



DLV02.02 – Architecture

Study on functional, technical and semantic interoperability requirements for the Single Digital Gateway (SDG) implementation

20/11/2018

Table of Contents

| | | |
|---------|---|----|
| 1 | Introduction | 4 |
| 2 | Scope and objective of deliverable..... | 4 |
| 3 | Methodology | 5 |
| 4 | SDG Interoperability mapped to the EIRA..... | 6 |
| 4.1 | Legal view..... | 8 |
| 4.1.1 | Binding instruments | 9 |
| 4.1.1.1 | Single Digital Gateway Regulation | 9 |
| 4.1.1.2 | Internal Market Information System | 9 |
| 4.1.1.3 | General Data Protection Regulation..... | 10 |
| 4.1.1.4 | Services Directive | 10 |
| 4.1.1.5 | Professional Qualifications Directive | 10 |
| 4.1.1.6 | Public Procurement Directives | 10 |
| 4.1.1.7 | Regulations on coordination of social security systems..... | 11 |
| 4.1.1.8 | eIDAS Regulation | 11 |
| 4.1.1.9 | Business Registers Interconnection System | 11 |
| 4.1.2 | Non-binding instruments | 12 |
| 4.1.2.1 | Digital Single Market Strategy..... | 12 |
| 4.1.2.2 | European Interoperability Framework | 12 |
| 4.1.2.3 | EU eGovernment Action Plan | 12 |
| 4.2 | Organisational view..... | 13 |
| 4.3 | Semantic view..... | 17 |
| 4.3.1 | SDG Registered Classifications | 19 |
| 4.3.2 | SDG Web Link | 20 |
| 4.3.3 | Crawling..... | 23 |
| 4.3.4 | User feedback on quality | 24 |
| 4.3.5 | User feedback on the obstacles..... | 24 |
| 4.3.6 | Statistic of use | 24 |
| 4.4 | Technical view..... | 26 |
| 4.4.1 | Technical view – Application services/interface | 26 |
| 4.4.2 | Technical view – Interoperability enablers | 31 |
| 4.4.3 | Technical view – Infrastructure..... | 34 |
| 5 | Annexes..... | 36 |
| 5.1 | Annex 1: ArchiMate® notation..... | 36 |

| | | |
|-------|---|----|
| 5.1.1 | ArchiMate® model concepts | 36 |
| 5.1.2 | ArchiMate® relationships | 37 |
| 5.2 | Terms and acronyms..... | 39 |
| 5.2.1 | Glossary | 39 |
| 5.2.2 | Acronyms and abbreviations..... | 40 |
| 5.3 | EIRA Files..... | 41 |
| 5.3.1 | High Level View | 41 |
| 5.3.2 | Organisational View | 41 |
| 5.3.3 | Semantic View | 41 |
| 5.3.4 | Technical view – Application services/interface | 41 |
| 5.3.5 | Technical view – Interoperability enablers | 41 |
| 5.3.6 | Technical view – Infrastructure..... | 41 |

Table of Figures

| | | |
|-----------|---|----|
| Figure 1: | High level view of the SDG..... | 6 |
| Figure 2: | Legal view ArchiMate® model | 8 |
| Figure 3: | Organisational view ArchiMate® model | 13 |
| Figure 4: | Semantic view ArchiMate® model | 18 |
| Figure 5: | Areas of information, procedures and assistance and problem solving services..... | 20 |
| Figure 6: | Web links information hierarchy | 22 |
| Figure 7: | Technical view – Application services/interface ArchiMate® model | 26 |
| Figure 8: | Technical view – Interoperability enablers ArchiMate® model | 31 |
| Figure 9: | Technical view – Infrastructure ArchiMate® model | 34 |

List of Tables

| | | |
|----------|--|----|
| Table 1: | Data exchange overview | 17 |
| Table 2: | Data flows for machine-to-machine interfaces | 30 |
| Table 3: | ArchiMate model concepts..... | 37 |
| Table 4: | ArchiMate relationships..... | 38 |
| Table 5: | Glossary | 39 |
| Table 6: | Acronyms and abbreviations..... | 40 |

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1 Introduction

The present document, framed into the project "*Study on functional, technical and semantic interoperability requirements for the single digital gateway implementation*", is the fourth version of the IT architecture for the Single Digital Gateway (SDG). The architecture is aimed at enabling a more efficient development of applications that support interconnection and interoperability at European Union (EU) and national level.

The SDG will be aligned with the Proposal for a Regulation of 2 May 2017 [COM(2017)256]. The regulation aims at making it easier for EU citizens and businesses that need to navigate regulatory and administrative requirements to access the necessary information, procedures and assistance services online.

This document contains the description for a solution architecture for SDG based on the European Interoperability Reference Architecture (EIRA)¹. EIRA provides a reference model that describes in a common way digital EU public services and plays a crucial role to guide public administrations in their challenges to provide interoperable EU public services to businesses and citizens.

In order to build interoperable e-Government systems, EIRA is aligned with the European Interoperability Framework (EIF)². The EIF provides a set of recommendations to public administrations on how to pursue interoperability at Legal, Organisational, Semantic and Technical levels in their information systems. Therefore, the EIRA defines elements that can help achieve a certain degree of interoperability by defining:

- A common terminology through the controlled vocabulary;
- Architectural Building Blocks (ABBs) as functionalities defined to meet the business needs of the professionals creating IT architectures related to e-Government;
- The ArchiMate® views to cover different aspects of interoperability, including the four views defined in EIF.

2 Scope and objective of deliverable

This document provides an exhaustive, definitive and comprehensive representation model and the objective is to describe in a structured way the architecture created with ArchiMate®³. This document contains a mature approach for the creation of an IT architecture defining a minimal, but holistic (legal, organisational, semantic and technical) interoperability architecture in the domain of the SDG.

The ArchiMate® file, containing the complete architectural model, is delivered together with the present document.

¹ See: European Commission (EC), "European Interoperability Reference Architecture (EIRA ©)". Available: <https://joinup.ec.europa.eu/asset/eia/>

² Source: EC, "The European Interoperability Framework". Available: https://ec.europa.eu/isa2/eif_en.

³ See: T. O. Group, "The Open Group ArchiMate® Forum". Available: <http://www.opengroup.org/subjectareas/enterprise/archimate>, and P. Beauvoir, "Archi®". Available: <http://www.archimatetool.com/>

3 Methodology

The present Architecture proposed for SDG is created on the base of the EIRA. EIRA is a reference model that defines the ABBs that are necessary to build interoperable e-Government systems. The model provides a common terminology that can be used by professionals working in various architecture and system development tasks for public administrations in the EU. The EIRA uses the ArchiMate® language to create architectural models based on the Service Oriented Architecture style.

The views of the EIRA are created and maintained through the Cartography Tool (CarTool©)⁴. The Cartography Tool is the IT instrument used to design the SDG solution based on EIRA. The tool supports system architects by providing the interoperability standards to use when creating solutions based on EIRA.

The EIRA consists of the following mandatory views: Legal, Organisational, Semantic and Technical (composed of application services and interfaces, interoperability enablers and infrastructure parts). Viewpoints that conform these views are also part of EIRA (e.g. high level viewpoint). Each view has a visual diagram, narrative, and set of focal ABBs. The visual diagram shows how the ABBs are related to each other. The narrative is a text description and provides natural language statements.

These views are independent of each other, meaning that changes in one view do not have direct impact on the remaining views, and that there is no hierarchy establishing the prevalence of one view over the others. However there are relations between some components belonging to different views, for example in the Legal view, some ABBs belonging to the Organisational view are included to show their relationship to the ABBs of the Legal view, hence illustrating how the two views influence each other.

The methodology chosen to build the solution architecture for SDG consists of adapting the functionalities of the SDG that have been identified in the business processes and requirements⁵ to the ABBs available in EIRA. Therefore this methodology results in an architecture that is aligned with the interoperability needs of EU e-Government systems.

The methodology allows for the identification of the ABBs needed to implement cross-border and cross-system interactions between the SDG and national IT systems and users. The ABBs identified are 182.

⁴ Source: EC, Cartography Tool (CarTool©) <https://joinup.ec.europa.eu/solution/cartography-tool/releases>.

⁵ See: DLV 02.01 Business Processes, DLV 03.01 Functional Requirements overview, and DLV 03.02 Technical Requirements overview - Study on functional, technical and semantic interoperability requirements for the Single Digital Gateway implementation. 2018.

4 SDG Interoperability mapped to the EIRA

This chapter contains, for each EIRA view, the corresponding ArchiMate® model and a narrative to explain the main components and how they are interrelated.

In **Annex 1: ArchiMate® notation**, the lists of model concepts and relationships used in the SDG model are available, with the corresponding definitions.

The following image presents a high-level introductory view on the focal ABBs of the SDG.

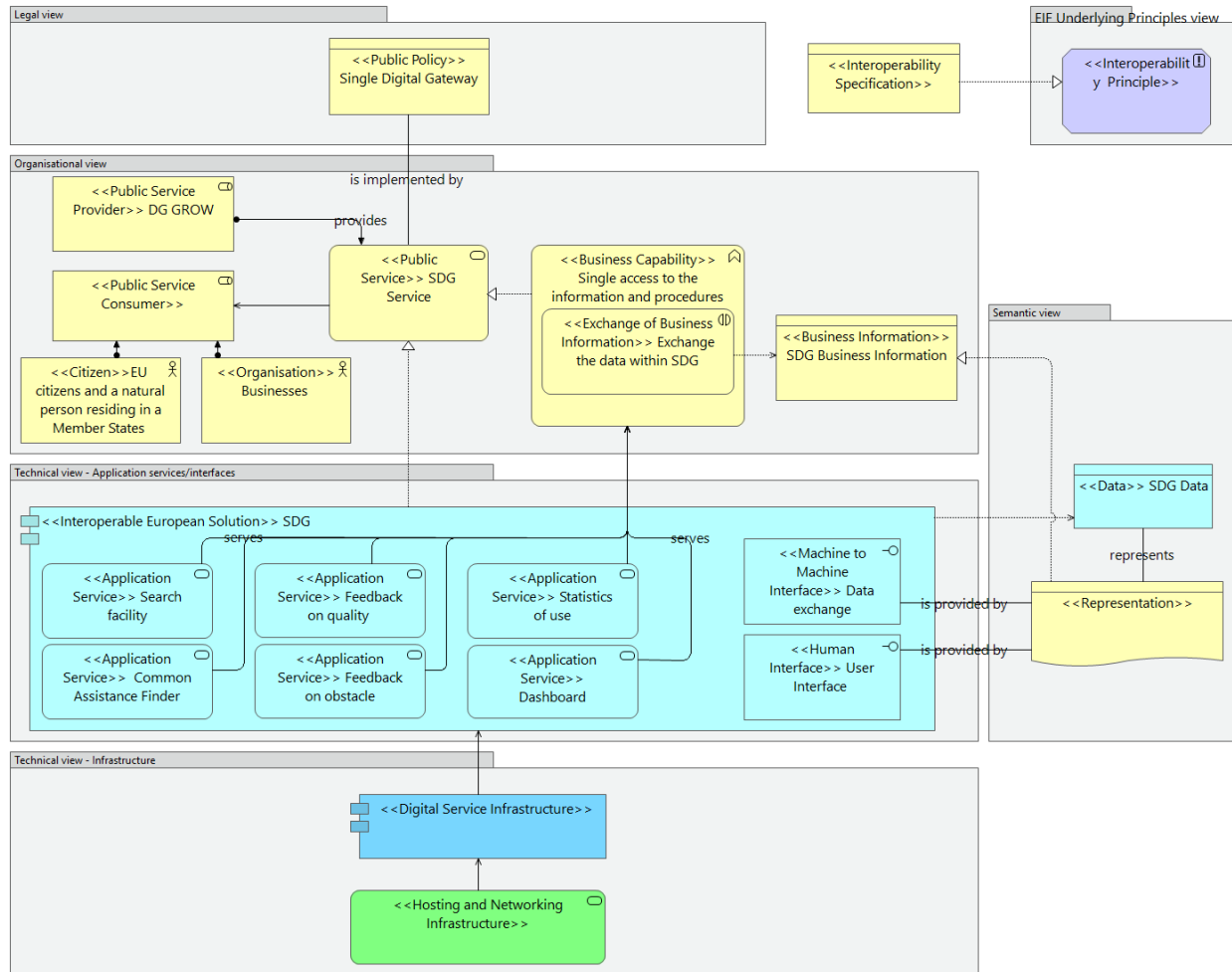


Figure 1: High level view of the SDG

This viewpoint connects the EIRA model with the European Interoperability Framework (EIF)⁶ conceptual model. This view links five major EIRA views, one for each interoperability level (with the exception of the Technical interoperability level to which correspond two views: Technical view – Application and Technical view – Infrastructure), and enables traceability between ABBs from different levels. The ABBs represented in the views are all necessary to develop an SDG solution that is interoperable.

The Legal view includes the *Public Policy*, which is the motivation for the SDG development. This policy is implemented by the *SDG Public Service*, which is provided by the *Public Service Provider*

⁶ Source: EC. The new European Interoperability Framework (EIF) https://ec.europa.eu/isa2/eif_en

and consumed by businesses and citizens of the EU. These aforementioned ABBs are presented and defined in the Organisational view.

The *Business Capability* of the SDG is also part of the Organisational view. The *Business Capability* includes *Exchange of Business Information*. The business data to be exchanged is represented by *Business Information* that are realised by *Representation* from the Semantic view.

The Semantic view describes the *Data* of the SDG. The SDG Data is processed by the SDG solution and is accessible via *Machine to Machine Interfaces* and *Human Interfaces* defined in the Technical view - Application.

In the Technical view – Application, the SDG *Interoperable European Solution* facilitates the delivery of the SDG *Public Service* and it consists of six application services that serve the *Business Capability*.

The SDG uses the *Digital Service Infrastructure (DSI)* which is served by the *Hosting and Networking Infrastructure* from the Technical view – Infrastructure.

The *Interoperability Specifications* define the interoperability aspects for any of the ABBs. The *Interoperability Specifications* should be developed in compliance with the *Interoperability Principles* that offer recommendations on how to establish and improve interoperability.

The following sections provide detailed information about these views and about the most salient ABBs that need to be taken into consideration in order to support interoperability when building an Interoperable European Solution.

4.1 Legal view

The Legal view models the most salient enablers of public policy development and the implementation instruments that shall be taken into consideration to support legal interoperability⁷. The following figure presents the map that addresses the legal interoperability level of the EIF.

The ABBs identified in the Legal view are 20.

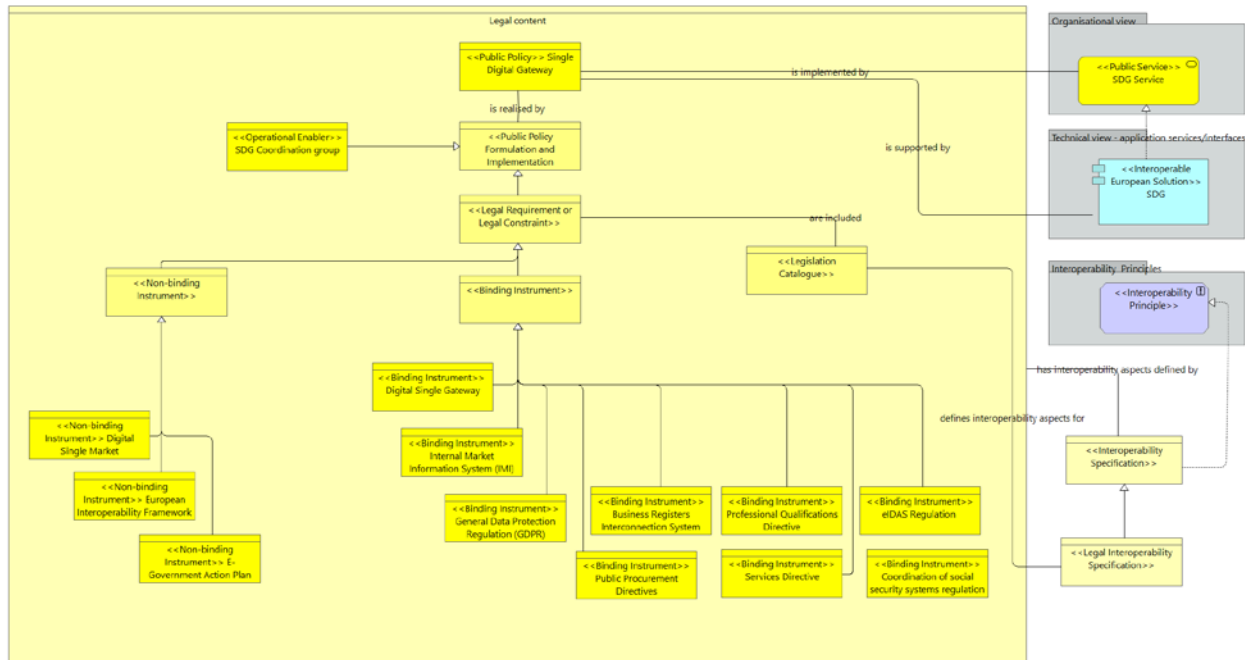


Figure 2: Legal view ArchiMate® model

The *SDG Public Policy* is the object used to group legal acts with a common scope regarding the SDG to be implemented by public authorities. The *SDG Public Policy* is based on the objectives defined by the Digital Single Market (DSM) Strategy and applies at EU level.

The *SDG Public Policy* is implemented by the *SDG Service*, which, being a *Public Service*, is a component in the Organisational view of EIRA. The *SDG Public Policy* is supported in its implementation by the SDG, which, being an *Interoperable European Solution*, is a component of the Technical view – Applications of EIRA.

There are 12 legal instruments presented in the view, which correspond to those that are referenced to in the SDG Regulation⁸. These legal instruments can be divided into two categories:

- *Binding instruments* are regulations, directives and decisions, they create obligations on those to whom they are addressed. The *Binding instruments* are referenced to because they are regulations, directives and decisions already in place, they will not be repealed by the SDG, and the SDG Regulation will be complementary to them. Some of the *Binding instruments* listed establish obligations for the MSs for the provision of specific categories of online services, the SDG Regulation refers to these legal instruments mainly with regard to the scope for obligatory use of the technical system to be set up to implement the once-only principle.

⁷ Source: EC, <https://joinup.ec.europa.eu/solution/eira>.

⁸ "SDG Regulation" refers to the text as agreed by Council and EP, planned to be formally adopted on 24/10/2018

- *Non-binding instruments* are recommendations, communications and opinions, they are non-mandatory acts which do not bind those to whom they are addressed. The *Non-binding instruments* are referenced in the SDG Regulation mainly to explain the strategic context of the SDG.

All the aforementioned ABBs constitute the legal content that is defined by the *Legal Interoperability Specification*, which covers the broader environment of laws, policies, procedures and cooperation agreements needed to allow the seamless exchange of information. The *Legal Interoperability Specification* defines the interoperability aspects of the Legal content, and is part of the *Interoperability Specification*, which is the document containing agreed normative statements for the ABBs that are used in an information exchange context and realising the *Interoperability Principles* of the EIF at legal layer.

A description of the *Non-binding* and *Binding instruments* is provided below, together with their official name and reference codes, and the link to the EUR-Lex correspondent page.

4.1.1 Binding instruments

4.1.1.1 Single Digital Gateway Regulation⁹

COM(2017)256. Proposal for a Regulation of the European Parliament and of the Council on establishing a single digital gateway to provide information, procedures, assistance and problem solving services and amending Regulation (EU) No 1024/2012.

This legislative instrument proposes the creation of an SDG that would provide easy online access to Single Market (SM) information, procedures, assistance and advice for citizens and businesses. The SDG would provide access to relevant web links to all the information people need to do business cross-border, travel to another MS and live, study or work in another MS. The SDG would be based on existing portals and contact points, improving the connections between these existing tools. Through the gateway, citizens and businesses would have access to the most used national procedures fully online, to make it easier for them to exercise their SM rights.

4.1.1.2 Internal Market Information System¹⁰

Regulation (EU) No 1024/2012 of the European Parliament and of the Council of 25 October 2012 on administrative cooperation through the Internal Market Information System and repealing Commission Decision 2008/49/EC (“the IMI Regulation”).

The Internal Market Information System (IMI) is a software application accessible via the internet, developed by the EC in cooperation with the MSs, in order to assist MSs with the practical implementation of information exchange requirements laid down in EU acts by providing a centralised communication mechanism to facilitate cross-border exchange of information and mutual assistance. The purpose of IMI should be to improve the functioning of the internal market by providing an effective, user-friendly tool for the implementation of administrative cooperation between MSs and between MSs and the EC.

⁹ Source, EC proposal for the Regulation, as the Regulation itself has not been adopted by the date of carrying out the current study: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52017PC0256>

¹⁰ Source: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32012R1024>

4.1.1.3 General Data Protection Regulation¹¹

Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation).

The General Data Protection Regulation (GDPR) sets rules for the protection of personal data and privacy for all individuals within the EU, and addresses also the export of EU citizens' personal data outside of the EU. It became enforceable on May 25, 2018. The GDPR is relevant for the SDG for those business processes that include processing of personal data (once-only technical system) and for those business processes where only anonymised data are collected to expressly exclude any processing of personal data.

4.1.1.4 Services Directive¹²

Directive 2006/123/EC of the European Parliament and of the Council of 12 December 2006 on services in the internal market.

The objective of the Services Directive is to realise the full potential of services markets in Europe by removing legal and administrative barriers to trade. The simplification measures introduced by the Directive have increased transparency and made it easier for businesses and consumers to provide or use services in the SM. The Directive was adopted in 2006 and implemented by all EU MSs in 2009. Under the Services Directive, MSs have to ensure that all procedures and formalities relating to access and the exercise of a service activity may be completed online through the relevant Points of Single Contact or with the relevant competent authorities. The SDG Regulation will require competent authorities to use the once-only technical system for the online procedures covered by the Services Directive, by the agreed deadline in 2023.

4.1.1.5 Professional Qualifications Directive¹³

Directive 2005/36/EC of the European Parliament and of the Council of 7 September 2005 on the recognition of professional qualifications.

This directive lays down obligations for MSs to ensure that the completion of requirements, procedures and formalities relating to the recognition of professional qualifications can be done online. The SDG Regulation will require competent authorities to use the once-only technical system for the online procedures covered by the Professional Qualifications Directive, by the agreed deadline in 2023, except for the procedures covered by the European Professional Card where a technical system for the cross-border exchange of evidence is already in place.

4.1.1.6 Public Procurement Directives¹⁴

Directive 2014/24/EU of the European Parliament and of the Council of 26 February 2014 on public procurement and repealing Directive 2004/18/EC and Directive 2014/25/EU of the European Parliament and of the Council of 26 February 2014 on procurement by entities operating in the water, energy, transport and postal services sectors and repealing Directive 2004/17/EC.

Among other things, these directives require that public procurement procedures are accessible online. The SDG Regulation will require competent authorities to use the once-only technical

¹¹ Source: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2016.119.01.0001.01.ENG

¹² Source: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:32006L0123>

¹³ Source: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32005L0036>

¹⁴ Source: <https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=celex%3A32013L0055> and <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:32014L0025>

system for the online procedures covered by the Public Procurement Directives, by the agreed deadline in 2023, except where other technical systems for the cross-border exchange of evidence are already in place.

4.1.1.7 Regulations on coordination of social security systems¹⁵

Regulation (EC) No 883/2004 of the European Parliament and of the Council of 29 April 2004 on the coordination of social security systems and Regulation (EC) No 987/2009 of the European Parliament and of the Council of 16 September 2009 laying down the procedure for implementing Regulation (EC) No 883/2004 on the coordination of social security systems.

These two regulations define the rights and obligations of insured persons and social security institutions as well as the procedures applicable in the field of social security coordination. Where the cross-border exchange of evidence is already covered by EESSI, the use of the once-only technical system set up by the SDG Regulation, will not become obligatory.

4.1.1.8 eIDAS Regulation¹⁶

Regulation (EU) No 910/2014 of the European Parliament and of the Council of 23 July 2014 on electronic identification and trust services for electronic transactions in the internal market and repealing Directive 1999/93/EC.

The eIDAS Regulation ensures that people and businesses can use their own national electronic identification schemes (eIDs) to access public services in other EU MSs where eIDs are available. Moreover, the regulation creates a European internal market for electronic Trust Services (eTS) – namely electronic signatures, electronic seals, time stamp, electronic delivery service and website authentication– by ensuring that they will work across borders and have the same legal status as traditional paper based processes. Only if they can be certain about the legal validity of the outcome of such digital services, businesses and citizens will use them as their natural way of interaction. Cross-border access to online procedures and the digitisation of procedures covered by the SDG will be supported by the eIDAS Regulation, which requires MSs to recognise, by September 2018, eIDs notified by other MSs.

4.1.1.9 Business Registers Interconnection System¹⁷

C/2015/3639. Commission Implementing Regulation (EU) 2015/884 of 8 June 2015 establishing technical specifications and procedures required for the system of interconnection of registers established by Directive 2009/101/EC of the European Parliament and of the Council.

The Business Registers Interconnection System (BRIS) infrastructure will facilitate the access to information on EU companies for the public and ensure that all EU business registers can communicate to each other electronically in a safe and secure way in relation to cross-border mergers and foreign branches. The ultimate aim is to enhance confidence in the SM through transparency and up-to-date information and reduce unnecessary burdens on companies. The system will consist of: A core services platform, named "European Central Platform"; The MSs business registers; and the e-Justice portal which will provide an interface serving as European electronic access point to information on companies. The relevance of the BRIS for the SDG is that the system will ensure access at EU level to information on companies registered in the MSs and the exchange of information between different registers. Where the cross-border exchange of evidence is already covered by BRIS, the use of the once-only technical system set up by the SDG Regulation, will not become obligatory.

¹⁵ Source: [https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:32004R0883R\(01\)](https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:32004R0883R(01)) and <https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A32009R0987>

¹⁶ Source: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2014.257.01.0073.01.ENG

¹⁷ Source: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32015R0884>

4.1.2 Non-binding instruments

4.1.2.1 Digital Single Market Strategy¹⁸

COM/2015/0192 final. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions A Digital Single Market Strategy for Europe.

The DSM Strategy was adopted on the 6 May 2015. It includes 16 specific initiatives which have been delivered by the EC by January 2017. The DSM Strategy is built on three pillars: 1) Access: better access for consumers and businesses to digital goods and services across Europe; 2) Environment: creating the right conditions and a level playing field for digital networks and innovative services to flourish; and 3) Economy and Society: maximising the growth potential of the digital economy. The communication states that the EC will include in the new e-Government Action Plan 2016-2020 the extending and integrating EU and national portals to work towards a "Single Digital Gateway" to create a user friendly information system for citizens and businesses. Concretely, the EC proposes to build on the Digital Services Infrastructures of the Connecting Europe Facility and to extend and integrate existing European portals, networks, services and systems (such as Your Europe, Single Points of Contact, Product Contact Points, and Contact Points for Construction Products) and linking them to the SDG.

4.1.2.2 European Interoperability Framework¹⁹

COM/2017/0134 final. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions European Interoperability Framework – Implementation Strategy.

Interoperability is a key factor in making digital transformation possible. It allows administrative entities to electronically exchange, amongst themselves and with citizens and businesses, meaningful information in ways that are understood by all parties. It addresses all layers that impact the delivery of digital public services in the EU, including: legal issues, e.g. by ensuring that legislation does not impose unjustified barriers to the reuse of data in different policy areas; organisational aspects, e.g. by requesting formal agreements on the conditions applicable to cross-organisational interactions; data/semantic concerns, e.g. by ensuring the use of common descriptions of exchanged data; and technical challenges, e.g. by setting up the necessary information systems environment to allow an uninterrupted flow of bits and bytes.

4.1.2.3 EU eGovernment Action Plan²⁰

COM/2016/0179 final. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions EU eGovernment Action Plan 2016-2020. Accelerating the digital transformation of government.

This e-Government Action Plan, in alignment with the DSM Strategy for Europe, aims to remove the existing digital barriers to the DSM and to prevent further fragmentation arising in the context of the modernisation of public administrations. This EU eGovernment Action Plan aims to be the instrument to join up efforts. While MS pursue their own strategies and activities, this Action Plan – based on a shared long-term vision - sets out a number of principles that forthcoming initiatives should observe in order to deliver the significant benefits that eGovernment can bring to businesses, citizens and public administrations themselves. The Action Plan will serve as a catalyst to coordinate public sector modernisation efforts and resources in the field of eGovernment.

¹⁸ Source: <http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1447773803386&uri=CELEX%3A52015DC0192>

¹⁹ Source: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2017:134:FIN>

²⁰ Source: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52016DC0179>

4.2 Organisational view

The Organisational view is defined as the “view that models the most salient ABBs that shall be considered in order to support organisational interoperability among providers and users of a public service”²¹. This view maps the representation of interoperability for organisations that wish to work together towards the delivery of public services.

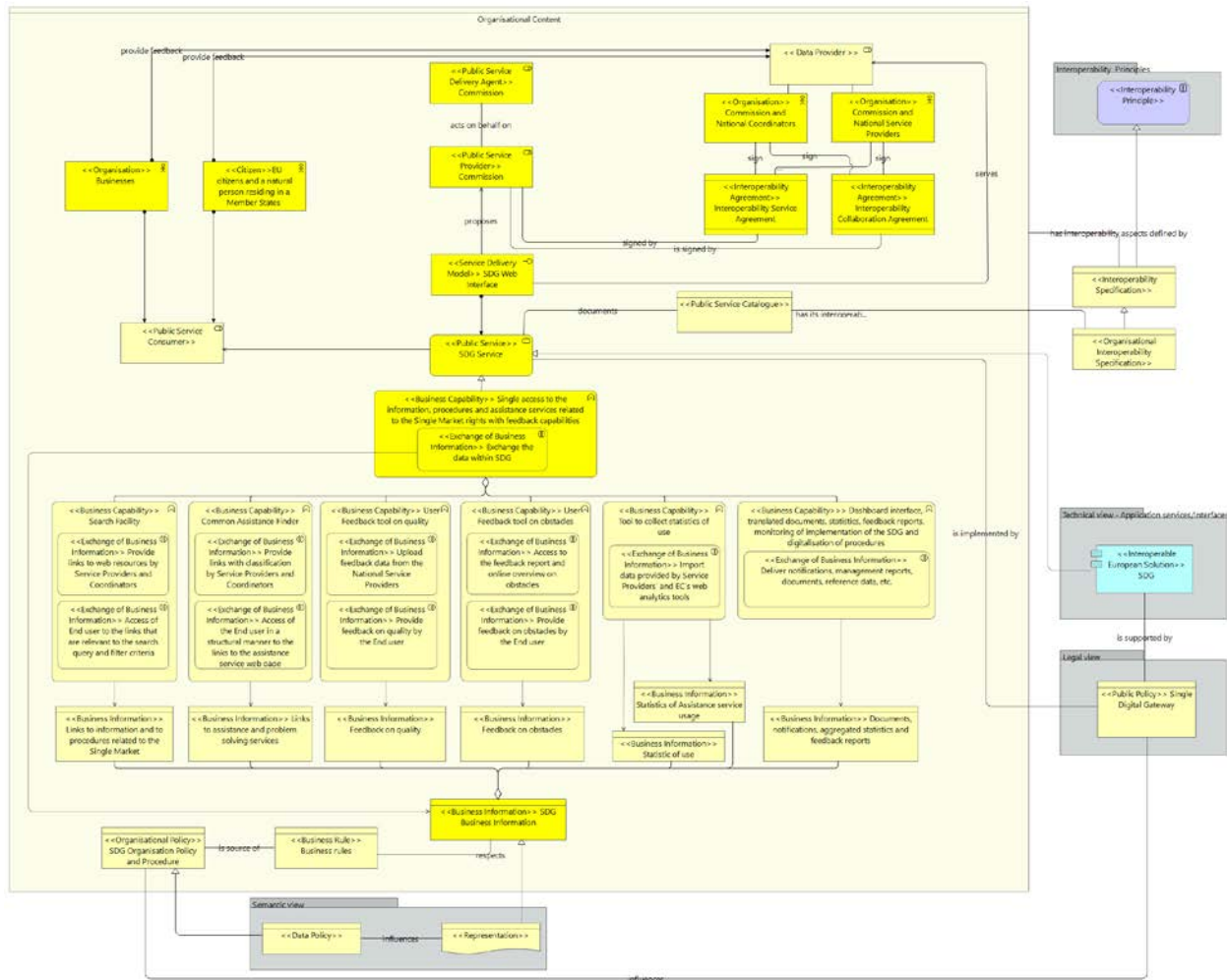


Figure 3: Organisational view ArchiMate® model

The *Public Service Provider*, the *Public Service Consumer* and the *Data Providers* are the main actors in this view:

- The *Public Service Provider* is the Commission by supplying the SDG Service to the users; and as the owner of the technological infrastructure, it also acts as *Public Service Delivery Agent*;
- The *Commission and National Coordinators*, and the *Commission and National Service Providers* are *Data Providers* and provide *Business Information* (i.e. *Links to information*

²¹ Source: EC, <https://joinup.ec.europa.eu/solution/eira>.

and to procedures related to the Single Market and Links to assistance and problem solving services) for the SDG;

- EU citizens and businesses are the *Public Service Consumers* of the SDG *Public Service*. However at the same time they are *Data Providers* by providing *Business Information* (Feedback on quality, Feedback on obstacles).

Rules for the exchange of business data described below between the *Data Providers* (*Commission and National Coordinators and Service Providers*) and the *Public Service Provider* (*Commission*), should be created. The SDG Regulation foresees an implementing act for this purpose. *Business Information* is the representation of business facts and data generated by the *Business Capabilities*, which are the tools composing the SDG.

The second *Interoperability Agreement* is the *Interoperability Service Agreement* that defines rules on the use of the EU Login service provided by the EC .The purpose of the *Interoperability Agreements* is to set rules for each *Data Provider* to submit data that is consistent, in format and content, with the data provided by all others.

The delivery of the *SDG Service* is realised through a *Business Capability* named as *Single access to the information and procedures related to the SM*. This *Business Capability* is composed by other six different business capabilities:

1. Search Facility;
2. Common Assistance Finder;
3. User feedback tool on quality;
4. User feedback tool on the obstacles in the Internal Market (further as user feedback on obstacles);
5. Tool to collect statistics of use, and
6. Dashboard interface providing functionalities like managing of documents for translation (and received translated documents), statistics and feedback reports, monitoring of implementation of the SDG and digitalisation of procedures and management of links. The Dashboard interface will also allow the visualisation and management of User feedback on quality and on obstacles.

These *Business Capabilities* are capacities of the SDG necessary to achieve its specific purpose and outcomes, and they correspond to the IT tools already identified and defined in the business processes deliverable²². The descriptions hereby given of the six *Business Capabilities* therefore are aligned with those already given in the business processes document:

- The *Search Facility* provides access to information on rights, obligations and rules laid down in EU and national laws, information on and links to procedures established at EU or national level in order to exercise those rights and comply with those obligations and rules. The *Search Facility* has access to web links and their descriptive information (i.e. “metadata”) provided by *National Service Providers* and *National Coordinators* via user interface or by an integration capability provided by SDG. These web links could be retrieved by a web crawler that would enrich the descriptive data in order to improve the outcome of the search engine when necessary;
- The *Common Assistance Finder* provides information on and links to assistance and problem solving services. The *Common Assistance Finder* has access to web links and their metadata provided by *National Service Providers* and *National Coordinators* via user interface or by an integration capability provided by SDG. These web links could be

²² See: DLV 02.01 Business Processes - Study on functional, technical and semantic interoperability requirements for the Single Digital Gateway implementation. 2018.

retrieved by a web crawler that would enrich the descriptive data in order to improve the outcome of the search engine when necessary;

- The *User feedback tool on quality* provides a user friendly interface to End users (citizens and businesses) to submit their feedback on the quality of services provided by Service Providers at both, the EU and national levels. Feedback on the quality of national services will also be collected at national levels and then shared with the SDG for consolidation with users' feedback received by the SDG directly;
- The *User feedback tool on obstacles* enables users of the SDG to signal obstacles to their internal market rights. The End user would have the possibility to access to certain information on SM obstacles;
- The *Tool to collect statistics of use* collects statistics of both the SDG and its equivalent portals at national levels in order to provide an overview of the use of the gateway and on the evolution of the gateway's performance;
- The Dashboard presents information in a legible and standardised format and is the user interface for the Application Manager, the Commission Coordinator, the National Coordinator, the Commission Service Provider and the National Service Provider with a different level of granularity according to their permission level. Accordingly, the Dashboard offers an interface for managing users' access and other system configuration as well as providing an interface for analysing and monitoring the data collected or provided by other sources (EU and national level). It would enable users to provide, modify and view the links that will be stored in the repository of links. It could also provide functionality that enable storing, managing and downloading original documents that needs to be translated to any language of Europe Union and their translated versions. Besides translated documents, the reports pre-processed on user feedback and on statistics of use would be stored and shared through the Dashboard.

In order to be provided correctly to the SDG users, the *Business Information* needs to respect some *Business Rules* to ensure quality and fitness to purpose. The *Business Rules* define the representation of the relationships between the input, management and output of the *Business Information* of the SDG. These rules are based on the *SDG Organisation Policy and Procedure*.

The *SDG Organisation Policy and Procedure* should be reflected in the *Interoperability Specification*. The *Interoperability Specification* defines the interoperability aspects of the Organisational content, and it is formulated on the base of the *Interoperability Principles* of EIF focused on the organisational layer. The *SDG Organisation Policy and Procedure* consists of principles, rules, and guidelines formulated within the boundaries that set by <<Public Policy>> Single Digital Gateway defined in the Legal view. Policies and procedures are typically published in a booklet or other form that is widely accessible.

As already mentioned, the Commission and National Coordinators, the Commission and National Service Providers, the citizens and businesses are all *Data Providers* for the SDG. Therefore the exchange of data will proceed between:

- The Commission and National Coordinators, the Commission and National Service Providers and the SDG, and
- The End users (citizens and business) and the SDG.

| Business Capability | Exchange of Business Information | Data Provider and access type to the Business Information |
|----------------------------|---|--|
| Search facility | Provide links to web resources of the Service Providers | Commission and National Service Providers and Coordinators: <ul style="list-style-type: none"> • Provide link sets, |

| Business Capability | Exchange of Business Information | Data Provider and access type to the Business Information |
|-----------------------------------|---|--|
| | | <ul style="list-style-type: none"> • Enrich sets of links, • Accept link sets, • Identify broken links and correct them, • Provide descriptive metadata for the links. <p>Links are the URL (Uniform Resource Locator) of the relevant websites (EU or MSs level) with the descriptive information that is presented to the end user by the search engine as a result of a query.</p> |
| Search facility | Access of End user to the links that are relevant to the search query and filter criteria | The End user is able to make a query providing relevant keywords to the search mechanism and as a result, get a list of relevant links to the relevant web resource(s) on a Service Provider's website, ordered in a way which best match the search criteria. |
| Common assistance service finder | Provide links with classification by Service Providers and Coordinators | <p>Commission and National Service Providers and Coordinators:</p> <ul style="list-style-type: none"> • Provide link sets, • Enrich sets of links, • Accept link sets, • Identify broken links and correct them, • Provide descriptive metadata for the links. <p>Links are the URL to the relevant web resources (EU or MSs level) with pre-defined taxonomy and optional descriptive information that is used by the Common assistance service finder to present these links to the End user as a result of a query or in drop-down lists ordered hierarchically.</p> |
| Common assistance service finder | Access of the End user in a structural manner to the links to the assistance service web page | The End user is able to use the drop-down lists of links with pre-defined taxonomy or make a query to get an access to the relevant list of links to the assistance services web pages on a Service Provider's website. |
| User feedback tool on quality | Upload feedback data from the National Service Providers | The National Service Providers is able to upload user feedback data collected at their level to consolidate the feedback data. |
| User feedback tool on quality | Provide feedback on quality by the End user | The End user is able to provide feedback on the quality of the gateway services. |
| User feedback tool on obstacles | Access to the feedback report and online overview on obstacles | The End user has an access to the publicly available reports and overviews on obstacles. |
| User feedback tool on obstacles | Provide feedback on obstacles by the End user | The End users are able to provide feedback on the obstacles. |
| Tool to collect statistics of use | Import data provided by Service Providers' and EC's web analytics tools | <p>The SDG provides an interface to upload:</p> <ul style="list-style-type: none"> • Statistics on the use of Assistance Services both at EU and national levels, |

| Business Capability | Exchange of Business Information | Data Provider and access type to the Business Information |
|---------------------|--|--|
| | | <ul style="list-style-type: none"> Statistics on the use of both, the SDG and its equivalent portals at national levels. <p>The statistics is collected and used in order to provide an overview of the evolution of the performance of online services.</p> |
| Dashboard | Deliver notifications, management reports, documents, reference data, etc. | Dashboard should enable an overview of the collected information (e.g. repository of links) and the feedback statistics in an easy and user friendly way. It contains of different information: classification, documents for translation, notifications, and statistics. Dashboards for feedback and obstacles could be accessed by users of the SDG with a different level of granularity according to their permission level. |

Table 1: Data exchange overview

More information about the data to be exchanged can be found in [Section 4.3 Semantic view](#).

4.3 Semantic view

The Semantic view is defined as the “view that models the most salient ABBs that should be considered in order to support semantic interoperability of information exchanges between administrations, businesses and citizens”²³.

²³ Source: EC, <https://joinup.ec.europa.eu/solution/eira>.

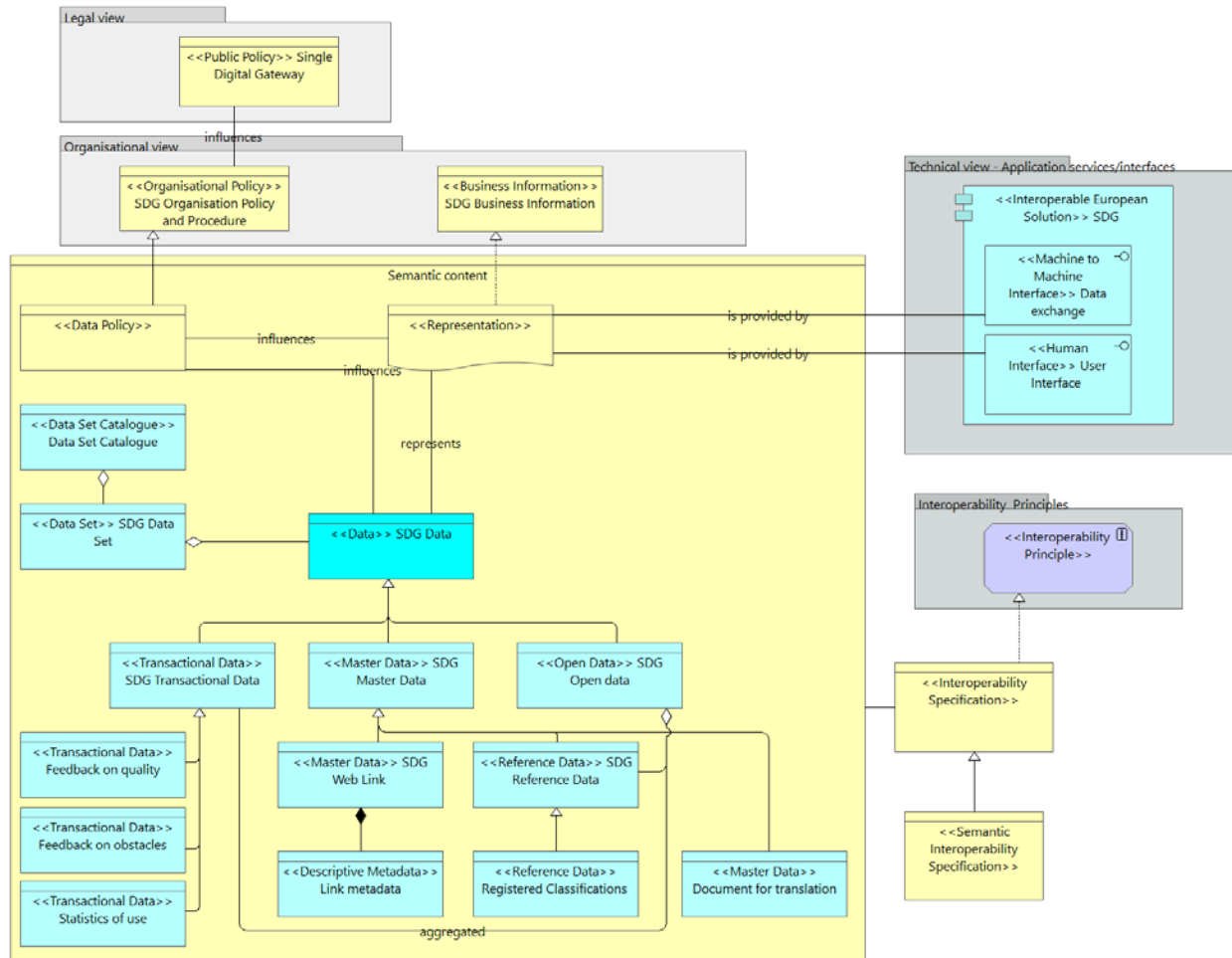


Figure 4: Semantic view ArchiMate® model

The *SDG Business Information* is realised by a *Representation* of *SDG Data*, the *Business Information* is therefore a more concrete and intelligible format to disclose the information expressed by the *SDG Data*. *SDG Data* will be grouped in *SDG Data Sets* which will be documented in *Data Set Catalogues*.

The *SDG Data Set* contains descriptions of different types of data of SDG: web links with their descriptive metadata, statistic of use of EU and national portals, reference data, etc. The *Data Set Catalogue* contains description of *Data Sets*.

The visual *Representation* of *SDG Data* is provided by the *Human Interfaces* of the SDG, while the technical *Representation* of *SDG Data* is provided by *Machine-to-Machine interfaces* of the SDG. This means that the *Representation* of *SDG Data* is defined by the functional requirements to the machine and the user interfaces.

The *SDG Master Data*, *SDG Open Data*, and *SDG Transactional Data* are all “specialisations” of *SDG Data*: they are different types of *SDG Data*.

In the SDG, the *Master Data* are:

- The *SDG Web Links* representing the *Business Information* objects already seen in the Organisational view: “Links to rights, obligations and rules related to the SM” and “Links

to assistance and problem solving services”, and all the metadata associated with them defining their content and characteristics, and

- The *SDG Reference Data*, which is needed to support the SDG data model and provide common data standards (e.g. list of permissible values, classification, etc.). The textual description of link descriptive metadata is also an example of the SDG Reference data. *Registered Classifications Data* is the specialisation of Reference data that provides the classification of *SDG Master Data* and *SDG Transactional data* (e.g. categories of obstacles, list of MSSs’ codes, list of language codes, etc.).

The *Master Data* is critical for the SDG services. It is captured from the Commission and National Service Providers and integrated into a single repository to ensure an easy access to the information requested by the user.

The SDG system should comply with the “Open data” principle, which refers to the idea that all public data should be freely available for use and reuse by others, unless restrictions apply (e.g. for protection of personal data, confidentiality, or intellectual property rights). The SDG solution should follow the “Open data by default” principle (e.g. some statistical data would be open).

The *SDG Transactional Data* represents the following *Business Information* objects already seen in the Organisational view: “Feedback on quality”, “Feedback on obstacles”, “Statistic of use”, and “Document for Translation”. The Transactional data includes the time when the events happened (feedback time, statistic period, etc.). It may also include a reference to the correspondent *Master Data* (i.e. links to information/services and reference data).

All of the *SDG Data* is governed by the *Data Policies*, which are established by the *SDG Organisational Policies and Procedures*, which are in turn influenced by the <<*Public Policy*>> *Single Digital Gateway defined in the Legal view*.

All these ABBs define the semantic content that has a *Semantic Interoperability Specification* associated. The *Interoperability Specification* that defines the interoperability aspects of the Semantic content is formulated on the base of the *Interoperability Principles* of EIF at semantic layer.

4.3.1 SDG Registered Classifications

The SDG Regulation defines the areas of information which are relevant for the citizens and businesses exercising their SM rights, procedures and a list of the assistance and problem solving services. The following figure provides a graphical view on the information defined in annexes to the SDG Regulation:

List of areas of information, procedures and the assistance and problem solving services relevant for citizens and business exercising their Single Market rights

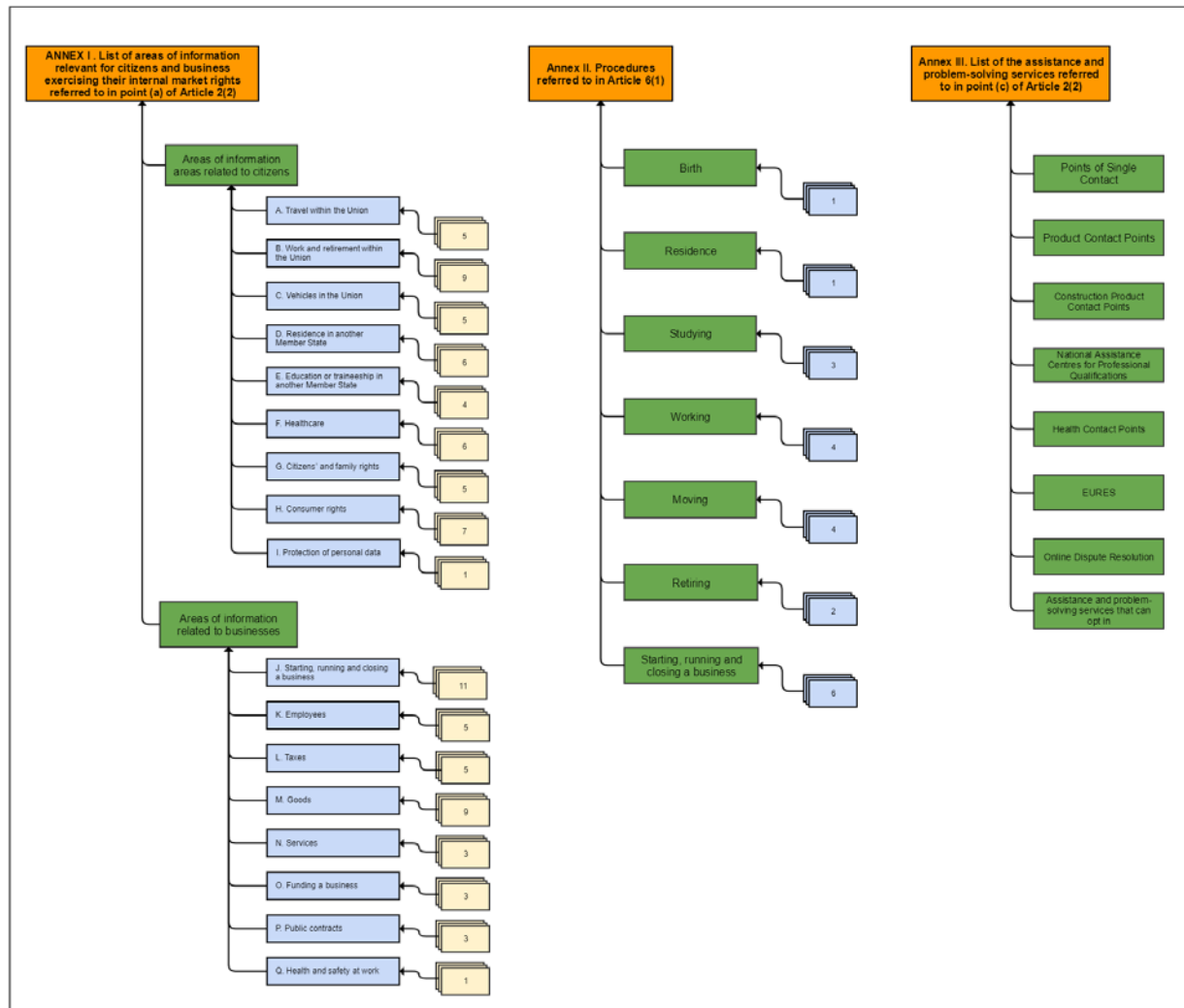


Figure 5: Areas of information, procedures and assistance and problem solving services

The information areas and procedures described above could be used as a basis for the SDG registered classification. The SDG should support different depth of classification, and it should enable the enhancement of the classification in width and depth if necessary. And besides, the possibility of amending the list of these areas (e.g. there could be more assistance and problem solving service than just those listed in Annex III) should be taken into account. This registered classification should be in all 24 official EU languages. The SDG registered classification could be used for links classification, feedback on quality and feedback on obstacle categorisation.

4.3.2 SDG Web Link

Links to online web resources is critical data for the SDG. There are two types of links: links to the information and to the procedures, and links to the assistance and problem solving services. On the data level, the difference between these two types of links is that the classifications are mandatory for links to the assistance and problem solving services (deep linking) in order to enable guided search by the users. At the same time these classification attributes can be used

for contextual search. Therefore, the classification is desirable but not compulsory for the links to the information and to the procedures laid down in the SDG Regulation.

However, both types of links should be stored in the SDG Link Repository and could be presented in the contextual search result. From a data representation and data structure perspective there is no big difference between links to information and to procedures and links to assistance and problem solving services. This section describes the data structure for both types of links.

During data exchange, there is a need for common identifiers for the resources and the use of URIs (Uniform Resource Identifier) is the mean to assign unique and global identifiers. A URI is a sequence of characters designed for unambiguous identification of a resource. An URI can be classified as a URL (locator), a URN (name), or both and have the advantage that can be dereferenced²⁴, it means that when an actor (human or machine) make a request to a specific URI it can receive a distinct response back (e.g. For the same URI, a web browser will get an human readable HTML document, while a RDF client will get a RDF).

Because of the need of a reliable persistent URI policy with satisfactory service level, including long-term persistence, resolvability, response times, and information quality, is highly recommended the analysis of the use of PURIs (Persistent Uniform Resource Identifiers)²⁵. The use of PURI service can help to improve semantic interoperability based on a common policy for the management of persistent HTTP-based URIs of EU institutions.

A Service Provider may operate several websites and it may be a MS or EU institution. The MSs appoint their National Coordinators who will, *inert alia*, act as Service Provider Coordinators. The Coordinator supports the Service Providers within its competence and approves the information provided by them. One Coordinator may be accountable for all the Service Providers of its own MS. A MS may have internally multiple Service Providers and multiple Coordinators, but for contacts with the Commission they appoint just one national coordinator in respect of all matters relating to the gateway²⁶. The Commission will also need to organise its coordination structure, including the task of coordinating the Commission Service Providers.

The following figure presents the hierarchy of the web resources' information:

²⁴ Information resources typically have one or more representations that can be accessed using HTTP. The act of retrieving a representation of a resource identified by a URI is known as dereferencing that URI. <https://www.w3.org/2001/tag/doc/httpRange-14/2007-08-31/HttpRange-14>

²⁵ European Commission. Joinup. EU Institutions define a common Persistent URI Service. <https://joinup.ec.europa.eu/node/157234>

²⁶ SDG Regulation, Art. 28.

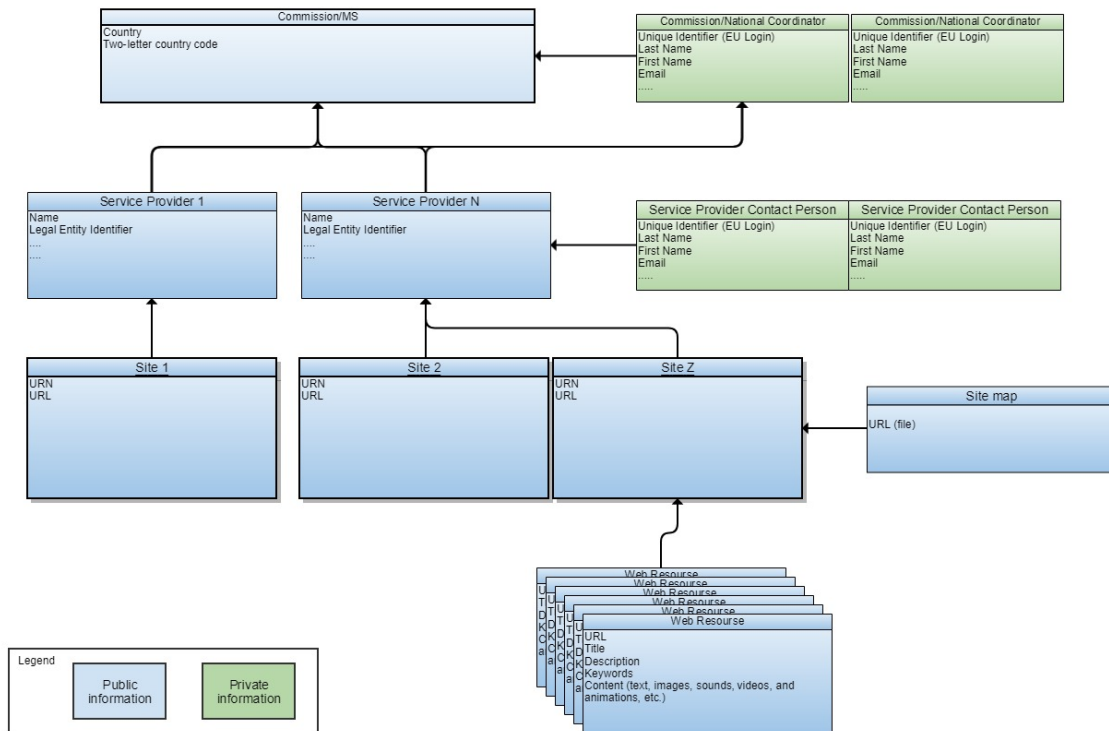


Figure 6: Web links information hierarchy

The Service Provider could provide metadata (data that provide information about other data) with the links to its online information, procedures and services. The metadata together with the link should be stored with the purpose of enabling the system to search and present the web resource (i.e. the link to the resource and some data associated with it, for example the type of page, etc.) to the End user that performed the query. It can contain structured and non-structured information.

Taking into account the information presented in **Figure 5** and **Figure 6**, the link data contains three type of descriptive information:

- Link identification data;
- Link classification metadata;
- Link content metadata.

The link identification data may contain the following attributes: URL, Secondary Name attribute, modification date, language, priority, Service Provider, etc. It is necessary for any link to identify (automatically) the Service Provider in order to find out the Service Provider's contact person(s), and the Commission and National Coordinators who have an access to modify the data of the links.

The link identification data may be also used as source data for crawling and indexing, confirmation and notification processes. The link identification data may be used for filtering the search results (for example by MS and language).

The link classification metadata is extremely relevant and recommended, but not mandatory. It is composed by a registered classification (taxonomy) and a determined hierarchy (as it is presented in the **Figure 5** above). The classification metadata, when provided, should be validated against a registered classification and should take the values from a controlled vocabulary. This data, may be used by the Search Facility and the Common Assistance Finder to increase the relevancy of the result provided to the End user on the execution of a search request. For the search facility and common assistance finder, the link classification metadata can be provided at the moment the link is added to the link repository through a manual insertion.

The Common Assistance Finder, can use the classification data of links in order to implement a guided search for the end user. Matching classifications, should have a highest priority for the assistance finder because the classification data offers the most accurate description of the web resource provided by the Service Provider.

4.3.3 Crawling

The crawling procedure is considered in the data architecture because it would enlarge and enrich the SDG Master Data. The purpose of the crawling is to find out the missing data when the Service Provider does not provide a complete data set. Crawling is possible through self-descriptive data provided by web resources and to the text analysis of web page content.

Web crawling can be used to discover web resources dynamically. It is possible to receive descriptive information from the site and from the web resource itself using content analysis. Web crawling and indexing will allow to find information on links in the web page and fill the Link Repository with descriptive information about links.

In order to identify a set of URLs in the site the web crawler can start in the root page, extract content, identify all the hyperlinks (URLs) in the page and finally add them to the list of URLs to visit them recursively. This operation is called “recursive crawling”.

It should be noted that the crawler reads the content of the web pages and consumes' resources on visited systems, which may result in deterioration of the functioning of visited systems. To avoid such a scenario, the crawler should have a scheduler. The scheduler includes a history log containing link identifiers (URLs), and it is configured to process each web link depending on the modification frequency of its content.

The possible variants of link data provided by the Service Provider are:

- Link for recursive crawling ("root page" of public portal);
- Link for non-recursive crawling (link to particular web resource relevant to SM information, but without metadata);
- Link for non-recursive crawling with classification metadata but without content metadata;
- Link with complete metadata (no crawling will be necessary).

The website may contain a sitemap that facilitates the discovery of the website by search engines. A sitemap is an xml-file containing a set of URLs of web pages and optionally their modification date, priority and modification frequency. The sitemap can be used to index only certain parts of a website. It should be noted that the sitemap protocol is open for extensions and new elements to the sitemap could be added. The crawling of a sitemap is similar to the case of a link for non-recursive crawling.

4.3.4 User feedback on quality

User feedback on quality should be connected with the concrete online service. The feedback could contain several dimensions, e.g. access, responsiveness, understanding, completeness, competence, etc. Therefore the feedback on quality could have the following structure:

- Internal identifier (sequence number);
- Link identifier (URL);
- The values of the dimensions addressed (one value for each dimension);
- Text description.

The internal identifier, link identifier and values are mandatory, text description is optional.

The SDG should also provide machine interface to upload aggregated feedback data from Service Providers. Aggregated data has a similar structure: link identifier, average value for each dimension, and number of feedback.

4.3.5 User feedback on the obstacles

The collected user feedback on obstacles, provides input for consultation, statistical analysis and the basis for management decisions. For the categorisation of the user feedback on obstacles, can be used the same SDG registered classification that is defined for the links classification (more information in the section **4.3.1 SDG Registered Classifications**). This will enable a better analysis of current state in a certain area in a structured way. Therefore the stored feedback on obstacle could be defined with the following structure:

- Internal identifier(sequence number);
- Hierarchical classifications (e.g. Country, category of obstacle, type of complainant);
- Text description.

The internal identifier is mandatory and created automatically by the system. The classification and text description are visible and available to the End user. At least, the classification needs to be filled by the user before submitting the feedback.

4.3.6 Statistic of use

There are two types of statistic of use that should be stored in the SDG: statistics of use provided by a web analytics tool or statistics of use provided by Service Providers' IT systems related to assistance and problem solving services or procedures.

The Statistics of use provided to the SDG by a web analytics tool (*Piwik*, *Google Analytics* or any other) may include aggregated data in different dimensions:

- User (visitor) data;
- Session data;
- Traffic source data;
- Page tracking data;
- Etc.

Statistics on the usage of the assistance service or procedure include aggregated data in the following dimensions:

- Number of applications (requests for assistance, launch of procedure);
- Subject matter of requests;
- Average response times;
- Maximum response times;

DLV02.02 – Architecture

- Etc.

The SDG stores this data and creates consolidated reports with the purpose of improving the quality and performance of the services and portals.

4.4 Technical view

The Technical view of the EIRA is defined as the “view that contains application ABBs that need to be considered in order to support technical interoperability when building an Interoperable European Solution”²⁷. This view is built on the technical interoperability level of EIF. In order to simplify the diagrams, the model has three technical views: Technical view – Application services/interfaces, Technical view – Interoperability enablers, and Technical view – Infrastructure. The ABBs identified in the Technical view are 101. These are the most salient ABBs that need to be considered in order to support the technical interoperability of the solution.

4.4.1 Technical view – Application services/interface

The following figure presents the Technical view – Application services/interfaces view, which is a Technical view that contains application services and application interfaces that should be provided by the *Interoperable European Solution*.

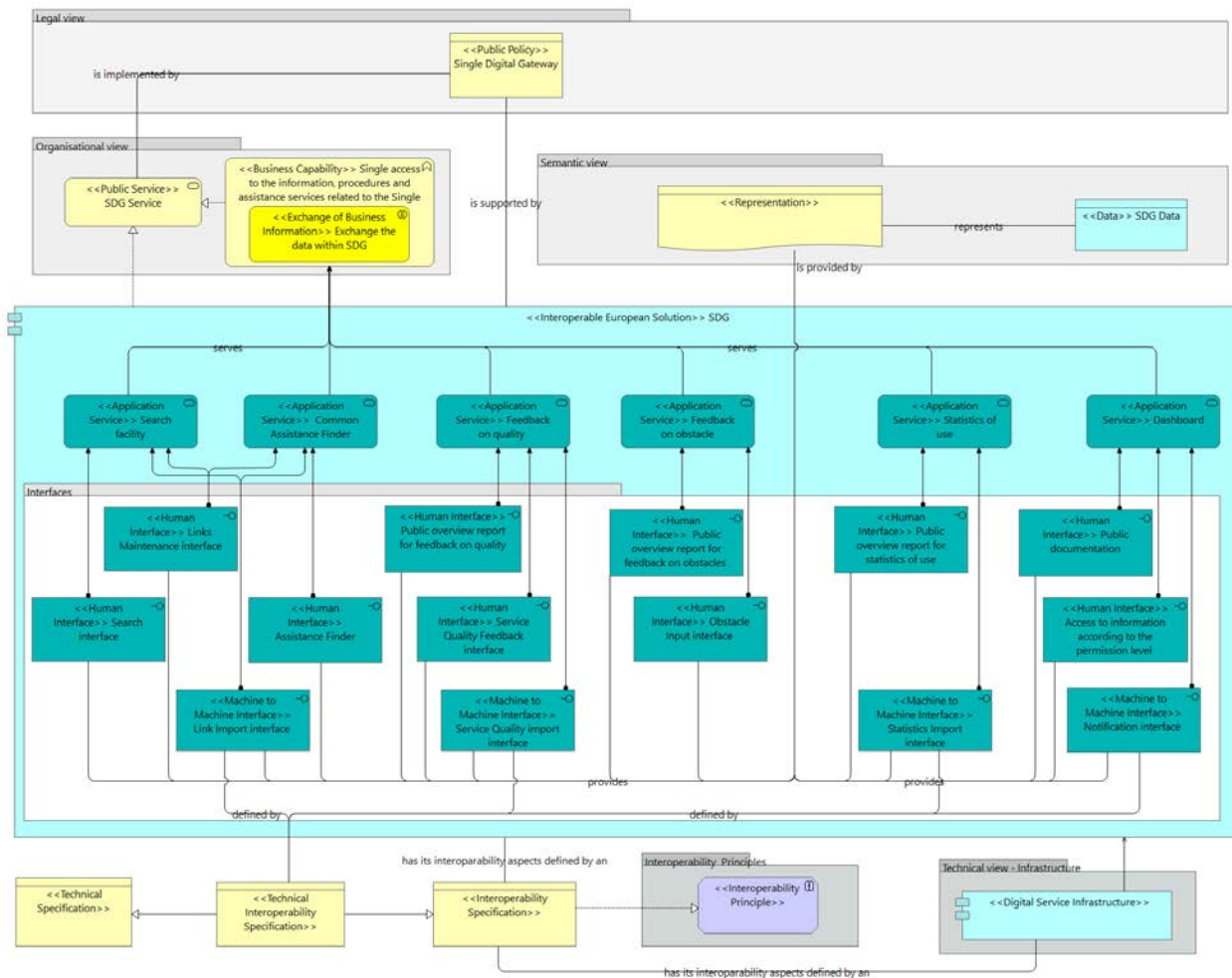


Figure 7: Technical view – Application services/interface ArchiMate® model

²⁷ Source: EC, <https://joinup.ec.europa.eu/solution/eira>.

The *SDG* is an *Interoperable European Solution*, it is a composite application and contains six *Application Services* that support the corresponding *Business Capabilities* already identified in the Organisational view.

An *Application Service* is a service with a description, contract and policies that define the functionality of its component to serve the *Business Capabilities*. The *Application Services* of the *SDG* are:

- *Search facility* processes the End user input query expressed as text. The service returns the set of relevant web links to EC and/or national websites;
- *Common Assistance Finder* that provides the End users with relevant web links to assistance and problem-solving services offered by the Commission and the Member States authorities;
- *Feedback on quality* allows the End user to provide feedback on the quality of the gateway in an anonymous and a structured way (structured amount of data) and/or expressed as a free text. Furthermore, this application service provides capability to create reports and overviews of the data collected;
- *Feedback on obstacles* allows the End user to provide anonymous feedback on an obstacle encountered in a structured way (structured amount of data) and/or expressed as a free text. Furthermore, this application service provides capability to create reports and overviews of the data collected;
- *Statistics of use* allows the National Service Provider to import aggregated statistics from the national levels. Furthermore, this application service provides capability to create reports and overviews of the data collected;
- The *Dashboard* provides access to information in a legible and standardised format and a user interface for all the users with a different level of granularity according to their permission level. Authorities will be using the system in a management perspective and with write access to manipulate data (limited by the permissions) while general public will have access only to documentation and reports that are publically available. The *SDG* will also allow authorities to monitor the implementation of the *SDG* and digitalisation of procedures, access to statistics and reports, an interface to request and access translated documents and the management of the links available in the repository of links.

An *Application Service* is implemented by application functions that are performed by an *Application Component*. Therefore, each and every one of the *SDG Application Services* is realised by the correspondent *Application Component*.

An *Application Component* performs one or more application functions and represents an explicitly defined shared application behaviour. It encapsulates its contents: its functionality is only accessible through a set of *Application Interfaces*.

An *Application Interface* specifies how the functions of a component can be accessed by other components and enables the exchange of data between *Application Services*. The same *Application Service* may be exposed through different *Application Interfaces*. The EIRA distinguishes two types of interfaces: Machine-to-Machine and Human-to-Machine, according to whether the information is exchanged, respectively, between two IT systems or between an IT system and its users.

The *Application Interfaces* of the six *Application Services* are:

- For the *Application Service – Search Facility* and for the *Application Service – Common Assistance Finder* there are the Machine-to-Machine interface *Link Import interface* and the Human interface *Links Maintenance interface*. The *Link Import interface* enables the

exchange of link data between non-human actors, especially between the SDG and the IT systems of Commission and National Service Providers and Coordinators. These IT systems should be able to provide links with descriptive data to the SDG. The Human-to-Machine interface *Links Maintenance interface* enables the users (Commission and National Service Providers and Coordinators) to maintain (i.e. add/update/delete) link data. Both interfaces store links' data in the Link Repository of the SDG and these links are used in both Application Services;

- For the *Application Service – Search Facility*, the Human interface is the *Search interface* that supports citizens and businesses and provides online read-only access to the requested data;
- For the *Application Service – Common Assistance Finder*, the Human interface is the *Assistance finder* that supports citizens and businesses and provides online read-only access to the requested data;
- For the *Application Service – Feedback on quality*, the Machine-to-Machine interface is the *Service Quality import interface* (to import feedback data collected at the national levels). The two Human interfaces are the *Service Quality Feedback interface* that enables citizens and businesses to leave feedback and the *Public overview report for feedback on quality interface* that provides end users an online access to published feedback overview reports;
- For the *Application Service – Feedback on obstacles*, the two Human interfaces are the *Obstacles input interface* and the *Public overview report for feedback on obstacles*;
- For the *Application Service – Statistics of use*, the Machine-to-Machine interface is the *Statistics import interface*, the Human interface is the *Public overview report for statistics of use* ; and finally,
- For the *Application Service – Dashboard*, the Machine-to-Machine interface is the *Notification interface*, while the two Human interface is the *Access to information according to the permission* and the *Public documentation*.

The high-level data flows for Human interfaces are defined in the Business processes document²⁸.

The table below contains high-level data flows for machine-to-machine interfaces.

²⁸ See: DLV 02.01 Business Processes - Study on functional, technical and semantic interoperability requirements for the Single Digital Gateway implementation. 2018.

| Interface | High level data flow |
|--|---|
| Link Import interface (to information and to procedures and assistance services) | <p>The process is started by the Commission or National Service Provider, which sends a request to the SDG to upload a link or a set of web links to the Link Repository. The request should contain the following business data:</p> <ul style="list-style-type: none"> • Service Provider code, • Links with metadata which may contain classifications. <p>The SDG should:</p> <ul style="list-style-type: none"> • Verify the authenticity of the requests, • Verify the content of the request, • Store the data (sent links), • Send a notification (acknowledgement) to the Service Provider that the data has been stored successfully. <p>If any of the checks (e.g. TLS certificates verification, content structure) fails, the procedure must be aborted and an error should be raised. The SDG should log all data exchanges, regardless of whether it was successful or unsuccessful.</p> |
| Statistics of Quality Import interface | <p>The process is started by the Service Provider, which sends a request to the SDG to upload quality feedback statistics. The request should contain:</p> <ul style="list-style-type: none"> • Service Provider code, • Aggregated feedback on quality. <p>The SDG should:</p> <ul style="list-style-type: none"> • Verify the authenticity of the requests, • Verify the content of the request, • Store the data, • Send a notification (acknowledgement) to the Service Provider that the data has been stored successfully. <p>If any of the checks (e.g. TLS certificates verification) fails, the procedure must be aborted and an error should be raised. The SDG should log all data exchanges, regardless of whether it was successful or unsuccessful.</p> |
| Statistics of Use Import interface | <p>The process is started by the Service Provider, which sends a request to the SDG to upload statistics (both the assistance service statistics and statistic of portal use). The request should contain:</p> <ul style="list-style-type: none"> • Service Provider code, • Aggregated statistics data <p>The SDG should:</p> <ul style="list-style-type: none"> • Verify the authenticity of the requests, • Verify content of the request, • Store the data, • Send a notification (acknowledgement) to the Service Provider that the data has been stored successfully. <p>If any of the checks (e.g. TLS certificates verification) fails, the procedure must be aborted and an error should be raised. The SDG should log all data exchanges, regardless of whether it was successful or unsuccessful.</p> |

| Interface | High level data flow |
|------------------------|--|
| Notification interface | <p>The process is started by the SDG, which sends a notification message according to the requirements of the appropriate notification protocol. The business attributes of the notification message should at least consist of:</p> <ul style="list-style-type: none"> • Delivery address (list of addresses), • Content (e.g. text) of the notification. <p>After sending the message the SDG should change the status of the notification and store the timestamp in a log.</p> |

Table 2: Data flows for machine-to-machine interfaces

Each of the Machine-to-Machine interfaces is defined by the *Technical Interoperability Specification*, which is part of the *Interoperability Specification*.

The *Interoperability Specification* that defines the interoperability aspects of the SDG applications is formulated on the base of the *Interoperability Principles* of EIF at semantic and technical layer, and in some cases at organisational layer.

4.4.2 Technical view – Interoperability enablers

The following figure presents the Technical view – Interoperability enablers, which complements the Technical view – Application services/interface with the most salient application components and interoperable enablers, which shall be considered in order to facilitate technical interoperability when developing an Interoperable European Solution.

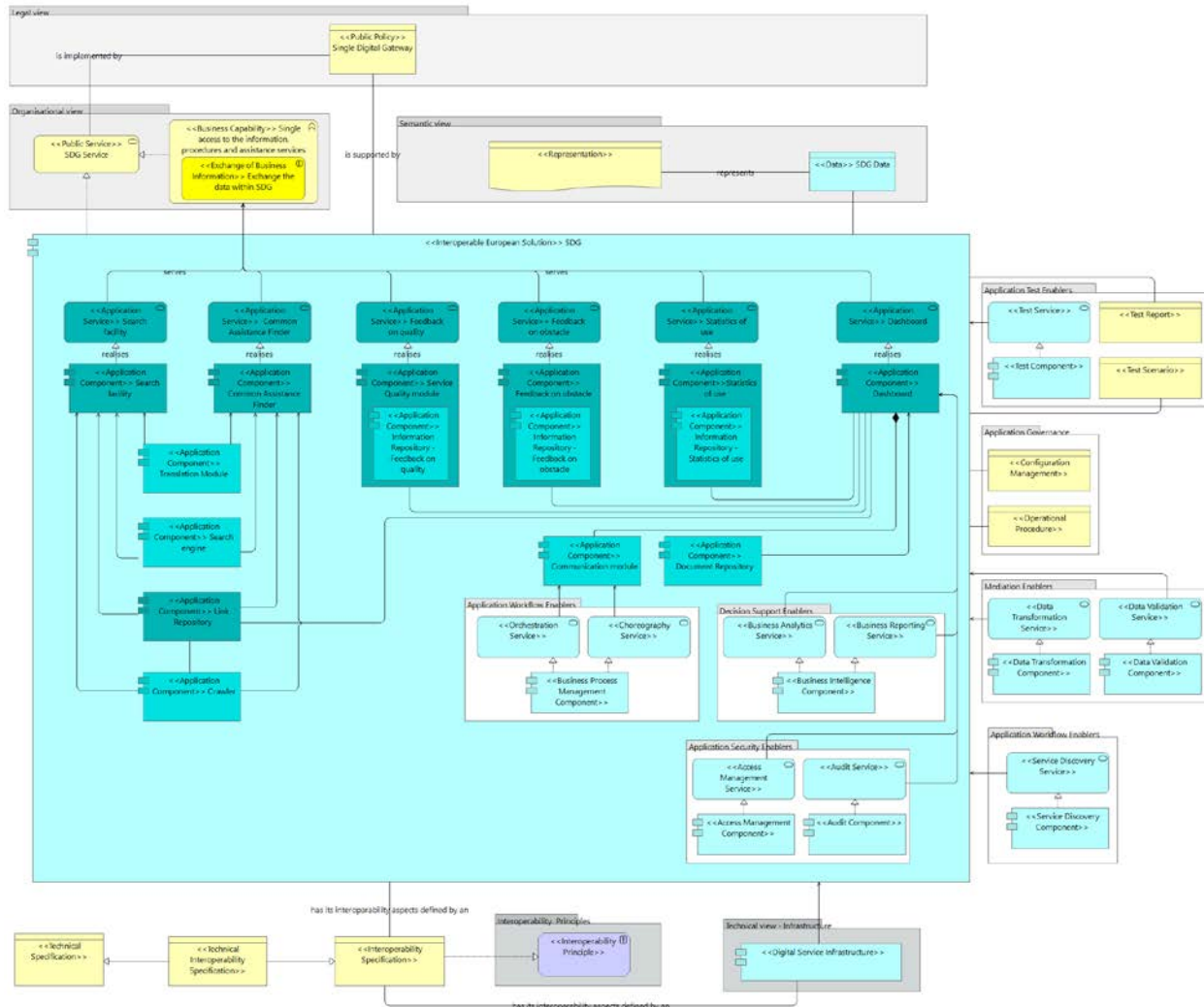


Figure 8: Technical view – Interoperability enablers ArchiMate® model

The view provides information about application components and services and about the relations between them. The *Interoperable European Solution SDG* consists of six main Application Components that provide services and are visible to actors or other IT systems:

- The *Search facility* component provides the service of returning the set of relevant web links to the Commission and/or to the national websites as a result of a query expressed in a text format. The service translates the query into English and other relevant languages to include results to links in all 24 official EU languages;
- The *Common Assistance Finder* component provides a service to enable the End user to use the drop-down lists of links with a pre-defined taxonomy or alternatively, to input a

query to access the relevant list of links to the assistance services web pages on a Service Provider website;

- The *Service Quality module* implements the Feedback on quality service and allows the End user to provide feedback on an obstacle anonymously or allows the Service Provider to import the statistics data aggregated from their portals/pages. The Service Quality module contains the *Information Repository - Feedback on quality* application component that keeps the feedback data and enables to create reports and an overview for the data collected;
- The *Feedback on obstacle* implements the Feedback on obstacle service that allows the End user to provide feedback on an obstacle anonymously as a structured amount of data and/or expressed as free text. The Feedback on obstacle also contains the *Information Repository - Feedback on obstacle* application component that keep the feedback data and enables to create reports and an overview for the data collected;
- The *Statistics of use* allows the National Service Provider to import statistics aggregated at their national level. The Statistics of use also contains the *Information Repository - Statistics of use* application component that keeps the statistics data and enables to create reports and an overview for the data collected;
- The *Dashboard* provides access to information in a legible and standardised format and a user interface for all the users with a different level of granularity according to their permission level. The SDG allow registered users to monitor the implementation of the SDG and digitalisation of procedures, access to statistics and reports, an interface to request and access translated documents and the management of the links available in the repository of links.

Additionally, the SDG contains application components considered as core functionality and extremely relevant for the operation of the entire system and in particular, for the six application services described above.

- The *Link Repository* is the database of links with metadata provided by Coordinators and Service Providers. The Link Repository is used by the *Search facility* and *Common Assistance Finder* components. The *Dashboard* supports link data change processes which enable the Commission and National Service Providers and Coordinators to provide and control the quality of the link data in the Link Repository;
- The *Search engine* provides a contextual search that works on the links' data stored in the Link Repository. The Search engine is also used by the *Search facility* and *Common Assistance Finder* components;
- The *Translation Module* provides the Machine Translation service to the query entered by the End user in all 24 official EU languages. The service is used by the *Search facility* and *Common Assistance Finder*;
- The *Crawler* crawls URLs from the Link Repository and adds new links as a result of the recursive crawling. The Crawler extracts additional information to index the links in the Link Repository and is able to identify broken links;
- The *Document management* component stores and share documents for translations. The component supports the Dashboard;
- The *Communication module* provides a functionality to support the automation of business processes for the Commission and National Coordinators and Service Providers. The component supports the Dashboard.

During the design and development phases it should be checked if the *Interoperability Enablers* used in the SDG (e.g. Business Process Management application component) are present in the Cartography database of the EC, and in such case, if they exist as Solution Building Blocks (SBB) too. This verification should be done to avoid unnecessary redundancy and duplication of the application platforms and services, and to share (or reuse) existing functionalities between application components.

The following components, services and data support the whole SGD solution:

- The *Test Component* provides the *Test Service* in order to implement test automation with a structured and modular approach. Data from testing activities are subsequently consolidated in the *Test Report*;
- The *Configuration Management* and the *Operational Procedure* define the processes of governance of the SDG solution, how the solution should be delivered and the rules for operating it;
- The *Data Transformation Component* and the *Data Validation Component* that implement the *Data Transformation Service* and the *Data Validation Service*, share the functionality of conversion of one data format to another and the validation of the data,
- The *Service Discovery Component* and the *Service Discovery Service* allow to provide machine-processable descriptions of services and enable to find the necessary service-related resources.

However there are several ABBs that support particular application components of the SDG:

- The *Business Process Management Component* is used to coordinate the behaviour of Commission and National Coordinators and Service Providers, and it provides the services that serve the Communication module of the SDG;
- The *Business Intelligence Component* provides the *Business Reporting Service* and the *Business Analytics Service* that are used to create the reports for the Dashboard and to facilitate business decision-making;
- The *Access Management Component* and the *Audit Component* provide the *Access Management Service* and the *Audit Service* that ensure that only authorised users are able to access or modify the assets and share the audit functionality.

4.4.3 Technical view – Infrastructure

The Technical view – Infrastructure provides an architecture content metamodel for the most salient cross-sectorial infrastructure services, along with the supporting hosting and networking facilities, which shall be considered in order to support technical interoperability when building an Interoperable European Solution. The difference with the application part of the Technical view is that the ABBs in the infrastructure view are considered to be relevant for solutions in any sector of government²⁹.

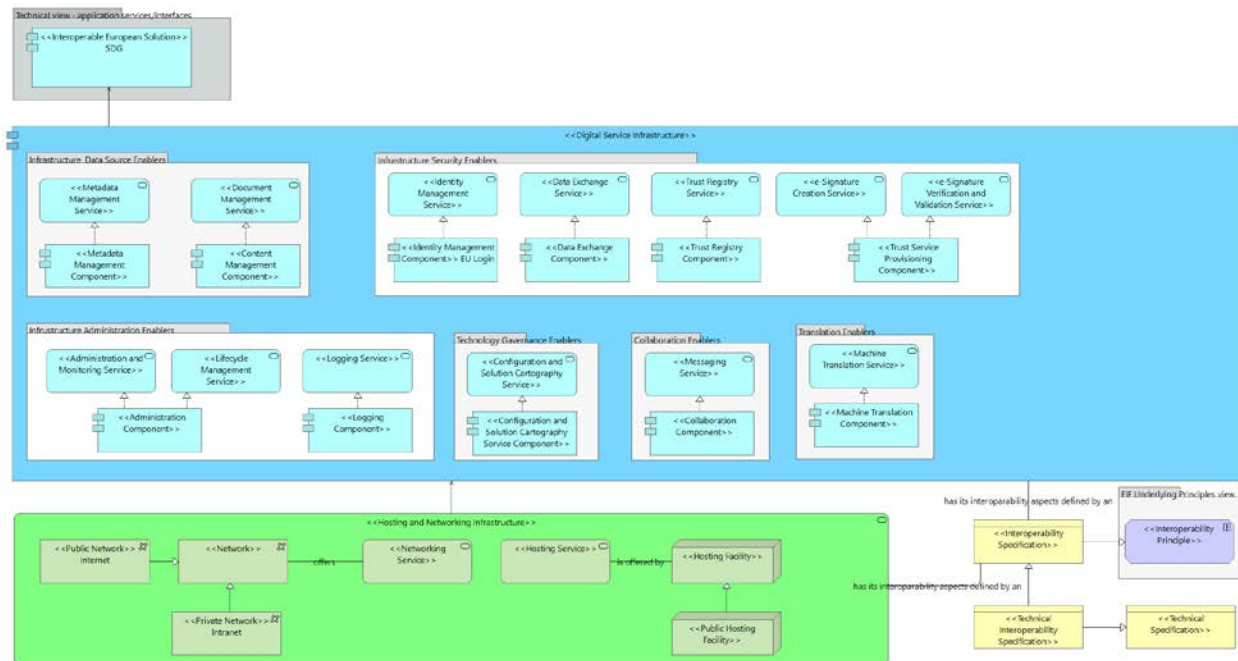


Figure 9: Technical view – Infrastructure ArchiMate® model

The *SDG solution* and its application components will make use of a cross-sectorial DSI.

The DSI provides several features:

- **Access to data** through *Infrastructure Data Source Enablers* such as *Metadata Management Service* and *Component* (to process the metadata in the web links repository) and the *Document Storage Service* and *Component* (to store and manage Documents for translation);
- **Security of data access and exchanges** through the *Infrastructure Security Enablers* such as the *Identity Management Service* (the shared component used is the *EU Login*), the *Data Exchange Service* and *Component* (to enable the secure exchange of messages between the SDG and other systems at EU and national level), the *Trust Registry Service* and *Component* (to have the essential information about issuing electronic certificates), and finally the *Trust Service Provisioning Component* (to create, verify, and validate electronic signatures based on electronic certificates and to secure the communication on both content and transport layers in line with EU legislation and standards);
- **Administration powers to authorised users** through the *Infrastructure Administration Enablers* such as the *Administration Component* (to monitor and manage services of the SDG) made of the *Administration and Monitoring Service* and the *Lifecycle Management*

²⁹ Source: EC, <https://joinup.ec.europa.eu/solution/eira>.

Service, and the *Logging Service and Component* (to trace all events and user actions having an impact on the SDG data),

- **Governance over the technology** through the *Technology Governance Enablers* such as the *Configuration and Solution Cartography Service and Component* (to document the architecture of the SDG solution);
- **Possibility to communicate within the SDG** through the *Collaboration Enablers* such as the *Messaging Service* (to exchange messages between the applications at the EU or national levels and the SDG, and between the SDG and the users, e.g. notifications);
- **Possibility to translate documents** through the *Translation Enablers* such as the *Machine Translation Service and Component* (to translate the metadata in compliance with the EuroVoc vocabulary³⁰).

The SDG and the DSI will be deployed and operated through the *Hosting and Networking Infrastructure's* technology services such as the *Public Network (Internet)*, the *Private Network (Intranet)* and the *Networking Service* that offers a *Network* common to the two, and the *Hosting Service*, offered by a *Public Hosting Facility* (the hosting infrastructure of the SDG solution).

The ABBs defined in both the DSI and the Hosting and Networking Infrastructure have their interoperability aspects defined by an associated *Interoperability Specification*, of which the *Technical Interoperability Specification* is specific exclusively to the ABBs listed in the Technical view. The *Interoperability Specification* that defines the interoperability aspects of the Hosting and Networking Infrastructure and of the DSI, is formulated on the bases of the *Interoperability Principles* of EIF.

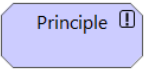
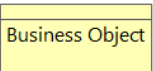
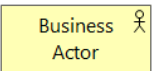
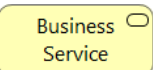
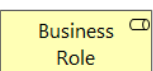
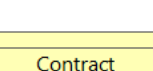
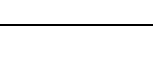
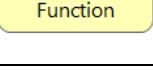
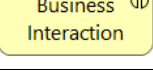
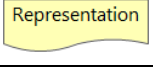
³⁰ Source: EC, EuroVoc – Multilingual Thesaurus of the European Union. Available: <http://eurovoc.europa.eu/drupal/?q=abouteurovoc>

5 Annexes

5.1 Annex 1: ArchiMate® notation

5.1.1 ArchiMate® model concepts

The SDG model presented in this document uses the following ArchiMate model concepts:

| Element | Definition (the ArchiMate 3.0.1 Specification, the Open Group Standard ³¹) |
|---|---|
|  Principle | A requirement represents a statement of need that must be met by the architecture. |
|  Business Object | A concept used within a particular business domain. |
|  Business Actor | A business actor is a business entity that is capable of performing behaviour. |
|  Business Service | A business service represents an explicitly defined exposed business behaviour. |
|  Business Role | A business role is the responsibility for performing specific behaviour to which an actor can be assigned or the part an actor plays in a particular action or event. |
|  Contract | A contract represents a formal or informal specification of an agreement between a provider and a consumer that specifies the rights and obligations associated with a product and establishes functional and non-functional parameters for interaction. |
|  Business Function | A business function is a collection of business behaviour based on a chosen set of criteria (typically required business resources and/or competencies), closely aligned to an organization, but not necessarily explicitly governed by the organization. |
|  Business Interaction | A business interaction is a unit of collective business behaviour performed by (a collaboration of) two or more business roles. |
|  Representation | A representation represents a perceptible form of the information carried by a business object. |
|  Application Component | An application component represents an encapsulation of application functionality aligned to implementation structure, which is modular and replaceable. It encapsulates its behaviour and data, exposes services, and makes them available through interfaces. |

³¹ Source: The Open Group. ArchiMate® 3.0.1 Specification. Available <http://pubs.opengroup.org/architecture/archimate3-doc/toc.html>

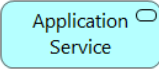
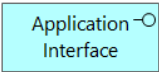
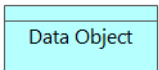


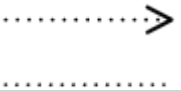
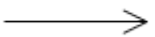





| | |
|---|--|
|  | An explicitly defined exposed application behaviour. |
|  | An application interface represents a point of access where application services are made available to a user, another application component, or a node. |
|  | Data structured for automated processing. |
|  | An explicitly defined exposed technology behaviour. |

Table 3: ArchiMate model concepts

5.1.2 ArchiMate® relationships

The SDG model presented in this document, uses the following ArchiMate relationships:

| Structural Relationships | | Notation |
|--------------------------|--|---|
| Association | Association models a relationship between objects that is not covered by another, more specific relationship. |  |
| Access | The access relationship models the access of behavioural concepts to business or data objects. |  |
| Used by | The used by relationship models the use of services by processes, functions, or interactions and the access to interfaces by roles, components, or collaborations. |  |
| Realization | The realization relationship links a logical entity with a more concrete entity that realizes it. |  |
| Assignment | The assignment relationship links units of behaviour with active elements (e.g., roles, components) that perform them, or roles with actors that fulfil them. |  |
| Aggregation | The aggregation relationship indicates that an object groups a number of other objects. |  |
| Composition | The composition relationship indicates that an object is composed of one or more other objects. |  |
| Dynamic Relationships | | Notation |
| Flow | The flow relationship describes the exchange or transfer of, for example, information or value |  |


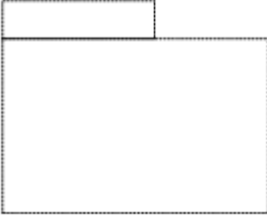


| | | |
|----------------------------|---|---|
| | between processes, function, interactions, and events. | |
| Triggering | The triggering relationship describes the temporal or causal relationships between processes, functions, interactions, and events. |  |
| Other Relationships | | Notation |
| Grouping | The grouping relationship indicates that objects, of the same type or different types, belong together based on some common characteristic. |  |
| Junction | A junction is used to connect relationships of the same type. |  |
| Specialization | The specialization relationship indicates that an object is a specialization of another object. |  |

Table 4: ArchiMate relationships

5.2 Terms and acronyms

5.2.1 Glossary

| Term | Description |
|---------------------------|---|
| Assistance Service | EU-level or national-level services aimed at informing effectively EU citizens and businesses about their rights and the rules that apply to them within the single market, or at supporting users in addressing problems they may encounter when trying to handle administrative procedures. |
| Competent Authority | Any MS's body or authority established at either national, regional or local level with specific responsibilities relating to the information, procedures, assistance and problem solving services covered by this study. |
| Feedback report | Document elaborated based on the feedback submitted to the gateway by the various actors at EU and National level. It will contain information on the quality of the service and the main obstacles found from exercising their Single Market rights. |
| Link Repository | A list of the stored links to be indexed by the SDG System. |
| Link Set | A set of one or several links provided by the EC or the MSs involved in the SDG National actors that will need to be indexed by the system. |
| Procedure | A procedure is a sequence of actions that must be taken by users to satisfy the requirements or obtain from a competent authority a decision in order to be able to exercise their rights. |
| Proposal for a Regulation | Regulation of the European Parliament and of the Council on establishing a single digital gateway to provide information, procedures, assistance and problem solving services and amending Regulation (EU) No 1024/2012 |
| Registered classification | Registered classifications support the SDG System to organise the repository of link sets. The classifications include the list of the 24 EU languages, the list of the EU level services involved in the SDG, the list of EU MS, and specific categories to the SDG. |
| Search Index | Group of objects that follow a specific configuration that is the result of the harvesting and indexing process and that will be composed of the links provided to the portal by the different actors. |
| Service | Means of delivering value to customers by facilitating outcomes customers want to achieve without the ownership of specific costs and risks. |

Table 5: Glossary

5.2.2 Acronyms and abbreviations

| Term | Description |
|------------------|---|
| ABB | Architecture Building Block |
| BRIS | Business Registers Interconnection System |
| DSI | Digital Service Infrastructure |
| DSM | Digital Single Market |
| EC | European Commission |
| EU | European Union |
| eID | Electronic Identification Document |
| eIDAS | Electronic identification and trust services for electronic transactions in the internal market Regulation |
| EIF | European Interoperability Framework |
| EIRA© | European Interoperability Reference Architecture |
| eTS | Electronic Trust Services |
| EU | European Union |
| GDPR | General Data Protection Regulation |
| IMI | Internal Market Information System |
| ISA ² | Interoperability solutions and common frameworks for European public administrations, businesses and citizens Programme |
| LOST | Legal, Organisational, Semantic and Technical layers of the EIF |
| MS | EU Member State |
| PURI | Persistent Uniform Resource Identifier |
| RDF | Resource Description Framework |
| SBB | Solution Building Block |
| SDG | Single Digital Gateway |
| SM | Single Market |
| TLS | Transport Layer Security |
| TMS | Translation Management System |
| URI | Uniform Resource Identifier |
| URL | Uniform Resource Locator |
| URN | Uniform Resource Name |

Table 6: Acronyms and abbreviations

5.3 EIRA Files



SDG_v7.0.archimate



SDG_v7.0.xml

5.3.1 High Level View



Highlevel viewpoint.png

5.3.2 Organisational View



Organisational view.png

5.3.3 Semantic View



Semantic view.png

5.3.4 Technical view – Application services/interface



Technical view - Application services_interfaces.png

5.3.5 Technical view – Interoperability enablers



Technical view - Interoperability enablers.png

5.3.6 Technical view – Infrastructure



Technical view - Infrastructure.png