Module Introduction to E-Government
Summer term 2025
Interoperability of public services

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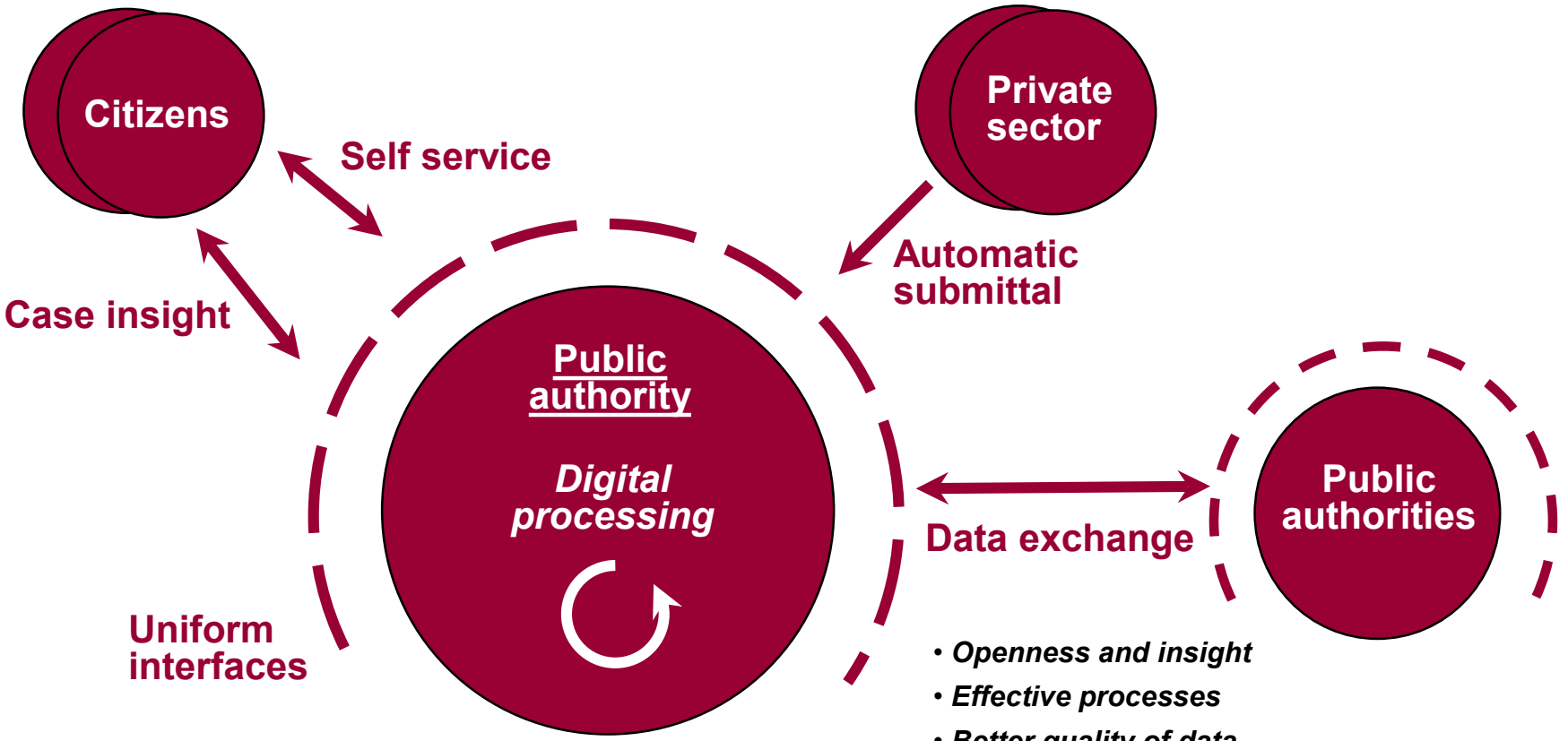
Basic concepts and typical e-government solutions: Interoperability of public services

Agenda

- Interoperability and standardisation
- European Interoperability framework and Interoperable Europe Act
- A case study from public e-procurement
- Building blocks to support cross-border interoperability
- Introduction to government enterprise architectures (GEA) and examples

E-government challenge: Interoperable administrative front and back offices in public service provisioning



CENELEC argues: Interoperability is key (1/2)

- Effectiveness of Information Society determined by the ability of components to 'talk' to each other, or to interoperate
  - ICT applications will not reach their full potential unless they and their supporting infrastructures are fully interoperable
  - Key role of standards

- Standards are technical specifications that support the development of open and competitive markets for the benefit of both consumers and industry

https://www.cencenelec.eu/european-standardization/

Interoperability in e-government of high interest since more than 20 years (1/2)

- EU defines interoperability already in 2003 as
  „the means by which the inter-linking of systems, information and ways of working, whether within or between administrations, nationally or across Europe, or with the enterprise sector, occurs"

[European Commission: Linking up Europe: the Importance of Interoperability for eGovernment Services, Commission Staff Working Paper, 2003]

Interoperability in e-government of high interest since more than 20 years (2/2)

- IDABC of EC defines interoperability in its EIF 2.0 as
  'Interoperability […] is the ability of disparate and diverse organisations to interact towards mutually beneficial and agreed common goals, involving the sharing of information and knowledge between the organisations, through the business processes they support, by means of the exchange of data between their respective ICT systems.'

- Interoperability is multilateral by nature and is best understood as a shared value of a community.

[http://eur-lex.europa.eu/resource.html?uri=cellar:2c2f2554-0faf-11e7-8a35-01aa75ed71a1.0017.02/DOC_3&format=PDF, p. 2
https://ec.europa.eu/isa2/eif_en/]

Digital Single Market strategy: Interoperability as an asset

- Interoperability is a valuable asset for '*ensuring effective communication between digital components like devices, networks or data repositories. It also means more efficient connections across borders, between communities and between public services and authorities*'

(COM (2015) 0192 final, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions A Digital Single Market Strategy for Europe.
European Commission (2016): European Interoperability Framework, https://ec.europa.eu/isa2/eif_en http://eur-lex.europa.eu/resource.html?uri=cellar:2c2f2554-0faf-11e7-8a35-01aa75ed71a1.0017.02/DOC_3&format=PDF)

Many initiatives on interoperability at EU level …

- Early EU-projects on interoperability
  - 2005 – 2010: Athena, Terregov, Guide, Qualeg, eMayor, BRITE, R4EGov, etc.

- Large-Scale Pilot projects (LSPs) in the past >15 years
  - 2008 – current:
    - First round (2008 – approx. 2012): epSOS, PEPPOL, SPOCS, STORK
    - Second round (ca. 2012 – ca. 2016): e-Codex, STORK 2, e-SENS
    - 2017-2021: TOOP
    - New projects starting in 2023: POTENTIAL and others focusing on EU digital identity wallet

Many initiatives on interoperability at national level

- National standardisation initiatives … some examples
  - E.g. XÖV (DE)
    - XÖV: http://www.xoev.de/
  - OIO (DK): http://arkitekturguiden.digitaliser.dk/introduction-national-enterprise-architecture-denmark
  - NORA (NL): https://joinup.ec.europa.eu/collection/nifo-national-interoperability-framework-observatory/solution/eif-toolbox/dutch-governmental-reference-architecture-nora and https://www.noraonline.nl/wiki/NORA_online

… interoperability can only be reached, if the activities are being coordinated among each other.

Interoperability vs. Integration / Compatibility / Adaptability (1/2)

- Interoperability often confused with other related concepts

- According to IDABC (EIF), interoperability is NOT
  - Integration, which is a means of changing loosely coupled systems to make them into more tightly coupled systems
    - [Klischewski/Scholl, 2006]: Integration means forming a (temporary or permanent) larger unit of government entities for the purpose of merging processes and/or sharing information
  - Compatibility, which is more about the interchangeability of tools in a particular context
  - Adaptability, which is a means of changing a tool, adding additional capabilities as needed even on an ad-hoc basis

[EIF 2.0: http://eur-lex.europa.eu/resource.html?uri=cellar:2c2f2554-0faf-11e7-8a35-01aa75ed71a1.0017.02/DOC_3&format=PDF]

Interoperability vs. Integration / Compatibility / Adaptability (2/2)

- Interoperation: information systems controlled by different jurisdictions/administrations or by external partners smoothly and effectively work together in a predefined and agreed upon fashion

[Klischewski/Scholl, 2006]

- Interoperability
  - refers to inherent capabilities on top of individual systems and tools
  - is neither ad-hoc, nor unilateral (nor even bilateral) in nature
  - is best understood as a shared value of a community
  - is a quality that can be measured via a series of quantifiable characteristics (metrics)

[EIF 2.0: http://eur-lex.europa.eu/resource.html?uri=cellar:2c2f2554-0faf-11e7-8a35-01aa75ed71a1.0017.02/DOC_3&format=PDF]

Definitions of European Public Service and European Interoperability Framework

- European public service: comprises any public sector service exposed to a cross-border dimension and supplied by public administrations, either to one another or to European businesses and citizens

- European interoperability framework
  - a commonly agreed approach towards the delivery of European public services in an interoperable manner
  - defines basic interoperability guidelines in the form of common principles, models and recommendations

European Interoperability Framework, http://eur-lex.europa.eu/resource.html?uri=cellar:2c2f2554-0faf-11e7-8a35-01aa75ed71a1.0017.02/DOC_3&format=PDF and http://ec.europa.eu/isa2/sites/isa/files/2017-03-29_eif.pdf

Challenges of “interoperation” in cross-organisational settings

- Collaboration across national boundaries with the need to link heterogeneous systems
- Stand-alone solutions with proprietary formats hamper working together in seamless government settings
- Systems in place often remain in operation while being equipped with networking capabilities
  - need for integrating legacy systems turns out to be expensive and highly complex
- Legacy systems remain under local responsibility, management and control
  - Integration may therefore in many cases not be possible

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European Interoperability Framework (EIF): Motivation

- Interoperability a complex phenomenon, involving much more than the exchange of data between IT systems
- Interoperability encompassing all different ways that organisations, entities and processes have to work together in order to achieve common goals
- EIF concerned with interoperability in the very specific Pan-European eGovernment Services (PEGS) context

[van Overeem et al 2007]

Purpose of the EIF

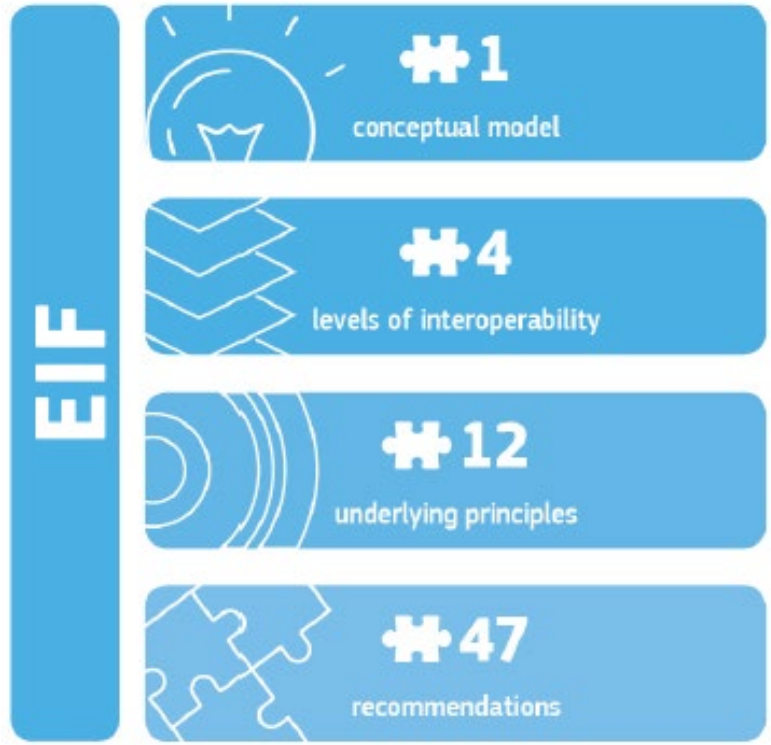
- Inspire European public administrations in their efforts to design and deliver seamless European public services to businesses and citizens which are, to the degree possible, digital-by-default (i.e. providing services and data preferably via digital channels), cross-border-by-default (i.e. accessible for all EU citizens) and open-by-default (i.e. enabling reuse, participation/access and transparency);
- Provide guidance to public administrations for the design and update of National Interoperability Frameworks (NIFs), or national policies, strategies and guidelines promoting interoperability;
- Contribute to the establishment of the DSM by fostering cross-border and cross-sectoral interoperability for the delivery of European public services.

The absence of interoperability is an important obstacle preventing the progress towards the creation of the DSM

European Interoperability Framework, http://eur-lex.europa.eu/resource.html?uri=cellar:2c2f2554-0faf-11e7-8a35-01aa75ed71a1.0017.02/DOC_3&format=PDF and http://ec.europa.eu/isa2/sites/isa/files/2017-03-29_eif.pdf

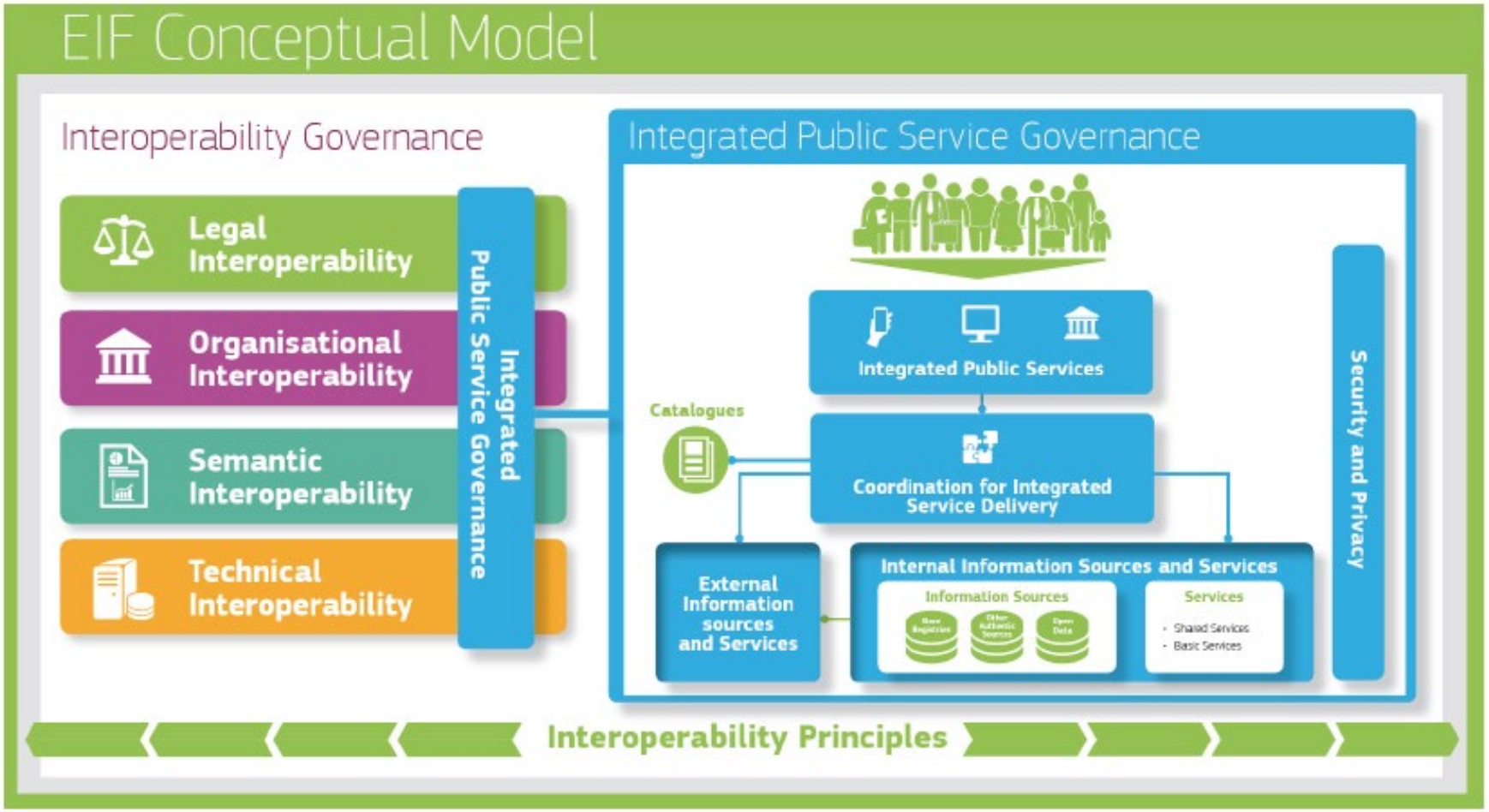
EIF to steer European interoperability initiatives

- Initiatives to contribute towards a coherent European interoperable environment, and to facilitate the delivery of services that work together, within and across organisations or domains



European Interoperability Framework, http://eur-lex.europa.eu/resource.html?uri=cellar:2c2f2554-0faf-11e7-8a35-01aa75ed71a1.0017.02/DOC_3&format=PDF and http://ec.europa.eu/isa2/sites/isa/files/2017-03-29_eif.pdf

European Interoperability Framework – Conceptual Model



European Interoperability Framework: http://eur-lex.europa.eu/resource.html?uri=cellar:2c2f2554-0faf-11e7-8a35-01aa75ed71a1.0017.02/DOC_3&format=PDF and http://ec.europa.eu/isa2/sites/isa/files/2017-03-29_eif.pdf

Twelve Interoperability Principles of the EIF

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

European Interoperability Framework: http://eur-lex.europa.eu/resource.html?uri=cellar:2c2f2554-0faf-11e7-8a35-01aa75ed71a1.0017.02/DOC_3&format=PDF

Putting interoperability governance into a legal act

The Interoperable Europe Act

Interoperable Europe act: Council adopts new law for more efficient digital public services across the EU

European Council
Council of the European Union

https://www.consilium.europa.eu/en/press/press-releases/2024/03/04/interoperable-europe-act-council-adopts-new-law-for-more-efficient-digital-public-services-across-the-eu/

Council of the EU | Press release | 4 March 2024 10:25

Interoperable Europe act: Council adopts new law for more efficient digital public services across the EU

With a view to creating a network of interconnected digital public administrations and accelerating the digital transformation of Europe's public sector, the Council adopted a new law regarding measures on a high level of public sector interoperability across the EU (**Interoperable Europe act**).

> The adoption of this regulation is a key moment for our commitment towards the EU's digital transformation. The new law will enable public administrations across Europe to cooperate more effectively, thus saving time and costs for our citizens and businesses. Moreover, it introduces measures to promote innovation, enhance skills and knowledge exchange, which are essential for a successful uptake of digital solutions.
>
> — **Mathieu Michel, Belgian Secretary of State for digitisation, administrative simplification, privacy protection and the building regulation**

Interoperable Europe act: Main objectives

https://www.consilium.europa.eu/en/press/press-releases/2024/03/04/interoperable-europe-act-council-adopts-new-law-for-more-efficient-digital-public-services-across-the-eu/

- Set up a new cooperation framework for EU public administrations to ensure the seamless delivery of public services across borders, and to provide for support measures promoting innovation and enhancing skills and knowledge exchange.

- Establish an interoperability governance structure with a view to creating an ecosystem of shared interoperability solutions for the EU's public sector, notably through the setting of regulatory sandboxes. This way, public administrations in the EU can contribute to and re-use such solutions, innovate together, and create added value.

Interoperable Europe act: Key elements

https://www.consilium.europa.eu/en/press/press-releases/2024/03/04/interoperable-europe-act-council-adopts-new-law-for-more-efficient-digital-public-services-across-the-eu/

- Concept and definition of ‘trans-European digital public services’ in line with the principles of subsidiarity and proportionality
- Provisions ensuring a structured EU cooperation, where public administrations come together in the framework of projects co-owned by member states, regions and cities
- Multi-level governance framework steered by the ‘Interoperable Europe Board’
- Possibility to share and reuse interoperability solutions, powered by a one-stop-shop for solutions and community cooperation (‘Interoperable Europe portal’) and supported by measures to promote innovation, and enhance skills and knowledge exchange
- Mandatory interoperability assessment, in line with the principle of proportionality to avoid overburdening national and local administrations
- Consistency with the artificial intelligence act (AIA) and the general data protection regulation (GDPR), regarding the establishment of and participation to interoperability regulatory sandboxes

Interoperable Europe act

https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=OJ:L_202400903&qid=1713621960462

Official Journal
of the European Union

EN
Series L

2024/903

22.3.2024

REGULATION (EU) 2024/903 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

of 13 March 2024

laying down measures for a high level of public sector interoperability across the Union (Interoperable Europe Act)

THE EUROPEAN PARLIAMENT AND THE COUNCIL OF THE EUROPEAN UNION,

Having regard to the Treaty on the Functioning of the European Union, and in particular Article 172 thereof,

Having regard to the proposal from the European Commission,

After transmission of the draft legislative act to the national parliaments,

Having regard to the opinion of the European Economic and Social Committee ([1]),

Having regard to the opinion of the Committee of the Regions ([2]),

Acting in accordance with the ordinary legislative procedure ([3]),

Whereas:

(1) It is necessary to strengthen the development of the cross-border interoperability of network and information systems which are used to provide or manage public services in the Union, in order to allow public administrations in the Union to cooperate and make public services function across borders. The existing informal cooperation should be replaced by a clear legal framework to enable interoperability across different administrative levels and sectors and to facilitate seamless cross-border data flows for truly European digital services that strengthen the internal market while respecting the principle of subsidiarity. Public sector interoperability has an important impact on the right to free movement of goods, persons, services and capital laid down in the Treaties, as burdensome administrative procedures can create significant obstacles, especially for small and medium-sized enterprises (SMEs).

Interoperable Europe act

Official Journal of the European Union

https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=OJ:L_202400903&qid=1713621960462

Chapter 1: General provisions

Article 1: Subject matter and scope

Article 2: Definitions

*(1) **'cross-border interoperability'** means the ability of Union entities and public sector bodies of Member States to interact with each other across borders by sharing data, information and knowledge through digital processes in line with the legal, organisational, semantic and technical requirements related to such cross-border interaction;*

*(2) **'trans-European digital public services'** means digital services provided by Union entities or public sector bodies to one another or to natural or legal persons in the Union, and requiring interaction across Member State borders, among Union entities or between Union entities and public sector bodies, by means of their network and information systems;*

*(3) **'network and information system'** means a network and information system as defined in Art 6 (1), of Directive (EU) 2022/2555 of the European Parliament and of the Council (14);*

*(4) '**interoperability solution'** means a reusable asset concerning legal, organisational, semantic or technical requirements to enable cross-border interoperability, such as conceptual frameworks, guidelines, reference architectures, technical specifications, standards, services and applications, as well as documented technical components, such as source code;*

etc.

Article 3: Interoperability assessment

Article 4: Share and reuse of interoperability solutions between Union entities and public sector bodies

Interoperable Europe act

Official Journal of the European Union

https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=OJ:L_202400903&qid=1713621960462

Chapter 2: European Interoperability enablers
- Article 5: General principles
- Article 6: European Interoperability Framework and specialised interoperability frameworks
- Article 7: Interoperable Europe solutions
- Article 8: Interoperable Europe portal

Chapter 3: Interoperable Europe support measures
- Article 9: Policy implementation support projects
- Article 10: Innovation measures
- Article 11: Establishment of interoperability regulatory sandboxes
- Article 12: Participation in interoperability regulatory sandboxes
- Article 13: Training
- Article 14: Peer review

Interoperable Europe act

Official Journal of the European Union

https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=OJ:L_202400903&qid=1713621960462

Chapter 4: Governance of cross-border interoperability

Article 15: Interoperable Europe Board

1. *The Interoperable Europe Board (the 'Board') is hereby established. It shall facilitate strategic cooperation and provide advice on the application of this Regulation.*
2. *The Board shall be composed of one representative from each Member State and from the Commission.*
3. *The Committee of the Regions, the EU Cybersecurity Agency (ENISA) and the European Cybersecurity Competence Centre shall each designate one expert, who shall be invited to participate as observers.*
4. *The Board shall be chaired by the Commission. […]*
5. *…. Etc.*

Article 16: Interoperable Europe Community

Article 17: National competent authorities and single points of contact

Article 18: Interoperability coordinators for Union entities

Interoperable Europe act

Official Journal of the European Union

https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=OJ:L_202400903&qid=1713621960462

Chapter 5: Interoperable Europe planning and monitoring

- Article 19: Interoperable Europe Agenda
- Article 20: Monitoring and evaluation

Chapter 6: Final provisions

- Article 21: Costs
- Article 22: Committee procedure
- Article 23: Entry into force
  1. *This Regulation shall enter into force on the twentieth day following that of its publication in the Official Journal of the European Union.*
  2. *Applies from 12 July 2024.*

  However, Article 3(1) to (4) and Article 17 applies from 12 January 2025.

This Regulation shall be binding in its entirety and directly applicable in all Member States.

EU interoperability requirements: Digital check in Germany

- According to EU 2024/903, the goal of interoperability is to increase cooperation and data exchange between European administrations and public institutions.
- Many interoperability requirements overlap with digital readiness.
  - Expand the digital readiness check to include interoperability aspects.

- **Six Key Questions on Digital Relevance and Interoperability:**
  - Does it require changes to an IT system?
  - Does it introduce cooperation duties?
  - Does it collect data already available to the administration?
  - Does it involve interaction with citizens or businesses?
  - Can implementation be improved through automation?
  - Does it involve data exchange with EU administrations?

If digital reference or interoperability requirements arise, the National Regulatory Control Council should be involved automatically!

https://erarbeiten.digitalcheck.bund.de/interoperabel

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Organisational Interoperability Framework:
A case study from the Public Procurement Domain
D02.04 – Toolbox for European organisational interoperability
December 2015
ISA
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(Wimmer et al 2015 - D02.04)

Introduction

This case study aims at showcasing how the proposed Organisational Interoperability Framework [1] can be applied to facilitate interoperability. While the framework is generic and can be applied to any domain, the case study presents a real example of its application in the **Public Procurement domain** based on the information from the eSENS and PEPPOL projects**.** The case study serves as a toolbox containing relevant links to artefacts that can be reused in order to enable the implementation of organisational interoperability.

The case study first gives an overview on key concepts necessary to the understanding of the proposed framework by presenting the definition of Organisational Interoperability and by explaining each element of the Organisational Interoperability Framework. Following that, the application of this framework is exemplified along each interoperability layer (i.e. legal, organisational, semantic and technical).

[1] The Organisational Interoperability Framework is part of the work done under D02.01 Organisational Interoperability Implementation Review

The need for Interoperability in Public Procurement

A major challenge in the public procurement domain is that European public administrations often cannot efficiently communicate or cooperate cross-border via electronic means with businesses across Europe. Major barriers lie in the lack of commonly agreed collaboration processes and of agreements to adhere to the use of existing interoperability artefacts. In consequence, higher transaction costs result for both, businesses and the European public administrations. These parties also miss business opportunities.

Organisational Interoperability

(Wimmer et al 2015 - D02.04)

How can Organisational Interoperability help

Organisational Interoperability provides the necessary concepts and tools for enabling efficient communication and collaboration among different parties along agreed upon business processes. It also establishes the management functions and principles of interoperability governance for a given domain.

What is Organisational Interoperability?

Organisational Interoperability is concerned with **setting the foundations** for collaboration between organisations, such as public administrations in different Member States, in order to achieve their mutually agreed goals in providing interoperable public services that reflect the users' (i.e. citizens, businesses, NGOs or other government organisations) needs.

Setting the foundations for collaboration among organisations refers to **aligning cross-organisational business processes and smart service orchestration** therewith ensuring seamless interaction and data exchange among distinct systems using standards and common interoperability interfaces. Organisational interoperability encompasses the necessary strategic, tactical and operational enablers as well as the respective artefacts implementing these enablers.

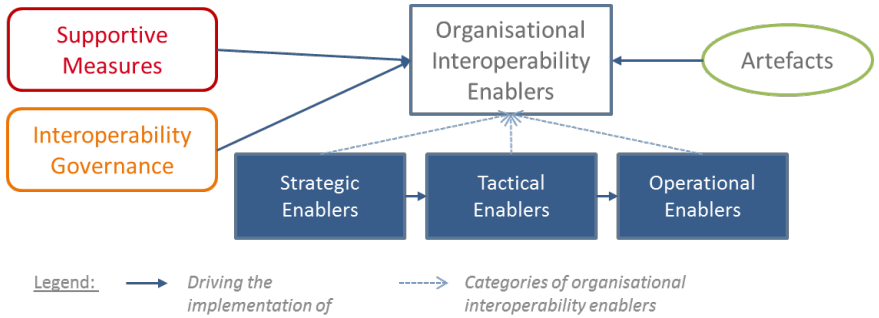
(Wimmer et al 2015 - D02.04)

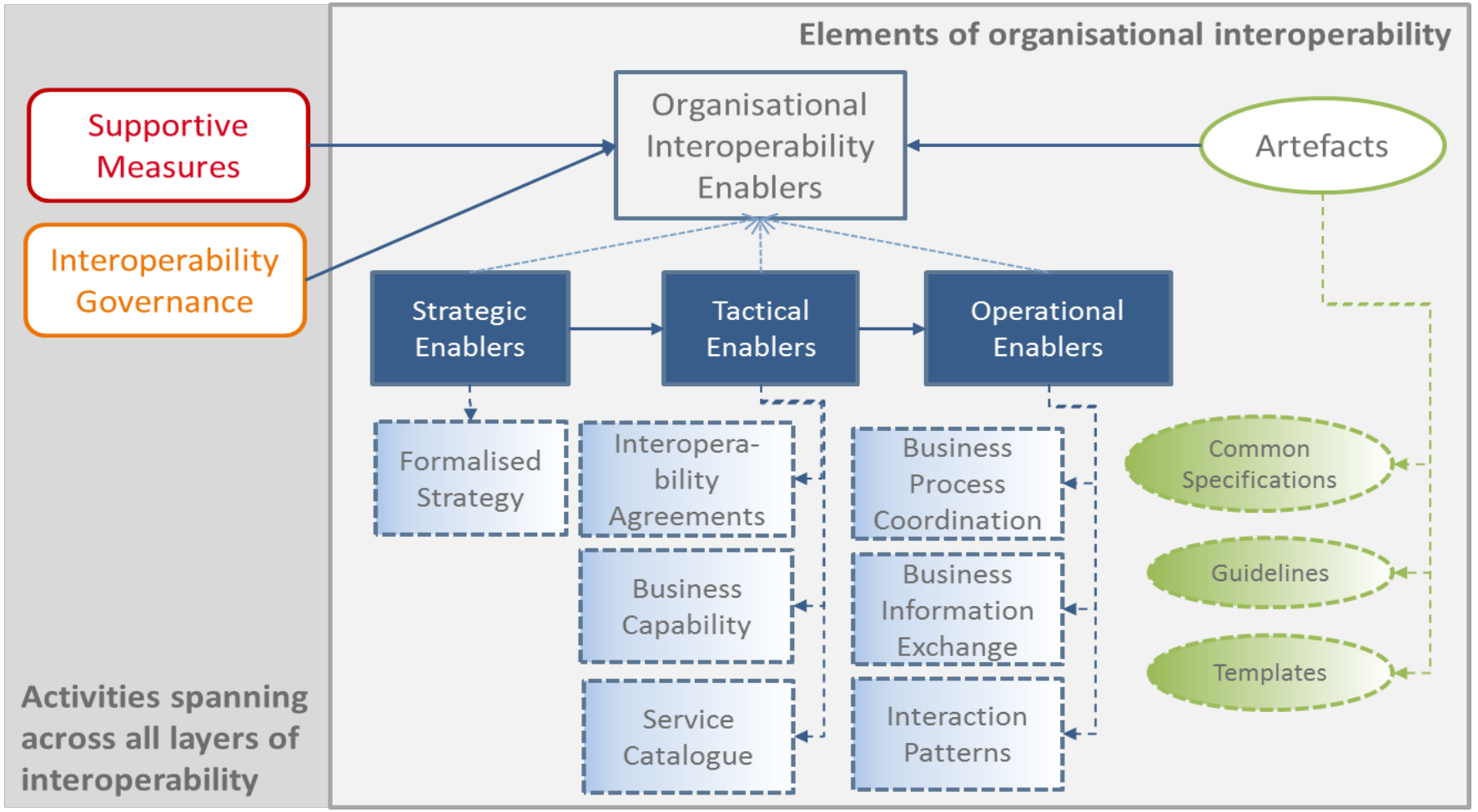
Organisational Interoperability Framework

The Organisational Interoperability Framework provides the necessary elements, which are needed to ensure interoperability of public services across borders. Those key elements include:

- **Organisational Interoperability Enablers** refer to the crucial elements that need to be put in place by a European public administration to implement organisational interoperability. They can be classified into strategic, tactical and operational enablers.
- **Organisational Interoperability Artefacts** are the tangible implementations to realise the crucial elements of organisational interoperability enablers and they serve as blueprints of solutions. Artefacts are instantiations of organisational interoperability enablers fostering the sharing and reuse of interoperability enablers and artefacts.
- **Supportive measures** interrelate with organisational interoperability as they support the establishment of a body of knowledge and the widespread implementation of organisational interoperability.
- **Interoperability governance** embodies the necessary managerial functions to provide the relevant enablers and artefacts, including measurement of maturity, maintenance and sustainability.

Concept of Organisational Interoperability with key elements





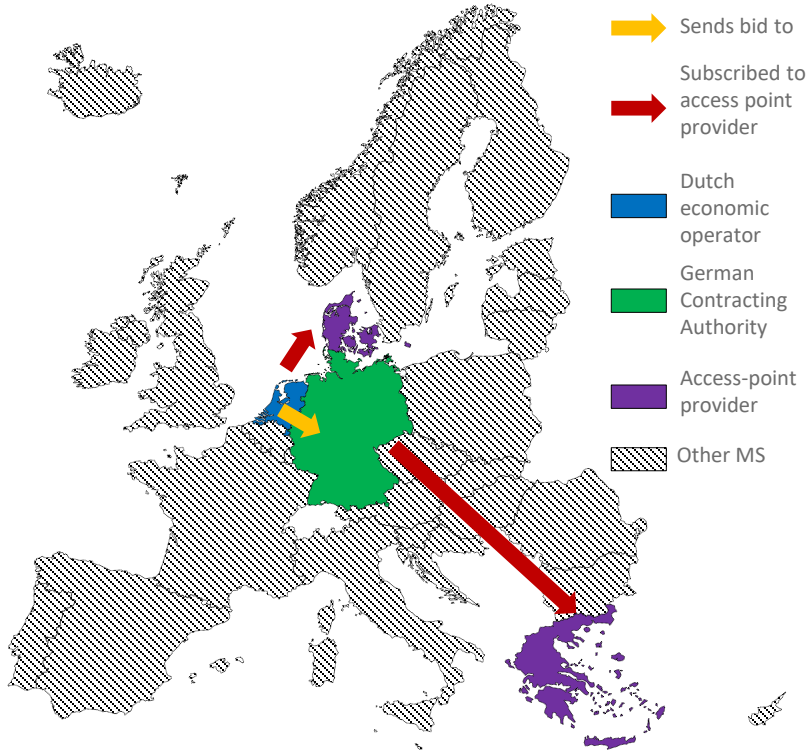
(Wimmer et al 2015 - D02.03)

Case study (1/2)

The use case of the specific interoperable public service is in the cross-border tendering. It tackles the process of cross-border submission of a bid in response to a call for tender as follows:

1. A German Contracting Authority has published a call for tender in TED (Tenders Electronic Daily) and a Dutch Economic Operator subscribes interest to it.
2. To prepare the bid and the qualification document (ESPD - European Single Procurement Document), the Dutch Economic Operator uses its local tendering platform, which also offers an ESPD service.
3. In preparing the bid and the ESPD, the standard building blocks for e-Tendering (CEN BII profile and e-Document of eSENS) are used.
4. The Economic Operator submits the bid and the ESPD from the Dutch tendering platform via the e-Delivery building block of eSENS (AS/4 protocol and PEPPOL access point provider in DK) to the Contracting authority (who is registered to the Greek access point provider).

(Wimmer et al 2015 - D02.04)



Access point providers are established in several European countries. Economic operators and contracting authorities are free to engage with and make agreements with any access point service provider within the PEPPOL network. This is a key feature of the PEPPOL network [2].

[2] https://peppol.eu/what-is-peppol/peppol-transport-infrastructure/

(Wimmer et al 2015 - D02.04)

Case study (2/2)

Features of the case study:

Main actors: Dutch Economic Operator (EO), German Contracting Authority (CA)

Platforms: Dutch e-Tendering platform, German e-Tendering platform

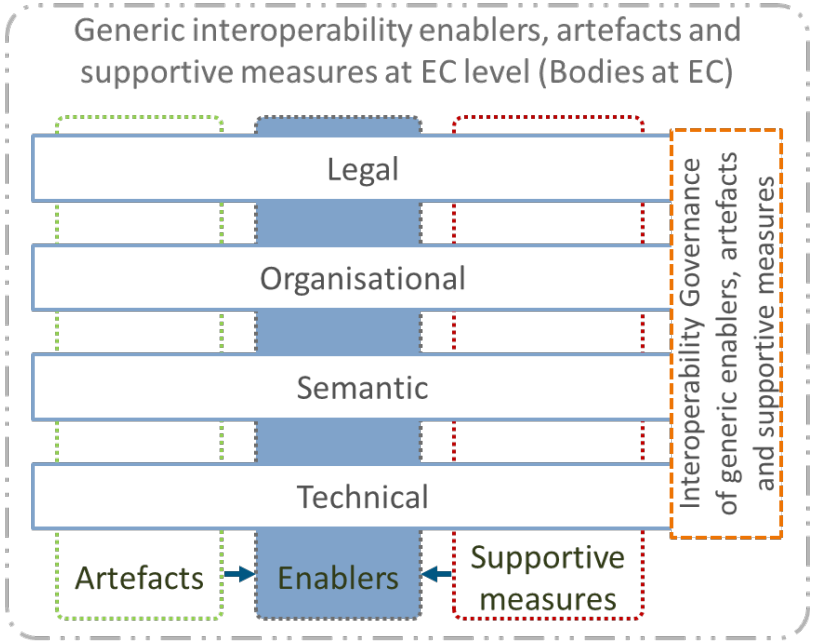
Service Providers: ESPD (European Single Procurement Document) provider (NL), Access point providers (GR) (DK)

Strategies driving the scenario: DSM, EIS and DAE

Tools: CEN BII profile 12 for Advanced Tendering and CEN BII profile 41 for ESPD, eSENS e-Document building block, eSENS e-Delivery building block, Transport protocol AS/4, used for data transmission and process execution

Prerequisites: PEPPOL transport infrastructure agreements and Service Level Agreements signed with access point providers

To better illustrate the case study, the interoperability layers of the European Interoperability Framework are mashed up with the concept of organisational interoperability. Interoperability governance is added as a vertical box to reflect its transcending role across all layers of interoperability.



Next, **interoperability enablers** and **artefacts** are explained along each of the four layers of interoperability, followed by supportive measures (relevant for all layers) and concluding with an overall picture of how the individual pieces all fit together.

(Wimmer et al 2015 - D02.04)

Legal Interoperability Layer

At the legal interoperability layer, the enabler is an interoperable legislation in place at European as well as Member State (NL, DE) level, which is supported by legal artefacts (the respective regulations and standard forms):

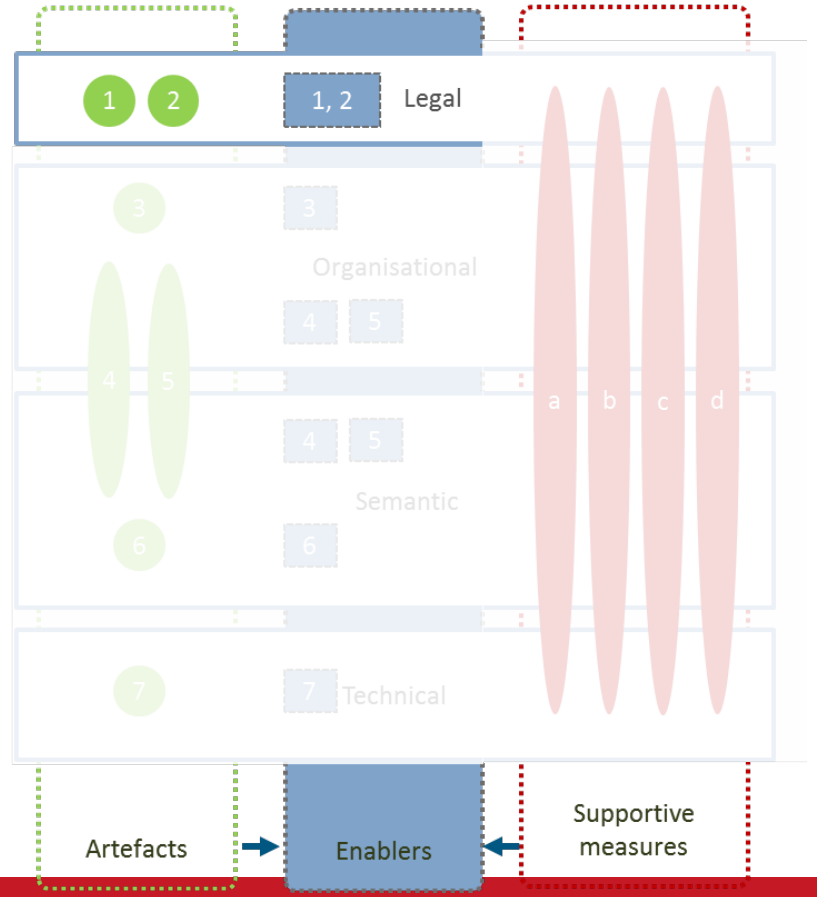
1 **Enabler:** Interoperable legislation

1 **Artefact:** Directive 24/2014/EU serving as common legal basis to ensure legal interoperability across Europe in the procurement domain. The directive also contains a set of exclusion grounds and selection criteria, which are common across Europe

2 **Enabler:** Legally binding standard forms for qualification

2 **Artefact:** The **ESPD standard form** is an artefact providing a legally binding template to collect qualification information in a standardised way.

Generic interoperability enablers, artefacts and supportive measures at EC and MS level



(Wimmer et al 2015 - D02.04)

Organisational Interoperability Layer

At the organisational layer, the e-Tendering platform providers as well as the CA & EO have signed agreements with access providers for the use of a common transport infrastructure. In addition, the CA & EO are adhering to the use of CEN BII profiles that describe the business process and information exchange from a business requirements perspective.

3 **Enabler:** Common agreements on transport infrastructure, which could be used across different domains

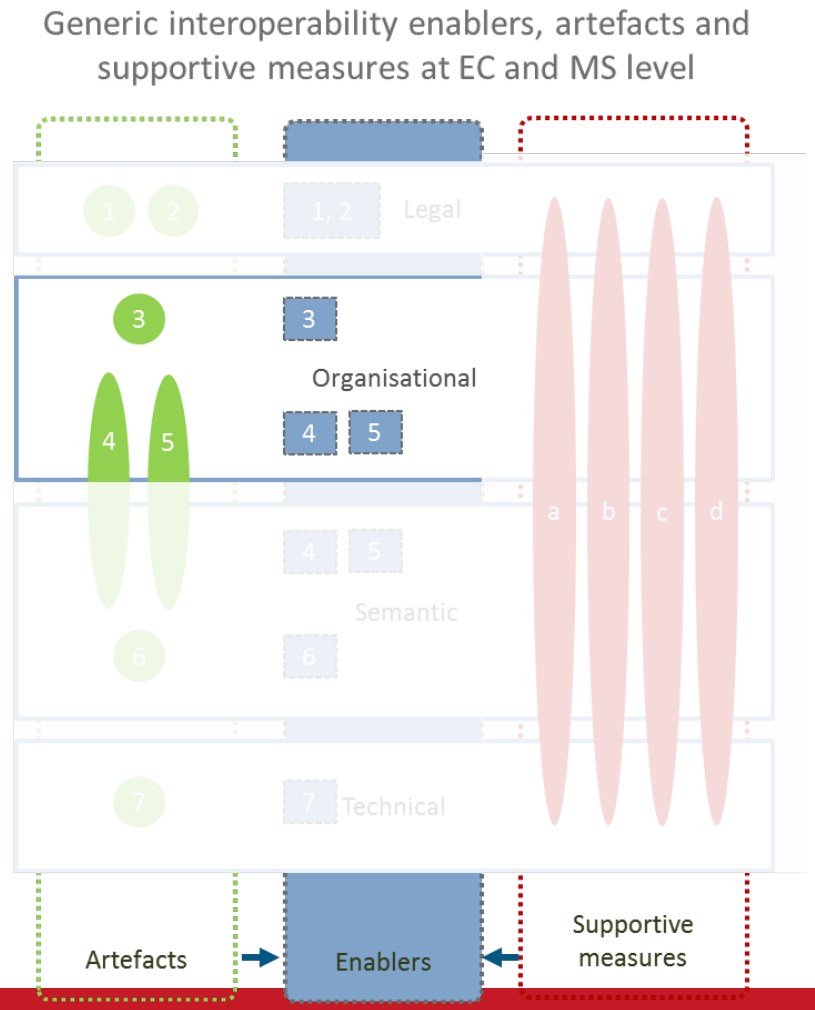
3 **Artefact:** Template for signing the PEPPOL transport infrastructure agreement

4/5 **Enabler:** Business processes

4 **Artefact:** CEN BII profile 12 for Advanced Tendering

5 **Artefact:** CEN BII profile 41 for European Single Procurement Document

The CEN BII profiles for e-Tendering provide a set of standards that describe business processes for interactions in tendering procedures and the respective transaction business requirements, transaction interaction requirements, information requirements models and UBL bindings. Accordingly, they also touch the semantic layer.



(Wimmer et al 2015 - D02.04)

Semantic Interoperability Layer

At the semantic layer, the CEN BII Information Requirements model and data models used for e-tendering and for the ESPD provide a common understanding of the semantic concepts. To send a bid or a qualification document, eSENS has developed a common eDocument building block. For qualification procedures, the eCertis service provides the mapping of criteria of qualitative selection or of exclusion grounds to evidences that economic operators can gather in their countries.

4/5 **Enabler:** Information Requirements Model / semantic model

4 **Artefact:** CEN BII profile 12 for Advanced Tendering

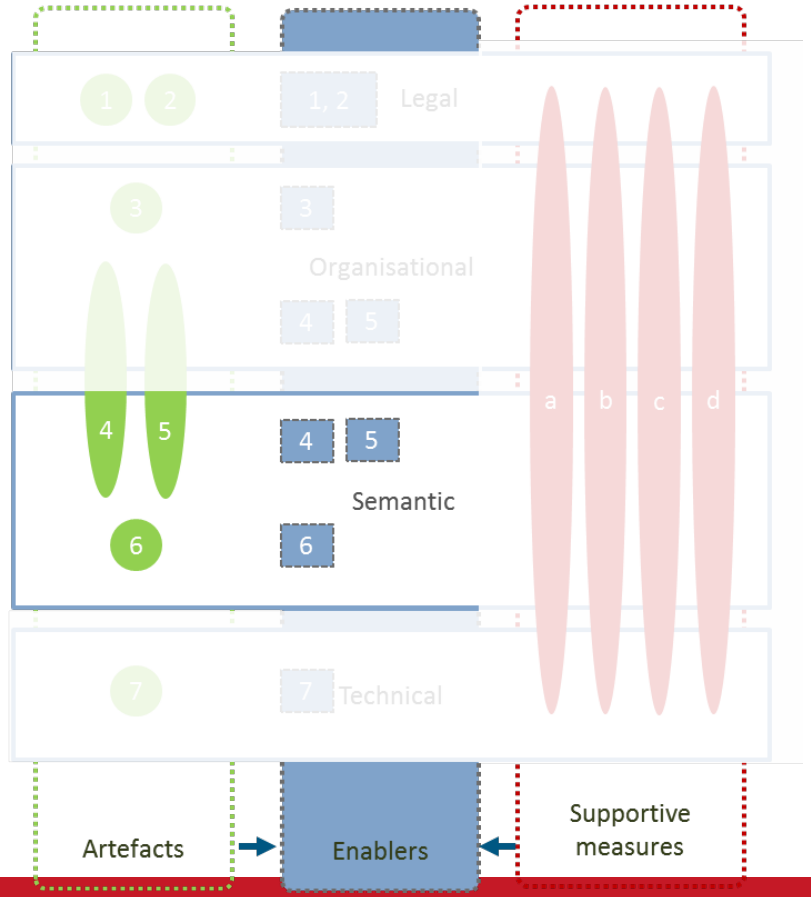
5 **Artefact:** CEN BII profile 41 for European Single Procurement Document

The CEN BII profiles for e-Tendering provide a set of standards that span across organisational and semantic layers (see before).

6 **Enabler:** eDocument building block of eSENS

6 **Artefact: The** eDocument container of eSENS serves to deliver the bid and the ESPD (both, enabler and artefact) to the CA. This enabler and artefact (the process, data model and software building block) is a generic enabler and artefact that could be used in different policy domains to exchange documents in a structured and interoperable way.

Generic interoperability enablers, artefacts and supportive measures at EC and MS level



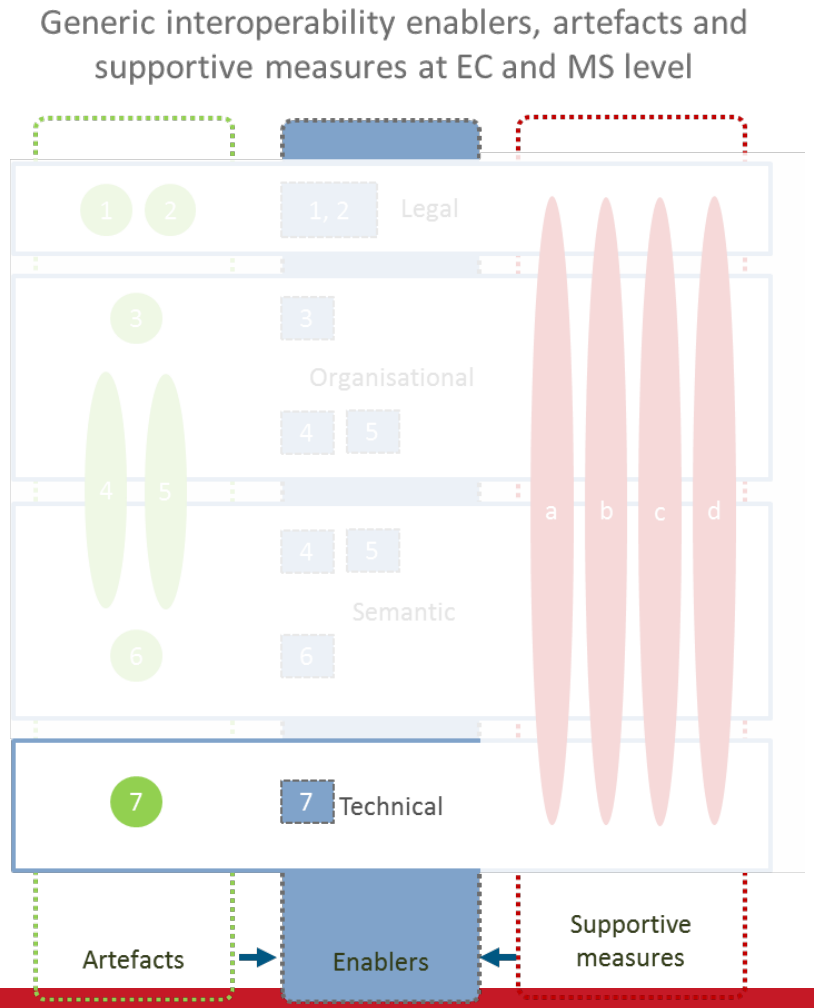
(Wimmer et al 2015 - D02.04)

Technical Interoperability Layer

At the technical interoperability layer, the eDelivery building block of eSENS as the enabler as well as the PEPPOL transport network and the AS/4 protocol are used to deliver the bid and the ESPD from the EO in the Netherlands to the CA in Germany via the access point providers in Denmark and Greece. Along this, eSignature and eID may also be used as relevant technical enablers and solutions building blocks.

7 **Enabler:** eDelivery building block

7 **Artefact:** The AS/4 protocol enables the EO in the Netherlands and the CA in Germany to communicate along the public service delivery to transport the payload using a standard protocol in a secure environment of the PEPPOL transport infrastructure



(Wimmer et al 2015 - D02.04)

Supporting Measures

Supporting Measures provide support to European public administrations to speed up the implementation of interoperability by establishing different externally oriented measures. Examples of support activities that can e.g. be carried out by respective bodies at EC level as well as by national and other overarching initiatives such as large-scale pilot projects or communities caring for the governance and reuse of interoperability artefacts and enablers are e.g.:

Supporting Measures:

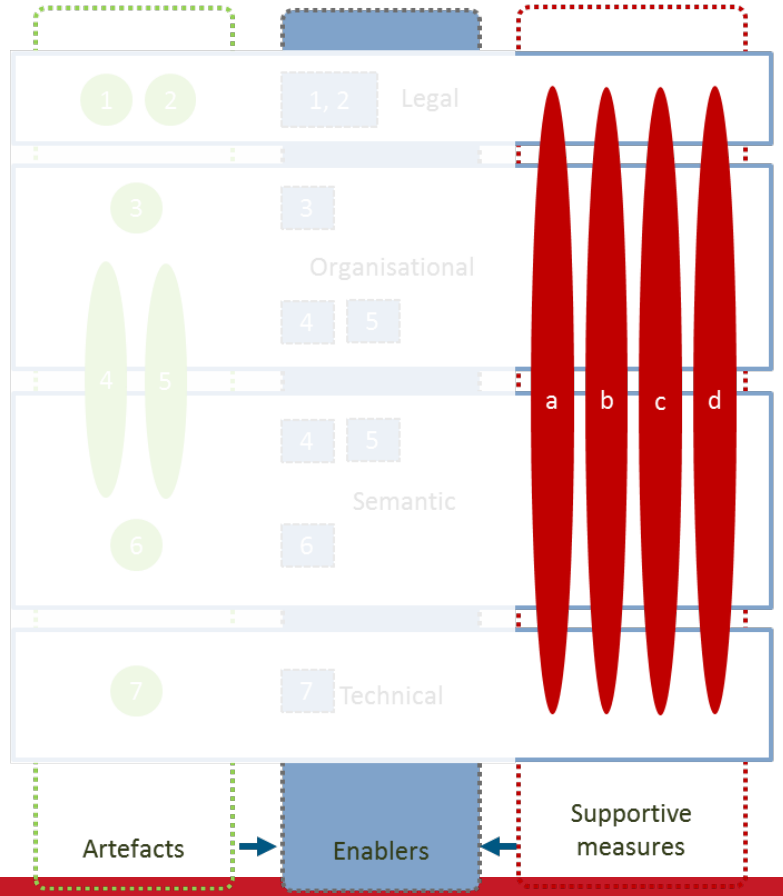
a. **Common repository** providing generic artefacts on a central place for sharing and reusing the artefacts in concrete instantiations of public service provisioning – e.g. Joinup, CEN BII

b. **Body of knowledge** including a core vocabulary, as is currently elaborated through ISA, DG GROW, eSENS, CEN BII and openPEPPOL

c. **Reference architecture** providing access to the repository in a structured way as is developed in eSENS

d. **Awareness raising activities** foster diffusion and use of generic interoperability artefacts in order to achieve the overall goals of EIS and DSM. Such activities are carried out by ISA, DG GROW, eSENS, CEN BII and openPEPPOL

Generic interoperability enablers, artefacts and supportive measures at EC and MS level

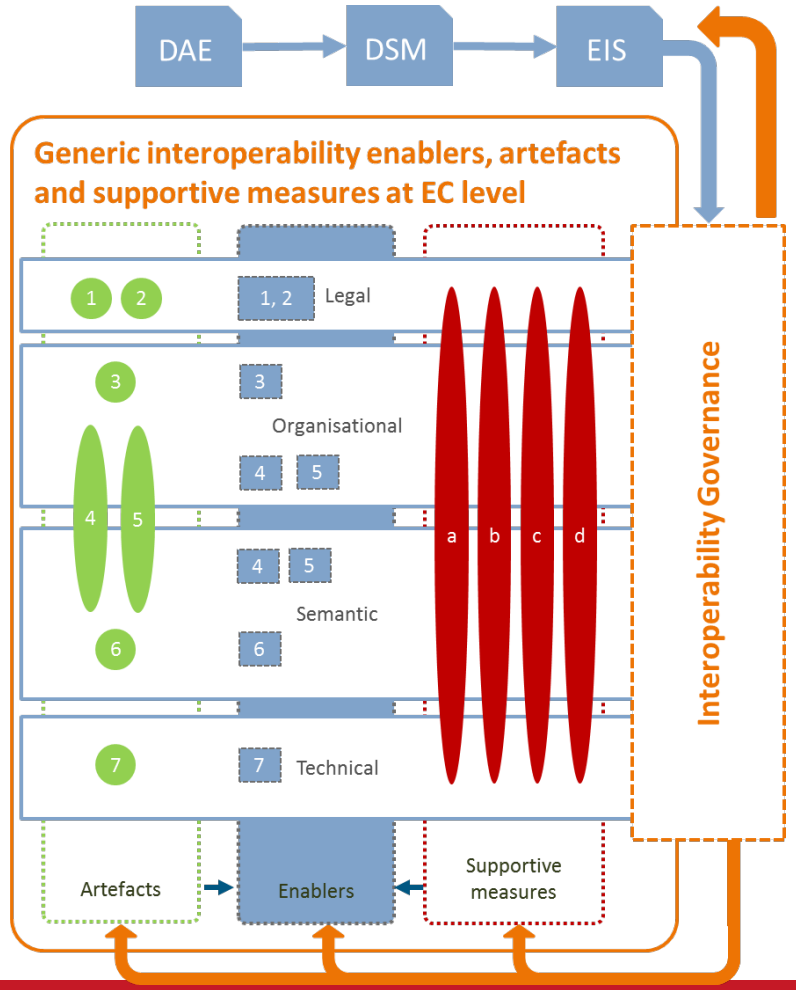


(Wimmer et al 2015 - D02.04)

Interoperability Governance

Interoperability Governance caters for a smooth transition and alignment of the concrete solutions with the overall objectives of the interoperability strategy. It provides a set of functions spanning across different layers of interoperability to ensure that concrete shareable and reusable artefacts are designed, implemented and provided for reuse, including the change management and sustainability thereof, for realising interoperability at the different layers. In the context of this case study these include e.g.:

- Providing and updating the European Interoperability Framework and supervising its alignment with the National interoperability frameworks in Member States is done by European Commission. This alignment can be found on the dedicated Joinup website;
- Providing and maintaining the European Interoperability Reference Architecture (EIRA), done by both European Commission on the dedicated Joinup website as well as by the eSens community, maintaining their own generic architecture repository;
- Providing and maintaining a repository for sharing and reusing generic IOP artefacts, done by the European Commission via the Joinup website, as well as by the eSens community.



Basic concepts and typical e-government solutions: Interoperability of public services

Agenda

- Interoperability and standardisation
- European Interoperability framework and Interoperable Europe Act
- A case study from public e-procurement
- Building blocks to support cross-border interoperability
- Introduction to government enterprise architectures (GEA) and examples

Strategic Background for Large-scale pilot projects (1/2)

- EU strategic framework i2010 (a European Information Society for growth and employment)
  - promotes an open, innovative and competitive digital economy
  - emphasises ICT as a driver of inclusion and quality of life
  - builds an integrated approach to the information society and audio-visual media policies in the EU

Strategic Background for Large-scale pilot projects (2/2)

- Three priorities for Europe's information society and media policies
  - Completion of a Single European Information Space which promotes an open and competitive internal market for information society and media
  - Strengthening Innovation and Investment in ICT research to promote growth and more and better jobs
  - Achieving an Inclusive European Information Society that is consistent with sustainable development and that prioritises better public services and quality of life

Competitive and Innovation Programme (CIP): ICT PSP

- Aimed at stimulating smart sustainable and inclusive growth by accelerating the wider uptake and best use of innovative digital technologies and content by citizens, governments and businesses
  - More proactive policies for uptake of ICT and exploitation of digital content in areas of public interest like health, public sector information, public administrations, etc.
- Major hurdles for use of ICT in these areas
  - Unavailability of ICT-based services
  - Lack of interoperability of solutions across the Member States
  - Market fragmentation of the information space and of ICT-based solutions
- ICT Policy Support Programme (PSP) to overcome the hurdles hindering the development of an information society for all

Large-scale pilots as instrument

- Pilot (Type A) projects building on initiatives in Member States (MSs) or associated countries
- Work in the broader context of significant investments in national or regional services
- Areas of large scale pilots
  - Health, e-identity, Public Procurement – EU e-procurement Directive, EU Services Directive, e-justice
- Drivers of activities
  - Public sector entities in the areas
- Consortia with 10+ partners from different EU countries
- Expected outcome from the projects
  - set of building blocks supporting cross-border public services

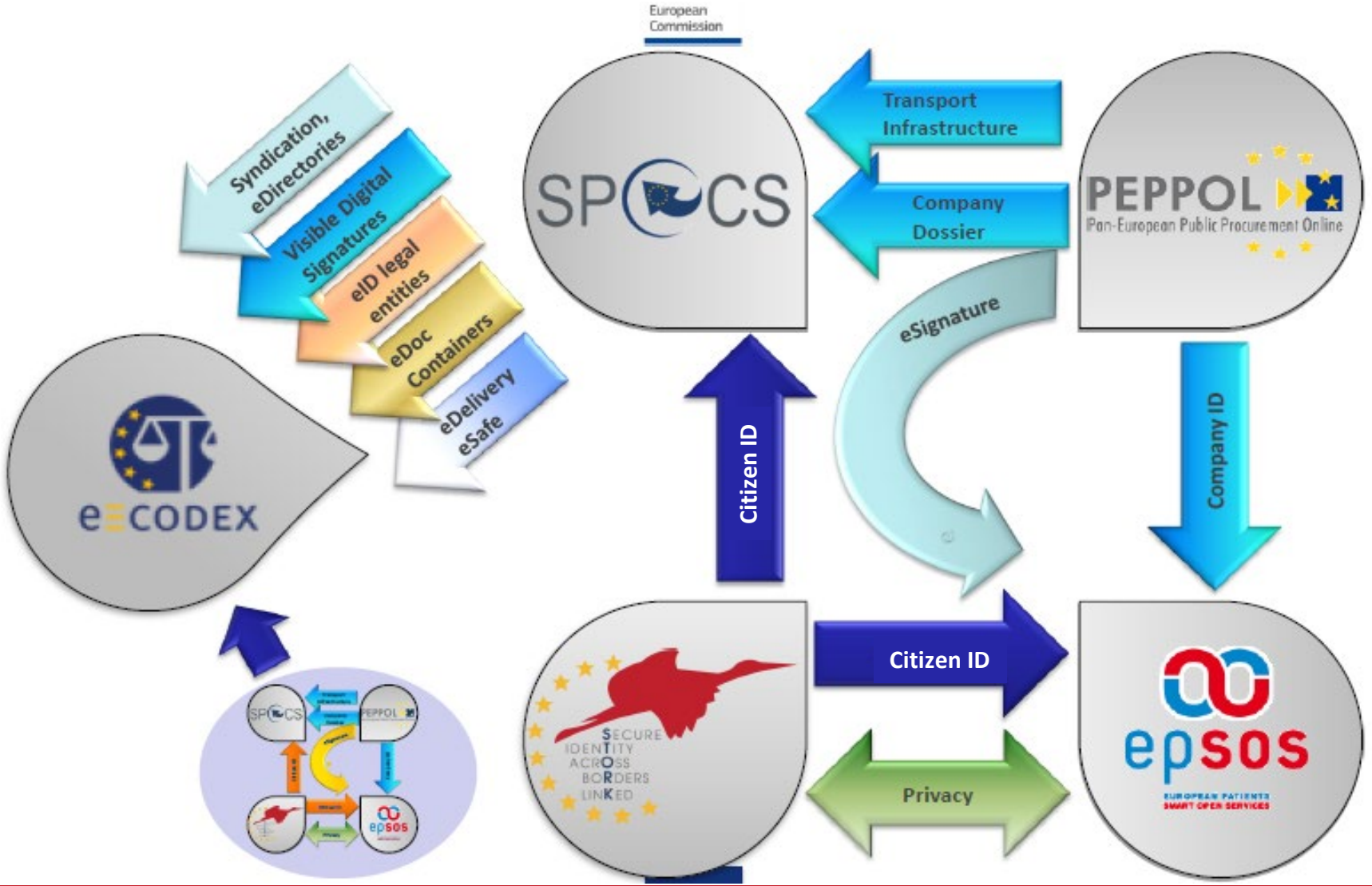
Large-scale pilots running since 2008 (1/2)

- eIdentity
  - STORK & STORK 2 – Securing Identity across Borders Linked
- Public Procurement – EU eProcurement Directive
  - PEPPOL – Pan-European Public Procurement Online
- EU Services Directive
  - SPOCS - Simple Procedures Online for Cross-border Services

Large-scale pilots running since 2008 (2/2)

- Health
  - epSOS – European Patient Smart Open Services
- eJustice
  - eCodex - e-Justice Communication via Online Data Exchange
- eSens (LSP since 2013 incorporating previous solutions)
  - eSens – moving services forward

Basic cross-sector building blocks from the LSPs



(Presentation of Jean-François Junger, EC on Open Call of CIP ICT PSP)

Follow-up by eSens

Objectives of eSens

- Facilitating cross-border processes within the EU by
  - Making it easier for companies to set up business electronically
  - Enabling electronic procurement procedures for businesses
  - Creating seamless access to EU legal systems
  - Making it easier to use healthcare services abroad in cases of emergency
- eSens developed a digital infrastructure for improving the quality of public services in the EU
- eSens supported implementation of European policies
  - In particular, the Digital Agenda for Europe

http://www.esens.eu/

eSENS project facts

- Over 100 partners from 18 European countries plus Norway, Turkey as well as openPEPPOL and ETSI
- Budget: € 27 Mio, EU Financing: 13,5 Mio €
- Runtime: April 2013 – March 2017
- Coordinator: Ministry of Justice NRW, Germany
- Piloting domains:

Major building blocks of eSENS

http://www.esens.eu/

e-Delivery aims to establish a common transport infrastructure meeting the requirements of cross- border communication between e-government applications in different domains

e-Document is a container component used to wrap business content and handle electronic documents (e.g. for the Virtual Company Dossier)

e-Identity establishes cross-border recognition and validation of national electronic identity schemes to support the requirements of various e-government applications

e-Signature provides cross-border interoperable components for a secure electronic signature infrastructure in different domains

Semantics provides semantic interoperability from a legal and official document (evidence, attestation) perspective

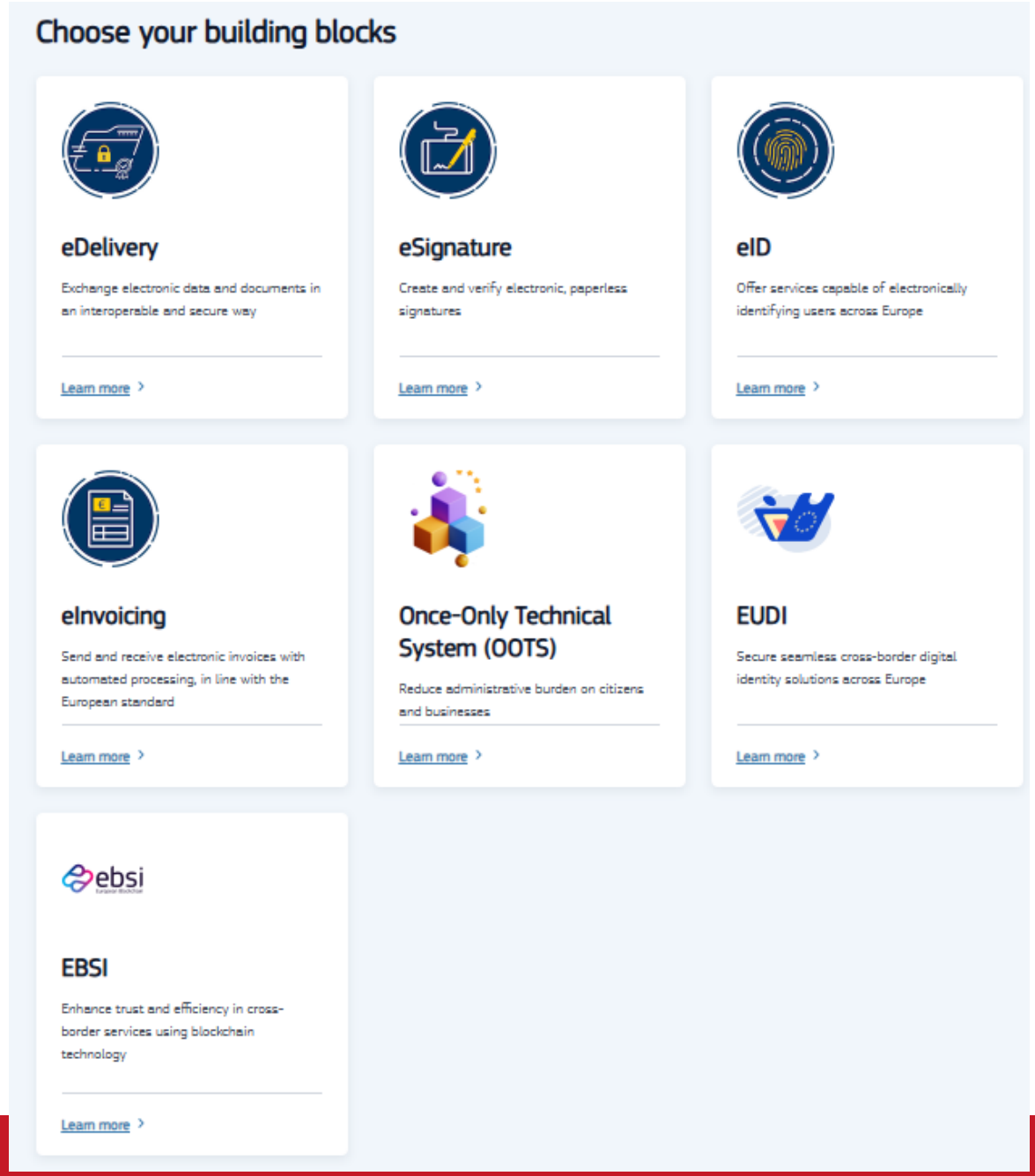
Subsequent initiatives … (next classes)

TOOP project for the once-only implementation (as an LSP run as an innovation action in H2020)
https://toop.eu
2017 - 2021

DE4A project for the single digital gateway implementation (as an LSP run as a research and innovation action in H2020)
https://de4a.eu
2021 - 2023

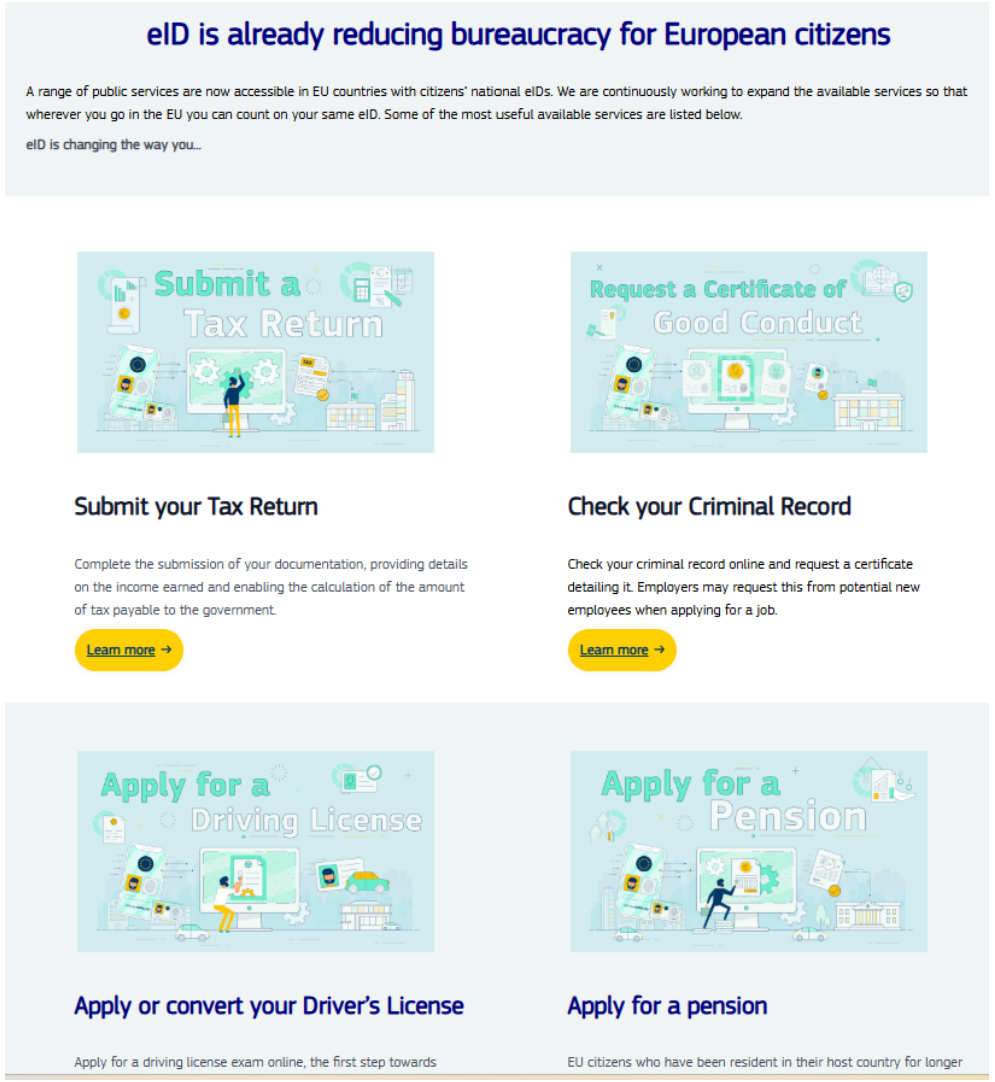
4 LSP projects for eID – European Digital Identity Wallet (EUDIW)
https://digital-strategy.ec.europa.eu/en/news/eu-digital-identity-4-projects-launched-test-eudi-wallet
2023 – 2024 (w extensions)

- **POTENTIAL – Pilots for European Digital Identity Wallet Consortium**
- **EWC – EU Digital Identity Wallet Consortium**
- **NOBID – Nordic-Baltic eID Wallet Consortium**
- **DC4EU – Digital Credentials for Europe Consortium**



Digital Building Blocks for Europe

https://ec.europa.eu/digital-building-blocks/sites/display/DIGITAL/Digital+Building+Blocks+for+Europe

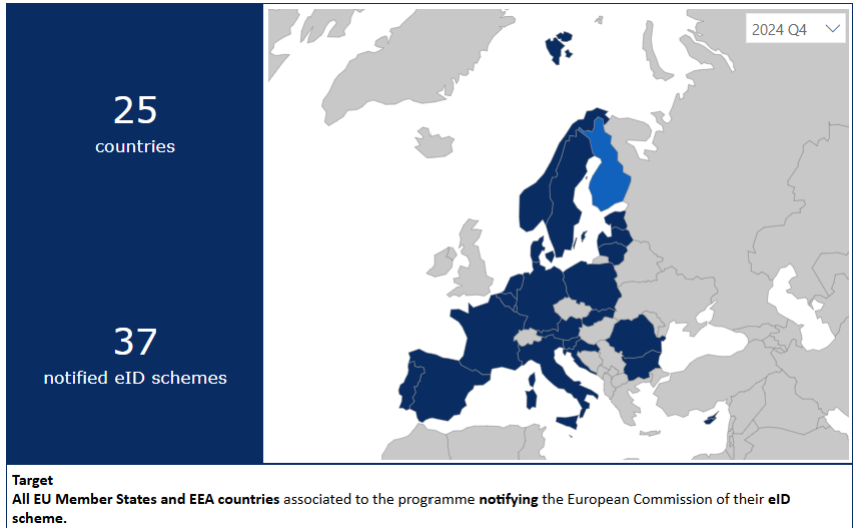


Example: eID

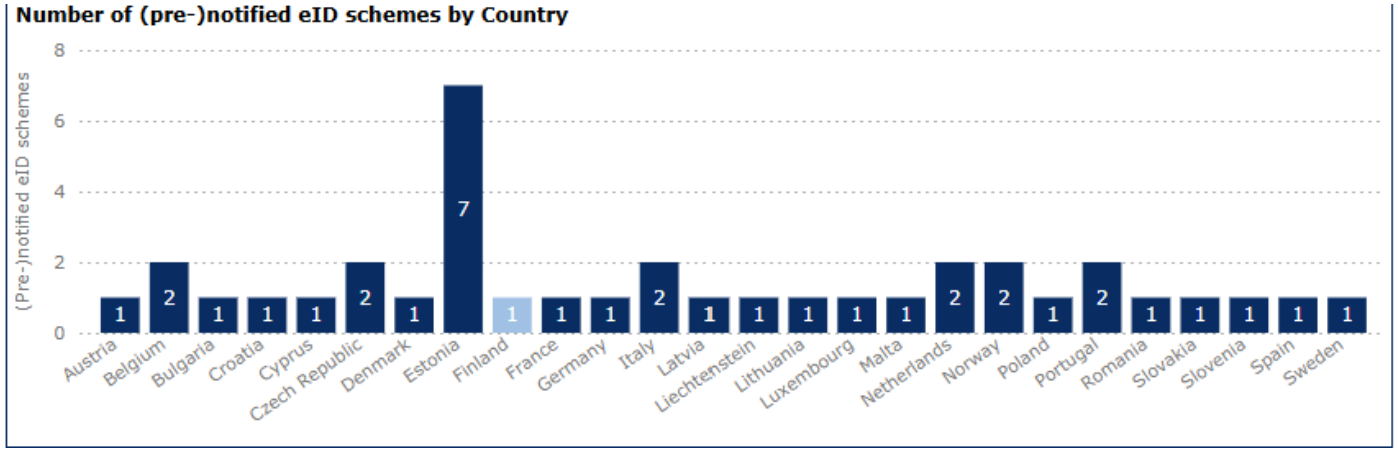
https://ec.europa.eu/digital-building-blocks/sites/display/DIGITAL/eID+for+You

eID Monitoring Dashboard

Adoption of eID schemes by EU and EEA countries



https://ec.europa.eu/digital-building-blocks/sites/display/DIGITAL/eID+Monitoring+Dashboard?ref=adoption



Estonia	Republic of Estonia	Estonian eID scheme: ID card	High	— ID card	NOTIFIED	07 Nov 2018	2018/C 401/08
		Estonian eID scheme: RP card		— RP card			
		Estonian eID scheme: Digi-ID		— Digi-ID			
		Estonian eID scheme: e-Residency Digi-ID		— e-Residency Digi-ID			
		Estonian eID scheme: Mobiil-ID (until 01.07.2022)		— Mobiil-ID (until 01.07.2022)/Mobile-ID (since 02.07.2022)			
		Estonian eID scheme: Mobile-ID (since 02.07.2022)					
		Estonian eID scheme: diplomatic identity card		— Diplomatic identity card			
Germany	Federal Republic of Germany	German eID based on Extended Access Control	High	National Identity Card	NOTIFIED	26 Sept 2017	2017/C 319/03
				Electronic Residence Permit			2020/C 432/07
				eID Card for Union Citizens and EEA Nationals			

https://ec.europa.eu/digital-building-blocks/sites/display/EIDCOMMUNITY/Overview+of+pre-notified+and+notified+eID+schemes+under+eIDAS

Basic concepts and typical e-government solutions: Interoperability of public services

Agenda

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Securing interoperability in networked governments through architecture

- Interoperability is a basic means of any e-government service or system provided in networked government
- E-government Architecture has to care for interoperability by large

Architectures – foundations for an integrated approach to e-government implementations

- "*A significant finding that emerged from e-government efforts was the need for a Federal Enterprise Architecture*"
  - » Executive Office of the president of the United States. eGovernment Strategy. 2003, April

- According to the Gartner Group, three types of documents should support any ICT initiative
  - Strategy
  - Architecture
  - Projects portfolio

Motivation for Government Enterprise Architecture (GEA)

- Queensland Government argues:
  - Enterprise Architecture (EA) has been identified as "*the most appropriate decision making and management framework for enabling government and agencies to collaboratively provide seamless services and maximally leverage existing investments"*.
  - QGEA is about structuring an organization's knowledge resources – "*processes, data, applications, and infrastructure captured in a set of policies and technical choices to achieve desired business and technical standardization and integration*."
  - "*QGEA provides the framework to support the development of better services for Queenslanders, more efficient and effective use of ICT in government, and effective partnering with the private sector*"

(Queensland Government: Queensland Government Enterprise Architecture, https://www.forgov.qld.gov.au/information-and-communication-technology/queensland-government-enterprise-architecture-qgea)

E-government architecture: linking services and applications

- E-government (or Enterprise) Architectures take form of a comprehensive set of interconnected models
- Models describe the structure and functions of government or enterprise
  - Systematic ICT planning and architecting
  - Enhanced decision making
- E-government Architecture models point to a business driven approach to government e-services implementation based on Service Oriented Architecture (SOA) principles

Enterprise Architecture Frameworks

- Many different approaches to EA exist
  - Dedicated to specific domains
    - Specific Government Enterprise Architectures
    - Industry-driven EAs
  - Approaches varying in focus of support
    - Frameworks supporting the process of development
    - Frameworks scoping the different views and viewpoints
    - Frameworks with focus on the tool-support

- Details given in lecture Enterprise Architecture (EA) in the masters program

Examples of government architecture frameworks

- Federal Enterprise Architecture (FEA) in USA (commissioned in February 2002, see https://obamawhitehouse.archives.gov/omb/e-gov/FEA)
- EIRA in Europe (European Interoperability Reference Architecture) (see next slides)
- Architecture Framework in Denmark (http://arkitekturguiden.digitaliser.dk/introduction-national-enterprise-architecture-denmark in Danish)
- NORA - a framework in the Netherlands (https://www.noraonline.nl/wiki/NORA_online in Dutch, and https://joinup.ec.europa.eu/collection/nifo-national-interoperability-framework-observatory/solution/eif-toolbox/dutch-governmental-reference-architecture-nora)

EIRA (European Interoperability Reference Architecture): The Needs

- To attain interoperability, public administrations in Europe need to coordinate across borders and sectors when developing digital solutions to avoid the risk of creating new digital barriers for administrations, businesses, and citizens

- Needs
  - Common terminology to design, assess, and communicate about e-government solutions
  - Stable interfaces for digital public services
  - Overview of already existing solution building blocks

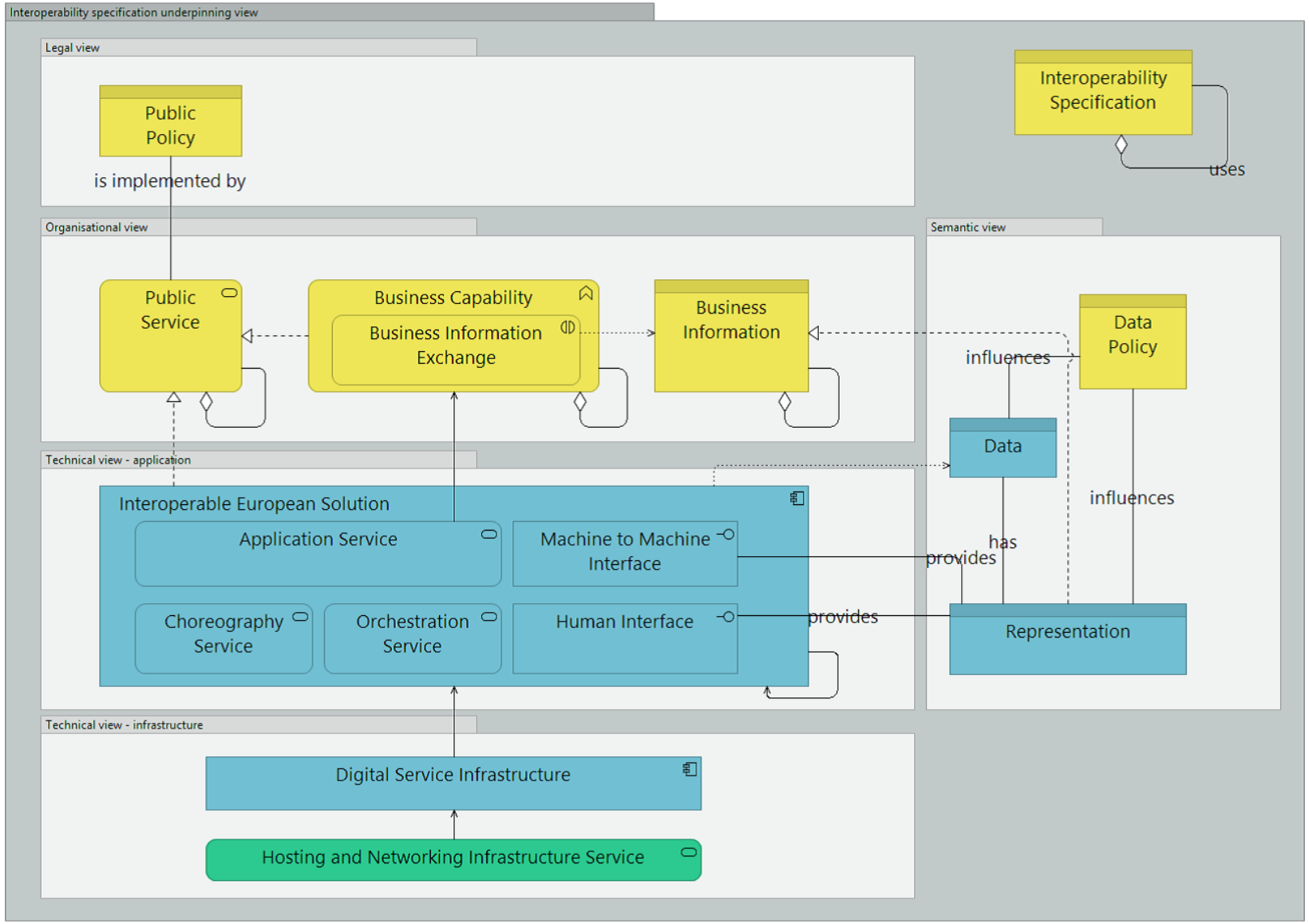
https://joinup.ec.europa.eu/collection/european-interoperability-reference-architecture-eira/about#eia

EIRA (European Interoperability Reference Architecture): The Concept

- Four-view reference architecture for delivering interoperable digital public services across borders and sectors
- Defining the required capabilities for promoting interoperability as a set of architecture building blocks (ABBs)

https://joinup.ec.europa.eu/collection/european-interoperability-reference-architecture-eira/about#eia

EIRA (European Interoperability Reference Architecture): High-level view of EIRA concept



https://joinup.ec.europa.eu/collection/european-interoperability-reference-architecture-eira/about#eia

EIRA (European Interoperability Reference Architecture): Four main characteristics (1)

- Common terminology to achieve a minimum level of coordination
- Reference architecture for delivering digital public services
  - offering a framework to categorise (re)usable solution building blocks (SBBs) of an e-government solution, allowing portfolio managers to rationalise, manage and document their portfolio of solutions

https://joinup.ec.europa.eu/collection/european-interoperability-reference-architecture-eira/about#eia

EIRA (European Interoperability Reference Architecture): Four main characteristics (2)

- Technology- & product-neutral and service-oriented architecture (SOA) style (promoting ArchiMate as a modelling notation)

- Alignment with European Interoperability Framework (EIF) and Compliance with the context given in the European Interoperability Strategy (EIS)
  - EIRA focuses on the architecture continuum and re-uses terminology and paradigms from TOGAF such as architecture patterns, building blocks and views

https://joinup.ec.europa.eu/collection/european-interoperability-reference-architecture-eira/about#eia

NIFO: National Interoperability Framework Observatory

About

The **European Interoperability Framework (EIF)** gives specific guidance on how to set up interoperable digital public services. It offers to public administrations **47 concrete recommendations** on how to improve governance of their interoperability activities, establish cross-organisational relationships, streamline processes supporting end-to-end digital services, and ensure that both existing and new legislation do not compromise interoperability efforts.

The EIF Monitoring Mechanism aims to monitor and evaluate the implementation of the European Interoperability Framework (EIF) within the 27 EU Member States and the United Kingdom, the members of the EFTA - European Free Trade Association (Iceland, Liechtenstein, Norway and Switzerland) as well as Ukraine, Montenegro, Turkey and the Republic of North Macedonia. More specifically, the monitoring mechanism measures, through a wide range of indicators, the performance of those countries in aligning their National Interoperability Framework (NIF) with the EIF.

The **EIF Monitoring Mechanism Results** will help the Member States identify the areas in which their performances should improve and the ones in which they are outperforming. A clear picture of the current implementation status will support them in defining the next milestones.

The present **EIF Monitoring Mechanism Dashboard** represents a key tool that provides stakeholders with a clear overview of the status and level of implementation of the EIF within each concerned country. The interactive dashboard showcases the performance of the countries at different levels of

Raw Data

More info

Global Overview

See more

EIF Recommendations

See more

EIF Pillars

See more

EIF KPIs

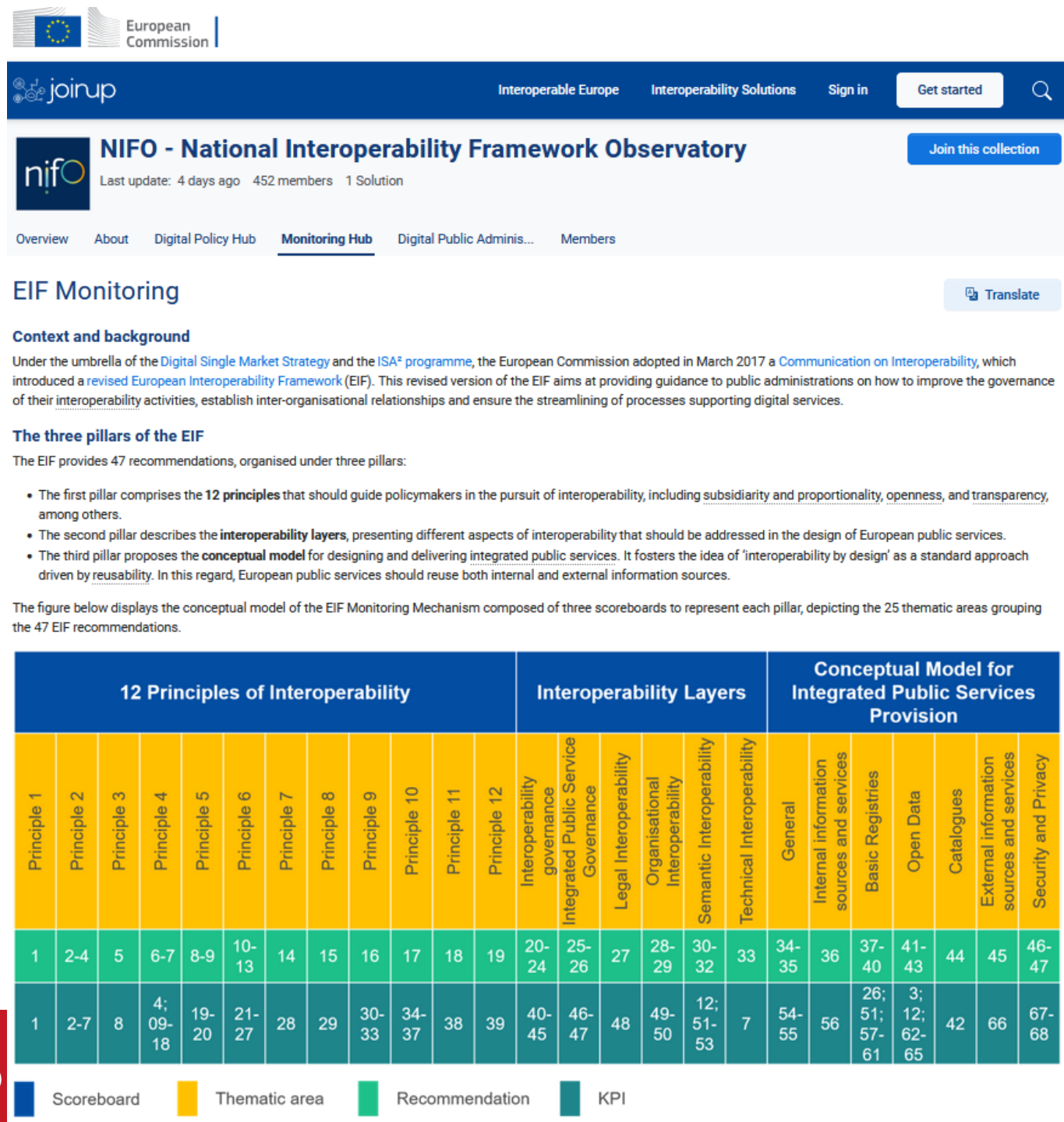
See more

Score values

0	Not available	1	low perf.	2	Mid. low perf.	3	Mid. high perf.	4	High perf.

EIF Monitoring by the European Commission through NIFO

https://joinup.ec.europa.eu/collection/nifo-national-interoperability-framework-observatory/eif-monitoring



European Commission

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NIFO - National Interoperability Framework Observatory

Last update: 4 days ago 452 members 1 Solution

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EIF Monitoring

Translate

Context and background

Under the umbrella of the Digital Single Market Strategy and the ISA² programme, the European Commission adopted in March 2017 a Communication on Interoperability, which introduced a revised European Interoperability Framework (EIF). This revised version of the EIF aims at providing guidance to public administrations on how to improve the governance of their interoperability activities, establish inter-organisational relationships and ensure the streamlining of processes supporting digital services.

The three pillars of the EIF

The EIF provides 47 recommendations, organised under three pillars:

- The first pillar comprises the **12 principles** that should guide policymakers in the pursuit of interoperability, including subsidiarity and proportionality, openness, and transparency, among others.
- The second pillar describes the **interoperability layers**, presenting different aspects of interoperability that should be addressed in the design of European public services.
- The third pillar proposes the **conceptual model** for designing and delivering integrated public services. It fosters the idea of 'interoperability by design' as a standard approach driven by reusability. In this regard, European public services should reuse both internal and external information sources.

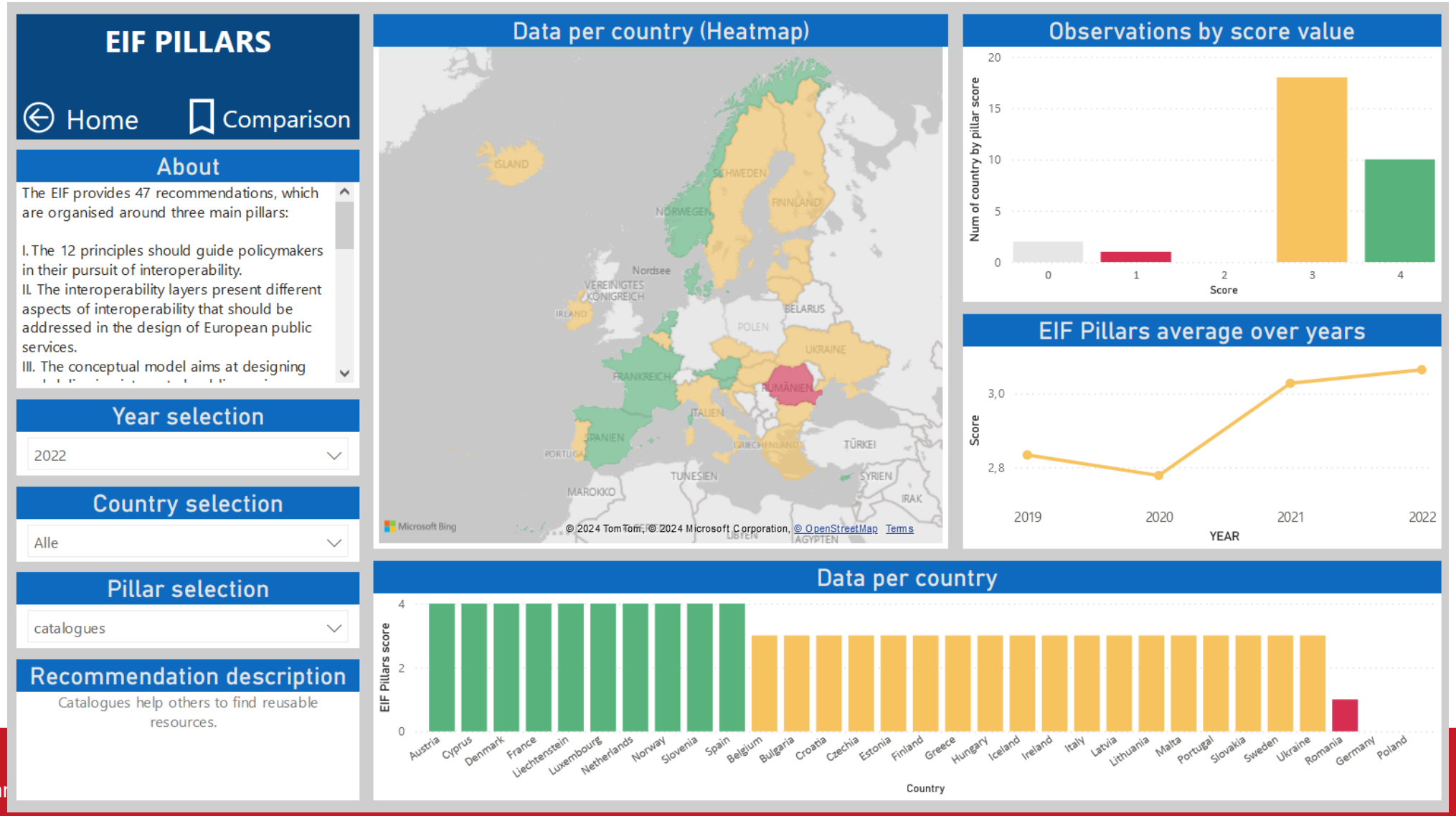
The figure below displays the conceptual model of the EIF Monitoring Mechanism composed of three scoreboards to represent each pillar, depicting the 25 thematic areas grouping the 47 EIF recommendations.

12 Principles of Interoperability												Interoperability Layers						Conceptual Model for Integrated Public Services Provision						
Principle 1	Principle 2	Principle 3	Principle 4	Principle 5	Principle 6	Principle 7	Principle 8	Principle 9	Principle 10	Principle 11	Principle 12	Interoperability governance	Integrated Public Service Governance	Legal Interoperability	Organisational Interoperability	Semantic Interoperability	Technical Interoperability	General	Internal information sources and services	Basic Registries	Open Data	Catalogues	External information sources and services	Security and Privacy
1	2-4	5	6-7	8-9	10-13	14	15	16	17	18	19	20-24	25-26	27	28-29	30-32	33	34-35	36	37-40	41-43	44	45	46-47
1	2-7	8	4; 09-18	19-20	21-27	28	29	30-33	34-37	38	39	40-45	46-47	48	49-50	12; 51-53	7	54-55	56	26; 51; 57-61	3; 12; 62-65	42	66	67-68

Scoreboard | Thematic area | Recommendation | KPI

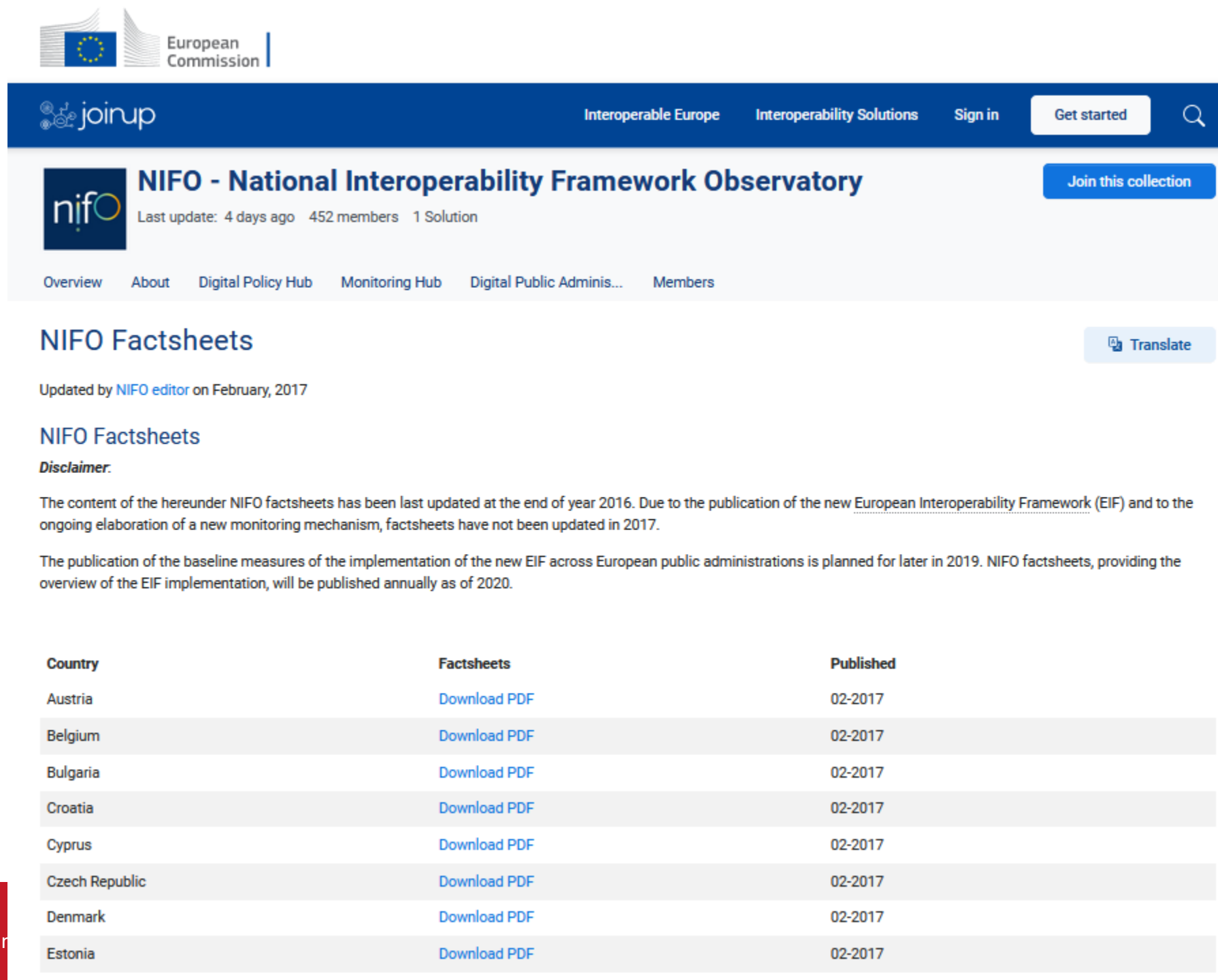
EIF Monitoring by the European Commission: Dashboard

https://joinup.ec.europa.eu/collection/nifo-national-interoperability-framework-observatory/eif-monitoring



National Interoperability Framework Observatory (NIFO) (before 2017)

https://joinup.ec.europa.eu/collection/nifo/nifo-factsheets



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Thank you for your attention and good success with the module!

… your questions!

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