



ISA Work Program – Access to Base Registries

Final Report



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This specification was prepared for the ISA programme by: Deloitte Consulting CVBA

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Executive summary

Base registries are reliable sources of basic information about persons, companies, vehicles, buildings locations or roads. The ISA Work Programme as launched Action 1.2 on "Access to base registries" in order to:

- help defining the needs and expectations of opening up base registries;
- assess the state of play in the Member States and their readiness to have a common action at EU level in this area;
- identify associated risks and opportunities of opening up Member States' registries across borders.

This document is the final report of the third phase of the aforementioned action. This document presents good practices to interconnect base registries in a cross-border and cross-sector setting taking into account the four levels of the European Interoperability Framework (EIF): Legal, Organisational, Semantic and Technical.

This report has two main objectives:

- Introducing and explaining the approach used to analyse Member States and European initiatives;
- Providing a detailed set of good practices for interconnecting base registries across-borders and across-sectors.

A total of 17 good practices were identified and formulated. Each good practice is a response to an obstacle to interconnect base registries. Furthermore, each good practice provides practical examples of how the obstacle was tackled in Member States or by European initiatives. Finally, every good practice provides a set of reusable solutions (i.e. frameworks, services or tools) that help to implement it.

The good practices are grouped according to the four levels of the EIF.

The following good practices were identified for the legal level:

- **Good practice #1: Equivalence of paper and electronic base registries records is formalised in legislation:**

Base registries are reliable sources of basic information on people, vehicles, businesses, etc. and are the cornerstone of public services. The EU already has legal instruments promoting both the principle of commercial and non-commercial reuse of any publicly available information in base registries, and EU-wide interconnection of base registries, starting with company registers. Obtaining this information online reduces administrative burdens. This will create a rising demand for this information to be deemed to be just as authentic as the paper versions. The equivalence of paper and electronic base registries records should therefore be formalised in legislation.

- **Good practice #2: Principles of data sharing across sectors are formalised to bridge differences in legislation:**

Citizen, land, vehicle and other registries are generally governed by sector-specific legislation, which may be a barrier to public administrations sharing electronic data across registries. Because this possibility was simply not taken into account, the legislation may have – probably unintentionally – created conflicts or obstacles to data sharing.

Experience shows that where base registries can adopt common data-sharing principles, interoperability agreements on governance, accessibility, data quality and 'once only data provision' then follow. This not only bridges differences in legislation, but is also a first step towards cross-base registry legal acts.

- **Good practice #3: European initiatives provide legal support to ensure that personal data is processed in accordance with individuals' fundamental rights and freedoms:**

Protecting the sensitive personal data held in base registries is a legal and reputational 'must' for public administrations. EU legislation on data protection and electronic communication provides a baseline. Nevertheless, public administrations may still have data protection fears about interconnecting their base registries, even if there will be benefits for citizens. Working with national data protection authorities, involving them in the decision-making process, compliance monitoring and dispute settlement builds trust. When interconnecting across borders, an additional legal support function is needed to ensure compliance. In this case, working to the guidelines of the European Data Protection Supervisor also makes good sense.

- **Good practice #4: Legislation regulating base registries uses technology-neutral terms or standards and specifications which are not proprietary:**

Both Member States and the EU need to beware of imposing technological constraints by specifying proprietary technologies when regulating the interconnection of base registries. This is likely to result in a maintenance burden for registries and unnecessary costs for public administrations which will find themselves locked into a single vendor. Overarching legal requirements describing the interconnection framework should be technology-neutral. If there is nevertheless a need to regulate the technical specifications, then more flexible legal instruments should be used, such as 'comitology' decisions in the case of the EU.

- **Good practice #5: When a common interconnecting infrastructure for base registries is available, legislation is used to force its use:**

The major challenge in linking up base registries does not relate to design and implementation of technology but to the lack of buy-in by their owners. Legislation is likely to be needed to force the use of interconnecting infrastructure and avoid continuing proliferation of point-to-point interconnections. Estonia and Spain offer models. Stakeholders should be involved in developing the legislation and be given enough time to prepare for implementation.

The following good practices were identified for the organisational level:

- **Good practice #6: Cross-organisational committees, with decision-making power, coordinate the interconnection between base registries:**

Consensus building and leadership are essential to the success of the interconnection of base registries. A cross-organisational committee at national level with decision-making powers helps achieve this. Its roles include promotion, coordination, harmonisation, monitoring, definition of interoperability principles and SLAs. Typically the committee is attached to a public body or an independent legal entity and several base registry owners will be represented on it. The committee's powers will normally extend to making decisions on the development of new interconnections between base registries. It may or may not also be responsible for providing the underlying infrastructure and technology management.

- **Good practice #7: Collaborative processes are put in place to design interoperable interfaces used for interconnecting base registries:**

Base registries are increasingly simplifying access to their data across sectors and across borders by interconnecting to other base registries using interoperable interfaces to the benefit not only of public administrations, but also citizens and businesses. To ensure public administrations are aligned with the real business needs of users, they need to collaborate when defining what interoperable interfaces are required. Cross-organisational committees are a proven way to achieve this.

- **Good practice #8: The conditions for exchanging data between base registries are formalised in interoperability agreements which are respected:**

Interoperability agreements are essential whenever base registries are to be interconnected in order to formalise the data provider/data consumer relationship and lock in commitment. They can range from declarations of intent to legally binding Service Level Agreements. Typically, looser forms of agreement are used initially. As trust and the areas of consensus increase, more constraining forms of agreement are concluded. Whatever their form, interoperability agreements should cover organisational (governance), and semantic and technical specification aspects. Designing, developing and implementing interoperability agreements that are sector- and Member State-neutral remains challenging.

- **Good practice #9: Stakeholder engagement is an integral part of the lifecycle of the interconnection of base registries:**

Stakeholder engagement should be an integral part of any initiative to interconnect base registries because these initiatives are bound to have organisational impacts. Early buy-in from base registry owners as future primary users is critical. Our research shows that owners of base registries need to focus on user-centricity, i.e. the services most needed, and business value, i.e. the benefits of interconnecting base registries.

- **Good practice #10: All base registries have data management in place:**

In the absence of interconnection, several base registries will hold the same data. This fragmentation generates inconsistencies, uncertainty as to which information is the most recent, and also breaches the principle of once-only registration in the EU Public Sector Information Directive (2013/37/EU). In addition, it is an administrative burden on citizens and public administrations. Robust data management processes and policies avoid this. The 'master-slave' approach is a good solution, which can also work in cross-border interconnection. When deciding which data is the 'master' and which is the 'slave' and defining the data owners' responsibilities, it helps to have a catalogue of base registries in place first.

- **Good practice #11: The owners of base registries have a business model for basic data that promotes its re-use:**

High charges for providing access to or for using base registries' data are one of the obstacles to effective and efficient cross-sector collaboration, yet may not be the best way to maximise revenue. It is up to each organisation to find the business model which suits it best. However, it has been proven that lowering prices can potentially increase the number of users sufficiently to increase overall revenue even where pricing at marginal cost, the model promoted by the EU Public Sector Information Directive (2013/37/EU). The case can also be made for making basic data that is widely used by public administrations available free of charge.

The following good practices were identified for the semantic level:

- **Good practice #12: Base registries are slowly moving towards the re-use of semantic assets:**

The lack of semantic interoperability is a major obstacle to the digital economy. Because base registries developed independently, they use different models for even the most basic information, such as a person's first and family name(s). Unless semantic conflicts are resolved, base registries cannot interoperate. When there are no semantic conflicts, data format issues (xml, csv, rdf, etc.) are usually easily resolved. Semantic assets, such as the Core Vocabularies being developed under the ISA Programme address this issue, but for the benefits of semantic interoperability to be realised, Member State and EU projects must begin to use them widely.

- **Good practice #13: EU-wide projects make use of coded values to reduce semantic conflicts:**

The co-existence of many languages may be a source of semantic conflicts, for example false equivalents. This is particularly challenging for the EU with its more than 20 official languages. Controlled vocabularies containing codes with a direct and unambiguous translation in every language can get round this problem in some cases, though they are not suited to registries containing large amounts of free-form data. The use of coded values created by standardisation organisations is preferable, but controlled vocabularies can be created by the project and contributed to one of these organisations subsequently.

- **Good practice #14: Entities can be unequivocally identified within the Member State and across borders:**

In order to avoid identification conflicts, the entity controlling the base registry typically assigns a single unique identifier to each, using a well-defined identification schema to mint these and make each unambiguous and ensure their persistency over time. These identifiers are increasingly important in the delivery of public services and in implementing the 'once-only' principle for citizens. The hurdles to overcome are data privacy and the lack of EU-wide identification schemes. Sector-specific identifiers, generated through hashing, can be used to preserve data privacy and still avoid conflicts. Concatenation can be a solution when base registries exchange data across borders.

The following good practices were identified for the technical level:

- **Good practice #15: Modular, loosely coupled service components are used for interconnecting base registries:**

The technical heterogeneity which has resulted from base registries having been developed independently of each other can be overcome by using modular, loosely coupled service components interconnected through infrastructure. Service Oriented Architecture (SOA) is an implementation of this concept and is emerging as the architectural style of choice for interconnecting base registries. There are two possible models. In the fully distributed model, the service infrastructure's main function is to facilitate the discovery of the services. Communication is point-to-point. In the semi-distributed model, the infrastructure offers some central services and acts as an interconnection hub.

- **Good practice #16: User and application access management is based on a federated structure of authorised users and applications:**

Where user access management systems are not interoperable, this can be a barrier to data sharing across sectors or borders. The ISA Programme, Action 1.18, is working on the identification of viable scenarios for federated user access management so that civil servants in the Member States can access the EC's applications using their national credentials. This model, where the base registry holding the data delegates management of the user access rights to a level closer to the user, is already in use in some Member States. Personal data can be processed where there is consent from the citizen.

- **Good practice #17: A set of security principles is guaranteed via the appropriate trust-based mechanisms:**

Secure information exchange requires the use of digital certificates to identify an entity, to sign a document or to encrypt a document. Each Member State publishes a Trusted List of Certification Service Providers and the European Commission maintains a central List of Trusted Lists. Thus a chain of trust is available for secure cross-border exchange between base registries. The European Commission's ambition is to create a European market for electronic trust services going beyond this, and it has proposed a draft regulation to achieve this.

Table of Contents

1 - Introduction	10
2 - Analysis of the interoperability aspects of the EIF	12
2.1 Interoperability parameters at legal level	12
2.2 Interoperability parameters at organizational level	12
2.3 Interoperability parameters at semantic level	13
2.4 Interoperability parameters at technical level	13
2.5 Putting the good practices to work	13
3 - Good practices	17
3.1 Legal layer good practices	19
3.2 Organizational layer good practices	34
3.3 Semantic layer good practices	49
3.4 Technical layer good practices	56
Annex I – Glossary of terms.....	64
Annex II – Member States Initiatives	72
Annex III – European initiatives.....	74
Annex IV - Bibliography	78

Glossary of basic terms

The basic terms used throughout this report are:

Base registry refers to a trusted authentic source of information under the control of an appointed public administration or organization appointed by government. According to the European Interoperability Framework 2.0, base registries are: "*reliable sources of basic information on items such as persons, companies, vehicles, licenses, buildings, locations and roads*" and "*are authentic and authoritative and form, separately or in combination, the cornerstone of public services*".

Base registry owner refers to the organization that is the appointed controller of the data in the base registry.

Basic data: base registries' data is sometimes referred to as 'basic data'.

Electronic record: a record which is in electronic form as a result of having been created by a software application or as a result of digitization, e.g. by scanning.

The complete glossary of terms can be found in **Annex I**.

1 - Introduction

The EIF provides a list of interoperability aspects, per interoperability level, to be addressed when designing a cross-border and/or cross-sector public service. These aspects provide fundamental guiding principles for interconnecting base registries, as they promote interoperability across public administrations in the EU.

The study team has further refined the interoperability aspects of the EIF in a list of key parameters relevant for the interconnection between base registries (hereafter referred to as interoperability parameters). These parameters were used as a guiding light in the design of the good practices (top-down approach). The good practices were developed through the study of different initiatives (bottom-up approach) using different techniques (desk research, questionnaire, interviews, etc.) and by identification of interconnection obstacles and the solutions to address them.



Figure 1: Approach

As introduced in the D2.2 Intermediate Report, all **interoperability levels** of ISA's EIF (i.e. legal, organizational, semantic, and technical) are taken into account in this study (see table 1). In that context, 17 Member States and European initiatives regarding the interconnection of base registries are analysed (see complete list of all initiatives in **Annex II** and **Annex III**).

Table 1.

Analysis in the context of EIF		
Legal	Analysis of the regulatory environment	The regulatory environments at EU and Member State level were considered in the formulation of the good practices.
Organisational	Interviews with organisations responsible for cross-sectorial initiatives in Member States	Interviews were conducted with organisations responsible for interconnecting base registries across different sectors. Additional information was collected through desk research and a web-based survey.
	Interviews with organisations responsible for cross-border initiatives	Interviews were conducted with organisations responsible for interconnecting base registries across borders. Additional information was collected through desk research and a web-based survey.
Semantic	Analysis of semantic trends	This study draws on the work of ISA's action on semantic interoperability as well as Member State and EU-wide initiatives.
Technical	Analysis of technology trends	The latest technology trends, including several on-going studies of the European Commission, were used as input for this study.

2 - Analysis of the interoperability aspects of the EIF

According to the study's research, there are a number of parameters that need to be considered by public administrations when interconnecting base registries. These parameters are aligned with the interoperability aspects put forward in the EIF (see figure 2). A mapping of the parameters to the good practices is provided in the next sections.

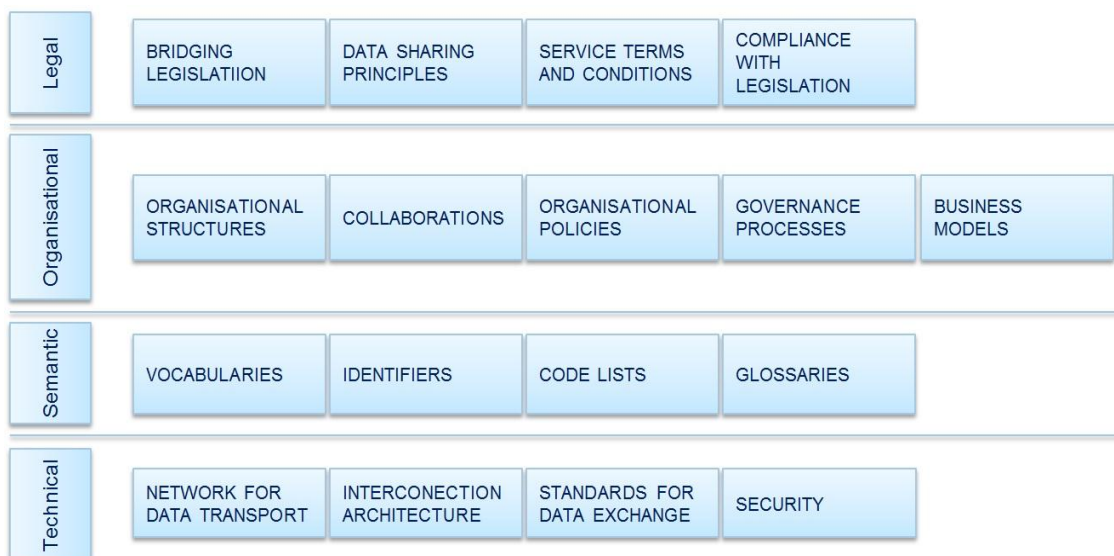


Figure 2. Analysis of the interoperability aspects.

2.1 Interoperability parameters at legal level

This layer concerns the **alignment of legislation across Member States**.

Public administrations should carefully consider all relevant legislation relating to data exchange, including data protection legislation, when seeking to establish a European public service.

The following parameters are taken into account within the legal level:

- Bridging legislation;
- Data sharing principles;
- Service terms and conditions;
- Compliance with legislation.

2.2 Interoperability parameters at organizational level

This layer concerns the **alignment of business processes across different organisations**.

Many aspects need to be covered, as a need to document business processes are documented, an agreement on how processes will interact, clarified organizational relationships and an agreement on change management processes.

The following parameters are taken into account within the organisational level:

- Organizational structures;
- Collaboration;
- Organizational policies;
- Governance processes;
- Business models.

2.3 Interoperability parameters at semantic level

This layer concerns the **alignment of the meaning of information**.

Many aspects need to be covered, such as a necessity to use a common taxonomy of basic public services and the necessity of a support to the establishment of sector-specific and cross-sector communities aiming to facilitate semantic interoperability.

The following parameters are taken into account within the semantic level:

- Vocabularies;
- Identifiers;
- Code lists;
- Glossaries.

2.4 Interoperability parameters at technical level

This layer concerns the **alignment of technical issues**.

Many aspects need to be covered, such as a necessity of the formalisation of specifications to ensure technical interoperability when establishing European public services.

The following parameters are taken into account within the technical level:

- Network for data transport;
- Interconnection architecture;
- Standards for data exchange;
- Security.

2.5 Putting the good practices to work

The good practices are put forward to allow owners of base registries to **evaluate the interoperability of their base registry with other base registries** in other sectors and across borders.

This is possible because every good practice is associated with an interoperability parameter. This means that:

If a base registry complies with a good practice, then the associated interoperability parameter will positively influence interoperability and thus interconnection with other base registries (see figure 4).

This means that the more good practices the base registry complies with, the more likely it is that it will be interoperable with other base registries.

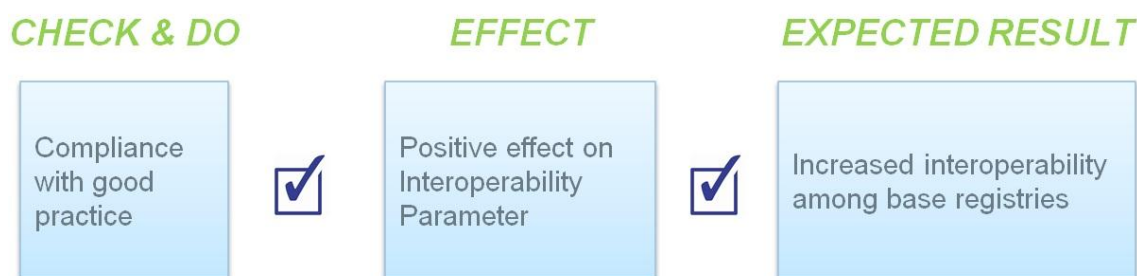


Figure 4: Putting the good practices to work

The overview of the associations between the interoperability parameters and the good practices is shown below. The following figures illustrate the mapping between the interoperability parameters and the EIF levels: legal, organisational, semantic and technical respectively (see figure 5, 6, 7 and 8).

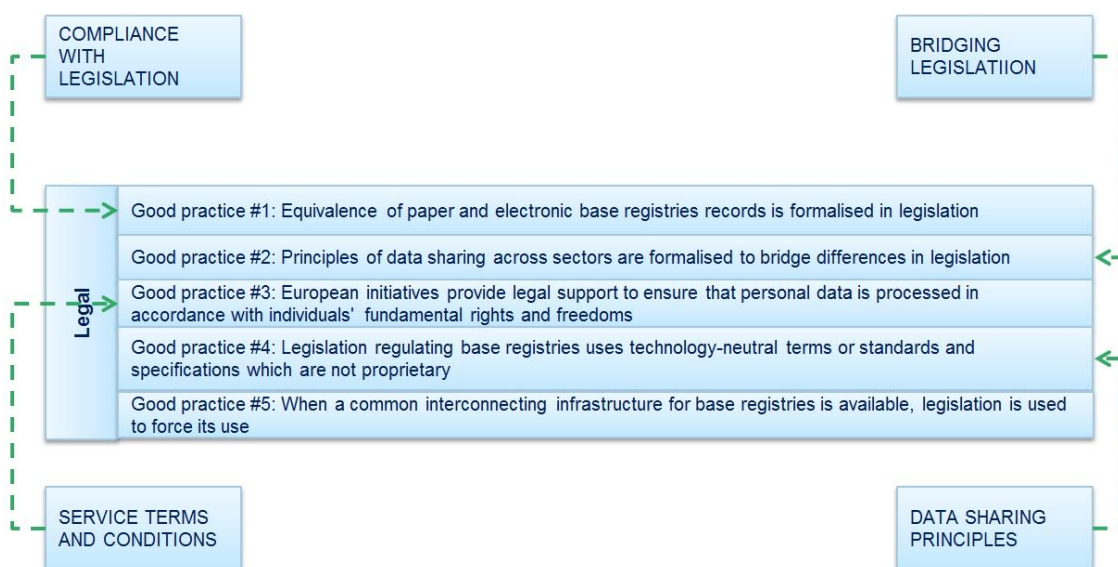


Figure 5: Interoperability parameters and good practices at legal level

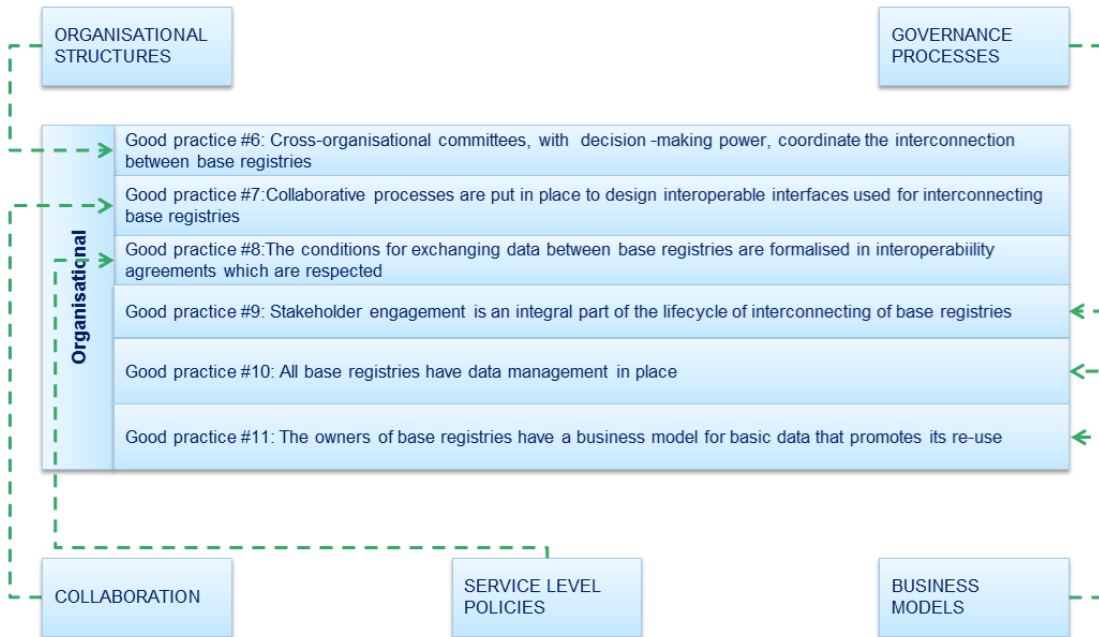


Figure 6: Interoperability parameters and good practices at organizational level

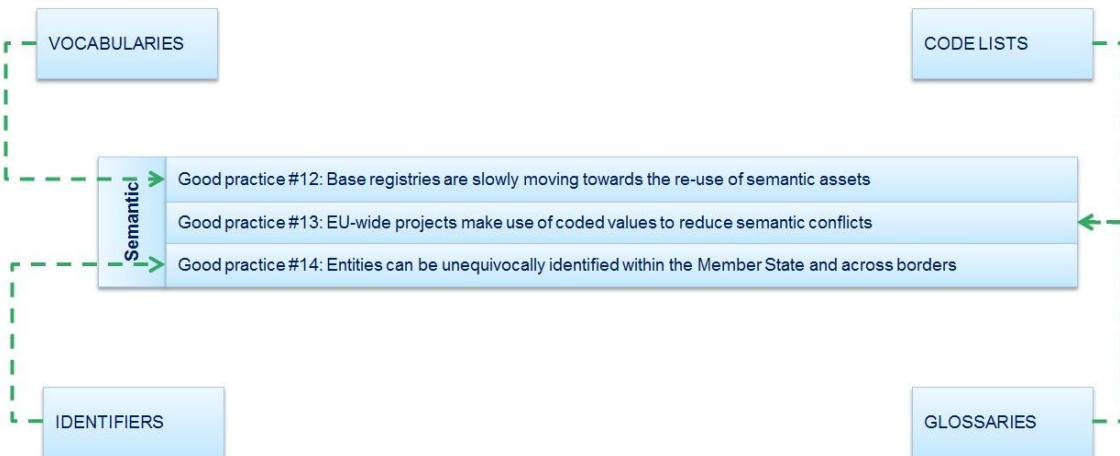


Figure 7: Interoperability parameters and good practices at semantic level



Figure 8: Interoperability parameters and good practices at technical level

3 - Good practices

Based on the analysis of the study findings described in the D2.2 Intermediate Report, a set of 17 good practices to interconnect base registries across-sector and/or across-border is formulated. The good practices are a lightweight tool for driving Member States to implement Recommendations 11 and 12 of the EIF:

- Recommendation 11: *"Public administrations should make their authentic sources of information available to others while implementing the appropriate access and control mechanisms to ensure security and privacy as foreseen in the relevant legislation."*
- Recommendation 12: *"Public administrations, when working to establish European public services, should develop interfaces to authentic sources and align them at semantic and technical level."*

All good practices are based on **evidence**. As a result, these are **evidence-based** good practices. The good practices are organised according to the EIF level they address. Chapter 3.1 provides good practices within the legal level, chapter 3.2 within the organisational level, chapter 3.3 within the semantic level and chapter 3.4 within the technical level.

Each of the good practice is presented following the scheme explained below:

- **Obstacle:** indicates the obstacle to the interconnection of base registries that the good practice addresses.
- **Description:** provides an explanation of the practice as follows
 - Part 1: a summary of the problem and key findings
 - Part 2: the conclusion drawn from the key findings i.e. the good practice.
- **Benefits:** indicates the expected benefits of adoption of a good practice and the potential beneficiaries.
- **Practical case:** presents a practical case that illustrates the use of the good practice in a Member State or by a European initiative.
- **Do's:** describes what should be done, in relation to the practice, to facilitate the interconnection of base registries.
- **Don'ts:** describes what should be avoided and could harm the interconnection of base registries.
- **Observations of this practice:** shows the Member State(s) and/or European initiative(s) where the good practice has been observed.

- **List of reusable solutions:**

Table 2. Reusable solutions template for good practices.

Solution type	Solution	Title of source document	Link
<p>This field provides one of the three types of reusable solution:</p> <ul style="list-style-type: none"> a. framework – document template, organisational structure, process. b. service – services provided between public administrations and services provided to citizens, businesses and other stakeholders by public administrations. c. tool – online platform, IT infrastructure. 	<p>This section provides a short description of the solution.</p>	<p>This field provides the title of the solution.</p>	<p>This field provides a link to the solution.</p>

3.1 Legal layer good practices

Good practice #1:

Equivalence of paper and electronic base registry records is formalised in legislation.

Summary:

Base registries are reliable sources of basic information on people, vehicles, businesses, etc. and are the cornerstone of public services. The EU already has legal instruments promoting both the principle of commercial and non-commercial reuse of any publicly available information in base registries, and EU-wide interconnection of base registries, starting with company registers. Obtaining this information online reduces administrative burdens. This will create a rising demand for this information to be deemed to be just as authentic as the paper versions. The equivalence of paper and electronic base registries records should therefore be formalised in legislation.

- **Obstacle:** Lack of equivalence of paper and electronic base registries.

- **Description:**

Base registries are reliable sources of basic information on persons, vehicles, businesses, etc. Given their importance, base registries are legally controlled and maintained by dedicated public administrations. According to the EIF v2.0 Conceptual Model, base registries are part of *“the most basic components from which European public services can be built”*. The same document states that base registries are *“the cornerstone of public services”* and for this reason the information held by them *“should be made available for wider reuse with the appropriate security and privacy measures”*. This is formally recognized and endorsed in the Public Sector Information Directive (2013/37/EU) which promotes the re-use of publicly available information for commercial and non-commercial purposes.

The use of base registries' data in electronic format, and the interconnection of different base registries, will become increasingly important as EU legislation promotes:

- EU-wide interconnection of base registries: the recent Directive on the interconnection of central, commercial and companies' registers (2012/17/EU) is a good example of this case. This Directive will enable *“electronic communication to take place between registers and transmitting information to individual users in a standardized way, by means of identical content and interoperable technologies”*.
- Adoption of digital documents: the Services Directive (2006/123/EC) or the modernisation of the public procurement directives (revision of Directives 2004/17/EC and 2004/18/EC) are good examples of this trend. In these domains, the use of electronic documents is providing the motivation for the use of authentic data stored in base registries in electronic format.

This shows that the interconnection of base registries is a key for the modernisation of public administrations and for the advancement of eGovernment. The main advantage is reduction in the administrative burden for citizens, businesses and public administrations. This in turn saves time and money, and increases transparency around the interconnection of base registries. This means that the use of electronic records stored in base registries should not be denied legal effect, validity, or enforceability merely because they are in electronic format. The equivalence of paper and electronic base registries records should therefore be formalised in legislation.

- **Benefits:** the use of electronic records reduces paper work and enables administrative simplification by automating administrative processes and procedures.
- **Practical case:**
 - ***Equivalence of paper and electronic base registry records*** (Source: Intermediation Platform, Spain): Article 9 of Spanish law 11/2007 of 22 June, 2007, mandates electronic access to public services by citizens as follows: each Public Administration body shall facilitate access to their data in electronic format to all other Public Administration bodies. (...) Availability of such data shall be strictly limited to what is required from citizens for the processing and administration of issues which fall within the competence of public administrations in accordance with the regulations which govern them.
 - ***Equivalence of paper and electronic base registry records*** (Source: Magda, Belgium): The Decree concerning the establishment and organization of the Flemish service integrator, art 13, says that the information that is distributed by the Flemish Service Integrator has the same legal value as proof as when it is distributed on paper.
- **Do's:** Promote the use of electronic registries enabling the use of electronic means for any procedure which involves citizens and business (Source: Spain (Intermediation Platform)).
- **Don'ts:** Lack of legal equivalence between digital and paper processes can impede the take up of e-government (Source: Spain (Intermediation Platform)).
- **Observations of this practice:**
 - Member State initiatives: Estonia (X-Road), Spain (Intermediation Platform), Belgium (Magda).

- **List of reusable solutions:**

Table 3. Reusable solutions for good practice #1.

Solution type	Solution	Title of source document	Link
Framework	Legal recognition of electronic records (Source: Intermediation Platform, Spain).	Law 11/207 of 22 June on electronic access to Public Services for members of the public.	http://www.boe.es/boe/dias/2007/06/23/pdfs/A27150-27166.pdf
Framework	The Decree concerning the establishment and organisation of the Flemish service integrator, art 13. (Source: Magda, Belgium).	Decree concerning the establishment and organisation of the Flemish service integrator.	www.corve.be/docs/juridisch/VDI_decreet_staatsblad_82tem87.pdf

Good practice #2:

Principles of data sharing across sectors are formalised to bridge differences in legislation.

Summary:

Citizen, land, vehicle and other registries are generally governed by sector-specific legislation, which may be a barrier to public administrations sharing electronic data across registries. Because this possibility was simply not taken into account, the legislation may have – probably unintentionally – created conflicts or obstacles to data sharing. Experience shows that where base registries can adopt common data-sharing principles, interoperability agreements on governance, accessibility, data quality and ‘once only data provision’ then follow. This not only bridges differences in legislation, but is also a first step towards cross-base registry legal acts.

- **Obstacle:** Legislation not taking into account interoperability between base registries.

- **Description:**

Sharing and re-use of data is endorsed in European law by the Public Sector Information Directive (2013/37/EU). However, the sharing and re-use of information between base registries in a cross-sector setting can be jeopardised by the legislative structure. Typically each type of base registry (citizen registry, land registry, vehicle registry, etc.) belongs to a sector regulated by specific legislation, which was not created with interoperability in mind. As a consequence, the interconnection of base registries may be blocked because of conflicting or contradictory sectorial regulations. Therefore, in order to increase interoperability, the exchange of data between base registries, for example between a land registry and a citizen registry, needs to take into account the different legal requirements associated with the different types of registry. Experience shows that the adoption of common data sharing principles across base registries paves the way to the creation of interoperability agreements that enable data to flow across registries (described in detail in good practice #8 of the organisational layer). The agreement on common data sharing principles across base registries not only bridges differences in legislation, but is also a first step towards cross-base registry legal acts.

Data sharing principles pave the way to the creation of the following interoperability agreements:

- Agreement on the governance of base registries, including:
 - o cost management;
 - o responsibilities;
 - o overarching principles of data sharing between base registries;
- Agreement on the rules of accessibility to base registry data, including:
 - o privacy and data protection principles;
 - o users’ consent;

- Agreement on the mechanisms regarding the quality control of the data exchanged across base registries;
- Agreement on the 'once only data provision' principle to avoid data redundancy and reduce the administrative burden (explained in good practice #10 of the organizational layer).
- **Benefits:** Implementation of formal data sharing principles across sectors enables base registries regulated by different legislations to exchange data with one another.
- **Practical case:**
 - **Principles of data sharing (Source:** I-NUP, Netherlands): The Netherlands formulated 12 data sharing principles on March 3rd 2003. These principles have to be followed by all 13 types of base registry. Below are the first two principles:
 - The authentic base registration is regulated by law with legal consequences;
 - The recipients of base registry content have the duty to report back to the suppliers of the content (...).
 - **Principles of data sharing (Source:** Directive 2012/17/EU): Cross-border access to business information on companies (...) can only be improved if all Member States engage in enabling electronic communication to take place between registers and transmitting information to individual users in a standardised way, by means of identical content and interoperable technologies.
- **Do's:**
 - Do create a national catalogue of base registries with information about the legislation regulating each base registry. This catalogue is a starting point for the creation of common data sharing principles (Source: Netherlands (I-NUP)).
 - Do agree on data sharing principles by mapping the legal requirements of the different base registries with one another to identify the common data sharing principles which can be adopted by all types of base registry (Source: Netherlands (I-NUP)).
 - **Observations of this practice:** Member State initiatives: Belgium (Fedict), Netherlands (I-NUP).

- **List of reusable solutions:**

Table 4. List of reusable solutions for good practice #2.

Solution type	Solution	Title	Link
Framework	Data sharing principles are created for all 13 base registry types (Source: I – NUP, Netherlands).	“Twaalfeisen” (twelve principles).	https://wiki.stelselvanbasisregistraties.nl/xwiki/bin/view/Stelselhandboek/12+eisen

Good practice #3:

European initiatives provide legal support to ensure that personal data is processed in accordance with individuals' fundamental rights and freedoms.

Summary:

Protecting the sensitive personal data held in base registries is a legal and reputational 'must' for public administrations. EU legislation on data protection and electronic communication provides a baseline. Nevertheless, public administrations may still have data protection fears about interconnecting their base registries, even if there will be benefits for citizens. Working with national data protection authorities, involving them in the decision-making process, compliance monitoring and dispute settlement builds trust. When interconnecting across borders, an additional legal support function is needed to ensure compliance. In this case, working to the guidelines of the European Data Protection Supervisor also makes good sense.

- **Obstacle:** Lack of EU-wide legal support to ensure that personal data is not misused.

- **Description:**

Base registries may contain sensitive data about people, for example:

- citizen registries contain information such as identity card numbers (which in some countries, such as Belgium, are considered to be sensitive information);
- criminal records registries contain information about criminal and civil offences;
- health care registries contain information about physical or mental health illnesses.

Thus, the protection of personal data requires special attention when interconnecting base registries. Misuse, unauthorized access or losses of base registries' data are very serious reputational risks for public administrations owning base registries. This is an area regulated EU-wide by Directive 95/46/EC ("Data Protection" directive) and Directive 2002/58/EC ('Electronic communications' directive). Experience shows that the involvement of the Member State's data protection authority in the interconnection of base registries is a way to promote trust between owners of base registries.

In order to establish trust between owners of base registries and maintain control over the use of data, it is good practice to involve the Member State data protection authority in:

- approving/rejecting requests for opening up and interconnecting base registries;
- monitoring compliance of interconnected base registries with the relevant principles of the Directive 95/46/EC and other relevant legislation;
- settling disputes in the context of data processing operations, when required.

In the case of cross-border interconnection of base registries, a legal support activity complements the role given to the national data protection authorities. The first step in providing legal support across borders is to define the type of support that is most required. This usually involves creating documentation that clarifies the way different processes interact across borders and throughout the different levels of public administration (see the ECRIS practical case). If the European initiative involves the provision of a new service to access national base registries, legal support is required in the creation of general terms and conditions of service use based on the respective national conditions (see the EULIS practical case). This legal support should be implemented in cooperation with the European Data Protection Supervisor or at least taking into account its guidelines on privacy/data protection compliance.

- **Benefits:** Compliance with European-wide data protection legislation creates the required trust for interconnecting base registries across-borders.
- **Practical case:**
 - **Legal support (Source: ECRIS):** ECRIS triggers communication of criminal sanctions and offences by using a matrix of a list of codes of criminal sanctions and offences. If citizen of a Member State (M1) commits a crime in another Member State (M2), M1 is notified via ECRIS. In that way, both Member States understand exactly the same thing by the crime committed as the ECRIS codes are mapped to the codes of each Member State. In order to assist the Member States in the mapping exercise, ECRIS established a legal support team.
 - **Legal support (Source: EULIS):** The EULIS Consortium maintains a website to enhance access for subscribers to information from Cadastre and Land Information Registers. General terms and conditions are available based on the respective national conditions.
- **Do's:**

When running a cross-border initiative involving the interconnection of base registries of different Member States, do establish cross-border legal support providing support related to differences in national legal systems (Source: EULIS).

 - **Observations of this practice:** European initiatives: ECRIS, EULIS.

- **List of reusable solutions:**

Table 5. Reusable solutions for good practice #5.

Solution type	Solution	Title	Link
Framework	The EULIS Consortium maintains a website to enhance access for subscribers to information from Cadastre and Land Information Registers based on the respective national conditions.	Conditions of use.	http://eulis.eu/uploads/files/conditions-of-use/EULIS-Conditions-of-use.pdf

Good practice #4:

Legislation regulating base registries uses technology-neutral terms or standards and specifications which are not proprietary.

Summary:

Both Member States and the EU need to beware of imposing technological constraints by specifying proprietary technologies when regulating the interconnection of base registries. This is likely to result in a maintenance burden for registries and unnecessary costs for public administrations which will find themselves locked into a single vendor. Overarching legal requirements describing the interconnection framework should be technology-neutral. If there is nevertheless a need to regulate the technical specifications, then more flexible legal instruments should be used, such as 'comitology' decisions in the case of the EU.

- **Obstacle:** Vendor lock-in.

- **Description:**

Member States need to be aware of the technological constraints hidden in the legal frameworks that regulate base registries. Strictly binding legal frameworks regulating base registries such as directives or regulations, and in particular legislation regulating the interconnection of base registries, should as far as possible avoid prescribing proprietary technical specifications. An illustration of such a practice could be Directive 2012/17/EU mentioning the necessity to use a platform to search for information on companies and their branches, without providing any prescribed technical specifications.

Using such references can cause:

- A maintenance burden - the inclusion directly in the legal framework of proprietary technical specifications or requirements for backward compatibility requires maintenance to keep pace with technological change.
- Vendor lock-in - a reference to a proprietary technical specification eliminates the possibility for many vendors to compete in public procurement tenders, which may lead to vendor lock-in. This usually results in lower quality and a higher price for public administrations. This good practice therefore applies to directives and regulations at European level and legislative action at Member State level. The detailed specifications on the interconnecting infrastructure should be set through types of acts of law, such as "Comitology Decisions", which can be changed more frequently based on evolving business or technological requirements. These specifications should be developed having in mind the prevention of vendor lock-in.

Legal frameworks relevant for the interconnection of base registries should have two parts:

- Technology-neutral legally binding acts (i.e. regulations, directives and decisions) describing the interconnecting framework (i.e. general business requirements, architectural principles, operating principles, etc.);

- Technical specifications relating to the interconnection infrastructure may be defined in other legally binding instruments such as implementing or delegated acts.
- **Benefits:** When legislation uses technology-neutral terms, it promotes independence from vendors and easier adaptation to technology changes.
- **Practical case:**
 - **Technology-neutral terms** (Source: ECRIS): E Article 3 European Criminal Records Information System (ECRIS): "ECRIS is a decentralized information technology system based on the criminal records registries in each Member State. It is composed of the following elements: (a) an interconnection software built in compliance with a common set of protocols enabling the exchange of information between Member States (b) a common communication infrastructure that provides an encrypted network.
 - **Technology-neutral terms** (Source: ISA Decision (No 922/2009/EC)): Do agree on the use of common and shared technical specifications and standards and do make references to existing European standards and open specifications.
- **Do's:**
 - Do avoid unnecessary use of brand names, proprietary technical specifications (Source: ECRIS, Guidelines for Public Procurement of ICT Goods and Services, SMART 2011/0044,D2 – Overview of Procurement Practices).
 - Do agree on the use of common and shared technical specifications and standards and do make references to existing European standards and open specifications (Source: ISA Decision (No 922/2009/EC)).
- **Observations of this practice:** Member State initiatives: Netherlands (I-NUP), Denmark (Grunddata), Estonia (X-Road). European initiatives: ECRIS.

• **List of reusable solutions:**

Table 6. Reusable solutions for good practice #4.

Solution type	Solution	Title	Link
Framework	Guide on wording procurement documents in a non-proprietary manner for desktop PCs, notebooks and servers (Source: ITK Beschaffung, Germany).	Independent portal providing guidelines on how to prepare product-neutral IT invitations to tender.	www.itk-beschaffung.de/en/introduction.html
Framework	Directive establishing an Infrastructure for Spatial Information in the European Community (INSPIRE).	Directive 2007/2/EC	www.eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32007L0002:en:NOT
Framework	Directive regarding the interconnection of central, commercial and companies registers.	Directive 2012/17/EC	www.eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2012:156:0001:0009:en:PDF
Framework	Decree concerning the establishment and organisation of the Flemish service integrator (Source: Magda, Belgium).	Decree concerning the establishment and organisation of the Flemish service integrator.	www.corve.be/docs/juridisch/VDI_decreet_staatsblad_82tem87.pdf

Good practice #5:

When a common interconnecting infrastructure for base registries is available, legislation forces its use.

Summary:

The major challenge in linking up base registries does not relate to design and implementation of technology but to the lack of buy-in by their owners. Legislation is likely to be needed to force the use of interconnecting infrastructure and avoid continuing proliferation of point-to-point interconnections. Estonia and Spain offer models. Stakeholders should be involved in developing the legislation and be given enough time to prepare for implementation.

- **Obstacle:** Lack of mechanisms to enforce the use of interconnecting infrastructures.

- **Description:**

Some Member States, such as Spain and Estonia have adopted a common interconnecting infrastructure for linking up their base registries. Others, like Denmark, are considering doing the same. When creating a common interconnecting infrastructure for base registries, Member States need to be aware that the major challenge is not the technical implementation but achieving buy-in from the owners of the base registries to use the common interconnecting infrastructure. Experience shows that legislation is an efficient and effective way to force base registries in a Member State to use a common interconnecting infrastructure. If there is no enforcement mechanism, it is likely that point-to-point interconnections between base registries will continue to proliferate despite the existence of the common interconnecting infrastructure. This aspect of legislation should be embedded in a more general framework stating, for instance, the need for electronic exchange between the base registries of governmental organisations.

It is also important to note that the legal instrument should come before the common interconnecting infrastructure to give enough time for owners of base registries to prepare for its implementation. As described in detail in good practice #4 of the organizational layer, stakeholder engagement is a key element for successful implementation of a common interconnecting infrastructure for linking up their base registries.

- **Benefits:** Enforcing the use of an interconnection infrastructure ensures that public administrations do not by-pass it thus enabling the investment made in the infrastructure to be leveraged.

- **Practical case:**

- **Legal framework** (Source: Estonia (X-Road)): In 2001, it became compulsory to connect all public and private sector (banking, energy, telecommunication) base registries to X-Road, Estonia's data exchange platform. This is enforced by the "Public Information Act" which states that "the exchange of data with the databases belonging to the state information system, and between the databases belonging to the state information

system, shall be carried out through the data exchange layer of the state information system (X-Road)”.

- **Legal framework** (Source: Spain (Intermediation Platform)): The use of a mediation platform has been required since July 2012 to perform common functions for the exchange of information between issuers and requesters of base registries’ data.
- **Do’s:**
Do use legislation as the driver for the creation of an interconnecting infrastructure. As mentioned in good practice #4, such legislation should use technology-neutral terms. This should be complemented by a stakeholder engagement campaign (Source: Estonia, X-Road (ICT Demo Center), BRIS).
- **Observations of this practice:** Member State initiatives: Spain (Intermediation Platform), Estonia (X-Road). European initiatives: ECRIS, BRIS.
- **List of reusable solutions:**

Table 7. Reusable solutions for good practice #5.

Solution type	Solution	Title	Link
Framework	The Public Information Act establishes the X-Road interconnecting infrastructure (Source: X-Road, Estonia).	Public Information Act	http://unpan1.un.org/intradoc/groups/public/documents/un-dpadm/unpan039520.pdf
Framework	Decree concerning the establishment and organisation of the Flemish service integrator (Source: Magda, Belgium)	Decree concerning the establishment and organisation of the Flemish service integrator	www.corve.be/docs/juridisch/VDI_decreet_staatsblad_82tem87.pdf

ISA Work Program – Access to Base Registries

Framework	Council Decision 2008/616/JHA of 23 June 2008 on the implementation of Decision 2008/615/JHA on the stepping up of cross-border cooperation, particularly in combating terrorism and cross-border crime (Source: Official Journal of the European Union).	Council Decision 2008/616/JHA of 23 June 2008 on the implementation of Decision 2008/615/JHA	http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:210:0012:0072:EN:PDF
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3.2 Organizational layer good practices

Good practice #6:

Cross-organisational committees, with decision-making power, coordinate the interconnection between base registries.

Summary:

Consensus building and leadership are essential to the success of the interconnection of base registries. A cross-organisational committee at national level with decision-making powers helps achieve this. Its roles include promotion, coordination, harmonisation, monitoring, definition of interoperability principles and SLAs. Typically the committee is attached to a public body or an independent legal entity and several base registry owners will be represented on it. The committee's powers will normally extend to making decisions on the development of new interconnections between base registries. It may or may not also be responsible for providing the underlying infrastructure and technology management.

- **Obstacle:** Lack of consensus building and leadership.

- **Description:**

The establishment of a cross-organizational committee helps to ensure that the interconnection between base registries is efficient, effective and well-coordinated. These committees are typically composed of several base registry owners and supported by an operational unit. The committee is usually empowered to make the requisite decisions for the development of new interconnections between base registries and corrective measures regarding the use of data of base registries by public administrations. The provision of the underlying interconnecting infrastructure can be the responsibility of such a committee. However, observation shows that this role may also be carried out by a separate organizational unit. Experience shows that these committees are either attached to a public body (ministry) or are an independent legal entity with a horizontal role within the public administration. In addition, experience shows that these committees either focus only on information management (while technology is managed by another unit) or cover the full governance spectrum, i.e. data and technology management at the same time.

Cross-organizational committees should be established to carry out the following types of activities:

- Promotion activities, such as: promoting cooperation among owners of base registries, promoting dialogue between public and private sector entities interested in having access to base registries data, promoting the adoption of common standards by the different base registries;
- Coordination activities, such as coordinating the interconnection between base registries, coordinating the provision of the underlying IT infrastructure that enables the interconnection between base registries;
- Harmonization activities, such as harmonizing data models, interfaces, etc.;

- Monitoring activities around the use of data in base registries by public authorities;
 - Definition of interoperability principles and interoperability agreements;
 - Definition and implementation of SLAs and operating procedures where an interconnecting infrastructure for base registries is planned.
- **Benefits:** Cross-organizational committees boost data re-use and sharing thus contributing to more efficient interconnection of base registries and improved public services.
 - **Practical case:**
Cross-organizational committees (Source: Belgium (Fedict)): Fedict includes a committee with the responsibility for coordinating the interconnection of base registries. This committee facilitates the dialogue between the owners of base registries, the operational units involved in processing base registry data and the consumers of base registries' data.
 - **Do's:**
 Do create cross-organizational committees to coordinate the interconnection of base registries. To be successful, these types of committees require proper empowerment (Source: Belgium (Fedict)).
 - **Don'ts:**
 Do not create an organisational structure with a coordination mandate but no decision-making power (Source: Finland (Base Register Working Party)).
 - **Observations of this practice:** Member State initiatives: Denmark (Grunddata), Estonia (X-Road), Finland (Registry Based Census), Belgium (Fedict). European initiatives: ECRIS, BRIS.
 - **List of reusable solutions:**

Table 8. Reusable solutions for good practice #6.

Solution type	Solution	Title	Link
Framework	Coordination commission coordinating interconnection of base registries (Source: Fedict, Belgium).	Coordination Commission	www.fedict.belgium.be/en

ISA Work Program – Access to Base Registries

Framework	Partners' board managed via EEIG (European Economic Interest Grouping) (Source: EBR).	Partners' Board	www.europa.eu/legislation_summaries/internal_market/businesses/company_law/l26015_en.htm
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Good practice #7:

Collaborative processes are put in place to design interoperable interfaces used for interconnecting base registries.

Summary:

Base registries are increasingly simplifying access to their data across sectors and across borders by interconnecting to other base registries using interoperable interfaces to the benefit not only of public administrations, but also citizens and businesses. To ensure public administrations are aligned with the real business needs of users, they need to collaborate when defining what interoperable interfaces are required. Cross-organisational committees are a proven way to achieve this.

- **Obstacle:** Silo thinking.

- **Description:**

Base registries are increasingly simplifying access to their data across sectors and across borders by interconnecting to other base registries using interoperable interfaces. While public administrations benefit from access to authentic and authoritative data sources, the ultimate beneficiaries are citizens and businesses, which benefit from better public services.

Experience shows that the participation of public administrations in the definition and design of interoperable interfaces makes them more aligned with the real business needs. Public administration owning base registries should therefore establish collaborative processes to define the interoperable interfaces required of base registries. A proven way to do this is through cross-organizational committees which facilitate the participation of different public administrations in the definition and design of the interoperable interfaces. To better understand how public administrations can use the data stored in base registries and how to interconnect them, public administrations may seek input from all base registry owners within different public administrations.

- **Benefits:** Collaboration across public administrations enables tuning services to better answer the needs of businesses and citizens.

- **Practical case:**

- **Open and collaborative process** (Source: Finland (Registry Based Census)): Base Register Working Party was appointed by the Finnish Advisory Committee on Information Management in the Public Sector. The committee includes experts on base registries, such as traffic, healthcare and pensions, as well as information security and data protection experts. The main objective of the Working Party is to engage in close collaboration with its stakeholders. This enables the identification of new development projects and new applications for data.
- **Open and collaborative process** (Source: Estonia (X-Road)): The X-Road management organization directs the activities of the X-Road project relating to planning, budgeting, deciding on who can join the platform and signing contracts with parties joining the X-Road. The management organization is also involved in further improving the X-Road platform by

cooperating with governmental institutions and by promoting seminars on the future directions for X-Road.

- **Do's:**

Do establish a cross-organizational committee which can facilitate the participation of public administrations in the definition of interoperable interfaces which facilitate access to base registries' data (Source: Finland (Registry Based Census) and Belgium (Fedict)).

- **Don'ts:**

Don't create services in isolation, but focus on 'what's in it for every government body' (Source: Netherlands (I-NUP)).

- **Observations of this practice:** Member State initiatives: Finland (Registry Based Census), Belgium (Fedict); Estonia (X-Road), Netherlands (I-NUP).

- **List of reusable solutions:**

Table 9. Reusable solutions for good practice #7.

Solution type	Solution	Title	Link
Framework	Base Register Working Party having as objective management of information within local authorities (Source: Finland (Registry Based Census)).	Base Register Working Party	www.vm.fi/vm/en/16_ict/053_juhta/02_perustietovarantojaos/index.jsp
Tool	Data Hunters online group enabling any citizen to submit requests for publishing any public data (Source: Denmark (Grunddata)).	Data Hunters	www.digitaliser.dk/news/523977
Tool	Public Data in Play initiative provides a platform to discuss the use of public data in the private sector (Source: Denmark (Grunddata)).	Public Data in Play	http://digitaliser.dk/group/237756

Good practice #8:

The conditions for exchanging data between base registries are formalised in interoperability agreements which are respected.

Summary:

Interoperability agreements are essential whenever base registries are to be interconnected in order to formalise the data provider/data consumer relationship and lock in commitment. They can range from declarations of intent to legally binding Service Level Agreements. Typically, looser forms of agreement are used initially. As trust and the areas of consensus increase, more constraining forms of agreement are concluded. Whatever their form, interoperability agreements should cover organisational (governance), and semantic and technical specification aspects. Designing, developing and implementing interoperability agreements that are sector- and Member State-neutral remains challenging.

- **Obstacle:** Lack of commitment.
- **Description:**

The data sharing principles (explained in good practice #2 of the legal layer) are principles bridging regulatory differences between different types of base registries (persons, land, business, etc.). Experience shows that the consensus on these principles paves the way to interoperability agreements that enable the exchange of data across base registries. Interoperability agreements are important as they formalize the relationship between the data providers and the data consumers and promote trust between them. The level of enforcement of these interoperability agreements ranges from simple “intentions to collaborate” to legally binding Service Level Agreements. Loose interoperability agreements are typically observed at the initial stages of collaboration between base registries. For example, it is the case when consensus between base registries’ owners has not yet been reached on some non-blocking aspects of the collaboration. When these aspects are clarified, understood and, even more important, agreed among all base registry owners, interoperability agreements can become legally binding.

Interoperability agreements are required in any type of initiative involving the interconnection of base registries. This means that the conditions for exchanging data between base registries should be defined at the outset of collaboration between owners of base registries.

An interoperability agreement should cover organizational, semantic and technical aspects and can contain the following building blocks:

- Organizational – base registries governance model: should list the owners of the base registries and their respective organisations, operational contacts, communication guidelines and enforcement mechanisms to ensure that the agreement is respected (e.g. audit, fines) and service performance levels;
- Semantic – specifications – should clarify the data exchange data model, relevant identifiers and code lists;
- Technical – technical specifications for exchanging data (communication protocol, data exchange protocol, etc.).

There remains a challenge, however, in designing, developing and implementing interoperability agreements that are sector and Member State neutral.

- **Benefits:** The use of interoperability agreements sets clear rules for collaboration among base registries and data consumers which can be verified.
- **Practical case:**
Interoperability agreement (Source: Spain (Intermediation Platform)): The Spanish Intermediation Platform functions based on interoperability agreements between base registry owners. The interoperability agreements define the way different base registries collaborate with one another. There is a common SLA template for all public administrations exchanging base registry data. This template covers:
 - General conditions (objective, scope, responsibilities);
 - General service levels for infrastructure and communication (basic infrastructure, communication, monitoring, backup);
 - Availability levels and support activities (urgency and impact, time of answer, report on performance indicators).
- **Do's:**
 Do create common interoperability agreements aligned with the underlying legal basis to ensure that the agreed conditions for interconnecting base registries are respected by the owners of base registries (Source: ECRIS).
- **Don'ts:**
 Don't create legally binding interoperability agreements at the start, especially if legislative coverage is missing or is incomplete. Use intermediary agreements (e.g. Declaration of Endorsement) to overcome difficulties related to reaching overall consensus (Source: EUCARIS).
- **Observations of this practice:** Member State initiatives: Spain (Intermediation Platform). European initiatives: ECRIS, EUCARIS, EULIS.
- **List of reusable solutions:**

Table 10. Reusable solutions for good practice #8.

Solution type	Solution	Title	Link
Framework	Service level agreement expressing required service level commitments from providers of the Fedict services (Source: Fedict, Belgium).	Service Level Agreement	www.fedict.belgium.be/fr/binaries/AV_Fedict_FR_tcm461-131716.pdf

Solution type	Solution	Title	Link
Framework	Interoperability agreements (Source: Spain, Intermediation Platform).	Acuerdo Temporal de Prestación del servicio de Verificación de Datos a los Ayuntamientos	http://administracionelectronica.gob.es/ctt/verPestanaDescargas.htm?idIniciativa=223
Framework	Service Level Agreement (Source: Denmark (Grunddata)).	EBR EEIG Service Level Agreement (European Business Register)	www.ebr.org

Good practice #9:

Stakeholder engagement is an integral part of the lifecycle of the interconnection of base registries.

Summary:

Stakeholder engagement should be an integral part of any initiative to interconnect base registries because these initiatives are bound to have organisational impacts. Early buy-in from base registry owners as future primary users is critical. Our research shows that owners of base registries need to focus on user-centricity, i.e. the services most needed, and business value, i.e. the benefits of interconnecting base registries.

- **Obstacle:** Lack of awareness about stakeholder engagement.

- **Description:**

Experience shows that the interconnection of base registries has a significant organisational impact. Therefore stakeholder engagement should be an integral part of any initiative to interconnect base registries. Introduction of a change, such as a new interconnection infrastructure for base registries, requires careful management and attention in order to achieve an early buy-in from the base registry owners seen as the primary users of the interconnection infrastructure. To be effective, stakeholder engagement should focus on two important aspects:

- user-centricity, and
- business value.

Focusing on 'user-centricity' means:

- Taking the needs of base registries' owners into account from the start of an interconnection project, for example by:
 - o focusing on the services that are most needed, e.g. the interconnection of the most basic base registries (i.e. registries of businesses and citizens) which are necessary in every public administration;
 - o providing training courses to raise awareness of the possibilities created by the interconnection of base registries.

Focusing on 'business value', in turn, is achieved by:

- communicating the expected benefits of interconnecting base registries. The expected benefits should come from the business case which was at the root of the initiative;
- promoting common interconnecting infrastructures;
- promoting mentoring and sharing of lessons learnt on interconnecting base registries among different organisations both within and across borders.

- **Benefits:** Stakeholder engagement ensures that the interconnection of base registries is implemented and used by public administrations.
- **Practical case:**
 - **Promotion of the business case** (Source: Denmark (Grunddata)): As of January 1st 2013, citizens, public administrations and businesses have had free access to base registries. Base registries have become a common digital resource. It is expected that by 2020, when all open data initiatives are implemented, the benefit for society will be around DKK 800 million annually. This information was a key for the promotion of this initiative.
 - **Showcasing and providing advice** (Source: Estonia (X-Road)): The ICT Demo Centre, part of the X-Road initiative, initiative delivers 'showcases' in different domains, such as interconnection of Business Registers. The ICT Demo Centre also provides advice on the use of the X-Road infrastructure, sharing experience with other Member States. Several of these events have been held already, for example with Latvia, Finland and the UK.
- **Do's:**

Do begin the process of interconnecting base registries with base registries that support the delivery of the most vital public services. Typically, a vital public service is related to citizen and business registries (Source: Estonia (X-Road)).
- **Observations of this practice:** Member State initiatives: Estonia (X-Road), Denmark (Grunddata). European initiatives: EBR.
- **List of reusable solutions:**

Table 11. Reusable solutions for good practice #9.

Solution type	Solution	Title	Link
Framework	ICT Demo Center – promotion of interoperability (Source: X-Road, Estonia).	ICT Demo Center	http://e-estonia.com/ict-demo-center
Framework	Business case illustrating financial gains from base registries as common digital resource (Source: Grunddata, Denmark).	Grunddata	http://uk.fm.dk/publications/2012/good-basic-data-for-everyone/

Good practice #10:

All base registries have data management in place.

Summary:

In the absence of interconnection, several base registries will hold the same data. This fragmentation generates inconsistencies, uncertainty as to which information is the most recent, and also breaches the principle of once-only registration in the EU Public Sector Information Directive (2013/37/EU). In addition, it is an administrative burden on citizens and public administrations. Robust data management processes and policies avoid this. The 'master-slave' approach is a good solution, which can also work in cross-border interconnection. When deciding which data is the 'master' and which is the 'slave' and defining the data owners' responsibilities, it helps to have a catalogue of base registries in place first.

- **Obstacle:** Data fragmentation.

- **Description:**

Experience shows that when base registries are not interconnected, data is duplicated in several registries. For example, the data of someone's address can be present in the citizen registry and in the land registry. As copies of the same data proliferate in different registries, a change of address is not necessarily replicated in all registers with a copy of the data. The fragmentation of data generates inconsistencies across base registries. Additionally, when this happens, it is often not clear which record is the most up to date.

Repeatedly asking the citizen for the same information is not aligned with the principles laid out on the re-use of public sector information directive (2013/37/EU). This directive (known as the PSI Directive) aims to overcome the barriers that limit the re-use of public sector information and as a result it enables the 'once-only' registration principle. This principle is promoted in the eGovernment Action Plan 2011-2015 as a means of reducing administrative burdens [1]. Citizens should input their data only once. If another register needs the same data, it should get it by electronic means. The replication of data also has other undesirable effects such as the inefficient use of resources to encode and maintain copies of the same data in different registries. To address these challenges robust 'data management' processes and policies should be put in place. Data management is defined by DAMA International [2] as a "business function that develops and executes plans, policies, practices and projects that acquire, control, protect, deliver and enhance the value of data". The adoption of data management addresses the challenges mentioned above. Our study observed that an effective data management approach is the 'master-slave' approach. When such an approach is in place, data is updated only once, in a single registry, with the updated data shared with every base registry having an interest in holding it. In order to achieve this level of data re-use, it is first necessary to perform an overview of the current data models and the data itself, together with identification of the data owners. This can be facilitated by the existence of a catalogue of base registries (mentioned as a good practice within the legal EIF layer).

The following step involves the identification and elimination of data redundancy. This means deciding on which data is the 'master' and which data is the 'slave' and defining the responsibilities of the data owners. The master-slave data management gains importance when interconnecting base registries across sectors and when there are many interconnections across base registries. It is important to bear in mind that, despite being highly complex, a master-slave management can also be applied in a cross-border setting. This needs to be evaluated case-by-case. To conclude, a master-slave management becomes a necessary condition for the sustainability of an environment where base registries are interconnected with one another across borders and sectors ([1] European eGovernment Action Plan 2011-2015 <http://goo.gl/XLSLcE>, [2] Dama International, www.dama.org).

- **Benefits:** Base registries data management including elimination of data duplicates and assignment of data owners, enables the efficient and high-quality re-use of data across base registries.
- **Practical case:**
Master-slave base registry governance (Source: Denmark (Grunddata)): Currently, Denmark's base registries are facing the challenge of data redundancy and the lack of clarity around data ownership. This leads to base registry inconsistencies and unnecessary use of resources to maintain and keep data up to date in a redundant way. In order to address these challenges, Danish public administrations responsible for land base registries have started to eliminate data duplication by identifying base registries' unique owners and through master-slave data governance.
- **Do's:**
Do establish master-slave base registry governance to avoid base registry duplication and redundancies (Source: Denmark (Grunddata)).
- **Observations of this practice:** Member State initiatives: Denmark (Grunddata). European initiatives: EBR.
- **List of reusable solutions:**

Table 12. Reusable solutions for good practice #10.

Solution type	Solution	Title	Link
Framework	Processes to achieve a common data model.	Good basic data for everyone	http://uk.fm.dk/publications/2012/good-basic-data-for-everyone/

Good practice #11:

The owners of base registries have a business model for basic data that promotes its re-use.

Summary:

High charges for providing access to or for using base registries' data are one of the obstacles to effective and efficient cross-sector collaboration, yet may not be the best way to maximise revenue. It is up to each organisation to find the business model which suits it best. However, it has been proven that lowering prices can potentially increase the number of users sufficiently to increase overall revenue even where pricing at marginal cost, the model promoted by the EU Public Sector Information Directive (2013/37/EU). The case can also be made for making basic data that is widely used by public administrations available free of charge.

- **Obstacle:** Charges for the access to and use of data.

- **Description:**

The abundance of data, and in particular of electronic data, constitutes an important source of new digital products and services for public administrations, businesses and citizens. However, charges for the access to and use of data can become one of the obstacles to effective and efficient cross-sector collaboration between public administrations. For this reason, every public administration should define its business model for data by considering zero and marginal cost models vs. partial and full cost recovery models. In this context, a business model is understood as 'the rationale of how an organisation creates, delivers and captures value'¹.

The POPSIS² study analysed the charging practices of 21 Public Sector Bodies and identified a clear trend towards lowering charges and/or facilitating the re-use of public sector information within the Member States. In particular, the study illustrated that lowering prices and facilitating access to public sector information may increase the number of users of data, and thus could lead to higher revenues, even in case of marginal cost pricing (see Practical Case for this good practice). This trend, of lower pricing of public sector data is promoted across the EU through The Public Sector Information Directive (2013/37/EU).

As there is no one size fits all' model, the charging regimes for accessing public sector data, and in particular basic data, should be carefully considered taking into account the type of data that is supplied and the demand faced by the Public Administration from other Public Administrations. Research shows³ that Member States are increasingly considering marginal cost and zero cost pricing for basic data because of its wide (re-) use by public administrations, both within the Member State and also across borders. This is, for instance, the case

¹ Business Model Generation, Ostewalder, Alexander and Pigneur, Yves.

² Pricing of Public Sector Information Study, European Commission, October 2011.

³ Re-use of Public Sector Information – Catalogue and highlights of studies, cases and key figures on economic effects of changing policies, de Vries, Marc, 2012.

with the land registries (addresses) in Denmark. At European level, hybrid models are also emerging, the BRIS initiative defined a business model where some basic information about companies, and their branches, is offered free of charge, and additional data is charged according to the Member States' own business model.

- **Benefits:** Setting a business model for basic data that promotes re-use is a way to increase the number of users, and thus could lead to higher revenues, even in case of marginal cost pricing.
- **Practical case:**

Marginal cost model within public sector data (Source: Pricing in Public Sector Information Study (POPSIS), October 2011): "The Centro Nacional de Informacion Geografica (CNIG) (National Centre for Geographic Information) is an autonomous body linked to the Instituto Geografico Nacional (IGN), the Spanish Geographical Institute. CNIG-IGN has advanced well over the last decade in providing increased access to geographical information for free to re-users for non-commercial purposes (or marginal cost if copying is provided) while implementing a pro re-user commercial policy. The effect is a remarkable increase in the number and type of re-users. For instance, re-users buying the PSI have increased from about 10 large companies purchasing the PSI for both commercial and non-commercial purchases (i.e. prior to 2008 when all the PSI was for sale) to a situation today in which over 40 re-users purchase the information for commercial purposes (the majority of them are SMEs) and hundreds of thousands of re-users do so for non-commercial purposes".
- **Do's:**

Do consider lowering charges for basic data (e.g. marginal cost model) as it may result in higher revenues provided that demand grows in large proportions (Source: Pricing in Public Sector Information Study (POPSIS), EC, October 2011).
- **Observations of this practice:** Member State initiatives: Denmark (Grunddata). European initiatives: See the study 'Pricing in Public Sector Information' (POPSIS), EC, October 2011, which includes case studies from DE, NL, UK, etc.

- **List of reusable solutions:**

Table 13. Reusable solutions for good practice #11.

Solution type	Solution	Title	Link
Framework	Directive on the re-use of public sector information.	Directive 2013/37/EU	http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2013:175:0001:0008:EN:PDF

3.3 Semantic layer good practices

Good practice #12:

Base registries are slowly moving towards the re-use of semantic assets.

Summary:

The lack of semantic interoperability is a major obstacle to the digital economy. Because base registries developed independently, they use different models for even the most basic information, such as a person's first and family name(s). Unless semantic conflicts are resolved, base registries cannot interoperate. When there are no semantic conflicts, data format issues (xml, csv, rdf, etc.) are usually easily resolved. Semantic assets, such as the Core Vocabularies being developed under the ISA Programme address this issue, but for the benefits of semantic interoperability to be realised, Member State and EU projects must begin to use them widely.

- **Obstacle:** Lack of widely used and (re-) usable vocabularies.

- **Description:**

As recognized in the Digital Agenda for Europe, the lack of semantic interoperability is a major obstacle to the digital economy. The use of common semantics so that data carries the same consistent meaning across base registries is of strategic importance in Member States and EU-wide. With this in mind, the revised PSI directive (2013/37/EU) states that: "public sector bodies should, where possible and appropriate, make documents available through open and machine-readable formats and together with their metadata, at the good level of precision and granularity, in a format that ensures interoperability". However, for historic reasons, the base registries of most Member States use different models even if they store the same data entities (businesses, people, etc.). For example, depending on the registry, a record describing a person can show:

- family name and then first name;
- first name and then the family name;
- all first names (some Member States use three) and then the family name, and so on.

As shown above, when exchanging data, base registries are confronted with semantic conflicts in addition to data format issues (xml, csv, rdf, etc.). If base registries are to work together, they need to be able to process the records of one another, but unless semantic conflicts are resolved, base registries cannot interoperate. When there are no semantic conflicts, data format issues are usually easily resolved.

To address the challenge above, a list of standardized specifications or semantic assets can be used to develop and share base registries' data.

The Core Vocabularies currently being developed by the European Commission are one of the examples of semantic assets. The Core Vocabularies aim to align the way that base registries describe their data records when exchanging or publishing data. The ISA Program has already developed four of these Core Vocabularies, namely: Core Business (contributed to W3C and renamed Registered Organization), Core Person, Core Location and Core Public Service. The challenge remains, however, to ensure the widespread use of these specifications by Member States and EU projects. Only then will the benefits of semantic interoperability be realized.

- **Benefits:** The re-use of semantic assets that promote interoperability reduces semantic conflicts.
- **Practical case:**
Use of core vocabulary (Source: Greece (publicspending.gr)): The Registered Organization Vocabulary is a vocabulary for describing organisations that have gained legal entity status through a formal registration process, typically in a national or regional register. The metadata descriptions of more than 28 000 companies registered in the Greek Tax Authorities’ business registry have been published as linked open data using the Registered Organization Vocabulary (renamed by W3C as Registered Organization Vocabulary [1]). The full case study is available on the Joinup platform ([1] <http://www.w3.org/TR/2013/NOTE-vocab-regorg-20130801/>).
- **Do’s:**
 Ensure that the interfaces, standards and data models for basic data are coordinated with each other (Source: Denmark (Grunddata)).
- **Observations of this practice:** Member State initiatives: Pilot in Greece by the International Hellenic University.
- **List of reusable solutions:**

Table 14. Reusable solutions for good practice #12.

Solution type	Solution	Title	Link
Framework	Core Vocabulary.	Registered Organization Vocabulary	http://www.w3.org/TR/2013/NOTE-vocab-regorg-20130801/

ISA Work Program – Access to Base Registries

Framework	Core Vocabulary.	Core Person Vocabulary	http://joinup.ec.europa.eu/asset/core_person/description/
Framework	Core Vocabulary.	Core Location Vocabulary	https://joinup.ec.europa.eu/asset/core_location/description/
Framework	Core Vocabulary.	Core Public Service	https://joinup.ec.europa.eu/asset/core_public_service/description

Good practice #13:

EU-wide projects make use of coded values to reduce semantic conflicts.

Summary:

The co-existence of many languages may be a source of semantic conflicts, for example false equivalents. This is particularly challenging for the EU with its more than 20 official languages. Controlled vocabularies containing codes with a direct and unambiguous translation in every language can get round this problem in some cases, though they are not suited to registries containing large amounts of free-form data. The use of coded values created by standardisation organisations is preferable, but controlled vocabularies can be created by the project and contributed to one of these organisations subsequently.

- **Obstacle:** Lack of semantic alignment.

- **Description:**

The European Union has more than 20 official languages. In EU projects, multilingualism refers to the exchange of data in several languages. The co-existence of different languages may be a source of semantic conflicts, for example false equivalents. A way of reducing this type of conflict is through the creation of controlled vocabularies. ISO 3166-1 alpha-2 is a very well-known controlled vocabulary that has values like DE for Germany and FR for France. Someone receiving one of these codes does not need to understand and communicate in more than one language because the code has a direct and unambiguous translation in every language of the EU. This means that everyone interprets these codes in exactly the same way. Furthermore, these codes are maintained by ISO which ensures that they are versioned as countries change over time. Much of the information stored in base registries is free-form, such as the name of a person or the name of a company. In these cases, the data is completely arbitrary and cannot be constrained in a controlled vocabulary. It is simply impossible and does not make sense to try. However, in some other cases it makes sense to put together a list of all possible values used in the EU to e.g. refer to a criminal sanction or offence. Once the list is assembled and an agreement reached on the codes to be used EU-wide, official translations can be made for every code.

The use of controlled vocabularies reduces semantic conflicts as the meaning of certain data entities is established by reference to a code. The use of coded values created by international, European or national standardization organisations is preferred. Otherwise, the controlled vocabularies can be created by the project and afterwards contributed to one of these organisations.

- **Benefits:** The use of coded values is a way to circumvent the challenges caused by the existence of different languages in the EU.
- **Practical case:**
 - **Common EU-wide code** (Source: ECRIS): ECRIS triggers communication of criminal sanctions and offences by using a matrix of a list of codes of criminal sanctions and offences.

If a citizen of a Member State (M1) commits a crime in another Member State (M2), the M1 is notified via ECRIS. In that way, both Member States understand exactly what is meant by the crime committed as the ECRIS codes are mapped to the codes of each Member State.

- **Common EU-wide multilingual glossary (Source: EULIS):** The EULIS on line multilingual glossary assists the understanding of the semantics used in land registries.
- **Do's:**
 - When appropriate, do specify a controlled vocabulary to ensure that a particular meaning is associated with each code (Source: ECRIS).
 - Create a multilingual glossary of terms as another way, in addition to the use of code lists, to promote the correct understanding of the underlying semantics of a base registry (Source: EULIS).
- **Observations of this practice:** European initiatives: ECRIS, EULIS.
- **List of reusable solutions:**

Table 15. Reusable solutions for good practice 13.

Solution type	Solution	Title	Link
Framework	Recommendations for the use of controlled vocabularies in a cross-border environment.	BII WG1 Controlled Vocabulary	http://goo.gl/DCiEZG
Framework	Generic code 1.0.	OASIS Generic code 1.0	https://www.oasis-open.org/committees/tc_home.php?wg_abbrev=codelist
Framework	Simple Knowledge Organization System (SKOS).	SKOS	http://www.w3.org/2004/02/skos/intro

Good practice #14:

Entities can be unequivocally identified within the Member State and across borders.

Summary:

In order to avoid identification conflicts, the entity controlling the base registry typically assigns a single unique identifier to each, using a well-defined identification schema to mint these and make each unambiguous and ensure their persistency over time. These identifiers are increasingly important in the delivery of public services and in implementing the 'once-only' principle for citizens. The hurdles to overcome are data privacy and the lack of EU-wide identification schemes. Sector-specific identifiers, generated through hashing, can be used to preserve data privacy and still avoid conflicts. Concatenation can be a solution when base registries exchange data across borders.

- **Obstacle:** Data privacy and the lack of EU-wide identification schemes.
- **Description:**

Base registries play the role of authentic sources of information about physical entities, such as a natural person or a building, and legal entities such as a company. To ensure that there are no entity identification issues, the organization appointed to control the base registry typically:

- assigns a single unique identifier per entity it registers; this means that the base registry ensures that there is only one single identifier per entity i.e. no duplicate identifiers are assigned to a same entity;
- uses a well-defined identification schema to mint the identifiers so that each assigned identifier is accurate and unambiguous - the International Organization for Standardization (ISO) maintains several specifications on unique identifiers, such as ISO 15459;
- ensures the persistency of the identifiers it issues over time.

Once minted, the public sector uses these identifiers in a variety of events to uniquely and precisely identify people, buildings, companies, etc. These identifiers are increasingly important in the delivery of public services and to make it possible for EU citizens to provide the same information to public administrations only once. However, data privacy and the lack of EU-wide identification schemes are hurdles to be overcome.

Regarding the data privacy challenge: in some Member States, such as Austria, the identifiers associated with people are considered to be sensitive data because they enable information about the same person from different sources to be linked and reconciled. In Austria, the unique identifiers of people are not public information, sector-specific identifiers, generated on the basis of the single unique identifier through hashing, and are used instead to avoid identification conflicts.

Regarding the cross-border challenge, as different identifier schemas are used in Member States, identification conflicts may occur when data is exchanged across borders. European-wide identifiers generated on the basis of the national identifiers through concatenation (e.g. by adding the country and registry codes to the national identifier) can be used to avoid identification conflicts when data is exchanged between base registers across borders.

Such approaches facilitate mutual recognition of national identifiers, for both natural and legal entities, so that cross-sector and cross-border data exchange about those entities can occur unequivocally and persistently.

- **Benefits:** The use of identifiers makes it possible to unequivocally identify people, businesses, etc.
- **Practical case:**
 - **Cross-border data exchange** (Source: BRIS): According to recital 14 of Directive 2012/17/EU, “Companies and their branches opened in other Member States should have a unique identifier allowing them to be unequivocally identified within the Union. The identifier is intended to be used for communication between registers (...)”.
 - **Overcoming the data privacy challenge** (Source: Austria (Central Register of Residence)): In Austria, every person receives a unique number from the Central Residents Register that is used as a master key personal identity code. This is known as the source PIN. For each sector, a Sector-Specific PIN is created by applying a SHA-1 hash-function. The sector-specific identifier guarantees that the identifier cannot be used for any other purpose or by other authorities unless it is related to the original context.
- **Do’s:**
 - Apply hashing techniques when the use of people identifiers conflicts with data privacy rules (Source: Austria (Central Register of Residence)).
 - Use concatenation techniques (e.g. by adding the country and registry codes to the national identifier) to accommodate identifiers from different Member States (Source: BRIS).
- **Observations of this practice:** Member State initiative: Austria (central Register of Residence). European initiatives: BRIS.
- **List of reusable solutions:**

Table 16. Reusable solutions for good practice #14.

Solution type	Solution	Title	Link
Framework	Document Schema Definition Language (DSDL)	ISO/IEC 19757-3:2006 Information technology -- Document Schema Definition Language (DSDL)	http://www.schematron.com /

3.4 Technical layer good practices

Good practice #15:

Modular, loosely coupled service components are used for interconnecting base registries.

Summary:

The technical heterogeneity which has resulted from base registries having been developed independently of each other can be overcome by using modular, loosely coupled service components interconnected through infrastructure. Service Oriented Architecture (SOA) is an implementation of this concept and is emerging as the architectural style of choice for interconnecting base registries. There are two possible models. In the fully distributed model, the service infrastructure's main function is to facilitate the discovery of the services. Communication is point-to-point. In the semi-distributed model, the infrastructure offers some central services and acts as an interconnection hub.

- **Obstacle:** Technological heterogeneity.

- **Description:**

Historically, base registries were developed by organisations working independently using their own technologies and handling their development according to sectorial requirements. The resulting technological heterogeneity becomes an important barrier to the interconnection of base registries. To overcome this obstacle, the EIF 2.0 *“highlights the need for modular, loosely coupled service components interconnected through infrastructure”*. Service Oriented Architecture (SOA) is an implementation of this concept. According to OASIS, *“SOA is a paradigm for organizing and utilizing distributed capabilities that may be under the control of different ownership domains”*⁴. Our study shows that Service Oriented Architecture (SOA) is emerging as the architectural style for interconnecting base registries. According to our study, the benefits of Service-Oriented infrastructures are:

- Loose coupling promotes the protection of the significant investments made in base registries as the legacy system is typically hidden from the service consumer, the basic data is exposed through a well-defined service interface (it includes the specific protocols, commands, and information exchange interactions) based on widely supported standards (e.g. WSDL and SOAP);
- Opening-up base registries through the services hosted on an integration infrastructure, such as an Enterprise Service Bus (ESB). According to the Carnegie Mellon Software Engineering Institute (SEI), ESBs *“connect service consumers to services and usually implement a loosely coupled, synchronous or asynchronous, message-based communication model, but other*

⁴ Service Migration and Re-use Technique (SMART), Carnegie Mellon Software Engineering Institute (SEI), 2005: <http://goo.gl/iuOtjk>.

mechanisms are possible. The infrastructure often contains elements to support service discovery, security, and other operations.”⁵.

Our research shows that Member States are following two different models when putting in place SOA architecture:

- The fully distributed model, where the service infrastructure’s main function is to facilitate the discovery of the services offered by base registries. The communication between the base registries happens point-to-point.
- The semi-distributed model where the service infrastructure offers a number of central services and facilitates the interconnection between the service consumer and the base registry as a hub.
- **Benefits:** The use of modular, loosely coupled service components safeguards the investments made in legacy systems.
- **Practical case:**

Distributed interconnection infrastructure (Source: Estonia (X-Road)): “X-Road is a platform-independent data exchange layer, enabling to search data from national databases over the Internet. Platform independence is achieved by using the SOAP protocol. X-Road provides a distributed, unified web-services based inter-organizational data exchange framework. The architecture consists of X-Road servers, X-Road server software and information systems that have joined to the X-Road. There is no central gateway and all connected organisations communicate directly”.
- **Do’s:**

“When establishing an interconnection infrastructure, do provide an ‘integration toolkit’ to build integration software that extracts base registries’ data and facilitates mapping it to a commonly agreed semantic model. For example, in Spain, base registries interconnected via the Intermediation Platform, use a protocol (v3) for replacing paper-based certificates (SCSP) by electronic ones. The SCSP Library developed by the Ministry of Finance and Public Administration can be used as part of the integration software to ease the connection of base registries to the Intermediation Platform and the data mapping of parties relying on it. The current version of the SCSP library is 3.2.1 for J2EE and 3.2.0 for .NET (Source: Spain, Intermediation Platform).
- **Observations of this practice:** Member State initiative: Estonia (X-Road), Spain (Intermediation Platform), Denmark (Grunddata).

⁵ Reference Model for Service Oriented, Reference Model for Service Oriented Architecture 1.0, 2006: <http://goo.gl/BIHDlh>.

- **List of reusable solutions:**

Table 17. List of reusable solutions for good practice #15.

Solution type	Solution	Title	Link
Framework	Interconnection infrastructure based on the SOA, Estonia (X-Road).	Estonia_X_Road technical	www.ria.ee
Framework	Intermediation platform, Spain (Intermediation platform) .	Intermediate platform	http://administracionelectronica.gob.es/pa/e/Home
Framework	Data distributor Denmark (Grunddata).	Good basic data for everyone	http://uk.fm.dk/publications/2012/good-basic-data-for-everyone/

Good practice #16:

User and application access management is based on a federated structure of authorised users and applications.

Summary:

Where user access management systems are not interoperable, this can be a barrier to data sharing across sectors or borders. The ISA Programme, Action 1.18, is working on the identification of viable scenarios for federated user access management so that civil servants in the Member States can access the EC's applications using their national credentials. This model, where the base registry holding the data delegates management of the user access rights to a level closer to the user, is already in use in some Member States. Personal data can be processed where there is consent from the citizen.

- **Obstacle:** Non-interoperable user access management technologies.

- **Description:**

User access management is the security feature that enables the authentication⁶ and authorization⁷ of users trying to access base registries' data. When proper access management is in place, only authorized users (machines or humans) can access base registries' data. When information is shared across different sectors or across borders, non-interoperable user access management may restrict access to base registries.

The topic of user access management is on the agenda of the ISA Program under action 1.18 Federated Authorization Across European Public Administrations. The action is developing a federated user access management model that shows how civil servants of Public Administrations in the Member States can access the applications of the European Commission using their national credentials. This model respects the subsidiarity principle given that the management of users happens at national level by the most suitable organization. A similar model is already in use in some Member States and has proven to be an effective and efficient way to implement 'User access management'. By applying this model, the base registry holding the data does not fully manage the users' access rights as it delegates this to a level closer to the user. The delegation happens via trust agreements between the organization responsible for the base registry and the user's organization. In that way, the access management in the context of interconnection of base registries ensures that access is granted only to authorized entities. This concept is usually referred to as "the chain of trust. It is important to mention, that where personal data is kept in base registries, such as health registries, the data can be processed if there is citizen's consent. Citizen's consent is needed in

⁶ Authentication refers to the act of verifying the identity of a user and the user's eligibility to access computerized information (source: COBIT 5).

⁷ Authorization determines whether a user is allowed to take action on specific areas within the system (source: Adobe).

order to fully comply with data protection regulations at EU and Member State level (see Practical Case Spain Intermediation Platform).

- **Benefits:** Federated user access management enables the delegation of this security feature to the most suitable level.

- **Practical case:**

- **Federated user access management (Source:** Austria (Central Register of Residence)): User Access Management is organised into an Application portal and a User portal. The application portal provides a list of applications that can be accessed by a given list of public administrations. Analogy applies to the user portal, where the role related to accessing information is defined. This network thus relies on trust. For example, the Ministry of the Interior gives permission to the Ministry of Finance to use the CRR application. Then the Ministry of Finance defines which of its employees have access to the CRR application.

- **User consent as part of access management (Source:** Spain (Intermediation Platform)): Within the Spanish Intermediation Platform, the user's consent to retrieving their data from a base registry by a given public administration is gathered whenever there is a need for it linked to an electronic procedure. It can exist in paper or electronic form. The user's consent is gathered before:

- An administrative clerk logs into the broker application using the digital signature as a result of the underlying public procedure associated with a user's request. This application gives access to the user's data held in one or several base registries and can be accessed through the broker system. The official or administrative clerk retrieves that data so that the public procedure can be completed. The user's consent has been gathered previously by the administrative clerk in the request form filled in by the user.

- The base registry is accessed by an eGOV service automatically as part on the underlying electronic procedure, by making a request sent via a web service to the broker. The user's consent has been gathered previously by the eGOV services in the request form electronically filled in by the user.

All requests for users' consent are registered by the eGOV application that will use the broker services to gather the requested user's data, such that any misuse of base registries data can be monitored and identified.

- **Do's:**

Do consider federated user access management (Fedict (Belgium)).

- **Observations of this practice:** Member State initiative: Austria (Central Register of Residence), Estonia (X-Road), Belgium (Fedict), Spain (Intermediation Platform).

- **List of reusable solutions:**

Table 18. Reusable solutions for good practice #16.

Solution type	Solution	Title	Link
Framework	Federated user access management model Austria (Central Register of Residence)	Central Registers and eGovernment in Austria	www.bmi.gv.at
Framework	X-Road user access management	X-Road regulations	www.ria.ee
Framework	Users' consent form	BOE, Number 230, 25.09.2013, Section IIB, Page 77372	www.boe.es

Good practice #17:

A set of security principles is guaranteed via the appropriate trust-based mechanisms.

Summary:

Secure information exchange requires the use of digital certificates to identify an entity, to sign a document or to encrypt a document. Each Member State publishes a Trusted List of Certification Service Providers and the European Commission maintains a central List of Trusted Lists. Thus a chain of trust is available for secure cross-border exchange between base registries. The European Commission's ambition is to create a European market for electronic trust services going beyond this, and it has proposed a draft regulation to achieve this.

- **Obstacle:** Non-interoperable identification, electronic signature and encryption mechanisms are a barrier to seamless access to base registries.

- **Description:**

The main objective of interconnection of base registries is to exchange information securely across organisations and/or across borders. One of the main mechanisms for ensuring security is to encrypt the information before sending it to a remote location (web server, mail server etc.). Encryption is, however, not sufficient: safe information exchange also requires the use of digital certificates. A digital certificate is an electronic document that makes use of a digital signature to link a public key, used for example when encrypting a document, with identity information (name of organisation, name of a person etc.) By validating the digital certificate of the recipient before sending the information, a sender can verify whether the public key used for encrypting the data is that of the expected recipient.

Typically, digital certificates are issued by a certificate authority. A certificate authority is defined by EU Directive 1999/93/EC, which stipulates the requirements for qualified certificates and certificate authorities. Certificate authorities digitally sign all the certificates they issue in order to certify that the identity information linked to the digital certificate has been verified by the certificate authority. An entity (e.g. a system) that trusts the certificate authority will in turn trust all the digital certificates the authority issues ("chain of trust"). In a cross-border setting, ensuring interoperability of digital certificates would then require that a validating entity should know (and trust) all the certificate authorities in all Member States.

To solve this problem, each Member State publishes a Trusted List of Certification Service Providers, which records all the certificate authorities entitled to issue certificates that allow citizens and businesses to sign documents electronically. The location of the national lists can be found by accessing a central list (the List of Trusted Lists), maintained by the European Commission.

It is important to mention that a draft regulation on electronic identification (eID) and electronic trust services (eTS) is currently under discussion (COM/2012/0238 final - 2012/0146 (COD)).

This proposal, among others, aims to create a European market for electronic trust services (electronic signatures, electronic seals, time stamps, electronic delivery services and website authentication) with equal legal validity of the electronic services in the European cross-border setting.

- **Benefits:** Interoperable security mechanisms establish trust between public administrations and thus enable the secure access, re-use and sharing of basic data.
- **Practical case:**
Issuing of certificates (Source: Official Journal L 013, 19/01/2000 P. 0012 - 0020): According to the eSignature Directive, Directive 1999/93/EC, the Member States are mandated to create and publish a list of accredited certification services providers. The list of certificate providers, the Trusted List, has to be published in a human readable format, but can also exist in machine process able format.
- **Do's:**
 Do make sure, when opting for a national certificate authority to acquire a digital certificate, that the authority is registered in the Trusted List of the Member State (Source: EC Decision 2011/767).
- **Observations of this practice:** Member State initiative: All Member States.
- **List of reusable solutions:**

Table 19. Reusable solutions for good practice #17.

Solution type	Solution	Title	Link
Tool	Digital Signature Service that allows Member States to create and verify X/CADES forms	Digital Signature Service (DSS)	https://joinup.ec.europa.eu/software/sd-dss/description

Annex I – Glossary of terms

GLOSSARY OF TERMS

Term	Description	Source
Basic data	Base registries' data is sometimes referred to as 'basic data'.	Deloitte
Base registry	A base registry is a trusted authentic source of information under the control of a Public Administration or organisation appointed by government. According to the EIF 2.0, base registries are: "reliable sources of basic information on items such as persons, companies, vehicles, licences, buildings, locations and roads" and "are authentic and authoritative and form, separately or in combination, the cornerstone of public services".	www.ec.europa.eu/isa/documents/isa_annex_ii EIF_en.pdf
Business base registry	A business base registry is a registry containing data related to a company. This registry may contain the following data: company name, type of enterprise (date of creation, limited company, association, co-operative, public limited company etc.), accounting period, address, main operating sector, bank account number, etc.	www.ec.europa.eu/isa/
Base registry owner	Base registry owner refers to the organisation that is the appointed controller of the data in the base registry.	Deloitte

GLOSSARY OF TERMS

Term	Description	Source
Core vocabulary	<p>Core vocabulary is a simplified, reusable, and extensible data model that captures the fundamental characteristics of an entity in a context-neutral way. Well known examples of existing Core Vocabularies include the Dublin Core Metadata Set. E-Government Core Vocabularies are the starting point for developing interoperable e-Government systems as they allow mapping with existing data models. This guarantees that Public Administrations can attain cross-border and cross-sector interoperability.</p>	<p>www.joinup.ec.europa.eu</p>
Comitology Decision	<p>The Commission's activities are assisted by the representatives of the Member States organised into committees chaired by the Commission. Relations between the Commission and the committees are based on models set out in the Council "Comitology Decision" established by Regulation No 182/2011 of the European Parliament and of the Council laying down the rules and general principles concerning mechanisms for control by Member States of the Commission's exercise of implementing powers.</p>	<p>www.europa.eu</p>
Decision	<p>A "decision" is binding on those to whom it is addressed (e.g. an EU country or an</p>	<p>http://europa.eu/eu-law/decision-making/legal-acts/index_en.htm</p>

GLOSSARY OF TERMS

Term	Description	Source
	individual company) and is directly applicable.	
Digital Agenda	The Digital Agenda for Europe (DAE) aims to reboot Europe's economy and help people and businesses in Europe to get the most out of digital technologies. It is the first of seven flagships initiatives under Europe 2020, the EU's strategy to deliver smart sustainable and inclusive growth.	www.europa.eu
Digital certificate	A digital representation of information which at least: <ol style="list-style-type: none"> 1) identifies the certification authority issuing it, 2) names or identifies its subscriber, 3) contains the subscriber's public key, 4) identifies its operational period, and 5) is digitally signed by the certification authority issuing it. 	www.nvlpubs.nist.gov/nistpubs/ir/2013/NIST.IR.7298r2.pdf Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on electronic identification and trust services for electronic transactions in the internal market /* COM/2012/0238 final - 2012/0146 (COD) */
Directive	A "directive" is a legislative act that sets out a goal that all EU countries must achieve. However, it is up to the individual countries to decide how.	http://europa.eu/eu-law/decision-making/legal-acts/index_en.htm
eGovernment	eGovernment refers to the utilizing of the Internet and the worldwide-web for delivering government information and services to the citizens.	www.un.org
EIF	The European Interoperability Framework is a set of recommendations organised into an enterprise architecture framework	Deloitte www.ec.europa.eu

GLOSSARY OF TERMS

Term	Description	Source
	targeting all those involved in the definition, design and implementation of European Public Services.	
EIF Conceptual model	The EIF Conceptual model describes organising principles for European Public Services. It is based on a survey on the implementation of European Public Services in the Member States, and embodies the common elements and good practices observed. It is a blueprint for future implementations of European Public Services.	www.ec.europa.eu
Electronic record	An electronic record is a record which is in electronic form as a result of having been created by a software application or as a result of digitisation, e.g. by scanning.	Deloitte
ESB	Enterprise Service Bus is an architecture pattern that enables interoperability between heterogeneous environments, using service orientation.	www.oracle.com
Interconnecting infrastructure	An interconnecting infrastructure is an IT infrastructure enabling base registry data exchange without the need to integrate base registries' data bases. This infrastructure is based on the concept of interconnection of base registries by a defined base registry data exchange layer.	Deloitte
Interoperability	Interoperability is the ability of disparate and diverse organisations to interact towards mutually beneficial and agreed common goals, involving the sharing of	www.ec.europa.eu

GLOSSARY OF TERMS

Term	Description	Source
	information and knowledge between the organisations, through the business processes they support, by means of the exchange of data between their respective IT systems.	
Interoperability agreement	Interoperability agreements are means through which public administrations formalise collaboration with one another from an organisational, semantic and technical point of view.	www.ec.europa.eu www.webgate.ec.europa.eu CISE Architecture Visions Document
ISO	International Organization for Standardization is the world's largest developer of voluntary international standards.	www.iso.org
Land base registry	A land base registry is a registry containing data that can be related to land. This registry may contain the following data: owner's rights, value of property, boundaries etc.	www.ec.europa.eu/isa/
Master-slave governance	In the context of base registries, master-slave governance refers to a model where the master base registry is the primary source of data, while the slave base registry has to synchronise with it.	Deloitte
Marginal cost	Marginal cost is a change in the total cost resulting from an increase of an output by one unit.	Deloitte
Opinion	An "opinion" is an instrument that allows the [EU] institutions to make a statement in a non-binding fashion, in other words without imposing any legal obligation on those to whom it is addressed. An opinion is	http://europa.eu/eu-law/decision-making/legal-acts/index_en.htm

GLOSSARY OF TERMS

Term	Description	Source
	<p>not binding. It can be issued by the main EU institutions (Commission, Council, Parliament), the Committee of the Regions and the European Economic and Social Committee. While laws are being made, the committees give opinions from their specific regional or economic and social viewpoint.</p>	
<p>Persons base registry</p>	<p>A persons base registry is a registry containing data that can be related to a natural person. Data in a person registry can be the following: first name and family name, birth date, gender, citizenship, address, title of insurance (insurance context), record of mouth-map for Dental Benefit (healthcare context), etc.</p>	<p>www.ec.europa.eu/isa/</p>
<p>Point-to-point connection</p>	<p>Point-to-point connection refers to a communication between two end points (i.e. two base registries).</p>	<p>Deloitte</p>
<p>Recommendation</p>	<p>A recommendation is not binding. It allows the [EU] institutions to make their views known and to suggest a line of action without imposing any legal obligation on those to whom it is addressed.</p>	<p>www.europa.eu</p>
<p>Regulation</p>	<p>A "regulation" is a binding legislative act. It must be applied in its entirety across the EU.</p>	<p>http://europa.eu/eu-law/decision-making/legal-acts/index_en.htm</p>
<p>SOA</p>	<p>Service Oriented Architecture is an architectural style that supports service-orientation. Service-orientation is a way of thinking in terms of</p>	<p>www.opengroup.org</p>

GLOSSARY OF TERMS

Term	Description	Source
	<p>services and service-based development and the outcomes of services.</p> <p>A service: is a logical representation of a repeatable business activity that has a specified outcome (e.g., check customer credit, provide weather data, consolidate drilling reports), is self-contained, may be composed of other services, is a “black box” to consumers of the service.</p>	
SLA	<p>A Service Level Agreement is an agreement between an IT service provider and a customer. A service level agreement describes the IT service, documents service level targets, and specifies the responsibilities of the IT service provider and the customer. A single agreement may cover multiple IT services or multiple customers.</p>	<p>www.itsm-portal.com</p>
Standard	<p>A standard means a technical specification, adopted by a recognised standardisation body, for repeated or continuous application, with which compliance is not compulsory.</p>	<p>www.eur-lex.europa.eu (Regulation on European Standardisation)</p>
Technical specification	<p>A technical specification means a document that prescribes technical requirements to be fulfilled by a product, process, service or system.</p>	<p>www.eur-lex.europa.eu (Regulation on European Standardisation)</p>
UAM	<p>User Access Management is the process responsible for allowing users to make use of IT services, data or other Assets. Access Management helps to protect the</p>	<p>www.itsm-portal.com</p>

GLOSSARY OF TERMS

Term	Description	Source
	confidentiality; integrity and availability of assets by ensuring only authorized users are able to access/modify the assets.	
Vehicle base registry	A vehicle registry is a registry containing data that can be related to a vehicle. This registry may contain the following data: engine capacity, colour, model, owner's details, VIN (Vehicle Identification Number), etc.	www.ec.europa.eu/isa/
W3C	The World Wide Web Consortium is an international community where member organisations, a full-time staff, and the public work together to develop Web standards.	www.w3.org

Annex II – Member States Initiatives

List of cross-sector initiatives			
Member State	Initiative	Description	Organization responsible
Austria	Central Register of Residence (www.bmi.gov.at)	Centralized repository of resident registries with online access to all of them.	Federal Ministry of Interior
Belgium	Fedict (www.fedict.belgium.be)	Fedict is responsible for Belgium's national eGovernment strategy. It promotes cooperation across the initiatives led by the Belgian communities and regions (e.g. Magda). Fedict provides an interconnecting infrastructure of base registries at federal level.	Federal Public Service for Information and Communication Technology
Belgium	Magda (www.corve.be/produkten/magda-diensten/)	Interconnecting infrastructure of base registries at regional level in Belgium.	Flemish eGovernment Coordination Unit (CORVE)
Denmark	Grunddata (www.digst.dk)	Digitization strategy for 2011-2015.	Agency for Digitisation - Ministry of Finance
Estonia	X-Road (www.ria.ee/x-road/)	Interconnecting infrastructure initiative of base registries at national level.	Information System's Authority - Ministry of Economic Affairs and Communications

List of cross-sector initiatives			
Member State	Initiative	Description	Organization responsible
Finland	Registry based census (www.stat.fi)	Population census based on base registries data.	Statistics Finland - Ministry of Finance
Netherlands	I-NUP Program (www.rijksoverheid.nl/ministeries/bz)	Government programme of municipal governments, provincial governments, water boards and central government aiming to create building blocks for the Dutch public sector.	Ministry of Interior Affairs
Spain	Intermediation Platform (www.administracionelectronica.gob.es)	Interconnecting infrastructure initiative of base registries at national level.	Ministry of Finance and Public Administration

Annex III – European initiatives

List of cross-border initiatives			
Base registry type	Initiative	Description	Organisation responsible
Business	BRITE (www.ecgi.org)	BRITE was a project funded by the European Commission involving 19 organisations such as the European Business Registers and Chambers of Commerce, IT Companies, Universities and SMEs. Its main objective was to set up an ICT service platform for register-to-register communications across the EU.	EEIG (European Economic Interest Grouping)
	BRIS (N/A)	BRIS stands for 'Business Registries Interconnection System'. BRIS is a new EU-wide project aiming to leverage existing business registry initiatives and harmonize information flows involving business registries. BRIS will use a service-based platform (EU Central Platform) and a portal (eJustice Portal). BRIS builds on the experience of EU-wide projects such as BRITE, EBR, ECRF, xEBR and XBRL, RMS, Interegisters, LEI and e-CODEX.	European Commission
	(EBR www.ebr.org)	EBR stands for 'European Business Registers'. EBR is a network of business registers and information providers from 28 jurisdictions whose objective is to offer reliable information on companies from all over Europe. It allows persons, businesses and public authorities to search for a company name or, in certain countries, a natural person through all the member business registers by submitting a single query in their own language.	EEIG (European Economic Interest Grouping)

List of cross-border initiatives			
Base registry type	Initiative	Description	Organisation responsible
People	ECRN (www.ecrn.eu)	ECRN stands for 'European Civil Registry Network'. This initiative provides an interconnecting infrastructure to enable the exchange of information about civil acts (birth, death, marriage, divorce) across the EU. ECRN was initially co-funded by the ICT Policy Support Programme (PSP) of the EU. ECRN was originally a pilot among the 'Civil Acts Registry of National Administrations' to allow safe transmission, and certain identification, of Civil Acts among public administrations at local level.	European Commission
	ECRIS (www.ec.europa.eu/justice/criminal/european-e-justice/ecris/)	ECRIS stands for 'European Criminal Records Information System'. ECRIS provides an infrastructure interconnecting registries of criminal records. Member States exchange information on convictions with one another.	European Commission
	RISER (www.riserid.eu)	RISER stands for 'Information Service on European Residents'. RISER started in 2004 as an innovation project within the European Commission eTEN Programme. The project ended in 2010 and since then a private company has further developed the service. RISER ID Services GmbH acts as a data processor on behalf of its customers (e.g. businesses and administrations) by providing them with full names and full addresses (and age in some cases) as listed in the respective official register or electoral roll register.	RISER ID Services GmbH

List of cross-border initiatives			
Base registry type	Initiative	Description	Organisation responsible
Land	ELRA (www.elra.eu)	ELRA stands for 'European Land Registry Association'. ELRA is a non-profit organisation having as its mission: "the development and understanding of the role of land registration in real property and capital markets". ELRA's main objective is to provide legal support and follow-up of land registries in Europe.	European Land Registry Association
	EULIS (www.eulis.eu)	EULIS stands for 'European Land Information Service'. The main objective of EULIS is to sell land registry information. It provides easy access to land and property information for professional customers in Europe. It also is a hub of information about different land registration conditions in each country (EULIS glossary). Its long-term mission is to underpin a single European property market through cross-border lending. The service is aimed at professional customers who use land registry information to assist them in their day-to-day work life. It helps with access to land and property information via computer applications. It is not meant to be a database itself, but simply to facilitate access to and retrieval of information. The EULIS platform was improved to v2 by the project LINE.	Consortium of Member States specialising in land registration

List of cross-border initiatives			
Base registry type	Initiative	Description	Organisation responsible
Vehicle	EUCARIS (www.eucaris.net)	EUCARIS stands for 'European CAR and driving licence Information System'. EUCARIS is a communications network (developed within the i2020 Agenda) which allows participating countries to consult and exchange data relating to motor vehicles and driving licences kept in the national registers of affiliated countries. This system helps fight car theft and registration fraud across the EU.	EUCARIS

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