signature	The VC(VA) signature will be based on the DP's DID, which does not relate to an eSEAL.	Conform to the SSI principle	First Final

#	Application component	Design choice for pilot iterations	Motivation	Release
9	DID anchoring	The public DID of the DC will not be anchored on the EBSI ledger. Student's DID will not be anchored on any ledger. The public DID of the DP will not be updated after being anchored on the EBSI ledger.	Current maturity of the EBSI infrastructure	First
10	SSI Agent Infrastructure – Student's approvals	The two-channel communication between the DC/DP and the Student via the eProcedure portals and SSI agent makes the process asynchronous, thus the Student will confirm his actions performed on the SSI agent manually on the eProcedure portal.	Reduce complexity at this stage	First (Final)

3.3.1 Pilot roles

All three participating Member States (Portugal, Slovenia, Spain) will be involved in the first pilot iteration. Studying Abroad pilot partners will have the following roles.

Table 33: Pilot partners' roles

Pilot Partner	Roles per Use Case
UJI	UC1 {DE, DO[1]} UC2 {DO[2]} UC3 {DP[3]}
MPTFP-SGAD	UC1 {DR, DT, DO} UC2 {DR, DT, DO} UC3 {DP}
INESC	UC1 {DR, DT} UC3 {DC, DP}
MIZŠ	UC1 {DE, DO} UC2 {DO} UC3 {DC, DP}
UM	/

[1] UJI participation as DO needs to be explained. The national strategy for Spain determines that SGAD will be the sole DO operator as it has access to most needed data sources. UJI will feed this DO as an internal provider of data.
[2] Same as above.
[3] Same as above.

Pilot Partner	Roles per Use Case
JSI	UC2 {DE}

Other institutions (members of the DE4A project or external) will have the following roles:

Table 34: Roles of other institutions

Country	Roles per Use Case	Name
ES	UC1, UC2, UC3 {DP}	Spanish Ministry of Universities
ES	UC1, UC2, UC3 {DP}	Spanish Ministry of Education & Professional Training
PT	UC1 {DE, DO}	Portuguese IST, University of Lisbon
SI	UC1, UC2 {DR, DT}	SI-MPA

3.3.2 Piloting in operational conditions

The table below shows operational conditions of the three use cases:

Table 35: MS overview piloting conditions

	Pilot real users?	Pilot real data?	Pilot eProcedure portal	Name (descriptive) of eProcedure / Use Case
ES	Yes	Yes	preinscripcio.uji.es	Universitat Jaume I's pre-enrolment application for graduate courses.
SI	Yes	Yes	UC#1: https://portal.evs.gov.si/prijava/?lang=en	Enrolment application for study
			UC#2: Dedicated portal in construction	Study grants
			UC#3: https://portal.evs.gov.si/prijava/?lang=en	Diploma recognition
PT	Yes	Yes	UC#1: Fenix Edu	Enrolment application for study
			UC#3: Fenix Edu	Diploma recognition

Furthermore:

- The SA pilot will rely on the national and EU legislation that is already in place for use of identity data (eIDAS) and student data in the eProcedures to pilot.
- The SA pilot assumes the SDGR provides sufficient legal basis to pilot the DE4A OOP technical system with real data in anticipation of (this part of) the SDGR going into effect end of 2023. To confirm this point of view, Member States will create a Memorandum of understanding for cross-border piloting.

- The SA pilot will inform the user – as part of the explicit request - that the DE4A OOP TS will be used for exchange of data before the SDGR is into effect at the moment the initial pilot starts. The user in all cases has the option not to proceed.

3.3.3 Restriction to piloting with two Member States

The SA pilot will be limited to the two Member State scenario in the first iteration: one Member State operating as Data Consumer and one Member State as Data Provider. Students using higher education services at Data Consumer will originate from the Data Provider country.

In the final pilot iteration, it is considered that students could have evidence in two Member States, e.g. a Portuguese student applying to a Slovenian university with part of the required evidence also stored in Spain.

3.3.4 Approach to use eIDAS network

The Data Consumers and Data Providers plan to use existing eIDAS network for authentication of foreign users. The following tables show details about the notified eIDS in the participating Member States and the status of eIDAS node.

Table 36: MS overview of notified eIDs

Member State	Notified eID(s)	Level of Assurance	Accepts non-notified eID for piloting (Yes/No, at DE and/or DO)
ES	Spanish ID card (DNIe)	High	Yes
PT	Portuguese national identity card (eID card). Digital mobile key. Professional Attributes Certification System (Pre-notified)	High High N/A	Yes
SI	Not notified yet	TBC	N/A

Table 37: MS overview of eIDAS nodes

Member State	Type of Node 1st iteration (Pre-prod or production, version of CEF reference SW / eIDAS specification)	Accepts eIDAS eID / National eID of the MS / Both (at DE, DO)
ES	Pre-prod v2.4 (confirmed)	Both (at DE, DO)
PT	v1.4.3 (Mix of prod for notified and pre-prod for non-notified)	Both (at DE, DO)
SI	Pre-prod v2.3 (v2.5 from Q1 2021) (confirmed)	Both (at DE, DO)

3.3.5 Data evidence types for cross-border exchange

Data for evidence exchange, required by participating Data Consumers, and the data available at Data Providers in the Studying Abroad pilot was assessed in D4.1 in order to define structure of canonical evidence for cross-border exchange. To reduce the number of evidence types for MVP it was agreed to use only diploma evidence in the first pilot run. A common denominator of the required and available higher education data was established and the HigherEducationDiploma canonical evidence defined in collaboration with WP3. The canonical format was based on the Europass and EDCI schemes and adapted on the basis of the feedback from the EBSI/ESSIF experts. The structure of the evidence type is described in more detail in Section 3.5.

The higher education evidence type is characterised by a number of attributes to allow all data owners/issuers to construct the evidence. The higher education data evidence is fully structured data. It is planned to exchange across borders only evidence in the canonical format and not including domestic evidence in the exchanged messages, as canonical evidence also has legal value and the Data evaluators have confirmed they do not need the domestic evidence along with the canonical one.

SA uses only a basic authority check in evidence exchange. The participating data requestors are known in advance and the data provider will not check whether the data consumer is authorised to request the data. Furthermore, the evidence status overview will be limited to the values (1) success and (2) fail. No intermediate information about the evidence status will be communicated as this is not needed as the user is not kept waiting in case of the USI patterns and is in full control of interactions in the VC pattern.

Table 38: Evidence

Evidence Type	Provider Country	DO ENTITY NAME	TERRITORIAL LEVEL	DT ENTITY NAME	ADDITIONAL PARAMETERS
HigherEducationDiploma	ES	MPTFP-SGAD	NUTS 0	MPTFP-SGAD	/
HigherEducationDiploma	SI	Ministry of Education, Science, and Sport	NUTS 0	SI-MPA	/
HigherEducationDiploma	PT	IST	NUTS 0	INESC	/

3.3.6 Explicit Request, Preview and logging

The Explicit Request itself is implemented as a user interaction that may take one or two steps. In the first, the user gets an explanation about the pilot and the OOP TS, then gives his consent to participate in the pilot (or denies it and is taken to the legacy, manual, process). The second explains that authorization is needed “for the automated cross-border exchange of evidence” (SDGR, Article 14), gives the names of the evidence providers, the types or data fields that will be exchanged, and the name of the Data Consumer (evidence requester). Then, the user is asked for consent to retrieve and provide the evidence, to satisfy requirements imposed by the GDPR.

The Preview mechanism is also imposed by the SDGR (Article 14). It aims to support the accuracy and relevance of the evidence exchanged and strengthens the user’s control over the evidence

exchanged through the technical system. In the SA pilot, the Data Owner will enable the user to preview the evidence before it is transferred to the Data Consumer in another Member State. The evidence will only be transferred across borders if the user explicitly agrees to such a transfer after having seen a preview of the evidence in canonical (and original) form. The preview will always be displayed to the user. Guidelines for the implementation of the preview will be prepared by WP5.

In Slovenia, evidence will be previewed at the central eGovernment portal (https://e-uprava.gov.si), which allows citizens to view their data stored in central databases of various institutions. An existing preview functionality in the "My eGovernment" section of the portal will be extended and aligned with the UI guidelines.

In Spain, the evidence will be previewed at a centralized point or 'Citizen Folder' —an ad hoc implementation will be required— where citizens will be able to access and review the information that the administrations hold about them.

In Portugal, AMA is implementing Preview functionality as part of a mobile app that it has already in operation (Autenticacao.gov). The app is available for 3 years and is much used in the country. However, the preview functionality is not much used or well-tested, as also the portal that allows access from non-mobile platforms. Therefore, this preview functionality will be used in the pilot but only in the second iteration. In the first iteration, an ad-hoc implementation of this functionality will be used.

As the Explicit Request & Preview will be implemented in a simple form, there is no need for request tokens as proof of explicit request in the first pilot iteration.

3.3.7 Record matching

Studying Abroad pilot will implement identity/record matching only at DO, as the higher education eProcedures in MVP are not recurring.

In Slovenia, identity/record matching is done centrally at SI-CAS (Slovenian Central Authentication System), which is operated by Ministry of Public Administration. SI-CAS provides a central identity to all users and supports different authentication methods that can be used by the Slovenian e-services. Furthermore, SI-CAS is coupled with the Slovenian citizen and business registries and provides trusted attributes to the services integrated within SI-CAS. SI-CAS verifies the user's identity at the relevant identity provider and, when necessary, obtains further identification attributes. If the identification attributes are not available for the registries, the user will be asked to provide them.

Record matching in Spain is done centrally: The Data Intermediation Platform / Data Owner in the General Secretariat for Digital Administration provides a centralized point where record matching is made once the request has been received from an authenticated user on the Data Evaluator. There is no risk of false positives as the national ID card has a unique identifier (number).

In Portugal the data owners of university diplomas are the universities themselves, so a decentralized solution is going to be adopted. The pilot will interface with Fenix Edu, an academic management system used by several universities, including University of Lisbon, the largest in the country and owner of INESC-ID (indirectly, through Instituto Superior Técnico that is its engineering school). Fenix Edu allows authentication using the national ID card that is compliant with the eIDAS regulation. The information about the students that are going to study abroad is stored at the database of Fenix Edu, at the universities. There is no risk of false positives as the national ID card has a unique identifier (number).

3.4 Generic process for the pilot and solution architecture

The first version of the pilot process was analysed and specified in the D4.1 deliverable. Subsequently, the processes have been further detailed by each of the pilot partners for their specific situation, functionality and requirements have been specified, the processes have been aligned to the project start architecture (that has been designed after D4.1), the solution architecture has been defined for the USI pattern, national customisations and integration activities and gaps have been identified. For detailed information on the solution architecture, please refer to Annex A. The pilot process will implement the reference process as designed in the Project start architecture (Section 4.3.2 business process collaboration) [7]. This section specifies the interpretation of the reference pattern for the SA pilot.

Point of attention when comparing to the initial pilot process design from D4.1 and the Member State specific detailed process designs (based on the solution architecture in Annex A):

- The USI pattern has been selected for UC#1 and UC#2 due to the legal obstacles in the participating Member States (see Section 3.1.2).
- The process "establish user identity" (user) in the SA pilot refers to record matching at the Data provider.
- The process "determine procedural requirements" and "require cross-border evidence" have been simplified for the SA pilot to reflect the decision to use just one evidence type. The procedural requirements and evidence to request are fixed in the scenario of each pilot partner.
- Saving and resuming the eProcedure (user) will not be supported in the SA pilot.
- "Provide public service" in the SA pilot initially means: submitting an application to the eProcedure portal.

The Solution Architecture for the USI pattern defines that:

1. The eIDAS mandatory personal data set are used to communicate the user identity information.
2. Existing eIDAS nodes in the participating member states are used.
3. The DE4A OOP TS is used for retrieving the student's data (evidence) needed for the eProcedure.

The main components and processes relevant for implementing UC#3 with the VC pattern and integrating national end points with the EBSI infrastructure are described in DE4A D5.7 First release of DE4A Blockchain supporting framework [8]. There are three work/message flows in UC#3 (see Section 3.4 in [8]):

- establishment of a secure connection between actors using DID Exchange Protocol 1.0[4],
- issuance of a diploma as a Verifiable Credential using Issue Credential Protocol 2.0[5], and
- verification of a diploma ownership as a Verifiable Presentation using Present Proof Protocol 2.0[6].

The first message flows occur between actors' SSI agents. The second one happens between students and data providers, and the last one between students and data consumers.

[4] https://github.com/hyperledger/aries-rfcs/tree/master/features/0023-did-exchange
[5] https://github.com/hyperledger/aries-rfcs/tree/master/features/0453-issue-credential-v2
[6] https://github.com/hyperledger/aries-rfcs/tree/master/features/0454-present-proof-v2

3.5 Data models design

As described in Section 3.3.5 the SA pilot uses one evidence type for the exchange of data: Diploma (HigherEducationDiploma). The design of the diploma evidence type, as defined in D4.1, has been improved together with WP3 to better incorporate existing standards (the majority of elements in the application profile are classes and properties defined by the European Learning Model (EDCI)). Furthermore, the relevance of all higher education attributes has been re-assessed by the pilot partners, leading to some adaptations to the data definition. Since the scope of the first iteration for UC#1 are applications to Master studies, only the attributes relevant for the 1st level Bologna degree diplomas were considered for defining the canonical model of the higher education evidence. The same evidence will also be used for UC#2 and UC#3. The final data definition is depicted below in a visual representation in Figure 2: UML diagram of higher education evidenceFigure 2.

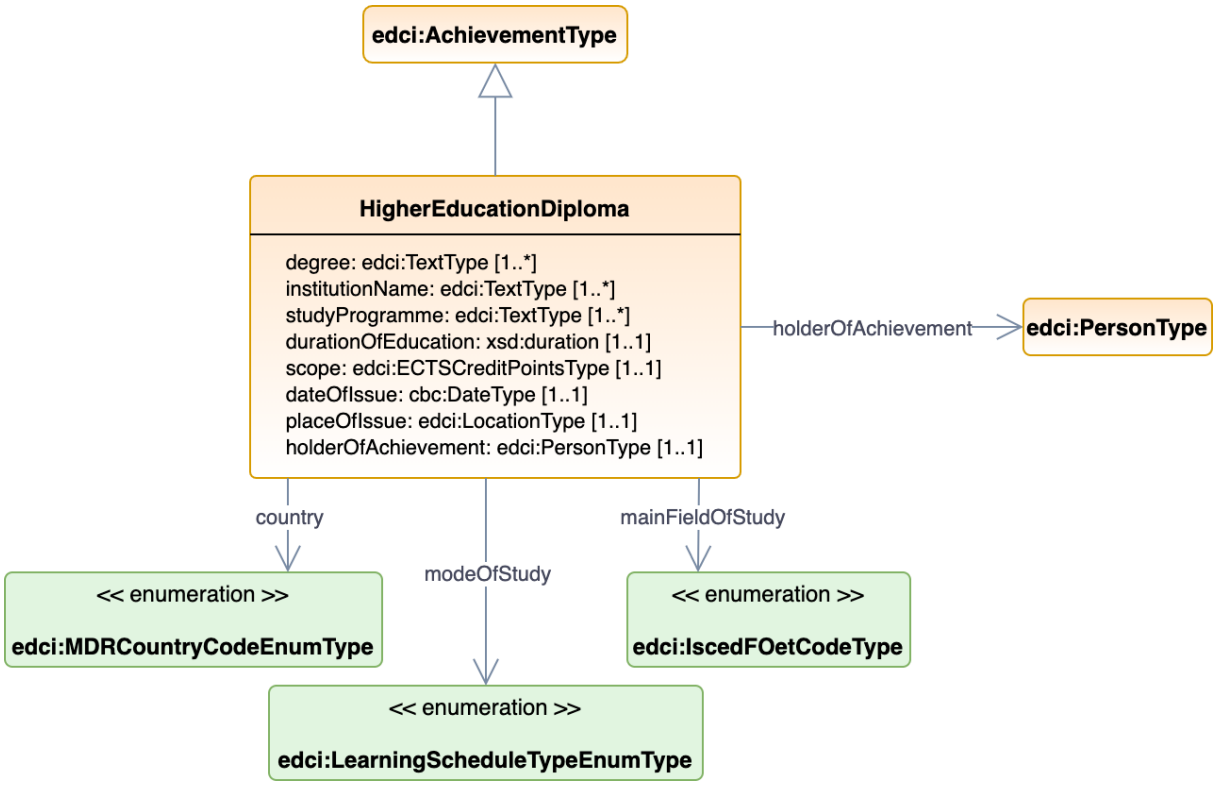

Figure 2: UML diagram of higher education evidence

The final data definition for UC#1 and UC#2 is depicted below in a table with all details on the attributes. The corresponding XSD is included in Annex B. The evidence has also been serialized in JSON-LD for the use in UC#3. More details about the model are available in D3.5 [9].

Table 39: Evidence type HigherEducationDiploma

Label	Definition	Field	Range (data type)	Cardinality
degree	An academic title or degree obtained by the student and proven by this diploma or certificate (evidence)	degree	edci:TextType	1 - *
institution name	The name of the higher education institution where the student obtained the degree	institutionName	edci:TextType	1 - *
study programme	Name of a study programme that the student finished at the higher education institution in order to obtain the degree	studyProgramme	edci:TextType	1 - *
duration of education	Official duration of education	durationOfEducation	xsd:duration	1
scope	The official workload of the study programme in the ECTS (European Credit Transfer and Accumulation System) credit points	scope	edci:ECTSCreditPointsType	1
date of issue	Date of issue of the certificate or diploma	dateOfIssue	cbc:DateType	1
place of issue	Place of issue (location) of the certificate or diploma	placeOfIssue	edci:LocationType	1

Label	Definition	Field	Range (data type)	Cardinality
country	Country where the study programme was completed by the student	country	edci: MDRCountryCodeEnumType	1
main field of study	Field of finished higher education	mainFieldOfStudy	edci:IscedFOetCodeType	1
mode of study	Mode of study	modeOfStudy	edci: LearningScheduleTypeEnumType	1

3.6 Common components

Both the eIDAS network and the DE4A OOP technical system are made up of common components that need to be deployed, configured and connected. In some cases, existing MS infrastructure (eIDAS nodes, AS4 gateways) will be used. Furthermore, the trust infrastructure needs to be in place to allow for secure connections (see Section 4.1.3).

3.6.1 Common roles

In this respect 3 groups of roles are concerned.

eIDAS roles:

- Authentication connector:

  The actor that – typically at a Member State level – connects to the eIDAS network as a relying party. Via the authentication connector, the data evaluator can request authentication, identifying attributes of the student.
- Authentication proxy:

  The actor that connects the national (notified and non-notified) eID provider.

DE4A OOP Technical system roles:

- The Data requestor:

  The actor in the data consuming Member State responsible for parsing evidence requests to the data providing Member State and receiving the evidences from that data providing Member State.
- The Data transferor:

  The actor in the data providing Member State responsible for receiving the evidence requests from the data consuming Member State and returning the evidence to that data consuming Member State.

Self-Sovereign Identity (SSI) Agent infrastructure roles:

- The Data consumer/Verifier:

  The actor in the data consuming Member State responsible for requesting the verifiable credentials required by the data evaluator's procedures, parsing the verifiable presentations

obtained from the student's edge agent (wallet) and forwarding the parsed evidence to the data evaluator for verification purposes.

- The Data provider/Issuer:

  The actor in the data providing Member State responsible for converting the original diploma evidence in the canonical form to a signed verifiable credential and presenting it to the student for acceptance.

Table 40: Partners responsible for common component implementation/deployment

	eIDAS		OOP TS		SSI Authority agent	
	Authentication connector	**Authentication proxy**	**Data requestor**	**Data transferor**	**Data consumer/ Verifier**	**Data provider/ Issuer**
ES	MPTFP-SGAD	MPTFP-SGAD	MPTFP-SGAD	MPTFP-SGAD	MPTFP-SGAD	MPTFP-SGAD
SI	SI-MPA	SI-MPA	SI-MPA	SI-MPA	SI-MPA	SI-MPA
PT	AMA	AMA	INESC	INESC	INESC	INESC

3.6.2 Common eIDAS components

The table below describes the common eIDAS components to use for implementing the pilot processes.

Table 41: eIDAS components

Component	Role	Short description of its use
eIDAS connector	Authentication connector	The component Member States implement to connect to the eIDAS network as a relying party. The connector accepts authentication requests from the service providers of the Member State and forwards the requests to the Member States that needs to authenticate the user. After authentication, the eIDAS connector receives the authentication results and sends them to the requesting service provider (relying party). The eIDAS connector can be implemented using CEF's reference software or a custom implementation compliant to the eIDAS interoperability specifications. The CEF reference software implements – besides the eIDAS SAML profile – also the JSON/REST eIDAS Light protocol to connect to national infrastructure.
eIDAS proxy	Authentication proxy	The component Member States implement to allow authentication with their (notified) eID for services provided in other Member States. The eIDAS proxy receives authentication requests from relying Member States and coordinates authentication. The eIDAS proxy then sends the result to the requesting eIDAS connector. Just like the eIDAS connector, the eIDAS proxy can be implemented using CEF's reference software or a custom implementation compliant to the eIDAS interoperability specifications. The CEF reference software implements – besides the eIDAS SAML profile –

Component	Role	Short description of its use
		also the JSON/REST eIDAS Light protocol to connect to national infrastructure.

3.6.3 Common OOP TS and evidence exchange components

In UC#1 and UC#2, the data requestor and the data transferor need to integrate the common DE4A OOP TS components, including the DE4A connector. Each Member State may decide on which national level to implement these components. For example, the data requestor may be data evaluator as well, but can also be a separate organisation, depending on national choices (see Section 3.6.1). Each Member State also needs to deploy SMP and external AS4 Gateway (in case the Phase4 gateway integrated with the DE4A connector will not be used; see Section 3.6.4). The components of the DE4A OOP TS that have been implemented nationally need to be configured for use with the other pilot Member States. This requires exchange and configuration of certificates and meta-data. WP5 will populate the Information Desk configuration file with national DP-entries that have been collected from the pilot partners in collaboration with WP3.

In UC#3, the data consumer and data provider need to integrate an SSI Authority agent.

Table 42: OOP TS and evidence exchange common components

Component	Role	Short description of its use
Information Desk configuration file	Data requestor and data transferor	The diploma issuing authorities can be located at a national level (Slovenia, Spain) or university level (Portugal). The information will be stored in a configuration file in the DE4A connector for MVP.
SMP	Data requestor and data transferor / central	For each evidence request and response, information on the receivers Access Point (URL) and its certificates are needed. It is expected there will a common project SMP for the test phase, while each Member State will host an SMP for the close-to-production phase. Before sending a request or response, the sending party queries the SMP of the receiver to get this info.
DNS & SML	Data requestor and data transferor	As there are multiple SMPs, the sending party needs to know where to find the SMP of the receiver to get the actual metadata. This location can be found in the centrally CEF-hosted DNS, that will be queried by the access point of the sending Member State. DNS entries will be created from the registration of SMPs: the SML, which is also centrally hosted by CEF.
eDelivery AS4 gateway	Data requestor and data transferor	This component – also referred to as eDelivery access point – handles the secure transfer of the data, including encryption and decryption as well as signing/sealing payloads and validating signatures/seals.
DE4A Connector	Data requestor and data	The DE4A connector is the reference software that data requestors and data transferors can use to connect to the DE4A OOP TS. This eases the work by abstracting the communication with the

Component	Role	Short description of its use
	transferor	components. The DE4A Connector already includes the Phase4 AS4 gateway for the Member States that do not want to have a separate gateway.
SSI Authority agent	Data Consumer/ Verifier and Data Provider/ Issuer	The SSI Authority agent is a component responsible for implementing the SSI approach (manage DP/DC DID, control, issue and receive VC securely interacting with students' edge agents) and integrating with EBSI/eSSIF infrastructure. It exposes a set of API endpoints that a DC/DP service calls in order to manage verifiable credentials and implement the VC pattern.
SSI Edge agent	Evidence Holder	Component for students (mobile SSI-Wallet) to manage issued Diplomas (receive them from Issuers as Verifiable Attestations and send them to Verifiers as Verifiable Presentations).

3.6.4 Common components deployment

Member States deploy the common components in their national infrastructure. There are several choices Member States have to make in doing so.

Table 43: eDelivery infrastructure components choices

Member State	AS4 Gateway (Default-Phase4 or Other – indicate product name and version)	SMP product name and version
ES	Phase4	Phoss SMP. Centrally hosted SMP for testing.
SI	Holodeck	Phoss SMP. Centrally hosted SMP for testing.
PT	Domibus	Phoss SMP. Centrally hosted SMP for testing.

Table 44: SSI components choices

Member State	Name and version
All	SSI Authority agent: ▸ Java-based REST API (Docker image) ▸ Hyperledger Aries Go latest stable release (4 Docker images included) Centrally hosted Sidetree for all participating MSs.

3.6.5 Other support services (EBSI-ESSIF) (Only UC#3)

EBSI and ESSIF infrastructure and governance framework represent a single point of trust for EU-wide self-sovereign public services compatible with current legal regulations. SSI agents (authority and edge) can connect to/use the EBSI ledger for instantaneous checks like verifying that the DID of an Issuer of a Diploma VC is publicly registered and can be trusted. Similarly, the schema structure of a received VP can also be checked to conform against a specified format. This way, it is ensured

ledger interoperability with other EU services based on the EBSI/ESSIF ledger/framework and Member States participating in the Use case gain knowledge about this distributed EU-wide infrastructure and are better prepared for other future uses of it in the context of eGovernment digitalisation.

Since the DE4A SSI agent is based on the Hyperledger Aries Go framework, which does not natively support the integration/interoperability with current EBSI-ESSIF, a specific EBSI-ESSIF connector will be implemented as part of the DE4A SSI agent. This connector will connect the agent's SSI functionalities with the EBSI ledger and be ESSIF complaint. The most important functionalities are: public DID anchoring for authority agent on TIR (Trusted Issuer Registry), schema (EDCI model) registration, and information verification for all involved agents (public DID verification and schema verification).

EBSI-ESSIF connector will be implemented as an isolated library, which will be included in mobile edge agent and authority agent. This library will handle all EBSI-ESSIF related workflow patterns and communication protocols. Data Consumer and Data Provider need to deploy the SSI authority agent, which includes the EBSI-ESSIF connector, while students need to download and install mobile edge agent.

Table 45: Roles in UC#3

Role (DC/DP)	Preparatory Action
Data Consumer	Deploy the SSI Authority agent including the EBSI-ESSIF connector to enable interoperability with EBSI.
Data Provider	Deploy the SSI Authority agent including the EBSI-ESSIF connector to enable interoperability with EBSI.

3.7 National specific components

The data consuming Member States need to adapt their eProcedure portals to adapt their service and to connect to the REST APIs of the DE4A Connector deployed at the Data Requestors. The data providing Member State should adapt the data service (in case it does not fulfil the data requirements of the SA pilot) and connect to the REST APIs of the DE4A Connector deployed at the Data Transferor.

OOP Technical system roles:

- The data evaluator

  The actor providing the eProcedure to the students. The data evaluator is the central role in coordinating the complete pilot procedure and hosts an eProcedure portal.
- The data owner

  The actor owning and maintaining the student data needed for higher education eProcedures. The data owner hosts the data service.

SSI Agent infrastructure roles:

- The data evaluator

The actor responsible for interpreting the obtained diploma evidence and applying a set of business rules to verify if the obtained diploma conforms to procedural requirements.

- The data owner

  The actor owning and maintaining the student's data needed for cross-border diploma verification. The data owner hosts the data service and prepares the diploma evidence in the canonical format.

Table 46: OOP national end-points

Component	Role	Short description of its use
eProcedure portal	Data evaluator	The eProcedure portal should be adapted to support the user authentication, the Explicit request, and use of the cross-border evidence in the process.
eProcedure backend	Data evaluator	The eProcedure backend handles all eProcedure specific logic.
Evidence portal	Data owner	The Evidence portal should be adapted to support the user authentication, the Preview, and provision of the cross-border evidence.
Data service	Data owner	The webservice of the data provider that will output the evidence requested.
Portal /Data Service to OOP TS interface	Data evaluator / Data owner	Member States may implement an interface from national OOP protocols to the DE4A data model (DE4A connector).

Table 47: Partners responsible for specific component implementation

MS	Data evaluator	Data owner
ES	UJI (UC1)	MPTFP-SGAD
SI	MIZŠ (UC1, UC3), JSI (UC2)	MIZŠ
PT	INESC-ID	INESC-ID

3.7.1 Spain - national applications

Spain will implement the specific components, using the following applications:

Table 48: Partners responsible for specific component implementation in MS

Component	National application(s)	Implementation	Description
eProcedure Portal frontend	UJI master's degree registration app	Existing	Allows a student to apply for an opening in any of the master level programmes offered by University Jaume I. Allows specifying all the personal information and to provide the evidence required by the acceptance committee to decide on

Component	National application(s)	Implementation	Description
			granting access or not. Access to eIDAS authentication exists through a project-specific interface, awaiting migration to national eIDAS access endpoint.
eProcedure Portal backend	-	Existing	A local application integrated with the corporate student information system.
Portal to OOP TS interface	-	New	Will require access to interactions with DE4A through the centralised Spanish intermediation platform to be developed.
Data service	Grades service	New	A secure API to retrieve average grades for a student with a degree will be deployed. Will require access to interactions with DE4A through the centralised Spanish intermediation platform to be developed

3.7.2 Slovenia - national applications

Slovenia will implement the specific components, using the following applications:

Table 49: Partners responsible for specific component implementation in MS

Component	National application(s)	Implementation	Description
eProcedure Portal frontend	eVŠ	Existing	Central evidence system for higher education at Ministry of Education, Science and Sport; the portal is already eIDAS-enabled; explicit request
	-	New	Service for study grants applications
eProcedure Portal backend	eVŠ	Existing	Central evidence system for higher education at Ministry of Education, Science and Sport
	-	New	Service for study grants applications
Evidence Portal	eGovernment portal	Existing	The national eGovernment portal at Ministry of Public administration; citizens folder will be extended with a Preview and approval service
Data service	eVŠ	Existing	Central evidence system for higher education at Ministry of Education, Science and Sport; existing web service for access to students' data will be used. The data service will be accessed through the national data exchange infrastructure called Tray. The data service will also transform existing evidence to a canonical model

3.7.3 Portugal - national applications

Portugal will implement the specific components, using the following applications:

Table 50: National application details in MS-name

Component	National application(s)	Implementation	Description (MS-specific details/constraints)
eProcedure Portal frontend	FenixEdu	Existing (partially, customization needed)	In Portugal mobility of students abroad is managed by universities, not centrally. FenixEdu is an open-source academic management system adopted in many Portuguese higher-education institutions.
eProcedure Portal backend	FenixEdu	Existing	Same system as previous row. Provides REST API.
PRT Data Broker	-	New	Adaptation of the Data Broker to access the OOP TS
Data service	FenixEdu	Existing	FenixEdu also contains data about diplomas, so it will be the data service
Preview portal	Preview portal	(partially, customization needed)	Portugal has a preview portal in a preliminary stage, that will have to be evolved and adapted for the pilot.

4 Pilot implementation activities

To implement the pilot as designed in Chapter 3, pilot partners need to develop, customize, adapt, deploy, configure and connect software. Furthermore, they need to test the components deployed and test the integration of components nationally and cross-border. Finally, pilot partners need to involve real users to the pilot - requiring a user involvement strategy as well as carefully selecting and reaching out to users.

This chapter specifies all activities needed to do so in a pilot-generic way. Chapter 5 specifies the milestones that collectively need to be reached in order to pilot cross-border successfully, including the time-lines to follow. Chapter 6 includes the tasks by which that Member State performs the activities specified in this chapter within the timeliness dictated in Chapter 5.

4.1 Common components customization and integration

4.1.1 eIDAS

The authentication connector role (in the Member State of the data consumer and data provider) needs to deploy and integrate a national eIDAS connector. As the Studying Abroad pilot will use an existing eIDAS infrastructure (regular preproduction eIDAS nodes) that already connects the participating Member States, no implementation activities are needed on the eIDAS nodes. The preproduction nodes are considered in order to ensure interoperability with non-notified eIDs from Slovenia.

4.1.2 OOP Technical system and evidence exchange

The data requestor and the data transferor need to deploy and configure the common DE4A OOP TS components, including the DE4A connector (see Table 40). Each Member State may decide on which national level to implement these components. For example, the data requestor may be data evaluator as well, but can also be a separate organisation, depending on national choices. The components of the DE4A OOP TS that have been implemented nationally, need to be configured for use with the other pilot Member States. This requires exchange and configuration of certificates and meta-data.

In UC#3, the data consumer and the data providers have to deploy, configure and integrate the SSI Authority agent.

Table 51: OOP technical system and evidence exchange customization and integration activities

Member State	Role	Activity ID	Activity	Description
Data consumer	Data requestor	SA-DR-1	Deploy and configure the DE4A OOP TS common components: the eDelivery AS4 gateway and SMP.	For requesting and receiving the evidence, Member States may choose to use a separate AS4 gateway as indicated in Table 43. This activity also deploys the SMP (Member States can choose to use a central SMP for testing) as well as configuration activities.
		SA-DR-2	Deploy and configure DE4A OOP TS common components: DE4A connector	For requesting and receiving the evidence, data requestors need to deploy and configure the DE4A Connector as provided by WP5.
		SA-DR-3	Have Information Desk configuration file populated by WP5.	WP5 makes the Information Desk configuration file with necessary information available in the DE4A Connector.
		SA-DR-4	Connect to eDelivery AS4 gateways of data transferors.	The AS4 gateways of the data requestors need to be connected to the AS4 gateways of the data transferors. This requires exchange and configuration of meta data and certificates. This task also includes testing whether cross-border connectivity works.
		SA-AR-2	Deploy and configure SSI Authority Agent with EBSI-ESSIF connector.	To be compliant with the EU blockchain infrastructure, an Authority agent needs to be connected with EBSI/ESSIF. This requires specific communication protocols. This task also includes testing whether EBSI-ESSIF connectivity works.

Data provider	Data transferor	SA-DT-1	Deploy and configure DE4A OOP TS common components: eDelivery AS4 gateway and SMP. Configure DNS & SML. Have Information Desk configuration file populated.	See SA-DR-1. The data transferors need to deploy and configure the same common components as the data requestor to receive evidence requests and send the evidence requested.
		SA-DT-2	Deploy and configure OOP TS common components: DE4A connector.	See SA-DR-2. The data transferors need to deploy and configure the same common components as the data requestor to receive evidence requests and send the evidence requested.
		SA-DT-3	Connect to eDelivery AS4 gateways of data requestors.	See SA-DR-2 This requires exchange and configuration of meta data and certificates. This task also includes testing whether cross-border connectivity works.
		SA-AT-2	Deploy and configure upgraded SSI Authority agent API with the EBSI-ESSIF connector.	To be compliant with the EU blockchain infrastructure, an Authority agent needs to be connected with EBSI/ESSIF. This requires specific communication protocols. This task also includes testing whether EBSI-ESSIF connectivity works.

4.1.3 Trust infrastructure (certificates)

Since the ground of each pilot with regards to trust certificates is the same, this section will be identical in each pilot planning deliverable. While this creates duplication in the content of the deliverables, it also ensures that the documents can be read and understood as stand-alone file.

In order to protect the data whenever the entities in DE4A send or receive information, it is necessary to use mechanisms that guarantee the secure communication. Transport Layer Security (TLS) will be used as the main protocol, which establishes an encrypted session between two endpoints in data transmission and uses digital certificates to help verify the identity of the servers.

Depending on the type of the deployment chosen by the MS regarding the eDelivery AS4 gateway, external to the DR/DT or integrated provided within the DE4A connector, it is possible to have different options. As it is shown in the following Figure 3, the internal communication between the

entities of each DC (DR and DE) or each DP (DT and DO) could be securely protected by TLS or another existing way depending on the MS infrastructure available.

It is worth noting that AS4 messages are encrypted and signed on the protocol level (using the possibilities of the WS-Security 1.1.1 specification) and by governance the usage of TLS 1.2 or later on the transport layer (with strong cipher suites only) is required, based on the CEF eDelivery AS4 profile. In the case of the SMP component, each SMP must have certificate from the same SMP root certificate (CEF PKI for testing) configured as a client certificate for communication with the SML, as a client certificate for communication with the DE4A connector and as an XML signing certificate for its REST responses.

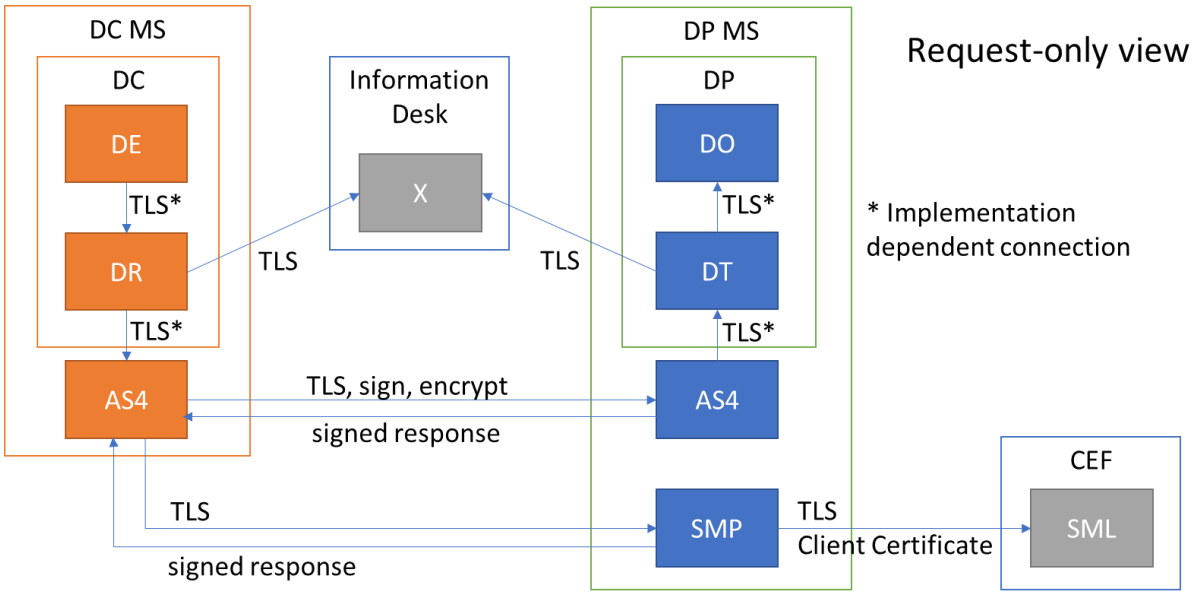

Figure 3: Secured data transmission with AS4 gateway

As a summary of the figure, the information of the certificates needed can be found in the following table:

Table 52: Trust Infrastructure to set up

Purpose/Server	Responsibility	Certificate usage	Certificate source
DC: DE	MS/DC	TLS	Up to MS (guided by DE4A)
DC: DR	MS/DC	TLS	Up to MS (guided by DE4A)
DP: DT	MS/DP	TLS	Up to MS (guided by DE4A)
DP: DO	MS/DP	TLS	Up to MS (guided by DE4A)
eDelivery/AS4	MS/DC, MS/DP	TLS	Up to MS (guided by DE4A)
eDelivery/AS4	DE4A (test & production)	Sign/Encrypt	Test: DE4A PKI Production: Commercial PKI

Purpose/Server	Responsibility	Certificate usage	Certificate source
eDelivery/SMP	MS/DC/DP	TLS	Up to MS (guided by DE4A)
eDelivery/SMP	DE4A (production), CEF (test)	Sign	Test: CEF PKI Production: Commercial PKI
eDelivery/SML	CEF	TLS	Outside of the DE4A scope

Based on the different stages of the pilot, two different PKIs will be used: test, prior to the pilot launch, and production, during the pilot running phase. For each of these stages a separate PKI will be used, separated in AS4 and SMP certificates, as shown in Figure 4.

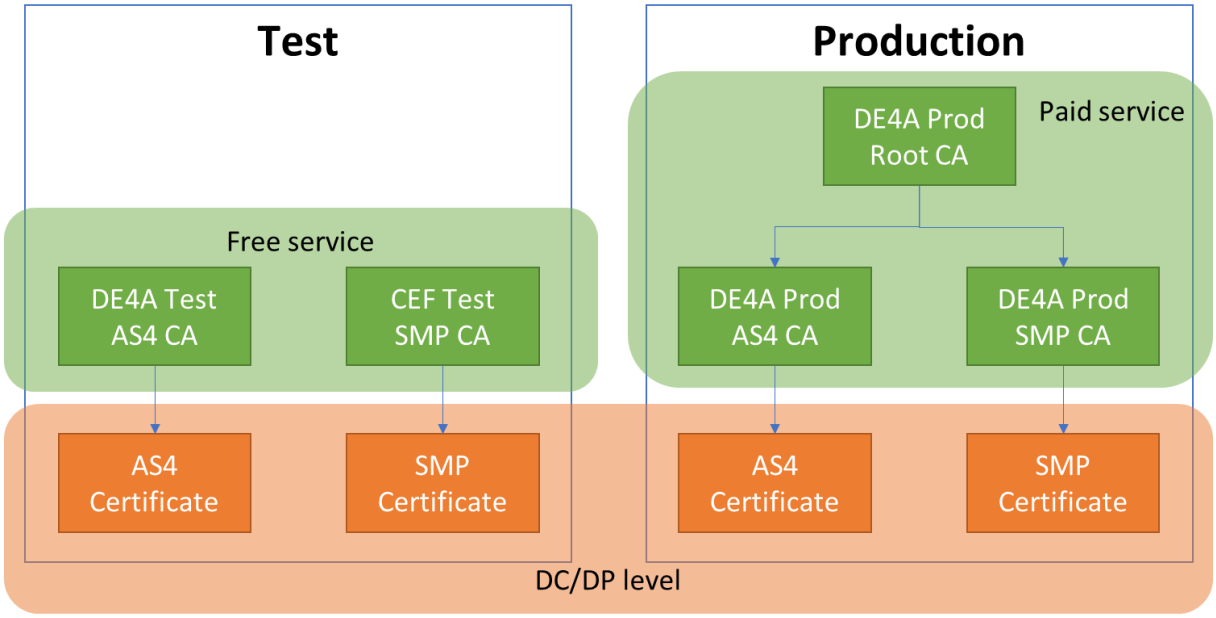

Figure 4: DE4A PKI Layout proposal

The setup for DE4A Test PKI for AS4 exchanges will be provided and maintained by one of participant of the consortium (eGovlab) and new certificates can be retrieved free of charge. In case of the SMP, CEF provided DE4A with ten test certificates based on an internal CEF PKI, with the strict requirement that DE4A will use an external CA.

For the production environment setup, the PKI will be based on a globally trusted PKI and cannot be self-signed, but this will be discussed during the preparation activities. The production CA for the SMP must be aligned with the CEF requirements for use in the SML.

Table 53: OOP trust infrastructure configuration activities

Member State	Role	Activity ID	Activity	Description
Data consumer and data provider	Data requestor and data transferor	SA-TR-1	Acquire required (PKI) certificates	The data requestor and transferor need to have all certificates needed to integrate to other Member States in a safe way.

The data requestor and transferor need to receive the public parts of the certificates of the other Member States to connect. Furthermore, as it was stated, each MS needs to configure the national AS4 gateway.

4.1.4 Self-sovereign identity authority agent

Self-sovereign identity authority agent is the core component in Use case 3 (Verifiable Credential pattern). The data consumers and the data providers need to integrate the SSI Authority agent into their existing IT infrastructure. Furthermore, the student (i.e. holder) will also have to use an SSI mobile (edge) agent.

Both SSI authority and mobile agents will be implemented using the open-source framework Hyperledger Aries Go. For the SSI authority agents two Docker images will be provided: SSI authority agent and API services exposed for communication with the agent to facilitate the integration of the SSI agent. SSI mobile agent will be implemented as a mobile application for the operating system Android.

Both SSI authority and mobile agents will have the functionality to establish DIDComm with other SSI agents. The SSI authority agents will also have functionality to issue verifiable credentials and verify verifiable presentations, while mobile agents will receive verifiable credentials and create/send verifiable presentations.

4.1.4.1 EBSI/ESSIF connector

EBSI/ESSIF is developing blockchain-based self-sovereign identity infrastructure for Member States of the European Union and is leading the development of government use of self-sovereign identity. To be complaint with EBSI/ESSIF, separate component/connector will be implemented to connect Aries-based SSI agent to EBSI/ESSIF infrastructure.

Table 54: SSI Authority agent API validation

Member State	Role	Activity ID	Activity	Description
Data consumer	Verifier	SA-AR-1	Validate the API	WP5 makes available the API for the authority agent
Data provider	Issuer	SA-AT-1	Validate the API	WP5 makes available the API for the authority agent

4.2 Specific component customization and integration

Data consuming and data providing Member States need to adapt their portals to invoke the regular eIDAS connectors.

Furthermore, the data consuming Member States need to adapt their eProcedure portal for the use of the USI pattern (e.g. implement Explicit Request) and to connect to the DE4A OOP technical system. The data providing Member States should adapt their Evidence portals and data services for the use of the USI pattern (e.g. implement preview) and connect to the DE4A OOP technical system. Both of them need to consider adaptations related to the re-direction of users from DE to DO portals and back.

Additional adjustments and deployments will also be needed to implement the VC pattern. Specifically, the data consuming and data providing Member States will need to deploy the components of the SSI agent infrastructure (Authority agent, Hyperledger Aries Go, EBSI/ESSIF connector) to their technical systems in order to enable the integration of the eProcedure portal with the agent infrastructure. This will allow verifiers to receive verifiable presentations from the students' edge agents, whereas the issuers will be able to generate verifiable credentials for students from the evidences in a canonical format. Both the data providing and data consuming Member States will also need to adapt their eProcedure and Evidence portals and data services for the use of the VC pattern (e.g. generating evidences in a pre-defined schema, facilitating the generation of a DID connection between the portal and the student via the SSI agents).

4.2.1 eIDAS

The authentication connector role (in the Member State of the data consumer and data provider) needs to deploy and integrate specific eIDAS connector with a national eIDAS connector, in case DC and DP are not eIDAS-enabled yet.

Table 55: eIDAS customization and integration activities

Member State	Role	Activity ID	Activity	DescriptionID
Data consumer	Authentication connector	SA-AC-1	Deploy and configure specific eIDAS connector	Connect to national eIDAS connector and confirm interoperability status
Data provider	Authentication connector	SA-AC-2	Deploy and configure specific eIDAS connector	Connect to national eIDAS connector and confirm interoperability status

4.2.2 eProcedure portal (Data Evaluators)

The eProcedure portal is one of two the main components in piloting. The eProcedure portal needs to be extended to allow for requesting the use of the DE4A OOP technical system for evidence exchange and implement explicit request. For the VC pattern, it needs to be extended to allow communication with the user wallet and EBSI.

Table 56: eProcedure portal adaptations

Member State	Role	Activity ID	Activity	Description
Data consumer	Data evaluator	SA-DE-1	Analysis of an online procedure to be integrated in the pilot	Analyse which parts of the portal need adaptation and how will the evidence be used during and after the procedure
		SA-DE-2	Decision on the pilot operation scope	Decide which part of the portal will be used in the pilot (e.g. production portal, isolated portal, portal clone) Optionally set up a pilot portal (real data, real users)
		SA-DE-3	Add authentication options	Add eIDAS login option for users Show the user that he/she has successfully authenticated and logged in the portal
		SA-DE-4	Procedure information	Suggest the user to apply for a service Inform the user about the evidence needed for the procedure
		SA-DE-5	Explicit request management	Present conditions for the use of the Technical system Ask the user to explicitly request the use of the Technical system for evidence exchange
		SA-DE-6	Issuing authority and evidence location selection	Allow the user to select/enter information needed for locating an issuing authority and evidence location (i.e. country where evidence is stored) Obtain details about DP from the DE4A connector
		SA-DE-7	Connect the eProcedure portal to national OOP TS implementation (DE4A connector) to request an evidence and to receive the evidence	Send evidence request to the DE4A connector Redirect user to DP and accept the user coming back from DP Receive and validate the evidence from the DE4A connector (Receive an error message and inform the user. Allow for re-requesting the evidence depending

Member State	Role	Activity ID	Activity	Description
				on the error).
		SA-DE-8	Received evidence	Transform evidence from canonical format to local format Display the evidence retrieved from DP to the user in prefilled application form Allow the user to enter missing information needed for the procedure in the form, for example information about the enrolled study programme
		SA-DE-9	Submission of form and acknowledgment of receipt	Ask the user to submit the application form Validate submitted form Return acknowledgment of receipt to the user
		SA-DE-10	UI internationalisation	Recommended provision of a procedure and information about the pilot in English
		SA-AE-1	SSI Authority agent deployment	Deploy and configure the SSI authority agent into the MS technical system
		SA-AE-2	SSI Authority agent integration	Establish connection between the eProcedure portal and SSI Authority agent through the API
		SA-AE-3	VC pattern initiation	Suggest the user to exchange evidence as in the form of VP (agent-to-agent)
		SA-AE-4	Supporting the DID communication	Add DIDComm support option for users (show QR code for establishing the connection) Show the user that he/she has established DIDComm with the portal's agent
		SA-AE-5	Supporting the VP exchange communication	Add VP exchange support for users (check response button) Show appropriate information on the portal
		SA-AE-6	Supporting VP	Able to verify the VP's authenticity

Member State	Role	Activity ID	Activity	Description
			validation	by comparing eIDAS MDS Able to verify the authenticity of the issuer and of the VP schema by using the EBSI service
		SA-AE-7	Transformation and display of evidence	Transform evidence from VC to local format Display the evidence retrieved

4.2.3 Data services (Data Owners)

The data owners in the pilot have to provide the student canonical data evidence that the data evaluators need for the three higher education procedures. All data providers are able to provide at least the mandatory data elements of the evidence type. In all cases they need to transform national data definitions (domestic evidence) to the canonical evidence type as defined in this pilot. As the canonical evidence has the necessary legal value to be accepted to carry out the procedures by the DEs, it has been agreed in the pilot that it is not necessary to exchange as well domestic evidence. Furthermore, they need to connect their data service to the DE4A OOP technical system in UC#1 and UC#2 or to the user wallet and EBSI in UC#3.

Table 57: Evidence portal and Data service adaptations

Member State	Role	Activity ID	Activity	Description
Data provider	Data owner	SA-DO-1	Examples of canonical evidence	Prepare examples of canonical evidence for testing of the DE4A Connector and overall evidence exchange process
		SA-DO-2	Add authentication options	Add eIDAS login option for users Show the user that he/she has successfully authenticated and logged in the portal
		SA-DO-3	Connect the data service to the national OOP TS implementation (DE4A connector) to receive an evidence request and send the evidence.	Receive and validate evidence request Send evidence if approved by the user (send error message, e.g. record matching failed, approval of transfer denied)
		SA-DO-4	Record matching	Retrieve domestic evidence (record matching)
		SA-DO-5	Evidence	Transform domestic evidence to

Member State	Role	Activity ID	Activity	Description
			transformation	canonical evidence definition
		SA-DO-6	Preview and user approval	Display evidence to be sent to DC Ask the user for approval to transfer the evidence to DC Manage case of no approval
		SA-DO-7	UI internationalisation	Recommended translation of UI into English
		SA-AO-1	SSI Authority agent deployment	Deploy and configure the SSI Authority agent into the MS technical system
		SA-AO-2	SSI Authority agent Integration	Establish connection between Issuer/DP portal and SSI agent through the API
		SA-AO-3	VC pattern initiation	Suggest the user to exchange evidence as in the form of VC
		SA-AO-4	Supporting DID communication	Add DIDComm support option for users Show the user that he/she has established DIDComm with the portal's agent
		SA-AO-5	Evidence transformation to VC	Conversion of the requested Diploma to VC format
		SA-AO-6	Supporting VC exchange communication	Add VC exchange support for users (check response button) Show appropriate information in the portal
		SA-AO-7	Supporting EBSI alignment	Anchor DID into EBSI ledger / add DID into EBSI TIR Add VC schema into EBSI TSR

4.3 Testing

Besides customizing and integrating the common and specific components, the pilot partners have to test their connectivity and integration with Member State specific components like the eProcedure portal, the Evidence portal and the data services. SA pilot testing will take a staged approach to ensure that the functionality of individual components and the integration with the other components are also validated and not only the full use case functionality.

The pilot testing activities assume:

- All individual components have been adequately tested by the partner responsible. Meaning that WP5 has tested the common components of the DE4A OOP Technical System and the SSI Authority agent and the user's mobile agent. Acceptance and test criteria for different levels or phases of testing will be agreed with pilot partners and with WP5 (test criteria will refer to specific test cases which need to be designed considering multiple aspects, in particular what the testing environment from WP5 will enable). Connectivity will be demonstrated in the DE4A playground first. After successful connection in the playground, the SA pilot Member States will deploy the components and perform national and cross-border integration testing.
- Member States responsible for their specific components take care of adequately testing their components, e.g. the eProcedure and Evidence portals and the data services, and national integration without interference of the other Member States. Member States do not need to provide formal proof of national testing to the other Member States.
- In national integration testing Member States will use a mock of the DE4A connector to simulate a cross-border request/answer for UC#1 and UC#2.
- Cross-border testing requires national testing to be completed successfully.
- Accessibility, usability and other quality criteria of acceptance testing will be included in the pilot running phase. The preparatory testing activities will focus on technical readiness of the solution for piloting with real users.

4.3.1 Objectives

The goal of testing is to ensure that the implemented use cases are ready to go live. The functioning of the use cases will be demonstrated by:

1. Logs with the intermediate result of each step and used component to demonstrate that information is handled and transported adequately by the individual components, or to demonstrate that the errors are invoked as intended (negative testing is important as well).
2. Screenshots showing successful completion of the procedure and visual proof of the information provided to the user in case of non-happy flows.
3. Recorded witness sessions, making a screen recording of a successful execution of the use case.

The testing results will be reported in the SA testing report, distinguishing between the Member State combinations that will be tested, e.g. a student from Portugal can apply to higher education in Slovenia and Spain, a student from Spain can apply for a study grant in Slovenia, or a student from Slovenia can request diploma recognition in Portugal.

The SA solution implements two interaction patterns, each consisting of two relatively independent flows: eIDAS-based authentication and evidence exchange. While evidence exchange is performed in UC#1 and UC#2 by means of the DE4A OOP technical system, in UC#3 the evidence is directly exchanged between the user's mobile agent and the SSI Authority agent at DP and DC. Therefore, the SA pilot will organize three domains of testing:

- eIDAS testing: these test activities focus on testing the eIDAS authentication flow, starting from a portal (eProcedure portal or the Evidence portal) with an authentication request and ending back at the portal with a successful authentication.
- DE4A OOP testing: these test activities focus on testing the data retrieval via the DE4A OOP technical system. The test flow starts in UC#1 and UC#2 with the eProcedure portal requesting an evidence type and ends with the portal receiving the (previewed) evidence and continuing the procedure (with any additional data completed data by user). Negative testing will also be addressed i.e. testing scenarios where errors are returned to confirm their correct handling.

- VC testing: these test activities focus on testing the verifiable credentials issuance and retrieval at the data provider and the provision to and validation of verifiable presentations at the data consumer.

4.3.2 Types of testing

This section elaborates on component testing, national integration testing, cross-border integration testing, and functional use-case testing.

Component testing

Component testing verifies that a single component is functioning correctly. This test focuses on the processing within a component, such as eProcedure and Evidence portals, and validating the outputs of the component as a function of the inputs provided. Component testing basically involves only the organisation responsible for providing the component.

National integration testing

Integration testing is validating the correct interaction between two or more components. This type of testing does not focus on the inner workings of a component, but on the cooperation of the components as defined in the pilot design. This requires involvement of two or more components that have been linked together. Integration testing starts with checking whether the connectivity of the components has been properly configured. It ends by testing all functions that the components are supposed to provide together.

National integration testing verifies that the components integrate adequately nationally, e.g. whether the eProcedure portal can successfully request an evidence and process the result. This is a national responsibility. For this purpose, the Member State uses WP5-stubs to simulate cross border interaction.

Components involved:

1. DC Member State national integration testing components:
   a. eIDAS flow:
      - eProcedure portal to the eIDAS interface
   b. OOP TS flow:
      - eProcedure portal to the OOP TS interface
      - DE4A connector
      - stub of foreign DP DE4A connector
   c. VC flow:
      - eProcedure portal to the SSI Authority agent
      - SSI Authority agent
      - (User mobile agent)
2. DP Member State national integration testing components:
   a. eIDAS flow:
      - Evidence portal to the eIDAS interface
   b. OOP TS flow:
      - data service
      - data service to OOP TS interface
      - DE4A connector
      - stub of foreign DC DE4A connector
   c. VC flow:

- Evidence portal to the SSI Authority agent
- SSI Authority agent
- (User mobile agent)

Cross-border integration testing

Cross-border integration testing focuses on communication between two Member States. Ideally, the tests are conducted sequentially: national tests first and then cross-border tests. In practise, this will not be feasible and not strictly necessary. There will be overlaps in testing of both types. Therefore, it is crucial to quickly assess the origin of issues encountered in testing. Issues in national integration should be solved individually by Member States. Cross-border issues require cooperation of two Member States. For this purpose, the SA pilot will set up an arrangement for proper issue tracking in JIRA. Issues will be categorised in "national" and "cross-border".

Testing eIDs that correspond to test users are being exchanged between Member States to enable cross-border integration testing of the eIDAS network and the OOP technical System. The eIDs should be configured to represent users of which data can be retrieved from the data owner.

Components involved:

1. eIDAS flow cross-border integration testing components:
   - eProcedure portal (DC)
   - Evidence portal (DP)
2. OOP TS flow cross-border integration testing components:
   - eProcedure portal (DC)
   - eProcedure portal to OOP TS interface (DC)
   - DE4A connector (DC)
   - DE4A connector (DP)
   - Evidence portal (DP)
   - data service to OOP TS interface (DP)
   - data service with real or test data (DP)
3. VC flow cross-border integration testing components:
   - eProcedure portal (DC)
   - SSI Authority agent (DC)
   - SSI Authority agent (DP)
   - Evidence portal (DP)
   - data service with real or test data (DP)
   - (User mobile agent)

Functional use case testing

After successful cross-border integration testing, Member States will test the use cases functionally. In a functional use case test, two Member States (one DC and one DP) will test the use case scenarios from the perspective of the student applying for the service. This type of testing addresses the happy as well as the non-happy flows. By successfully functional testing, the two Member States have ensured they can go-live.

Components involved:

1. DC components:
    - eProcedure portal
    - eProcedure portal to OOP TS interface
    - DE4A connector
    - eProcedure portal to the SSI Authority agent interface
    - SSI Authority agent
    - (User mobile agent)
2. DP components
    - Evidence portal
    - data service with real or fictitious data
    - data service to OOP TS interface
    - DE4A connector
    - SSI Authority agent
    - Evidence portal to the SSI Authority agent
    - (User mobile agent)

4.3.3 Testing responsibilities

The responsibilities for component testing are as follows:

Table 58: Component testing responsibilities

eIDAS testing	
Component	***Role responsible for testing***
eProcedure portal: ▸ eIDAS functions	Data evaluator
Evidence portal: ▸ eIDAS functions	Data provider
OOP testing	
Component	***Role responsible for testing***
eProcedure portal: ▸ OOP functions	Data evaluator
Data service	Data owner
OOP TS common components: ▸ DE4A Connector, including eDelivery AP ▸ DNS/SML ▸ SMP ▸ Information Desk configuration file	▸ WP5: software components ▸ Data requestor and data transferor: deployment & configuration (support by WP5)
VC testing	
Component	***Role responsible for testing***
eProcedure portal:	▸ WP5: software components

eIDAS testing	
▸ SSI Authority agent functions	▸ Data consumer: deployment & configuration
Evidence portal: ▸ SSI Authority agent functions	▸ WP5: software components ▸ Data provider: deployment & configuration
Mobile agent	▸ WP5: software development

The responsibilities for national and cross-border integration testing are as follows:

Table 59: Integration testing responsibilities

eIDAS testing		
Component	*Role responsible for testing*	*Type of testing*
eProcedure portal to eIDAS integration	Data evaluator	National integration testing
Evidence portal to eIDAS integration	Data provider	National integration testing
OOP testing		
Component	*Role responsible for testing*	*Type of testing*
eProcedure portal to OOP TS integration	Data evaluator (support by WP5)	National integration testing
Data service to OOP TS integration	Data owner (support by WP5)	National integration testing
Cross-border OOP testing	National test coordinators (coordinated with WP5, cross-border Hackathons)	Cross-border integration testing
VC testing		
Component	*Role responsible for testing*	*Type of testing*
SSI Authority agent integration to the eProcedure portal	Data evaluator (support by WP5)	National integration testing
SSI Authority agent integration to the Evidence portal	Data owner (support by WP5)	National integration testing
Mobile agent communication with the SSI Authority agent	Data evaluator and data owner (support by WP5)	National integration testing
Cross-border VC testing	National test coordinators (coordinated with WP5)	Cross-border integration testing

National integration testing requires national coordination by the partner leading the DE4A Studying Abroad pilot participation. The national coordinator is also responsible for coordinating with the other Member States in cross-border testing, as well as for the functional use case testing.

Table 60: National test coordinators

	National test coordinator
ES	MPTFP-SGAD

	National test coordinator
SI	MIZŠ
PT	INESC

4.3.4 Use of mocks and stubs

For testing purposes, the SA pilot expects testing facilities to be provided by WP5:

- Mock of the DE4A connector to test DE and DO connections to the OOP TS. The mock should simulate the common OOP TS components, to be able to process/send evidence requests and issue/process evidence responses.
- Mock of the DE and DO to allow the Member State to validate its deployment and configuration of the DE4A connector.
- JAVA Client libraries for (un)marshalling the XML messages.

Furthermore, SA expects WP5 to:

- Support deployment of the OOP TS common components, especially with regards to installation and configuration of meta-data and certificates;
- Organise connectathons to validate OOP TS connectivity between the pilot Member States;
- Operate and support the playground as testing environment including centrally hosted SMP and eDelivery gateway.

4.3.5 Bug tracking

The SA pilot will use JIRA for registration of bugs and other issues. The JIRA issues will be discussed in regular bug tracking meetings to be organized by the SA test coordinator.

The following table lists the severity definitions used to classify defects.

Table 61: Severity of bugs

Severity	Description of Severity
P1	**Critical** – the system is broken and cannot be used, major functionality is impaired, or there is data loss. There are no workarounds
P2	**Major** – the fault renders several system elements unusable, or affects one or more system elements. Workarounds exist which may be unacceptable to the customer.
P3	**Minor** – the fault affects system elements that are not key to the overall functionality of the system or operation of the Departments day-to-day business. The system continues to produce correct results and data is not affected. Acceptable workarounds for the end customer may exist.
P4	**Trivial** – this fault barely affects the quality of a system and will only be fixed if time permits.

4.3.6 Testing activities

Table 62: Testing and bug tracking activities

Activity ID	Activity
SA-TE-1	Prepare test cases for local component testing
SA-TE-2	Prepare test cases for integration testing with WP5 common components (Connector)
SA-TE-3	Prepare test cases for integration testing with WP5 common components (Connector+eDelivery)
SA-TE-4	Prepare test cases for cross-border testing against other MSs (Pre-prod)
SA-TE-5	Prepare test cases for integration testing against other MS (Prod, Focus Group tests)
SA-TE-6	Hackathons against simulated components (mocked Connector, Demo-DE/DO)
SA-TE-7	Hackathons against foreign components (mocked Connector, Demo-DE/DO)
SA-TE-8	Local users group tests
SA-AO-8	Final integration testing of the SSI Authority agent by Data owner
SA-AE-8	Final integration testing of the SSI Authority agent by Data evaluator

4.4 User involvement activities

The user engagement strategy is important for the success of the pilot. Specific challenge of the Studying Abroad pilot arises from the cross-border nature of the pilot, i.e. to find potential students who would apply for a higher education procedure in a Member State different from their Member State of origin. A successful project relies on feedback from users in both the design and evaluation of a service. Thus, users must also be selected and engaged with, in order for the piloting activity to be carried out in such a way, that all its varied aims can be met. These range from the technical objectives, to the business success criteria and to the overall goals of the pilot and of the project as a whole.

Each of the iterations and use cases will have its own specific requirements, which may in turn vary from country to country. Only the users who are target groups of the services and whose data is available at the integrated data providers and can be exchanged through the DE4A OOP Technical System or with Verifiable credentials/Verifiable presentations will be able to participate in the pilot:

Table 63: Eligible users for piloting in the first iteration

MS	Data owner
ES	Students of University Jaume I with the 1st level Bologna degree diploma
SI	All Slovenian students with the 1st level Bologna degree diploma
PT	Students of Instituto superior Técnico (University of Lisbon) with the 1st level Bologna degree diploma

Table 64: Eligible users for piloting in the final iteration

MS	Data owner
ES	All students of University Jaume I
SI	All Slovenian higher education students
PT	All students of University of Lisbon

The core of the user-engagement strategy is thus to ensure there will be a sufficient number of users for whom the cross-border services are aimed to in order to achieve a successful set of piloting activities. In the final pilot iteration, efforts will be addressed to find a few students who could have evidence in two Member States, although this is expected to be very difficult considering the group of eligible users.

4.4.1 User involvement strategy: classification of pilot users and targeted actions

The following four user groups are considered for the Studying Abroad piloting:

Local users

Local users are students who will use the pilot during the testing phase. This user group will include a few users from the participating higher education institutions (University of Maribor, University Jaume I) and the research institutions with students (Jozef Stefan Institute, INESC) who are somehow involved in the project. It is expected that the users will come from the information technology programmes.

Focus group users

The focus group includes a small number of students who will use the pilot once the service has gone live. They provide the guarantee that there will be enough end-users to validate the pilots. These users will be asked to provide formal feedback through an online evaluation tool to help us understand their views on the pilot.

The formal selection of known users should be defined by each MS; however, the following is suggested:

1. Small number of users from the involved higher education institutions (University of Maribor, University of Lisbon, University Jaume I) and the research institutions with students (Jozef Stefan Institute, INESC).
2. The users should be information technology literate, but not all from the information technology programmes.

Unknown but reachable users

Students from other departments of the involved higher education institutions will be invited to validate the pilot after the focus group.

Unknown users

All other eligible students (see Table 63 and Table 64), for example the students from other universities in Slovenia. MS support for pilot dissemination and for finding users interested in benefiting from e-Services offered by foreign DE portals will be sought.

In the rest of this subsection, more details about user engagement activities of the participating Member States are provided:

Slovenia

In Slovenia, the Ministry of Education (MIZŠ) will act as a Data Owner, which provides the necessary data for UC1 and UC3, whereas the University of Maribor (UM) will facilitate the search for target users of the system. Since the pilot execution is highly dependent on the MS partners' activities, the user involvement strategy for Slovenia will also focus on Slovenian students with undergraduate degrees wishing to apply for a master's study at foreign universities in the partner countries.

Therefore, the target users will be students interested in a master's study at a partner university (any study programme). Some additional efforts might be needed to motivate Slovenian students to engage in a student's exchange programme in a foreign country during the COVID-19 pandemic.

The UM will publish information on the corporate site and available social media platforms about the programme offer and inform about the system every time they are asked for information on the programmes, access requirements or application procedure. Additional media outreach for promotion purposes will also be facilitated by the Slovenian ministries.

The users in the testing focus groups will have a varying knowledge about the IT field in order to obtain the most relevant user experience feedback. Their interaction will be supervised (if possible, in person for the local users, in group sessions; else, through remote meeting), to guide them when needed and collect live unstructured feedback. After the process is completed, they will answer a short survey to provide structured and quantifiable feedback. The questionnaire will be offered after completion of the procedure.

For the running phase, the same above-described mechanisms to engage and collect feedback will be applied again, to engage the potential students going abroad, but no supervised sessions will be taken unless a support request is made by the user.

Along the national and international dissemination activities, recruitment of users will be advertised as above.

The results of the surveys will be analysed and accumulated periodically (considering a minimum of new inputs is received).

Spain

For the Spanish pilot partners, the focus of the piloting population lies on the master studies applicants, so the rest of the partners will need to recruit in this sector. For the role as DO held by UJI in all use cases, to support the testing of the other partner's services, both UC1 and UC3 require the same target: the owners of undergraduate degrees.

The target users will be students coming from a partner university applying to any programme. Depending on the final scope of the participating DOs, this scope might open to other universities in the same MS. Given the COVID crisis, it is expected that for the upcoming academic year, mobilities will fall, which added to an already limited scene (only users from the participating universities in mobility to other partner universities can be initially relied upon), throws a big risk of user shortage.

The engagement strategy will be adaptive and will depend on the existing situation due to COVID restrictions. The IRO of the university will collaborate to probe the availability of said users and establish contact. Local students willing to go abroad for a master's degree (to test other partner's services), and foreign students coming to study a master's degree (to test Spanish service) will be targeted. If the main target users cannot be engaged, other common students, not willing to participate in abroad studies, will be asked to collaborate in the testing, by issuing real requests to the partner university's services that will be later dismissed in collaboration with the partner, to render them ineffective.

The IRO will publish information on the corporate site along the programme offer, and inform about the system every time they are asked for information on the programmes, access requirements or application procedure.

The users in the testing focus groups will preferably be untrained in any IT related field, to avoid contaminating the user experience feedback. Their interaction will be supervised (if possible, in person for the local users, in group sessions; else, through remote meeting), to guide them when needed and collect live unstructured feedback. After the process is completed, they will be passed a short survey to provide structured and quantifiable feedback. This will apply to locally recruited users that accept to participate, but others may decide to act on their own. In that case, the survey will be offered along the information about the system, so they can fill it if desired.

For the running phase, the same above-described mechanisms to engage and collect feedback will be applied again, to engage the potential students going abroad or coming to UJI, but no supervised sessions will be taken unless a support request is made by the user.

Along the national and international dissemination activities, recruitment of users will be advertised as above.

The results of the surveys will be analysed and accumulated periodically (considering a minimum of new inputs are received).

Portugal

In Portugal the pilot will involve Instituto Superior Técnico (IST), the largest engineering higher-education school in Portugal, and majority owner of INESC-ID (it owns 51% of IST). The strategy to engage end users, i.e., students from IST willing to study in the other countries/universities involved in the pilot, has a set of steps. IST has exchange agreements with several European universities. The first step is to obtain information about which of these universities are involved in the pilot, e.g., Spanish and Slovenian universities. The second step is to compile a list of international relation representatives of each department (e.g., Computer Engineering, Electrical Engineering, Civil Engineering). These representatives will then be contacted periodically in order to obtain information about which students are interested in studying abroad in one of the universities involved. Once such students are identified, they will be engaged and invited to get involved in the pilot. Students in Portugal are usually willing to help and will certainly accept to join the pilot once they are identified. However, there is the possibility that students willing to study abroad in these universities are hard to find or even that no students are interested in joining any of the universities involved in the pilot within the timings that are needed for DE4A. If that is the case, the team will engage students from IST doing PhD and MSc research at INESC-ID. The population of such students is large (hundreds), and a few are working in the team of the project or with the senior researchers of the project. The pilot has already identified a pool of around 12 students that could participate.

4.4.2 Focus group

The instructions given to users from the focus group will be limited to reflect the real-world environment. To allow for a meaningful evaluation, the instructions must be written in a common format and it must be clear that the participating institutions are not allowed to change them. If there is a deficiency in the instructions, it should be changed at one point. They should provide a high-level view of the goal, e.g. completing a procedure with exchange of evidence according to one of the two interaction patterns.

These users should be encouraged to test within the first month of procedures going live. All feedback should be anonymous except in the context of local engagement activities, where users are encouraged to provide detailed feedback on the process as they are undertaking it.

4.4.3 User communication and feedback

Pilots information sheet and instructions

For the pilot, a microsite will be set up, providing:

- Information on the advantages of the DE4A approach;
- Scope, objectives, use cases and benefits of the Studying Abroad pilot;
- Presentation of all pilot steps for the three use cases
  - For UC# 3, specific instructions to obtain the mobile application needed;
- An invitation for students to join the pilot;
- Feedback form (questionnaire) that can be used by the students involved in the SA pilot. These forms contain questions corresponding to the metrics of Chapter 2. First draft of some questions is provided in Annex C.

Following the technical requirements on the Android ecosystem, the mobile application will be compiled in the APK format and afterwards, it will be made reachable for the users, including a brief explanation of the steps needed to be downloaded and installed in user´s device.

The SA pilot lead will propose texts and structure in collaboration with WP8, while the participating Member States translate the information to their native language.

Internal Feedback within pilot

Interviews will also be conducted with representatives of participating DEs, DOs, and Member States to obtain feedback on the effort, costs, benefits and experience with the customization, deployment, implementation and maintenance of the portals and technical system for evidence exchange. Students will be asked to fill an online form after completing the procedure. The first draft of the questionnaires is presented in Annex C.

External feedback (results) from pilot: T4.1 will be responsible for communicating results from the pilot. Communications will follow a common agreed communication strategy with WP8, which is responsible for the wider communications within the DE4A project, and the Member States. The pilot results will be based on the acceptance criteria defined at the start of the project. It will be the responsibility of each of the Member States to provide their information to the pilot leader for wider communication. Partners from the different Member States in the pilot will conversely support efforts for making the pilot known and the specific details of participation known within the Member States, in particular to achieve participation of end-users towards foreign portals.

4.4.4 User involvement activities

The following table lists the user involvement activities and the responsible partners.

Table 65: User involvement activities and responsible partners

Activity ID	Activity	Responsible partners
SA-UI-1	Select users to reach out to	UJI, UM, INESC, JSI
SA -UI-2	Construct general pilot information	JSI

Activity ID	Activity	Responsible partners
	sheet	
SA -UI-3	Construct pilot instructions	UJI
SA -UI-4	Construct questionnaires	JSI
SA -UI-5	Design interviews	INESC

5 Customization and integration pilot management plan

This chapter addresses the planning for the customization & integration, testing and user involvement activities to be taken by all pilot participants in order to launch the pilots. The chapter specifies the milestones (5.2) that the pilot partners need to achieve in the first iteration as well as the activities (as specified in the previous chapter) that are needed for doing so (5.3). Sections 5.4, 5.5 and 5.6 specify the prerequisites and dependencies for performing the activities as well as risks identified. Section 5.7 provides sketches of the second pilot iteration.

The activities need to be detailed as the Member State specific tasks to be performed. These tasks must be planned carefully by all pilot partners in order to launch as much as possible at the same time with the functionality agreed upon. The Member State specific planning of the tasks to perform by that Member State is addressed in Chapter 6.

This chapter starts with an overview of the phasing of the two pilot iterations (5.1).

5.1 High level management plan

The pilot consists of two pilot iterations. Starting from the SA 'use case definition and requirements'-phase, both pilot iterations follow the same phasing:

- Pilot planning (including pilot design)
- Customization and integration, including pilot go-live
- Pilot running, evaluation and reporting

Debugging will follow the pilot running and evaluation phase of the first iteration.

The timeline for the pilot iterations is presented in the figure below:

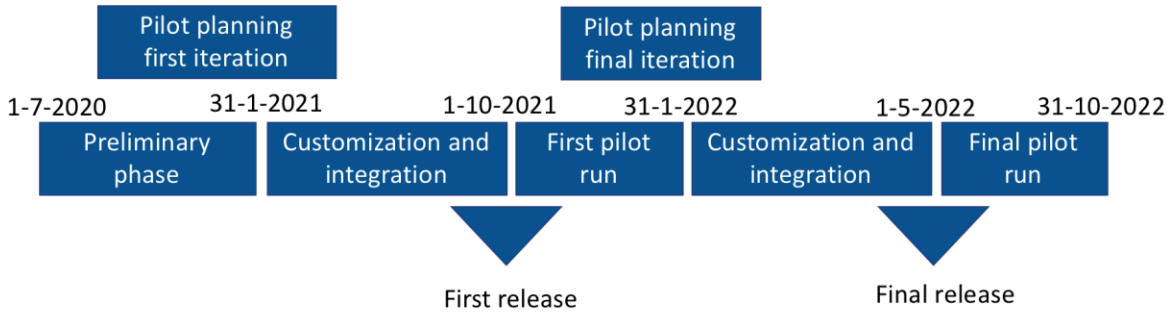

Figure 5: High level management plan

Please refer to Section 3.2 for more details on the two iterations.

The exact scope and content of the first pilot iteration has been specified in the pilot design in Section 3. A Minimum Viable Product (MVP) was defined and following the agile approach increments of the MVP were elicited. The solution architecture was prepared for the USI pattern (Annex A). In the customization and integration phase the national and common components needed to plot the MVP will be customized, deployed, configured, connected, and tested. Users will

also be engaged to run the pilot. After the go-live criteria presented in Section 7.1 are met, the running phase of the first pilot iteration begins. The running phase ends after the results are evaluated.

In the pilot planning-phase for the second, final iteration, the processes to be piloted are defined in more detail, as are the increments of the final solution. The results of the first iteration will serve as input for the second iteration.

5.2 First iteration milestones

Pilot implementation during the 'Customization & Integration' activities will be organized in increments to reach complete Minimum Viable Product that can be piloted in operational conditions. Per increment, a set of activities will be addressed and completed by each of the participating Member States, leading up to the release of software and national infrastructures that are integrated with the OOP TS and being able to facilitate the pilot runs.

It is important to realize that an increment dictates a set of activities that must be ready at the end of the increment (at latest), corresponding to a major milestone to which pilot partners align together with the DE4A WP5. This means that participating Member States can start development and testing activities to achieve these outcomes at any moment prior to the end date (also in the earlier increments), provided that all conditions to start an activity are met. Different teams in the MS will be involved, including for eIDAS integration, eDelivery infrastructure set-up, and portals and data services customizations. Increments and activities are modelled and monitored in Agile approach within the internal DE4A JIRA tool as Epics and User Stories.

Each of the participating Member States will participate in the activities that are defined in this chapter. But the required effort to develop each infrastructural component varies between all participating Member States, and each Member State has their own internal challenges, opportunities, resource-availability and approval processes that determine when certain activities will start. Therefore, in this chapter only end dates are relevant, while Chapter 6 will provide more detail on the starting dates of activities, per Member State.

In this regard, pilot partners all have their own pilot scenarios, components, infrastructure and test organization. That greatly dictates the effort of the partner to perform the activities defined in the previous chapter and, by that, launch the pilot. As all pilot scenarios are cross border, there are milestones to be reached by all participants (independently of their national effort to reach those). The milestones safeguard synchronous launching the pilot.

Prior to entering customization and integration activities, all pilots have undertaken common activities to get ready for this phase of the project.

Table 66: Initial activities

Preliminary Phase – Initial activities / design pilot systems		Start date	End date
Activity 1	Analyse the situation on the MS (gap analysis)	10/09/20	07/12/20
Activity 2	Decide the MVP iterations		31/01/21
Activity 3	Generate the Solution Architecture (Technical Task Team)	01/12/20	27/01/21
Activity 4	Alignment of increments between pilots and with WP3, WP5		31/01/21

In the following table, the milestones of the first iteration increments are summarized for the eIDAS part, the DE4A OOP TS, and the SSI approach.

Table 67: Milestones of the increments of the first iteration

No	Increment	Milestone
eIDAS		
1	eIDAS-based authentication ready	30/04/2021
DE4A OOP TS		
1	Examples of canonical evidence	28/02/2021
2	Common infrastructure	30/04/2021
3	Portals connected to OOP TS through the DE4A connector	30/06/2021
4	Ready to start pilot	30/09/2021
SSI Authority agent		
1	SSI Authority agent API validated	16/04/2021
2	Deployment and integration of the SSI Authority agent	07/06/2021
3	DP/DC portal integration with the SSI Authority agent and EBSI alignment	21/06/2021
4	DP/DC portal DID connection support	01/07/2021
5	VC/ VP exchange support	20/07/2021
6	DC is able to verify a VP	10/08/2021

5.3 First iteration planning

5.3.1 eIDAS milestone: eIDAS- based authentication ready.

Table 68: Plan of the activities related to eIDAS

End date	30-04-2021		
Result	DC and DP connected to the national eIDAS node in preproduction		
Required activities	ID	Description	Responsible Team (DE, DO)
	SA -AC-1	Connect DC to the national eIDAS connector	DE
	SA-AC-2	Connect DP to the national eIDAS connector	DO
	SA -DE-3	Add eIDAS login option for users to authenticate at DE Show the user that he/she has successfully authenticated and logged in the portal	DE
	SA -DO-2	Add eIDAS login option for users to authenticate at DO Show the user that he/she has successfully authenticated and logged in the portal	DO

5.3.2 OOP TS milestone 1: Examples of canonical evidence

Table 69: First increment of the USI-based MVP

End date	28-02-2021		
Result	Canonical evidence examples ready		
Required activities	ID	Description	Responsible Team (DE, DO)
	SA-DO-1	Prepare examples of canonical evidence	DO

5.3.3 OOP TS milestone 2: Common infrastructure

Table 70: Second increment of the USI-based MVP

End date	30-04-2021		
Result	▸ Common components set up by Member States ▸ IAL and ESL configuration files populated		
Required activities	ID	Description	Responsible Team (DE, DO, MS-eDelivery)
	SA-DE-1	Analysis of an online procedure to be integrated in the pilot	DE
	SA-DE-2	Decision on the pilot operation scope	DE
	SA-DR-1	Deploy and configure eDelivery AS4 gateway (if not integrated with the DE4A Connector) and SMP.	MS-eDelivery
	SA-DR3	Populate IAL and ESL configuration files.	WP5
	SA -DR-4	Connect to eDelivery AS4 gateways of data transferors.	MS-eDelivery
	SA -DT-1	Deploy and configure OOP TS common components: eDelivery AS4 gateway and SMP.	MS-eDelivery
	SA -DT-3	Connect to eDelivery AS4 gateways of data requestors.	MS-eDelivery

5.3.4 OOP TS milestone 3: Portals connected to OOP TS through the DE4A connector

Table 71: Third increment of the USI-based MVP

End date	30-06-2021		
Result	▸ eProcedure portal connected to OOP TS through DE4A connector ▸ Evidence portal connected to OOP TS through DE4A connector		
Required activities	ID	Description	Responsible Team (DE, DO, DT, DR)
	SA-DR-2	Deploy and configure the DE4A connector	DR

	SA-DT-2	Deploy and configure the DE4A connector	DT
	SA-DE-4	Suggest the user to apply for a service Inform the user about the evidence needed for the procedure	DE
	SA-DE-7	Connect the eProcedure portal to the national OOP TS implementation (DE4A connector) to request an evidence and to receive the evidence	DE
	SA-DO-3	Connect the data service to the national OOP TS implementation (DE4A connector) to receive an evidence request and send the evidence	DO
	SA-TE-1	Prepare test cases for local component testing	DE/DO
	SA-TE-2	Prepare test cases for integration testing with WP5 common components (Connector)	DE/DO
	SA-TE-3	Prepare test cases for integration testing with WP5 common components (Connector+eDelivery)	DE/DO
	SA-TE-6	Hackathons against simulated components (mocked Connector, Demo-DE/DO)	DE/DO
	SA-TE-7	Hackathons against foreign components (mocked Connector, Demo-DE/DO)	DE/DO

5.3.5 OOP TS milestone 4: Ready to start pilot

Table 72: Fourth increment of the USI-based MVP

End date	30-09-2021		
Result	▸ eProcedure portal and backend ready for piloting ▸ Evidence portal and data service ready for piloting		
Required activities	ID	Description	Responsible Team (DE, DO)
	SA-DE-5	Implement explicit request in the eProcedure portal	DE
	SA-DE-6	Allow the user to select/enter information needed for locating an issuing authority and evidence location Obtain details about DP from the DE4A connector	DE
	SA-DE-8	Transform evidence from canonical format to local format Display the evidence retrieved from DP to the user in prefilled application form Allow the user to enter missing information needed for the procedure in the form, for example information about the enrolled study programme	DE

End date	30-09-2021		
	SA-DE-9	Ask the user to submit the application form Validate submitted form Return acknowledgment of receipt to the user	DE
	SA-DE-10	UI internationalisation	DE
	SA-DO-4	Record matching	DO
	SA-DO-5	Transform domestic evidence to canonical evidence definition	DO
	SA -DO-6	Implement preview and user approval at the Evidence portal	DO
	SA-DO-7	UI internationalisation	DO
	SA-TE-4	Prepare test cases for cross-border testing against other MSs (Pre-prod)	DE/DO
	SA-TE-5	Prepare test cases for integration testing against other MS (Prod, Focus Group tests)	DE/DO
	SA-TE-8	Local users group tests	DE/DO

5.3.6 Self-sovereign identity agent milestone 1: DP/DC validate Authority agent API

Table 73: First increment of the VC-based MVP

End date	16-04-2021		
Result	▸ Authority agent REST API defined ▸ Initial version of the Mobile application		
Required activities	ID	Description	Responsible Team (DE, DO)
	SA-AR-1	DC evaluates the Authority Agent API	DR
	SA-AT-1	DP evaluates the Authority Agent API	DT

5.3.7 Self-sovereign identity agent milestone 2: DP/DC deployment of SSI Authority agent

Table 74: Second increment of the VC-based MVP

End date	07-06-2021		
Result	▸ Authority agent is deployed ▸ Mobile application includes the DID exchange flow ▸ Issuer (DO) DID is anchored at the EBSI ledger and added to the TIR		
Required	ID	Description	Responsible Team (DE, DO)

End date	07-06-2021		
activities	SA-AE-1	SSI agent deployment	DE
	SA-AO-1	SSI agent deployment	DO

5.3.8 Self-sovereign identity agent milestone 3: DP/DC portal integration with the SSI Authority agent and EBSI alignment

Table 75: Third increment of the VC-based MVP

End date	21-06-2021		
Result	▸ SSI Authority agent is integrated into the eProcedure and Evidence portals ▸ Mobile application includes the DID exchange flow ▸ Issuer (DO) DID is anchored at the EBSI ledger and added to the TIR		
Required activities	ID	Description	Responsible Team (DE, DO)
	SA-AE-2	SSI Authority agent integration and testing	DE
	SA-AO-2	SSI Authority agent integration and testing	DO
	SA-AO-7	Supporting EBSI alignment	DO

5.3.9 Self-sovereign identity agent milestone 4: DP/DC portal DID connection support

Table 76: Fourth increment of the VC-based MVP

End date	01-07-2021		
Result	▸ eProcedure and Evidence portals show the options for the VC pattern initialisation. ▸ eProcedure and Evidence portals enable the DID connection/communication establishment. ▸ Data service prepares the evidence and the SSI authority agent converts it into a VC. ▸ SSI edge agent establishes a DID connection with the SSI authority agent deployed within the eProcedure and Evidence portals		
Required activities	ID	Description	Responsible Team (DE, DO)
	SA-AO-3	VC pattern initiation	DO
	SA-AO-4	Supporting the DID communication	DO
	SA-AO-5	Evidence transformation to VC	DO
	SA-AE-3	VC pattern initiation	DE
	SA-AE-4	Supporting the DID communication	DE

5.3.10 Self-sovereign identity agent milestone 5: DP provides a diploma as VC to the student's edge agent & DC obtains a diploma as VP from student's edge agent

Table 77: Fifth increment of the VC-based MVP

End date	20-07-2021		
Result	▸ SSI Authority agent is able to issue a credential to the student's edge agent ▸ SSI Authority agent is able to obtain a presentation from the student's edge agent ▸ eProcedure and Evidence portals are able to support the VP/VC exchange with GUI support ▸ SSI edge agent exchanges the VP/VC with the SSI Authority agent		
Required activities	ID	Description	Responsible Team (DE, DO)
	SA-AO-6	Supporting VC exchange communication	DO
	SA-AE-5	Supporting the VP exchange communication	DE

5.3.11 Self-sovereign identity agent milestone 6: DC able to verify the VP

Table 78: Sixth increment of the VC-based MVP

End date	10-08-2021		
Result	▸ eProcedure portal is able to verify the presentation obtained by the means of eIDAS identity checking/mapping ▸ eProcedure portal's SSI Authority agent is able to connect to EBSI to verify VC issuer DID ▸ eProcedure portal transforms VC into local format and displays evidence		
Required activities	ID	Description	Responsible Team (DE, DO)
	SA-AE-6	Supporting VP validation	DE
	SA-AE-7	Transformation and display of evidence	DE
	SA-AO-8	Final integration testing	DO
	SA-AE-8	Final integration testing	DE

5.4 First iteration prerequisites

The increment definitions, tasks and activities, and schedules are based on four key assumptions that must prove stable and valid in order to maintain the pace and outcomes described in this section:

- The assumption that the decisions described in Section 3.3 will hold during the customization & integration phase of the first pilot iteration, as they will form the basis for the pilot scope and solution that will facilitate the first pilot iteration.

- The assumption that the (external) deliverables of other work packages on which this pilot depends (see Section 5.5) will be available and usable in a timely manner.
- The assumption that all SA pilot partner Member States will be able to solve individual challenges (such as obtaining approvals and allocating resources) and set up their national solutions according to the increment definitions. This is, of course, a double-barrelled assumption, since the increments are a planning and thus a goal in themselves. However, if one or more Member States cannot keep up the pace described in the increment planning, this means that the integration and testing efforts will also take longer for all other participating Member States. This not only makes it more difficult to organize the activities for each Member State, but also requires more effort, putting additional stress on the available budgets.
- The assumption that the available budget in the participating Member States is sufficient for the development of the facilities required for the first pilot iteration.

5.5 First iteration dependencies

The activities in the increments towards the First Release are depending on the following outcomes from other Work Packages in the DE4A project (external deliverables). Possible additional dependencies that exist in individual Member States will be described in Chapter 6.

Table 79: First iteration dependencies

External activity	Comment	Provider of outcome	Required for milestone
Common components: ▸ DC and DP stub for DE4A connector ▸ DE4A connector (including populated Information Desk configuration file) ▸ SSI Authority and Edge agents ▸ UX guidelines for explicit request at DE ▸ UX guidelines for preview at DP	Initial version, including documentation and support	WP5	2
Common components: ▸ SMP ▸ eDelivery AS4 gateway	Set up by Member States	MS	2
Final Studying Abroad Evidence Message XSD	/	WP3	2
Common components (updated version): ▸ DC and DP stub for DE4A connector ▸ DE4A connector ▸ SSI Authority and Edge agents	Added to previous version: ▸ Issuing verifiable credentials ▸ Integration with EBSI/eSSIF via an embedded connector	WP5	3

External activity	Comment	Provider of outcome	Required for milestone
	▸ Bug fixes		
Common components (updated version): ▸ DE4A connector ▸ SSI Authority and Edge agents ▸ eDelivery AS4 gateway ▸ SMP	Added to previous version: ▸ Diploma verification ▸ Bug fixes ▸ Error logging ▸ Improved availability	WP5	4

Table 80: Dependencies between activities:

Activity	Dependencies
SA-DR-1	WP5 Common Components (updated): ▸ eDelivery AS4 gateway ▸ SMP
SA-DR-2	WP5 Common Components (updated): ▸ DE4A connector (including populated Information Desk configuration file)
SA-DR-4	SA-DR-1
SA-DT-1	WP5 Common Components (updated): ▸ eDelivery AS4 gateway ▸ SMP
SA-DT-2	WP5 Common Components (updated): ▸ DE4A connector
SA-DT-3	SA-DT-1
SA-DE-5	WP5 UX guidelines for explicit request
SA-DO-6	WP5 UX guidelines for preview
SA-DE-7	SA-DR-1 (Deploy and configure OOP TS common components: eDelivery AS4 gateway and SMP) SA-DR-2 (Deploy and configure OOP TS common components: DE4A connector) SA-DR-3 (Have Information Desk configuration file populated by WP5)
SA-DO-3	SA-DT-1 (Deploy and configure OOP TS common components: eDelivery AS4 gateway if separated from the DE4A Connector and SMP) SA-DT-2 (Deploy and configure OOP TS common components: DE4A connector.)
SA-AR-2	SA-AR-1
SA-AT-2	SA-AT-1
SA-AE-2	SA-AE-1
SA-AO-2	SA-AO-1

5.6 First iteration risks

Common risks (not Member State Specific) for the first pilot iteration are addressed in the following table.

These risks will be actively monitored during the bi-weekly SA meetings by the pilot partners. The pilot lead will facilitate this process and escalate risks as soon as they require mitigation actions that are beyond the pilot itself. The risk table will be updated accordingly during the customization & integration phase.

Table 81: First iteration risks

ID	Risk description	Measures	Impact	Chance	Risk
1	There will be delays in provision of the common components (DE4A Connector for the USI pattern, SSI Authority agent)	Close monitoring of the agile development process; participating in the WP5 sprints	High	Medium	High
2	Not all participating Member States will move at the same pace of customization and integration. Delays in one Member State may impact the pace of others.	Bi-weekly pilot meeting to monitor progress	Medium	Medium	Medium
3	Member States may reconsider major design decisions at pilot level in the customization and integration phase.	Limiting discussion on the topics already agreed upon by the Member States; organising bilateral meetings to discuss possible solutions.	Mediu m	Medium	Medium
4	The common components may initially have issues, bugs or lacking documentation preventing the pilot partners achieving the milestones on time	Provide feedback to WP5; agree with WP5 on timeline for fixes and updates	High	Medium	High
5	Lack of students for the running phase as the school year 2021/2022 begins a few weeks after the start of the first pilot iteration (mid of October)	Following the user engagement activities defined in D2.4; starting with students from the pilot partners	High	Medium	High

5.7 Second iteration

The content of the second iteration has been defined in Section 3.2. The main focus is on implementing functionalities that go beyond the minimum viable product of the first iteration.

The second iteration will extend the scope with respect to the first iteration in the following ways:

- Support of multiple-country scenario – a student will be from a country different from the Data Consumer and Data Provider countries
- Support of multiple evidence – more than one type of evidence will be used in UC#1 and UC#2
- Use of the IDK services via the DE4A connector instead of configuration files

5.7.1 Milestones

Table 82: Milestones of the second pilot iteration

Phase	Exp. date	Milestone
Pilot planning	1-11-2021	Start of the detailed second iteration pilot planning
	15-12-2021	Pilot planning for the second iteration detailed
	15-1-2022	Data models for additional higher education evidence made available by WP3
	15-1-2022	Additional features to the USI and VS patterns available (WP3 and WP5).
	15-2-2022	Final details of the pilot plan for the second iteration ready
Customization & integration	1-3-2022	eProcedure and Evidence portals and data services updated
	1-4-2022	Additional features to the USI and VS patterns integrated by pilot partners.
	30-4-2022	eProcedure and Evidence portals adapted and data services ready for the second iteration
Pilot running phase	1-5-2022	Go-live with second iteration pilot
	31-10-2022	Second iteration pilot finished
	31-10-2022	Reporting on second iteration pilot finished

5.7.2 Risks

The common risks (not Member State specific) for the second pilot iteration are addressed in the table below. These risks will be actively monitored during the bi-weekly SA meetings by the pilot partners. The pilot lead will facilitate this process and escalate risks as soon as they require mitigation actions that are beyond the pilot itself. The risk table will be updated accordingly during the customization & integration phase.

Table 83: Common risks for the second pilot iteration

ID	Risk description	Measures	Impact	Chance	Risk
1	There will be delays in provision of the updated common components (DE4A Connector for the USI pattern, SSI Authority agent)	Close monitoring of the agile development process; participating in the WP5 sprints	High	Medium	High

ID	Risk description	Measures	Impact	Chance	Risk
2	Member States may reconsider major design decisions at pilot level in the customization and integration phase.	Limiting discussion on the topics already agreed upon by the Member States; organising bilateral meetings to discuss possible solutions.	Medium	Medium	Medium
3	Limited time of the customization and integration phase for the final iteration	The planning activities for the second iteration will run in parallel with running phase of the first iteration	High	Medium	High

5.7.3 Prerequisites

General prerequisites for piloting the second iteration:

- Continued support from the SA pilot partners for piloting the second iteration.
- Absence of delays in piloting the first iteration that may endanger the start of the second iteration.
- Availability of the data models for the evidence needed in the second iteration.
- Support of multiple evidences and multiple-country scenario

5.7.4 Dependencies - Final Release

At this point in time the following general dependencies exist:

- For customization & integration of the second pilot iteration, the required software components need to be extended (WP3 and WP5).
- Additional data models for higher education are made available by WP3.

6 Member State management plan

This chapter includes the Member State specific plan for execution of the 'customizations and integration' tasks. Each Member State specific section includes national design decisions that impact the pilot, the gaps that have been identified (defining the amount of work to be done for customization and integration), the planning of the tasks to perform and the identification of Member State specific risks to be mitigated.

6.1 Slovenia

Next to the common assumptions as described in Chapter 4, the following assumptions apply for the development of the National Infrastructure and integration with the OOP TS:

6.1.1 Specific customizations and integrations

eProcedure portal (Data Evaluator)

Table 84: Slovenia - Customization Activities at DE

Application component	Change description	Change owner	Precondition	Release
eVŠ portal	Add an option to the eVŠ e-procedure web page for the use of OOP TS	MIZŠ	-	First
	Connect eVŠ portal to the joint infrastructure through the DE4A connector	MIZŠ	-	First
	Implement explicit request	MIZŠ	UX guidelines for explicit request available: WP5, WP7	First
	Process response from DP	MIZŠ	-	First
	Integrate the SSI authority agent	MIZŠ	-	First
Study grant application	Implement service and integrate it with the DE4A Connector	JSI	-	First

National OOP-components (Data Requestor, Data Transferor)

Table 85: Slovenia - Customization Activities at DR / DT

Application component	Change description	Change owner	Precondition	Release
AS4-node	Configure the Holodec node	MPA	-	First
SMP	Set up a Phoss SMP node	MPA	-	First

Data Owner

Table 86: Slovenia - Customization Activities at DO

Application component	Change description	Change owner	Precondition	Release
eVŠ portal	Translate data from eVŠ into canonical evidence format	MIZŠ	-	First
eGovernment portal	Implement preview	MPA	UX guidelines for preview available: WP5	First
	Request evidence from eVŠ through Tray	MPA	-	First

6.1.2 National Planning

The Customization & Integration towards MVP will be organized according to the tables below.

Table 87: Slovenia – plan for increment 1

Increment 1						
ID	Description	Existing applications	New applications	Change owner	Start date	End date
SA-DO-1	Prepare examples of canonical evidence	eVŠ		JSI	1.2.2021	28.2.2021

Table 88: Slovenia – plane for increment 2

Increment 2						
ID	Description	Existing applications	New applications	Change owner	Start date	End date
SA-DE-1	Analysis of an online procedure to be integrated in the pilot	eVŠ	Study grant	MIZŠ, JSI	1.3.2021	31.3.2021
SA-DE-2	Decision on the pilot operation scope	eVŠ	Study grant	MIZŠ, JSI	1.3.2021	31.3.2021
SA-DR-1	Deploy and configure eDelivery AS4 gateway	Holodeck installation		MPA		
	Deploy and configure SMP		SMP	MPA		30.4.2021
SA -DR-4	Connect to eDelivery AS4 gateways of data transferors		OOP TS node	MPA		30.4.2021
SA -DT-1	Deploy and configure OOP TS common components: eDelivery AS4 gateway		OOP TS node	MPA		30.4.2021
	Deploy and configure OOP TS common components: SMP		SMP	MPA		30.4.2021
SA -DT-3	Connect to eDelivery AS4 gateways of data requestors		OOP TS node	MPA		30.4.2021
SA-AR-1	DC evaluates the Authority Agent API	eVŠ				16.4.2021
SA-AT-1	DP evaluates the Authority Agent API	eVŠ				16.4.2021

Table 89: Slovenia – plan for increment 3

Increment 3						
ID	Description	Existing applications	New applications	Change owner	Start date	End date
SA-DR-2 SA-DT-2	Deploy and configure the DE4A connector		DE4A connector	MPA	19.4.2021	31.5.2021
SA-DE-4	Suggest the user to apply for a service	eVŠ	Study grant	MIZŠ, JSI		30.6.2021
	Inform the user about the evidence needed for the procedure	eVŠ	Study grant	MIZŠ, JSI		30.6.2021
SA-DE-7	Connect the eProcedure portal to the national OOP TS implementation (DE4A connector) to request an evidence and to receive the evidence	eVŠ	Study grant	MIZŠ, JSI		30.6.2021
SA-DO-3	Connect the data service to the national OOP TS implementation (DE4A connector) to receive an evidence request and send the evidence	eVŠ		MIZŠ		30.6.2021
SA-AE-1 SA-AO-1	SSI agent deployment		SSI Authority agent	MPA, MIZŠ		7.6.2021
SA-AE-2	SSI Authority agent integration and testing	eVŠ		MIZŠ		21.6.2021
SA-AO-2	SSI Authority agent integration and testing	eVŠ		MIZŠ		21.6.2021
SA-AE-3	VC pattern initiation	eVŠ		MIZŠ		30.6.2021
SA-AO-3	VC pattern initiation	eVŠ		MIZŠ		30.6.2021
SA-AE-4	Supporting the DID communication	eVŠ		MIZŠ		30.6.2021
SA-AO-4	Supporting the DID communication	eVŠ		MIZŠ		30.6.2021
SA-AO-5	Evidence transformation to VC	eVŠ		MIZŠ		30.6.2021
SA-AO-7	Supporting the EBSI alignment	eVŠ		MIZŠ		21.6.2021

Table 90: Slovenia – plan for increment 4

Increment 4						
ID	Description	Existing applications	New applications	Change owner	Start date	End date
SA-AO-6	Supporting the VC exchange communication	eVŠ		MIZŠ, MPA		20.7.2021
SA-AE-5	Supporting the VP exchange communication	eVŠ		MIZŠ, MPA		20.7.2021
SA-DE-5	Implement explicit request in the eProcedure portal	eVŠ	Study grant	MIZŠ, JSI		1.9.2021
SA-DE-6	Allow the user to select/enter information needed for locating an issuing authority and evidence location	eVŠ	Study grant	MIZŠ, JSI		1.9.2021
	Obtain details about DP from the DE4A connector	eVŠ	Study grant	MIZŠ, JSI		1.9.2021
SA-DE-8	Transform evidence from canonical format to local format	eVŠ	Study grant	MIZŠ, JSI		1.9.2021
	Display the evidence retrieved from DP to the user in prefilled application form	eVŠ	Study grant	MIZŠ, JSI		1.9.2021
	Allow the user to enter missing information needed for the procedure in the form, for example information about the enrolled study programme	eVŠ	Study grant	MIZŠ, JSI		1.9.2021
SA-DE-9	Ask the user to submit the application form	eVŠ	Study grant	MIZŠ, JSI		1.9.2021
	Validate submitted form	eVŠ	Study grant	MIZŠ, JSI		1.9.2021
	Return acknowledgment of receipt to the user	eVŠ	Study grant	MIZŠ, JSI		1.9.2021
SA-DE-10	UI internationalisation	eVŠ	Study grant	MIZŠ, JSI		30.9.2021
SA-DO-4	Record matching	eGovernment portal		MPA		1.9.2021
SA-DO-5	Transform domestic evidence to canonical evidence definition	eVŠ		MIZŠ		1.9.2021
SA -DO-6	Implement preview and user approval at the Evidence portal	eGovernment portal		MPA	1.5.2021	1.9.2021
SA-DO-7	UI internationalisation	eGovernment		MPA		30.9.2021

Increment 4						
		portal				
SA-AE-6	Supporting VP validation	eVŠ		MIZŠ		10.8.2021
SA-AE-7	Transformation and display of evidence	eVŠ		MIZŠ		10.8.2021
SA-AE-8	Final integration testing	eVŠ		MIZŠ		15.9.2021
SA-AO-7	Final integration testing	eVŠ		MIZŠ		15.9.2021

6.1.3 Specific risks

No specific risks at this stage.

6.2 Spain

6.2.1 Specific customizations and integrations

eProcedure portal (Data Evaluator)

Table 91: Spain - Changes to be implemented at DE

Application component	Change description	Change owner	Precondition	Release
UJI-DE	Separated authentication option for eIDAS	UJI	-	First
	Integrate with Clave 2 system, gateway to eIDAS	UJI	Have access to gateway	First
	Request access to the Clave 2 system gateway for universities	UJI	-	First

National OOP-components (Data Requestor, Data Transferor)

Table 92: Spain - Changes to be implemented at DR/DT

Application component	Change description	Change owner	Precondition	Release
SDG node	N/A	SGAD	Availability	First

Data owner

Table 93: Spain - Changes to be implemented at DO

Application component	Change description	Change owner	Precondition	Release
UJI-DO	Export API to offer the data models for the pilot UC1 to the Spanish Intermediation platform	UJI	-	First
	Export API to offer the data models for the pilot UC3 to the Spanish Intermediation platform	UJI	-	First
	Export API to offer the data models for the pilot UC2 to the Spanish Intermediation platform	UJI	-	Final
	Secure and expose APIs through RedSARA private network to connect it to the Intermediation platform	UJI		First

6.2.2 National Planning

The Customization & Integration towards MVP will be organized according to the tables below:

Table 94: Spain – plan for eIDAS related activities

eIDAS						
ID	Description	Existing applications	New applications	Change owner	Start date	End date
SA - DE-3	Add eIDAS login option for users to authenticate at DE	Direct integration of the enrolment application	SSO integration	UJI	26.04.2021	07.05.2021

Table 95: Spain – plan for increment 1

Increment 1						
ID	Description	Existing applications	New applications	Change owner	Start date	End date
SA-DO-1	Prepare examples of canonical evidence	UJI system		UJI	1.2.2021	28.2.2021

Table 96: Spain – plan for increment 2

Increment 2						
ID	Description	Existing applications	New applications	Change owner	Start date	End date
SA-DE-1	Analysis of an online procedure to be integrated in the pilot	UJI pre-enrolment		UJI	1.3.2021	1.3.2021
SA-DE-2	Decision on the pilot operation scope	UJI pre-enrolment		UJI	1.3.2021	31.3.2021
SA-DR-1	Deploy and configure eDelivery AS4 gateway			MPTFP-SGAD		30.4.2021
	Deploy and configure SMP			MPTFP-SGAD		30.4.2021
SA - DR-4	Connect to eDelivery AS4 gateways of data transferors			MPTFP-SGAD		30.4.2021
SA - DT-1	Deploy and configure OOP TS common components: eDelivery AS4 gateway			MPTFP-SGAD		30.4.2021
	Deploy and configure OOP TS common components: SMP			MPTFP-SGAD		30.4.2021

Increment 2						
SA - DT-3	Connect to eDelivery AS4 gateways of data requestors			MPTFP-SGAD		30.4.2021
SA-AT-1	DP evaluates the Authority Agent API			MPTFP-SGAD		30.4.2021

Table 97: Spain – plan for increment 3

Increment 3						
ID	Description	Existing applications	New applications	Change owner	Start date	End date
SA-DR-2 SA-DT-2	Deploy and configure the DE4A connector			MPTFP-SGAD		1.5.2021
SA-DE-4	Suggest the user to apply for a service	UJI pre-enrolment		UJI		30.6.2021
	Inform the user about the evidence needed for the procedure	UJI pre-enrolment		UJI		30.6.2021
SA-DE-7	Connect the eProcedure portal to the national OOP TS implementation (DE4A connector) to request an evidence and to receive the evidence	UJI pre-enrolment		UJI		15.07.2021
UJI-DE-1	Separated authentication option for eIDAS	UJI pre-enrolment		UJI	01.05.2021	15.06.2021
UJI-DE-2	Integrate with Clave 2 system, gateway to eIDAS	UJI pre-enrolment		UJI	01.05.2021	15.06.2021
UJI-DE-3	Request access to the Clave 2 system gateway for universities	UJI pre-enrolment		UJI	01.05.2021	15.06.2021
SA-DO-3	Connect the data service to the national OOP TS implementation (DE4A connector) to receive an evidence request and send the evidence			MPTFP-SGAD		30.6.2021
SA-AO-1	SSI Authority agent deployment			MPTFP-SGAD		30.6.2021

Increment 3						
SA-AO-2	SSI Authority agent integration and testing			MPTFP-SGAD		30.6.2021
SA-AO-3	VC pattern initiation			MPTFP-SGAD		30.6.2021
SA-AO-4	Supporting the DID communication			MPTFP-SGAD		30.6.2021
SA-AO-5	Evidence transformation to VC			MPTFP-SGAD		30.6.2021
SA-AO-6	Supporting VC exchange communication			MPTFP-SGAD		30.6.2021

Table 98: Spain – plan for increment 4

Increment 4						
ID	Description	Existing applications	New applications	Change owner	Start date	End date
SA-DE-5	Implement explicit request in the eProcedure portal	UJI pre-enrolment		UJI	01/05/21	01.07.2021
SA-DE-6	Obtain details about DP from the DE4A connector					
SA-DE-8	Transform evidence from canonical format to local format	UJI pre-enrolment		UJI	01.06.2021	01.08.2021
	Display the evidence retrieved from DP to the user in prefilled application form	UJI pre-enrolment		UJI	01.06.2021	01.08.2021
	Allow the user to enter missing information needed for the procedure in the form, for example information about the enrolled study programme	UJI pre-enrolment		UJI	01.06.2021	01.08.2021
SA-DE-9	Ask the user to submit the application form	UJI pre-enrolment		UJI	01.06.2021	01.08.2021
	Validate submitted form	UJI pre-enrolment		UJI	01.06.2021	01.08.2021
	Return acknowledgment of receipt to the user	UJI pre-enrolment		UJI	01.06.2021	01.08.2021
SA-	UI internationalisation	UJI pre-		UJI	01.07.2021	01.09.2021

Increment 4						
DE-10		enrolment				
UJI-DO-1	Export API to offer the data models for the pilot UC1 to the Spanish Intermediation platform	UJI pre-enrolment		UJI	01.04.2021	01.07.2021
UJI-DO-2	Export API to offer the data models for the pilot UC3 to the Spanish Intermediation platform	UJI pre-enrolment		UJI	01.04.2021	01.07.2021
UJI-DO-3	Secure and expose APIs through RedSARA private network to connect it to the Intermediation platform	UJI pre-enrolment		UJI	01.04.2021	01.07.2021
SA-DO-4	Record matching			MPTFP-SGAD		01.09.2021
SA-DO-5	Transform domestic evidence to canonical evidence definition			MPTFP-SGAD		01.09.2021
SA - DO-6	Implement preview and user approval at the Evidence portal			MPTFP-SGAD		01.09.2021

6.2.3 Specific risks

Table 99: Spain – specific risks

ID	Description	Measures	Impact	Chance	Release
ESR1	Data not available on the intermediation platform from a government authoritative source	If data is available from the participating university, export it through specific APIs, for the sake of the pilot.	High	Low	First Final
ESR2	Failure to integrate with Spanish interoperability platform	Seek expert counselling from SGAD	Medium	Low	First Final

6.3 Portugal

6.3.1 Specific customizations and integrations

eProcedure portal (Data Evaluator)

INESC-ID / Portugal will implement a dedicated eProcedure portal for several reasons: making it easier to deploy in other universities; the current system uses a simplified authentication scheme (per-application token) so it is hard to integrate with eIDAS.

Table 100: Portugal - Changes to be implemented at DE

Application component	Change description	Change owner	Precondition	Release
eProcedure portal	Implementation of the dedicated eProcedure portal, extending the functionality of the original portal (Fenix Edu)	INESC-ID	-	First
eProcedure portal	Connection to the DE4A Connector	INESC-ID	DE4A Connector provided by WP5	First
eProcedure portal	Integration with the eIDAS node	INESC-ID / AMA	-	First
eProcedure portal	Implementation of the dedicated eProcedure portal, extending the functionality of the original portal (Fenix Edu)	INESC-ID	-	First
eProcedure portal	Integration of the SSI Authority agent	INESC-ID		First

National OOP and evidence exchange components (Data Requestor, Data Transferor)

Table 101: Portugal - Changes to be implemented at DR/DT

Application component	Change description	Change owner	Precondition	Release
SDG node	none		eDelivery available	First

Data owner

Table 102: Portugal - Changes to be implemented at DO

Application component	Change description	Change owner	Precondition	Release
PRT Data Broker	Adaptation to the needs of DE4A / the pilot	INESC-ID / AMA	(NB: owned by AMA)	First
PRT Data Broker	Integration with the Academic Management System (Fenix Edu)	INESC-ID		First
PRT Data Broker	Connection to the Data Transferor	INESC-ID / AMA	Data Transferor provided by WP5	First
PRT Data Broker	Integrations with PRT National Evidence Previewer Portal and PRT Authentication System		(same as for the DE)	Final
PRT Data Broker	Integration of the SSI Authority agent	INESC-ID / AMA	(NB: owned by AMA)	First

6.3.2 National Planning

Table 103: Portugal – plan for eIDAS related activities

eIDAS						
ID	Description	Existing applications	New applications	Change owner	Start date	End date
SA - AC-1	Connect DC to the national eIDAS connector	Fenix Edu	dedicated eProcedure portal	INESC-ID		15.5.2021
SA- AC-2	Connect DP to the national eIDAS connector	Fenix Edu / PRT Data Broker		INESC-ID		15.5.2021
SA - DE-3	Add eIDAS login option for users to authenticate at DE	Fenix Edu	dedicated eProcedure portal	INESC-ID		15.5.2021
	Show the user that he/she has successfully authenticated and logged in the portal			INESC-ID		15.5.2021
SA - DO-2	Add eIDAS login option for users to authenticate at DO	Fenix Edu / PRT Data Broker		INESC-ID		15.5.2021
	Show the user that he/she has successfully authenticated and logged in the portal			INESC-ID		15.5.2021

Table 104: Portugal – plan for increment 1

Increment 1						
ID	Description	Existing applications	New applications	Change owner	Start date	End date
SA-DO-1	Prepare examples of canonical evidence	Fenix Edu / PRT Data Broker		INESC-ID	1.2.2021	28.2.2021

Table 105: Portugal – plan for increment 2

Increment 2						
ID	Description	Existing applications	New applications	Change owner	Start date	End date
SA-DE-1	Analysis of an online procedure to be integrated in the pilot	Fenix Edu		INESC-ID		31.3.2021
SA-	Decision on the pilot			INESC-		31.3.2021

Increment 2						
DE-2	operation scope			ID		
SA-DR-1	Deploy and configure SMP	SML		AMA		30.4.2021
	Connect to eDelivery AS4 gateways of data transferors	eDelivery AS4 gateway		AMA		30.4.2021
SA - DR-4	Deploy and configure OOP TS common components: eDelivery AS4 gateway	eDelivery AS4 gateway		AMA		30.4.2021
SA - DT-1	Deploy and configure OOP TS common components: SMP			AMA		30.4.2021
	Configure DNS & SML			AMA		30.4.2021
SA - DT-3	Connect to eDelivery AS4 gateways of data requestors	eDelivery AS4 gateway		AMA		30.4.2021

Table 106: Portugal – plan for increment 3

Increment 3						
ID	Description	Existing applications	New applications	Change owner	Start date	End date
SA-DR-2	Deploy and configure the DE4A connector	eDelivery AS4 gateway		AMA / INESC-ID		31.5.2021
SA-DT-2	Deploy and configure the DE4A connector	eDelivery AS4 gateway		AMA / INESC-ID		31.5.2021
SA-DE-4	Suggest the user to apply for a service			INESC-ID		
	Inform the user about the evidence needed for the procedure			INESC-ID		
SA-DE-7	Connect the eProcedure portal to the national OOP TS implementation (DE4A connector) to request an evidence and to receive the evidence			INESC-ID		30.6.2021
SA-DO-3	Connect the data service to the national OOP TS implementation (DE4A connector) to receive an evidence request and send the evidence			INESC-ID		30.6.2021
SA-	SSI Authority agent		SSI agent	INESC-		7.6.2021

Increment 3						
AE-1 SA-AO-1	deployment			ID		
SA-AE-2	SSI Authority agent integration and testing	Fenix Edu		INESC-ID		21.6.2021
SA-AO-2	SSI Authority agent integration and testing	Fenix Edu		INESC-ID		21.6.2021
SA-AE-3	VC pattern initiation: Suggest the user to exchange evidence as in the form of VP (agent-to-agent)					1.7.2021
SA-AE-4	Supporting the DID communication: Add DIDComm support option for users (show QR code for establishing the connection); Show the user that he/she has established DIDComm with the portal's agent					1.7.2021
SA-AO-3	VC pattern initiation - Suggest the user to exchange evidence as in the form of VC	Fenix Edu		INESC-ID		1.7.2021
SA-AO-4	Supporting DID communication - Add DIDComm support option for users; Show the user that he/she has established DIDComm with the portal's agent	Fenix Edu		INESC-ID		1.7.2021
SA-AO-5	Evidence transformation to VC - Conversion of the requested Diploma to VC format	Fenix Edu		INESC-ID		1.7.2021
SA-AE-5	Supporting VC exchange communication - Add VC exchange support for users (check response button); Show appropriate information in the portal	Fenix Edu		INESC-ID		20.7.2021
SA-AO-6	Supporting VC exchange communication	Fenix Edu		INESC-ID		20.7.2021
SA-	Supporting VP validation: Able to verify the VP's					10.8.2021

Increment 3						
AE-6	authenticity by comparing eIDAS MDS; Able to verify the authenticity of the issuer by using the EBSI service					

Table 107: Portugal – plan for increment 4

Increment 4						
ID	Description	Existing applications	New applications	Change owner	Start date	End date
SA-DE-5	Implement explicit request in the eProcedure portal			INESC-ID		1.9.2021
SA-DE-6	Allow the user to select/enter information needed for locating an issuing authority and evidence location			INESC-ID		1.9.2021
	Obtain details about DP from the DE4A connector			INESC-ID		1.9.2021
SA-DE-8	Transform evidence from canonical format to local format			INESC-ID		1.9.2021
	Display the evidence retrieved from DP to the user in prefilled application form			INESC-ID		1.9.2021
	Allow the user to enter missing information needed for the procedure in the form, for example information about the enrolled study programme			INESC-ID		1.9.2021
SA-DE-9	Ask the user to submit the application form			INESC-ID		1.9.2021
	Validate submitted form			INESC-ID		1.9.2021
	Return acknowledgment of receipt to the user			INESC-ID		1.9.2021
SA-DE-10	UI internationalisation			INESC-ID		1.9.2021
SA-DO-4	Record matching			INESC-ID		1.9.2021
SA-DO-5	Transform domestic evidence to canonical evidence			INESC-ID		1.9.2021

Increment 4						
	definition					
SA - DO-6	Implement preview and user approval at the Evidence portal			INESC-ID		1.9.2021
SA-DO-7	UI internationalisation			INESC-ID		1.9.2021

6.3.3 Specific risks

No specific risks were identified.

7 Running phase management plan

7.1 Go-live Launching Criteria

Go-live of the pilot is a Member State specific decision. It is planned to launch procedures in all use cases by October 2021. However, as far as the deployment of the DC and DP in the close to production environment could suffer delays, as set of launching criteria has been defined.

Criteria for go-live are:

1. eIDAS testing, DE4A OOP TS testing, SSI Authority agent testing, User mobile agent, national integration testing, cross-border integration testing, pre-production testing and production testing have been concluded successfully. This means all blocking issues have been solved. Member States don't need to solve all non-blocking issues.
2. The flow has been validated with one real user with real data to safeguard everything is working fine.
3. Users from the three participating Member States are available for testing. The participant infrastructure, e.g. microsites, and the questionnaires for students, competent authorities and Member States are ready.

These criteria establish two situations:

- Minimum: A minimum of one DC and DP from different Members States that implement each of the two interaction patterns (USI and VC). The DP should provide the attributes needed by the students to perform a procedure at the DC according to the implemented pattern. At least 5 students are available for testing each pilot scenario. Participant infrastructure and questionnaires are ready.
- Desirable: All DCs and DPs that are involved in each of the three use cases. At least 15 students are available for testing each pilot scenario. Participant infrastructure and questionnaires are ready.

The pilot Studying Abroad involves 3 different countries: Portugal, Slovenia and Spain.

7.2 Running phase activities

In the pilot running phase (in the first as well as in the second pilot iteration) the following activities are carried out:

1. Prepare pilot scenario:
   Prepare all necessary measurements according to the risk classification of the pilot-scenario.
2. Plan pilot runs details:
   The pilot runs are planned in detail and the timeboxes for the pilot-runs are scheduled in the agendas of the participants.
3. Check go-live pilot scenarios:
   The pilot-leader checks if pilot-scenarios fulfil the go live criteria.
4. Execute pilot runs:
   The pilot runs are performed according the plan and the way-of-work as described below.
5. Coordination and reporting:
   The pilot leader documents the execution of the pilot runs and reports to the product owner and program management

7.3 Running phase milestones

The main timestamps for both pilot iterations are:

- First pilot scenario alive: the first of the pilot-scenarios to run is live and ready to run.
- All pilot-scenarios alive: all of the pilot-scenarios to run are live and ready to run.
- First pilot scenario successfully executed: the first of the pilot-scenarios to run has been executed completely, all evidence is collected and the goals are evaluated.
- All pilot scenarios successfully executed: all of the pilot-scenarios to run have been executed successfully, all evidence is collected and the goals are evaluated.
- Report of running phase delivered: the report of the results and conclusions to the running phase of the pilot is ready for submission.

7.4 Running phase planning

Activities of the first pilot iteration are listed in the following table.

Table 108: Activities of the first pilot iteration

Activity	Sept '21	Oct '21	Nov '21	Dec '21	Jan '22
1. Prepare pilot scenarios					
2. Plan pilot runs details					
3. Check go-live pilot scenarios					
4. Execute pilot runs					
5. Collect the data needed for evaluation					
6. Coordination and reporting					
7. Deliver report of running phase (D4.3)					

The next table includes activities of the final pilot iteration.

Table 109: Activities of the final pilot iteration

Activity	Apr '22	May '22	June '22	July '22	Aug '22	Sept '22
1. Prepare pilot scenarios						
2. Plan pilot runs details						
3. Check go-live pilot scenarios						
4. Execute pilot runs						
5. Collect the data needed for evaluation						
6. Coordination and reporting						
7. Deliver report of running phase (D4.4)						

7.5 Governance structure

This subsection outlines the scope of DE4A pilots' governance, providing an overview on its objectives, involved parties, responsibilities, and mechanisms to manage different situations that may arise during piloting.

Since the governance of all pilots during the execution will be under the common entities mentioned below, this section in each pilot planning deliverable will be the same. While this creates duplication in the content of the deliverables, it also ensures that the documents can be read and understood as stand-alone deliverable.

The Governance of the DE4A Pilots in production environment aims to fulfil the following main objectives:

- Continuous supervision of pilot activities to ensure the execution of the pilots is aligned with project target outcomes and expected impacts. To achieve this the prompt reaction to any issue is necessary and advisory support to the follow-up of preventive measures. This monitoring will facilitate the fulfilment of the Executive Board duties which have to be periodically reported to the decision bodies of the project (i.e. MS-Council).
- Adequate and timely management of either those situations common to the three pilots requiring a common direction across them and/or situations which require escalation to higher management levels and/or coordination from Technical Working Group i.e. they could have a project-wide impact.
- Integrated reporting to the management workpackage (WP9) and DE4A management and decision bodies including the Project Coordinator and the Member State Council.

In addition to existing governance bodies in the project, a new one will be designated, called **Pilot Supervisory Team (PST)**, as an operational entity that aims to provide effective coordination within the existing pilot management level. The scope and responsibilities of the PST are is limited to the duration of the pilots.

This Pilot's Supervisory Team will include the Pilot Leader and one Representative from each of the MS partners involved in the pilot (when there are multiple partners representing the different eProcedure portals and data services). This representative will be an appointed leader from the MS that can act as main contact point for coordinating different responsibilities of the participant in the pilot when different agencies are involved. The Pilot leader will also ensure that other partners in the pilot who do not belong to the PST are informed of any major decisions which affect them and MS representative will ensure national internal coordination for needed activities at MS level in the pilot.

It is recommended also to have special internal groups on each pilot where experts are identified with support from all partners by the Pilot Leader to focus on and support to help resolve specific matters/challenges as they arise. Such groups can be agreed upon by the Pilot Supervisory Team and convened on demand during the different phases of the pilot. It is worth to mention these specialized teams are generally of a technical nature and supportive to the overall governance.

This proposed DE4A Pilots Governance structure is shown in the following figure:

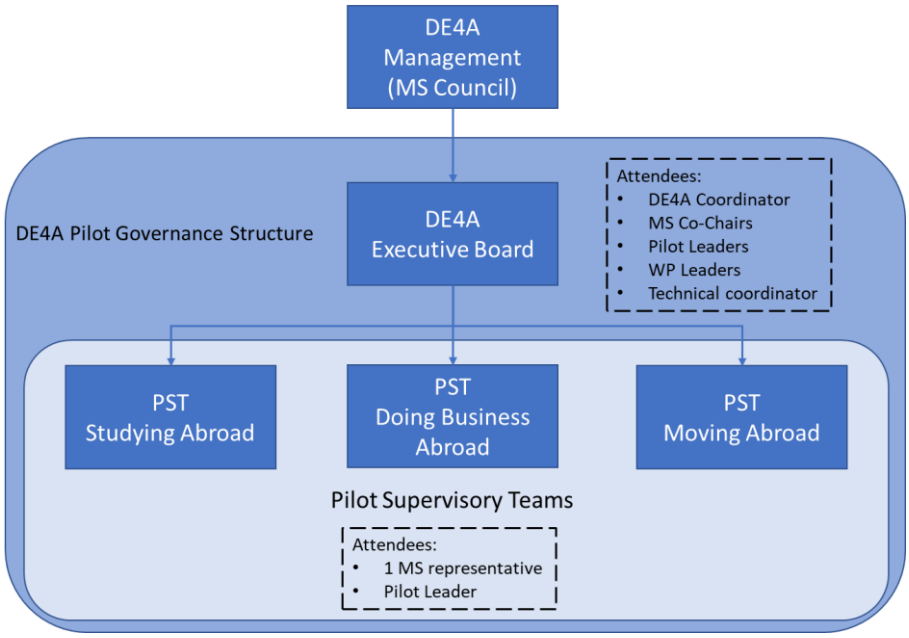

Figure 6: DE4A Pilots Governance structure

The goal of this governance entity (PST) is to discuss situations that are related to the online cross-border services and the execution activities performed within the pilot. The PST meetings can be the current regular pilot meetings where all pilot partners are participating. The PST will be chaired by the Pilot Leader and it will have periodic conference calls with high frequency in the first weeks after pilot launch. The PST can decide to modify this frequency later as it is confirmed that the pilot runs in a sufficiently stable way.

In such meetings, internal decisions can be taken on the pilot, continuously assessing the running of the pilot online services and on-going activities of the running phase and agree the problems that need to be raised to the DE4A Executive Board. When needed, important stakeholders for the pilot such as other WP leaders or Technical Coordinator, can be invited to participate actively on PST meetings.

Any significant operational issue will be duly reported to the Executive Board without significant delay.

Hierarchical management of issues determines that at pilot level it is possible to manage the following types of problems:

1. Technical and non-technical internal pilot running problems of non-critical nature,
2. Technical internal pilot problems unique to one MS,
3. Problems related to support to pilot users
4. Pilot marketing and awareness activities.

When necessary, the Pilot Leader can take advantage of General Assemblies for discussing any situation that can affect the pilot running phase and it could be replicated in other pilots, to share the lessons learned during the execution.

The Pilot Leader can submit to the Executive Board, any requests or issues for guidance on pilot management-related issues during the running phase of the pilot.

Unexpected urgent matters related to the pilot execution can be escalated offline to the Executive Board, upon prior consultation with the DE4A Pilots Coordinator. Conversely, the PST will provide feedback to the Executive Board when this is requested by such body and this response will be coordinated by the Pilot Leader attending to its urgency and ensuring its clarity.

In terms of pilot governance, the Executive Board, as one of the supervisory body for execution of the Project, will support the management of the operational activities during the live running of the pilot as a decision making body guided by the information provided by the PST (represented by the Pilot Leader).

The Executive Board will share with the PST the responsibility of governing the running phase of the pilots (including an effective implementation of decisions by the MS Council). It will provide advice supporting issue resolution based on feedback provided by the Pilot Leader on behalf of the PST. It can indicate to the PST what would need to be done, although operational decisions on how to achieve these objectives or actions will be made at PST level (and if and when necessary, discussed with the Executive Board of which Pilot Leaders are also members).

The Executive Board will focus on those problems that are common to all the pilots or any relevant issues related to running phase activities that require support beyond pilot level management. Where appropriate, the Board could include in their recommendation's advice on how the required actions could be carried out, but the final decisions on how they should be implemented remain the responsibility of the PST.

Examples of problems that would be managed at the level of the Executive Board can include:

1. Technical and non-technical problems which, affecting one particular pilot, cannot be solved at PST level,
2. Technical problems common to more than one pilot which have external causes,
3. Problems unique to one MS which have an external cause and non-technical pilot problems common to more than one MS which have external causes,
4. Major security incidents which have cross-border impact (crisis management procedures would apply).

The Executive Board is chaired by Project Coordinator (ATOS) and the conference call is every two weeks. Minutes are being produced after every teleconference and the MS-Council can be informed or asked for support for especially critical issues as well based Executive Board conclusions when needed.

7.6 Identified risks for running phase

Risks for the running phase are addressed in the following table.

These risks will be actively monitored during the bi-weekly SA meetings by the pilot partners. The risk table will be updated accordingly during the customization & integration phase.

Table 110: Risks for the running phase

ID	Risk description	Measures	Impact	Chance	Risk
1	Lack of students for the running phase as the school year 2021/2022 begins a few weeks after the start of the first pilot iteration (mid of October)	Following the user engagement activities defined in D2.4; starting with students from the pilot partner	High	Medium	High
2	Lack of interest of real users to use the integrate eProcedures	Any student who is eligible for piloting will be invited for using the procedures; evidence and applications will be discarded for those students who do not really want to go studying abroad or request diploma recognition	Medium	High	High
3	Data protection issues	Implemented explicit request will clearly describe conditions of the use of eProcedures; piloting should be organised under the supervision of a data protection officer	High	Medium	High

8 Conclusions

This document will serve as a reference to monitor progress of the pilot for customization of national endpoints and their integration with common components. The results will also be used by other DE4A activities, in particular WP2 – Architecture vision and framework (validation of the project start architecture, the User-supported intermediation pattern and the Verifiable credentials pattern), WP3 - Semantic interoperability solutions (validation of data models for higher education), WP5 - Common component design & development (validation of the common components such as DE4A Connector and SSI Authority agent, and the underlying evidence exchange infrastructure - DE4A OOP Technical system and the EBSI infrastructure), WP6 – Sustainability impact and new governance models (business models and new models for shared delivery of common services), and WP8 – Stakeholder dialogue, dissemination and communication (dissemination and communication activities).

Over the past few months, the pilot partners have already made some progress towards launching the pilot according to the plan described in the document. As part of the preliminary phase, they produced a Member State gap analysis, defined the MVP increments, supported generation of a solution architecture for the USI pattern that was prepared in collaboration with WP2, defined data models for higher education in collaboration with WP3, and collaborated with WP3, WP5 and other pilots in aligning the MVP increments. The results of these activities, presented in this document, served as the basis for the planning phase of the first iteration of the pilot.

With respect to the first customization and integration phase, they analysed the online procedures to be integrated in the pilot (which parts of the portals need to be adapted and how the evidence will be used during and after the procedure) and defined the operation scope of the pilots. They have also reached the first iteration milestone for both the DE4A OOP TS (preparation of examples of canonical evidence which are used by the DE4A Connector mock) and the SSI approach (evaluation of the Authority agent API). Close collaboration with EBSI/eSSIF enabled the DE4A project and the Member States involved in UC#3 (Portugal, Slovenia and Spain) to be accepted in the EBSI Early Adopters Programme [3]. This will help to ensure that the pilot is aligned as much as possible with the EBSI/eSSIF activities and that the EBSI infrastructure can be used for registering the pilot's data scheme, anchoring the evidence issuers' DIDs into the EBSI ledger, and validating the issuers of verifiable credentials.

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A Annex A: Solution Architecture

A.1 Introduction

This annex presents the solution architecture for the implementation of the USI pattern in the Studying Abroad (SA) pilot. It has been constructed in close cooperation with WP2 to ensure full alignment with the DE4A architecture. Its purpose is to guide the design and development of (adaptions to) required components by the pilot participants and to assist the ongoing cooperation and alignment with WP3 for semantics and WP5 for software components.

The solution architecture presented in this document is guided by several aspects of previous work, like D4.1 and D2.4. This previous work defines scope, working assumptions, preconditions, areas of interest, design choices, etc. Not all of these have been copied into this document. This chapter highlights only the most important ones, without pretending to be complete. Please refer to those documents for more information on the SA pilot.

This document specifies the SA solution architecture. Its purpose is to assist the design of the software architecture and development and configuration of the components needed:

- By WP5 and WP3 for the common components.
- By the DCs for their specific application services, like the eProcedure portal and connection to the OOP TS (i.e. DE4A TS) and eIDAS.
- By the DPs for their specific application services, like the Evidence portal, data services and connection to the OOP TS and eIDAS.

A.1.1 Scope and focus

The scope of this architecture is limited to the minimum viable product (MVP) that has been defined by the partners of the SA pilot for UC#1 and UC#2. The second pilot run is out of scope of this version of the solution architecture. Furthermore:

1. The MVP implements the smallest possible functionality needed to run the SA pilots for the first use case (application to higher education), although it is also applicable to the second use case (applying for a study grant), as both use cases plan to implement the same interaction pattern. All components that do not directly contribute to the MVP are out of scope for this architecture.
2. This solution architecture applies to the User-supported intermediation pattern only, relevant for the SA UC#1 and UC#2. The verifiable credentials pattern that will be implemented for the SA UC#3 has not been covered by this document.
3. The solution to implement should be production-worthy as the goal of the SA pilot is to pilot in a close-to-production environment.
4. In the MVP the SA pilot will use just one type of evidence (‘higher education diploma’) that all DCs and DPs involved will use. There will be just one data provider per Member State and the DC will request just one Member State for the evidence.

A.1.2 DE4A preconditions

The SA solution architecture implements some DE4A-wide decisions:

1. The OOP TS consists of functionality for evidence exchange as well as the information desk. DE4A uses eDelivery for implementing the evidence exchange functionality. Other options for messaging have not been considered in constructing this solution architecture.
2. DE4A uses eIDAS. Other options have not been considered in constructing this solution architecture.

A.1.3 Design choices

The SA pilot partners made several choices in implementing the SA pilots:

1. The SA pilot uses the eIDAS mandatory personal data set to communicate the user identity information. DPs can request for additional attributes needed for record matching. As MVP will only cover two-country scenarios, the students can also use their national identities for authenticating at the DP if supported by national central authentication systems, such as SI-CAS in Slovenia.
2. The SA pilot will use the OOP TS for retrieving the student's data needed for the eProcedure.
3. The SA pilot will use existing eIDAS nodes in the participating Member States.

A.1.4 eIDAS and OOP TS

The SA pilot implements the reference processes of the DE4A's project start architecture to meet the requirement of the SA pilot. In designing the solutions for the processes, SA distinguishes between the:

1. **SA eIDAS solution architecture**
   The architecture for using eIDAS to authenticate the natural person. See Chapter A.2.
2. **SA OOP TS solution architecture**
   The architecture for using the OOP TS for exchange of student data between the data consumer and the data provider. See Chapter A.3.

Each of the (sub) solution architectures is divided in:

   a. Shared solution: the common part of the solution.
      The application services that are common to the SA pilot UC#1 and UC#2. These are typically the application services that are part of the Once Only Technical System (OOP TS) and eIDAS. The SA pilot expects WP3 and WP5 to select, design and develop the components needed for these common application services. These components need to be deployed and configured by each of the piloting Member State.
   b. DC-specific solution: the part of the solution the DC has to implement.
   c. DP-specific solution: the part of the solution the DP has to implement.

The eIDAS network is a – from the OOP TS – separate network of eIDAS nodes and their connections. It is linked to the OOP TS via the data consumer that coordinates the eProcedure portal and the data provider that coordinates the Evidence portal.

A.2 SA eIDAS solution

The roles defined in the PSA refer to the party's involvement in the exchange of evidence. For SA, besides that also the eIDAS domain is of utmost importance. As eIDAS does not deal with evidence exchange as such, but with information on identities, different roles are involved.

The additional roles for eIDAS are:

- Authentication connector: the actor that – typically at a Member State level – connects to the eIDAS network as a relying party. Via the authentication connector, the data consumer or data provider can request student authentication.
- Authentication proxy: the actor that connects the national (notified and non-notified) eID(s) to the eIDAS network. The authentication proxy role coordinates the authentication process. In the two-country scenario, authentication takes place in the data providing Member State as the user and its eID are expected to be from the DP Member State. In the multiple-country scenario, which will not be validated in the first iteration, the authentication proxy can be in third Member State (different from the data consumer and data provider Member States).

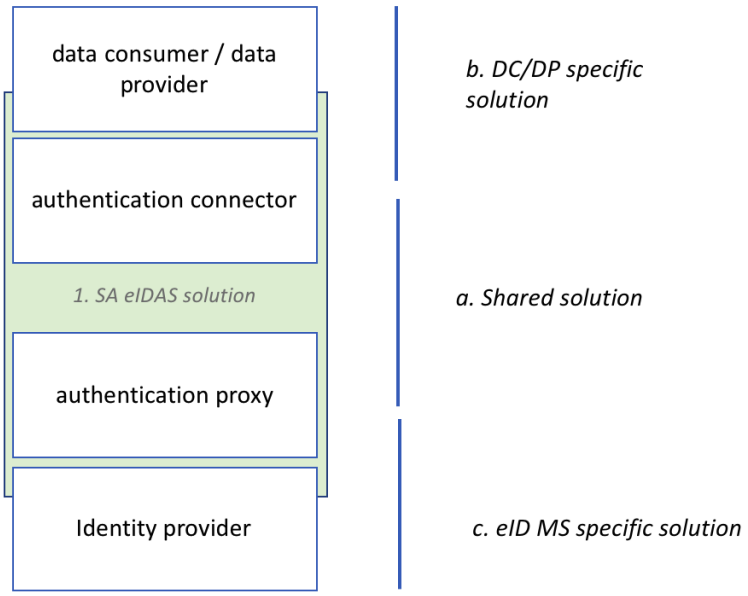

Figure 7: SA eIDAS Solution

In the eIDAS domain the roles "authentication connector" and "authentication proxy" handle cross-border requests for authentication. In the case of two-country scenario the authentication connector of the DC-Member State sends an authentication request to the DP-Member State. The authentication proxy coordinates all national activities (IdP) and returns the authentication result to the authentication connector. DP needs to do the record matching of the students and request additional attributes in case the minimal attribute data set is not sufficient for uniquely identifying a student.

A.2.1 Shared solution

The shared solution consists of common functionality that is part of the core eIDAS network.

A.2.1.1 Process realisation

The table below presents the components that implement the common application services for the SA pilot.

Table 111: Common application services

Role	Process	Application service	Components
Authentication connector	Request authentication	Authentication initiation	eIDAS connector
Authentication proxy	Provide authentication details (user)	User authentication	eIDAS proxy

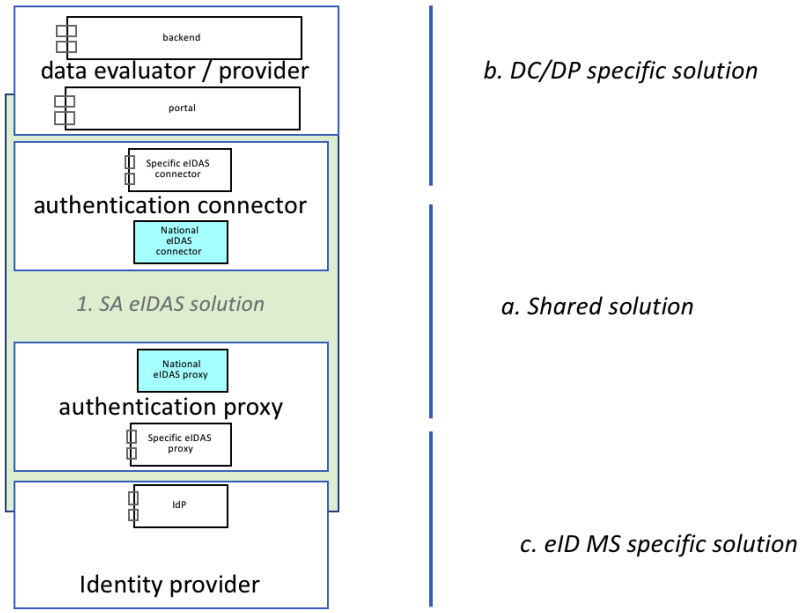

Figure 8: Solution Architecture: Common application services

A.2.1.2 Component description

Table 112: eIDAS solution: Component description

Component	Short description of its use
eIDAS connector	The component Member States implement to connect to the eIDAS network as a relying party. The connector accepts authentication requests from the service providers of the Member State and forwards the requests to the Member States that needs to authenticate the user. After authentication, the eIDAS connector receives the authentication results and sends them to the requesting service provider (relying party). The eIDAS connector can be implemented using CEF's reference software or a custom implementation compliant to the eIDAS interoperability specifications. The CEF reference software implements – besides the eIDAS SAML profile – also the JSON/REST eIDAS Light protocol to connect to national infrastructure.
eIDAS proxy	The component Member States implement to allow authentication with their (notified) eID for services provided in other Member States. The eIDAS proxy receives authentication requests from relying Member States and coordinates authentication. The eIDAS proxy then sends the result to the requesting eIDAS connector. Just like the eIDAS connector, the eIDAS proxy can be implemented using CEF's reference software or a custom implementation compliant to the eIDAS interoperability specifications. The CEF reference software implements – besides the eIDAS SAML profile – also the JSON/REST eIDAS Light protocol to connect to national infrastructure.

A.2.1.3 Requirements

The SA pilot did not define any additional requirements for the common eIDAS components (connector, proxy). The CEF reference software fulfils the needs of the SA pilot. However, there is a need to support non-notified Slovenian eIDs in order for Slovenian students to be able to participate in the trials of MVP.

Table 113: eIDAS solution: Requirements

Requirement	Iteration 1 MVP	Iteration 2 Final version
MS support for non-notified eIDs in the pre-production eIDAS nodes.	Y	Y

A.2.1.4 Component Implementation

The national eIDAS pre-production systems are planned to be used.

A.2.2 DC-specific solution

The DC-specific eIDAS architecture consists of the data evaluator specific services and the authentication connector specific services. The DC specific solution is different for every DC. Its solution architecture will be specified in the design documents of the DC pilot processes (one for each data consumer). Nonetheless the DC-specific solution at a higher level of abstraction shows similarities. These will be addressed in this section.

A.2.2.1 Process realisation

The table below presents the components that implement the application services for the SA pilot.

Table 114: DC: Components implemented by application services

Role	Process	Application service	Components
Data evaluator	Request authentication	Authentication initiation (collaboration: eProcedure portal)	eProcedure portal and backend (different for each DC participant)
Authentication connector	Request authentication	Authentication initiation (collaboration: eProcedure portal)	Specific eIDAS connector (different for each Member State).

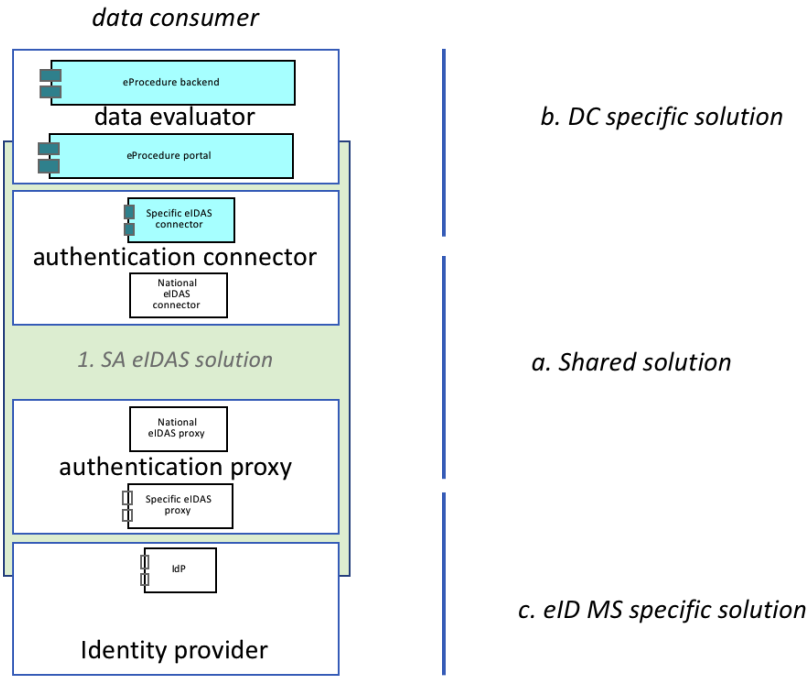

Figure 9: Solution architecture: Data consumer

A.2.2.2 Component description

Table 115: DC Components description

Component	Short description of its use
eProcedure portal	The eProcedure portal (like portal.evs.gov.si) should connect to the national specific eIDAS connector. This requires the eProcedure portal to add the eIDAS login option to the login-webpage and the interface to the specific eIDAS connector (see below). Of relevance here is the type of eIDAS authentication request that the portal should implement: ▸ authentication at LoA substantial or high ▸ requesting the natural person attributes (at least the mandatory ones) After receiving the authentication response, the MS specific portal should: ▸ deny the user access to the procedure in case of an "authentication failed". ▸ grant the user access to the procedure in case of an "authentication successful".
eProcedure back-end	The eProcedure back-end handles all eProcedure specific functions.

A.2.2.3 Requirements

The table below presents the requirements that the data evaluator and the authentication connector must implement. These concern the DC specific implementation only.

Table 116: DC requirements

Role	Requirement	Iteration 1 MVP	Iteration 2 Final version
Data evaluator	The eProcedure portal adds an eIDAS login option for piloting.	Y	Y
	The eProcedure portal connects to a *national* eIDAS node in pre-production.	Y	Y

A.2.3 DP-specific solution

The DP-specific eIDAS architecture is similar to the DC specific architecture and consists of the data providers specific services and the authentication connector specific services. The DP specific solution is different for every DP. Its solution architecture will be specified in the design documents of the DP pilot processes (one for each data provider). Nonetheless the DP-specific solution at a higher level of abstraction shows similarities. These will be addressed in this section.

A.2.3.1 Process realisation

The table below presents the components that implement the application services for the SA pilot.

Table 117: DP Components implemented by application services

Role	Process	Application service	Components
Authentication proxy	Provide authentication details	User authentication	Specific eIDAS proxy (different for each Member State).
Authentication connector	Request authentication	Authentication initiation (collaboration: Evidence portal)	Specific eIDAS connector (different for each Member State).

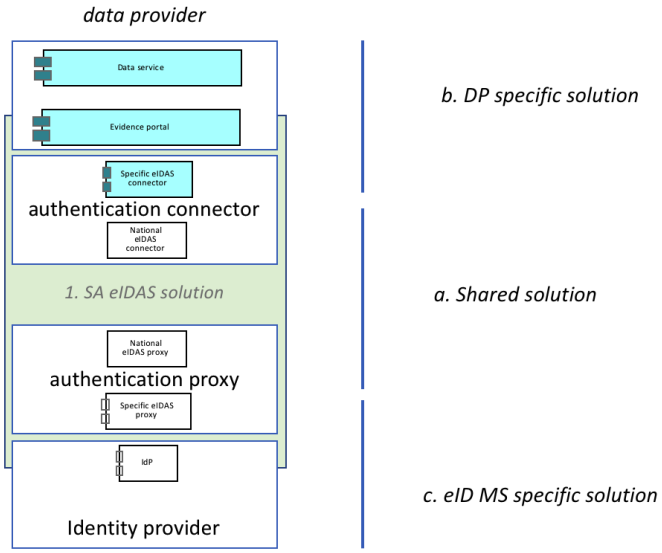

Figure 10: Solution architecture: Data provider

A.2.3.2 Component description

Table 118: DP Components description

Component	Short description of its use
Evidence portal	The Evidence portal (like eGovernment portal in Slovenia) should connect to the national specific eIDAS connector. This requires the Evidence portal to add the eIDAS login option to the login-webpage and the interface to the specific eIDAS connector (see below). Of relevance here is the type of eIDAS authentication request that the portal should implement: ▸ authentication at LoA substantial or high ▸ requesting the natural person attributes (at least the mandatory ones) After receiving the authentication response, the MS specific portal should perform the student identity/record matching.
Data service	The webservice of the data provider that will output the evidence requested.

A.2.3.3 Requirements

The table below presents the requirements that the data provider must implement.

Table 119: DP requirements

Role	Requirement	Iteration 1 MVP	Iteration 2 Final version
Data provider	The Evidence portal adds an eIDAS login option for piloting.	Y	Y
	The Evidence portal connects to a *national* eIDAS node in pre-production.	Y	Y
	The Evidence portal asks the student to provide additional attributes for identity/record matching.	N	Y
	The Evidence portal provides single sign-on support for the cases where multiple evidence requests are expected at the same data provider.	N	Y

A.3 SA OOP TS solution

The shared solution for the OOP TS consists of all common functionalities of the OOP technical system. Most of the common OOP TS components need to be implemented by the data requestor and data transferor (in all participating MS, DR and DT will be separate from DE and DO), although the OOP TS uses two central components as well.

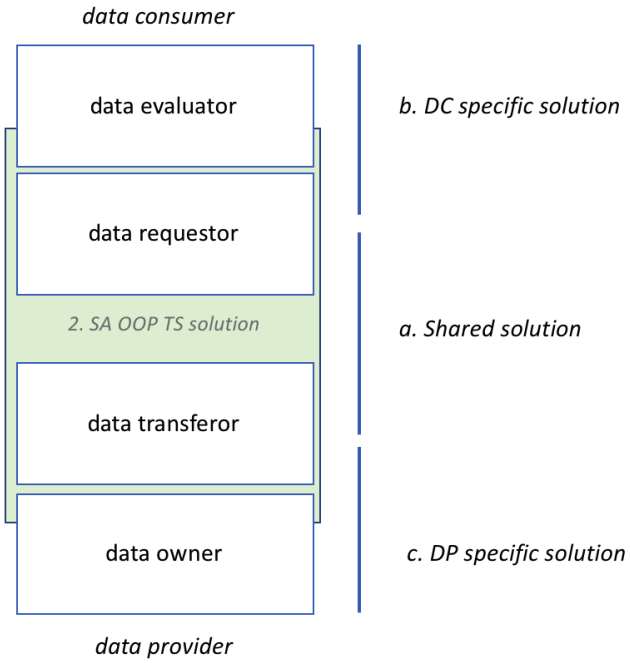

Figure 11: Solution architecture: SA OOP TS

A.3.1 Shared solution

The OOP TS domain (WP5) should provide the data requestor and data transferor with the components needed for cross-border evidence exchange. WP3 should provide the data consumer with the components needed for interaction with the information desk.

Although the explicit request will be implemented by the DC in its eProcedure portal and the preview functions by the DP in its Evidence portal, SA expects guidelines for doing so (MVP) and reference software to ease the implementation. The same applies to the guidelines and reference software for the use of the IAL and ESL components of the Information desk.

That's why the requirements for these functionalities have been included in this section.

A.3.1.1 Process realisation

The table below presents the components that implement the application services for the SA pilot.

Table 120: OOP TS: Components implemented by application services

Process	Application service	Components
Lookup routing information (DC)	Inquire routing information (collaboration: information desk)	• DE4A connector • Issuing authority locator (IAL) configuration file • Evidence service locator (ESL) configuration file • SMP • DNS & SML
Request evidence (DC)	Message encryption e-signature creation service data exchange service	• DE4A Connector • eDelivery AS4 gateway

Forward evidence (DC)	Message decryption e-signature verification and validation service data exchange service	• DE4A Connector • eDelivery AS4 gateway
Evaluate evidence request (DP)	Message decryption e-signature verification and validation service data exchange service	• DE4A Connector • eDelivery AS4 gateway
Transfer evidence (DP)	Message encryption e-signature creation service data exchange service	• DE4A connector • SMP • DNS & SML

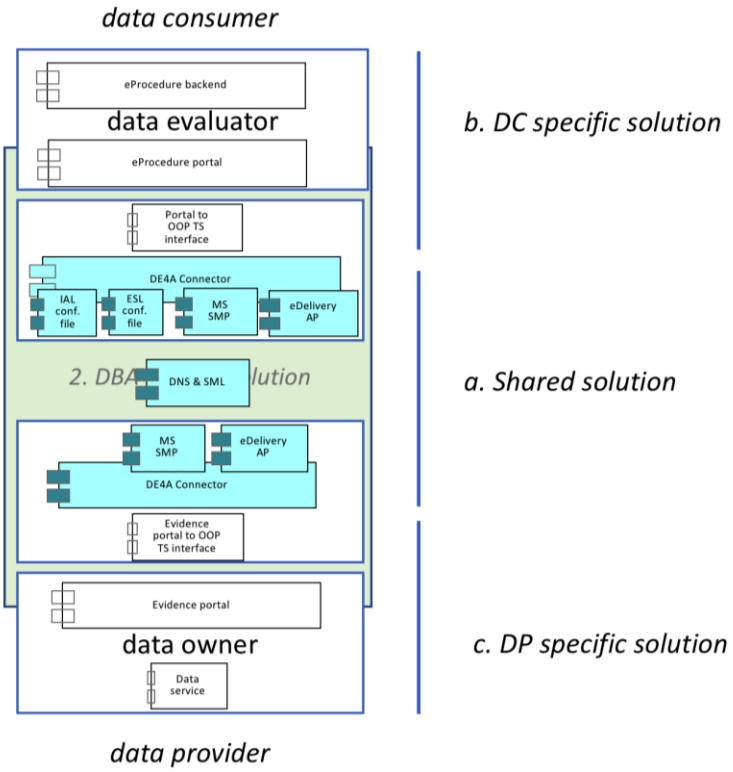

Figure 12: Solution architecture: OOP TS Shared components

A.3.1.2 Component description

Table 121: OOP TS: Components description

Component	Short description of its use
Issuing Authority Locator (IAL) configuration file	The diploma issuing authorities can be located at a national level (Slovenia, Spain), or university level (Portugal). The information will be stored in a configuration file for MVP.
Evidence service locator	The information about evidence service locations will be stored in a

Component	Short description of its use
(ESL) configuration file	configuration file for MVP.
SMP	For each evidence request and response, information on the receivers Access Point (URL) and its certificates are needed. It is expected there will a common project SMP for the test phase, while each Member State will host an SMP for the close-to-production phase. Before sending a request or response, the sending party queries the SMP of the receiver to get this info.
DNS & SML	As there are multiple SMPs, the sending party needs to know where to find the SMP of the receiver to get the actual metadata. This location can be found in the centrally CEF-hosted DNS, that will be queried by the access point of the sending Member State. DNS entries will be created from the registration of SMPs: the SML, which is also centrally hosted by CEF.
eDelivery AP (AS4 gateway)	This component – also referred to as eDelivery access point – handles the secure transfer of the data, including encryption and decryption as well as signing/sealing and validating signatures/seals.
DE4A Connector	The DE4A connector is the reference software that data requestors and data transferors can use to connect to the OOP TS. This eases the work by abstracting the communication with the components.

For the first pilot run the following Information desk components do not need to be implemented:

- Cross-border Access Authorisation Registry (CAAR): The CAAR helps the DP to check if the request has the required authorization. This is not needed for the MVP of the SA pilot as the pilot network will be limited to just the pilot partners only. The DPs will not validate the DC's authorisation to request the information in the first pilot run. In the final pilot run, the DPs may validate the authority if needed.
- Multilingual Ontology repository (MOR): SA will not implement a translation mechanism in MVP. The attributes are well defined and understood by the data evaluators participating in the pilot. All data elements (attributes) of the diploma evidence will be transformed into the canonical evidence as defined in the SA pilot.

A.3.1.3 Requirements

The table below presents the requirements for the common application services in the OOP TS domain. Please note that the requirements for the second pilot run (not MVP) have been included as a sketch only (and have been greyed out). It is likely additional requirements for the second pilot run will be defined later on in the project.

Table 122: OOP TS: requirements

Application Service	Requirement	Iteration 1 MVP	Iteration 2 Final version
Data Exchange Service	Provides support for requesting a specific (canonical) evidence type, where an evidence type is defined as a fixed collection of evidence data-elements.	Y	Y
	Supports evidence requests, including in the request the following data-elements:	Y	Y

Application Service	Requirement	Iteration 1 MVP	Iteration 2 Final version
	▸ data evaluator ▸ data evaluating Member State ▸ eIDAS natural person minimum dataset ▸ data providing Member State ▸ data provider ▸ requested canonical evidence type		
	The request and the response are uniquely relatable.	Y	Y
	The exchange of evidence is uninterrupted. The user will wait online for the evidence to be available at the DC.	Y	Y
	The response message supports the Studying Abroad evidence type.	Y	Y
	The service response is either the evidence(success) or a failure message.	Y	Y
	The service supports functional and technical error codes in case of failed request processing.	Y	Y
	The service provides a response within 10 seconds.	N	Y
	The service supports encrypted exchange of the request and the response between Member States (DR & DT). The service establishes a trust relation between DP and DC.	Y	Y
	Supports logging & audit trail of the following data: ▸ Data consumer ▸ Data provider ▸ Evidence type ▸ Hash of the evidence (not the evidence itself) ▸ Date and time of exchange ▸ Result (success, fail) ▸ Reason for fail (…)	N	Y
	The service enables multiple requests to the same data provider with one redirection and one preview or a request for list of evidences.	N	Y
Inquire routing information	Minimum functionality needed for correct routing on a technical level.	Y	Y
Message encryption	Basic message encryption	Y	Y
Message decryption	Basic message decryption	Y	Y
e-Signature Creation Service	Basic message signing / sealing	Y	Y
e-Signature	Basic verification of signatures/seals	Y	Y

Application Service	Requirement	Iteration 1 MVP	Iteration 2 Final version
Validation Service			

Although each eProcedure portal will implement the explicit request individually, the SA pilot specifies the requirements for a common user interaction in the MVP.

Table 123: OOP TS: requirements for USI

Application Service	Requirement	Iteration 1 MVP	Iteration 2 Final version
Explicit request	Contains UX guidelines for the explicit request web page that Data Evaluators need to implement in their system: ▸ The GUI allows the user to proceed with the evidence retrieval or to select an alternative channel. ▸ The UX guidelines specify the user interaction components (button or checkbox, placement of text with relation to interaction components…) ▸ The UX guidelines specify the visual design requirements (font, colour, images, …) ▸ Contains text that needs to be displayed to inform user about the explicit request. - The text is compliant to legal requirements (SDG, pilot situation, …) - The text is compliant to user centricity requirements (understandable, …) ▸ Include wireframes (GUI mockups)	Y	Y
	The Explicit Request service should be available as reference software (to be implemented by data evaluator or data requestor).	N	Y
	Supports logging & audit trail of the following data: ▸ Data consumer ▸ Data provider ▸ Evidence type ▸ Date and time of explicit request ▸ Result (approved, denied) ▸ Reason for denial (…)	N	Y
	The explicit request GUI and reference software have logic for handling legal exceptions that exist for an explicit request, meaning that the option to explicit request will only be offered in cases that this is required by SDGR.	N	Y
Inquire routing	Contains UX guidelines for the selection of issuing authorities and evidence service endpoints that Data	Y	Y

Application Service	Requirement	Iteration 1 MVP	Iteration 2 Final version
information	Evaluators need to implement in their portal		

A.3.1.4 Component implementation

CEF hosts a central DNS & SML that is widely in use today. SA expects DE4A to use these components as well. The Issuing Authority Locator (IAL), Evidence service locator (ESL), and the DE4A Connector need to be implemented by WP3 and WP5. The SMP and the eDelivery AS4 gateway need to be set up by the participating Member States.

A.3.2 DC-specific solution

The DC specific solution is different for every DC. The DC specific solution architecture will be specified in the design document of the pilot processes. Nonetheless the DC-specific solution at a higher level of abstraction show similarities.

The DC specific architecture consists of the evaluator and requestor specific services. The requestor specific services are typically implemented at Member State level.

A.3.2.1 Process realization

Table 124: OOP TS DC scenario: Process realization

Process	Application service	Components
Request authentication	Authentication initiation	eProcedure backend
Evaluate evidence	Evidence status tracker Requirements/evidence matching	eProcedure portal
Request public service	eProcedure initiation	eProcedure portal
Abort eProcedure	eProcedure termination	eProcedure portal
Request OOP transfer of evidence	Explicit request	eProcedure portal portal to OOP TS interface
Follow evidence status	Evidence status overview	eProcedure portal portal to OOP TS interface
Receive acknowledgement of receipt	eProcedure confirmation	eProcedure portal portal to OOP TS interface
Submit eProcedure	eProcedure submission	eProcedure portal
Receive public service result	receive (public) service result	eProcedure portal

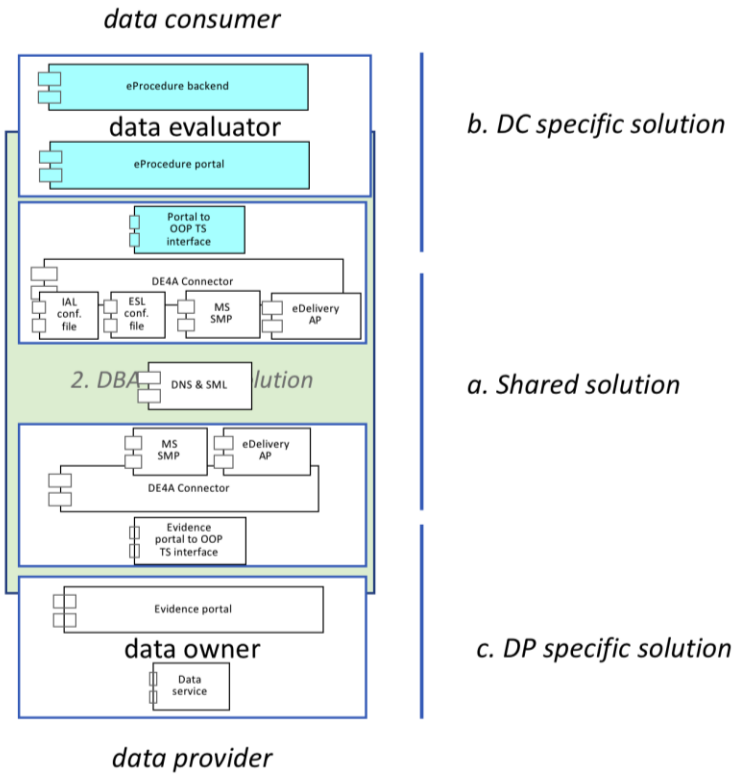

Figure 13: Solution architecture: SA OOP TS DC components

A.3.2.2 Component description

Table 125: OOP TS DC scenario: components

Component	Short description of its use
eProcedure portal	The eProcedure portal should be adapted to support the use of the cross-border evidence in the process. For that purpose, it should facilitate the user in the OOP-process and connect to the OOP TS. Connection to the OOP TS is typically implemented via a Portal-to-OOP TS-interface that may utilise national OOP-protocols and infrastructure.
eProcedure backend	The eProcedure backend handles all eProcedure specific logic. For the SA pilot this backend functionality basically remains unchanged.
Portal to OOP TS interface	Member States may (but do not need to) implement an interface from national OOP protocols to the DE4A data model (DE4A connector). Such an interface guarantees that the data evaluator can use the same (national) OOP protocols and services for cross-border use as well.

A.3.2.3 Requirements

The requirements below need to be implemented by the data evaluator and/or data requestor.

Table 126: OOP TS DC scenario: Requirements

Application Service	Requirement	Iteration 1 MVP	Iteration 2 Final version
eProcedure Initiation	The eProcedure portal has web page with the option to start the eService to pilot.	Y	Y
	The eProcedure portal is connected to (national) OOP TS.	Y	Y
eProcedure termination	The eProcedure portal has web page with information on the termination of the eService mentioning the alternative channel.	Y	Y
eProcedure save and resume	Not to be implemented by SA		
eProcedure confirmation	The eProcedure portal confirms use of the evidence received to the user.	Y	Y
eProcedure submission	The eProcedure portal has web page to inform user that it applies for the eProcedure when proceeding.	Y	Y
Alternative channel	The eProcedure portal has a web page stating that the alternative channel is out of scope for the pilot.	Y	Y
Procedural requirements determination	The eProcedure portal implements requirements validation in case that is required for the eProcedure.	Y	Y
Available evidence determination	Not to be implemented by SA		
Evidence status overview	The eProcedure portal shows whether evidence retrieval has been successful or failed.	Y	Y
	The eProcedure portal shows more detailed information on status of evidence exchange.	N	Y
	In case of a fail: the eProcedure shows information on the reason for non-availability of the evidence.	N	Y
Evidence request tracker	Session management to be implemented by eProcedure portal to make sure each request receives a response.	Y	Y
Evidence status tracker	Provides information on success and failure only.	Y	Y
	Provides more detailed information on the reason for failing.	N	Y
Explicit request	The data evaluator implements the UX guidelines to be provided by WP5	Y	Y
	The data evaluator may implement the explicit request component to be provided by WP5.	N	Y

A.3.3 DP-specific solution

The DP specific solution is different for every DP. The DP specific solution architecture will be specified in the design document of the pilot processes. For example, there can exist a central national component (Evidence portal) that can query for evidence at different national data owners/registries (see Slovenian service Pladenj as an example) without a need for a user to be redirected to and authenticate at those data owners, prepare a preview on the basis of the obtained evidence, and ask the user for triggering evidence transfer to DC. In other MS, the student could be asked to authenticate and preview evidence directly at the data owners, which can become not user friendly in the case of multiple evidences, especially if all evidences are provided by the same data provider.

Nonetheless the DP-specific solution at a higher level of abstraction show similarities. The DP specific solution consists of:

1. Data owner specific services:

   The application services that are specific to a single data owner. Furthermore, the data owner needs to connect its data services to the national OOP TS components.

2. Data transferor specific services:

   The Member State specific parts of eIDAS and the OOP TS that may be needed for integration of eIDAS and the OOP TS into current national OOP-networks (if applicable).

A.3.3.1 Process realisation

Table 127: OOP TS DP scenario: Process realization

Process	Application service	Components
Evaluate evidence request	Data exchange service	Portal to OOP TS interface
Generate URL for direct user interaction	Persistent URL generation	Evidence portal
Extract evidence	Evidence lookup	Data service
Prepare preview	Prepare preview	Evidence portal
Transfer evidence	Data exchange service	Portal to OOP TS interface

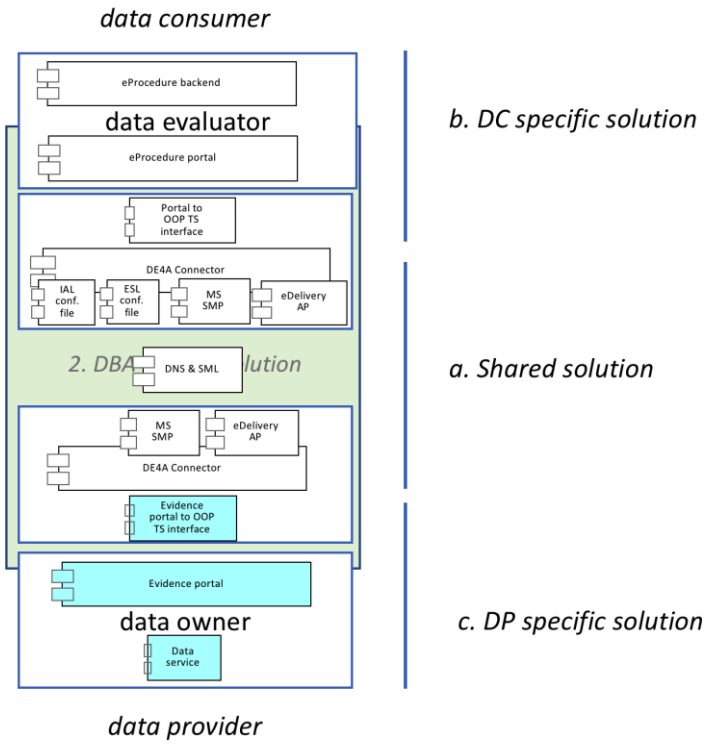

Figure 14: Solution architecture: SA OOP TS DP components

A.3.3.2 Component description

Table 128: OOP TS DP scenario: Components

Component	Short description of its use
Evidence portal	The portal at the data provider where the user can authenticate and preview evidence.
Data service	The webservice of the data provider that will output the evidence requested.
Evidence portal to OOP TS interface	Member States may (but do not need to) implement an interface from national OOP protocols to the DE4A data model (DE4A connector).

A.3.3.3 Requirements

The table below presents the requirements for the DP-specific part of the solution. These requirements need to be fulfilled by the data owner and/or data transferor.

Table 129: OOP TS DP scenario: requirements

Application Service	Requirement	Iteration 1 MVP	Iteration 2 Final version
Evidence preview	Contains UX guidelines for the preview web page that Data Providers need to implement in their system:	Y	Y

Application Service	Requirement	Iteration 1 MVP	Iteration 2 Final version
	▸ The preview allows the user to optionally view the evidence retrieved. ▸ The preview is able to display the Studying Abroad evidence type. ▸ The preview allows the user to accept or deny the evidence transfer. ▸ The UX guidelines specify the user interaction components (button or checkbox, placement of text with relation to interaction components…) ▸ The UX guidelines specify the visual design requirements (font, colour, images, …) ▸ Contains text that needs to be displayed to inform user about the preview. - The text is compliant to legal requirements (SDG, pilot situation, …) - The text is compliant to user centricity requirements (understandable, …) - Include wireframes (GUI mockups)		
	The preview allows the user to select a reason for denial (e.g. error in data).	N	Y
	The preview provides for a feedback mechanism to the data provider in case there is an error in the data.	N	Y
	The data provider implements the UX guidelines to be provided by WP5	Y	Y
Evidence lookup	Adapt the DP data service to provide the SA canonical evidence.	Y	Y
	Connect the data service to the OOP TS.	Y	Y
Identity/record matching	Matching of identities and student records at DP	Y	Y
Persistent URL generation	Generation of URL where the user should be redirected by DC	Y	Y
Message decryption	Basic message decryption	Y	Y
Message encryption	Basic message encryption	Y	Y
eSignature creation service	Basic message signing / sealing	Y	Y
eSignature verification and validation service	Basic eSignature / eSeal verification	Y	Y

A.4 Archimate component diagrams

A.4.1 SA eIDAS solution architecture example

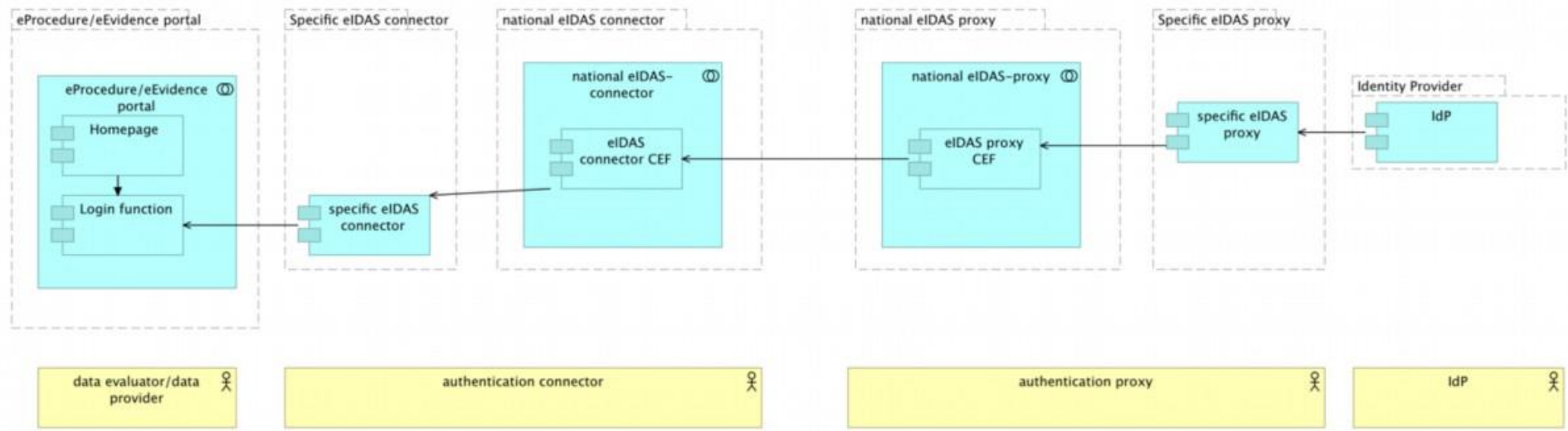

Figure 15: SA eIDAS solution architecture example

A.4.2 OOP TS solution architecture example

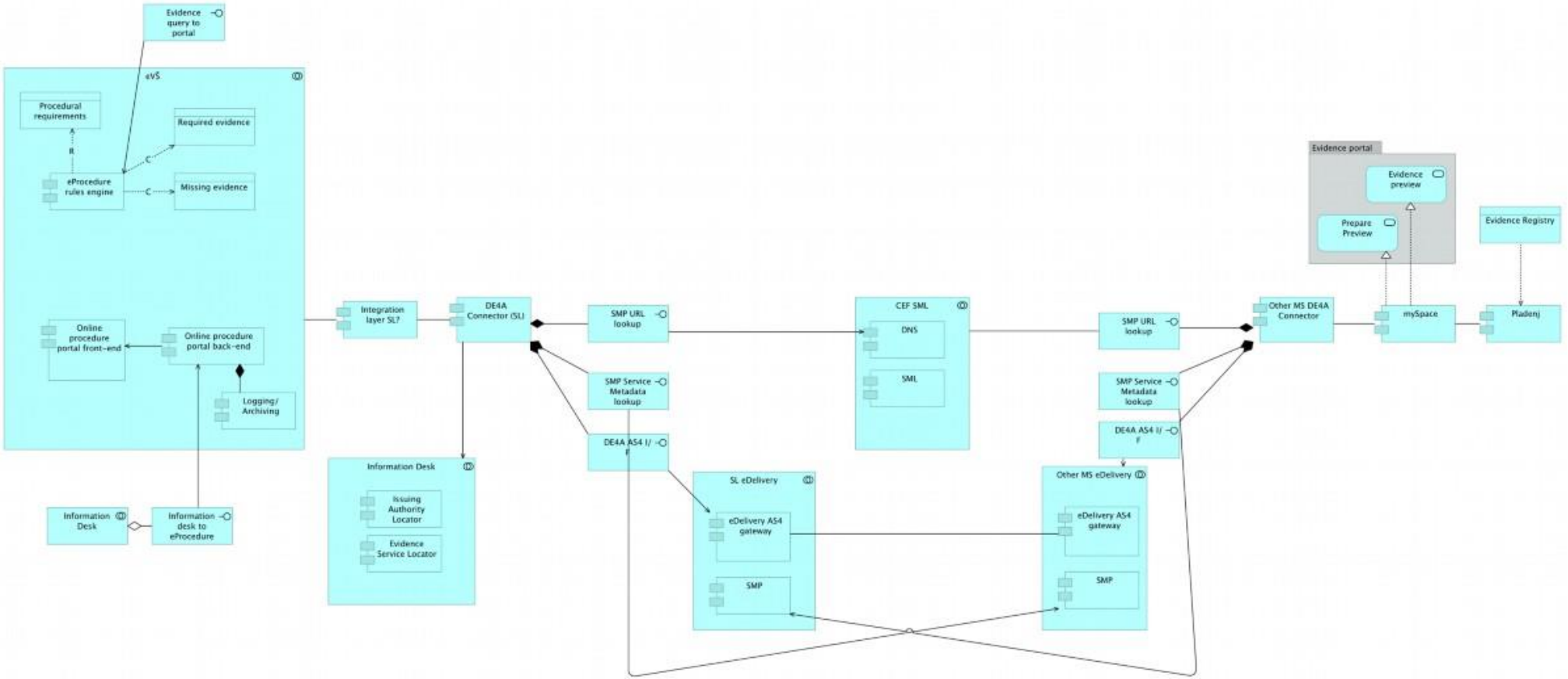

Figure 16: SA OOP TS solution architecture example

B Annex B: XSD of Pilot Evidence Types

```
<?xml version="1.0" encoding="utf-8"?>
<xsd:schema elementFormDefault="qualified"
                        xmlns:xsd="http://www.w3.org/2001/XMLSchema"

        xmlns:cbc="urn:oasis:names:specification:ubl:schema:xsd:CommonBasicComponents-2"
                        xmlns:sa="urn:eu-
de4a:xsd:CanonicalEvidenceType::HigherEducationEvidence:v1.0"
                        xmlns:edci="http://data.europa.eu/europass/model/credentials#"
                        targetNamespace="urn:eu-
de4a:xsd:CanonicalEvidenceType::HigherEducationEvidence:v1.0">
        <xsd:import namespace="http://data.europa.eu/europass/model/credentials#"
schemaLocation="edci_credentialTypes.xsd"/>
        <xsd:import namespace="http://www.w3.org/ns/corevocabulary/BasicComponents"
schemaLocation="CoreVocabularyBasicComponents-v1.00.xsd"/>
        <xsd:import
namespace="urn:oasis:names:specification:ubl:schema:xsd:CommonBasicComponents-2"
schemaLocation="common/UBL-CommonBasicComponents-2.0.xsd"/>
        <xsd:import
namespace="urn:un:unece:uncefact:data:specification:UnqualifiedDataTypesSchemaModule:2"
schemaLocation="common/UnqualifiedDataTypeSchemaModule-2.0.xsd"/>
        <xsd:element name="HigherEducationDiploma" type="sa:HigherEducationDiplomaType"/>
        <xsd:complexType name="HigherEducationDiplomaType">
                <xsd:complexContent>
                        <xsd:extension base="edci:AchievementType">
                                <xsd:sequence>
                                        <xsd:element name="degree" type="edci:TextType"
minOccurs="1" maxOccurs="unbounded">
                                                <xsd:annotation>
                                                        <xsd:documentation>An academic title or
degree obtained by the student and proven by this diploma or certificate
(evidence)</xsd:documentation>
                                                </xsd:annotation>
                                        </xsd:element>
                                        <xsd:element name="country"
type="edci:MDRCountryCodeEnumType" minOccurs="1" maxOccurs="1">
                                                <xsd:annotation>
                                                        <xsd:documentation>Country where the
study programme was completed by the student</xsd:documentation>
                                                </xsd:annotation>
                                        </xsd:element>
                                        <xsd:element name="institutionName" type="edci:TextType"
minOccurs="1" maxOccurs="unbounded">
                                                <xsd:annotation>
                                                        <xsd:documentation>The name of the higher
education institution where the student obtained the degree</xsd:documentation>
                                                </xsd:annotation>
                                        </xsd:element>
```

```
                                        <xsd:element name="studyProgramme"
type="edci:TextType" minOccurs="1" maxOccurs="unbounded">
                                                <xsd:annotation>
                                                        <xsd:documentation>Name of a study
programme that the student finished at the higher education institution in order to obtain the
degree</xsd:documentation>
                                                </xsd:annotation>
                                        </xsd:element>
                                        <xsd:element name="mainFieldOfStudy"
type="edci:IscedFOetCodeType" minOccurs="1" maxOccurs="1">
                                                <xsd:annotation>
                                                        <xsd:documentation>Field of finished higher
education</xsd:documentation>
                                                </xsd:annotation>
                                        </xsd:element>
                                        <xsd:element name="modeOfStudy"
type="edci:LearningScheduleTypeEnumType" minOccurs="1" maxOccurs="1">
                                                <xsd:annotation>
                                                        <xsd:documentation>Mode of
study</xsd:documentation>
                                                </xsd:annotation>
                                        </xsd:element>
                                        <xsd:element name="durationOfEducation"
type="xsd:duration" minOccurs="1" maxOccurs="unbounded">
                                                <xsd:annotation>
                                                        <xsd:documentation>Official duration of
education - see 'xsd:duration' documentation for the correct format of duration
values</xsd:documentation>
                                                </xsd:annotation>
                                        </xsd:element>
                                        <xsd:element name="scope"
type="edci:ECTSCreditPointsType" minOccurs="1" maxOccurs="1">
                                                <xsd:annotation>
                                                        <xsd:documentation>The official workload of
the study programme in the ECTS (European Credit Transfer and Accumulation System) credit
points</xsd:documentation>
                                                </xsd:annotation>
                                        </xsd:element>
                                        <xsd:element name="dateOfIssue" type="cbc:DateType"
minOccurs="1" maxOccurs="1">
                                                <xsd:annotation>
                                                        <xsd:documentation>Date of issue of the
certificate or diploma</xsd:documentation>
                                                </xsd:annotation>
                                        </xsd:element>
                                        <xsd:element name="placeOfIssue"
type="edci:LocationType" minOccurs="1" maxOccurs="1">
                                                <xsd:annotation>
                                                        <xsd:documentation>Place of issue (location)
of the certificate or diploma</xsd:documentation>
                                                </xsd:annotation>
```

```
                                        </xsd:element>
                                        <xsd:element name="holderOfAchievement"
type="edci:PersonType" minOccurs="1" maxOccurs="1">
                                                <xsd:annotation>
                                                        <xsd:documentation>Person that has
obtained the academic title or degree</xsd:documentation>
                                                </xsd:annotation>
                                        </xsd:element>
                                </xsd:sequence>
                        </xsd:extension>
                </xsd:complexContent>
        </xsd:complexType>
        <xsd:simpleType name="ModeOfStudy">
                <xsd:restriction base="xsd:string">
                        <xsd:enumeration value="distance learning"/>
                        <xsd:enumeration value="full time"/>
                        <xsd:enumeration value="part time"/>
                </xsd:restriction>
        </xsd:simpleType>
</xsd:schema>
```

C Annex C: User Feedback Forms Drafts

Questionnaire for Data Evaluators (USI pattern)

A1.1	Please rate your appreciation of the quality of student data when using the DE4A OOP TS compared to the traditional situation where the DE4A OOP TS is not used, focusing on the following aspects:	Very low	Low	Neutral	High	Very high
	Availability in electronic format					
	If the value is “Very low” or “Low”, please explain briefly what were the issues with availability in electronic format					
	Availability in structured format					
	If the value is “Very low” or “Low”, please explain briefly what were the issues with availability in structured format					
	Completeness of available data					
	If the value is “Very low” or “Low”, please explain briefly what were the issues with completeness of available data					
	Correctness of available data					
	If the value is “Very low” or “Low”, please explain briefly what were the issues with correctness of available data					
	Reliability of available data					
	If the value is “Very low” or “Low”, please explain briefly what were the issues with reliability of available data					
	Meaningfulness of available data					
	If the value is “Very low” or “Low”, please explain briefly what were the issues with meaningfulness of available data					

A2.1	Please rate the effort required for processing student data when using the DE4A OOP TS compared to the traditional situation where the DE4A OOP TS is not used, focusing on the following aspects:	Considerably more effort	More effort	Same effort	Less effort	Considerably less effort
	Amount of work					
	Interpretation of data					
	Solving transcription and translation errors, missing data and exceptions					
	If the benefits are estimated as smaller than the cost and effort for any of the aspects, please explain briefly why					
	Please estimate the effort saved in processing student data in minutes per application					
D2.1	Please estimate the benefits compared to the costs and effort required to customize the eProcedure portal and integrate it with the DE4A Connector, focusing on the following aspects	Considerably less than cost and effort	Less than cost and effort	On par with cost and effort	Exceeding cost and effort	Considerably exceeding cost and effort
	Lower manual effort for processing					
	Lower communications cost					
	Lower risk of errors that result from manual processing and language challenges					
	Shorter duration of application processing					
	• Please estimate the change of duration of application processing in minutes per application					
	More complete, valuable, consistent and correct data available					
	Trustworthiness of the data					
	If the benefits are estimated as smaller than the cost and effort					

	for any of the aspects, please explain briefly why					
D2.2	Please estimate the effort required for completing the following activities when customizing and integrating the eProcedure portal to the DE4A Connector in person days (enter N/A if the activity was not needed):					
	Integration of the portal with an eIDAS node					
	Implementation of explicit request					
	Integration of the portal with the DE4A Connector					
	Transformation from canonical format and use of the received evidence					
	UI internationalization					
	Overall effort					
		Absolutely inadequate	Inadequate	Sufficient	Adequate	Perfectly adequate
F1.1	Please indicate to which extent the higher education evidence model satisfies your needs for information on the students when performing the e-procedure					

Questionnaire for Data Evaluators (VC pattern)

A1.1	Please rate your appreciation of the quality of student data when using the SSI approach compared to the traditional situation where the SSI approach is not used, focusing on the following aspects:	Very low	Low	Neutral	High	Very high
	Availability in electronic format					

	If the value is “Very low” or “Low”, please explain briefly what were the issues with availability in electronic format					
	Availability in structured format					
	If the value is “Very low” or “Low”, please explain briefly what were the issues with availability in structured format					
	Completeness of available data					
	If the value is “Very low” or “Low”, please explain briefly what were the issues with completeness of available data					
	Correctness of available data					
	If the value is “Very low” or “Low”, please explain briefly what were the issues with correctness of available data					
	Reliability of available data					
	If the value is “Very low” or “Low”, please explain briefly what were the issues with reliability of available data					
	Meaningfulness of available data					
	If the value is “Very low” or “Low”, please explain briefly what were the issues with meaningfulness of available data					
A2.1	Please rate the effort required for processing student data when using the SSI approach compared to the traditional situation where the SSI approach is not used, focusing on the following aspects:	Considerably more effort	More effort	Same effort	Less effort	Considerably less effort
	Amount of work					
	Interpretation of data					
	Solving transcription and translation errors, missing data and exceptions					
	If the benefits are estimated as smaller than the cost and effort					

	for any of the aspects, please explain briefly why					
	Please estimate the effort saved in processing student data in minutes per application					
E2.1	Please estimate the benefits compared to the costs and effort required to customize the eProcedure portal and integrate it with the SSI Authority agent, focusing on the following aspects	Considerably less than cost and effort	Less than cost and effort	On par with cost and effort	Exceeding cost and effort	Considerably exceeding cost and effort
	Lower manual effort for processing					
	Lower communications cost					
	Lower risk of errors that result from manual processing and language challenges					
	Shorter duration of application processing					
	• Please estimate the change of duration of application processing in minutes per application					
	More complete, valuable, consistent and correct data available					
	Trustworthiness of the data					
	If the benefits are estimated as smaller than the cost and effort for any of the aspects, please explain briefly why					
E2.2	Please estimate the effort required for completing the following activities when customizing and integrating the eProcedure portal with the SSI Authority agent in person days (enter N/A if the activity was not needed):					
	Integration of the SSI Authority agent with the portal					
	Customization of the portal					
	Data transformation from canonical format and use of evidence					

	UI internationalization					
	Overall effort					
		Very inadequate	Inadequate	Sufficient	Adequate	Very adequate
F1.1	Please indicate to which extent the higher education evidence model satisfies your needs for information on the students when performing the e-procedure					

Questionnaire for Data Owners (USI pattern)

B1.1		Considerably more effort	More effort	Same effort	Less effort	Considerably less effort
	Please rate the effort required for processing requests for evidence using the DE4A OOP TS compared to the traditional situation where the DE4A OOP TS is not used					
	Please estimate the change of effort in processing requests for evidence in minutes per request					
D1.1	Please estimate the benefits compared to the costs and effort required to customize the Evidence portal and integrate it with the DE4A Connector, focusing on the following aspects	Considerably less than cost and effort	Less than cost and effort	On par with cost and effort	Exceeding cost and effort	Considerably exceeding cost and effort
	Lower manual effort for processing					
	Lower communications cost					
	Lower risk of errors that result from manual processing and language challenges					
	Shorter duration of application processing					

	• Please estimate the change of duration of application processing in minutes per application	
	If the benefits are estimated as smaller than the cost and effort for any of the aspects, please explain briefly why	
D1.2	Please estimate the effort required to complete the following activities when customizing the Evidence portal and the data service and integrating them with the DE4A Connector in person days (enter N/A if the activity was not needed):	
	Integration with an eIDAS node	
	Implementation of Preview	
	Integration with the DE4A Connector	
	Transformation to canonical format and provision of the requested evidence	
	UI internationalization	
	Overall effort	
F3.1	Please describe how effective was the process of record matching on students and what were the difficulties	
	Please estimate the share of cases with doubts about the identity of the data subject (in percentage)	

Questionnaire for Data Owners (VC pattern)

E1.1	Please estimate the benefits compared to the costs and effort required to customize the Evidence portal and integrate it with the SSI Authority agent, focusing on the following aspects	Considerably less than cost and effort	Less than cost and effort	On par with cost and effort	Exceeding cost and effort	Considerably exceeding cost and effort

	Lower manual effort for processing					
	Lower communications cost					
	Lower risk of errors that result from manual processing and language challenges					
	Shorter duration of application processing					
	• Please estimate the change of duration of processing requests for evidence in minutes per application					
	If the benefits are estimated as smaller than the cost and effort for any of the aspects, please explain briefly why					
E1.2	Please estimate the effort required for the following activities when customizing the Evidence portal and the data service and integrate them with the SSI Authority agent in person days (enter N/A if the activity was not needed):					
	Integration of the SSI Authority agent with the portal and data service					
	Customization of the portal					
	Transformation to canonical format and provision of evidence					
	UI internationalization					
	Overall effort					
F3.1	Please describe how effective was the process of record matching on students and what were the difficulties					
	Please estimate the share of cases with doubts about the identity of the data subject (in percentage)					

Questionnaire for Member States

D3.1	Please estimate the benefits compared to the costs, effort and time required to setting up and deploying the AS4 gateway, the SMP and the DE4A Connector focusing on the following aspects	Considerably less than cost, effort and time	Less than cost, effort and time	On par with cost, effort and time	Exceeding cost, effort and time	Considerably exceeding cost, effort and time
	Effort and cost of implementation					
	Effort and cost of maintenance					
	Effort and cost of training					
	Shorter duration of application processing					
	• Please estimate the change of duration of application processing in minutes per application					
	If the benefits are estimated as smaller than the cost, effort and time for any of the aspects, please explain briefly why					
D3.2	Please estimate the effort required to set up and deploy (in person days):					
	AS4 gateway (if not integrated with the DE4A Connector)					
	SMP					
	DE4A Connector					

Questionnaire for Students

	Please rate your satisfaction with the completed e-procedure focusing on the following aspects:	Very dissatisfied	Dissatisfied	Neutral	Satisfied	Very satisfied
C1.1	Required effort					
	Clarity of the procedure					

	Simplicity					
	Number of errors and interruptions					
	Language					
	Communication					
	Overall user experience					
C1.2	Duration of the procedure					
C1.3	Security and protection of your privacy					
C1.4	Control when managing my education credentials					
C1	In case of the “Very dissatisfied” or “Dissatisfied” values, please provide your comments with respect to the above aspects, any problems you might have experienced during the procedure, and suggestions for improving user experience					
F2.1	Please describe briefly your experience with the following specific functionalities:					
	Explicit request at the procedure start (e.g. did you understand under which conditions you are using the service, or how and from where the evidence will be retrieved)					
	Evidence preview (e.g. were you fully informed what data will be transferred across border; did you feel in control of the evidence transfer)					