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**D3.2 Assessment on the maturity of building blocks: third cycle**

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**Abstract:**

This report presents the outcomes of the third cycle of assessment of e-SENS BBs. This third assessment cycle focussed on 5 BBs divided over the generic SATs Non-repudiation, Semantics, Conformance and Interoperability Testing and the specific SAT eHealth. The assessment process was carried out thanks to close cooperation within the e-SENS project between the WP3 assessors and the WP6 building block owners that submitted the BBs for assessment. An assessment framework was used that is described in more detail in deliverable D3.1 and contains standardisation, policy and business/market criteria. A more extended abstract of the outcomes can be found in the executive summary of this document.

## History

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## List of Abbreviations

Acronym	Explanation
A2A	Application-2-Application
ABB	Architectural BB
AS4	ActionScript version 4
ATNA	Audit Trail and Node Authentication
B2B	Business to Business
B2G	Business to Government
BB	Building Block
BDXr TC	Business Document Exchange Technical Committee
CC	Competence Cluster in e-SENS WP6
CDA	Clinical Document Architecture
CEF	Connecting Europe Facility
CEN	European Committee for Standardization
CENELEC	European Committee for Electrotechnical Standardization
CMS	Cryptographic Message Syntax
CSP	Certificate Service Providers
D3.1	Deliverable 3.1 "Guidelines to the assessment of the sustainability and maturity of building blocks"
D6.1	Deliverable 6.1 "Executable baseline ICT architecture"
DG	Directorate-General
DIGIT	Directorate-General for Informatics
DNS	Dynamic Name Server
DSI	Digital Service Infrastructures
DSS	Digital Signature Service
ebXML	Electronic Business XML
<a href="#">e-CODEX</a>	e-Justice Communication via Online Data Exchange
EIRA	European Interoperability Reference Architecture
eIDAS	Draft Regulation "on electronic identification and trusted services for electronic transactions in the internal market"
EIF	European Interoperability Framework



EN	European Standard
<a href="#">epSOS</a>	Smart Open Services for European Patients
EU	European Union
EU-PL	European Union – Public License
e-SENS	Electronic European Networked Services
ETSI	European Telecommunications Standards Institute
FAQ	Frequently Asked Questions
(F)RAND	(Fair) reasonable and non-discriminatory
GITB	Global e-business Interoperability TestBed
HL7	Health Level 7
IEC	International Electrotechnical Commission
IETF	Internet Engineering Task Force
IHE	Integrating the Health care Enterprise
IoT	Internet of Things
IPR	Intellectual Property Rights
ISA	Interoperability Solutions for European Public Administrations
ISMS	Information Security Management System
ISO	International Organisation for Standardization
ITU	International Telecommunication Union
JSON	JavaScript Object Notation
LCM	Lifecycle Management
LSP	Large-Scale Pilot
MSH	Message Service Handlers
OASIS	Organisation for the Advancement of Structured Information Standards
OCF	OEBPS Container Format
ODF	Open Document Format
OEBPS	Open Ebook Forum Publication Structure
PDF	Portable Document Format
PIA	Personal Identity Attributes
<a href="#">PEPPOL</a>	Pan-European Public Procurement Online

RAND	Reasonable And Non-Discriminatory
REST	Representational State Transfer
RF	Royalty-Free
ROI	Return on Investments
SAT	Solution Architecture Template
SBB	Solution BB
SLA	Service Level Agreement
SMS	Semantic Mapping Service
SOAP	Simple Object Access Protocol
<a href="#">SPOCS</a>	Simple Procedures Online for cross-border Services
<a href="#">STORK (2.0)</a>	Secure Identity Across Borders linked (2.0)
TAML	Test Assertion Mark-up Language
T3.2	Task 3.2 of Work Package 3 focuses on the sustainability assessment of the building blocks that e-SENS will consolidate.
TBD	To Be Discussed
Ten-Tele Regulation	Regulation of the European Parliament and of the Council on “Guidelines for trans-European telecommunications networks” (part of the CEF)
TOA	Target Of Assessment
TOGAF	The Open Group Architecture Framework
TSL	Trust Services List
TSP	Trusted Service Provider
UBL	Universal Business Language
UCF	Universal Container Format
VCD	Virtual Company Dossier
W3C	World Wide Web Consortium
WP2	e-SENS Work Package 2 “Communication and Marketing
WP3	e-SENS Work Package 3 “Sustainability and Long-Term Governance”
WP4	e-SENS Work Package 4 “Project Legal Expertise Centre”
WP5	e-SENS Work Package 5 “Piloting”
WP6	e-SENS Work Package 6 “Building Block Provision”
WSDL	Web Service Definition Language

XACML	eXensible Access Control Markup Language
XML	eXtensible Markup Language

**Table 1: Abbreviations**

## Executive Summary

The e-SENS project - Electronic Simple European Networked Services - focuses on strengthening the Single Market by facilitating public services across borders. In the previous and on-going LSPs (STORK, PEPPOL, e-CODEX, SPOCS, epSOS) technical building blocks have been developed and piloted, enabling seamless cross-border services that cover all the various challenges and requirements that were faced. The purpose of e-SENS is to consolidate and improve the work done by the previous LSPs, by industrialising the solutions and extending their potential to new domains. The goal of e-SENS Work Package 3 is to pave the way for the sustainable usage and long-term governance<sup>1</sup> of the e-SENS BBs to achieve the interoperability of public services across all European Member States and Associated Countries. Task 3.2 of Work Package 3 focuses on the assessment of the BBs that e-SENS will consolidate. This assessment focuses on the maturity and long-term sustainability of BBs. These BBs will eventually be handed over to the Connecting Europe Facility (CEF).

Within the e-SENS project, an assessment of each BB is also done by WP6 during the development of the BB. This WP6 assessment focuses on technical maturity and includes technical, integration, usability, reliability and scalability readiness. In addition, WP5 takes an overall look at the market/business maturity of the BBs that are selected for a pilot. The WP3 assessment adds to that an assessment on the maturity with respect to standardisation, policy alignment and more in depth market/business needs.

There are three cycles of sustainability assessments in WP3:

- The first cycle has been carried out in 2013 and encompassed 14 BBs, of which 8 BBs are sufficiently mature in terms of market acceptance.
- The second cycle has been carried out in 2014 and encompassed 8 BBs, of which 3 BBs are sufficiently mature in terms of market acceptance.
- The objective of this document is to present the outcome of the third cycle of assessment of the sustainability and maturity for 5 BBs consolidated by e-SENS.
  - In this third cycle, the focus was on BBs divided over the generic SATs Non-repudiation, Semantics, Conformance and Interoperability Testing and the specific SAT eHealth. These BBs have been assessed and recommendations for the improvement of the sustainability and maturity of these BBs are given. In addition, recommendations for a public consultation to relevant stakeholders external to the e-SENS project and further piloting per BB are given.

The methodology used for the sustainability assessment is described in deliverable D3.1 “Guidelines to the assessment of the sustainability and maturity of building blocks”. This document presents a short recap of the assessment framework and its criteria. The methodology is based on 3 groups: standardisation criteria, policy alignment criteria and business needs criteria. For each of these criteria, questions were posed and answered during the sustainability assessment. For each assessment question that could not be answered satisfactorily a recommendation was given to improve on that aspect of sustainability and maturity. The main outcome of this second cycle of assessment for each of the clusters is described below.

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<sup>1</sup> See for a definition of long-term governance: deliverable D3.5 “Preliminary proposal for long-term sustainability in the CEF”.

For Non-repudiation, the ABBs XACML and ATNA have been assessed:

- The ABB XACML is *sufficiently mature* to be used by Member States for dealing with access control across borders in the Non-repudiation SAT. The XACML specification is being standardized via OASIS, which is a well-organized standardisation body. However, in order to make the BB even more mature, the recommendations on business need and market support should be followed. Especially, the recommendation on market support and market share adoption should be taken into account.
- The ABB ATNA has reached a level of *maturity* to be classified as “Accepted” and to be used by Member States for dealing with access control across borders in the Non-repudiation SAT. The XACML specification is being standardized via IHE, which is a well-organized initiative to standardize the information exchange in the health care sector and works closely together with HL7. The building block is already accepted by the EU Multi-Stakeholder Platform for ICT Standardization as ICT technical specification to be used in public procurement. However, in order to make the BB even more mature, the recommendations on backward compatibility, openness and EIF alignment should be followed.

For Semantics, the ABB SMS has been assessed:

- The ABB Semantic Mapping Service is *not sufficiently mature* for broad roll-out outside of the e-SENS project. However, it can be used for further piloting by Member States for mapping of semantic terms across borders. Thus, the recommendation is to put the ABB forward for further development and adoption by Member States. Via which means this will be done is a topic for further discussion together with CEF. A new European project in which the semantic mappings can be further developed and tested is recommended.

For Conformance and Interoperability Testing, the ABB Conformance and Interoperability Testbed has been assessed:

- The Conformance and Interoperability Testbed ABB is *sufficiently mature* to be used by Member States for specifying a highly sustainable, interoperable and scalable testbed which guarantees the quality of their eGovernment services especially when there are involved complex interactions among a larger number of organizations. Besides, relevant stakeholders (CEF, ISA, and OASIS) are involved in its development.

For eHealth, the SBB CDA has been assessed:

- The SBB CDA has reached a level of *maturity* to be classified as “Accepted” and to be used by Member States for dealing with clinical documents in the eHealth domain. The CDA specification is being standardized via HL7, which is a well-organized standardisation organization that standardizes the information exchange in the health care sector. The building block is already in use in the health care sector for a decade or more and has been piloted in

various projects. However, in order to make the BB even more mature, the recommendations on life cycle management, policy alignment and costs/benefits should be followed.

This is the final version of the assessment Deliverable D3.2. No future steps in e-SENS task T3.2 on the assessment of BBs are therefore planned. In Deliverable D3.7 further work on sustainability plans for the various SATs and their building blocks is described. This deliverable makes statements on the future maintenance of all the building blocks after the lifetime of the e-SENS project. However, future steps in the e-SENS project with the results of this assessment are:

- The BBs that are indicated as being ready for public consultation should be put forward to stakeholders external to the e-SENS project for further promotion and adoption. In this respect, special attention will be put on interaction with the European Multi-Stakeholder Platform for ICT Standardisation. Further promotion and adoption of the building blocks is required to be performed in close cooperation with WP2 and WP5/6.
- All ABBs pay little or no attention to the ease of national implementation. As a consequence, this needs to be investigated in the next phase with piloting. The current national implementations can be inventoried to check compliance to the BBs. Alternatively, a pilot setting could be chosen by the e-SENS project in which further alignment between the BBs and national implementations can be tested.

## 1. Introduction

### 1.1. Scope and Objective of Deliverable

The objective of this document is to present the outcome of the third cycle of assessment of the sustainability and maturity for 5 BBs consolidated by e-SENS. The scope focussed on BBs in the generic SATs Non-repudiation, Semantics and Testing and the specific SAT eHealth. Recommendations are provided: to improve them, for further promotion, adoption and piloting.

### 1.2. WP3 “Sustainability and Long-Term Governance” and Task 3.2 “Assessment of building blocks”

e-SENS Work Package 3 “Sustainability and Long-Term Governance” concerns the long-term consolidation and maintenance of the technical solutions developed within e-SENS. In this regard it will prepare the path towards a sustainable infrastructure for interoperable electronic cross-border services. Governance, policies and agreements on the organisational as well as political and legal level need to be taken into account.

Task 3.2 “Assessment of building blocks” of WP3 focuses on the assessment of the BBs that are developed by e-SENS for their maturity and long-term sustainability within the “Connecting Europe Facility” (CEF). This assessment is done in 3 cycles during the entire e-SENS project. This document focuses on the third cycle of assessments carried out during the period of June to October 2016.

### 1.3. Methodology of Work

The assessments have been carried out using a high-quality assessment framework and process based on existing European assessment frameworks. This is described in more detail in Chapter 2.

### 1.4. Relations to Internal e-SENS Environment

Cooperation with WP6 and WP5 is very important and will be maintained throughout the e-SENS project. The technical assessments done in WP6 and the business assessments done in WP5 are used as input to the sustainability assessments in WP3, where WP3 adds to that maturity in terms of standardisation organisation, policy alignment and market readiness. One platform to achieve this cooperation is the joint meetings of the Architectural Board<sup>2</sup>, Domain Board<sup>3</sup> and WP3 are collaborating on architectural and building block issues.

### 1.5. Relations to External e-SENS Environment

The relations with the external e-SENS environment can be found in external stakeholders that have a role in the further adoption of the BBs. We can distinguish various types of those stakeholders, such as the CEF DGs of the European Commission, standardisation organisations, IT industry, public administrations in the various EU countries, etc. For each of the assessed BBs that have been found sufficiently mature, it can be decided within the e-SENS project how to further promote the adoption of these BBs towards these stakeholders.

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<sup>2</sup> The Architectural Board will establish and maintain an Architecture Framework for the project as a whole and the technical deliverables and development in particular.

<sup>3</sup> The Domain Board is the reunion of the leaders of the individual domains as defined within WP5. Its role is to ensure horizontal cooperation across domains in the execution of piloting activities. The Domain Board is chaired by the WP leader of WP5 and reports to the Management Board.

## 1.6. Quality Management

This section describes the process used to ensure the quality of the deliverable.

Category	Remarks	To be checked by
Conformance to e-SENS template	OK	Freek van Krevel
Language & Spelling	Done	Freek van Krevel
Delivered on time	Delayed because of later assessment due to holiday season	Freek van Krevel
Each technology description contains the correct elements	Not applicable	Freek van Krevel
Consistency with description in the TA and in other e-SENS deliverables	OK	Freek van Krevel
Contents is fit for purpose	OK	Freek van Krevel
Contents is fit for use	OK	Freek van Krevel
Commitment within WP	Done in the first review	Freek van Krevel

**Table 2: Quality Checklist**

## 1.7. Risk Management

This section describes the process used for effective risk management. It summarises the risks identified for creating this deliverable and includes: identifying risks, risk analysis, risk assessment and defining responses and risk owner.

Description	Probability	Impact	Priority	Response	Owner
Low involvement of partners working in the project	medium	medium	medium	Approval of WP3 structure and task division	WP3 leader, T3.2 leader
Limited resources and time against high expectations and unforeseen work	medium	high	high	Prioritisation of the tasks and responsibilities, which need to be carried out	WP3 leader, T3.2 leader
Contributions by the partners are not delivered in	medium	high	medium	Controlling timeline and reminding the partners to meet the	T3.2 leader



time/the deadlines are not met				deadlines/ monitoring the delivery	
Contributions by the partners do not have the sufficient quality and quantity	medium	high	high	Monitoring of the development process of the deliverable and iterating the document	T3.2 leader, WP3 leader
Analysis of the given information is not detailed enough	medium	high	high	Drafting a table of content and formulation of guidelines and expectations	T3.2 leader, WP3 leader
Perception of a biased assessment among the LSP communities	low	high	high	Explain the content and implementations process of chosen methodology	T3.2 leader, WP3 leader
Non-acceptance of the methodology	Low	high	high	Explain the aims of D3.1	T3.2 leader, WP3 leader

**Table 3: Risks**

## 1.8. Legal issues

No legal issues have been identified for the work described in this document.

## 1.9. Structure of the document

The structure of this document consists of the following chapters:

1. Introduction, this section.
2. The assessment framework and process
3. The assessment results for the submitted Non-repudiation BBs
4. The assessment results for the submitted Semantics BB
5. The assessment results for the submitted Conformance and Interoperability Testing BB
6. The assessment results for the submitted eHealth BB
7. Conclusions and general recommendations

## 2. The assessment framework and process

### 2.1. Objective

The chapter gives a short overview of the type of BBs that have been assessed and the framework and process that was used to perform the assessment.

### 2.2. Type of building blocks to be assessed

Within the e-SENS project an extensive discussion has taken place about the definition of a building block. This discussion resulted in the e-SENS European Interoperability Reference Architecture (EIRA) that is described by WP6 in deliverable D6.6. In this EIRA various types of BBs are defined amongst which three types are most relevant for the assessment process. These types are the solution architecture template (SAT), the architectural building block (ABB) and the solution building block (SBB). The definitions of these types of BBs are documented in chapter 4 of e-SENS deliverable D6.6 [1], titled “e-SENS EIRA n° 3”, that gives an overview of the framework and the models used. All the building blocks that are part of the EIRA are being maintained at the e-SENS building block Wiki<sup>4</sup>. In order to make this document as self-contained as possible, the BB definitions are copied below. For further details, we refer to deliverable D6.6.

#### 2.2.1. Solution Architecture Template

A solution architecture template (SAT) is a specification containing a sub-set of ABBs of the EIRA. It focuses on the most salient building blocks needed to build an interoperable solution, addressing a particular interoperability need. A SAT consists of:

- A goal and description,
- A set of EIRA ABBs,
- A set of requirements & recommendations (linked to ABBs).

#### 2.2.2. Building Block definition

A Building Block (BB) represents a (potentially re-usable) component of business, IT, or architectural capability that can be combined with other BBs to deliver architectures and solutions. (TOGAF9<sup>5</sup>).

BBs have generic characteristics as follows (TOGAF9 refined by e-SENS):

- A BB is a package of functionality defined to meet the business needs across a domain.
- A BB has a defined boundary and offers services that are generally recognisable by domain experts.
- A BB may interoperate with other, inter-dependent, BBs.
- A good BB has the following characteristics:
  - It considers implementation and usage, and evolves to exploit technology and standards.
  - It may be assembled from other BBs.
  - It may be a subassembly of other BBs.
  - Ideally it is re-usable, replaceable, and well specified.

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<sup>4</sup> <http://wiki.ds.unipi.gr/display/ESENS/WP6+-+Building+Blocks>

<sup>5</sup> [www.opengroup.org/togaf/](http://www.opengroup.org/togaf/)

### 2.2.3. Architectural Building Block definition

Within e-SENS, an architectural building block (ABB) is an encapsulated component that captures architecture requirements (e.g., business, data, application and technology requirements), and performs its capabilities through services. The ABB is a component that directs the development of SBBs. Types of e-SENS relevant ABBs are (e-SENS) components:

- Specifications (Standards)
- Profiling of specifications

The following apply to relationships of ABBs:

- An ABB can be a **composition** of other ABBs
- An ABB can be a **profile** of another ABB i.e. specialise to be useful in e-SENS

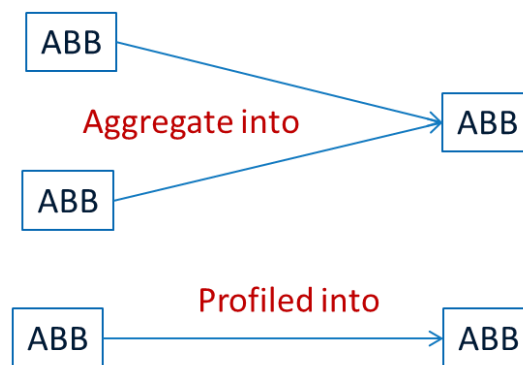


Figure 1. ABB relationships

Types of ABBs are:

- A **Generic ABB** can be used in many domains (example: eDocument)
- A **Domain ABB** is specific to a single or few domains
- A **Solution ABB** can be a profiling and composition of generic ABBs and composed with Domain ABBs.

An example of an ABB is a profiling of an eDocument (Generic ABB) into the eProcurement domain. eInvoicing is then “e-SENS BIS 4a – Basic Invoice” that specifies the processes, semantics and syntax of a simple invoice transaction. It is done by a composition of profiling eDocument with the Domain ABBs “CEN BII Profile 4 – Basic Invoice” (Processes and Semantics) and OASIS UBL (Format and structure of syntax).

### 2.2.4. Solution Building Block definition

Within e-SENS, a Solution Building Block (SBB) is a sample design and/or software component that is an implementation of (part of) an ABB. A sample design and/or software component is conformant to (part of) the ABB specification. Related assets/artefacts to SBBs are:

- Design guidelines
- Implementation guidelines
- Test guidelines and results
- Deployment guidelines
- Operational guidelines

An example of a SBB is the implementation of the Digital Signature Service (DSS) that can be used to create and verify digital signatures.

Deliverable D6.6 presents a vast number of ABBs and SBBs that have been developed in the various LSPs and that are given as input to the e-SENS project. Thereby, it shows that each SAT contains 4-5 ABBs, some of them implemented by an SBB. To perform an assessment of the sustainability and maturity of these SATs, it is therefore necessary to perform a separate assessment of each of the ABBs and SBBs. The maturity of an SAT depends on the maturity of all its ABBs/SBBs in the sense that an SAT is as mature as the lowest level of maturity of all its ABBs/SBBs. Nevertheless, a single ABB/SBB within an SAT can be promoted for further sustainability on its own independent of other ABBs/SBBs in the same SAT. In that respect, the SAT is nothing more than a clustering concept for a group of ABBs/SBBs in the same domain.

### 2.3. Assessment framework

This section presents a short recap of the assessment framework and its criteria. This framework has been described in D3.1 [2] in detail and is based on 3 groups of assessment criteria: standardisation, policy alignment and business needs. For each of these three groups, the assessment criteria and a short explanation are presented in the following tables. The complete assessment framework is presented in Appendix I and contains one or more questions per criterion that need to be answered during the assessment. In the assessment framework, the general term Target Of Assessment (TOA) is used to denote the item that has to be assessed. One of the policy alignment criteria refers to the European Interoperability Framework that defines twelve principles for good interoperability. This EIF document can be found at [http://ec.europa.eu/isa/documents/isa\\_annex\\_ii\\_eif\\_en.pdf](http://ec.europa.eu/isa/documents/isa_annex_ii_eif_en.pdf).

Within the e-SENS project, an assessment of each BB is also done by WP6 during the development of the BB. This WP6 assessment focuses on technical maturity and includes technical, integration, usability, reliability and scalability readiness. In addition, WP5 takes an overall look at the market/business maturity of the BBs that are selected for a pilot. The WP3 assessment adds to that an assessment on standardisation maturity, policy alignment and a more in depth market/business need assessment.

Criterion	Description	Sub-Criterion	Description
Maturity	A TOA should in itself be mature enough for adoption by public administrations. This category addresses the development status, the quality, guidelines and stability of the TOA.	Development	For the 'development status', the current development status of the TOA in the development cycle is addressed.
		Quality	For 'quality', the level of detail in the TOA and the conformance of implementations is addressed.
		Guidelines	For the 'guidelines', the existence of implementation guidelines or reference implementations is addressed.
		Stability	For 'stability', the level of change to the TOA and the stability of underlying technologies is addressed.
Openness	A TOA should be sufficiently open and available, to be relevant for adoption by public administrations. This category addresses the openness of the organization maintaining the TOA and its decision-making process, and openness of the documentation and accessibility of the TOA.	Organization	For the 'openness' of the organization maintaining the TOA, the level of openness for participating in this organization is addressed.
		Process	For the 'process', the level of openness regarding the development and decision-making process for the TOA is addressed.
		Documentation	For the openness of the 'documentation', the accessibility and availability of the documentation of the TOA is addressed.
Intellectual Property Rights	A TOA should be licensed on (F)RAND terms or even on a royalty-free basis in a way that allows implementation in different products. This category addresses the availability of the documentation on the IPR and the licenses for the implementation of the TOA.	IPR Documentation	For the 'documentation of the intellectual property rights', the availability of the information concerning the ownership rights of the TOA is addressed.
		Licenses	For the 'licenses' within the intellectual property rights, a (fair) reasonable and non-discriminatory ((F)RAND) or even royalty-free basis is addressed for the use and implementation of the TOA.
Life Cycle Management	The life cycle management process provides life cycle policies, processes, and procedures.	LCM process	There should be a life cycle management process.
Maintenance	The maintenance process provides cost-effective support to the TOAs during their life-cycle, including change management.	Implementation	There should be plans and procedures for conducting the maintenance activities.
		Problem analysis	The problem reports or modification requests should be analysed for their impact.
		Modification	It should be determined and documented which software items need to be modified.
		Migration	Migration of a system or software product (including data) should be planned, documented, and performed.
		Disposal	Ending the existence of a TOA should be planned, documented, and performed.
Service levels	The services related to the TOA should be agreed with the customers.	SLA	If applicable, there should be service level agreements relating to the availability of the TOA.
Security	Systems, data, and resources should be protected from accidental or malicious acts.	ISMS	The maintainer should have an information security management system.
		Identification	Information security requirements should be understood.
		Risks	Information security risks should be assessed.
		Controls	Information security controls should be selected and implemented.
		Monitor	The effectiveness of the ISMS should be monitored, maintained, and improved.

**Table 4: Assessment criteria for standardization**

Criterion	Description	Sub-Criterion	Description
Interoperability	The LSPs and Building Blocks in Member States should be interoperable.	EIA	The TOA should confirm to the European Interoperability Architecture.
		EIF	The TOA should confirm to the European Interoperability Framework.
		A2A services	The TOA should support Application-2-Application services, if applicable.
Compliance	The proposed solutions should be compliant with the EU legal framework on data protection and legislation on electronic signatures.	Data protection	The proposed solutions should be compliant with the EU legal framework on data protection.
		Electronic signatures	The proposed solutions should be compliant with the EU legislation on electronic signatures.
Member States	Alignment with national frameworks of the participating countries and avoiding potential incompatibilities between Member States.	National frameworks	Alignment with national frameworks of the participating countries.
		Incompatibilities	Avoiding potential incompatibilities between Member States.
Legal	The legal validity of information exchanged must be maintained across borders.	Information	Maintenance of the legal validity of information exchanged across borders.
Protection	Data protection legislation in both originating and receiving countries must be respected.	Data protection	Adherence to the data protection legislation in both originating and receiving countries.
Applicability	A TOA should be usable and easy to implement in different products and relevant for adoption by public administrations. This category addresses the definition of functional scope and area of application, the possible reusability in other areas, the possible alternative specifications, and the compatibility and dependency on other specifications or technologies.	Area of application	For the 'area of application', the functionalities and intended use of the TOA are addressed within the context of interoperability and eGovernment.
		Requirements	For the 'requirements', the functional and non-functional requirements for using and implementing the TOA are addressed. This criterion is related to the use of assessment scenario 3
		Reusability	For 'reusability', the level of reusability of the TOA in the same or other areas of application is addressed.
		Alternatives	For the 'alternatives', the degree to which the TOA adds value compared to alternative TOAs in the same area of application is addressed.
		Compatibility	For 'compatibility', the compatibility of the TOA with other TOAs in the same area of application is addressed.
		Dependencies	'Dependencies' addresses the degree of dependence of the TOA on specific vendor products, platforms or technologies.
Potential	A TOA should have sufficient and positive future consequences, evolution and impact for being adopted by public administrations. This category addresses the consequences and impact of using or adopting the TOA, the advantages and risks, the maintenance and possible future developments.	Impact	For the 'impact', the minimization of the consequences of using and adopting the TOA is addressed. The consequences can be evaluated and described in terms of different aspects.
		Risks	For the 'risks', the level of uncertainty is addressed for using and adopting the TOA
		Maintenance and future developments	For the 'maintenance' and future developments, the support and the planned or existing actions to maintain, improve and develop the TOA in the long term are addressed.

**Table 5: Assessment criteria for policy alignment**

Criterion	Description	Sub-Criterion	Description
Business need	Need for the TOA by end users.	Change	Potential change in the quality of the service delivered to the citizen/business by the administration before and after adopting the TOA.
		Usage	Opportunities for software/service providers to put the TOA into use.
		Business plan	Availability of a commercially-oriented, robust Business Plan for investment, built upon an underlying 'commercially sustainable' business model.
		Business case	A business case should take into account how a TOA will help public partners in achieving their missions.
		Sharing	Relevance of having the same components integrated as European (shared) building blocks across different Use Cases.
		Cross-border	Usefulness of the TOA in the development of eGovernment cross-border services.
		Market	Potential of the TOA to be adopted by the market and be used in cross-border eGovernment services.
		ROI	Where applicable the costs and benefits of adopting the TOA, including the assessment of the Return on Investment.
		Geographic	Possibility for a broader geographic and sector usage.
Market support	A TOA should have sufficient market acceptance and support in order to be adopted by public administrations. This category addresses the proven and operational implementations of the TOA, the market share and demand for the products, and the support from users and communities.	Implementations	For the 'implementations', the existence of proven and best practice implementations for the TOA is addressed, in different domains and by different vendors.
		Market demand	For 'market demand', the penetration and acceptance of products implementing the TOA in the market is addressed.
		Users	For the 'users', the diversity of the end-users of the products implementing the TOA is addressed.
		Interest groups	For the 'interest groups', the degree of support from different interest groups is addressed.
		Payer	For the 'Payer' the existence of groups ready to pay for the service is addressed.
		Competition	For the 'Competition' the existence of competing solutions is addressed.
		Support	For the 'Support' the existence of support for the market is addressed.

**Table 6: Assessment criteria for business needs**



## 2.4. Assessment procedure

This section presents the overall procedure used for the assessment that is explained in more detail in D3.1. It contains the steps taken in the process to answer the assessment questions and to come up with the recommendations for improvement. The assessment procedure is carried out in close collaboration between WP3 and WP6/5. It consists basically of a proposal step, a consideration step, an assessment step, and a recommendation step as depicted in the figure below.

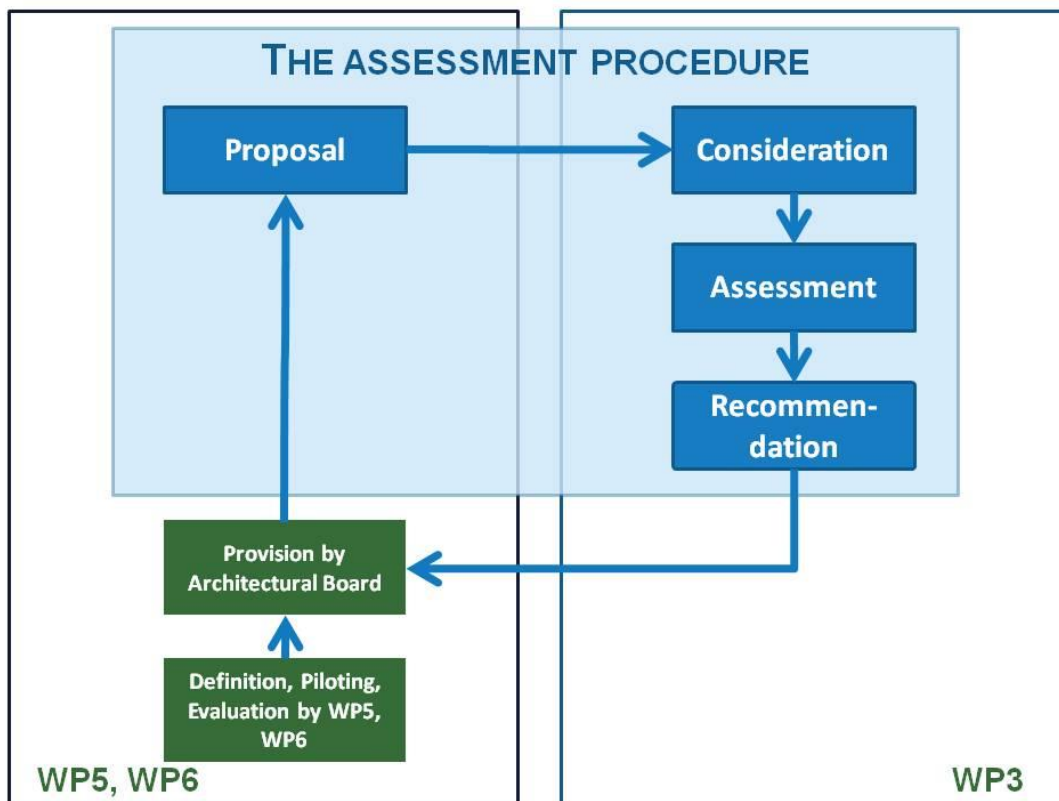


Figure 2. The assessment procedure with main e-SENS work packages

1. In the proposal step, the e-SENS WP6 Architectural Board provides a target of assessment (an ABB, including supporting artefacts such as guidelines) to Task 3.2. The target of assessment is provided using predefined proposal criteria that provide general information about the proposed target of assessment, its status, and other artefacts provided for assessment.
2. In the consideration step, consideration criteria are used before the actual assessment, to validate information received and the relevance of the proposal.
3. In the assessment step, the assessment criteria are categorised under standardisation, alignment with existing policy frameworks, and business need as presented in the previous section. Additional information will be sought from other work packages and external stakeholders.
4. In the recommendation step, recommendations are derived from the assessment and a conclusion is drawn for a classification (Discarded, Observed, Accepted, Recommended, Mandatory) of the target of assessment. This classification will be reported back to WP6 Architectural Board for using by other work packages.



## 2.5. Assessment procedure applied

The general assessment procedure has been applied during the third assessment cycle. In this assessment cycle the focus was only on ABBs.

In the third cycle 5 different BBs were assessed in the generic SATs Non-repudiation, Semantics and Testing and the specific SAT eHealth. For each of these BBs, WP6 appointed a building block owner<sup>6</sup> who acted as the proposer of the BBs to be assessed. The cluster leaders followed the proposal step and provided Task 3.2 on the sustainability assessment (T3.2) with a Building Block Submission Form and documentation of the BB to be assessed. The form contains the major pieces of information necessary to understand which BB has to be assessed and what type of BB it is. The consideration step during this second assessment cycle was performed by (1) making a check whether the most basic documents were submitted, i.e. the submission form and the BB specification, and (2) checking whether the BB has a clear function in the EIRA defined in D6.6.

During the assessment step, for each of the BBs a team of T3.2 assessors was set-up to do the assessment of the submitted BB. The teams that carried out the assessments have a diverse geographical background as well as a diverse background in the LSPs. The assessment teams consisted of assessors from The Netherlands, Turkey, Romania and Spain. For each submitted BB, a lead assessor within the team was appointed. The task of the lead assessor was to fill in the Building Block Assessment Form as described in Appendix I for his/her BB with answers to the assessment criteria questions and recommendations where needed. In order to achieve this, the following process was used:

1. The lead assessor organises a physical or teleconference meeting with the proposer of the ABB to discuss the documentation and go through the assessment framework questions for a first impression about the possible answers.
2. The lead assessor writes a first set of the answers in the form. These answers are reviewed by a second assessor in the team based on the documentation provided and where needed supported by a search on the web.
3. The lead assessor interacts when necessary with the proposer of the BB so the proposer can provide additional explanation and documentation on specific aspects/questions where needed.
4. The lead assessor finalises the assessment form and derived recommendations for WP6/5 for those criteria that need improvement.

This process for the assessment step takes about 3 to 4 weeks. Finally, the recommendations for improvement are written down as part of this deliverable.

During this third cycle, it was chosen to use the classifications “Observed” or “Accepted” as conclusions for the assessment of the ABBs. The main reason for this is that classifications “Discarded”, “Recommended” and “Mandatory” are too strong for a T3.2 judgment the e-SENS project and the goal of the assessment is to give recommendations for improvement. In addition to these classifications, we also use the term “Sufficiently Mature”, which means that a BB is technically ready for deployment, but that a few more requirements regarding the assessment criteria need to be taken care of in further piloting activities.

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<sup>6</sup> The task of a building block owner is to coordinate the daily operations of the said building block identified respectively in WP6 from an operational perspective.

## 2.6. Structure of assessment description

In the next three chapters, the specific assessment results and recommendations are described for each of the clusters. For each of the assessed BBs, the same information will be presented, which is:

- What has been assessed and which documentation has been used.
- The current sustainability and maturity status and the main barriers.
- The main recommendations for improvement of the BB.
- The main recommendation for public consultation and further piloting.

For each assessed BB, the target is to present the bullets above structured along the lines of the assessment framework (standardisation, policy, business/market).

### 3. Assessment of Non-repudiation BBs

#### 3.1. Objective

This chapter focuses on the Non-repudiation BBs that were assessed during the third cycle. These are:

1. ABB eXtensible Access Control Markup Language (XACML)
2. ABB Audit Trail and Node Authentication (ATNA)

#### 3.2. ABB eXtensible Access Control Markup Language (XACML)

##### 3.2.1. What has been assessed

Description:	XACML( eXtensible Access Control Markup Language) is an OASIS standard that describes both a policy language and an access control decision language (written in XML), established since 2004. It is used cross-sector and major implementations are in place, like, e.g., Red hat, IBM, Cisco, Oracle, Universities and Computer Science Institutes, eHealth exchange initiative. OASIS XACML Standard, Version 3.0 was released on 22 January 2013 and it is used in several implementations.
Assessment main documentation:	<a href="https://www.oasis-open.org/committees/tc_home.php?wg_abbrev=xacml">https://www.oasis-open.org/committees/tc_home.php?wg_abbrev=xacml</a> <a href="https://www.oasis-open.org/">https://www.oasis-open.org/</a> <a href="http://wiki.ds.unipi.gr/display/ESENS/Whitepaper++Non+Repudiation#Whitepaper-NonRepudiation">http://wiki.ds.unipi.gr/display/ESENS/Whitepaper++Non+Repudiation#Whitepaper-NonRepudiation</a> <a href="http://docs.oasis-open.org/xacml/3.0/xacml-3.0-core-spec-os-en.pdf">http://docs.oasis-open.org/xacml/3.0/xacml-3.0-core-spec-os-en.pdf</a> <a href="https://www.oasis-open.org/committees/download.php/14877/ConformanceTests.html">https://www.oasis-open.org/committees/download.php/14877/ConformanceTests.html</a> <a href="https://issues.oasis-open.org/browse/XACML/?selectedTab=com.atlassian.jira.jira-projects-plugin">https://issues.oasis-open.org/browse/XACML/?selectedTab=com.atlassian.jira.jira-projects-plugin</a> <a href="https://tools.oasis-open.org/version-control/browse/wsvn/xacml/?sc=0">https://tools.oasis-open.org/version-control/browse/wsvn/xacml/?sc=0</a> <a href="http://www.epsos.eu/uploads/tx_epsosfileshare/D3.7.2_SECTION_II_epSOS_Security_Services">http://www.epsos.eu/uploads/tx_epsosfileshare/D3.7.2_SECTION_II_epSOS_Security_Services</a>
Location of all submitted documentation and results:	<a href="https://www.jol.nrw.de/bscw/bscw.cgi/7874733">https://www.jol.nrw.de/bscw/bscw.cgi/7874733</a>

##### 3.2.2. Sustainability and maturity status

This section provides an overview of the sustainability and maturity status. For details, please refer to the building block assessment form at the location of submitted documentation and results on the BSCW server.

###### 3.2.2.1. Standardisation

For the standardization criteria there have been assessed three categories: Maturity, Intellectual Propriety Rights and Life Cycle Management. The assessment has shown that most of the standardization criteria have been satisfied and the solution has reached a good level of **maturity** and stability. Also it must be stated that the piloting experience proved the XACML solution to be

sufficiently mature to be used in production environments and several implementations are already in place: epSOS large scale project implementation as a way to specify access control policy in a machine-readable format; AuthzForce - an open source project that provides a XACML 3.0 compliant policy engine; FACPL - an Eclipse plug-in for the specification and analysis of XACML 3.0 policies; Enterprise Java XACML 2.0 Implementation, Sun's XACML Open Source Implementation, Brown University, US: Margrave, XACML policy verification and change analysis tool, etc. XACML is an XML based language for specifying security policies. XML is a natural choice as the basis for a common security-policy language, due to the ease with which its syntax and semantics can be adjusted to map the requirements of the application and it is widely used for the interchange of data over the Internet, being stable and benefiting from widespread support from all the main platform and tool vendors.

OASIS, a non-profit consortium producing open standards for the global information society, is the organization maintaining XACML. The development, maintenance and release process of XACML is transparent and publicly available and the information concerning the decision making process is published by OASIS.

In terms of **IPR**, Oasis TC are subject to one of the four licensing types: RAND, RF on RAND Terms, RF on Limited Terms or Non-Assertion. XACML TC operates under the RF on Limited Terms Mode of the OASIS IPR, which is based on RAND. XACML TC operates under the RF (Royalty-Free) on Limited Terms Mode of the OASIS IPR Policy, which allows the most freedom to projects that want to implement the standard.

It has also been investigated if a **life-cycle management** process exists and even if there are steps in this direction. OASIS is the organization developing, maintaining, consolidating and creating policies and procedures for XACML. OASIS work is based on a generic methodology and guidelines for creating, approving and publishing standards. The official XACML page provides workflow related information on releases, revisions, additional new features, development status, work under review, etc. For OASIS standards there are in place generic maintenance activities and for maintenance and report issues purpose it was set up an Issues Management JIRA Project.

### 3.2.2.2. Policy framework alignment

Several important policy criteria have been satisfied for the XACML that is in line with most of the existing policies. XACML is a versatile standard that facilitates the use of different encryption standards during the exchange of sensitive data shared in interoperable systems and is in line with EIF v2.03 principles, specifically with Principle 4 Security and Privacy, Principle 9 Openness and it is compliant with public services conceptual model as defined in EIF, in particular with Secure data exchange layer.

It has been determined that the XACML is compliant with the EU legal framework on data protection. XACML includes a Digital Signature Profile Version, thus it is compliant with the EU legislation on electronic signatures. XACML is in line with most of the existing policies of the ***national frameworks*** of the participating countries, since it was successfully implemented in epSOS project by several Member States, therefore it is aligned with their frameworks. Because it is an access control standard it contributes to the maintenance of the legal validity and non-repudiation of information exchanged.

XACML fulfils all the criteria for Applicability. OASIS proved the Interoperability of XACML Access Control Standard in a Health Care Scenario and one of the XACML goals is to promote common terminology and interoperability between implementations by multiple vendors. XACML addresses and facilitate the development of e-Government since centralized access control policy in a standards-based framework is very important to the success of e-Government initiatives.

The functional and non-functional requirements for the use and implementation of the XACML are clearly defined and there are several implementations of XACML in different domains that can be extended or reused. As it is XML based, XACML is versatile and compatible to other standards and

implementations. It is largely independent from specific vendor products and it is a standard that can be implemented using various technologies and platforms.

It was established that the XACML has positive future advantages and impact when adopted by public administration and other stakeholders. Every organization, developer, user, or maintainer of applications that require secure authorization could benefit from the specification. The adoption of the XACML positively impacts the security because it is an access control policy language and it provides a set of policy rules, functions, and obligations used to enforce privacy. XACML promotes secure policy based access for eGovernment services which can positively impact the administrative burden. More details can be found in the Annex. The recommendation for improvement section below also comprises suggestions for further improvement.

### 3.2.2.3. Business/market

In order to have a complete view over the XACML, the **basic business needs** and the **market support criteria** were investigated. Most of the sub-criteria under the business/market need criteria are satisfied. The assessment proves that there is a potential increase in the quality of the service delivered to the citizen/business by the administration after adopting XACML standard. Further efforts should be taken in order to determine if the products that implement the XACML have a significant market share of adoption. To this end a study on market share adoption would be recommended. Also further work needs to be done to investigate in what extent the XACML competes with other solutions available in member countries. A detailed assessment of the criteria could be found in the annex and more business related recommendations for improvement in the below section.

### 3.2.3. Recommendations for improvement

Standardisation criteria - recommendations for openness:

- Provide more information if stakeholders, other than members, can raise objections to the development of XACML

Standardisation criteria - recommendations for lifecycle management:

- Provide more information on the existence of procedures for developing, documenting, and executing migration plans
- Information concerning disposal plans should be provided
- Provide more information if the maintainer assessed the information security risks related to the XACML
- Provide more information if the maintainer selected and implemented information security controls related to the XACML
- Provide more information if the maintainer is monitoring, maintaining, and improving the effectiveness of the XACML

Alignment with *Existing Policy Frameworks criteria* - recommendations for basic alignment with existing policies:

- Provide information about potential incompatibilities between Member States
- Provide information about the adherence to the data protection legislation in both originating and receiving countries.

Alignment with *Existing Policy Frameworks* criteria - recommendations for potential:

- Provide information if there is evidence that the adoption of the XACML positively impacts the migration of current systems
- Provide information if there is evidence that the adoption of the XACML positively impacts the financial costs
- Provide information if there is evidence that the adoption of the XACML positively impacts the disability support
- Provide information about the risks and the probability of their emergence related to the adoption of the XACML
- Provide information about the finances and the resources for the future development in the middle to long term (e.g. next 3 years)

Business need criteria - market support:

- Provide more information if the products that implement the XACML have a significant market share adoption
- Provide a study on market share adoption
- Provide more information to determine to what extent the XACML competes with other solutions available in member countries

### 3.2.4. Recommendation for public consultation or piloting

The ABB XACML is *sufficiently mature* to be used by Member States for dealing with access control across borders in the Non-repudiation SAT. The XACML specification is being standardized via OASIS, which is a well-organized standardisation body. However, in order to make the BB even more mature, the recommendations on business need and market support should be followed. Especially, the recommendation on market support and market share adoption should be taken into account.

## 3.3.ABB Audit Trail and Node Authentication (ATNA)

### 3.3.1. What has been assessed

For the assessment, the following documents and other material have been investigated.

Description:	The Audit Trail and Node Authentication (ATNA) Integration Profile establishes security measures which, together with the Security Policy and Procedures, provide patient information confidentiality, data integrity and user accountability.
Assessment main documentation:	IHE IT Infrastructure (ITI) Technical Framework Volume 1 (ITI TF-1) Integration Profiles-- Revision 12.1 – Final Text April 22, 2016
	IHE IT Infrastructure Technical Framework Volume 2a (ITI TF-2a) Transactions Part A – Sections 3.1 – 3.28 -- Revision 12.0 – Final Text September 18, 2015
	e-SENS EIRA, Non-Repudiation ABB and Non-Repudiation White paper -- <a href="http://wiki.ds.unipi.gr/display/ESENS/Whitepaper++Non+Repudiation">http://wiki.ds.unipi.gr/display/ESENS/Whitepaper++Non+Repudiation</a>
	<a href="http://ec.europa.eu/isa/documents/isa_annex_ii_eif_en.pdf">http://ec.europa.eu/isa/documents/isa_annex_ii_eif_en.pdf</a>
	<a href="http://www.ihe.net/Technical_Framework/upload/IHE_ITI_Whitepaper_Security_and_Privacy_2007_07_18.pdf">http://www.ihe.net/Technical_Framework/upload/IHE_ITI_Whitepaper_Security_and_Privacy_2007_07_18.pdf</a>
	<a href="http://wiki.ihe.net/index.php/Audit_Trail_and_Node_Authentication">http://wiki.ihe.net/index.php/Audit_Trail_and_Node_Authentication</a>
Other documentation:	e-SENS D3.1 Guidelines to the assessment of the sustainability and maturity of building blocks

Location of all submitted documentation and results:	<a href="https://www.jol.nrw.de/bscw/bscw.cgi/7874784">https://www.jol.nrw.de/bscw/bscw.cgi/7874784</a>
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### 3.3.2. Sustainability and maturity status

This section provides an overview of the sustainability and maturity status. For details, please refer to the building block assessment form at the location of submitted documentation and results on the BSCW server.

#### 3.3.2.1. Standardisation

The Audit Trail and Node Authentication (ATNA) Integration Profile establishes security measures which, together with the Security Policy and Procedures, provide patient information confidentiality, data integrity and user accountability.

Four main categories of standardization criteria have been examined in order to assess the maturity of the IHE ATNA BB, namely Maturity, Openness, Intellectual Property Rights, and Lifecycle Management.

The investigation of the subcategories of Maturity, such as Development status, Quality, Guidelines, and Stability showed that the solution has reached a good level of maturity.

Regarding the status of IHE ATNA in the development cycle, IHE ATNA has been used in Patient Summary, e-Prescription and e-Confirmation Pilots, and hence has overcome most of its initial problems. The underlying standards of IHE ATNA are well-established standards. Moreover, IHE has been established since 1998, and continuously improved. In order to assess conformity of the implementation of IHE ATNA, conformance tests with NIST tools, Minder and Gazelle Testbeds were conducted successfully. In addition, the use of IHE ATNA in previous projects and pilots proves that it has sufficient details, consistency and completeness for the use and development of products.

IHE ATNA provides implementation guidelines and documentation in the IHE ITI TF-1 document. OpenNCP and OpenATNA are reference implementations of IHE ATNA. Backward compatibility for IHE Audit Message Format is addressed in the IHE ITI TF-1 document. However, backward compatibility for Authentication Nodes is not addressed.

The underlying standards of IHE ATNA referenced in the IHE ITI TF-2a are well-established and proven standards and several different implementations of these standards are available. The IHE IT Infrastructure Technical Framework (ITI TF) defines specific implementations of established standards including the IHE ATNA profile.

The openness of the organization maintaining IHE ATNA, namely IHE, and its decision-making process were assessed alongside with the openness and accessibility of the documentation. Information on the IHE policies for the establishment and operation process, the standardization process, and the decision making process is publicly available on the IHE official website. IHE is open to participation, and the participation terms can be found in the IHE website as well. IHE ATNA has been approved following the IHE governance model, which is a model that aims at reaching a consensus. Any comments or objections can be submitted through ways explained in the website. Regarding the documentation, The Technical Framework document is expanded annually, after a period of public review, and maintained regularly through the identification and correction of errata.

The Intellectual Property Rights Documentation and Licences were assessed under the IPR category.



The intellectual property policies of IHE International are described fully in Appendix A of the IHE International Principles of Governance. These policies include a Patent Disclosure duty for IHE Member Organizations (section A.3). IHE ATNA is also subject to OASIS IPR Policy, which is chartered under the RAND IPR mode.

The Lifecycle Management category was assessed under Lifecycle Management, Maintenance, Service Levels, and Security subcategories. IHE is the organization that provides lifecycle policies and processes for IHE ATNA. The IHE ITI TF Committee maintains the IHE IT Infrastructure Technical Framework. IHE ATNA Wiki and FAQ pages as well as contact by mail are available as helpdesk to the end users. The criteria for the Security subcategory are not applicable since IHE ATNA is not an IT infrastructure rather an implementation framework. However, the framework itself aims to establish security measures, which, together with the Security Policy and Procedures, provide patient information confidentiality, data integrity and user accountability.

### 3.3.2.2. Policy framework alignment

Basic alignment with existing policies, Applicability, and Potential were the categories investigated for IHE ATNA. IHE ATNA is aligned to a good extent with the existing policies. IHE ATNA is mostly aligned with the 12 underlying principles of EIFv2.0. There is no direct evidence found that the 3rd and 5th principles are satisfied. On the other hand, these principles do not directly address IHE ATNA rather depend the public service that adopts IHE ATNA. IHE ATNA is in line with public services concept as defined in EIF 2.03.

IHE ATNA supports A2A services, providing mechanisms for authentication, access control, confidentiality, integrity and non-repudiation. The IHE Policy Environment is made up of many layers of policies including country specific policies, like EU or US-HIPAA. The IHE framework provides mechanisms to configure policies according to the needs of the participating country.

Within the context of interoperability and eGovernment, IHE ATNA facilitates cross-domain eHealth services on audit recording and node authentication. Requirements for the use and implementation of IHE ATNA are clearly defined in the respective documentation. IHE ATNA is applicable and extensible for implementations in different domains, but not as it is. Since it is profiled from widely used standards, the basis of the IHE ATNA can be used in different domains.

Users of public health services benefit from the IHE ATNA specification. IHE ATNA does not directly address environmental issues. The security mechanisms of IHE ATNA are well defined. The adoption of IHE ATNA positively impacts the privacy. The adoption of IHE ATNA in the epSOS project, which has a legal framework lying to related EU Directives, proves this point. The experience in this project also showed that it lessens the burden medical care processes that cross European borders.

Regarding the future development of IHE ATNA, The IHE IT Infrastructure Technical Framework is continuously maintained and expanded on an annual basis by the IHE IT Infrastructure Technical Committee. The development and maintenance process of the Framework follows a number of principles to ensure stability of the specification so that both vendors and users may use it reliably in specifying, developing and acquiring systems with IHE integration capabilities

### 3.3.2.3. Business/market

Basic business need criteria and Market Support were investigated in this section. IHE engages clinicians, health authorities, industry, and users to develop, test, and implement standards-based solutions to vital health information needs annually in order to improve the quality of service delivered to the citizen. Opportunities for software/service providers to put IHE ATNA into use exist. The pilots such as Patient Summary, e-Prescription and e-Confirmation build on the experiences of the epSOS, NETC@RDS and ENED projects, are now extending into new areas in e-SENS.



IHE ATNA provides the process for closing the gap between standards and systems integrations in the complex and ever-changing information domain healthcare enterprise. The usage of IHE ATNA in the pilots of epSOS and e-SENS has proved that IHE ATNA is useful in providing cross-border services in line with European requirements. The pilots such as Patient Summary, e-Prescription and e-Confirmation have shown the potential of the IHE ATNA to be used in cross-border eGovernment Services.

IHE ATNA has been used for different implementations by different vendors on the Health IT domain. 22 IHE national deployment committees have been established in 17 countries across the globe. IHE International sanctions them to conduct testing, education, outreach, collaboration with local health agencies and other deployment-related activities.

Besides pilots, projects in many different countries have leveraged this profile to improve their systems interoperability and information access for patients and providers. The list of projects is available in the IHE website. Stakeholders from all areas of Health IT are involved, including clinicians, health authorities, industry, and users to develop, test, and implement interoperable Health IT systems. The pilots in the e-Health Domain have shown that the interest in Health IT Systems Interoperability is high.

Many IHE national deployment committees coordinate their activities through regional groupings. All national deployment committees also participate in the IHE Global Deployment Coordination Committee (GDC). This committee meets regularly to coordinate planning of major IHE activities and to share resources and best practices.

### 3.3.3. Recommendations for improvement

In this section, several recommendations are given on the ABB to improve the sustainability and maturity level of IHE ATNA. In the recommendations, references are given to the materials cited above, when appropriate. Some recommendations coincide for different criteria; in this case they are given only once (for the first case).

Standardisation criteria - recommendations for Maturity:

- Backward compatibility for Authentication Node should be addressed.

Standardisation criteria - recommendations for Openness:

- Information about the approval process of IHE ATNA should be provided.

Existing policy criteria – recommendations for basic alignment with existing policies:

- In order for IHE ATNA to completely conform to the European Interoperability Framework, the 3rd and 5th principles should be satisfied or direct evidence that these principles are satisfied should be provided.

### 3.3.4. Recommendation for public consultation or piloting

The ABB ATNA has reached a level of *maturity* to be classified as “Accepted” and to be used by Member States for dealing with access control across borders in the Non-repudiation SAT. The XACML specification is being standardized via IHE, which is a well-organized initiative to standardize the information exchange in the health care sector and works closely together with HL7. The building block is already accepted by the EU Multi-Stakeholder Platform for ICT Standardization as ICT technical specification to be used in public procurement. However, in order to make the BB even more mature, the recommendations on backward compatibility, openness and EIF alignment should be followed.

## 4. Assessment of Semantics BB

### 4.1. Objective

This chapter focuses on the Semantics BB that was assessed during the third cycle. This is:

1. ABB Semantic Mapping Service

### 4.2. ABB Semantic Mapping Service (SMS)

#### 4.2.1. What has been assessed

For the assessment of the ABB SMS the following material has been submitted.

Description:	Semantic Mapping Service ABB, consists of an architectural specification of a service which translates terms or concepts between different domains or communities or between different levels of abstraction, completing the agent's knowledge with relevant domain knowledge. In the scope of e-SENS, the service's conceptual functionality is to provide legal and semantic interoperability, with the provision of legal document equivalence mapping.
Assessment main documentation:	<a href="http://wiki.ds.unipi.gr/display/ESENS/ABB+-+Semantic+Mapping+Service+-+0.6.0">http://wiki.ds.unipi.gr/display/ESENS/ABB+-+Semantic+Mapping+Service+-+0.6.0</a>
	W3C, RDF Working Group, <a href="http://www.w3.org/2011/rdf-wg/wiki/Main_Page">http://www.w3.org/2011/rdf-wg/wiki/Main_Page</a> , 2014
	W3C, RDF Vocabulary Description Language 1.0: RDF Schema, <a href="http://www.w3.org/TR/rdf-schema/">http://www.w3.org/TR/rdf-schema/</a> , 2014.
	W3C, OWL Working Group, <a href="http://www.w3.org/2007/OWL/wiki/OWL_Working_Group">http://www.w3.org/2007/OWL/wiki/OWL_Working_Group</a> , 2014.
	W3C, SPARQL Working Group, <a href="http://www.w3.org/2009/sparql/wiki/Main_Page">http://www.w3.org/2009/sparql/wiki/Main_Page</a> , 2014.
	Core Vocabularies can be downloaded from <a href="https://joinup.ec.europa.eu/asset/core_vocabularies/description">https://joinup.ec.europa.eu/asset/core_vocabularies/description</a> , 2014
Location of all submitted documentation and results:	<a href="https://www.jol.nrw.de/bscw/bscw.cgi/7874669">https://www.jol.nrw.de/bscw/bscw.cgi/7874669</a>

#### 4.2.2. Sustainability and maturity status

This section provides an overview of the sustainability and maturity status. For details, please refer to the building block assessment form at the location of submitted documentation and results on the BSCW server.

##### 4.2.2.1. Standardisation

For the ABB Semantic Mapping Service the majority of the standardisation criteria have been satisfied. The ABB is based on multiple specifications that are already standardized at W3C for a couple of years. Also the Core Vocabularies that are used in the ABB are under constant maintenance at the ISA/ISA<sup>2</sup> Programme. The ABB and the underlying specifications are described in sufficient detail and consistency.

A few standardisation criteria have not been satisfied. There is no planned mechanism specified to assess the conformity of implementations to the semantic mapping service specifications. Furthermore, the description of the REST APIs of the ABB can be extended with a more detailed description of the JSON/XML output format. In addition, the process for participating in the development of the ISA Core Vocabulary is less open and is strongly controlled by the EC and contractors. With respect to life cycle management of the ABB, it is not clear yet if there is a future maintaining organization. Within the e-SENS project this is taken care of, but after the lifetime of the project this is not guaranteed. This includes also the process, procedures and tools for the maintenance of the ABB. The "Recommendations for improvement" section below comprises suggestions that might be considered for these criteria.

#### 4.2.2.2. Policy framework alignment

Most of the policy criteria are satisfied by the ABB Semantic Mapping Service. It complies to the EIF v2.0 and is aligned with national frameworks. Especially, it is meant to provide a mapping between national semantic frameworks and thereby enhancing the usage of evidence and criteria across European Member States. The security related policy criteria of the assessment framework are not applicable to this ABB. With respect to the potential criteria, only the evidence criteria, have not been met. The submitter of the ABB provided too little information about the evidence criteria of the impact of the ABB to do a proper assessment on the criteria that relate to this. In addition, a risk assessment document of the ABB would be needed to make statements on the maturity of that criterion. Finally, with respect to future developments, it is most important to define a future governance organization for this ABB. This organization should take care of the further development of the Semantic Mapping Service and its adoption. The "Recommendations for improvement" section below comprises some policy related suggestions.

#### 4.2.2.3. Business/market

Some of the business/market needs criteria are not satisfied by the ABB. Although there are applications for the Semantic Mapping Service that have positive changes towards citizens/businesses, a clear business plan with a good business case description should be provided. Furthermore, there is no evaluation of costs and benefits as ROI of using the SMS in a Member State provided. As there is no commercial implementation of the SMS ABB yet, it is very important to stimulate the further development and usage of the semantic mapping service. Thus, further support for this ABB by a future governance organization is very important. The "Recommendations for improvement" section below comprises some business/market need related suggestions.

### 4.2.3. Recommendations for improvement

In this section, several recommendations are given on the ABB to improve the sustainability and maturity level of the Semantic Mapping Service.

Standardisation criteria – recommendations for maturity:

- Provide a better description of the REST APIs of the ABB by extending them with a more detailed description of the JSON/XML output format.

Standardisation criteria – recommendations for openness and lifecycle management:

- Enable a process in which all stakeholders can participate or influence in the development of components in the ISA Core Vocabularies.

Standardisation criteria – recommendations for life-cycle management:

- Specify a clear future long-term governance organization for the ABB Semantic Mapping Service.
- Ensure the future maintenance by handing over the ABB specifications to this new organization.
- Define proper and open maintenance processes and procedures for this new organization to deal with modifications, migration, disposal and especially with the contribution of all stakeholders.

Alignment with Existing Policy Frameworks criteria - recommendations for potential:

- Provide evidence on the potential of DSS to make an assessment possible. This concerns evidence on positive impact, risk assessment and future development.

Business need – recommendations on basic criteria:

- Define a business plan and a clear business case for the usage and commercialization of the ABB semantic mapping service.
- Provide an evaluation of cost and benefits of using SMS between Member States based on a specific use case for mapping of different terms between countries.

Business need – recommendations on market support:

- Stimulate the usage of the semantic mapping service in commercial products via proper handover of the ABB to the CEF and support from the responsible EC DGs.

#### 4.2.4. Recommendation for public consultation or piloting

The ABB Semantic Mapping Service is *not sufficiently mature* for broad roll-out outside of the e-SENS project. However, it can be used for further piloting by Member States for mapping of semantic terms across borders. Thus, the recommendation is to put the ABB forward for further development and adoption by Member States. Via which means this will be done is a topic for further discussion together with CEF. A new European project in which the semantic mappings can be further developed and tested is recommended.

## 5. Assessment of Conformance and Interoperability Testing BB

### 5.1. Objective

This chapter focuses on the Conformance and Interoperability Testing BB that was assessed during the third cycle. This is:

1. ABB Conformance and Interoperability Testbed

### 5.2. ABB Conformance and Interoperability Testbed

#### 5.2.1. What has been assessed

Description:	Conformance and Interoperability Testbed Architectural Building Block (ABB) is the main element of Conformance and Interoperability Testing SAT. It aims to specify a highly sustainable, interoperable and scalable testbed for the e-SENS SBBs.
Assessment main documentation:	[1] <a href="http://wiki.ds.unipi.gr/pages/viewpage.action?pageId=25166219">http://wiki.ds.unipi.gr/pages/viewpage.action?pageId=25166219</a> [2] <a href="http://wiki.ds.unipi.gr/display/ESENS/SAT++Conformance+and+Interoperability++0.4.1">http://wiki.ds.unipi.gr/display/ESENS/SAT++Conformance+and+Interoperability++0.4.1</a> [3] <a href="http://wiki.ds.unipi.gr/display/ESENS/SBB++Minder++0.6.0">http://wiki.ds.unipi.gr/display/ESENS/SBB++Minder++0.6.0</a> [4] <a href="http://wiki.ds.unipi.gr/display/ESENS/SP++eSENS+TestBed++0.2.0">http://wiki.ds.unipi.gr/display/ESENS/SP++eSENS+TestBed++0.2.0</a> [5] e-SENS D3.7 Sustainability plans for e-SENS building blocks_v1.pdf [6] <a href="https://joinup.ec.europa.eu/software/minder/home">https://joinup.ec.europa.eu/software/minder/home</a>
Other documentation:	[7] e-SENS D6.6 Enterprise Interoperability Architecture - e-SENS EIRA n°3 v1.01.docx [8] Test Assertion Guidelines_v0.1.docx [9] eSENS_WP6_Testing Strategy_v0.6.docx [10] <a href="http://www.cen.eu/work/areas/ict/ebusiness/pages/ws-gitb.aspx">http://www.cen.eu/work/areas/ict/ebusiness/pages/ws-gitb.aspx</a> [11] <a href="http://ec.europa.eu/isa/library/isa-work-programme/index_en.htm">http://ec.europa.eu/isa/library/isa-work-programme/index_en.htm</a> [12] EIF - European Interoperability Framework for European public services, <a href="http://ec.europa.eu/isa/documents/isa_annex_ii_eif_en.pdf">http://ec.europa.eu/isa/documents/isa_annex_ii_eif_en.pdf</a> [13] <a href="https://github.com/mindertestbed/minder/releases/tag/V2.0-TributeJ15">https://github.com/mindertestbed/minder/releases/tag/V2.0-TributeJ15</a>
Location of all submitted documentation and results:	<a href="https://www.jol.nrw.de/bscw/bscw.cgi/7874762">https://www.jol.nrw.de/bscw/bscw.cgi/7874762</a>

#### 5.2.2. Sustainability and maturity status

This section provides an overview of the sustainability and maturity status. For details, please refer to the building block assessment form at the location of submitted documentation and results on the BSCW server.

##### 5.2.2.1. Standardisation

The assessment has shown a **good level of maturity, openness and stability** for the addressing ABB. This statement is based on the following reasons:

1. The Conformance and Interoperability Testbed ABB is successfully used in all domains of e-SENS where a set of pilots are conducted among different Member States performing a set of different use cases. It is remarkable its use in AS4 Conformance event and SMP testing where using information properly in terms of syntactic (communication and exchanging data) and semantic (interpreting the information exchanged meaningfully) is crucial. This ABB and its main SBB ("Minder") make it feasible to carry out:
  - a. Conformance testing evaluates whether a product meets the necessary requirements for communication standards determined by WP6.1, e-Document standards determined by WP6.2 and eID, Security and Trust standards determined by WP6.3. In e-SENS, conformance testing verifies whether the e-SENS products perform in compliance with the defined standards.
  - b. Interoperability testing evaluates whether all the e-SENS modules, that are candidate to be used in piloting in all domains, exchange and use information properly in terms of syntactic (communication and exchanging data) and semantic (interpreting the information exchanged meaningfully) aspects.
2. The Conformance and Interoperability Testbed ABB is based on open and well-known standards and specifications: 1) Global eBusiness Interoperability Test Beds (GITB), 2) OASIS Test Assertions Specification and 3) OASIS TAML.
3. The Conformance and Interoperability Testbed ABB has a complete set of guidelines, functional and technical documentation available in e-SENS-wiki and JoinUp portal.
4. All software resources related to this ABB are available in JoinUp portal under EUPL license.

The assessment has also confirmed that a **life-cycle management** process exists where CEF and ISA are expected to take over the ownership and maintenance. It is important to note that one of the aims of Minder has been to achieve compliance with the Global e-Business Interoperability Test Bed methodologies (GITB). Towards this target, GITB – Minder collaboration has been initiated through the Commission ISA Programme in the first half of year 2015. The ISA GITB team has selected the “Minder” as the first test bed to be piloted for GITB compliance. The Minder GITB compliance work has been finished and Minder 2.0-TributeJ15 has been released as the first fully service level GITB compliant testbed.

#### 5.2.2.2. Policy framework alignment

The Conformance and Interoperability Testbed ABB is in line with the **European Interoperability Framework**, in particular with Principle n° 4 Security and Privacy, Principle n° 9 Openness and Principle n° 11 Technological neutrality and adaptability. EU Data Protection Legislation is fully respected by this ABB.

This assessment has confirmed the significant **applicability** and high **potential** of the addressing ABB when the quality and reliability of cross-border services are crucial for citizens, public or private organizations. In other words, the adoption of the addressing ABB could be a great leap in **eGovernment** services when conformance and interoperability testing are crucial to guarantee that the background products/systems comply with the requirements of a specification and on the other hand, to verify the ability of two or more products/systems to work properly together.

### 5.2.2.3. Business/market

The assessment has shown a **significant and improving business need** in the use of the Conformance and Interoperability Testbed ABB. This is especially true when e-business testing capabilities are needed, particularly in situations where e-business operations imply complex interactions among a larger number of organizations. Therefore, potential change in the quality of the services delivered to the citizens, public or private organizations after adopting this ABB is guaranteed.

This assessment has also confirmed the **market support** and acceptance by the public administration where relevant stakeholders are involved: CEF (Connecting Europe Facility), ISA (Interoperability Solutions for European Public Administrations) and Standardisation (OASIS TAM v.10, ADMS, GITB).

No competing solutions are available in Member Countries.

## 5.2.3. Recommendations for improvement

### 5.2.3.1. Standardisation criteria

1. Provide more details about the hand over process to CEF and ISA for the Conformance and Interoperability Testbed ABB.
2. Ensure successful conclusion of the work on GITB compliance with the Conformance and Interoperability Testbed ABB.

### 5.2.3.2. Existing Policy criteria

1. No recommendation for improvement.

### 5.2.3.3. Business need criteria

1. Provide some figures with the realistic demand for cross-border services in the short, medium and long term.
2. Provide some figures with information about the costs and benefits for adopting the addressing ABB.

## 5.2.4. Recommendation for public consulting or piloting

The Conformance and Interoperability Testbed ABB is *sufficiently mature* to be used by Member States for specifying a highly sustainable, interoperable and scalable testbed which guarantees the quality of their eGovernment services especially when there are involved complex interactions among a larger number of organizations. Besides, relevant stakeholders (CEF, ISA, and OASIS) are involved in its development.



## 6. Assessment of eHealth BB

### 6.1. Objective

This chapter focuses on the eHealth BB that was assessed during the third cycle. This is:

1. SBB Clinical Document Architecture (CDA)

### 6.2. SBB Clinical Document Architecture (CDA)

#### 6.2.1. What has been assessed

Description:	HL7 Defines CDA as follows: The HL7 Version 3 Clinical Document Architecture (CDA®) is a document markup standard that specifies the structure and semantics of "clinical documents" for the purpose of exchange between healthcare providers and patients. It defines a clinical document as having the following six characteristics: 1) Persistence, 2) Stewardship, 3) Potential for authentication, 4) Context, 5) Wholeness and 6) Human readability. <sup>7</sup>
Assessment main documentation:	<a href="http://www.hl7.org/implement/standards/product_brief.cfm?product_id=7">http://www.hl7.org/implement/standards/product_brief.cfm?product_id=7</a> <a href="http://www.hl7.org/implement/standards/product_brief.cfm?product_id=408">http://www.hl7.org/implement/standards/product_brief.cfm?product_id=408</a> <a href="http://www.hl7.org/implement/standards/product_brief.cfm?product_id=258">http://www.hl7.org/implement/standards/product_brief.cfm?product_id=258</a>
Other documentation:	<a href="http://stackoverflow.com/questions/9678853/what-difference-hl7-v3-and-cda">http://stackoverflow.com/questions/9678853/what-difference-hl7-v3-and-cda</a> <a href="https://en.wikipedia.org/wiki/Clinical_Document_Architecture">https://en.wikipedia.org/wiki/Clinical_Document_Architecture</a> <a href="http://ec.europa.eu/isa/documents/isa_annex_ii_eif_en.pdf">http://ec.europa.eu/isa/documents/isa_annex_ii_eif_en.pdf</a> <a href="http://wiki.ds.unipi.gr/display/ESENS/ABB+-+Document+Provisioning+-+0.7.0">http://wiki.ds.unipi.gr/display/ESENS/ABB+-+Document+Provisioning+-+0.7.0</a> <a href="http://www.epsos.eu/technical-background/systems-standards/patient-service-order-service.html">http://www.epsos.eu/technical-background/systems-standards/patient-service-order-service.html</a> <a href="http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1380194/">http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1380194/</a> <a href="http://xml.coverpages.org/CDA-Release2-Unofficial.html">http://xml.coverpages.org/CDA-Release2-Unofficial.html</a> <a href="http://www.hl7.org/events/index.cfm?showallevents">http://www.hl7.org/events/index.cfm?showallevents</a>
Location of all submitted documentation and results:	<a href="https://www.jol.nrw.de/bscw/bscw.cgi/7874705">https://www.jol.nrw.de/bscw/bscw.cgi/7874705</a>

#### 6.2.2. Sustainability and maturity status

This section provides an overview of the sustainability and maturity status. For details, please refer to the building block assessment form at the location of submitted documentation and results on the BSCW server.

##### 6.2.2.1. Standardisation

The standardization criteria for the HL7 CDA have been grouped under the following categories: Maturity, Openness, Intellectual Property Rights and Lifecycle Management.

IHE CDA document standard has almost finished its second decade being as a commonly used health document format. Its use has spread in many countries in Europe and America and prestigious

<sup>7</sup> [http://www.hl7.org/implement/standards/product\\_brief.cfm?product\\_id=7](http://www.hl7.org/implement/standards/product_brief.cfm?product_id=7)



companies like Google and Microsoft. It has been also adopted and profiled for further enhancements by different organizations. As an example, Continuity of Case Document (CCD) has been developed as a combination of CDA and ASTM's Continuity of Case Record (CCR). CDA has also been used as the main business level transport structure in the eSOS LSP.

HL7 is not an open organization. Access to most of the resources is free but participation to the development (e.g. conformance tests, X-thon events) requires non-trivial payment. However, Access to the CDA specification is available after a free registration to the HL7 web site. Therefore, one can access the latest progress, the change requests, new features, new releases and release date information on the HL7 Web site. This includes the specification and implementation guidelines for the CDA specification.

The access of all the HL7 resources is available after a voluntary licence agreement between HL7 and the licence holder (e.g. the end user). The CDA resources licence agreement can be categorized as (F)RAND and Royalty Free.

HL7 maintains the lifecycle of all its standards including CDA. CDA has been released as CDA1, CDA2, CDA2.1 and CDA3 as an ongoing work. The improvements in the specification are decided based on a proposal database as well as workshops.

#### 6.2.2.2. Policy framework alignment

HL7 CDA emits different behaviours with respect to the alignment with existing policies like interoperability, compliance with the EU legal framework on data protection and alignment with Member States' national frameworks. CDA is in line with EIFv2.0 underlying principles and the EU legal framework on data protection and electronic signatures. However, it does not provide a specification on the security, integrity and privacy of the data being carried in a CDA document and such requirements should be satisfied by the system that uses this document format. Since it's essentially an XML structure, a standard XML security – integrity mechanism can be easily used with the CDA document for protection.

CDA is an interoperable clinical data transport structure, and is XML based. It can be easily converted to/from the national or Member State specific document formats. Its contents can easily be traversed by a standard DOM parser or with XPath queries. CDA is defined to represent health documents like discharge summary, referral, clinical summary, diagnostic report in a language and state neutral way. It has been developed using the HL7 data types and is fully interoperable and is also well aligned with the national frameworks.

The functional non-functional requirements of HL7 CDA have been clearly defined under the e-SENS EIRA Document Provisioning ABB and are available in the e-SENS wiki page for Member States' access.

The CDA is adopted by different countries and health organizations in order to facilitate standardization and interoperability. This facilitates long term sustainability of the systems that adopt the specification. Clinical and Public Health Laboratories, Immunization Registries, Quality Reporting Agencies, Regulatory Agency, Standards Development Organizations (SDOs) mostly benefit from the CDA. From the fact that it is XML based, it can be induced that it makes adoption and migration easy and provides flexibility to the systems.

#### 6.2.2.3. Business/market

HL7 provides support for further improvement of the CDA specification. While it has been widely used in the market for about two decades, the business and technical needs that are related to the content of the business document have also evolved. Towards fulfilment of newly emerging requirements, additional revisions and releases of the CDA specification have been developed by HL7 and its

participants. Currently CDAV2 provides three levels for transfer of data as coded/non-coded parts such as embedded PDFs or additional clinical data. The evolution of the specification in order to satisfy business needs, increases the adoption of the standard.

CDA has been adopted in the epSOS project as the document format for 'ePrescription' and 'Patient summary'. In the U.S CDA is a basis for Continuity of Care Document (CCD). Also Austria Personally Controlled Electronic Health Record (PCEHR) uses HL7 CDA format. UK, IT and several other EU MS also use the document format.

### 6.2.3. Recommendations for improvement

Standardisation criteria - recommendations for lifecycle management:

- Provide more information about the service level agreements related to the availability of CDA.

Alignment with *Existing Policy Frameworks criteria* - recommendations for basic alignment with existing policies:

- CDA leaves security and data protection to systems but more information can be provided on how it can be used without a problem in such a system.
- For CDA it is hard to talk about 'alignment with national framework' because it is not related to but is convertible vice versa to national data types. More information might be obtained by examining MS use cases.

Alignment with *Existing Policy Frameworks criteria* - recommendations for potential:

- Provide evidence for the positive impact on financial costs.
- Provide evidence for the positive impact on administrative burden.

Business need criteria - market support:

- Provide information on the costs and benefits of adopting the CDA spec.

### 6.2.4. Recommendation for public consulting or piloting

The SBB CDA has reached a level of *maturity* to be classified as "Accepted" and to be used by Member States for dealing with clinical documents in the eHealth domain. The CDA specification is being standardized via HL7, which is a well-organized standardisation organization that standardizes the information exchange in the health care sector. The building block is already in use in the health care sector for a decade or more and has been piloted in various projects. However, in order to make the BB even more mature, the recommendations on life cycle management, policy alignment and costs/benefits should be followed.

## 7. Conclusions, recommendations and future steps

The main conclusions of this third e-Sens BB assessment cycle are:

- All the BBs require further improvement by e-SENS WP6:
  - Recommendations for further improvement are provided.
- Two of the 5 BBs are classified “Accepted”:
  - ABB Audit Trail and Node Authentication (ATNA):
    - IHE ATNA is already accepted by the Multi-Stakeholder Platform for ICT Standardisation as ICT technical specification to be used in public procurement
  - SBB Clinical Document Architecture (CDA):
    - HL7 CDA is already in use in the health care sector for a decade or more and has been piloted in various projects.
- Two of the 5 BBs are sufficiently mature for further promotion and adoption by important national stakeholders external to the e-SENS project:
  - ABB eXtensible Access Control Markup Language (XACML)
  - ABB Conformance and Interoperability Testbed (CIT)

During this process, special attention needs to be placed on interaction with the European Multi-Stakeholder Platform for ICT Standardisation, although for these building blocks the recommendations should be handled first. They could be put under the attention of stakeholders like DG Connect and DIGIT that deal with the CEF, as well as the formal European standardisation organisations.

- One of the 5 BBs is not sufficiently mature and needs further development:
  - ABB Semantic Mapping Service (SMS):
    - Although the underlying semantic specifications are well-standardised at W3C and ISA<sup>2</sup>, the ABB itself that makes use of these specifications needs further development, piloting and testing before broader roll-out.
- Further promotion and adoption of the building blocks is required to be performed in close cooperation with WP2 and WP5/6.
- Further piloting by WP5 per BB is required.
- All ABBs pay little or no attention to the ease of national implementation. As a consequence, this needs to be investigated in the next phase with piloting. The current national implementations can be inventoried to check compliance to the BBs. Alternatively, a pilot



setting could be chosen by the e-SENS project in which further alignment between the BBs and national implementations can be tested.

This is the final version of the assessment Deliverable D3.2 as WP6 and WP5 are concluding their development activities and the e-SENS project is running to its end. No future steps in e-SENS task T3.2 on the assessment of BBs are therefore planned. In Deliverable D3.7 further work on sustainability plans for the various SATs and their building blocks is described. This deliverable makes statements on the future maintenance of all the building blocks after the lifetime of the e-SENS project.

## References

1. e-SENS deliverable D6.6 titled “e-SENS EIRA n° 3”, editors Cagatay Karabat, Eric Gandry, Klaus Vilstrup Pedersen, version 1.01, April 2016.
2. e-SENS deliverable D3.1 titled “Guidelines to the assessment of the sustainability and maturity of building blocks”, editor Jaak Tepandi, version 1.0, October 2013.

## Appendix I – Assessment framework

In this appendix, the complete assessment framework as described in D3.1 is depicted in detail.

### Maturity

Nr	Category	Description	Nr	Sub-Category	Description	Nr	Criteria
2	Maturity	A TOA should in itself be mature enough for adoption by public administrations. This category addresses the development status, the quality, guidelines and stability of the TOA.	2.1	Development status	For the development status, the current development status of the TOA in the development cycle is addressed.	A.9	Has the TOA been sufficiently developed and in existence for sufficient period to overcome most of its initial problems?
			2.2	Quality	For quality, the level of detail in the TOA and the performance of implementations is addressed.	A.10	Are there existing or planned mechanisms to assess conformity of the implementations of the TOA (e.g. conformity tests, certifications)?
						A.11	Has the TOA sufficient detail, consistency and completeness for the use and development of products?
			2.3	Guidelines	For the guidelines, the existence of implementation guidelines or reference implementations is addressed.	A.12	Does the TOA provide available implementation guidelines and documentation for the implementation of products?
						A.13	Does the TOA provide reference (or open source) implementation?
			2.4	Stability	For stability, the level of change of the TOA and the stability of underlying technologies is addressed.	A.14	Does the TOA address backward compatibility with previous versions?
						A.15	Have the underlying technologies for implementing the TOA been proven?
						A.15	Have the underlying technologies for implementing the TOA been stable?
						A.15	Have the underlying technologies for implementing the TOA been clearly defined?
							If applicable, other indicators may be applied, such as volume of transitions, frequency of transactions, and so on.

### Openness

Nr	Category	Description	Nr	Sub-Category	Description	Nr	Criteria
3	Openness	A TOA should be sufficiently open and available to be relevant for adoption by public administrations. This category addresses the openness of the organisation maintaining the TOA and its decision-making process, and openness of the documentation and accessibility of the TOA.	3.1	Organisation	For the openness of the organisation maintaining the TOA, the level of openness for participating in this organisation is addressed.	A.16	Is information on the terms and policies for the establishment and operation of the organisation maintaining the TOA publicly available?
						A.17	Is participation in the creation process of the TOA open to all relevant stakeholders (e.g. organisations, companies or individuals)?
			3.2	Process	For the process, the level of openness regarding the development and decision-making process for the TOA is addressed.	A.18	Is information on the standardisation process publicly available?
						A.19	Information on the decision-making process for approving TOAs is publicly available?
						A.20	Are the TOAs approved in decision-making process which aims at reaching consensus?
						A.21	Are the TOAs reviewed using formal review process with all relevant external stakeholders (e.g. public consultation)?
						A.22	All relevant stakeholders can formally appeal or raise objections to the development and approval of TOAs?
			3.3	Documentation	For the openness of the 'documentation', the accessibility and availability of the documentation of the TOA is addressed.	A.23	Relevant documentation of the development and approval process of TOAs is publicly available (e.g. preliminary results, committee meeting notes)?
						A.24	Is the documentation of the TOA publicly available for implementation and use on reasonable terms?

IPR

Nr	Category	Description	Nr	Sub-Category	Description	Nr	Criteria
4	Intellectual property rights	Are OAs should be licensed in (F)RAND terms or even on royalty-free basis in a way that allows implementation in different products. This category addresses the availability of the documentation on the IPR and the licenses for the implementation of the OA.	4.1	Documentation	For the documentation of the intellectual property rights, the availability of the information concerning the ownership rights of the OA is addressed.	A.25	Is the documentation of the IPR or OAs publicly available?
			4.2	Licenses	For the licenses within the intellectual property rights, (fair) reasonable and non-discriminatory ((F)RAND) or even royalty-free basis is addressed for the use and implementation of the OA.	A.26	Is the OA licensed in (F)RAND basis?
						A.27	Is the OA licensed in a royalty-free basis?

Lifecycle management

Nr	Category	Description	Nr	Sub-Category	Description	Nr	Criteria
	Life cycle management	The life cycle management process provides life cycle policies, processes, and procedures.			There should exist a life cycle management process.		Is an organisation available for providing life cycle policies, processes, and procedures for the OA?
							Is the life cycle workflow over the project lifetime (development, revisions, updates, work in progress, and incremental version releases) established?
	Maintenance	The maintenance process provides cost-effective support of the OAs during their life cycle, including change management.		Maintenance implementation	There should be plans and procedures for conducting the maintenance activities.		Does the maintaining organisation exist?
							Has the maintaining organisation developed, documented, and executed plans and procedures for conducting the maintenance activities?
				Problem analysis	The problem reports or modification requests should be analyzed for their impact.		Does the maintainer have procedures for analyzing the problem reports or modification requests for their impacts on the organization, the existing system, and its interfaces?
				Modification implementation	It should be determined and documented which software items need to be modified.		Does the maintainer have procedures for determining which software units and versions need to be modified?
				Migration	Migration of the system or software product (including data) should be planned, documented, and performed.		Are there procedures for developing, documenting, and executing migration plans, including the system, data, and users?
				Disposal	Ending the existence of the OA should be planned, documented, and performed.		Are there procedures for developing, documenting, and executing disposal plans for OAs?
	Service levels	The services related to the OA should be agreed with the customers.		SLA	If applicable, there should be service level agreements relating to the availability of the OA.		Do SLAs relating to the availability of the OA exist?
					If applicable, there should exist an emergency helpdesk for the OA.		Is there an emergency helpdesk for the OA?
	Security	Systems, data, and resources should be protected from accidental or malicious acts.		ISMS	The maintainer should have an information security management system.		Does the maintainer have a system based on business risk approach, to establish, implement, operate, monitor, review, maintain and improve information security?
				Identification	Information security requirements should be understood.		Has the maintainer analysed and understood the information security requirements related to the OA?
				Risks	Information security risks should be assessed.		Has the maintainer assessed the information security risks related to the OA?
				Controls	Information security controls should be selected and implemented.		Has the maintainer selected and implemented information security controls related to the OA?
				Monitor	The effectiveness of the ISMS should be monitored, maintained, and improved.		Is the maintainer monitoring, maintaining, and improving the effectiveness of the ISMS?

Basic alignment with existing policies

Nr	Category	Description	Nr	Sub-Category	Description	Nr	Criteria
	Interoperability	The ESAs and Building Blocks in Member States should be interoperable.		EIA	The TOA should conform to the European Interoperability Architecture.		Are there any disagreements between the TOA and the EIA?
				EIF	The TOA should conform to the European Interoperability Framework.		Is the TOA in line with the 23 underlying principles of the EIF v2.0? And if not, which principles are not satisfied?
				A2A services	The TOA should support A2A services, if applicable.		Is the TOA in line with the conceptual model for public services as defined in the EIF? And if not, which recommendations are not satisfied?
	Compliance	The proposed solutions should be compliant with the EU legal framework on data protection and legislation on electronic signatures.		Data protection	The proposed solutions should be compliant with the EU legal framework on data protection.		Are the proposed solutions compliant with the EU legal framework on data protection?
				Electronic signatures	The proposed solutions should be compliant with the EU legislation on electronic signatures.		Are the proposed solutions compliant with the EU legislation on electronic signatures?
	Member States	Alignment with national frameworks of the participating countries and avoiding potential incompatibilities between Member States.		National frameworks	Alignment with national frameworks of the participating countries.		Is the TOA aligned with national frameworks of the participating countries?
				Incompatibilities	Avoiding potential incompatibilities between Member States.		Are potential incompatibilities between Member States taken care of?
	Legal	The legal validity of information exchanged must be maintained across borders.		Information	Maintenance of the legal validity of information exchanged across borders.		Is the legal validity of information exchanged maintained across borders?
	Protection	Data protection legislation in both originating and receiving countries must be respected.		Data protection	Adherence to the data protection legislation in both originating and receiving countries.		Is data protection legislation in both originating and receiving countries respected?

Applicability

Nr	Category	Description	Nr	Sub-Category	Description	Nr	Criteria
1	Applicability	A TOA should be usable and easy to implement in different products to be relevant for adoption by public administrations. This category addresses the definition of functional scope and areas of application, the possible reusability in other areas, the possible alternative specifications, the compatibility and dependency on other specifications or technologies.	1.1	Area of application	For the area of application, the functionalities and intended use of the TOA are addressed within the context of interoperability and Government.	A.1	Does the TOA address and facilitate interoperability between public administrations?
						A.2	Does the TOA address and facilitate the development of eGovernment?
			1.2	Requirements	For the requirements, the functional and non-functional requirements for using and implementing the TOA are addressed. This criterion is related to the use assessment scenario.	A.3	Are the functional and non-functional requirements for the use and implementation of the TOA clearly defined?
			1.3	Reusability	For reusability, the level of reusability of the TOA in the same or other areas of application is addressed.	A.4	Is the TOA applicable and extensible for implementations in different domains?
			1.4	Alternatives	For the alternatives, the degree to which the TOA adds value compared to alternative TOAs in the same area of application is addressed.	A.5	Does the TOA provide sufficient added value compared to alternative TOAs in the same area of application?
			1.5	Compatibility	For compatibility, the compatibility of the TOA with other TOAs in the same area of application is addressed.	A.6	Is the TOA largely compatible with related (not alternative) TOAs in the same area of application?
			1.6	Dependencies	'Dependencies' addresses the degree of independence of the TOA from specific vendor products, platforms or technologies.	A.7	Is the TOA largely independent from specific vendor products?
						A.8	Is the TOA largely independent from specific platforms or technologies?

Potential

Nr	Category	Description	Nr	Sub-Category	Description	Nr	Criteria
6	Potential	A TOA should have sufficient and positive future consequences, evolution and impact for being adopted by public administrations. This category addresses the consequences and impact of using or adopting the TOA, the advantages and risks, the maintenance and possible future developments.	6.1	Impact	For the impact, the minimisation of the consequences of using and adopting the TOA is addressed. The consequences are evaluated and described in terms of different aspects.		Is there somebody who directly benefits from the specification?
						A.33	Is there evidence that the adoption of the TOA positively impacts organisational processes?
						A.34	Is there evidence that the adoption of the TOA positively impacts the migration of current systems?
						A.35	Is there evidence that the adoption of the TOA positively impacts the environment?
						A.36	Is there evidence that the adoption of the TOA positively impacts the financial costs?
						A.37	Is there evidence that the adoption of the TOA positively impacts the security?
						A.38	Is there evidence that the adoption of the TOA positively impacts the privacy?
						A.39	Is there evidence that the adoption of the TOA positively impacts the administrative burden?
						A.40	Is there evidence that the adoption of the TOA positively impacts the disability support?
							Is there evidence that the adoption of the TOA advances or is supported by the emerging technologies such as cloud computing or Internet of Things?
			6.2	Risks	For the risks, the level of uncertainty is addressed for using and adopting the TOA.	A.41	What are the risks? What is the probability of their emergence? Are they related to the adoption of the TOA?
			6.3	Maintenance and future developments	For the maintenance and future developments, the support and the planned or existing actions to maintain, improve and develop the TOA in the long term are addressed.	A.42	Are there future plans for the future development of the TOA?
						A.43	Is there sufficient finances and resources for the future development in the middle to long term (e.g. next 3 years)?



Basic business need criteria

Nr	Cate-gory	Description	Nr	Sub-Cate-gory	Description	Nr	Criteria
	Business need	Need for the TOA by end users.		Change	Potential to change in the quality of the service delivered to the citizen/business by the administration before and after adopting the TOA.		Are positive changes in the quality of the service delivered to the citizen/business by the administration before and after adopting the TOA foreseen?
				Usage	Opportunities for software/service providers to put the TOA into use.		Do opportunities exist for software/service providers to put the TOA into use?
				Business plan	Availability of a commercially-oriented, robust Business Plan for investment, built upon an underlying commercially sustainable business model.		Is the Business Plan for investment built upon an underlying commercially sustainable business model?
				Business case	A business case should take into account how the TOA will help public partners in achieving their missions.		Does the business case take into account how the TOA will help public partners in achieving their missions?
				Sharing	Relevance of having the same components integrated as European (shared) building blocks across different use cases.		Could the TOA be integrated as a European (shared) building block across different use cases?
				Cross-border	Usefulness of the TOA in the development of eGovernment cross-border services.		Could the TOA be useful in the development of eGovernment cross-border services?
				Market	Potential for the TOA to be adopted by the market and be used in cross-border eGovernment services.		Does the TOA have a potential to be adopted by the market and be used in cross-border eGovernment services?
				ROI	Where applicable, the costs and benefits of adopting the TOA, including the assessment of the Return on Investment.		If applicable, is the evaluation of the costs and benefits of adopting the TOA available?
				Geographic	Possibility for a broader geographic and sector usage.		Is there any possibility for a broader geographic and sector usage?

Market support

Nr	Cate-gory	Description	Nr	Sub-Cate-gory	Description	Nr	Criteria
5	Market support	A TOA should have sufficient market acceptance and support in order to be adopted by public administrations. This category addresses the proven and operational implementations of the TOA, the market share and demand for the products, and the support from users and communities.	5.1	Implementations	For the 'implementations', the existence of proven and best practice implementations for the TOA is addressed, in different domains and by different vendors.	A.28	Has the TOA been used for different implementations by different vendors/suppliers?
						A.29	Has the TOA been used in different industries, business sectors or functions?
			5.2	Market demand	For 'market demand', the penetration and acceptance of products implementing the TOA in the market is addressed.	A.30	Do the products that implement the TOA have a significant market share in adoption?
			5.3	Users	For the 'users', the diversity of the end-users of the products implementing the TOA is addressed.	A.31	Do the products that implement the TOA target a broad spectrum of end-users?
			5.4	Interest groups	For the 'interest groups', the degree of support from different interest groups is addressed.	A.32	Has the TOA strong support from different interest groups?
				Payer	For the 'payer' the existence of groups ready to pay for the service is addressed.		Who is willing to pay for the service?
				Competition	For the 'competition' the existence of competing solutions is addressed.		To what extent the TOA competes with other solutions available in member countries?
				Support	For the 'support' the existence of support for the market is addressed.		Is there any support available for the market in using the TOA?