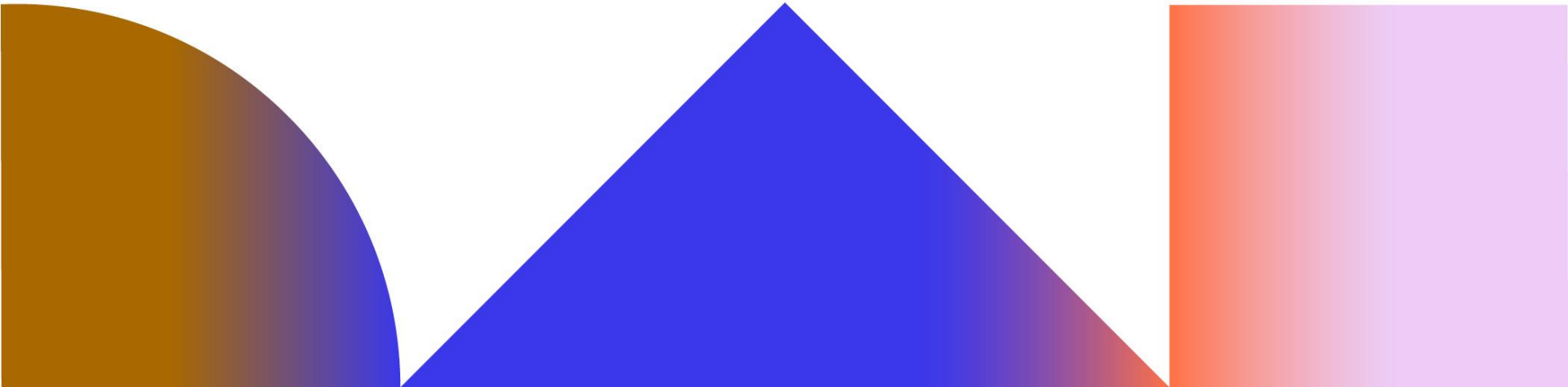


The use of digital certificates for exchanges between KU Leuven and Unibo



Una Europa EBSI Multi university pilot



Speakers



KU LEUVEN

Lerouge Ellen

KU Leuven

Ellen.lerouge@kuleuven.be

Head of administrative
applications for Student KU
Leuven ICTS



Du Caju Jan

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Coordination / support of
new initiatives KU Leuven
ICTS



Co-funded by the
Erasmus+ Programme
of the European Union

KU Leuven as part of Una Europa



Una Europa is an alliance of nine European universities.



Uniwersytet Jagielloński w Krakowie



KU Leuven



Universidad Complutense de Madrid



Université Paris 1 Panthéon-Sorbonne



Leiden University



Freie Universität Berlin



Alma Mater Studiorum Università di Bologna



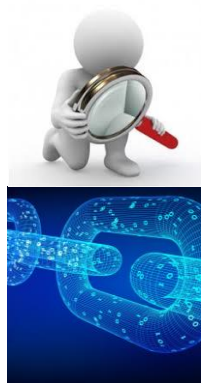
University of Edinburgh



Helsingin yliopisto/ Helsingfors universitet



Una Europa Blockchain Working Group



Driver

Deliver research results, including proof of concepts, on what possibilities **blockchain** offers as a technology to **exchange diplomas and credits** between the institutions of the consortium and beyond in a **secure and fraud-proof manner**.



Timeline – preliminary study



September 2020 – workshop 1
Kick off meeting

- Introducing members
- Proof of concept KU Leuven
- Proposal of the approach

December 2020 – workshop 2
Impact mapping

- Internal workshops
- Impact mapping workshop with partner universities

Q1-Q2 2021
GATACA workshops

- Introduction to and necessity of SSI
- EBSI diploma use case
- SSI for UNA Europa
- Low level design

Q1 2021 – workshop 3
Preliminary study

- Other European initiatives (Emrex and Europass)
- Software vendors
- Potential of blockchain technology

Workshop 1: Getting acquainted

24 September

Topic	Expected outcomes
Introduction	Introduction
Background	Background
Workshop 1	Workshop 1
Workshop 2	Workshop 2
Workshop 3	Workshop 3

Workshop 2: Impact mapping

High-level requirements

- We want to issue digital credentials
- No digital credentials need to be verifiable meaning
 - Authority of the issuer (student or alumni)
 - Issuability of the credential (not tampered)
 - In a cross-border setting (GDPR compliant)
- We should be able to revoke a digital credential
- No interaction needed between issuer and verifier
- No manual verification (specifying verifier)
- GDPR compliant

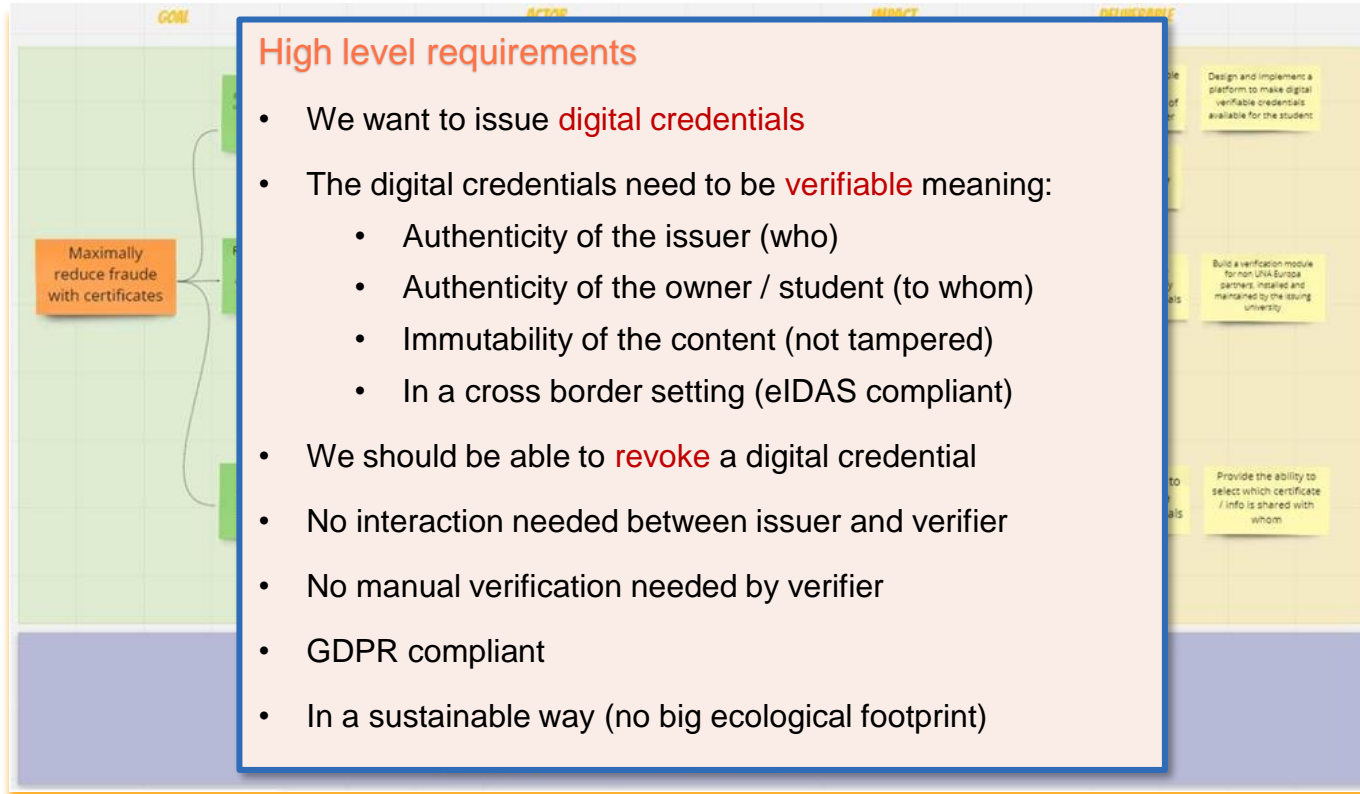
Gataca workshops

Workshop 1	Workshop 2	Workshop 3	Workshop 4
Introductory workshop	SSSI - Academic Options and Career Impact	SSSI for UNA Europa	Low Level Design
Introduction, background, objectives, topics, use cases, 2024 Education	What is SSSI? EBSI registration, EBSI network, EBSI-requirements, Academic options, EBSI Case Alignment with Europe & other initiatives	EBSI cases, Academic options, Decisions on usage, Overview of SSSI, Technology	SSSI, Use cases from EBSI network, EBSI-requirements, Technical requirements
Report back	Report back	Report back	Report back

Workshop 3: results preliminary study

- European initiatives
 - Emrex
 - Europass Digital Credential Infrastructure
- Commercial providers
 - Credly
 - Accredible
 - Signify
 - SafeCert
 - MetCredential
 - Diploma
 - Digistate
 - OpenBadges.me
 - Smart Certificates
 - SimpleCert
 - DiplomaSuite
 - ...

Workshop 2: Impact mapping

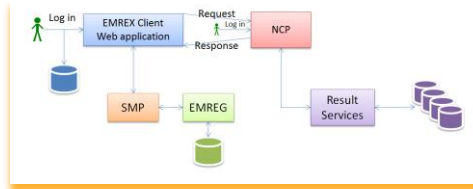


Workshop 3: Results preliminary study



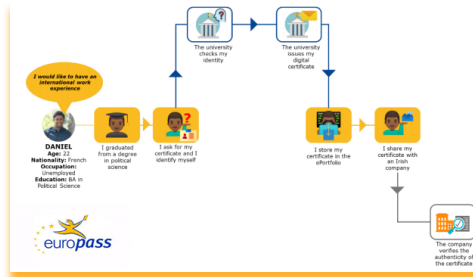
• European initiatives

- Emrex
- Europass Digital Credential Infrastructure
- EBSI



• Commercial products

- Credly
- Accredible
- Badgr
- Sertifier
- NetCredential
- Diplo-me
- Digitalme
- Openbadges.me
- Smart Certificate
- SimpleCert
- Diplomasafe
- ...



Result preliminary study = EBSI



Impact map

- We want to issue **digital credentials**
- The digital credentials need to be **verifiable** meaning:
 - Authenticity of the issuer (who)
 - Authenticity of the owner / student (to whom)
 - Immutability of the content (not tampered)
 - In a cross border setting (eIDAS compliant)
- We should be able to **revoke** a digital credential
- No interaction needed between issuer and verifier
- No manual verification needed by verifier
- GDPR compliant
- In a sustainable way (no big ecological footprint)



EBSI usecase



Self-Sovereign Identity

EBSI is helping to implement a Self-Sovereign Identity model in Europe, allowing users to create and control their own identity across borders.



Diplomas

Citizens gain digital control of their educational credentials, significantly reducing verification costs and improving trust in documents' authenticity.

On June 30, 2021, Una Europa (Unibo and KU Leuven) submits a request to participate in **the EBSI Early adopter program**



EBSI early adopter program



Wave 01

- Provide Wallet solution;
- Establish Trust Sources;
- Co-create technical specs. and guidelines;
- Pilot EBSI Notarisation and other UCs.

Wave 02

- Extend Wave 1 with more actors and solutions;
- Focus on cross-border;
- Integrate with CEF EBSI projects;
- Pilot EBSI Notarisation and other UCs.



The EBSI multi university pilot



18 universities from 15 countries
2 European universities alliances



Co-funded by the Erasmus+ Programme of the European Union

Timeline – EBSI Early adopter program



Q2 2021 EBSI early adopter program explore phase

- Application
- Introduction to EBSI
- EBSI diploma use case
- EBSI Una europa use case

Q2/3 – 2021 EBSI early adopter design phase

- Defining the Una Europa scenario with actors and roles
- High level project plan

Q4 2021 – EBSI early adopter build phase

- Split up the use cases in smaller (technical) POC's
- Implement POC 1 with GATACA

Future

- Prepare next POC's



Exploration phase - Objectives of pilot



The screenshot shows a web browser displaying the 'EBSI - Early Adopters' website. The main content area features a large blue-tinted image of a person wearing glasses, with the text 'EBSI's Verifiable Credentials Lifecycle' overlaid. Below the image are three navigation buttons: 'Early Adopters Home', 'EBSI's Verifiable Credentials Playbook', and 'Wallet Conformance Testing'. The left sidebar contains a 'PAGE TREE' with various links, including 'Verifiable Credentials Lifecycle' and 'EBSI - Early Adopters forum'. The main text area below the buttons is titled 'How to use this page' and provides information about the Verifiable Credentials lifecycle and its actors.

EBSI's Verifiable Credentials Lifecycle

Your one-stop-shop for navigating EBSI's Verifiable Credentials Profile

[Early Adopters Home](#) [EBSI's Verifiable Credentials Playbook](#) [Wallet Conformance Testing](#)

How to use this page

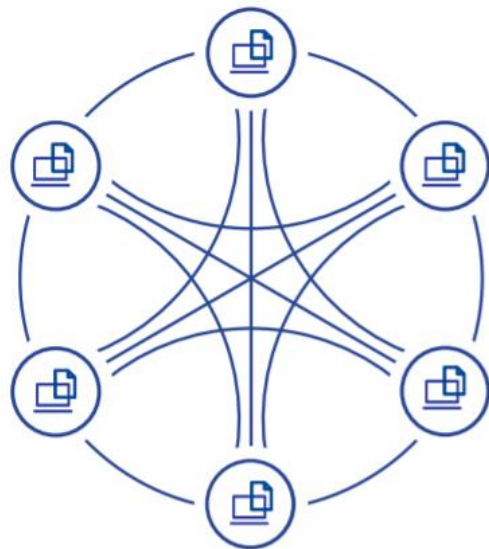
The Verifiable Credentials lifecycle (VC lifecycle) represents the different steps that of an exchange of Verifiable Credentials (VC) supported by the European Blockchain Services Infrastructure (EBSI).

The actors of this lifecycle are:

- the **Trusted Accreditation Organisations (TAO)** that accredit the issuers to issue Verifiable Credentials;
- the **issuers** of Verifiable Credentials;
- the **Holders** of Verifiable Credentials (using the wallet);
- the **Verifiers** of Verifiable Credentials

The **VC lifecycle** aims at providing an easy way for stakeholders to:

- navigate through the different steps and requirements in order to understand what they need to do to be able to exchange Verifiable Credentials;
- find the detailed specifications;



1 Decentralized / Distributed

A blockchain is a 'distributed ledger / database'.

The data in this database is not stored on one, but on every node (at different locations) of the network.

This benefits **security** and user-friendliness.

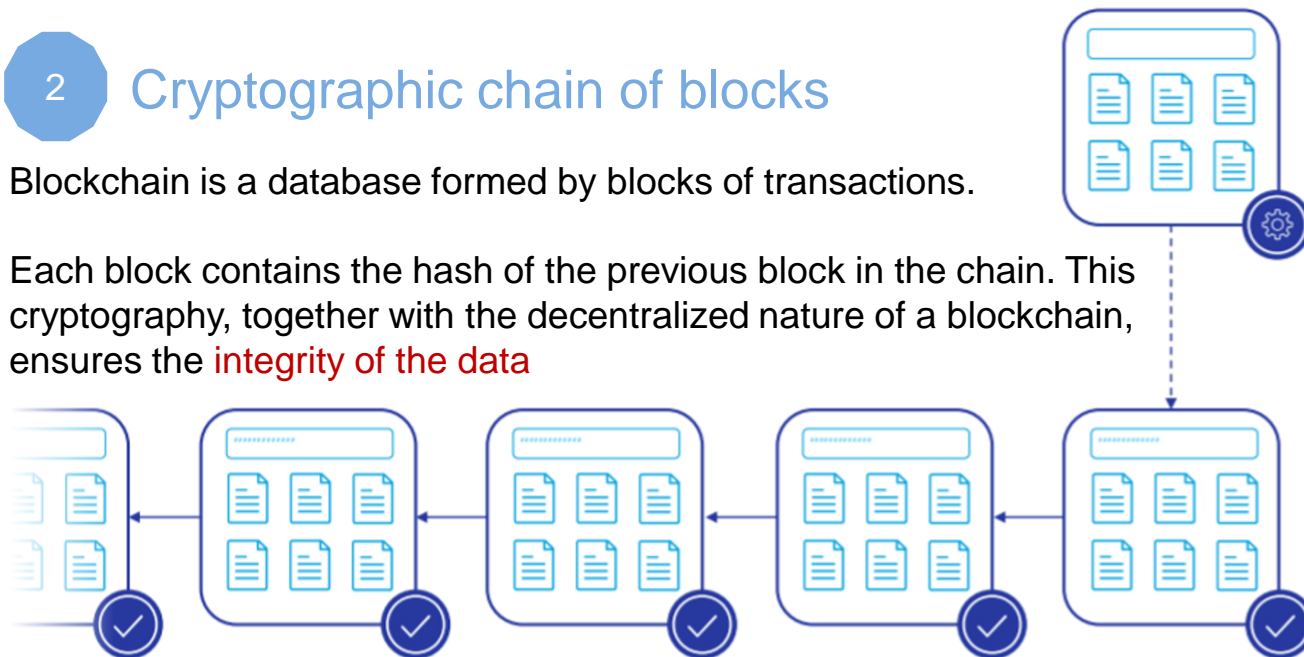


Digital credentials must be tamper proof / trustworthy

2 Cryptographic chain of blocks

Blockchain is a database formed by blocks of transactions.

Each block contains the hash of the previous block in the chain. This cryptography, together with the decentralized nature of a blockchain, ensures the **integrity of the data**



Digital credentials must be tamper proof / trustworthy

- Not everyone can just become a node of the network
 - Nodes of European commission
 - Nodes per EU member state (national)
 - Nodes in non-EU countries of EBP (European Blockchain Partnership) – Norway and Liechtenstein
 - Two Belgian nodes: Smalls and Belnet
- Some data is publicly accessible, other data is reserved for public authorities to support a cross-border service



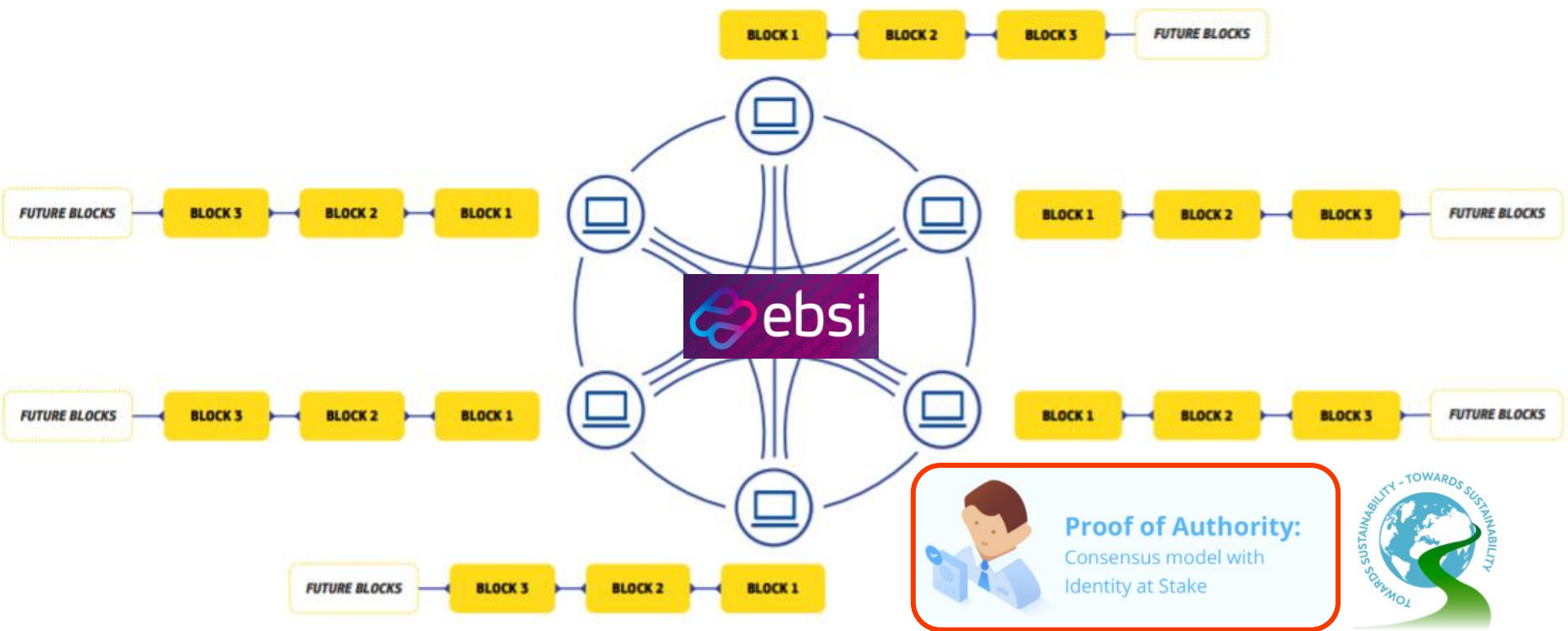
A new block is added to the blockchain based on a **consensus mechanism**



Open network – no access rights – anyone can write on the blockchain. Consensus is obtained through a mining process



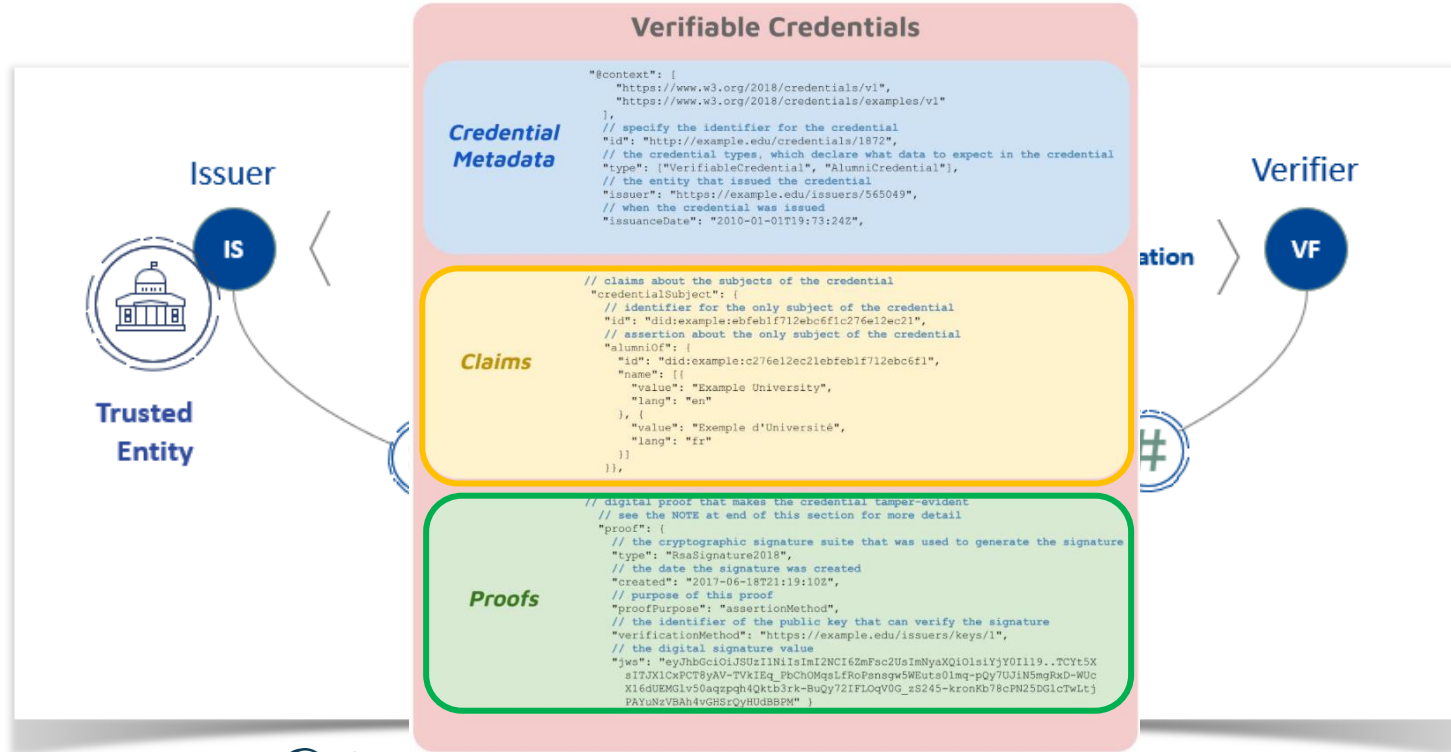
Permissioned network – Transactions and blocks are validated by approved accounts. Every EU Member State has a representative who carries out the validations.





Digital credentials must comply with European regulations

Privacy? Verifiable credentials in user wallet

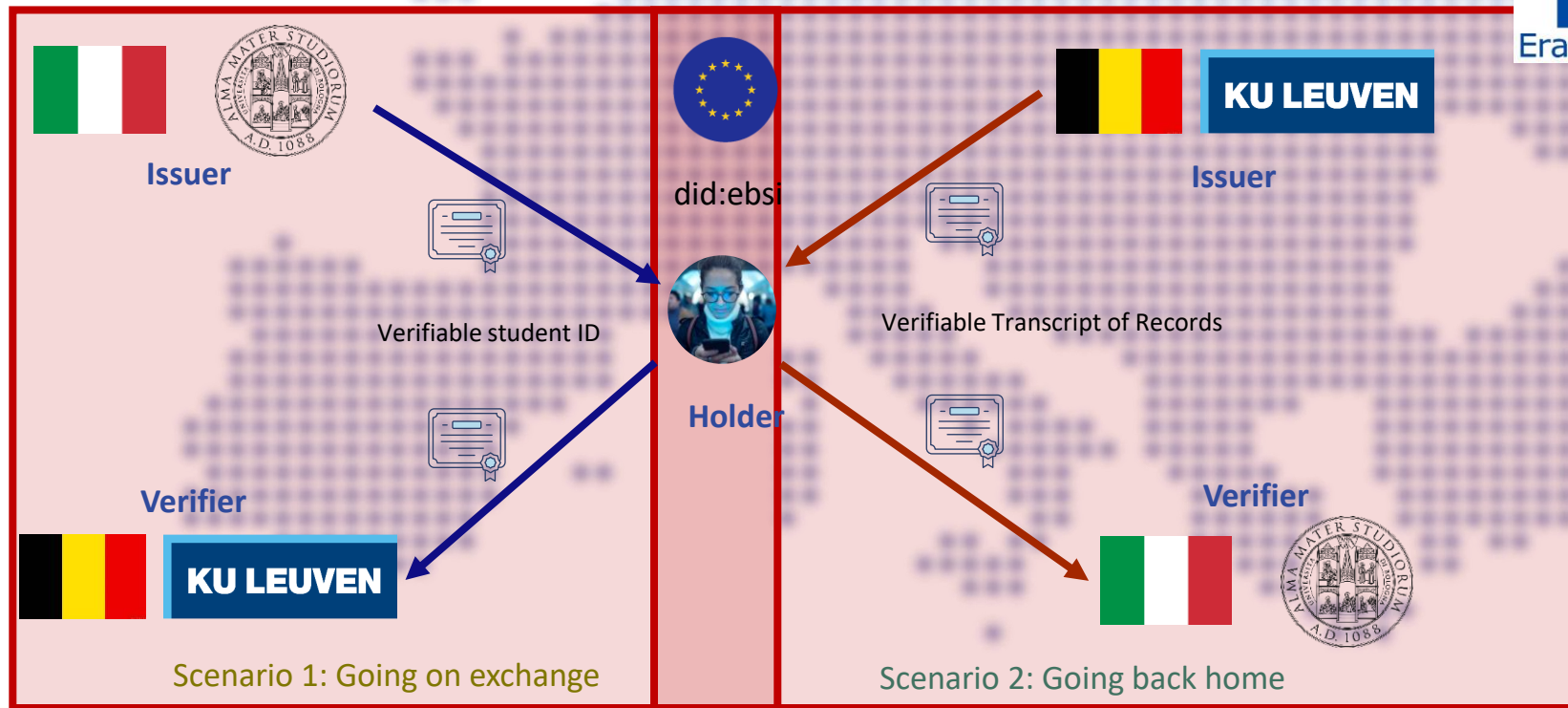


User in control of own data



No personal data put on the blockchain (only in user wallet)

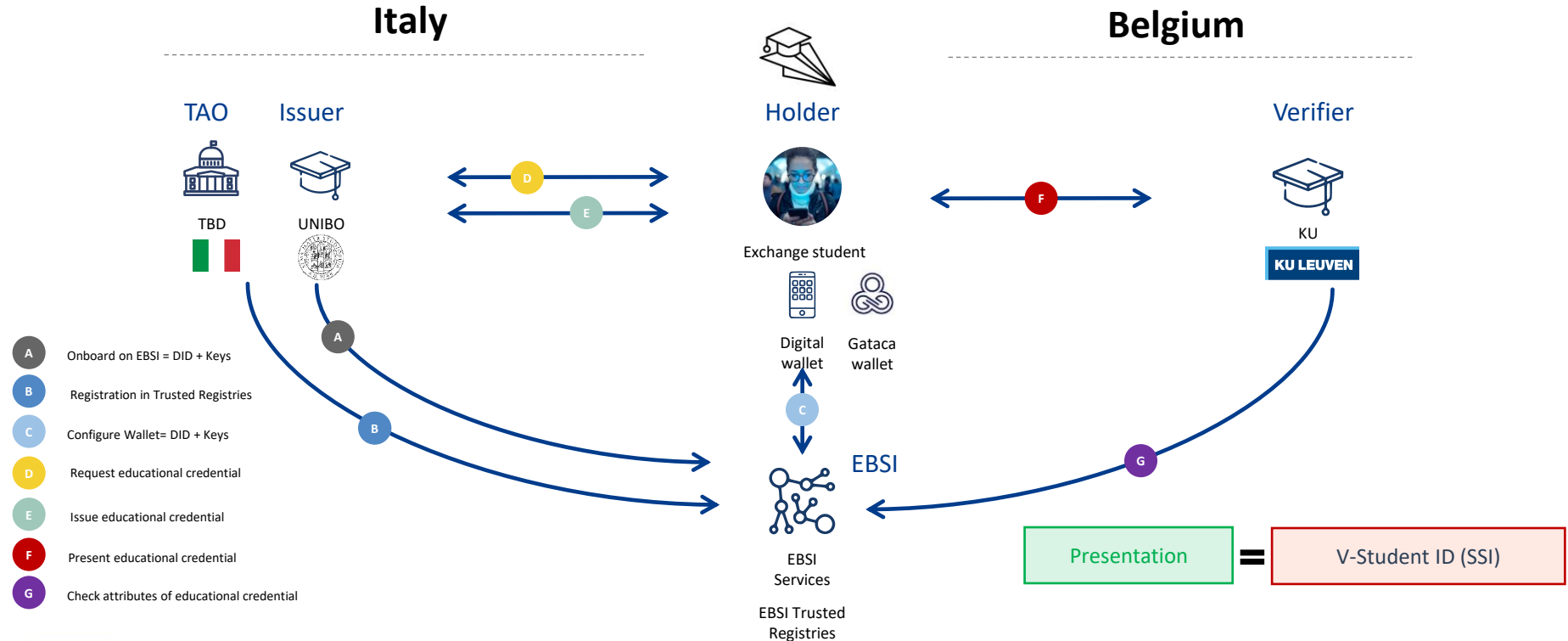
Una Europa cross-border scenario



Scenario 1: Before exchange



Apply for exchange at KU Leuven based on UNIBO Verifiable Student ID



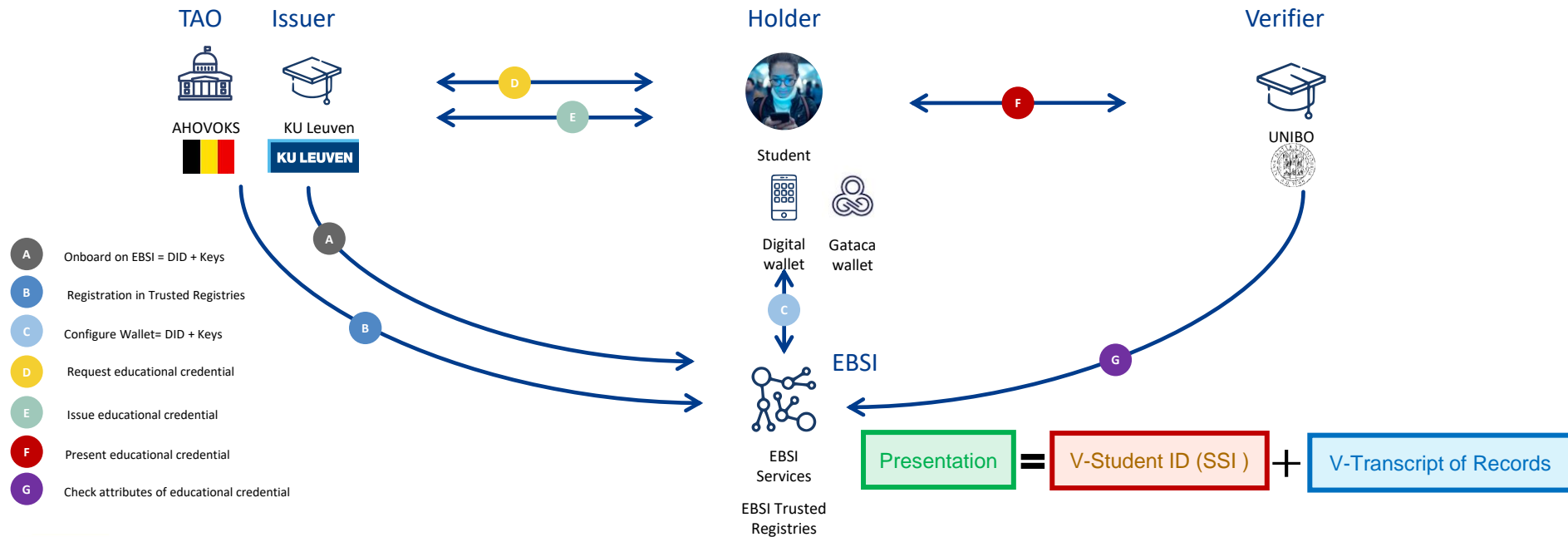
Scenario 2: After exchange



Bring back home obtained KU Leuven credits based on a Verifiable Transcript of Records

Belgium

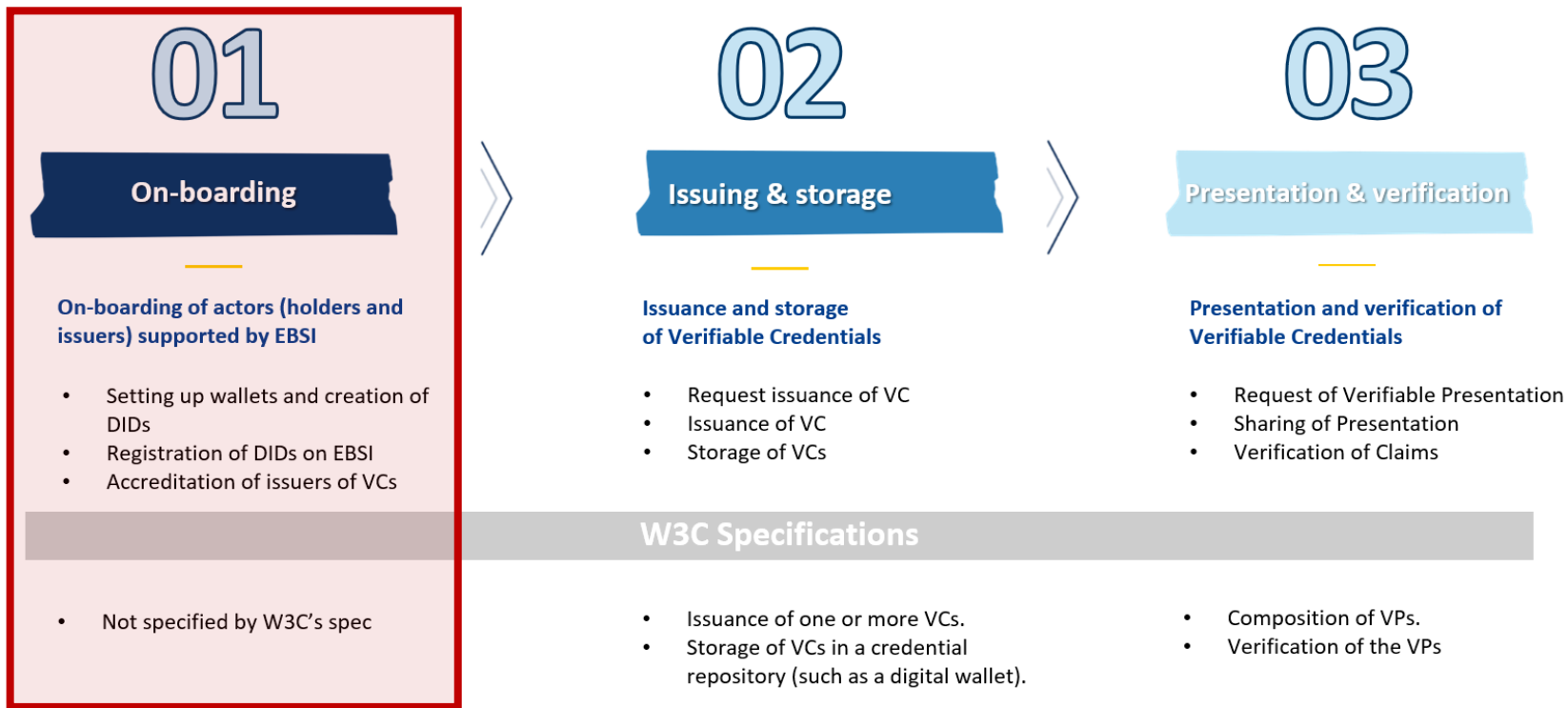
Italy



The Verifiable Credentials Lifecycle



One common Verifiable Credentials Lifecycle based on W3C specifications



Wallets – Service provider



Menu

EBSI Conformant Wallets

Here you can find the list of all the wallets conformant with EBSI.

You can select one of the digital wallets below and start enjoying the opportunities offered by EBSI.

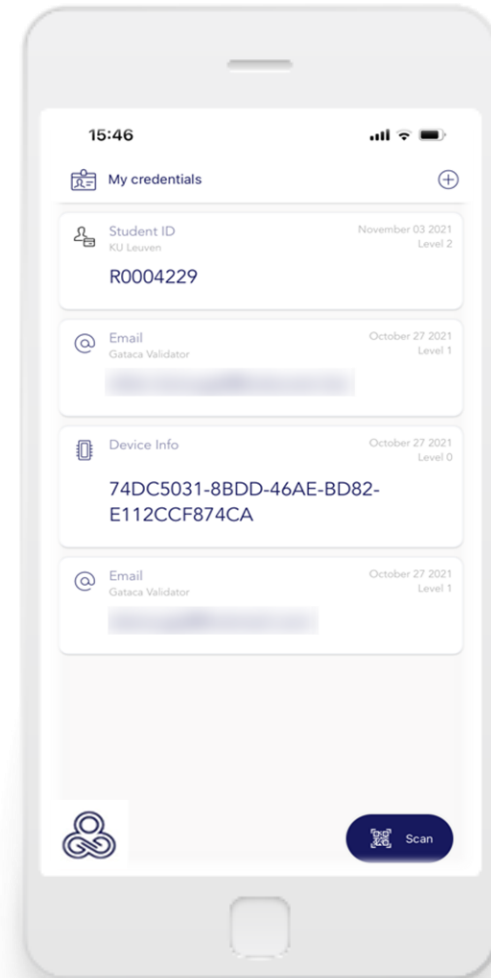
*Do you have a solution and do you want to be part of EBSI. Let's begin by taking the test. **Become conformant***

<p>CIMEA Diplome</p> <p>Compatible use case</p> <ul style="list-style-type: none"><input checked="" type="checkbox"/> Diploma <p>Support</p> <ul style="list-style-type: none"><input type="checkbox"/> Mobile	<p>Danube Tech</p> <p>Compatible use case</p> <ul style="list-style-type: none"><input checked="" type="checkbox"/> Diploma <p>Support</p> <ul style="list-style-type: none"><input type="checkbox"/> Desktop	<p>GATACA</p> <p>Compatible use case</p> <ul style="list-style-type: none"><input checked="" type="checkbox"/> Diploma <p>Support</p> <ul style="list-style-type: none"><input type="checkbox"/> Desktop <input type="checkbox"/> Mobile	<p>Poste Italiane</p> <p>Compatible use case</p> <ul style="list-style-type: none"><input checked="" type="checkbox"/> Diploma <p>Support</p> <ul style="list-style-type: none"><input type="checkbox"/> Desktop <input type="checkbox"/> Mobile	<p>ValidatedID</p> <p>Compatible use case</p> <ul style="list-style-type: none"><input checked="" type="checkbox"/> Diploma <p>Support</p> <ul style="list-style-type: none"><input type="checkbox"/> Desktop <input type="checkbox"/> Mobile	<p>Systems Integration Solutions</p> <p>Compatible use case</p> <ul style="list-style-type: none"><input checked="" type="checkbox"/> Diploma	<p>walt.id</p> <p>walt.id</p> <p>Compatible use case</p> <ul style="list-style-type: none"><input checked="" type="checkbox"/> Diploma <p>Support</p> <ul style="list-style-type: none"><input type="checkbox"/> Desktop <input type="checkbox"/> Mobile
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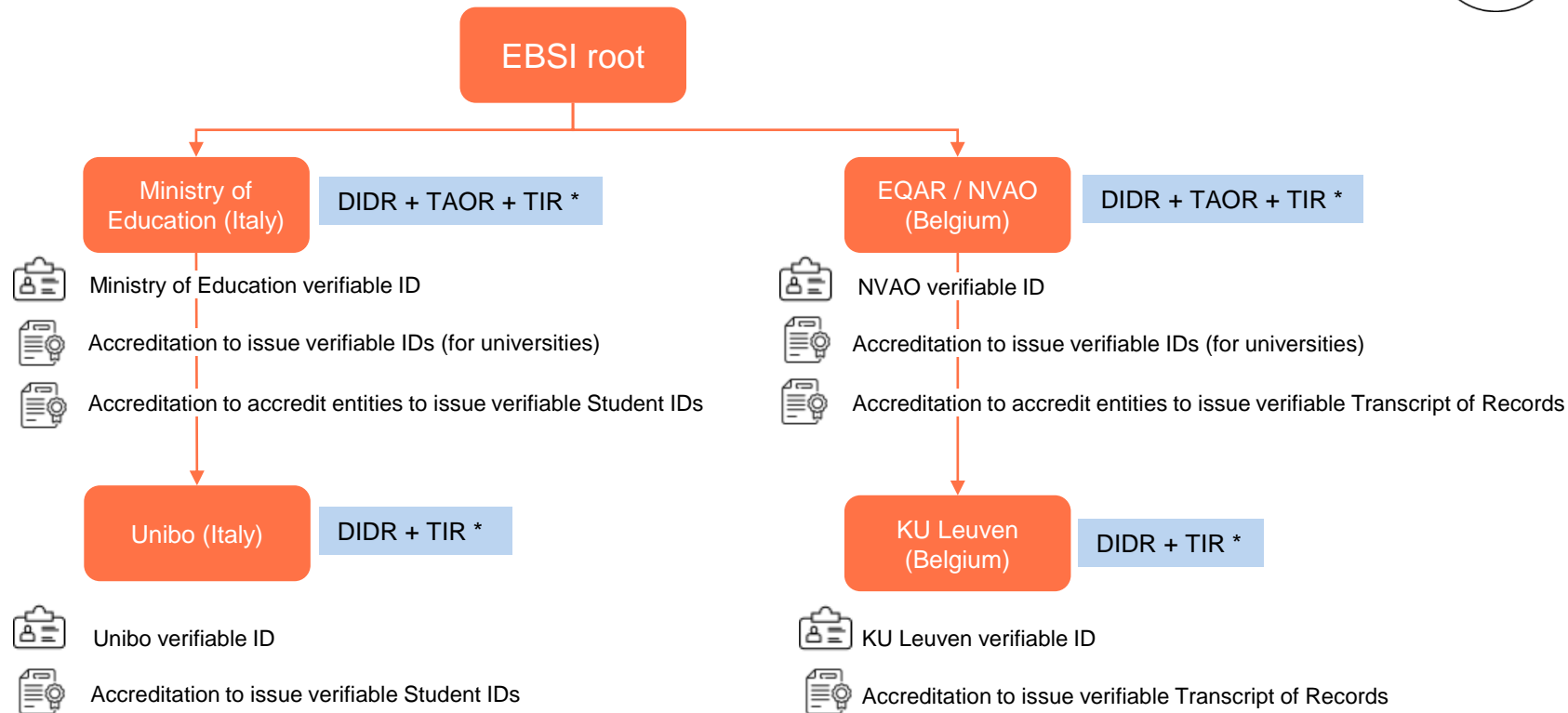
Wallets – Service provider

We use Gataca as a service provider for both

- Enterprise wallets
- user / Student wallet



EBSI onboarding – Trusted registries



EBSI onboarding – data schemas in TSR



TSR
Trusted schema registry

Transcript of records

```
["@context": [
  "https://www.w3.org/2018/credentials/v1",
  "https://base.eki.europass.com/contexts/v1"
],
"type": [
  "VerifiableCredential",
  "VerifiableAttestation",
  "Europass"
],
"id": "urn:credential:5a4d5412-27e3-4540-a5e5-flaa4d55b20c",
"issuer": {
  "id": "epass:org:1",
  "issuanceDate": "2020-07-20T13:58:53+02:00",
  "validFrom": "2019-09-20T00:00:00+02:00",
  "credentialSubject": {
    "id": "did:epass:person:1",
    "identifier": {
      "schemeID": "Student identification number",
      "value": "99009900"
    },
    "achieved": {
      "id": "urn:epass:learningAchievement:1",
      "title": "TITLE OF PROGRAMME",
      "identifier": {
        "wasDerivedFrom": {
          "specifiedBy": {
            "wasInfluencedBy": {
              "hasPart": {
                "learningAchievement": [
                  {
                    "id": "urn:epass:learningAchievement:2",
                    "title": "Topic #1",
                    "wasDerivedFrom": {
                      "id": "urn:epass:assessment:2",
                      "title": "Topic 1 assessment",
                      "grade": "85%"
                    },
                    "specifiedBy": {
                      "id": "urn:epass:qualification:2",
                      "title": "Topic #1",
                      "volumeOfLearning": "5"
                    }
                  },
                  {
                    "id": "urn:epass:learningAchievement:3",
                    "title": "Topic #2",
                    "wasDerivedFrom": {
                      "specifiedBy": {

```

Student identity

```
"@schema": "https://tsn-schema.org/draft/2020-12/schema",
"title": "EBSI Natural Person Verifiable ID",
"description": "Schema of an EBSI Verifiable ID for a natural person participating in the educational use cases ",
"type": "object",
"allOf": [
  {
    "@ref": "https://api.proenod.ebsi.eu/trusted-schemas-registry/v1/schemas/0x14b05b52130e7d333ec1fe1d0c8c739a3f3dc5a59bac5eb38fa0c255124f49#"
  },
  {
    "properties": {
      "credentialSubject": {
        "description": "Defines additional properties on credentialSubject to describe IDs that do not have a substantial level of assurance.",
        "type": "object",
        "properties": {
          "id": {
            "description": "Defines a unique identifier of the credential subject",
            "type": "string"
          },
          "identifier": {
            "description": "Defines an alternative identifier for the person ",
            "type": "array",
            "items": {
              "@ref": "#/defs/identifier"
            }
          },
          "familyName": {
            "firstName": {
              "dateOfBirth": {
                "personalIdentifier": {
                  "nameAndFamilyNameAtBirth": {
                    "placeOfBirth": {
                      "currentAddress": {
                        "gender": {

```

The Verifiable Credentials Lifecycle

One common Verifiable Credentials Lifecycle based on W3C specifications

01

On-boarding

On-boarding of actors (holders and issuers) supported by EBSI

- Setting up wallets and creation of DIDs
- Registration of DIDs on EBSI
- Accreditation of issuers of VCs

- Not specified by W3C's spec

02

Issuing & storage

Issuance and storage of Verifiable Credentials

- Request issuance of VC
- Issuance of VC
- Storage of VCs

W3C Specifications

- Issuance of one or more VCs.
- Storage of VCs in a credential repository (such as a digital wallet).

03

Presentation & verification

Presentation and verification of Verifiable Credentials

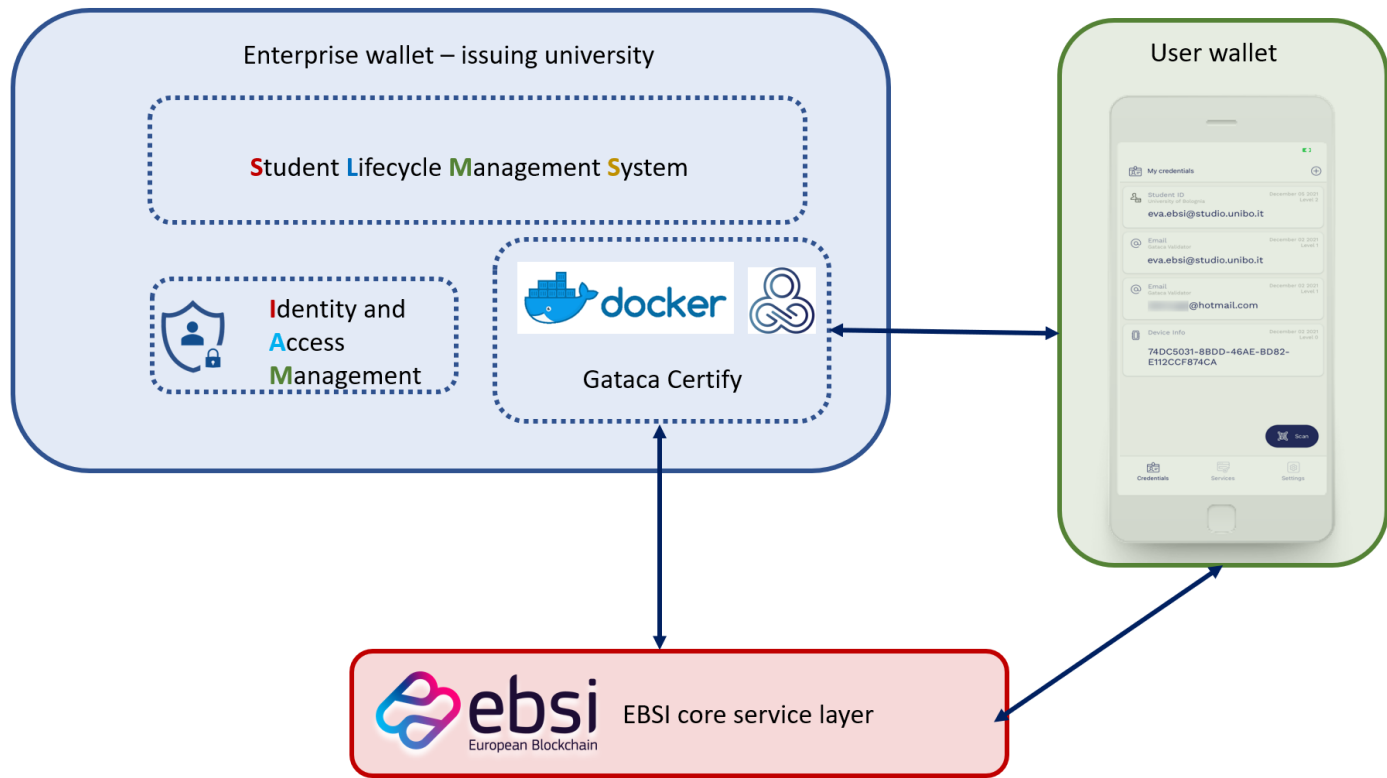
- Request of Verifiable Presentation
- Sharing of Presentation
- Verification of Claims

- Composition of VPs.
- Verification of the VPs

Software architecture - issuance



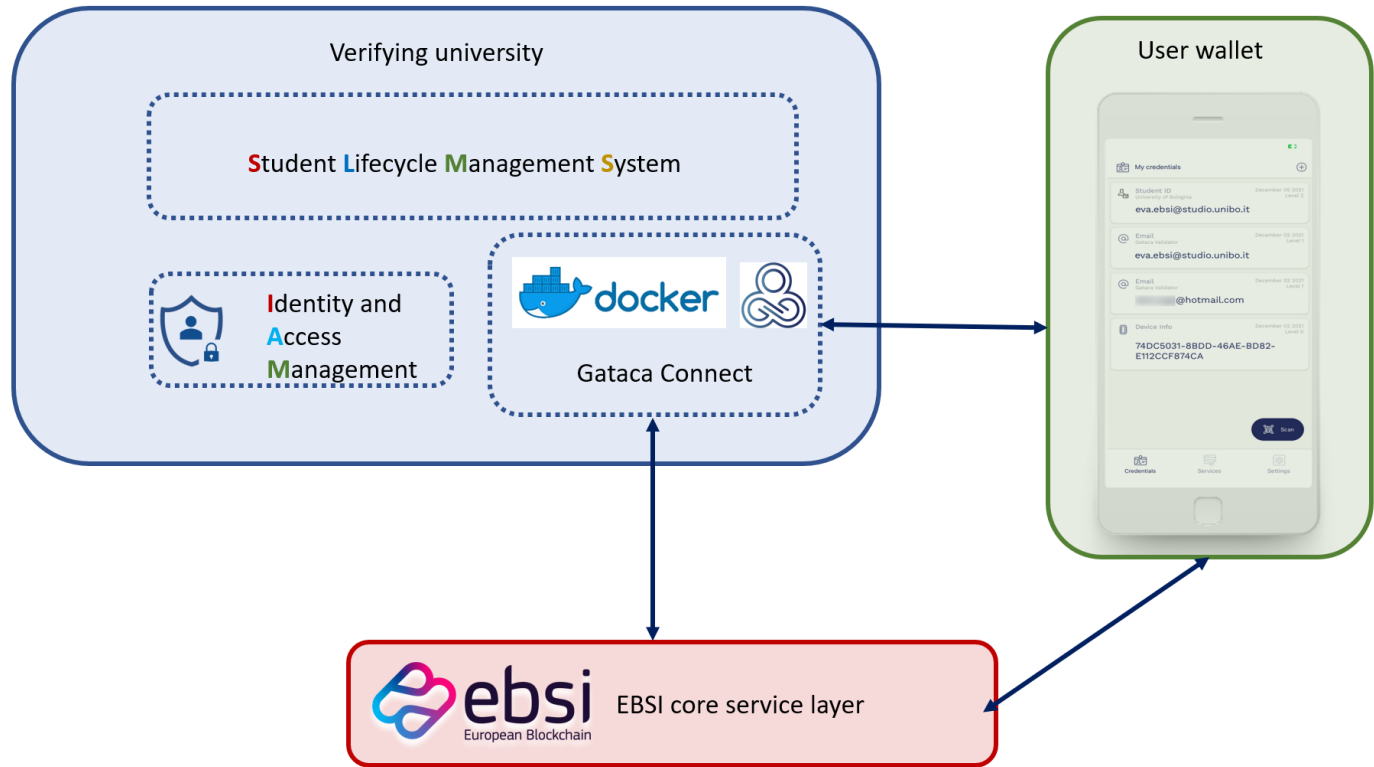
ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA



Software architecture - verification

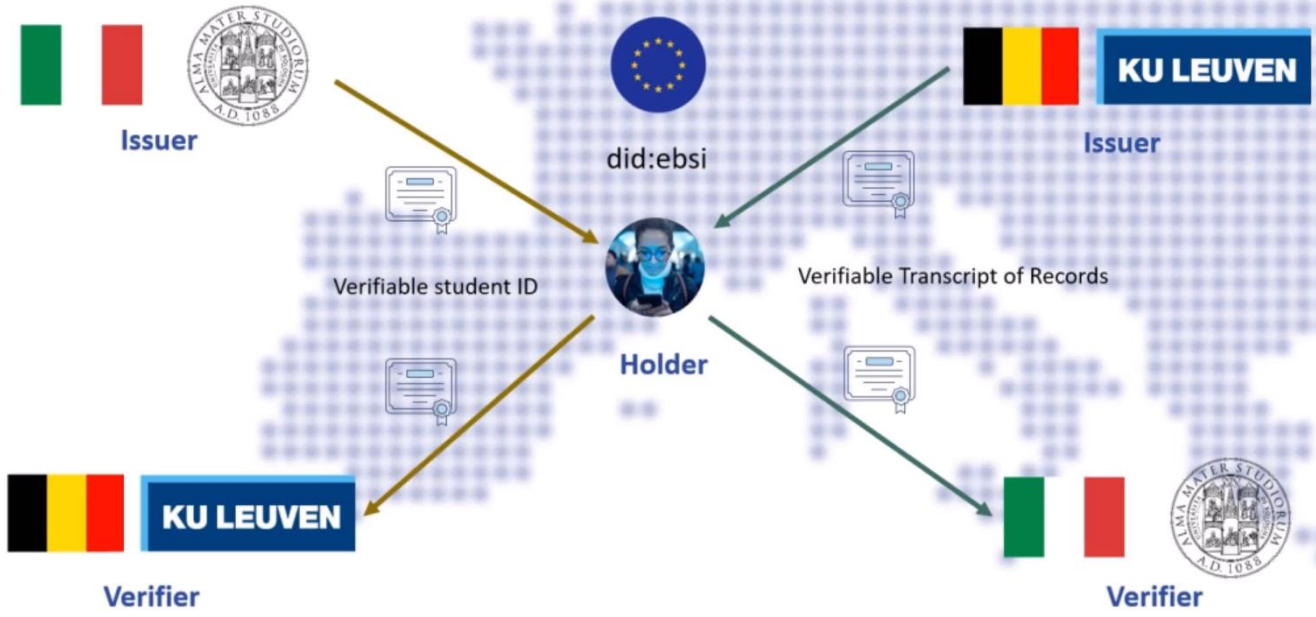


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Una Europa multi university pilot

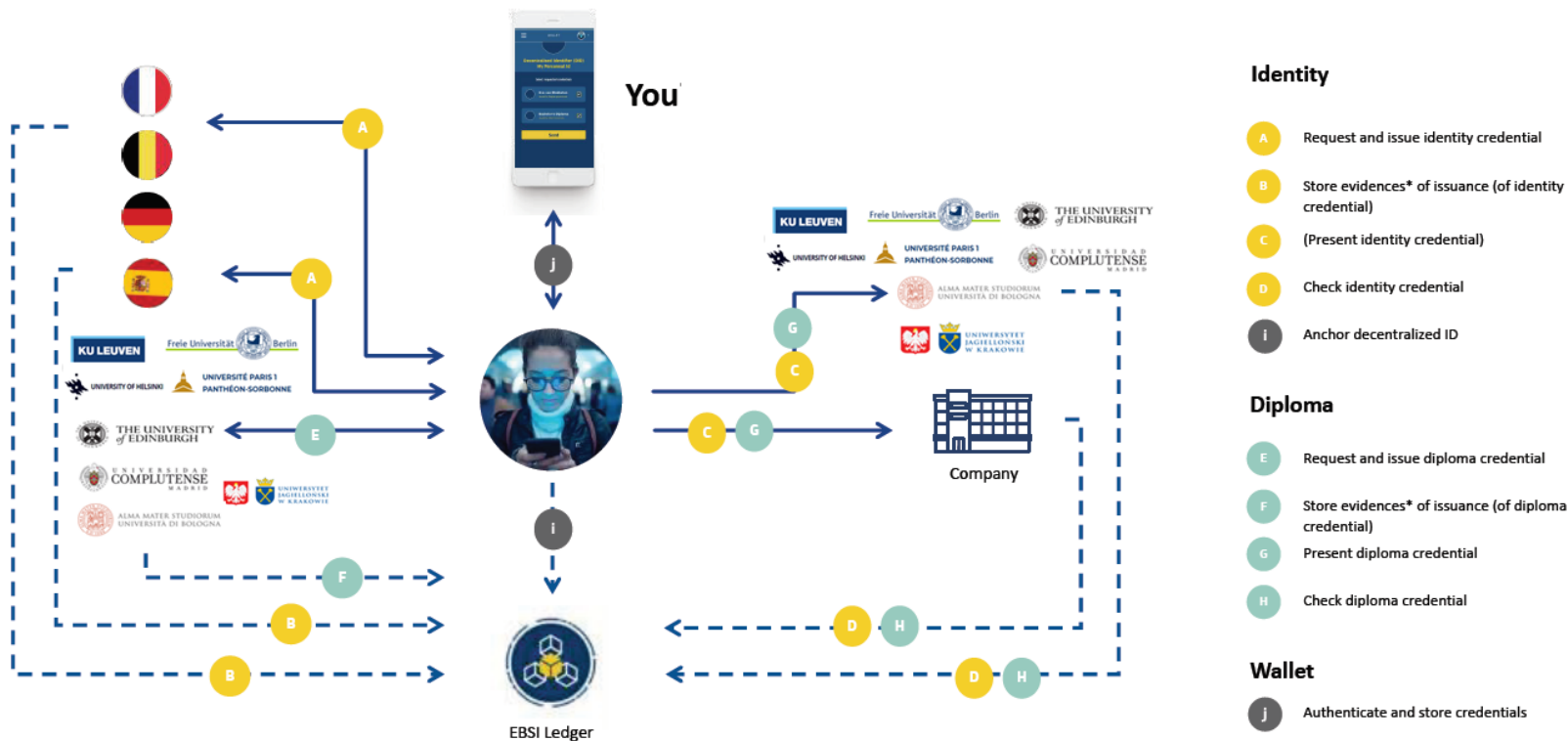


Scenario 1: Going on exchange

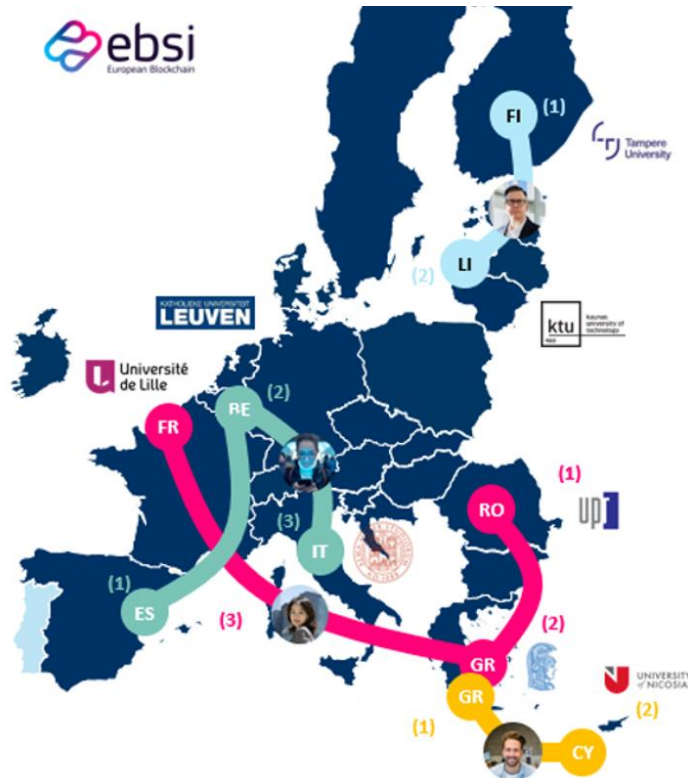
Scenario 2: Going back home



Ultimate goal – Entire cross border ecosystem



Next – EBSI demo days in May



Get a diploma with a list of course units validated from Erasmus
Transcript of Records Credential

Eva is a Spanish student and get a Bachelor Degree from the University of *Bovira y Virgili* (1). Eva takes a Master degree at KU Leuven University (2). In that context, she goes in Erasmus for a period of 6 months at the University of Bologna in Italy (3). In order to get her diploma, she needs to get the list of course taken in Italy that is verified by the KU Leuven University (4).



Apply for a job with Master Degree from a foreign country
License Practice Credential

Nikos is a Cypriot student who took a Master Degree in Mechanical Engineering in the University of Athens (1). In order to be able to apply for a job in Cyprus, he needs to receive his diploma from the University of Athens that is verified by ETEK in Cyprus who will then issue his License practice (2).



Apply for complementary Master with a Master from a foreign country
Master Diploma Credential

Alice is a Romanian student from the University of Politehnica University of Timisoara (1). She took her Master Diploma at University of Athens in Greece (2) and wants to apply for a complementary Master at the University of Lille in France (3).



Apply for specific courses in foreign country
Micro-credentials

Matias is a Finnish student from the University of Tampere (1). He wants to and take some specific courses for several weeks at the Kaunas University of Technology in Lithuania (2).



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of the European Union

Scenario 1 in details (v1.1)

Eva is a Spanish student and gets a Bachelor Degree from the University of Rovira y Virgili (1). Eva takes a Master degree at KU Leuven University (2). In that context, she goes in Erasmus for a period of 6 months at the University of Bologna in Italy (3). In order to get her diploma, she needs to get the list of course taken in Italy that is verified by the KU Leuven University (4).

- (0)
- La Moneda and BOSA-DT, University of Rovira i Virgili, KU Leuven and University of Bologna are onboarded as TIR (universities by ECAR?)
- (1)
- Eva is Spanish student. She applies for Bachelor Degree in the University of **Rovira i Virgili** in Spain
 - She requests the **Fabrica Nacional de Moneda** in Spain to issue a **Verifiable ID (VID)**
 - The University of **Rovira i Virgili** verifies the VID of Eva
 - The University of **Rovira i Virgili** issues a **student ID (V.Attestation)**
 - Eva becomes official student of the University of **Rovira i Virgili** in Spain and gets her Bachelor Diploma
- (2)
- Eva applies a Master Degree at the **KU Leuven University** in Belgium
 - The **KU Leuven University** requests Eva her **Bachelor Diploma (V. Attestation)** issued by **University of Rovira i Virgili** and the VID issued by the **Fabrica Nacional de Moneda**
 - Eva applies for a temporary Belgian VID at **BOSA-DT** by presenting her Spanish VID
 - The **KU Leuven University** verifies the **Bachelor Diploma (V. Attestation)** and **Spanish VID** and Eva enrolls for her Master Degree
- (3)
- In the context of her Master Degree, Eva applies for an Erasmus exchange to the **University of Bologna** in Italy
 - The **KU Leuven University** issues a **student id (V. Attestation)**
 - The **University of Bologna** verifies it and Eva can then enrol for Erasmus
- (4)
- After her Erasmus, Eva requests the **KU Leuven University** to issue her Diploma
 - The **KU Leuven University** requests the University of Bologna to issue a **transcript of records (V.Attestation)**
 - The **University of Bologna** issues a **Transcript of Records (V.Attestation)**
 - The **KU Leuven University** verifies it and can then proceed with the issuance of the Master Degree.



Countries

- Spain
- Belgium
- Italy

Actors in the scenario

- Fabrica Nacional de Moneda (ES)
- University of Rovira i Virgili (ES)
- BOSA-Digital Transformation (BE)
- KU Leuven University (BE)
- University of Bologna (ES)
- (ECAR?)

Types of credentials

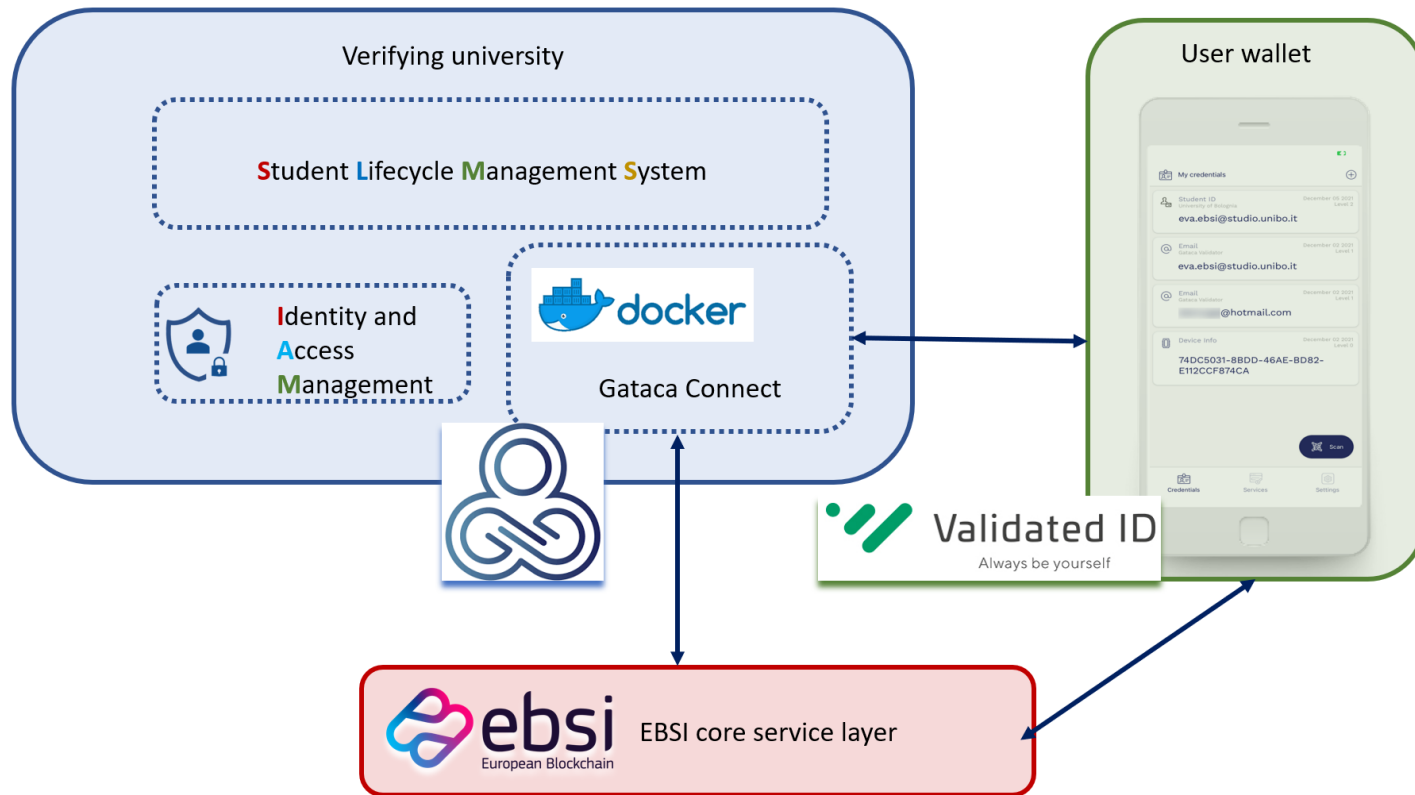
- Verifiable ID (VID)
- Student ID (Verifiable Attestation)
- Diploma (Verifiable Attestation)
- Transcript of Records (Verifiable Attestation)

Wallet

- Gataca



Interoperability



Let's build a digital Europe
together!