

Assessment of the Maturity of eGovernment Building Blocks for Public Administrations in the European Union

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Abstract: This paper describes the results of a maturity assessment of a set of generic building blocks for public administrations in the EU. In the European e-SENS project, various generic building blocks are developed, such as eID, eSignature, eDelivery and eDocument building blocks. They should be used by all EU administrations when they are sufficiently mature. In order to assess the maturity, an assessment framework is described based on a combination of existing methodologies, such as CAMSS and ADMS. The framework contains clusters of criteria on standardization, policy alignment and business/market needs. It has been applied by the e-SENS project to a set of 14 building blocks. The main lesson learned is that standardization criteria are fairly easy to check, policy alignment criteria need to be checked in sufficient detail and business/market need criteria can only be checked properly at national level via a public consultation. Some of the building blocks are brought further to the EU Multi-Stakeholder Platform on ICT standardization, while for others improvements have been defined.

1. Introduction

In the European Union a lot of effort has been spent the last 10 years to stimulate the development and use of generic building blocks for pan-European public administration services, such as electronic signatures, electronic identities, electronic delivery and electronic documents. Most of these activities were carried out in big European projects, the so-called Large-Scale Pilots (LSPs) [1] SPOCS [2], e-CODEX [3], epSOS [4], STORK [5] and PEPPOL [6], each of them focusing on a different application domain, such as eProcurement, eHealth and eJustice. They have demonstrated that the provision of electronic cross-border services is achievable and feasible. For each domain, technical building blocks have been developed and piloted, mostly with a domain-specific focus.

As a successor of all of these pilots, the e-SENS project - Electronic Simple European Networked Services - focuses on strengthening the Single Market by facilitating public services across borders. The goal of e-SENS is to consolidate and improve the work done by the previous LSPs, by industrializing the solutions and extending their potential to new domains. An important part of the project is to align the solutions developed in the various domains to generic building blocks (BBs) for the EU as a whole such as e-ID, e-Signatures, e-Documents and e-Delivery. These generic building blocks should be used by target users like European governments for their electronic service delivery to citizens, businesses and other government organizations.

A key issue for the uptake of these generic building blocks is that they are mature and ready for long-term governance¹ in order to achieve the interoperability of public services across all European Member States and Associated Countries. In order to decide whether a BB is sustainable, the e-SENS project has performed an assessment of a set of BBs that the project wants to consolidate. This assessment focuses on the maturity and long-term sustainability of BBs and makes use of an assessment framework. One of the challenges

¹ See for a definition of long-term governance: e-SENS deliverable D3.5 “Preliminary proposal for long-term sustainability in the CEF”.

is to come up with a good assessment framework. The framework that we used is a combination of European sources such as the Common Assessment Method for Standards and Specifications (CAMSS) framework [7,8,9] and the Asset Description Metadata Schema (ADMS) [10,11,12]. The authors of this paper have extended the frameworks in order to be useful for the assessment of building blocks. In addition, the framework has been applied to a set of building blocks in the area of eSignature, eDelivery, eDocuments and eID. Some lessons learned on the usage of the assessment framework have been drawn. A full report of this work can be found in the e-SENS deliverable D3.2 named “Assessment on the maturity of building blocks: first cycle” [13]. The detailed results of the assessments can be found at the European Commission website Join-up [14].

2. Objectives

The objective of this paper is to present the framework for the assessment of the maturity of electronic government building blocks and the outcome of the assessment of the maturity of 14 BBs consolidated by e-SENS. The focus was on four high-level BBs e-Signature, e-Delivery, e-Documents and eID. For each of these HBBs, 3-4 lower-level BBs have been assessed and recommendations for the improvement of the sustainability and maturity of these BBs are given. Another objective of the paper is to discuss the usefulness of the assessment framework and describe lessons learned during the assessment.

3. Methodology: assessment framework

The methodology used for the sustainability assessment consists of an assessment framework and a process for applying the framework to a building block to be assessed. This framework is based on CAMSS [7,8,9] and ADMS [10,11,12] and reuses most of the criteria in these methods. These methodologies are already a few years old and cover a large portion of maturity criteria that are necessary for the building blocks to be assessed. However, the clustering of the criteria in our framework is based on other higher-level aspects. The criteria in the assessment framework are clustered in 3 groups, which were found to be most important for the EC with respect to maturity: standardization criteria, policy alignment criteria and business needs criteria. Each group contains multiple sub-criteria as presented in the following tables. The term Target of Assessment (ToA) is used to denote the building block to be assessed.

Table 1: Assessment criteria for standardization

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.	Develop-ment	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.	Organiza-tion	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.
		Documen-tation	For the openness of the ‘documentation’, the accessibility and availability of the documentation of the TOA is addressed.

Criterion	Description	Sub-Criterion	Description
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 2: Assessment criteria for policy alignment

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.

Criterion	Description	Sub-Criterion	Description
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 3: Assessment criteria for business needs

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	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.

Criterion	Description	Sub-Criterion	Description
	from users and communities.	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.

The assessment criteria originate from various sources. First, a number of sustainability assessment criteria have been provided in the e-SENS Technical Annex [15] and in discussions with the e-SENS project participants. Second, CAMSS presents the following main categories of criteria for the assessment step: applicability, maturity, openness, intellectual property rights, market support, and potential. Third, there are other frameworks / standards (such as ADMS, e-SENS deliverable D6.1 [16], ISO/IEC 12207², ISO/IEC 25000 series standards³, and other) potentially suitable for assessment. To preserve compatibility with CAMSS, the CAMSS categories are fully integrated into the assessment criteria based on the e-SENS Technical Annex and complemented where necessary, indicating the source for the additional criteria.

4. Methodology: assessment process

The assessment framework has been used in an assessment process that is also based on CAMSS and consists of the following general steps:

1. In the proposal step, the project Architectural Board provides a target of assessment (a BB, including supporting artefacts such as guidelines) to the assessors. 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 sources within the project 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 Architectural Board for using the project.

In a first cycle of assessment, different BBs have been assessed, across the 4 HBBs eSignature, eDelivery, eDocuments and eID. For each of the 4 HBBs, we appointed a responsible person who acted as the proposer of the BBs to be assessed. The proposers followed the proposal step and provided assessors 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 first assessment cycle was only used in a very light

² ISO/IEC 12207:2008. Systems and software engineering. Software life cycle processes

³ ISO/IEC 25000:2005. Software Engineering. Software product Quality Requirements and Evaluation (SQuaRE). Guide to SQuaRE

way insofar as it only made a check whether the most basic documents were submitted, i.e. the submission form and the BB specification.

During the assessment step, for each of the HBBs a team assessors was set-up to do the assessment of the submitted BBs for that HBB. The teams that carried out the assessments had a diverse geographical background as well as a diverse background in the LSPs. 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 that contains the assessment (sub)-criteria as described above. For each of these subcriteria, 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. Summarizing, the assessment step consists of the following activities:

1. The lead assessor organises a physical or teleconference meeting with the proposer of the BB 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. During this first cycle, it was chosen to use the classifications “Observed” or “Accepted” as conclusions for the assessment of the BBs. The main reason for this is that classifications “Discarded”, “Recommended” and “Mandatory” are too strong for a judgment at this stage of the project.

5. Business case and results

The business case for these generic building blocks and their maturity is that it is beneficial for European governments when they use mature generic building blocks for their electronic service delivery to citizens, businesses and other government organizations. For example, having a single electronic identifier that can be used throughout Europe is beneficial for each government as well as citizen/business when dealing with various services and information exchange in various domains such as health and procurement. Getting access to health care records of a patient in another country or sending an electronic invoice to a customer with an electronic signature that can be verified on the other end is very helpful for creating an internal market and society.

For the four HBBs we assessed the following 14 BBs:

- eSignature: EU eSignature Standards Framework, STORK2.0 eSignature creation, PEPPOL eSignature verification and e-CODEX trust library,
- eDelivery: Addressing PartyIdType, Metadata Service Location and Transport ebMS3/AS4,
- eDocuments: Omnifarious Contained for eDocuments, Virtual Company Dossier and Associated Signature Container,
- eID: Security Assesstion Markup Language, Personal Identity Attributes, Quality Authentication Assurance Levels and Online Certificate Status Protocol profile.

For eSignatures, the BB EU eSignature Standards Framework is sufficiently robust to form the standard basis for eSignature solutions across Europe. The standards in that framework are developed by international standards organizations. These organizations are sufficiently open for stakeholders to contribute. As the framework is a result of a European mandate and directive on eSignatures, the standards must be adopted by the national governments. Market acceptance is already taking place. In addition, the three BBs coming from STORK, PEPPOL and e-CODEX currently provide eSignature functionality in a different application domain targeting different end-users. When it comes to market acceptance and national alignment it is very important that these solutions become aligned and part of one overall interoperable eSignature framework that can be used in multiple domains handling all the different requirements. This needs to be solved before a European-wide eSignature solution can be successfully implemented.

For e-Delivery, the BBs that have been assessed are fairly mature and are all ready for public consultation. From a technological robustness point of view the specifications are well standardized in an open manner within the OASIS community. In addition, these BBs are working well together and specific points can still be investigated in a pilot setting. The ebMS3.0/AS4 specifications satisfy the requirements for a transport solution. They are currently being implemented in the LSPs PEPPOL and e-CODEX. The ebMS3/AS4 specifications are supported by OASIS (a non-profit organization that drives the development, convergence and adoption of open standards for the global information society). If they become e-SENS building blocks, suitable life cycle management procedures must be established and implemented.

For e-Documents, the three BBs that have been assessed show a difference in maturity. The ASiC building block is the most mature one as it is based on international standardization activities in ETSI. The building block has been piloted and is now running in various open source implementations. As a result, a public consultation is needed to get further opinions from external stakeholders. A similar result can be drawn for the OCD building block although some more piloting would be welcome. For VCD, a public consultation is too early and more pilot experience should be gained first.

For eID, the four BBs that have been assessed also show a difference in maturity. SAML, PIA and QAA levels are fairly mature and can be put into public consultation - especially SAML, an OASIS standard already being used in various countries. As a consequence, SAML can be easily put forward by the eSens project as a European building block. The PIA and QAA building blocks have been developed within STORK and look mature enough to be put into public consultation although there are still some improvements to make. The biggest issue with the assessed eID BBs is with the OCSP Profile. The place and function of this building block as a PEPS proxy in the overall eID architecture should be reconsidered before the next piloting or public consultation step is taken.

6. Lessons learned

Lessons learned have been drawn in applying the assessment framework to the mentioned building blocks. These are:

- The standardization criteria are fairly easy to check as most of them apply to either a formal/non-formal standardization organization or a project that usually does not have a mature maintenance process in place.

- The policy alignment criteria are much harder to assess and need to be worked out in more detail. For instance, a criterion on the alignment of a building block with national legislation is difficult to check and needs extensive work.
- The business/market need criteria can only be assessed at global level based on publicly available information. A better picture of these needs has to be collected in a public consultation process with external stakeholders.

An overall lesson that was learned is that all BBs pay little or no attention for the ease of national implementation. Already existing national implementations should in the end adhere to the generic building blocks that are to be consolidated at European level. Therefore, the development of the generic building blocks or the selection of underlying standards should take into account that they have to be interoperable with different implementations. However, it looks like this is not sufficiently taken into account as proof and evidence for this in pilot settings is not available.

7. Conclusions and further steps

All the BBs that have been assessed got recommendations for further improvement by the e-SENS project with respect to the sustainability criteria used in our assessments. As a consequence, none of the BBs can already get the classification “Accepted”. More than half of the BBs are already sufficiently mature that a public consultation in a next phase is feasible and advisable. As a consequence, the time scale for availability of the BBs varies significantly, because some are already well-standardized and can be implemented immediately, while others need to be developed further and piloted before they are available for wide usage.

Specifically, the following BBs are ready for an open consultation process to get the opinion of important national stakeholders external to the e-SENS project:

- EU eSignature Standards Framework
- Addressing PartyIDType
- Metadata Service Location
- Transport ebMS3 and AS4
- Associated Signature Container
- Security Assertion Markup Language
- Personal Identity Attributes
- Quality Authentication Assurance levels

Specifically for the HBB eSignature, there are different BBs that have similar or overlapping objectives and functionality, which has to be dealt with in the e-SENS project in order to come up with a single interoperable framework for the e-SENS eSignature HBB. For the HBB eID, the place and functionality of the OCSP profile BB in the overall eID architecture should be reconsidered, as it is now used as a proxy for the PEPS which is not in line with what it was designed for.

Future work is needed in several ways. With respect to adherence to national implementations, it is important to investigate this in the next phase with public consultation or to be subject of piloting in e-SENS. With a public consultation the current national implementations can be inventoried to see whether they comply to the BBs. If not, a pilot setting can be chosen by the e-SENS project in which further alignment between the BBs and national implementations can be tested.

Future work is also necessary on the assessment procedure. An extension of the assessment procedure that incorporates a public consultation step is currently in development. In this respect, special attention is put on interaction with the European Multi-Stakeholder Platform for ICT Standardisation (MSP). The MSP maintains a list of

standards that governments of European member states are allowed to request in European tendering procedures. This list can contain only standards that are in development or maintained by a non-formal standardization organization. The reason for this is that governments of European member states are already legally allowed to request standards from formal standardization bodies, i.e. from CEN, CENELEC, ETSI, ISO, IEC and ITU-T.

Future steps for each of the 8 sufficiently mature BBs are also necessary. A check was done whether they could be submitted to the MSP for inclusion on its list. When looking at the 8 BBs, the EU eSignature Standards Framework and the Associated Signature Container are developed by ETSI and can therefore not be submitted for the MSP list. In addition, the BBs Personal Identity Attributes and Quality Authentication Assurance levels are developed by STORK, which is not a standardization organization and can therefore also not be submitted for the MSP list. The next step for these 2 STORK BBs could be to push them into a standardization organization for further development towards a standard and to align with national governments for further uptake and adoption of the specifications. As a result, only the other 4 BBs can be submitted to the MSP as they are being maintained by OASIS, which is a well-known non-formal standardization organization. This step is currently being taken via the European commission.

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