



# EBSI-VECTOR

Education and work reloaded

## D2.2: Interoperability Strategy of EBSI Use Cases

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# 1 List of Terms and Abbreviations

Abbreviation	Definition
ARF	<a href="#">Architecture and Reference Framework</a> <sup>1</sup>
CEN	<a href="#">European Committee for Standardization</a> <sup>2</sup>
CENELEC	<a href="#">European Committee for Electrotechnical Standardization</a> <sup>3</sup>
DCAT	<a href="#">Data Catalogue Vocabulary</a> <sup>4</sup>
DCAT-AP	<a href="#">Data Catalogue Vocabulary Application profile for data portals in Europe</a> <sup>5</sup>
DID	<a href="#">Decentralized Identifier</a> <sup>6</sup>
DLT	Distributed ledger technologies
EBRS	<a href="#">European Blockchain Regulatory Sandbox</a> <sup>7</sup>
EBSI	<a href="#">European Blockchain Service Infrastructure</a> <sup>8</sup>
EIF	The <a href="#">New Interoperability Framework</a> <sup>9</sup> .
ETSI	<a href="#">European Telecommunications Standard Institute</a> <sup>10</sup>
IDA	<a href="#">Interchange of Data between Administrations</a> <sup>11</sup>
IDABC	<a href="#">Interoperable Delivery of Pan-European eGovernment Services to Public Administrations, Business and Citizens</a> <sup>12</sup>

<sup>1</sup> <https://digital-strategy.ec.europa.eu/en/library/european-digital-identity-architecture-and-reference-framework-outline> (Accessed on 30.08.24)

<sup>2</sup> <https://www.cencenelec.eu/about-cen/> (Accessed on 30.08.24)

<sup>3</sup> <https://www.cencenelec.eu/about-cenelec/> (Accessed on 30.08.24)

<sup>4</sup> <https://www.w3.org/TR/vocab-dcat/> (accessed on 30.08.24)

<sup>5</sup> <https://op.europa.eu/en/web/eu-vocabularies/dcat-ap> (Accessed on 30.08.24)

<sup>6</sup> <https://www.w3.org/TR/did-core/> (Accessed on 30.08.24)

<sup>7</sup> <https://digital-finance-platform.ec.europa.eu/cross-border-services/ebsi> (Accessed on 30.08.24)

<sup>8</sup> <https://ec.europa.eu/digital-building-blocks/sites/display/EBSI/Home> (Accessed on 30.08.24)

<sup>9</sup> [https://ec.europa.eu/isa2/sites/default/files/eif\\_brochure\\_final.pdf](https://ec.europa.eu/isa2/sites/default/files/eif_brochure_final.pdf) (Accessed on 30.08.24)

<sup>10</sup> <https://www.etsi.org/> (Accessed on 30.08.24)

<sup>11</sup> <https://eur-lex.europa.eu/EN/legal-content/summary/electronic-interchange-of-data-between-administrations-ida-programme.html> (Accessed on 30.08.24)

<sup>12</sup> <https://eur-lex.europa.eu/EN/legal-content/summary/the-idabc-programme-2005-2009.html> (Accessed on 30.08.24)

IEA	<a href="#">Interoperability Europe Act</a> <sup>13</sup>
IEB	<a href="#">Interoperable Europe Board</a> <sup>14</sup>
IEP	<a href="#">Interoperable Europe Portal</a> <sup>15</sup>
ISG PDL	(ETSI) <a href="#">Industry Specification Group on Permissioned Distributed Ledger</a> <sup>16</sup>
NIF	National Interoperability Frameworks <sup>17</sup>
OIDC4VP	<a href="#">OpenID Connect for Verifiable Presentations</a> <sup>18</sup>
PDL	<a href="#">Permissioned Distributed Ledgers</a> <sup>19</sup>
SEMIC	<a href="#">Semantic Interoperability Community</a> <sup>20</sup>
SSI	Self-Sovereign Identity
TC	Technical Committees
WP	Work Package
W3C	<a href="#">World Wide Web Consortium</a> <sup>21</sup>

<sup>13</sup> [https://ec.europa.eu/commission/presscorner/detail/en/IP\\_24\\_1970](https://ec.europa.eu/commission/presscorner/detail/en/IP_24_1970) (Accessed on 30.08.24)

<sup>14</sup> [https://commission.europa.eu/publications/interoperable-europe-act-proposal\\_en](https://commission.europa.eu/publications/interoperable-europe-act-proposal_en) (Accessed on 30.08.24)

<sup>15</sup> <https://joinup.ec.europa.eu/> (Accessed on 30.08.24)

<sup>16</sup> <https://www.etsi.org/committee/1467-pdl> (Accessed on 30.08.24)

<sup>17</sup> [https://ec.europa.eu/isa2/sites/default/files/eif\\_brochure\\_final.pdf](https://ec.europa.eu/isa2/sites/default/files/eif_brochure_final.pdf), p. 17. (Accessed on 30.08.24)

<sup>18</sup> [https://openid.net/specs/openid-connect-4-verifiable-presentations-1\\_0-07.html](https://openid.net/specs/openid-connect-4-verifiable-presentations-1_0-07.html) (Accessed on 30.08.24)

<sup>19</sup> <https://www.etsi.org/technologies/permissioned-distributed-ledgers> (Accessed on 30.08.24)

<sup>20</sup> <https://data.europa.eu/en/news-events/events/semic-2024> (Accessed on 30.08.24)

<sup>21</sup> <https://www.w3.org/> (Accessed on 30.08.24)

## 2 Executive Summary

This deliverable (D2.2) is part of task 2.2 'Interoperability' for the EBSI-VECTOR project. It describes the EU and international standardisations relevant to the EBSI-VECTOR project and presents an interoperability strategy for the use cases. The document aims to sensitise all partners to relevant standardisation, regulation, frameworks, and reusable software solutions essential to ensure interoperability of the EBSI-VECTOR use cases.

The report has two focus areas:

- Firstly, it provides an overview of the Interoperable Europe Act (section 3) and the New European Interoperability Framework (section 4), along with additional standardisations and regulations relevant to the EBSI-VECTOR project.
- Secondly, it outlines an interoperability strategy (section 5) addressing technical, semantic, organisational, and legal layers for interoperability, specifically for educational certificates and social security.

The strategy is specifically defined for the two EBSI-VECTOR use cases on educational certificates (WP4) and social security certificates (WP5) and has two focus areas:

1. Comply with the four key measures of the Interoperable Europe Act, and
2. Implement the New European Interoperability Framework.

The interoperability strategy has 17 concrete actions in all, addressing the Interoperable Europe Act and the four interoperability layers described in the European Interoperability Framework: technical-, semantic-, organisational-, and legal interoperability.

The deliverable does not address interoperability between blockchain systems, as the use cases are being designed for the European Blockchain Service Infrastructure (EBSI). This document does not specifically address eIDAS regulation as this will be covered in a future deliverable (D2.3).

### 3 Introduction

Strengthening public sector interoperability is not just about improving administrative efficiency; it also offers significant opportunities for innovation, better crisis management, and enhancing the EU's technological sovereignty. Interoperability is essential when providing public services cross-border in the EU where different business processes already exist in the public entities of the member states. To ensure that digital processes can run seamlessly business processes, digital systems, responsibilities, and expectations must be aligned to allow digital systems to communicate, exchange data and function meaningfully.

To ensure that the EBSI-VECTOR project is aligned with current and future interoperability standards and regulations mandated by the European Commission, this deliverable presents the existing and upcoming activities unrolled by the EC.

Since the 1990s, the European Commission has promoted interoperability between public administrations through action plans and subsequent funding programs like IDA<sup>22</sup>, IDABC<sup>23</sup>, ISA, and ISA<sup>24</sup> and the European Interoperability Framework (EIF). On April 11, 2024, the Interoperable Europe Act (IEA) entered into force, introducing four key pillars to support public sector interoperability across the EU.

The Commission has created various tools and training resources to assist Member States and European institutions in implementing public sector interoperability. These include the EIF toolbox<sup>25</sup>, the SEMIC Support Centre<sup>26</sup>, the JoinUp platform<sup>27</sup>, and the Interoperable Europe Academy<sup>28</sup>. Additionally, the New European Interoperability Framework<sup>29</sup> offers 12 principles and 47 recommendations to support interoperable public services. The GovTech<sup>30</sup> Incubator

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<sup>22</sup> <https://eur-lex.europa.eu/EN/legal-content/summary/electronic-interchange-of-data-between-administrations-ida-programme.html> (Accessed on 30.08.24)

<sup>23</sup> <https://eur-lex.europa.eu/EN/legal-content/summary/the-idabc-programme-2005-2009.html> (Accessed on 30.08.24)

<sup>24</sup> [https://ec.europa.eu/isa2/home\\_en/](https://ec.europa.eu/isa2/home_en/) (Accessed on 30.08.24). The work of ISA<sup>2</sup> is continued on <https://joinup.ec.europa.eu/interoperable-europe>

<sup>25</sup> <https://joinup.ec.europa.eu/collection/nifo-national-interoperability-framework-observatory/solution/european-interoperability-framework-eif-toolbox> (Accessed on 30.08.24)

<sup>26</sup> <https://joinup.ec.europa.eu/collection/semic-support-centre> (Accessed on 30.08.24)

<sup>27</sup> <https://joinup.ec.europa.eu/> (Accessed on 30.08.24)

<sup>28</sup> <https://joinup.ec.europa.eu/collection/digital-skills-public-sector/solution/interoperable-europe-academy> (Accessed on 30.08.24)

<sup>29</sup> [https://ec.europa.eu/isa2/sites/default/files/eif\\_brochure\\_final.pdf](https://ec.europa.eu/isa2/sites/default/files/eif_brochure_final.pdf) (Accessed on 30.08.24)

<sup>30</sup> <https://joinup.ec.europa.eu/collection/public-sector-tech-watch/govtech> (accessed on 30.08.24)

initiative also enables governments to collaborate and adopt innovative solutions from startups and other governments across the EU.

To ensure that the EBSI-VECTOR project is aligning with the current and future digital solutions of the EU this deliverable is based on:

- the Interoperability Europe Act (including the Cooperation Framework),
- the New European Interoperability Framework, and
- the European Interoperability Framework Toolbox.

Especially, this deliverable addresses the four interoperability layers mentioned in the New European Interoperability Framework: technical-, semantic-, organisational-, and legal interoperability. Each of these layers must be addressed to ensure complete and meaningful interoperability across the borders of the Member States.

This deliverable aims to make an interoperability strategy for the EBSI-VECTOR project in line with existing and upcoming EU interoperability strategies and standards, to ensure that the EBSI-VECTOR use cases seamlessly enter the European digital landscape and to avoid lock-in effects. The following sections provide an overview of the New European Interoperability Framework followed by the interoperability strategy. The deliverable first presents the Interoperable Europe Act (section 3) and the New Europe Interoperability Framework (section 4), before presenting the interoperability strategy (section 5).

This document presents an overall interoperability strategy for the EBSI-VECTOR project. For specific technical interoperability standards for educational certificates (WP4), please see section 6 'Interoperability' in D4.1 'Business Blueprint (BBP)'.

This report is limited to advice on how to ensure interoperability for the use cases of EBSI-VECTOR on educational- and social security certificates. This report will not address interoperability between blockchain systems or how to ensure interoperability with eIDAS regulation. The latter topic will be addressed in D.2.3 which is due by May 2025.



## 4 Interoperable Europe Act

This report is based on the Interoperable Europe Act<sup>31</sup> which entered into force on April 11<sup>th</sup>, 2024, mandated by the European Commission. The act aims to ensure interoperable public processes in the EU by facilitating cross-border data exchanges and supporting the digital transformation of the public sector.

The Act underlines the importance of interoperability for the digital single market, highlighting how it can reduce administrative burdens that otherwise hinder the free movement of goods and services. Hereby, the Interoperable Europe Act is a cornerstone for the EBSI-VECTOR project's interoperability aim, as the EBSI-VECTOR use cases aim to verify educational- and social security certificates cross-border within the EU.

Furthermore, the Interoperable Europe Act aims to present a co-owned **EU cooperation framework**<sup>32</sup> to support cross-border, interoperable public processes across the EU. The framework has four key pillars:

- The **Interoperable Europe Board**<sup>33</sup> which will be co-owned by the Member States and the EU and supported by public and private actors. The IEB will develop a strategic agenda for cross-border interoperability, support the implementation of interoperability solutions, and monitor progress.
- **Mandatory interoperability assessments** to evaluate cross-border IT systems and to build "interoperable-by-design" public services. Member States must designate national competent authorities to enforce the IEA and European Institutions, agencies, and public sector bodies should conduct the interoperability assessments, by January 2025<sup>34</sup>.
- Creation of an '**Interoperable Europe Portal**<sup>35</sup> (IEP) which will serve as a community platform for shared and reusable interoperability solutions.

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<sup>31</sup> [https://ec.europa.eu/commission/presscorner/detail/en/IP\\_24\\_1970](https://ec.europa.eu/commission/presscorner/detail/en/IP_24_1970) (Assessed 30.08.24)

<sup>32</sup> [https://commission.europa.eu/publications/interoperable-europe-act-proposal\\_en](https://commission.europa.eu/publications/interoperable-europe-act-proposal_en) (Accessed on 30.08.24)

<sup>33</sup> Unable to find official information on the persons/ organisations that constitute the Interoperable Europe Board. Maybe the IEB has not been officially established yet as the IEA only entered into force this April 2024.

<sup>34</sup> [https://ec.europa.eu/commission/presscorner/detail/en/IP\\_24\\_1970](https://ec.europa.eu/commission/presscorner/detail/en/IP_24_1970) (Accessed on 30.08.24)

<sup>35</sup> <https://joinup.ec.europa.eu/> (Accessed on 30.08.24)

- Development and further evolvement of **regulatory sandboxes** and the **GovTech**<sup>36</sup> cooperation to promote policy experimentation, skill development, and the scaling up of interoperability solutions to be reused across the EU.

Through these four key pillars, the Interoperable Europe Act aims to support the EU's goals of a single digital market and cross-border digital interoperability between Member States. In section 5, the EU Cooperation framework is addressed.

As part of the IEA, the New European Interoperability Framework presents four interoperability layers to ensure cross-border interoperability of public services. The four layers are:

- **Legal interoperability** ensures that the legal frameworks of different organisations do not hinder the seamless delivery of public services across and within Member States.
- **Organisational interoperability** requires effective coordination among public sector bodies at all levels of government to deliver public services smoothly.
- **Semantic interoperability** ensures that the format and meaning of exchanged data are preserved and understood by all parties involved.
- **Technical interoperability** ensures that different systems can effectively communicate and exchange data.

The four interoperability layers are described in more detail in section 4, where the New European Interoperability Framework is presented.

To enhance interoperability the Interoperable Europe Act also promotes open-source solutions and -standards. However, there is not a single legislation that mandates open standards, but the EC financially supports three European standardisation organisations<sup>37</sup>:

- ETSI (European Telecommunications Standards Institute)<sup>38</sup>
- CEN (European Committee for Standardization)<sup>39</sup>
- CENELEC (European Committee for Electrotechnical Standardization)<sup>40</sup>

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<sup>36</sup> <https://joinup.ec.europa.eu/collection/public-sector-tech-watch/govtech> (Accessed on 30.08.24)

<sup>37</sup> [https://single-market-economy.ec.europa.eu/single-market/european-standards/ict-standardisation\\_en](https://single-market-economy.ec.europa.eu/single-market/european-standards/ict-standardisation_en) (accessed on 30.08.24)

<sup>38</sup> <https://www.etsi.org/> (Accessed on 30.08.24)

<sup>39</sup> <https://www.cencenelec.eu/about-cen/> (Accessed on 30.08.24)

<sup>40</sup> <https://www.cencenelec.eu/> (Accessed on 30.08.24)

ETSI, CEN, and CENELEC are mandated to ensure ‘e-accessibility’ and a “Design for All” approach to products and services under the EC standardisation Mandate no. 376<sup>41</sup> from 2005. CEN and CENELEC have several Technical Committees (TC) in place to support the digital transformation<sup>42</sup>. Specifically, the **CEN-CENELEC Focus Group on Blockchain and Distributed Ledger Technologies (FG-BDLT)** published the Whitepaper ‘*Recommendations for Successful Adoption in Europe of Emerging Technical Standards on Distributed Ledger/Blockchain Technologies*’<sup>43</sup> in 2018. Based on the recommendations in the White Paper **CEN-CLC/JTC 19 Blockchain and Distributed Ledger Technologies**<sup>44</sup> group was established to identify and adopt international standards for blockchain already available or under development. Furthermore, the **ETSI Industry Specification Group on Permissioned Distributed Ledger (ISG PDL)**<sup>45</sup> has been established to provide information and a foundation for the operation of permissioned distributed ledgers. An overview of the CEN and CENELEC TCs and the ISG PDL deliverables are presented in the Annex.

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<sup>41</sup> <https://www.anec.eu/images/attachments/M376.pdf> (Accessed on 30.08.24)

<sup>42</sup> [https://www.cencenelec.eu/media/CEN-CENELEC/Areas%20of%20Work/CEN%20sectors/Digital%20Society/Emerging%20technologies/fg-bdlt-white\\_paper-version1-2.pdf](https://www.cencenelec.eu/media/CEN-CENELEC/Areas%20of%20Work/CEN%20sectors/Digital%20Society/Emerging%20technologies/fg-bdlt-white_paper-version1-2.pdf) p. 15-16 (30.08.24)

<sup>43</sup> [https://www.cencenelec.eu/media/CEN-CENELEC/Areas%20of%20Work/CEN%20sectors/Digital%20Society/Emerging%20technologies/fg-bdlt-white\\_paper-version1-2.pdf](https://www.cencenelec.eu/media/CEN-CENELEC/Areas%20of%20Work/CEN%20sectors/Digital%20Society/Emerging%20technologies/fg-bdlt-white_paper-version1-2.pdf) (30.08.24)

<sup>44</sup> [https://standards.iteh.ai/catalog/tc/cen/d96ab6b7-aac8-49e9-9ac5-b391bbd2abdc/cen-clc-jtc-19?srsId=AfmBOork\\_SvpYLTxcN1EyGuCHLvubxUZzuRYAKgK86PFWCFYGG1iX2x](https://standards.iteh.ai/catalog/tc/cen/d96ab6b7-aac8-49e9-9ac5-b391bbd2abdc/cen-clc-jtc-19?srsId=AfmBOork_SvpYLTxcN1EyGuCHLvubxUZzuRYAKgK86PFWCFYGG1iX2x) (Accessed on 30.08.24)

<sup>45</sup> <https://www.etsi.org/committee/1467-pdl> (Accessed on 30.08.24)

## 5 The New European Interoperability Framework

The New European Interoperability Framework presents guidance on how to develop interoperable services in the EU and create a coherent digital environment where services can work seamlessly together across agencies and organisations. The framework emphasises the need for interoperable trans-European networks that benefit citizens and support the European internal market. Adopted on March 23, 2017, as part of the Communication (COM(2017)134)<sup>46</sup>, the EIF is a key element in the European Commission’s goal to establish cross-border public services in the EU. The EIF provides shared guidance for interoperability policies across Member States and helps to coordinate National Interoperability Frameworks (NIFs) and Domain Interoperability Frameworks (DIFs) to enable overall interoperability of EU solutions.

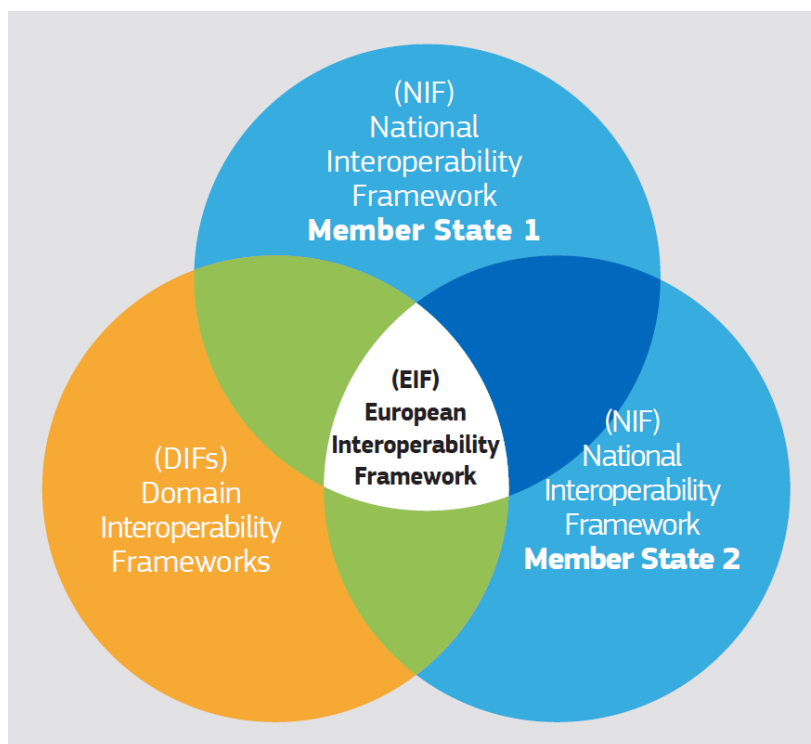


Figure 1 in the EIF<sup>47</sup>

While Member States have the freedom to develop their National Interoperability Frameworks based on EIF recommendations, these NIFs should be adapted to address national specificities

<sup>46</sup> <https://www.eumonitor.eu/9353000/1/j9vvik7m1c3gyxp/vkcw9q2gvczu> (Accessed on 30.08.24)

<sup>47</sup> [https://ec.europa.eu/isa2/sites/default/files/eif\\_brochure\\_final.pdf](https://ec.europa.eu/isa2/sites/default/files/eif_brochure_final.pdf) (Accessed on 30.08.24)

effectively, while also supporting digital environments where public administrations can collaborate efficiently

The principles and recommendations focus on improving interoperability efforts by building cross-organisational solutions, streamlining processes for end-to-end digital services, and ensuring that new and existing laws do not hinder interoperability. As mentioned earlier, the EIF presents four levels of interoperability, 12 underlying principles, and 47 specific recommendations to support digital interoperability in cross-border EU Member States. The 12 core principles are listed below:

1. Subsidiarity and proportionality
2. Openness
3. Transparency
4. Reusability
5. Technological neutrality and data portability
6. User-centricity
7. Inclusion and accessibility
8. Security and privacy
9. Multilingualism
10. Administrative simplification
11. Preservation of information
12. Assessment of effectiveness and efficiency

These principles are divided into four categories:

1. The principle that sets the context for EU actions on interoperability.
2. Core interoperability principles.
3. Principles related to generic user needs and expectations.
4. Foundation principles for cooperation among public administrations.

Implementing the EIF successfully will enhance the quality of public services across Europe and is essential to overcome policy differences that lead to inconsistency and lack of interoperability,

threatening the digital single market. To ensure that the EBSI-VECTOR project is interoperable with current and future digital solutions in the EU, this report is based on the guidelines in the EIF.

To support the practical implementation of digital solutions based on the EIF, the EIF Toolbox<sup>48</sup> has been created to guide national public administrations with the tools needed to align their National Interoperability Frameworks with the EIF. The Toolbox contains documents that explain the EIF's policy background (EIF Policy<sup>49</sup>), a set of reusable solutions (EIF Solutions<sup>50</sup>) and a community space for knowledge sharing (EIF Community<sup>51</sup>). Below the four interoperability layers are discussed in individual subsections.

## 5.1 Technical Interoperability

To ensure technical interoperability, EBSI-VECTOR project partners should use open-source and open standards when applicable. Technical interoperability includes interface specifications, interconnection services, data integration services, data presentation, data exchange, and secure communication protocols. Below is an overview of standardisations bodies, recommendations, and guidelines relevant to the EBSI-VECTOR project.

**WC3** has made two recommendations related to blockchain-based solutions, such as self-sovereign identities. The first is **Decentralized Identifiers (DIDs) v1.0**<sup>52</sup>, which outlines the DID syntax, a shared data model, key properties, serialised formats, DID operations, and details on how to resolve DIDs to their corresponding resources. The second is the **Verifiable Credentials Overview**<sup>53</sup> which offers a way to represent verifiable credentials on the Web that is cryptographically secure, privacy-respecting, and machine-verifiable.

**ISO/TC 307 Blockchain and distributed ledger technologies**<sup>54</sup> working groups have finished 12 standards and are currently working on completing an additional nine. Four of these standards

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<sup>48</sup> <https://joinup.ec.europa.eu/collection/nifo-national-interoperability-framework-observatory/solution/european-interoperability-framework-eif-toolbox> (Accessed on 30.08.24)

<sup>49</sup> <https://joinup.ec.europa.eu/collection/nifo-national-interoperability-framework-observatory/solution/european-interoperability-framework-eif-toolbox/eif-policy> (Accessed on 30.08.24)

<sup>50</sup> <https://joinup.ec.europa.eu/collection/nifo-national-interoperability-framework-observatory/solution/european-interoperability-framework-eif-toolbox/eif-solutions> (Accessed on 30.08.24)

<sup>51</sup> <https://joinup.ec.europa.eu/collection/nifo-national-interoperability-framework-observatory/solution/european-interoperability-framework-eif-toolbox/eif-community> (Accessed on 30.08.24)

<sup>52</sup> <https://www.w3.org/TR/did-core/> (Accessed on 30.08.24)

<sup>53</sup> <https://www.w3.org/TR/vc-overview/> (Accessed on 30.08.24)

<sup>54</sup> <https://www.iso.org/committee/6266604/x/catalogue/> (Accessed on 30.08.24)

are connected to blockchain-based identities and identifiers, one presents a governance standard, three are related to use cases and describe data flows between DLT systems and related systems, and one upcoming standard will specify a framework with recommendations for interoperability between blockchain systems and entities outside the system<sup>55</sup>.

ETSI<sup>56</sup> have completed 17 deliverables on Permissioned Distributed Ledgers and has a further nine deliverables upcoming. A full overview of the completed deliverables is presented in the Annex. Especially, the **PDL-013 - Supporting Distributed Data Management**<sup>57</sup> deliverable presents a set of requirements and functional architecture to support distributed data management based on PDL.

**INSPIRE Directive**<sup>58</sup> has presented interoperability standards for spatial data infrastructures between Member States. The EBSI-VECTOR partners are encouraged to use the INSPIRE Knowledge Base which provides specific guidance for Metadata<sup>59</sup>, Data Specifications<sup>60</sup>, Network Services<sup>61</sup>, Data and service sharing<sup>62</sup>, Spatial Data Service<sup>63</sup>, and Monitoring and Reporting<sup>64</sup>, as well as addresses<sup>65</sup>.

In D4.1, section 6, technical interoperability is described for the educational certificates. This description includes the future **eIDAS2 Architecture and Reference Framework (ARF)**<sup>66</sup> and the **OpenID Connect for Verifiable Presentations (OIDC4VP)**<sup>67</sup> maintained by the OpenID Foundation<sup>68</sup>. A detailed description can be read in full in section 6.1.3 in D4.1 'Business Blueprint'.

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<sup>55</sup> <https://www.iso.org/standard/82098.html?browse=tc> (Accessed on 30.08.24)

<sup>56</sup> <https://www.etsi.org/> (Accessed on 30.08.24)

<sup>57</sup> [https://www.etsi.org/deliver/etsi\\_gs/PDL/001\\_099/013/01.01.01\\_60/gs\\_PDL013v010101p.pdf](https://www.etsi.org/deliver/etsi_gs/PDL/001_099/013/01.01.01_60/gs_PDL013v010101p.pdf) (Accessed on 30.08.24)

<sup>58</sup> [https://knowledge-base.inspire.ec.europa.eu/index\\_en](https://knowledge-base.inspire.ec.europa.eu/index_en) (Accessed on 30.08.24)

<sup>59</sup> [https://knowledge-base.inspire.ec.europa.eu/metadata-technical-guidelines\\_en](https://knowledge-base.inspire.ec.europa.eu/metadata-technical-guidelines_en) (Accessed on 30.08.24)

<sup>60</sup> [https://knowledge-base.inspire.ec.europa.eu/data-specifications-technical-guidelines\\_en](https://knowledge-base.inspire.ec.europa.eu/data-specifications-technical-guidelines_en) (Accessed on 30.08.24)

<sup>61</sup> [https://knowledge-base.inspire.ec.europa.eu/inspire-network-services-update\\_en](https://knowledge-base.inspire.ec.europa.eu/inspire-network-services-update_en) (Accessed on 30.08.24)

<sup>62</sup> [https://knowledge-base.inspire.ec.europa.eu/data-and-service-sharing\\_en](https://knowledge-base.inspire.ec.europa.eu/data-and-service-sharing_en) (Accessed on 30.08.24)

<sup>63</sup> [https://knowledge-base.inspire.ec.europa.eu/spatial-data-services\\_en](https://knowledge-base.inspire.ec.europa.eu/spatial-data-services_en) (Accessed on 30.08.24)

<sup>64</sup> [https://knowledge-base.inspire.ec.europa.eu/monitoring-and-reporting\\_en](https://knowledge-base.inspire.ec.europa.eu/monitoring-and-reporting_en) (Accessed on 30.08.24)

<sup>65</sup> <https://joinup.ec.europa.eu/collection/inspire/solution/inspire-data-specifications-addresses-guidelines-v301> (Accessed on 30.08.24)

<sup>66</sup> <https://digital-strategy.ec.europa.eu/en/library/european-digital-identity-architecture-and-reference-framework-outline> (Accessed on 30.08.24)

<sup>67</sup> [https://openid.net/specs/openid-connect-4-verifiable-presentations-1\\_0-07.html](https://openid.net/specs/openid-connect-4-verifiable-presentations-1_0-07.html) (Accessed on 30.08.24)

<sup>68</sup> <https://openid.net> (Accessed on 30.08.24)

## 5.2 Semantic Interoperability

Semantic interoperability addresses the preservation of the *meaning* of interoperable data exchanges. If information is passed on without reflections on the original context, the semantic interoperability might be liable. Semantically interoperable systems enable data exchanges and -interpretation in a meaningful way. Meaningful data exchanges between systems enhance communication, coordination, and decision-making between public authorities cross-border the EU. The semantic aspect involves using data models, controlled vocabularies, and common code lists as well as understanding data elements and their relationships. The syntactic aspect focuses on the precise format of the information, including its grammar and structure. Semantic interoperability hereby covers both the meaning (semantic) and structure (syntactic) of data. Semantic interoperability hereby ensures that the exact format and meaning of data are preserved and understood during exchanges between individuals and organizations. Below are mentioned EU initiatives to support semantic interoperability in cross-border, public services.

Existing standards for exchanging educational data are described in D4.1. These include **ELMO EML**<sup>69</sup>, **EMREX**<sup>70</sup>, and **Erasmus Without Paper (EWP)**<sup>71</sup> and also present schemas, such as **Open Badges**<sup>72</sup> and **Micro-credentials**<sup>73</sup>. A full description of the standards can be found in section 6.1.4 in D4.1.

**Interoperable Europe Portal** has a subtheme on ‘semantics’<sup>74</sup>, which, among other things, includes **Data Spaces**<sup>75</sup>, **Knowledge Hub**<sup>76</sup>, and the **SEMIC Support Center**<sup>77</sup>. The Semantic Interoperability Community (SEMIC) initiative by the European Commission promotes and supports semantic interoperability between e-Government systems. The SEMIC Support Centre exists to facilitate interoperable European administrations in alignment with the Interoperable Europe Act and offers tools, standards, and good practices to promote semantic interoperability.

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<sup>69</sup> <https://github.com/emrex-eu/elmo-schemas> (Accessed on 30.08.24)

<sup>70</sup> <https://emrex.eu> (Accessed on 30.08.34)

<sup>71</sup> <https://erasmus-plus.ec.europa.eu/european-student-card-initiative/ewp> (Accessed on 30.08.24)

<sup>72</sup> <https://openbadges.org> (Accessed on 30.08.24)

<sup>73</sup> <https://education.ec.europa.eu/education-levels/higher-education/micro-credentials> (30.08.24)

<sup>74</sup> <https://joinup.ec.europa.eu/topic/ict/semantics> (Accessed 30.08.24)

<sup>75</sup> <https://joinup.ec.europa.eu/collection/semic-support-centre/data-spaces> (Accessed on 30.08.24)

<sup>76</sup> <https://joinup.ec.europa.eu/collection/semic-support-centre/knowledge-hub> (Accessed on 30.08.24)

<sup>77</sup> <https://joinup.ec.europa.eu/collection/semic-support-centre> (Accessed on 30.08.24)



The **DCAT Application Profile for data portals in Europe**<sup>78</sup> (DCAT-AP) is a specification built on the **Data Catalogue Vocabulary (DCAT)**<sup>79</sup>. It describes public sector datasets in Europe, allowing for better cross-portal searches and improved data discoverability across borders and sectors. This is done by sharing dataset descriptions between data portals.

### 5.3 Organisational Interoperability

Public administrations must align their business processes, responsibilities, and expectations to achieve shared goals. Organisational interoperability involves documenting and integrating these processes, and the information exchanged. This alignment ensures that services are user-focused, easily identifiable, accessible, and meet the needs of the user community.

In the EU, administrative entities may need to adjust or establish new processes to work together effectively across borders. However, while the New European Interoperability Framework (EIF) highlights this need, the EBSI-VECTOR project cannot change or align existing business processes in Europe. Instead, it offers solutions for cross-border verification of educational- and social security certificates along with recommendations for public entities to follow.

Organizational interoperability requires documenting business processes using agreed methods and modelling techniques. This ensures all public administrations involved in delivering European public services understand the complete process and their role in it. Governance is crucial for a holistic approach, involving decisions on frameworks, institutional arrangements, roles, and responsibilities at local, national, and EU levels.

Furthermore, for an organisation to be part of the platform, it must be identified to ensure security and trust. This includes providing metadata anchored in a trusted layer like the EBSI infrastructure. Each organisation must have an identifiable structure to ensure reliable information. For example, in D4.1 it is mentioned that the Ministry of Education in Spain could onboard Spanish universities. Required metadata includes legal names, registration numbers, accreditations, display information, and a list of services provided by the entity.

To ensure organisational interoperability WP4 and WP5 are encouraged to contact and collaborate with the national authorities responsible for managing and issuing the data sets

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<sup>78</sup> <https://op.europa.eu/en/web/eu-vocabularies/dcat-ap> (Accessed on 30.08.24)

<sup>79</sup> <https://www.w3.org/TR/vocab-dcat/> (Accessed on 30.08.24)

needed in the use cases. The national authorities should provide any NIF relevant to ensuring interoperability for the use cases.

In D4.1 organisational interoperability is described in more detail for the use case on educational certificates.

## 5.4 Legal Interoperability

Legal interoperability enables organisations to collaborate across different legal policies and frameworks. Acquiring suitable data licenses is important for effective data sharing and interoperability. Key points for ensuring cross-border interoperability include focusing on user-centric and open solutions that protect public interests. With open-source users can review and improve system compatibility and security, and hereby foster collaboration between Member States, mitigate cybersecurity risks, and lock-in effects. Open-source solutions combined with open standards create a strong foundation for interoperability. To ensure legal interoperability of the EBSI-VECTOR project, the partners must be aware of current and upcoming regulation which applies to and influence the success of the EBSI-VECTOR use cases. In this section, legal interoperability recommendations and regulations are presented, many of which are also presented in D4.1.

**Regulation 1025/2012**<sup>80</sup> and the **(EU) 2017/863**<sup>81</sup> is the overall EU legal framework for standardisation actors. The purpose of the regulations is to facilitate and reuse software developed by public administrations.

**GDPR Data Portability**<sup>82</sup> states that services must provide user data in a standardized, machine-readable format for easy transfer between services.

**eIDAS Regulation**<sup>83</sup> establishes requirements for electronic identification and trust services for online transactions and is currently under revision.

**Open Data and Public Sector Information Directive (EU) 2019/1024**<sup>84</sup> supports open data and the reuse of public sector information.

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<sup>80</sup> <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32012R1025> (Accessed on 30.08.24)

<sup>81</sup> <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32017D0863> (Accessed on 30.08.24)

<sup>82</sup> <https://gdpr-info.eu/art-20-gdpr/> (Accessed on 30.08.24)

<sup>83</sup> <https://digital-strategy.ec.europa.eu/en/policies/eidas-regulation> (Accessed on 30.08.24)

<sup>84</sup> <https://eur-lex.europa.eu/eli/dir/2019/1024/oj> (Accessed on 30.08.24)

**Recommendation 27**<sup>85</sup> of the EIF suggests reviewing existing laws to find interoperability barriers. These may include sectoral or geographical data restrictions, vague data license models, overly strict technology requirements, conflicting rules for similar processes, and outdated security needs.

**European Blockchain Regulatory Sandbox**<sup>86</sup> sets up a framework for regulatory discussions to enhance legal certainty for blockchain innovations. The sandbox enables policymakers to discuss and explore new regulations related to blockchain solutions. The work done by the EBSI will set the direction for future regulation applying to the EBSI-VECTOR project and use cases.

The following four directives and frameworks are specifically relevant to the use case on educational certificates (WP4).

**Directive 2005/36/EC**<sup>87</sup> modernises the verification of professional qualifications across EU member states, allowing citizens to have their qualifications recognised in other countries, especially for regulated professions and temporary services. It was updated by Directive 2013/55/EU to simplify the recognition process.

**Europass**<sup>88</sup> seeks to improve transparency regarding qualifications and skills. They have created the **European Qualifications Framework (EQF)**<sup>89</sup> which is a tool for translating national qualifications to make them easier to understand and more comparable.

**Bologna Process**<sup>90</sup> and the European Higher Education Area aim to improve higher education systems<sup>91</sup>. Although not legally binding, its principles affect the recognition of higher education qualifications and are therefore especially relevant for the educational certificates.

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<sup>85</sup> [https://ec.europa.eu/isa2/sites/default/files/eif\\_brochure\\_final.pdf](https://ec.europa.eu/isa2/sites/default/files/eif_brochure_final.pdf) (Accessed on 30.08.24)

<sup>86</sup> <https://digital-finance-platform.ec.europa.eu/cross-border-services/ebsi> (Accessed on 30.08.24)

<sup>87</sup> <https://eur-lex.europa.eu/eli/dir/2005/36/oj> (Accessed on 30.08.24)

<sup>88</sup> <https://europass.europa.eu/en> (Accessed on 30.08.24)

<sup>89</sup> <https://europass.europa.eu/en/europass-digital-tools/european-qualifications-framework> (Accessed on 30.08.24)

<sup>90</sup> <https://ehea.info> (Accessed on 30.08.24)

<sup>91</sup> <https://education.ec.europa.eu/education-levels/higher-education/inclusive-and-connected-higher-education/bologna-process> (Accessed on 30.08.24)

## 6 Interoperability Strategy

In the press release from April 11, 2024, it is stated that “The Commission will provide the necessary guidelines and support”<sup>92</sup>. However, as the EBSI-VECTOR project is already more than halfway through and to be concluded in May 2025, it is reasonable to expect that sufficient information on the mandatory interoperability assessments and the necessary guidelines, might not be provided before the EBSI-VECTOR project is concluded. EBSI-VECTOR partners are therefore encouraged to use existing European and international standards mandated by institutions such as, but not limited to, WC3, ISO, ETSI, CEN, and CENELEC.

The EBSI-VECTOR project therefore must strive to ensure interoperability cross-border, based on currently available interoperability framework and guidelines, while also being attentive to the strategies introduced by the Interoperable Europe Act which will unfold as the EBSI-VECTOR project is going into its final stages. Below are recommendations to ensure the EBSI-VECTOR project aligns with the Interoperable Europe Act.

Objectives	Actions	Timeline	Responsibility
Focus area 1. Comply with the four key measures of the <b>Interoperable Europe Act</b> <sup>93</sup>			
Comply with upcoming interoperability strategies developed by the <b>Interoperable Europe Board</b> .	1. Stay informed of any actions from the IEB once it has officially been established.	Aug.24 – May.25	WP2

<sup>92</sup> [https://ec.europa.eu/commission/presscorner/detail/en/IP\\_24\\_1970](https://ec.europa.eu/commission/presscorner/detail/en/IP_24_1970) (Accessed on 30.08.24)

<sup>93</sup> [https://ec.europa.eu/commission/presscorner/detail/en/IP\\_24\\_1970](https://ec.europa.eu/commission/presscorner/detail/en/IP_24_1970) (Accessed on 30.08.24)

<p>Comply with the <b>mandatory interoperability assessments</b> conducted by the national authorities responsible for implementing the IEA by January 2025<sup>94</sup>.</p>	<p>2. Contact the IEB once it has been established to get a list of national authorities conducting the interoperability assessments. 3. Contact relevant EBSI-VECTOR partners and inform them of the interoperability assessments connected to the EBSI-VECTOR project.</p>	<p>Aug.24 – Dec.24</p>	<p>WP2</p>
<p><b>Reuse existing interoperability solutions</b> for public administrations.</p>	<p>4. Utilise the resources available on the <b>Interoperability Europe Portal</b><sup>95</sup> and from other standardisation groups, such as, but not limited to, WC3, ISO, ETSI, CEN, and CENELEC.</p>	<p>Aug.24 – May.25</p>	<p>WP3, WP4, WP5</p>
<p>Strengthened <b>policy support mechanisms</b> and regulatory sandboxes for policy experimentation.</p>	<p>5. Collaborate and stay updated on the recommendations developed by the <b>European Regulatory Blockchain Sandbox</b><sup>96</sup>.</p>	<p>Aug.24 – May.25</p>	<p>WP2</p>
<p>Focus area 2: Implement the <b>New European Interoperability Framework</b></p>			
<p>2.1 Technical Interoperability</p>			
<p>Ensure interoperability of spatial data infrastructures</p>	<p>6. Use the <b>INSPIRE Knowledge Base</b><sup>97</sup> and the <b>PDL-013</b> -</p>	<p>Aug.24 – May.25</p>	<p>WP3, WP4, WP5</p>

<sup>94</sup> [https://ec.europa.eu/commission/presscorner/detail/en/IP\\_24\\_1970](https://ec.europa.eu/commission/presscorner/detail/en/IP_24_1970) (Accessed on 30.08.24)

<sup>95</sup> <https://joinup.ec.europa.eu/> (Accessed on 30.08.24)

<sup>96</sup> <https://digital-finance-platform.ec.europa.eu/cross-border-services/ebsi> (Accessed on 30.08.24)

<sup>97</sup> [https://knowledge-base.inspire.ec.europa.eu/overview/implement\\_en](https://knowledge-base.inspire.ec.europa.eu/overview/implement_en) (Accessed 30.08.24)

between Member States, if relevant for the use cases.	<b>Supporting Distributed Data Management</b> <sup>98</sup> .		
Cooperate in the development of shared, cross-border solutions.	7. Reuse existing relevant solutions when relevant, such as, but not limited to, the <b>EIF Toolbox</b> <sup>99</sup> , the <b>Interoperable Europe Software Solutions</b> <sup>100</sup> , and the ISA <sup>2</sup> <b>'Sharing and Reuse Framework for IT Solutions</b> <sup>101</sup> . As well as standardisation solutions made by the institutions mentioned in Action 4.	Aug.24 – May.25	WP3, WP4, WP5
Ensuring interoperability of blockchain-based solutions.	8. Stay aware of the upcoming <b>ISO/CD TS 23516 Blockchain and Distributed Ledger Technology – Interoperability</b> <sup>102</sup> <b>Framework</b> and the recommendations on interoperability.	Aug.24 – May.25	WP3, WP4, WP5
Ensure interoperability of Smart Contracts (if implemented into use case solutions).	9. Use the ETSI <b>'Permissioned Distributed Ledgers (PDL) Smart Contracts System Architecture and Functional</b>	Aug.24 – May.25	WP3, WP4, WP5

<sup>98</sup> [https://www.etsi.org/deliver/etsi\\_gs/PDL/001\\_099/013/01.01.01\\_60/gs\\_PDL013v010101p.pdf](https://www.etsi.org/deliver/etsi_gs/PDL/001_099/013/01.01.01_60/gs_PDL013v010101p.pdf) (Accessed on 30.08.24)

<sup>99</sup> <https://joinup.ec.europa.eu/collection/nifo-national-interoperability-framework-observatory/solution/european-interoperability-framework-eif-toolbox> (Accessed on 30.08.24)

<sup>100</sup> <https://joinup.ec.europa.eu/software-solutions> (Accessed on 30.08.24)

<sup>101</sup> <https://joinup.ec.europa.eu/collection/sharing-and-reuse-it-solutions/sharing-and-reuse-framework-it-solutions-line> (Accessed on 30.08.24)

<sup>102</sup> <https://www.iso.org/standard/82098.html?browse=tc> (Accessed on 30.08.24)

	<p><b>Specification<sup>103</sup>, the ISO/TR 23455:2019 Blockchain and distributed ledger technologies — Overview of and interactions between smart contracts in blockchain and distributed ledger technology systems<sup>104</sup> standard, and the PDL-004 - Smart Contracts PDL System Architecture and Functional Specification<sup>105</sup>.</b></p>		
Ensure interoperability of Decentralized Identifiers.	<p>10. Build on the work of relevant standards such as <b>W3C DID Working Group<sup>106</sup>, W3C Verifiable Credentials Working Group<sup>107</sup>.</b></p> <p>11. Stay updated on the future work by <b>CEN/CLC/JTC 19/WG 01- Decentralised identity management<sup>108</sup>.</b></p>	Aug.24 – May.25	WP3
2.2 Semantic interoperability			
Ensure semantic interoperability between national	<p>12. Use the solutions provided by the <b>SEMIC Support Center<sup>109</sup>, the DCAT Application Profile</b></p>	Aug. 2024 – May 2025	WP4, WP5

<sup>103</sup> [https://www.etsi.org/deliver/etsi\\_gr/PDL/001\\_099/004/01.01.01\\_60/gr\\_PDL004v010101p.pdf](https://www.etsi.org/deliver/etsi_gr/PDL/001_099/004/01.01.01_60/gr_PDL004v010101p.pdf) (Accessed on 30.08.24)

<sup>104</sup> <https://www.iso.org/standard/75624.html?browse=tc> (Accessed on 30.08.24)

<sup>105</sup> [https://www.etsi.org/deliver/etsi\\_gr/PDL/001\\_099/004/01.01.01\\_60/gr\\_PDL004v010101p.pdf](https://www.etsi.org/deliver/etsi_gr/PDL/001_099/004/01.01.01_60/gr_PDL004v010101p.pdf) (Accessed on 30.08.24)

<sup>106</sup> <https://www.w3.org/2019/did-wg/> (Accessed on 30.08.24)

<sup>107</sup> <https://www.w3.org/2017/vc/WG/> (Accessed on 30.08.24)

<sup>108</sup>

[https://standards.cencenelec.eu/dyn/www/f?p=205:7:0::::FSP\\_ORG\\_ID:2935523&cs=1FD8E28605C868918FE6DCA C943F90338](https://standards.cencenelec.eu/dyn/www/f?p=205:7:0::::FSP_ORG_ID:2935523&cs=1FD8E28605C868918FE6DCA C943F90338) (Accessed on 30.08.24)

<sup>109</sup> <https://joinup.ec.europa.eu/collection/semic-support-centre> (Accessed on 30.08.24)

authorise in EU Member States.	<b>for data portals in Europe</b> <sup>110</sup> and existing solutions, such as, but not limited to, <b>ELMO EML</b> <sup>111</sup> , <b>EMREX</b> <sup>112</sup> , <b>Erasmus Without Paper (EWP)</b> <sup>113</sup> , <b>Open Badges</b> <sup>114</sup> , and <b>Micro-credentials</b> <sup>115</sup> .		
Preserve meaning of information when exchanged across language barriers.	13. Follow <b>Recommendation 16</b> in EIF: ‘Use information systems and technical architectures that cater for multilingualism when establishing a European public service. Decide on the level of multilingualism support based on the needs of the expected users.’	Aug. 2024 – May 2025	WP3, WP4, WP5
<b>2.3 Organisational interoperability</b>			
Ensure business process interoperability between all use case providers.	14. Contact and collaborate with the entities and national authorities responsible for managing and issuing the data sets needed in the use cases and coordinate with the EIF recommendations.	Aug. 2024 – May 2025	WP3, WP4, WP5
<b>2.4 Legal interoperability</b>			

<sup>110</sup> <https://op.europa.eu/en/web/eu-vocabularies/dcat-ap> (Accessed on 30.08.24)

<sup>111</sup> <https://github.com/emrex-eu/elmo-schemas> (Accessed on 30.08.24)

<sup>112</sup> <https://emrex.eu> (Accessed on 30.08.34)

<sup>113</sup> <https://erasmus-plus.ec.europa.eu/european-student-card-initiative/ewp> (Accessed on 30.08.24)

<sup>114</sup> <https://openbadges.org> (Accessed on 30.08.24)

<sup>115</sup> <https://education.ec.europa.eu/education-levels/higher-education/micro-credentials> (30.08.24)



Ensure that business and citizens interact securely with the EBSI-VECTOR solutions in compliance with relevant regulations.	15. Comply with the <b>Regulation and Directive on data protection</b> <sup>116</sup> and the <b>Regulation on electronic identification and trust services</b> <sup>117</sup> .	Aug. 2024 – May 2025	WP3, WP4, WP5
Ensure that the EBSI-VECTOR use cases comply with relevant regulations.	16. Stay updated and comply with relevant legal regulations, such as the ones listed in section 4.4	Aug. 2024 – May 2025	WP4, WP5
Stay updated on future EU regulation of blockchain systems.	17. Participate in the <b>European Blockchain Regulatory Sandbox</b> meetings.	Present -	WP2

<sup>116</sup> <https://eur-lex.europa.eu/eli/reg/2016/679/oj> (Accessed on 25.08.24)

<sup>117</sup> <https://eur-lex.europa.eu/eli/reg/2014/910/oj> (Accessed on 30.08.24)

## 7 Conclusions

This document describes the Interoperable Europe Act and the European Interoperability Framework and is the first out of two deliverables for the T2.2 'Interoperability'. The document describes relevant EU and international standards and regulations relevant to ensure interoperability for the EBSI-VECTOR use cases.

The interoperability strategy has two focus areas:

1. Comply with the four key measures of the Interoperable Europe Act, and
2. Implement the New European Interoperability Framework.

The first focus area describes 5 actions to ensure compliance with the Interoperable Europe Act. The second focus area presents 12 actions divided into the subsections of technical-, semantic-, organisational-, and legal interoperability to ensure that the EBSI-VECTOR use cases uphold the highest level of interoperability standards. However, it is doubtful whether the establishment of new European and national bodies and structures (the Member States will designate national competent authorities) will enter into force and become relevant at all before the end of the EBSI-VECTOR project.

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## 9 Annex

### Overview of ISG PDL completed deliverables since 2019<sup>118</sup>

- PDL-001 - Landscape of Standards and Technologie
- PDL-002 - Applicability and Compliance to Data Processing Requirements
- PDL-003 - Application Scenarios
- PDL-004 - Smart Contracts PDL System Architecture and Functional Specification
- PDL-005 - Proof of Concepts Framework
- PDL-006 - Inter-Ledger interoperability
- PDL-008 - Research and Innovation Landscape
- PDL-009 - Federated Data Management
- PDL-010 - Operations in Offline Mode
- PDL-011 - Specification of Requirements for Smart Contracts' architecture and security
- PDL-012 - Reference Architecture
- PDL-013 - Supporting Distributed Data Management
- PDL-014 - Study on non-repudiation techniques
- PDL-015 – Reputation Management
- PDL-018 - Redactable Distributed Ledgers
- PDL-019 - PDL Services for Identity and Trust Management
- PDL-020 - Wireless Consensus Network

<sup>118</sup> <https://www.etsi.org/technologies/permissioned-distributed-ledgers> (Accessed on 30.08.24)

Overview of Technical Committees (TC) of CEN and CENELEC <sup>119</sup>	
CEN/TC 114 and CLC/TC 44X	Safety of machinery
CLC/TC 65X	Industrial-process measurement, control and automation
CLC/SR 119	Printed electronics
CEN-CLC/JTC 13	Cybersecurity and data protection
CEN-CLC/JTC 8	Privacy management in products and services
CEN/TC 310	Advanced automation technologies and their applications
CEN/TC 438	Additive Manufacturing
CLC/TC 210	Electromagnetic Compatibility (EMC)
CEN/TC 224	Personal identification and related personal devices with secure element, systems, operations and privacy in a multi sectorial environment
CEN/TC 225	AIDC Technologies
CEN/TC 319	Maintenance
CLC/TC 13	Electrical energy measurement and control
CLC/TC 205	Home and Building Electronic Systems (HBES)
CLC/TC 215	Electrotechnical aspects of telecommunication equipment
CEN/TC 224	Personal identification and related personal devices with secure element, systems, operations and privacy in a multi sectorial environment
CLC/TC 8X	System aspects of electrical energy supply
CLC/TC 57	Power systems management and associated information exchange
CEN/CLC/ETSI	SEG-CG Coordination Group on Smart Energy Grids
CEN/CLC/ETSI	SM-CG Smart Meter Coordination Group

<sup>119</sup> [https://www.cencenelec.eu/media/CEN-CENELEC/Areas%20of%20Work/CEN%20sectors/Digital%20Society/Emerging%20technologies/fg-bdlt-white\\_paper-version1-2.pdf](https://www.cencenelec.eu/media/CEN-CENELEC/Areas%20of%20Work/CEN%20sectors/Digital%20Society/Emerging%20technologies/fg-bdlt-white_paper-version1-2.pdf) (Accessed on 30.08.24)