



CEF Digital  
Connecting Europe

# European Blockchain Service Infrastructure, **explained**

Master Class – European Blockchain Convention

15/12/2020

# Hello.

## Who is in the call today?



**Pierre  
MARRO**

DG CNECT  
Policy Officer



**Joao  
FRADE**

DIGIT  
Head of sector



**Zaira  
LIN**

DIGIT  
SMO



**Robert  
CZARNY**

DIGIT  
Project Manager



**Saky  
KOURTIDIS**

DIGIT  
SMO



**Kevin  
AMBROGI**

DIGIT  
Product Owner



**Iulian  
NITA**

DIGIT  
EBSI Architect



**Alen  
HORVAT**

DIGIT  
EBSI Architect

# What are we going to do today?

## Let's have a look at the objectives and agenda

01

Introduction and **Policy context** of the European Blockchain Service Infrastructure (EBSI).

10'

02

Introduction to blockchain technology and **what it means for PAs.**

15'

03

**Discover and get inspired by** the European Blockchain Service Infrastructure **(EBSI).**

30'

04

Discover **EBSI capabilities** through scenario example **(diploma UC).**

30'

05

**Get engaged and start with EBSI** (CEF Digital and EBSI Community).

10'

**How we will keep this call  
interactive and interesting?**

**Go to [www.menti.com](https://www.menti.com) and use the code 65 90 96 7**

# 01

## Policy context and the European Blockchain Services Infrastructure



Pierre Marro  
Policy Officer, DG CNECT

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10'

# Our ambition is to establish global leadership in blockchain and distributed ledger technologies



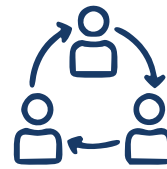
## Joined-up political vision (EU-MS)

Joint declaration on the establishment of the European Blockchain Partnership [EBP] and the development of the European Blockchain Services Infrastructure [EBSI] for cross-border digital services of public interest



## Public-private partnership

Supporting the creation of the International Association of Trusted Blockchain Applications [INATBA]; a multistakeholder organisation to promote trust and interoperability at Global level



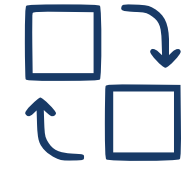
## Connecting Global Expertise

The EU blockchain observatory and forum brings together the leading global experts to identify obstacles, incentives and practical solutions to promote blockchain uptake.



## Investing in EU Innovation and start-ups

Through the Connecting Europe Facility and H2020 Programmes, the EU is co-investing in the most advanced digital infrastructure and the most innovative EU start-ups **New** EU investment scheme for AI and blockchain + support programme



## Promoting an enabling DSM

Promoting and enabling legal framework interoperable standards and skills development

# EBSI aims at seizing the opportunities offered by blockchain and in particular to exploit them for enhancing cross border services.

**2019**

-  
**Initial funding conditions**

In early 2019, the European Commission published the 2019 Telecommunications Work Programme of the Connecting Europe Facility (CEF) creating initial funding conditions for EBSI.

**2020**

-  
**Release of the first version of EBSI**

In early 2020, release of the first version of EBSI. Start of EBSI testing by EBP members, national administrations and interested public authorities parties.

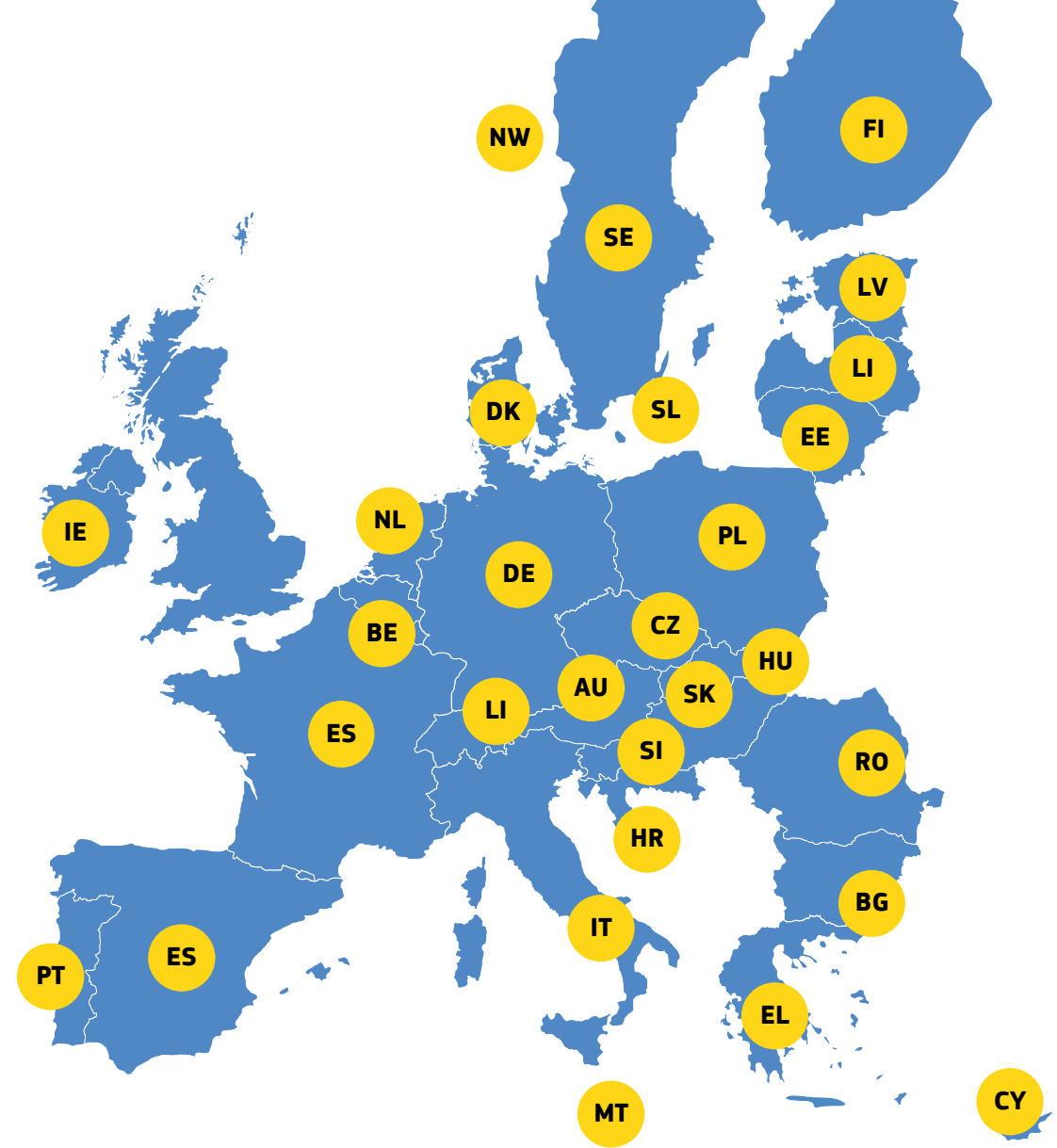
**2021**

-  
**Digital Europe Programme**

From 2021 on EBSI will be supported under the Digital Europe Programme. New use cases selected by the EBP will be added, cooperation with industry reinforced and more legal certainty provided for market actors through regulatory sandbox activities

# European Blockchain Partnership. EBSI is supported by 29 participating countries\* and the European Commission forming the European Blockchain Partnership (EBP) - (\*in 2020)

<https://ec.europa.eu/cefdigital/wiki/display/CEFDI/GITALEBSI/List+of+EBP+Representatives>





# Practically, four use cases have been selected by the EBP and are currently under development.

(V1 as a sandbox and v2 in production)



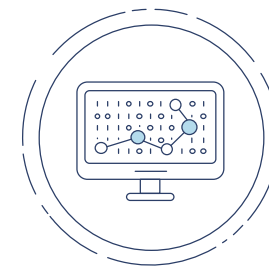
**Notarisation**  
of documents



European Self-Sovereign **Identity**



**Diplomas**  
Management



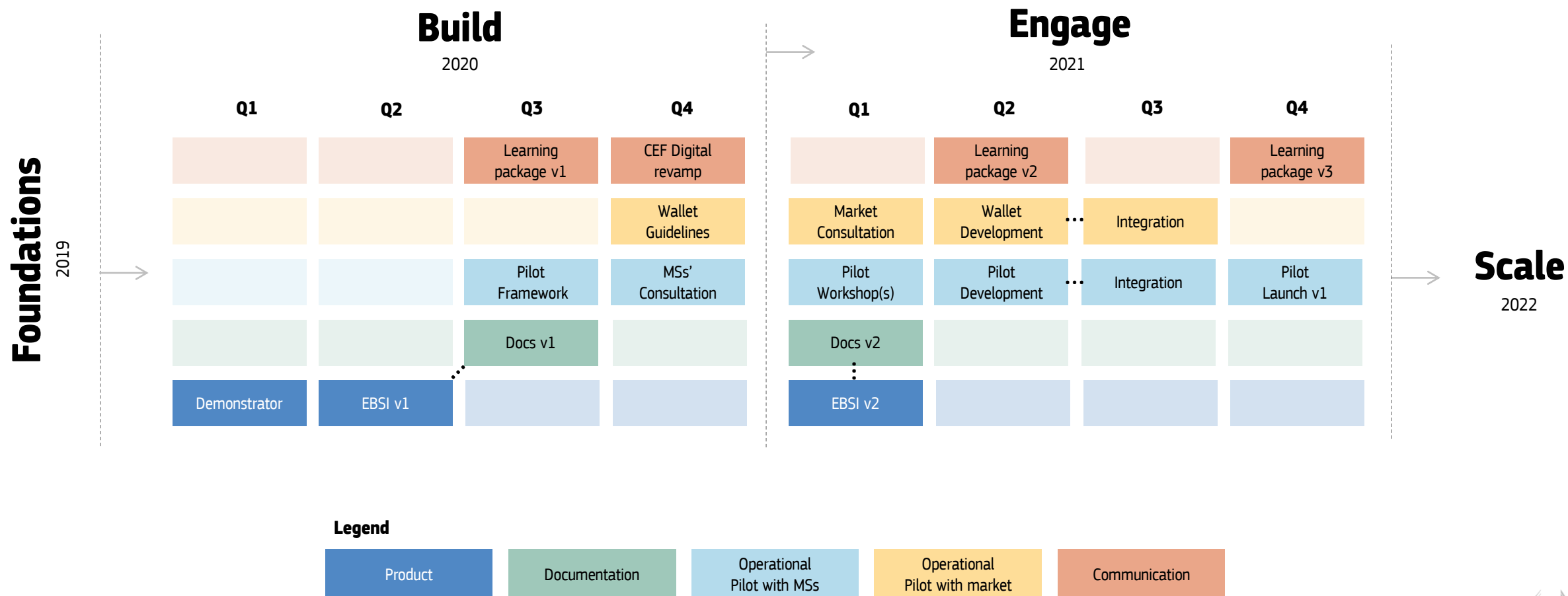
**Trusted data**  
sharing

(Reserved for TAXUD's Community at this stage)

+ 3 new use cases

SME financing, European Social Security Identification Number, Asylum process management

**In 2019 and 2020, we built and launch the foundations. In 2021 we aim at releasing EBSI v2 and launching a number of pilots.**



# We started piloting EBSI with public actors. But soon, we will also engage with private companies.

e.g. for the development of wallet applications.

## Public market (MSs)



Prepare to **integrate your application** with EBSI.

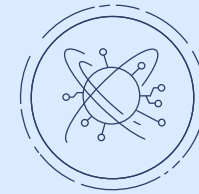


Deploy a **blockchain node** and connect to the network.



Take a **citizen's journey** and test the EBSI services.

## Private market



**European Blockchain PCP** – Call is open



Looking at the **wallets' market** (Coming soon)

02

# Introduction to blockchain technology and what it means for public administrations

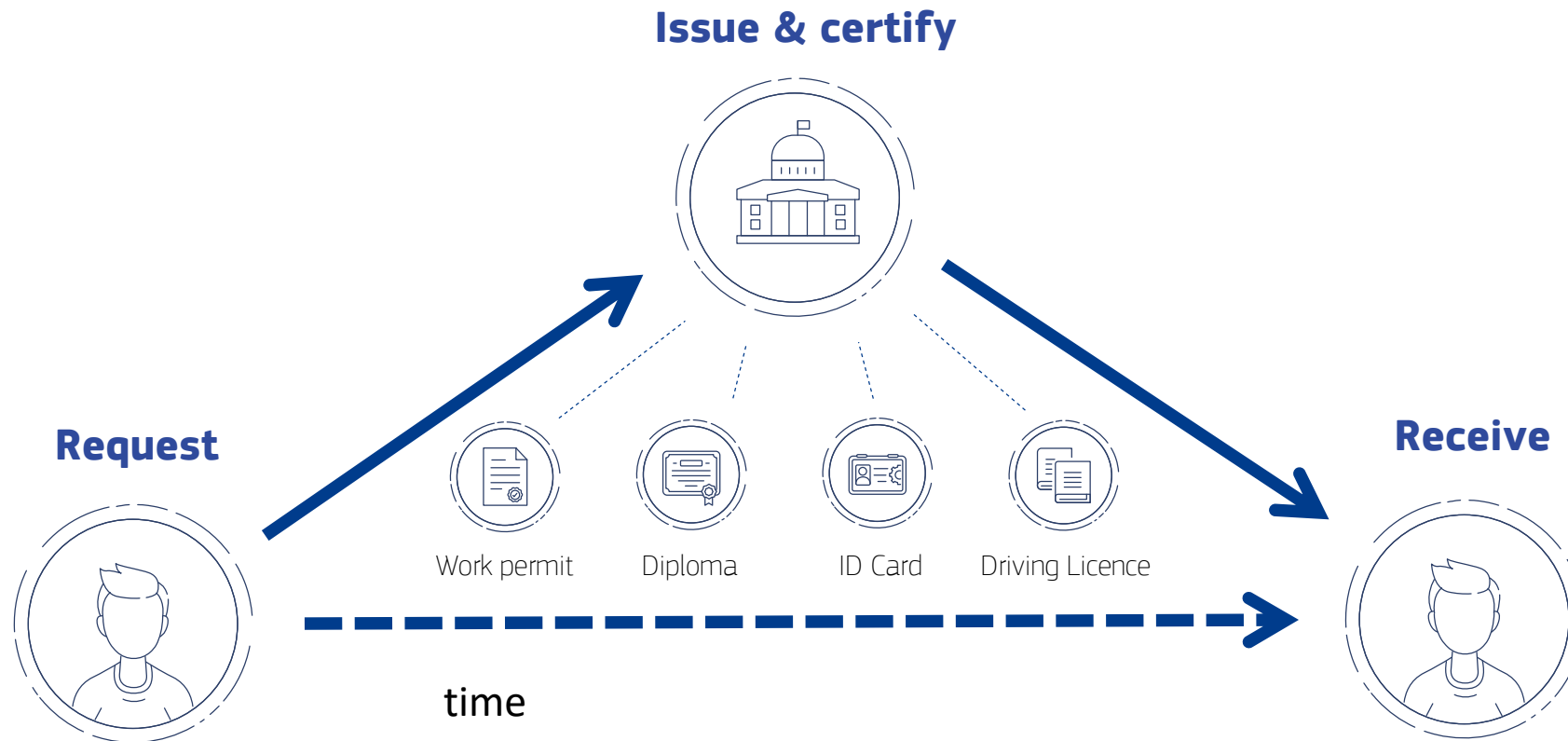


Joao Frade  
Head of Sector, DIGIT



15'

# Governmental entities are important intermediaries of many transactions happening in our society.

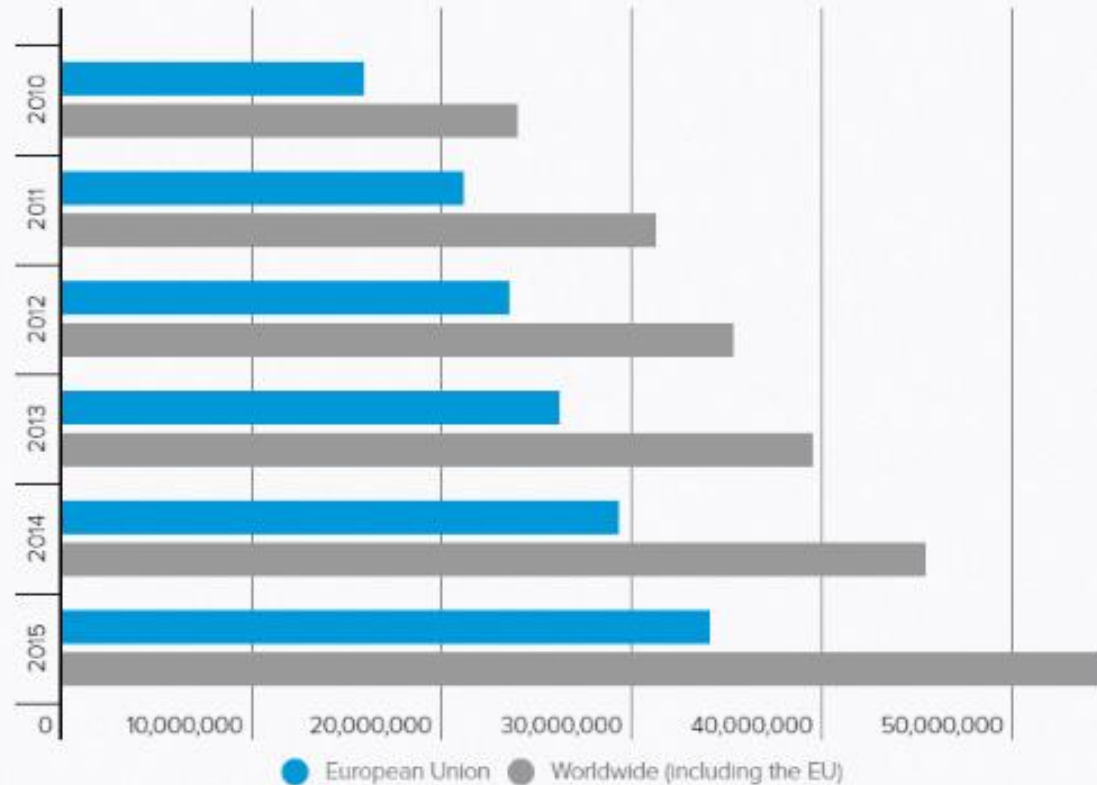


# We need to address the challenge of digital fraud. Governments need technology to verify the authenticity of information.

Interpol has seen a sharp uptick in the number of missing passports — within Europe and around the globe.



Lost and stolen travel documents



Source: Interpol

These are two of the key patterns for sharing and verifying official documents.



# Pattern 01

## “Digital Post”

Just in time evidence issuance

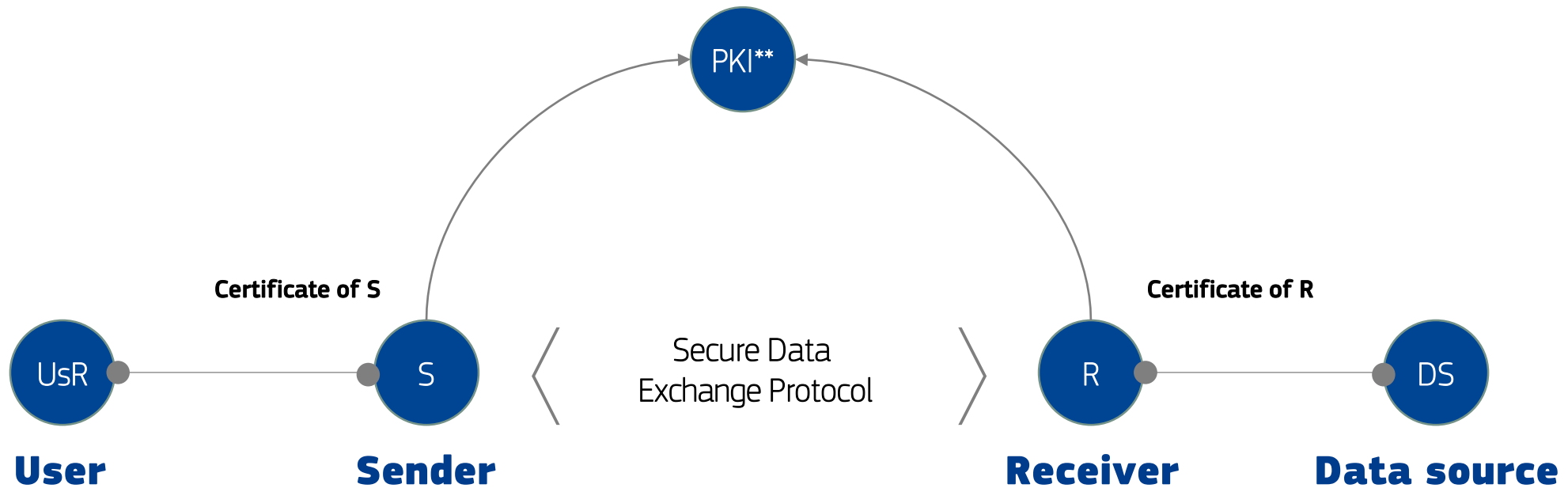


# Pattern 02

## “Digital Wallet”

Verifiable Credentials

# The traditional data sharing scenario replicates the post office pattern\*.

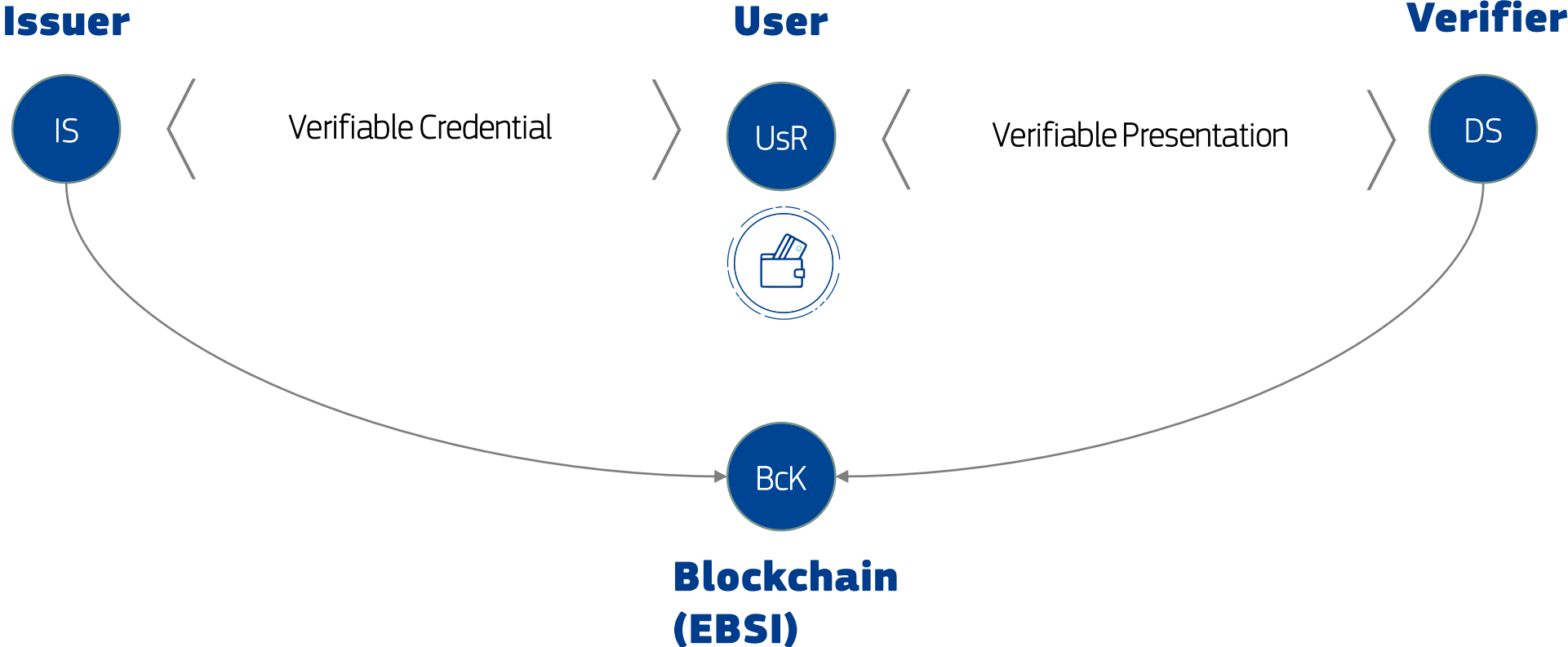


\*The just in time evidence issuance pattern: this model is similar to a traditional paper-based flow of post-office

\*\*Public Key Infrastructure



# Let's have a look at the concept of verifiable credential and the Digital Wallet: How does it work?



# A new paradigm for making data trustworthy. Blockchain is often misunderstood as another data sharing protocol.

## 01

Blockchain is not a protocol for sending and delivering data between systems but a **shared ledger** that creates **permanent digital records**.

## 02

Blockchain uses **cryptographic methods** and a distributed consensus that creates **trust** between disparate systems.

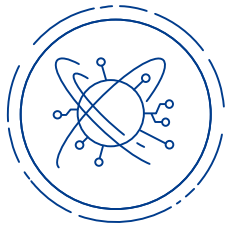
## 03

Blockchain is a new trust system that is used to anchor **verifiable claims** so parties can trust them.

## 04

Blockchain allows **greater control** for the end-user.

# What are the key advantages of using blockchain and the verifiable credentials?



Data control by  
the citizen



Enhanced  
selective data  
discloser



Improved  
traceability of the  
origin and of the  
recipient

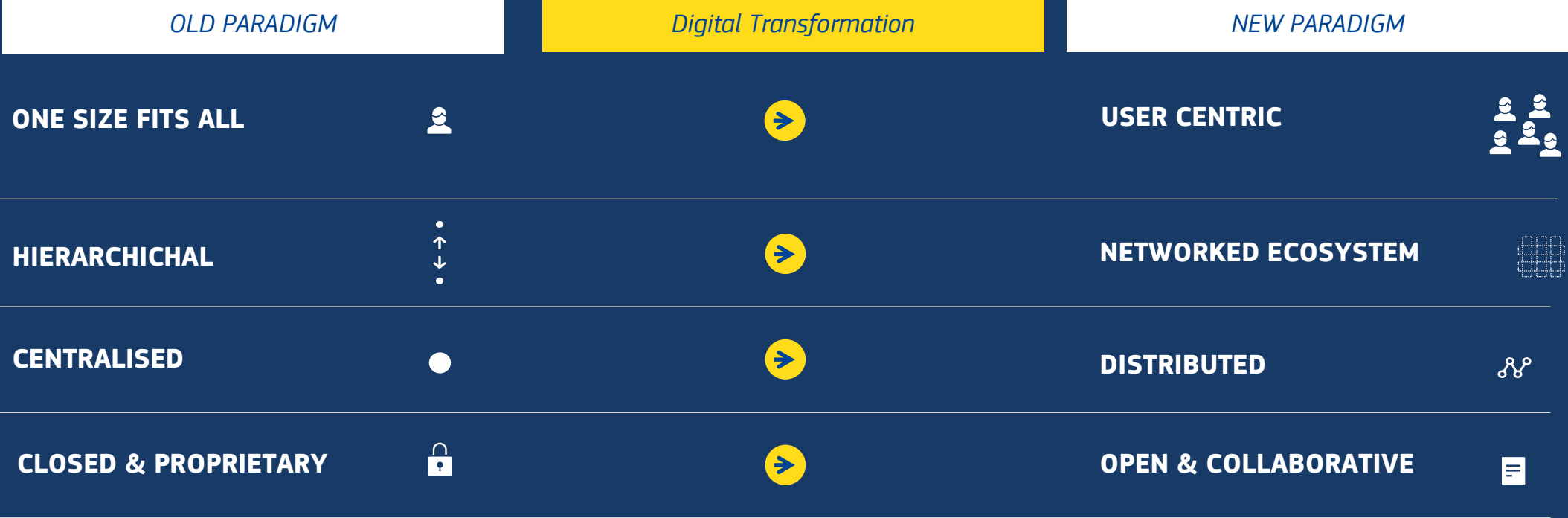


Increased  
efficiency  
(no need of “just-  
in-time evidence  
issuance”)



Reduced  
verification costs  
(once at scale)

# In summary, the Digital transition propels public administrations to a new paradigm.



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03

# Get inspired by the European Blockchain Service Infrastructure





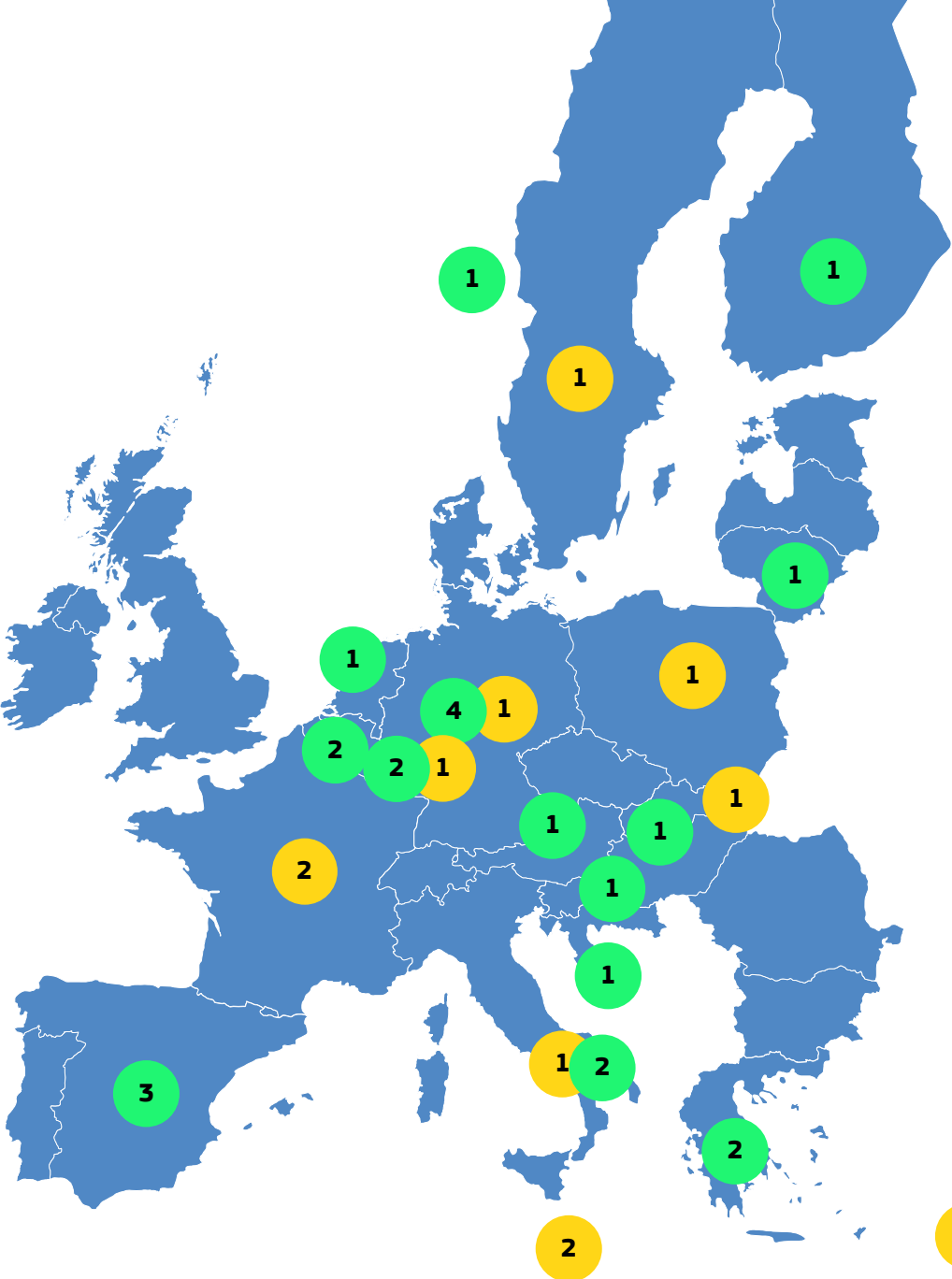
Robert Czarny  
Project Manager, DIGIT



20'

Governments, and society, need technology to verify the authenticity of information. Having this challenge in mind, DG CNECT and DIGIT are currently developing the EBSI, in close cooperation with the EBP, to accelerate the creation of cross-border services and **putting blockchain technology at the service of public administrations for the purpose of verification of information, making the services trustworthy.**

-  25 Live Nodes
-  11 Nodes in Setup phase



# EBSI will be the first EU-wide blockchain infrastructure, driven by the public sector, in full respect of European values and rules

(in particular for high-level of data security, data protection, and privacy)



## Mobility

Enhances Cross Border services provided by Governments to citizens



## Sustainable

Sustainable by design. Supports Use Cases that enhances environmental and Green Deal Policies



## Compliance

Complies with GDPR, EAIDAS, NIS Directive



## Enabler

Reinforces Blockchain capacities In Europe

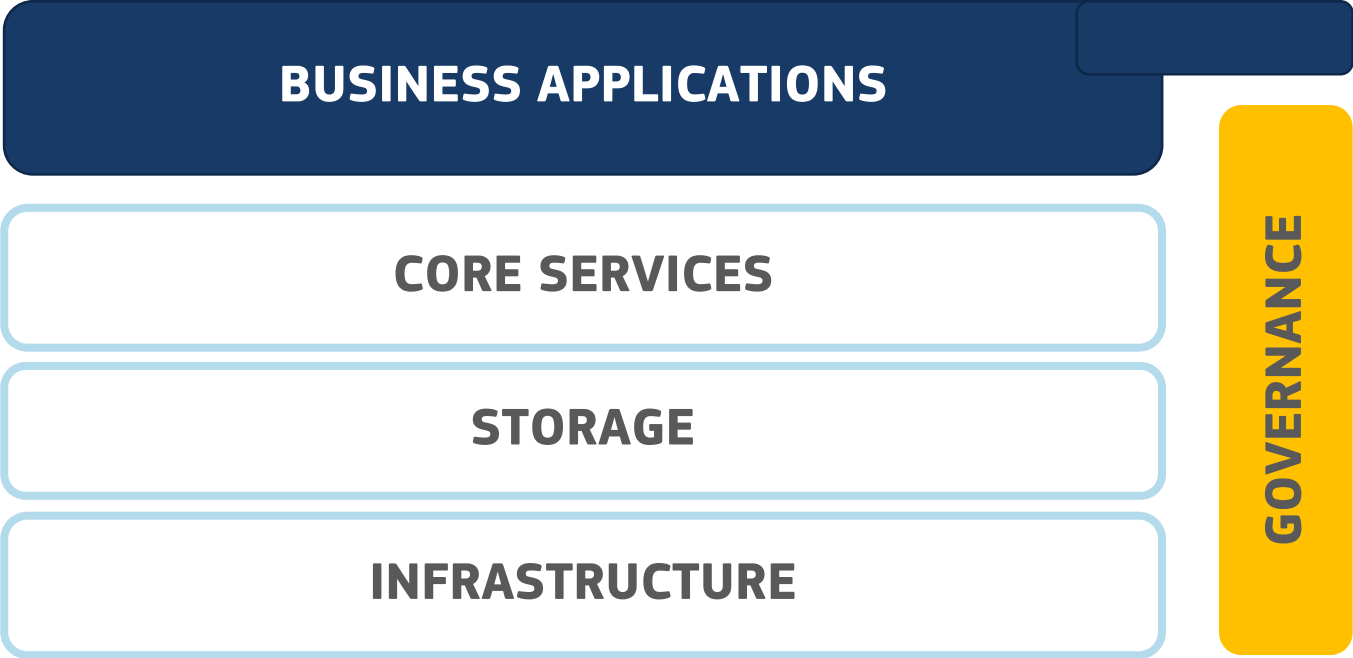


## Open

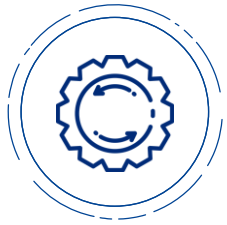
Based on open standards, market friendly and multi-vendor



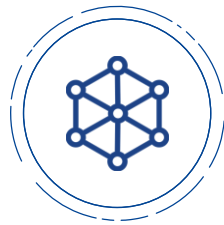
**EBSI is composed of a layered architecture. The architecture of each node is composed of three main functional areas.**



# What can you achieve by using EBSI?



Simplifies  
Administrative  
Processes



Enhances Trust  
with stakeholders



Increases  
Efficiency



Increases  
Transparency



Aligns to European  
values (e.g. Regulatory  
Compliance)

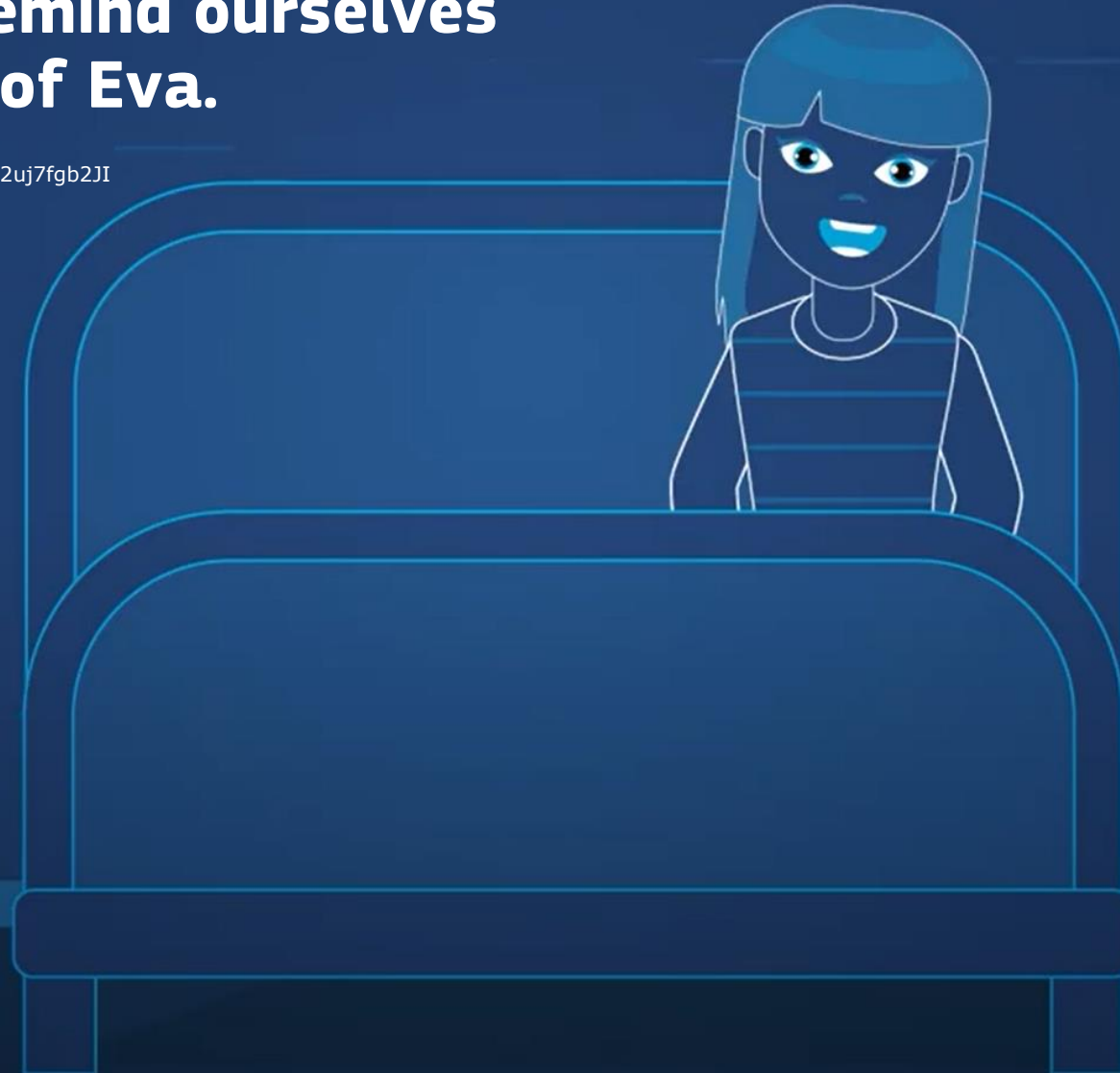


Makes the  
verification of data  
authenticity easy  
and at low cost

# In order to understand the potential of blockchain and EBSI, let's remind ourselves the journey of Eva.

<https://www.youtube.com/embed/m2uj7fgb2JI>

Watch the video

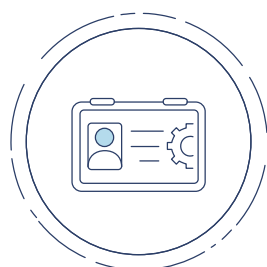


# Practically, four use cases have been selected by the EBP and are currently under development.

(V1 as a sandbox and v2 in production)



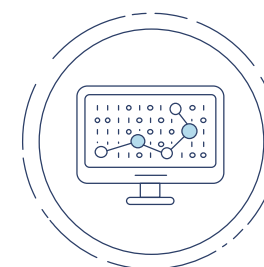
**Notarisation**  
of documents



European Self-Sovereign **Identity**



**Diplomas**  
Management



**Trusted data**  
sharing

(Reserved for TAXUD's Community at this stage)

+ 3 new use cases

SME financing, European Social Security Identification Number, Asylum process management

# European Self-Sovereign Identity.

## Features available in EBSI v2.0

	 Natural Person	 Legal Entity	 ESSIF On-boarding service (TRA)
Onboard on ESSIF	✓	✓	
Set up Verifiable ID Authentication		✓	
Authenticate using Verifiable ID	✓		
Request issuance of Verifiable ID	✓		
Request Verifiable Attestation	✓		
Present Verifiable Attestation	✓		
Register a Verifiable ID Issue			✓
Register a Trusted Registration Authority			✓
Register a Verifiable ID Data Schema in TSR			✓

# Diploma Management.

## Features available in EBSI v2.0

	 Natural Person	 Education Organisation	 Third Party	 Accreditation Organisation
Onboard	✓	✓	✓	
Request a credential	✓	✓	✓	
Assign a new diploma VC to a Legal Entity		✓		✓
Register an Educational Organization		✓		✓
Register a new diploma VC		✓		✓
Request to be accredited to issue a diploma		✓		✓
Share credential(s)	✓		✓	
Register a QAA in the TAR				✓
Request to be added to the TAR				✓

# Notarization.

## Features available in EBSI v2.0



Natural Person



Legal Entity

	Natural Person	Legal Entity
Onboard	✓	✓
DID Authentication	✓	✓
Notarize a document (together with its metadata)	✓	✓
Retrieve / browse the notarization history	✓	✓
Visualize notarization details	✓	✓
Verify the existence of a notarization with metadata	✓	✓
Notarize a new version document	✓	✓
Store notarized document's metadata on EBSI storage	✓	✓
Register the data on Smart contract	✓	✓
Data linkage	✓	✓

# Trusted Data Sharing.

## Features available in EBSI v2.0



	Member State Entity	Consulting Member State Entity	Group Administrator
Onboard	✓	✓	
Verify an existing record	✓	✓	
Register a new record	✓		
Update / delete an existing record	✓		
Consult the information about a sharing group	✓	✓	
Create / update / delete a sharing group			✓
Consult the information about a sharing group member	✓	✓	
Add / remove a member to / from a sharing group			✓
Update rights of a sharing group member			✓



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# Q&A

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10'

04

# Discover EBSI capabilities through scenario example



30'



Kevin Ambrogi  
Product Owner, DIGIT



Saky Kourtidis  
SMO, DIGIT

# Let's imagine, you are looking to integrate your application with EBSI. The first step is to create your Pilot scenario.



**So, based on your scenario, you now know which EBSI use case you can start exploring and the typical features they offer.**



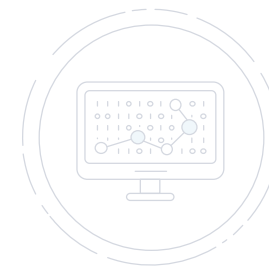
**Notarisation**  
of documents



European Self-Sovereign **Identity**



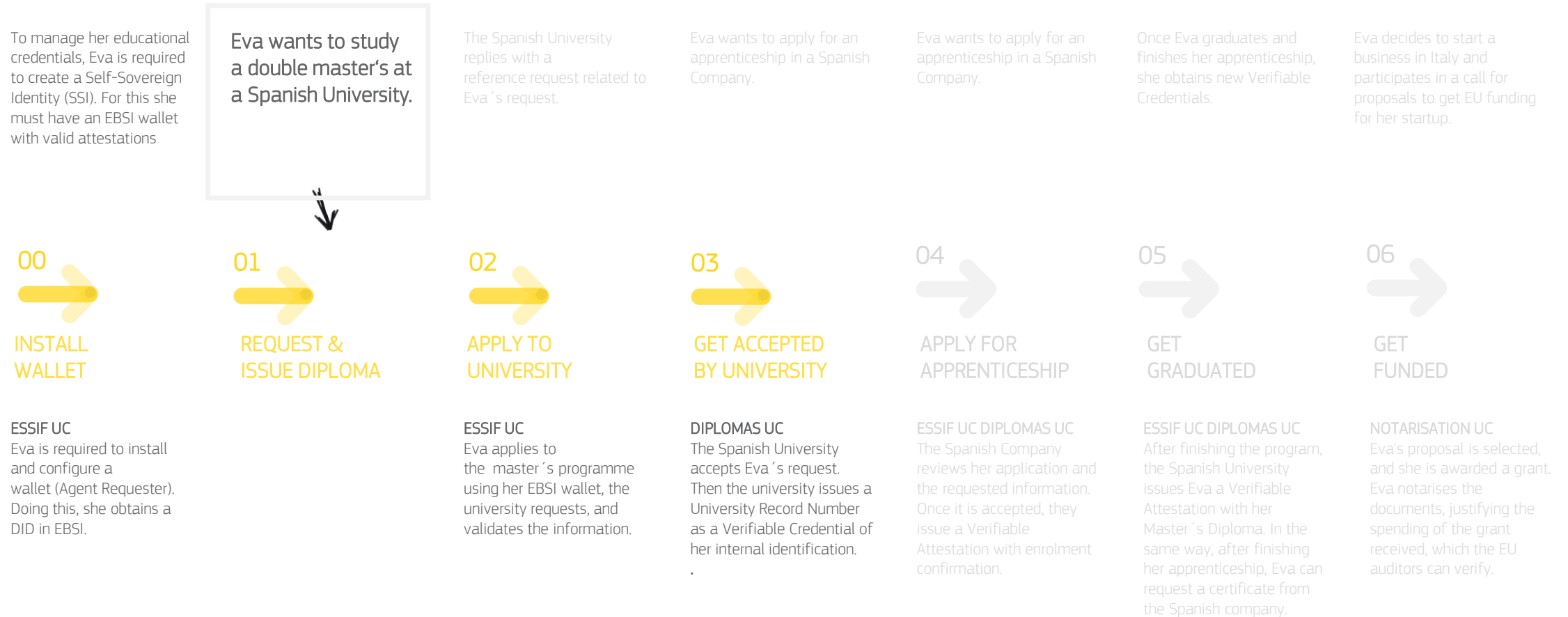
**Diplomas**  
Management



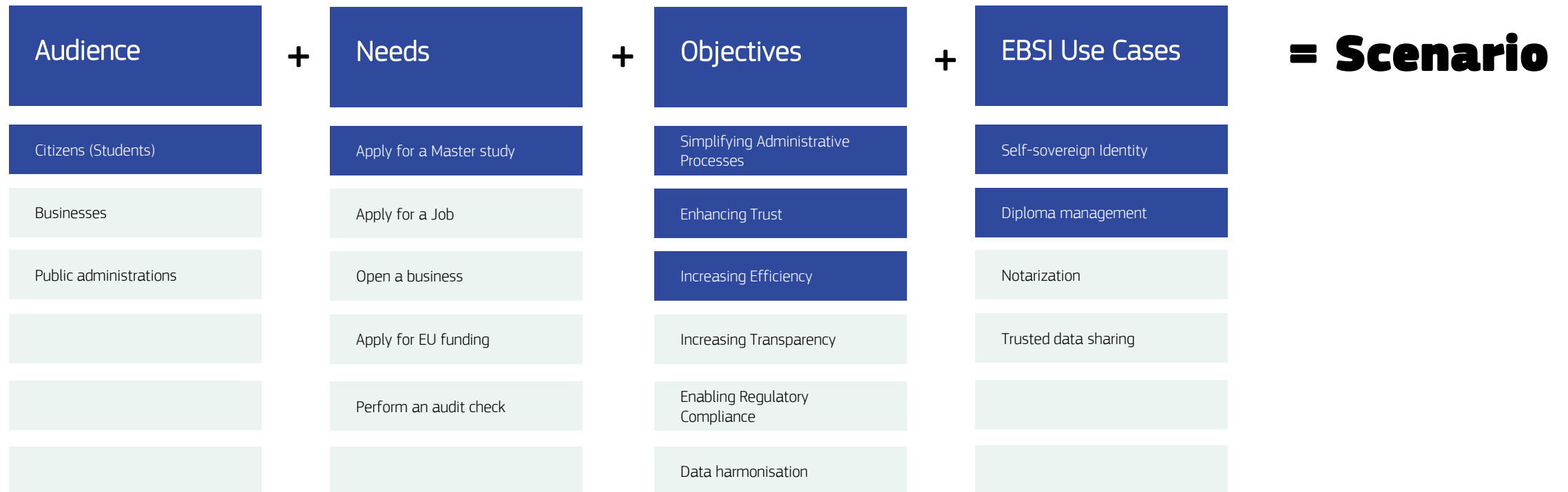
**Trusted data**  
sharing

(Reserved for TAXUD Community)

# In the story of Eva, she is going through a journey during which she will answer several needs.



# For the sake of making the story reasonable in terms of scope, we will take a part of that journey to build our scenario.



## **The following scenario has been identified as the most relevant one**

How to help European students and universities facilitate the issuance, sharing and verification of educational credentials across border in order to enhance free mobility of students and make the process more efficient and trust-worthy by using EBSI?



Once you have defined your starting point, you are going to take 3 tasks to design your pilot scenario.

01

Define **stakeholders** and their **benefits**

02

Model the **pilot scenario** and identify **pre-requisites**

03

Define the **EBSI APIs\*** you need for the pilot

\*Application Programming Interfaces (Core services of EBSI)

**Eva just finished her Bachelor's degree at the University of Ghent (BE). She wants to apply for a Master's degree at the University of Rovira i Virgili (ES). To do so, she has to request the issuance of her Bachelor Diploma from the University of Ghent and then share the Bachelor Diploma with the University of Rovira i Virgili for verification.**

# In our scenario, the stakeholders and their roles can be described as follows:



**Student**

**Eva**

[The user]

Request the issuance her Verifiable Attestation (Diploma).



**University of Ghent**

**Udo**

+ automated systems.

[The issuer]

Verifies the request of Eva and issues a Verifiable Attestation (Diploma).



**University of Rovira i Virgili**

**Miguel**

+ automated systems.

[The verifier]

Verifies the Verifiable Presentation and accepts Eva 's request.



**Belgian government**

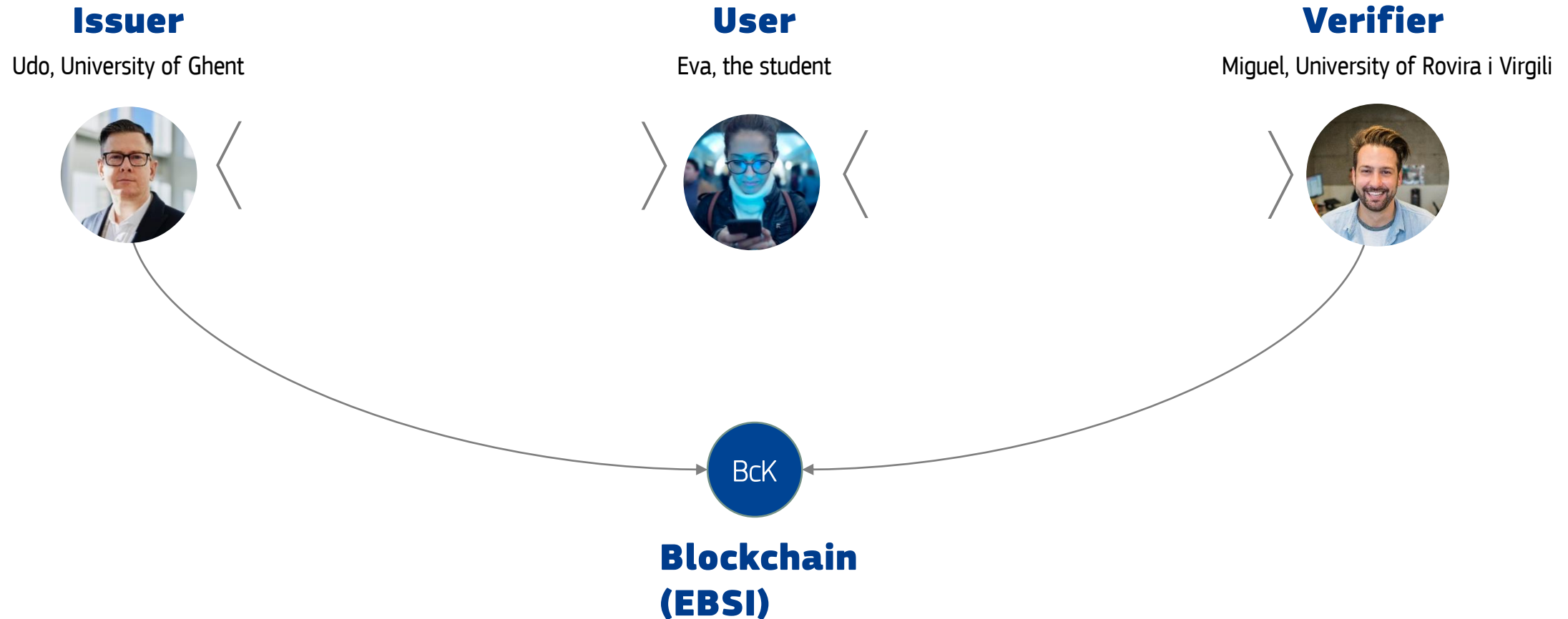
**Isabelle**

+ automated systems.

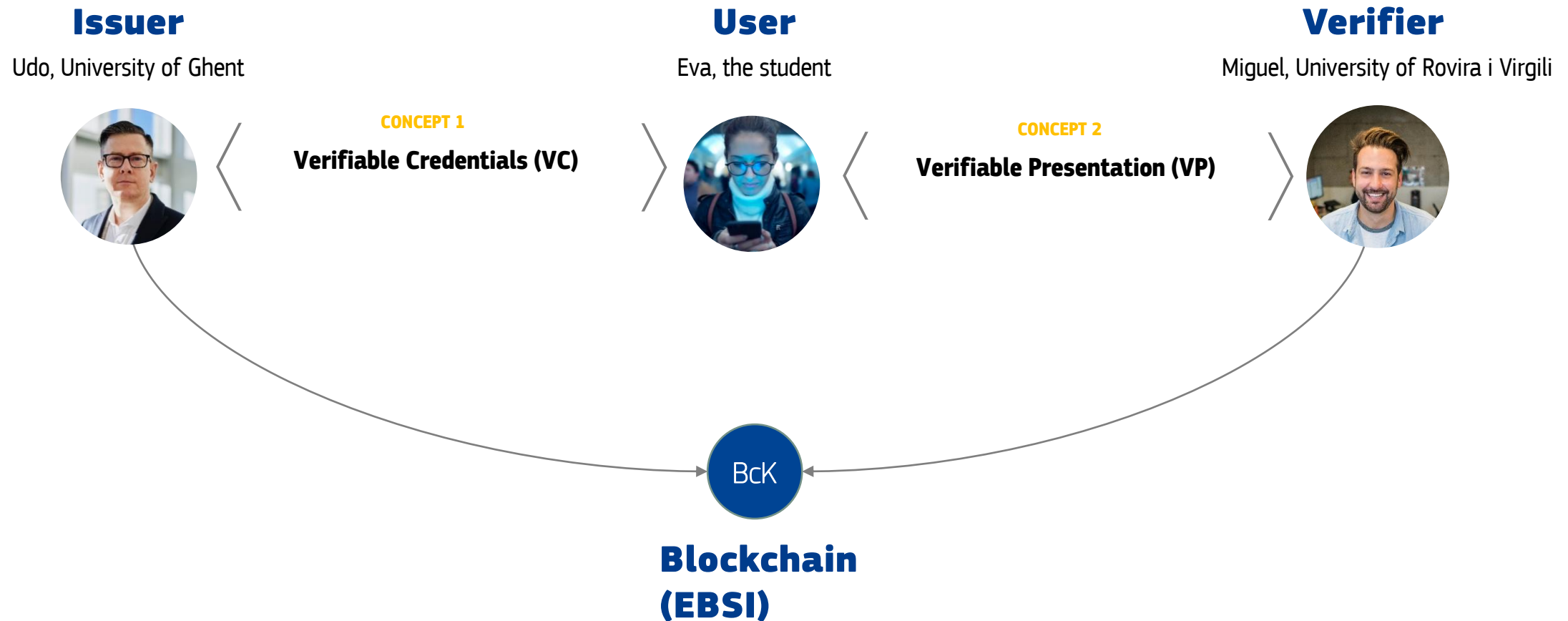
[Trusted Registration Authority / Trusted Identity Issuer]

Issues the verifiable ID  
Registers the DID on the EBSI Ledger

**In our scenario, the exchange of information will need to happen between the user, the issuer and the verifier.**



# There are two important concepts to understand in this exchange of information: Verifiable Credential and Verifiable Presentation.



# Let's look at the definitions of these two key concepts (Verifiable Credential and Verifiable Presentation).

## CONCEPT 1

### Verifiable Credential (VC)

is an electronic information **structured in a standardised way** (semantic and format)



#### Verifiable ID (V-ID)

a special form of a Verifiable Credentials used only for identification / authentication (passports or national eIDs),

- Family name
- First name
- Birth date
- Place of birth
- Unique identifier
- Etc.



#### Verifiable Attestation (VA)

a special case of a Verifiable Credentials used as evidence of attributes without identification.

- **Diplomas**
- Bus tickets
- Membership
- Postal address
- e-mail address
- Bank account
- Etc.

a special case of a Verifiable Credential used as evidence of a permit/authorisation.

- Driving license
- Work permit
- Access control
- Etc.

## CONCEPT 2

### Verifiable Presentation (VP)

represents the **minimum set of data** passing from an entity to a relying party **for a given purpose**.



Extract of (V-ID)



Extract of (VA)

+

**GIVEN PURPOSE**

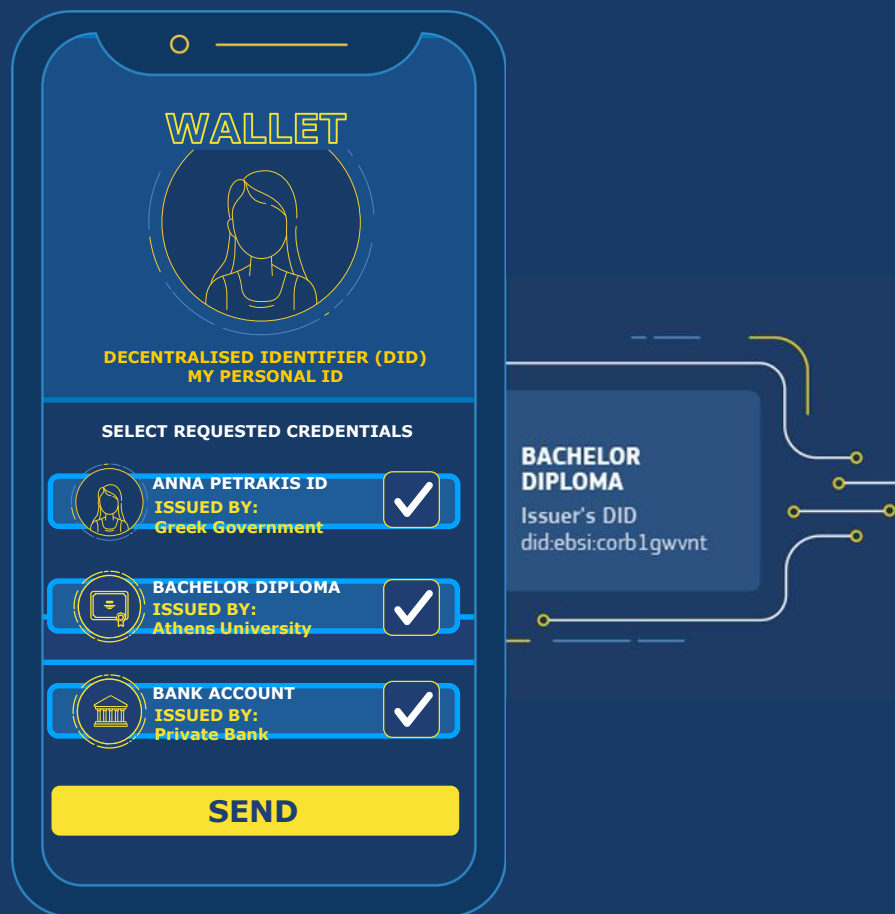
usually composed of V-ID, VA and the purpose of sharing such data. Verifiable means it can be easily verified following a cryptographic-based standard procedure

- **Diplomas**
- Bus tickets
- Memberships
- Postal address
- E-mail address
- Bank account
- Etc.

+

**Register for a master course/curriculum**

# Another key concept to understand is the Decentralised Identifier (DID)? What does it mean and why is it so important?



A **Decentralised identity (DID)** is just a permanent (persistent) identifier that can be looked up to retrieve a DID Document, which describes how to interact with the DID owner (mostly cryptographic keys and service endpoints). It does not provide any kind of information about the DID owner.

DIDs leverage on the inherent properties **of blockchain or distributed ledgers**, by creating a tamper-proof and distributed sequence of events. This allows any DID owner to update and keep track of the changes in the DID document without the need of any central authority.

**did:{method}:xwyz123456**



**Method specific identifier**

**How to create, read, update and delete information related to a DID (its DID document) on a specific blockchain/distributed ledger**

# The Decentralised Identifier (DID) allows for the verification processes associated to a given Party (1).

## 01

### Identify a Party uniquely

---

Create a Decentralised Identifier (DID). A decentralised identifier can **uniquely identify a Party** (Issuer, Owner/Holder, Relying Party). It is fully under the Party's control and used for referring to it.

## 02

### Store on EBSI Ledger to secure it

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Store the Decentralised Identifier (DID) on Blockchain (to protect it and make it available for verification). (A Trusted Registration Authority must authorise the user to store the DID on the EBSI Ledger).

## 03

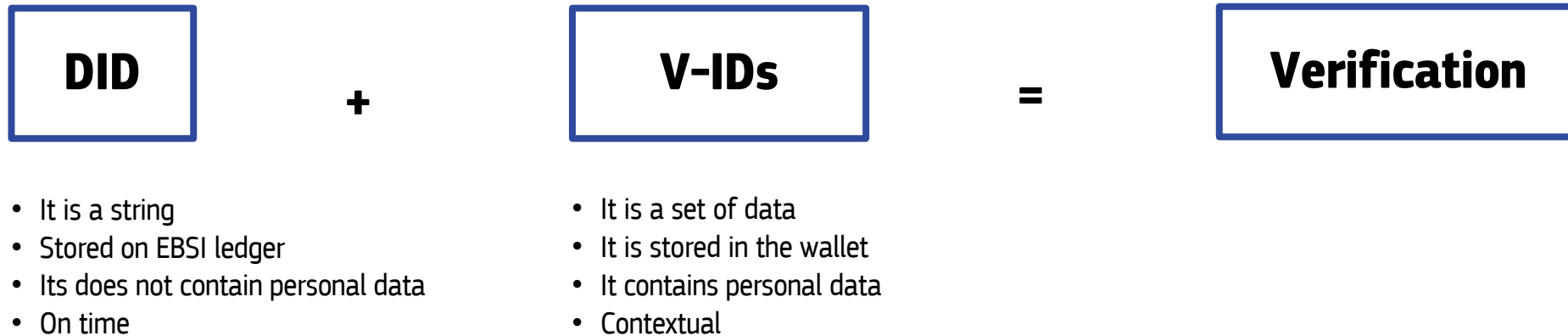
### Activate trustworthy verification process

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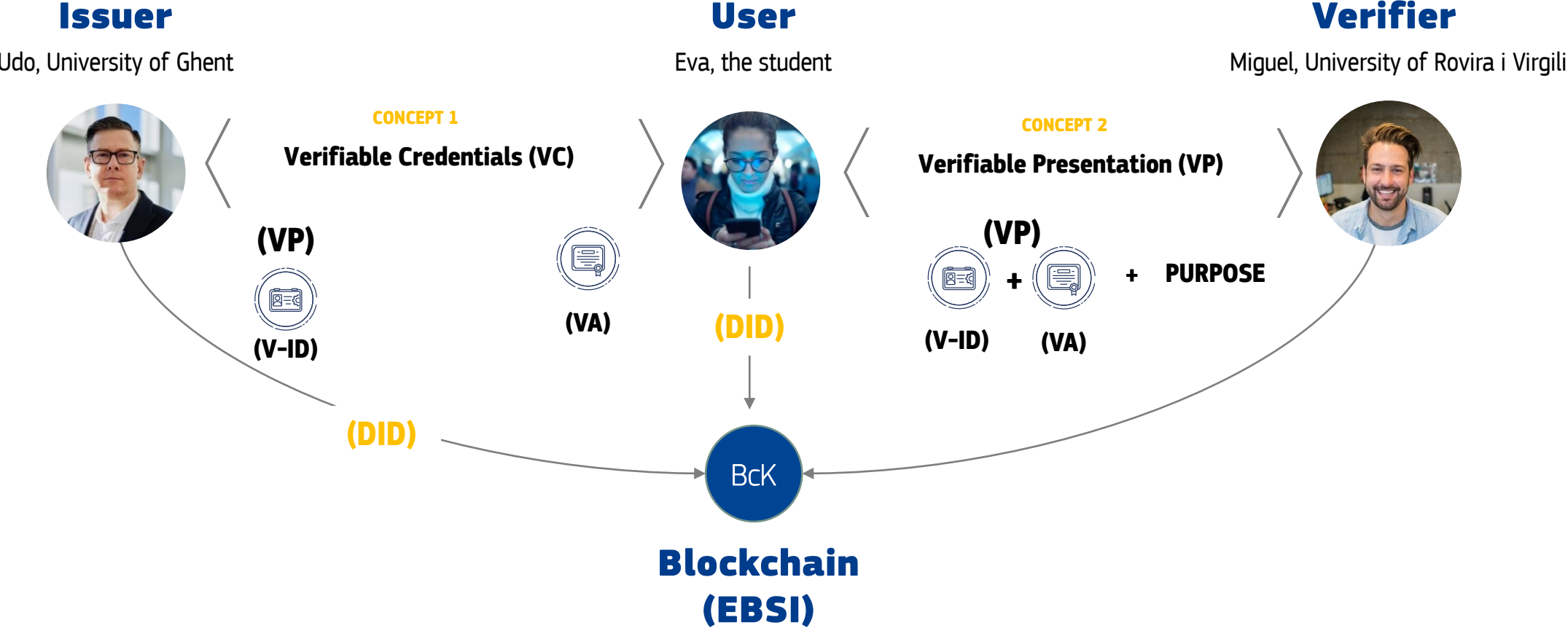
Parties can **check the trustworthiness of information** (VC, VP) thanks to Decentralized Identifier (DID) that is stored on the EBSI Ledger.



## So, we could summarize it as follows:

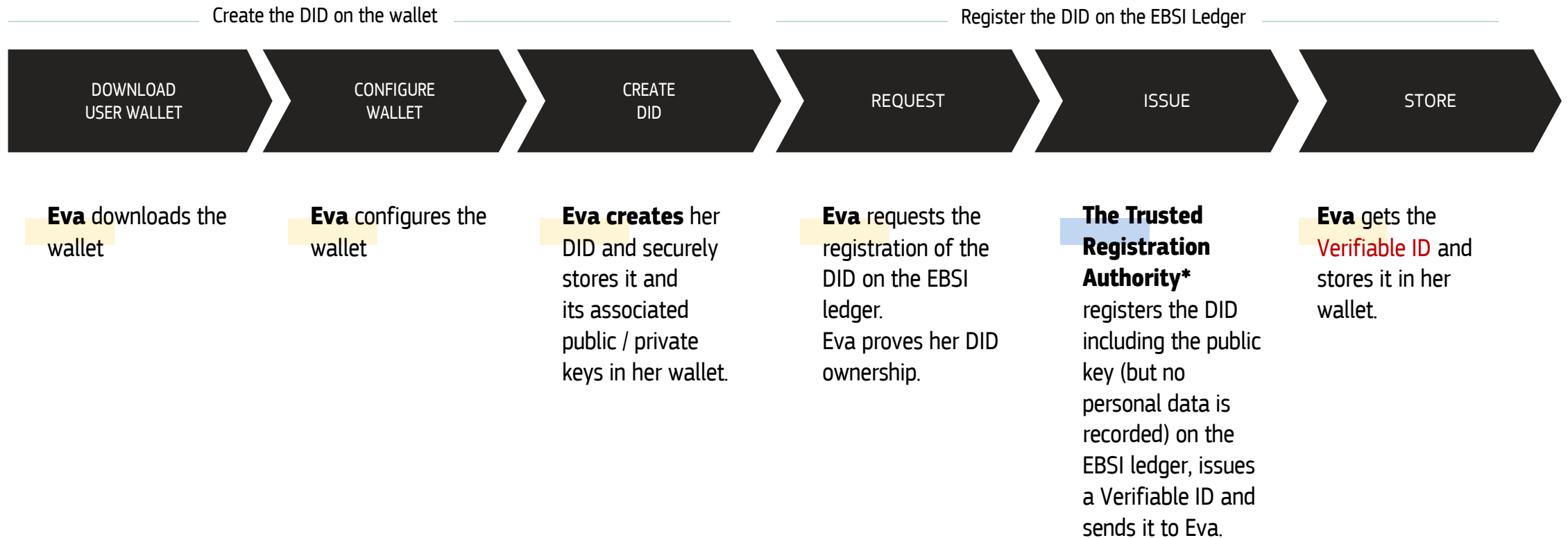


# Eva needs to have her (DID) stored on-chain. The Issuer and the Verifier will use the blockchain to check the DID of Eva.



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# For this scenario to work, Eva needs to set up her wallet and request a Verifiable ID from the Trusted Registration Authority



\* Different options are currently being analysed.

# The University of Ghent and Rovira i Virgili also need to be onboarded and register their diploma on EBSI

The University of Ghent and Rovira i Virgili **onboarding** on ESSIF:



The University of Ghent and Rovira i Virgili are accredited by an official accreditation authority to issue a specific Diploma:



# Eva is a Bachelor student at the University of Ghent (BE) and she registers for a Master's Degree at the University of Rovira i Virgili (ES)



**Eva** requests the issuance of her Bachelor's Diploma (VA) from the University of Ghent

**Udo** (from University of Ghent) issues the Bachelor's Diploma (VA) and sends it to Eva

**Eva** receives and accepts the Bachelor's Diploma (VA). She stores it in her wallet

**Eva** shares her Bachelor's Diploma (VA) with the University of Rovira i Virgili

**Miguel** (from the University of Rovira i Virgili) verifies the Bachelor's Diploma (VA) of Eva

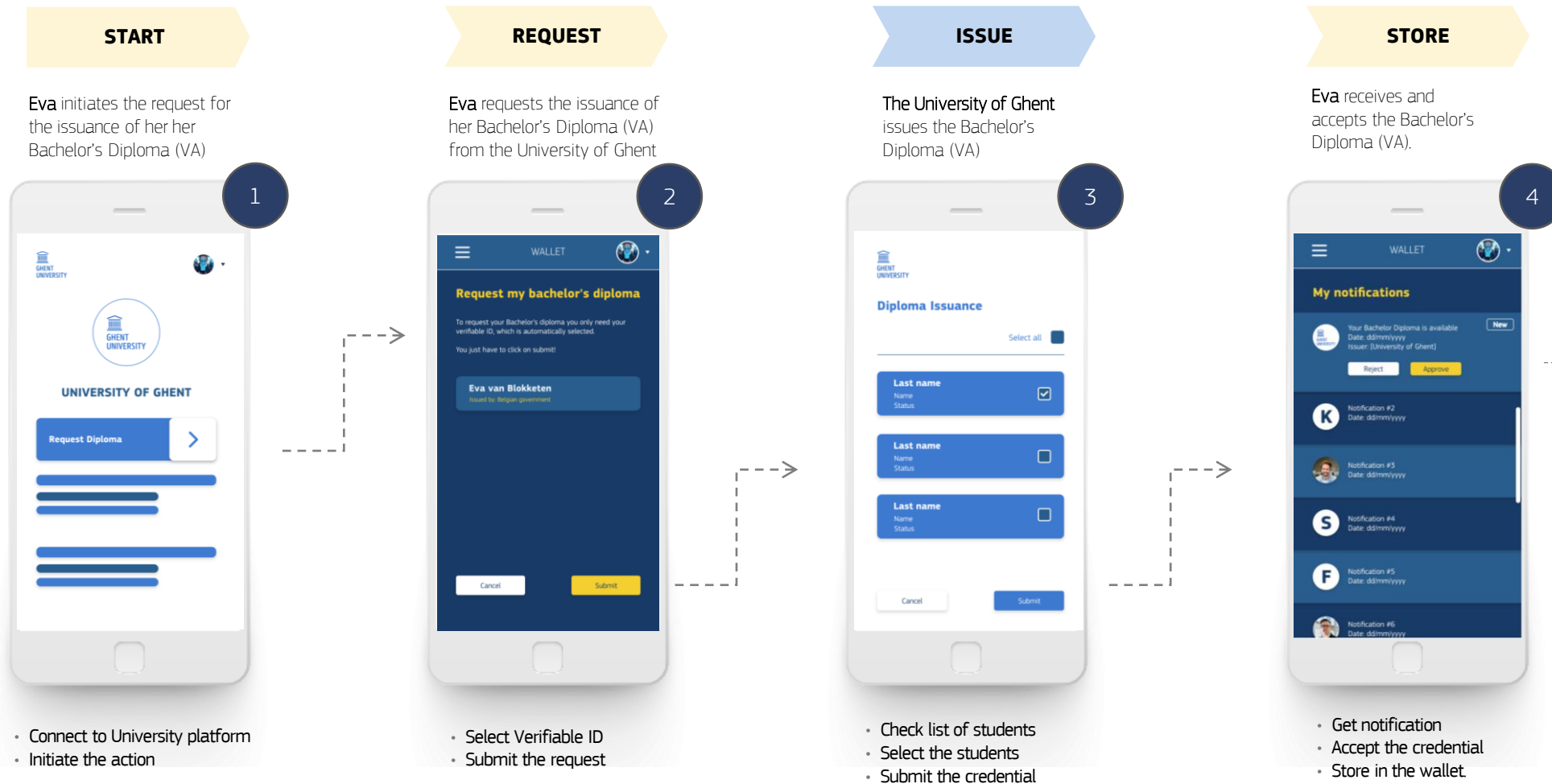
**Eva** enrolls for a Master's Degree at the University of Rovira i Virgili



# How this could look like?

Reimagine the way we manage educational credentials across Europe. Together. With EBSI.

# First, Eva requests the issuance of her Bachelor's diploma to the University of Ghent (BE).

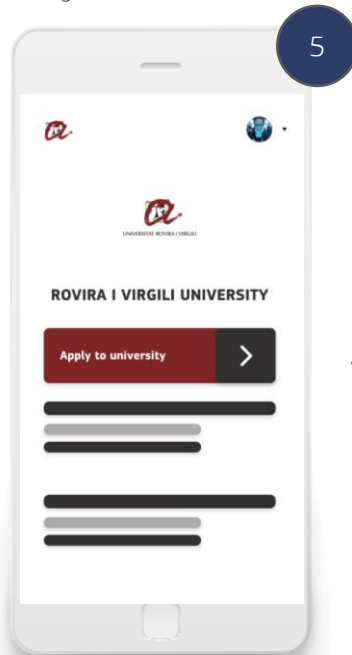




# Then, Eva requests her enrolment at the University of Rovira i Virgili (ES)

## START

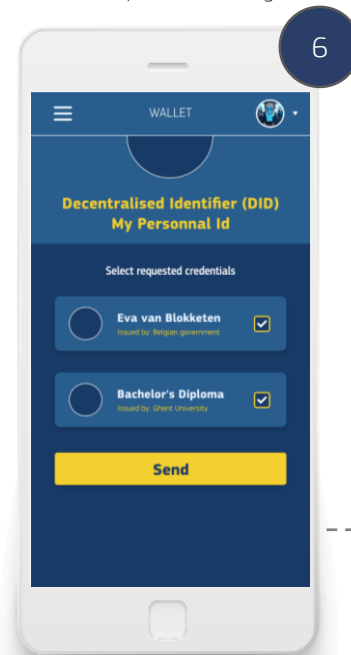
Eva initiates the application to the University of Rovira i Virgili



- Connect to University platform
- Initiate the action

## SHARE

Eva shares her Bachelor's Diploma (VA) with the University of Rovira i Virgili



- Select Verifiable ID
- Select Bachelor's diploma
- Submit the request

## VERIFY

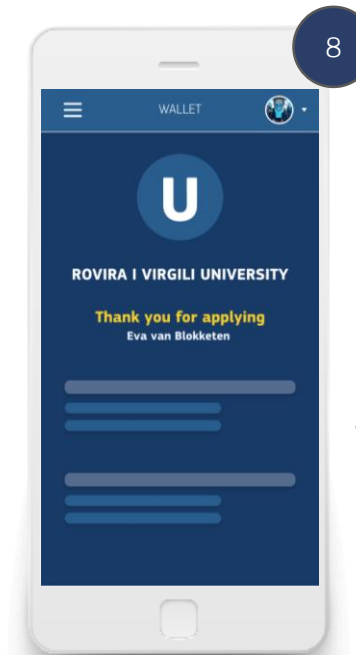
The University of Rovira i Virgili verifies the Bachelor's Diploma (VA) of Eva



- Get notification
- Check list of requests
- Check details of diploma

## ENROL

Eva enrolls for a Master's Degree at the University of Rovira i Virgili



Eva is only one example out of the  
**4 million students**  
**graduated** in Europe...  
...every year...

# Trusted diplomas have great potential.

Students' mobility in Europe is a broad market. EBSI and EuroPass are its enablers.



**17 million**

students (Bachelor, Master and PhD).



**2,465**

higher education institutions



**27**

European countries



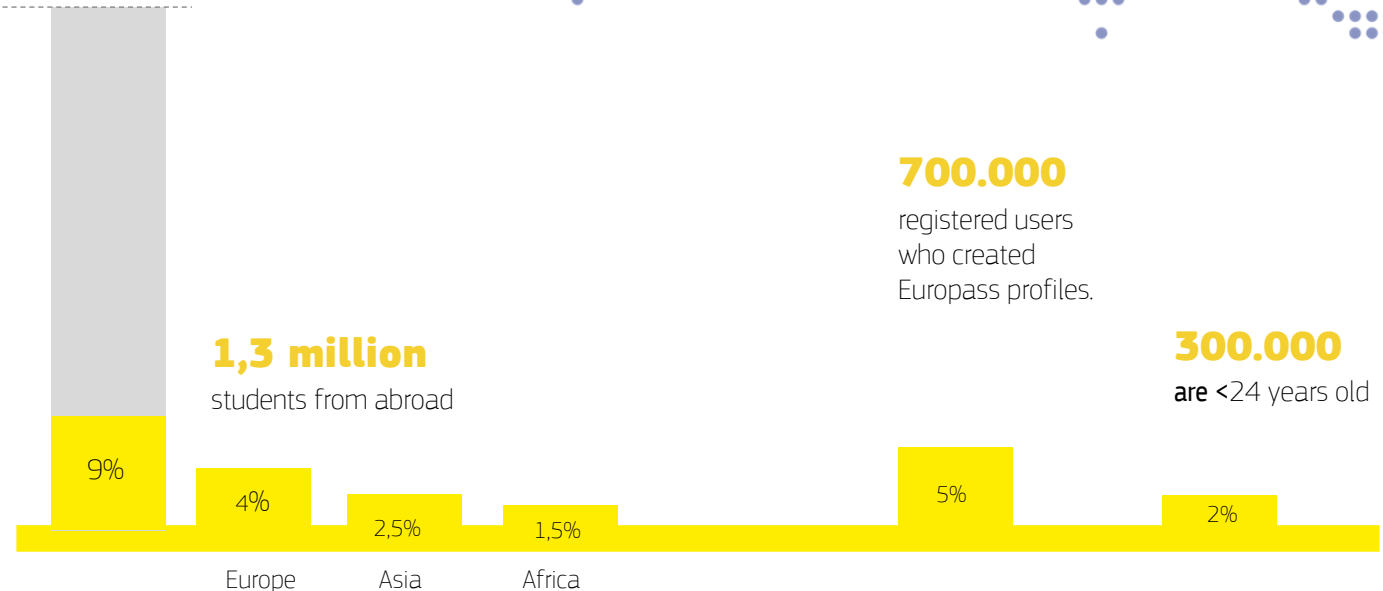
**1.35 million**

teachers



**4.0 million**

students graduated (diplomas)



**1,3 million**

students from abroad

**700.000**

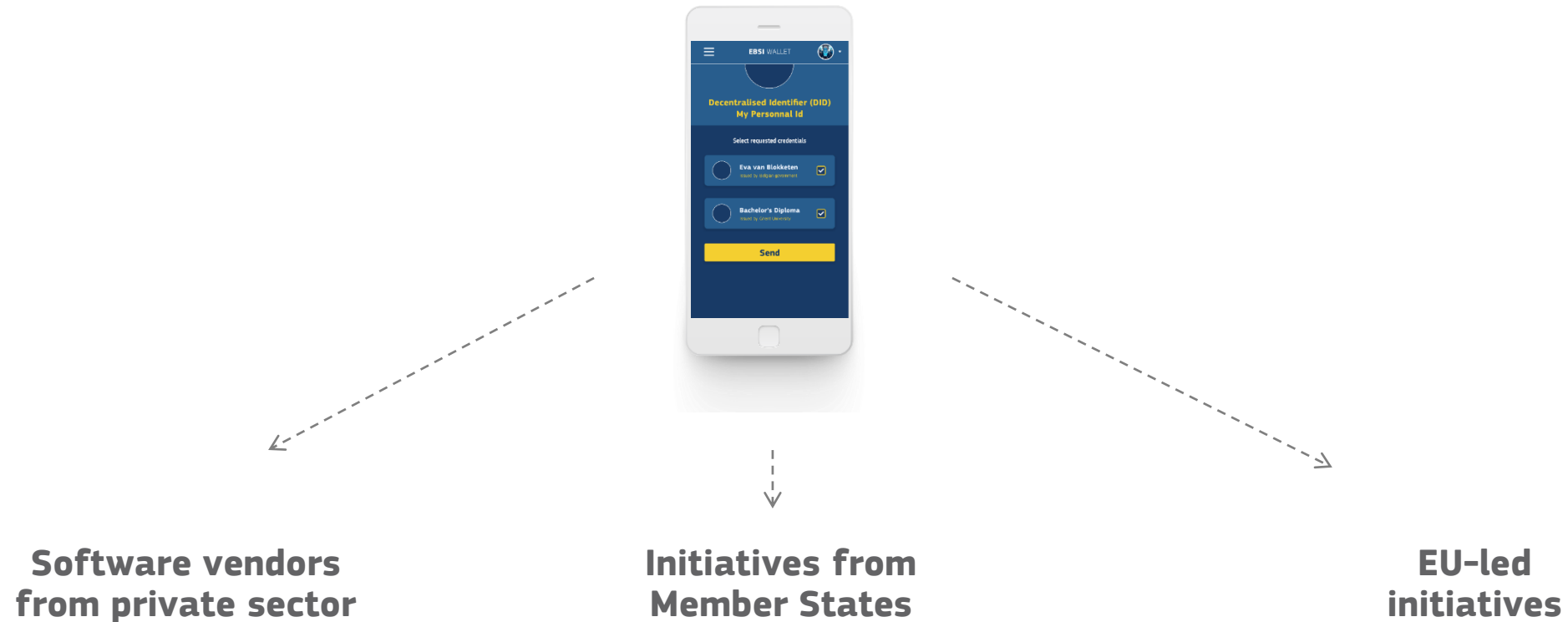
registered users  
who created  
Europass profiles.

**300.000**  
are <24 years old

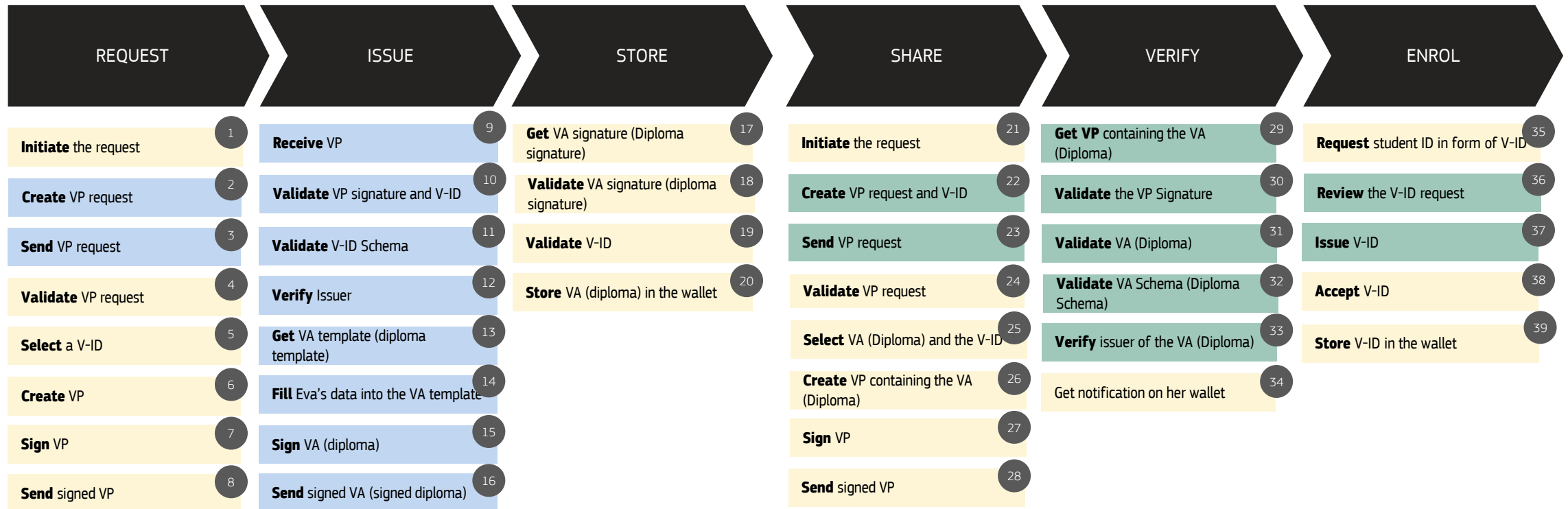
## Sources

- [https://ec.europa.eu/education/european-tertiary-education-register\\_en](https://ec.europa.eu/education/european-tertiary-education-register_en)
- [https://ec.europa.eu/eurostat/statistics-explained/index.php/Learning\\_mobility\\_statistics](https://ec.europa.eu/eurostat/statistics-explained/index.php/Learning_mobility_statistics)
- [https://ec.europa.eu/eurostat/statistics-explained/index.php/Tertiary\\_education\\_statistics#Graduates](https://ec.europa.eu/eurostat/statistics-explained/index.php/Tertiary_education_statistics#Graduates)
- <https://europa.eu/europass/en/statistics>

# EBSI does not plan to build a wallet. We expect the wallet to come from the following actors.



# Of course, in the journey, each step of the scenario is made of atomic steps.



Request the issuance of VA (Diploma)  
= Share my V-ID

Request the enrolment to University  
= Share my VA (Diploma)

# For each step of the journey, you can check and understand the EBSI APIs you need to make it happen.

Functionality		APIs					Local	
		Wallet API	ID Hub API	Verifiable Presentation API	Trusted Schema Registry API	Trusted Issuers Registry API		
Request	1	Eva (student) initiates the request to issue her diploma						Yes
	2	The University of Ghent creates the Verifiable Presentation (VP) request						Yes
	3	The University of Ghent sends the Verifiable Presentation (VP) request						Yes
	4	Eva (student) validates the Verifiable Presentation (VP) request					Yes	
	5	Eva (student) selects the Verifiable ID (V-ID)		Yes				
	6	Eva (student) creates the Verifiable Presentation (VP)			Yes			
	7	Eva (student) signs the Verifiable Presentation (VP)						Yes
	8	Eva (student) sends the signed Verifiable Presentation (VP) to the University of Ghent	Yes					
Issue	9	Udo (University of Ghent) receives the Verifiable Presentation (VP) request						
	10	Udo (University of Ghent) validates the VP Signature and the V-ID	Yes					
	11	Udo (University of Ghent) validates the Verifiable ID (V-ID) Schema				Yes		
	12	Udo (University of Ghent) verifies the issuer of the Verifiable ID (V-ID)					Yes	
	13	Udo (University of Ghent) gets the VA template (diploma template)				Yes		
	14	Udo (University of Ghent) fills Eva's data into the VA template (diploma template)						Yes
	15	Udo (University of Ghent) signs the VA (diploma)	Yes					
	16	Udo (University of Ghent) sends the signed VA (signed diploma) to Eva	Yes					
Store	17	Eva (student) receives the signed VA (signed diploma) (via notification)	Yes					
	18	Eva (student) validates the VA signature (diploma signature)	Yes					
	19	Eva (student) validates the verifiable ID (V-ID) of the University of Ghent					Yes	
	20	Eva (student) stores the VA (diploma) on her wallet.		Yes				
Share	21	Eva (student) initiates the request to apply for a Master Degree						Yes
	22	The University of Rovira i Virgili creates the VP request of Eva's VA						Yes
	23	The University of Rovira i Virgili sends the VP request to Eva						Yes
	24	Eva (student) validates the Verifiable Presentation (VP) Request				Yes		
	25	Eva (student) selects the VA (Diploma)		Yes				
	26	Eva (student) creates the VP containing the VA (Diploma)			Yes			
	27	Eva (student) signs the Verifiable Presentation (VP)						Yes
	28	Eva (student) sends the signed VP to University of Rovira i Virgili	Yes					
Verify	29	Miguel (University of Rovira i Virgili) gets the VP containing the Diploma						Yes
	30	The University of Rovira i Virgili validates the VP Signature	Yes					
	31	The University of Rovira i Virgili validates Diploma (VA) from Eva	Yes					
	32	The University of Rovira i Virgili validates Diploma (VA) Schema						
	33	The University of Rovira i Virgili verifies issuer of Diploma				Yes		
	34	Eva (student) receives the notification on her wallet					Yes	
Enrol	35	Eva (student) requests student ID from the University of Rovira i Virgili (as a V-ID)	Yes					
	36	Miguel (University of Rovira i Virgili) reviews the Verifiable ID (V-ID) request	Yes					
	37	Miguel (University of Rovira i Virgili) issues the Verifiable ID (V-ID)	Yes					
	38	Eva (student) receives and accepts the Verifiable ID (V-ID)	Yes					
	39	Eva (student) stores the Verifiable ID (V-ID) in her wallet	Yes					

Go to [www.menti.com](https://www.menti.com) and use the code 65 90 96 7

05

# Get engaged and start with EBSI (CEF Digital and EBSI Community)



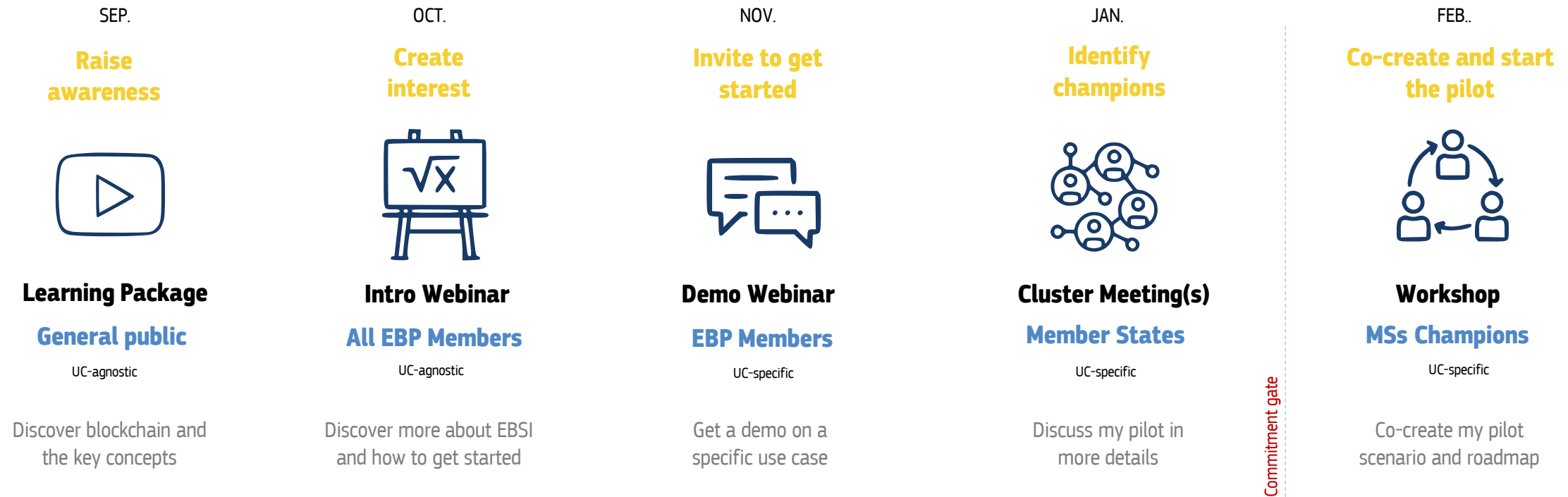
Zaira Lin  
SMO, DIGIT



10'



# We are currently piloting with Member States and conveners following an educative and collaborative approach.



Commitment gate

Co-creation level

# An ecosystem of resources is available for you to get started with EBSI.

## 01

### Learn.

Want to learn about EBSI and stay informed about what we do?

- Watch our **episodes**
- Read our **research paper and articles**
- Subscribe to the **newsletter** and follow us on **social media**

## 02

### Make.

Want to check specs and services in more details and start playing with EBSI?

- Download our **toolkit**
- Check the **EBSI documentation**
- Check the **Wallet guidelines (soon)**

## 03

### Share.

Want to get involved in EBSI and engage with EBSI stakeholders ?

- Ask your questions on the **open forum**
- Share your ideas on the **collaborative space**
- Participate to our **(demo) webinars**

> Stay tuned as **Member States are piloting and public consultations will soon be launched**

Go to [www.menti.com](https://www.menti.com) and use the code 65 90 96 7

**Thank you !**