The National Interoperability Framework of Spain, a Global Approach to Interoperability Integrated in the eGovernment Legal Framework

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Abstract—This article is about the National Interoperability Framework (NIF) of Spain. It develops the three key success factors of the NIF explains how it addresses the interoperability principles, dimensions, agreements and governance, plus other issues related to interoperability, such as standards, common infrastructures and services, reuse of applications, electronic signature, and electronic documents. The NIF embeds interoperability requirements in the legal framework of eGovernment, thus configuring a coherent and comprehensive approach in the context of European Union policies and actions in this field.

I. INTRODUCTION

Cooperation between public administrations is essential to deliver services to citizens and guarantee their rights; especially in a complex scenario such as is the case of the European Union or of decentralized countries like Spain, where there might be a wide number of different stakeholders interacting.

But cooperation requires the right conditions; there must be interoperability which should embrace all aspects of interaction between organizations, whether legal, organizational, semantic and technical.

According to the Decision No 922/2009/EC of the European Parliament and of the Council of 16 September 2009 on interoperability solutions for European public administrations (ISA) [1], interoperability means “the ability of disparate and diverse organizations to interact towards mutually beneficial and agreed common goals, involving the sharing of information and knowledge between the organizations, through the business processes they support, by means of the exchange of data between their respective ICT systems”. This definition involves the diverse dimensions of the interaction between organizations.

Interoperability is a precondition in the service of the development of eGovernment. Interoperability is important, first of all, to make a reality principles and rights of the citizens, such as the right not to deliver data or documents already in the hands of public administrations; secondly to enable easier cooperation which facilitates the implementation of public policies; and, finally, to enable better effectiveness and efficiency in order to achieve a reduction of time and costs in the development and delivery of eGovernment services, also for citizens and business.

That’s why interoperability is one of the seven challenges identified in the Digital Agenda for Europe [2]. The achievement of interoperability has been receiving a growing recognition in European acts and policies along the years. The Communication from the Commission titled Towards interoperability for European public services [3] includes in annex the European Interoperability Strategy and the European Interoperability Framework; there is also a community program called ISA, Interoperability Solutions for Public Administrations, in charge of the implementation of this Strategy and Framework.

According to the European Interoperability Framework, an interoperability framework ‘is an agreed approach to interoperability for organizations that wish to work together towards the joint delivery of public services. Within its scope of applicability, it specifies a set of common elements such as vocabulary, concepts, principles, policies, guidelines, recommendations, standards, specifications and practices’. The European Commission expects Member States to develop their own national interoperability frameworks and that they remain aligned with the European one.

In Spain, the eGovernment law of 2007 [4] created the National Interoperability Framework (NIF) together with the National Security Framework; afterwards, the NIF was developed by means of a lower level act, a Royal Decree published in January 2010.

II. INTEROPERABILITY CHALLENGES

The following facts allow a better understanding of the challenges faced in Spain in terms of interoperability:

- eGovernment services have to be provided in a complex scenario which involves the interaction of the General State Administration, 17 regional governments plus 2 autonomous cities, and over 8,000 local entities; together
with the interactions with institutions and agencies of the European Union and the administrations of other European countries.

- All these actors have wide differences in organization, processes, data structures and technological solutions.
- In the middle of the decade of 2000 it was clear that without common rules and without common infrastructures and services, efforts would be repeated and resources wasted. An approach based on recommendations and best practices was not enough.
- The growing sophistication in egovernment services evolving from information to personalized services required also a stronger effort to improve interoperability.

Considering all these challenges the approach followed to develop the national interoperability framework of Spain is based on the following three main success factors:

- the support of a sound legal basis;
- the role of common infrastructures and services;
- and a strong cooperation effort between public bodies.

III. A NATIONAL INTEROPERABILITY FRAMEWORK WITH LEGAL SUPPORT

Spain has developed a comprehensive legal framework for eGovernment oriented to implement the legal safeguards that exist in the real world to the virtual world. This legal framework provides legal certainty. The legal certainty has been essential to decide that the National Interoperability Framework and its Interoperability Agreements had the form of legal instruments. The eGovernment law regulates, first of all, a number of principles and rights, such as the right to interact electronically with Public Administration which means the obligation of public administrations to enable electronic access to their services; then, the main elements of the administrative procedure by electronic means including the notion of the electronic office, electronic identification and authentication, notifications and communications, electronic document, and e-archive, among other elements; and finally, the cooperation between public administrations.

It was understood that the support of a sound legal basis was a success factor to achieve interoperability between public bodies. Consequently, in the eGovernment law, within the section about cooperation, there is a mandate to public administrations to adopt measures to ensure organizational, semantic and technical interoperability and there is an article, number 42, which creates the National Security Framework and the National Interoperability Framework. These two frameworks, nowadays in place, are the result of a collective effort of all public administrations; also the Industry was consulted through their main associations.

The National Interoperability Framework (NIF) has been developed through a legal text, the Royal Decree 4/2010 [5], which develops the provisions about interoperability stated in the eGovernment law: this decree is applicable to all public administrations and it was developed with the participation of all of them. In this way the NIF embeds interoperability requirements in the legal framework of eGovernment, thus configuring a coherent and comprehensive approach.

The objectives of the NIF are mainly the following: to contribute to create adequate interoperability conditions for the deployment and delivery of eGovernment services; provide benefits in terms of effectiveness and efficiency; introduce common elements of interoperability to guide public administrations; and facilitate the implementation of security policies (through the National Security Framework, Royal Decree 3/2010 [6]) thanks to a more rational environment.

The NIF addresses requirements in relation to the implementation of interoperability principles, dimensions, agreements and governance, plus other issues related to interoperability, such as standards, common infrastructures and services, reuse of applications, electronic signature, and electronic documents. The NIF develops the following main elements:

- **Principles**: the NIF assumes the general principles stated in the eGovernment law and, additionally, defines three specific principles of interoperability which are (1) interoperability as an integral quality from the conception of services and systems and through their lifecycle: planning, design, acquisition, implementation, deployment, exploitation, publication, preservation and access or interconnection among them; (2) the multidimensional character of the interoperability since it will be understood considering its organizational, semantic and technical dimensions, without forgetting the temporary dimension which should guarantee the access to the information through time.; and (3) the approach of multilateral solutions will be promoted to obtain the advantages derived from the use of modular and multiplatform architectures, the economies of scale, and from sharing, reusing and collaborating.

- **Legal interoperability**: the eGovernment legal framework provides legal support to interoperability among the public administrations and between them and the citizens. The eGovernment Law mandates public administration the adoption of organizational and technical measures to ensure interoperability, promotes the cooperation and the exchange of information in particular through a section about cooperation and creates the National Interoperability Framework.
• **Organizational interoperability**: within this field, the NIF sets out a number of dispositions addressing issues like the role of interoperability nodes (entities that provide interoperable services on behalf of others); the inventories and code lists of administrative information (procedures, services, administrative units, other concepts); the availability of services through the network of the Spanish Public Administrations and the conditions under which those services can be used by other public bodies; this approach supports the extension of brokering or intermediation services which facilitate the access to a number of base registries (Identity, Residence, Cadastral information, Tax information Social Security information, Education Titles,...) by public bodies.

• **Semantic interoperability**: the NIF includes the publication and use of semantic assets and associated code lists. This also involves the deployment of a semantic interoperability center following the European experiences with SEMIC and JOINUP.

• **Technical interoperability**: the NIF specifies conditions about the selection and use of standards, taking into account the European and national legal framework about standards, as well as other references like the Common Assessment Method of Standards and Specifications (CAMSS) developed by the European programs IDABC and ISA.

• **Common infrastructures and services**: they contribute to the simplification and propagation of interoperability; they facilitate multilateral interactions; in consequence there is a call to public administrations throughout the country to link their infrastructures and services to those ones provided by the General State Administration. In particular, there is a call to public administrations to link their networks to the network of the Spanish Public Administrations, provided by Red SARA, thetranet of public administrations in Spain. It is mandatory to follow the IP Addressing Plan of the Administration.

• **Reuse of software**: it is explicitly recognized that the practice of 'reuse' applied to software of public administrations, associated information and other objects of information, together with the notions of 'share' and 'collaborate' contributes to a better interoperability. The NIF includes provisions about applicable licenses, particularly about Open Source Software, suggesting the use of the European Union Public License (EUPL), about repositories and their linking, with a call to public administrations to consider solutions available in those repositories and to publish the code of their applications.

• **Electronic signature**: there is a section on the interoperability of electronic signatures and electronic certificates with provisions about policies, profiles of certificates, validation platforms and other issues.

• **Electronic document**: there is a section on the preservation and recovery of the electronic document, since the NIF adds the effect of time in interoperability to the traditional dimensions, with a focus on electronic documents. The NIF establishes that public administrations should adopt measures to ensure the preservation and recovery of electronic documents and that they should create electronic repositories equivalent in their functions to the traditional archives.

• **Compliance**: there are some provisions about compliance with the NIF.

• **Interoperability Agreements**: the NIF is extended through a number of Interoperability Agreements, this notion was included in the European Interoperability Framework; those agreements are technical interoperability regulations which develop specific requirements necessary to guarantee the more practical and operational aspects of interoperability between public administrations and citizens.

There are twelve interoperability agreements already published in the Official Gazette of the State about the following issues:

• **Catalogue of standards** [7]: it establishes the conditions for the selection of standards, maintenance and use of standards for eGovernment services.

• **Electronic document** [8]: it describes eDocuments as including content, eSignatures, and minimum required metadata; together with the rules to exchange and copy them. The Annex contains a definition of the minimum required metadata, XML schemas for document exchange, and basic information on the signature of eDocuments.

• **Digitization of documents** [9]: it describes the components of a digitized eDocument, including digital images, eSignatures, and metadata, and the rules to digitize paper documents by public administrations in compliance with applicable formats, quality levels, technical conditions and
standards.

- **Electronic file** [10]: it describes the structure of eFiles, including eDocuments, eIndexes, eSignatures, and minimum required metadata, and the specifications to send them and make them available. The Annexes contain a definition of the minimum required metadata and XML schemas for file exchange.

- **Electronic signature policy** [11]: it sets forth the criteria for the development or incorporation of certificate-based eSignature policies by public administrations. It describes the contents of certificate-based eSignature policies, determining the characteristics of common rules like formats, use of algorithms, or signature creation and validation for eDocuments, as well as the trust rules for eCertificates, timestamps, and long-term signatures.

- **Data Intermediation (brokering) protocols** [12]: it defines the roles of the actors involved in mediated data exchanges and sets forth the conditions for mediated data exchange processes with the mediation platform of the Ministry of Finance and Public Administration, which can apply to the mediation platforms of other public administrations. These are the conditions to be satisfied by public administrations providers and consumers in the access to base registries.

- **Data models** [13]: it establishes the conditions to design and publish the data models (semantic assets) regarding model formats, identification and documentation, use, definition and encoding, and interaction with the Semantic Interoperability Centre, publishing data models, in line with European standards and practices sponsored by JOINUP.

- **Electronic documents management policy** [14]: it includes the elements to take into account in the development of e-documents management policies by public entities: the main contents and relationship with other policies, the actors, the document management processes, the metadata and training, auditing and maintenance processes. There is also a metadata schema for the electronic document developed.

- **Requirements for the connection to the network of the Spanish public administration** [15]: it sets forth the conditions under which every agency in the public administration can access the SARA Network, describes the functions and responsibilities of the agents connecting to said network, and establishes the requirements to connect to, access, and use the services provided through it.

- **Procedures for authentic copies and conversion between formats** [16]: it establishes the rules for the production and issue of authentic eCopies and authentic paper copies of eDocuments in public administrations, and for the format conversion of eDocuments by public administrations.

- **Data model for the exchange of records between official input/output registries** [17]: it defines the conditions and characteristics for the interconnection of registers of public administrations and exchange of information between them.

- **Reuse of public sector information** [18]: it sets forth the basis guidelines for the reuse of documents and information resources produced or stored by the public sector. It develops the selection, identification, description, format, applicable terms and conditions of use and catalogue of reusable public information.

These interoperability agreements have been developed in cooperation between all public administrations in Spain following the same cooperative approach which was used to develop the NIF. They follow current practices in the treatment of technical issues in other sectors such as, for example, the telecommunications or civil works.

Although additional documents on compliance with the NIF are still to be published, a monitoring process of the implementation of the NIF, mainly in the General State Administration, was started in February 2013 and carried out through May, September and December 2013; with an additional round in March 2014.

### IV. COMMON INFRASTRUCTURES AND SERVICES

An ecosystem of common infrastructures and services is available and growing, built to support the whole administrative procedure lifecycle as defined in our legal framework. These common infrastructures and services have legal support. They are enablers of the massive and full implementation of e-services and they also contribute to security through simplification of the interoperability scenario. There are agreements for the use of these common services between national, regional and local governments. There are actions ongoing to extend and improve them and to add new ones.

The development and extensive use of a series of common infrastructure and services that the General State Administration offers to all public administrations, has greatly facilitated interoperability between them. This approach contributes to service quality and allows providing many more services, more channels and better quality and management parameters at much lower cost. Some relevant common infrastructures and services are the following ones:

- **The communications platform**, called Red SARA, allows the interconnection of the Spanish Public Administrations. Red SARA interconnects 13 ministries, all Autonomous Communities (17) and Autonomous Cities (2), as well as over 3708 local entities, representing more than 90% of the population. It enables the cooperation and the exchange of information and services between them as well as with the European Union and other Member States through the link with the transeuopean network TESTA. The connection between Red SARA and TESTA facilitates the integration of the
Spanish Administration in European cross-border services: at least 21 services used by 16 entities, corresponding to 18 sectoral issues. Red SARA has been evolving to become a cloud of services (called Red SARA Cloud); Red SARA is more than a communications platform since it also provides a set of services and applications for public administrations aiming to facilitate the sharing of services and infrastructures to reduce operating costs and investment needs.

- **The multiPKI validation platform for eID and eSignature**, called @Firma, provides secure services to eGovernment applications for the creation and validation of electronic signatures, electronic certificates as well as time stamping; it allows the interoperability of electronic signatures and electronic certificates, including electronic signatures created by citizens and businesses in any eGovernment service. It is offered as a cloud service to national, regional and local eGovernment services, as well as a software product which can be deployed by public bodies with a high demand of signature services.

- **The national electronic identity card**, called DNLe, which makes it possible to digitally sign electronic documents, identify and authenticate citizens in a secure digital environment.

- **The data intermediation (brokeraging) platform** is intended to simplify administrative procedures, so that citizens or businesses do not have to deliver data or documents already held by public authorities, and contributes to reduce fraud. This platform facilitates the access to base registries, between providers of information and consumers of that information. It currently provides intermediation for the verification of 40 data types, including: unemployment situation and grants; cadastral information; checking of the fulfillment of tax and social security obligations; and academic degrees.

- **The directory of offices and units of the administration**, called DIR3, provides the hierarchical relationship of the structure of the government by means of a unique coding and it is updated by all participating public bodies.

- **The service for electronic official notifications**, called eNotifications, allows citizens and businesses to receive online official notifications and correspondence through the so called Electronic Administrative Address.

- **The single entry point for Invoices of the General State Administration**, called FACe, allows the submission of invoices in electronic format to those government agencies that accept the receipt of invoices in that format.

- **The main site for the reuse of public sector information**, called datos.gob.es. It is the national portal that organizes and manages the Catalogue of Public Information, the single point of access to data sets of the General State Administration.

- **The Center for Technology Transfer** (CTT) promotes the reuse of interoperability solutions for public administrations; it is linked with the European center for reuse, called JOINUP.

There are many others like the Inter-connection Registry System (SIR) or the single point of contact of the Services Directive of the European Union in Spain, called ‘eugo.es’, all of them included in the catalogue of common infrastructures and services [19].

All these infrastructures and services facilitate the resolution of common needs. They complement each other as building blocks and help spread the interaction capacity of public bodies, favoring multilateral relations, especially by creating scenarios of the type ‘any-to-any’ or ‘any-to-all’. For instance, the use of the Intermediation platform involves also the use of the communications platform, Red SARA, and of the platform for the creation and validation of electronic signatures @firma.

Many of these common services are provided as cloud computing services. This approach is helping to break the gap with regional and especially local administrations.

V. Cooperation

A strong cooperation effort has contributed to the development of eGovernment and to interoperability. eGovernment in Spain is the result of a collaborative effort with the participation of all public administrations (General State, Regional, Local, Universities, Justice), plus the opinion of the Industry through their main associations.

The cooperation effort takes place through a structure of committees dealing with eGovernment which join the General State Administration, the regional governments and the local entities and their working groups of experts.

During the last seven years more than two hundred experts of all public administrations have contributed to the drafting and development of the NIF, its Interoperability Agreements and the National Security Framework, providing different profiles (ICT, legal, archives, etc...); also the main associations of ICT Industry have contributed with their opinion through a number of experts.

Cooperation also takes part in the context of the European Union where the following main strategic lines are applied: early alignment with interoperability strategies, policies and actions of the European Union; contribution and feedback with the Spanish position; and reuse of policies, results and products; the linking of common infrastructures and services of Spain to the equivalent ones in the European Union; and participation in cross border services in operation and pilot projects like STORK/STORK2, GEN6, eSENS, C4E, ePSOS,…

The complex scenario of Spain facilitates the reuse of approaches, architectures and solutions from the European Union and our feedback is also interesting in the European context.

VI. ALIGNMENT WITH THE EUROPEAN INTEROPERABILITY FRAMEWORK

The NIF takes into account the European context and its recommendations. It is aligned with the European Interoperability Framework and it systematically refers to the
linking of the interoperability instruments of Spain with the equivalent ones in the European Union environment.

In relation to the alignment with the European Interoperability Framework, the National Interoperability Framework Observatory (NIFO), an action of the European Program ISA, in the factsheet of Spain [20], states that “Spain is fully aligned with the EIF on the ‘Governance’, the ‘Principles’ and the ’Interoperability Agreements’. It has an almost full alignment on the ‘Conceptual Model’ and a good alignment on the ‘Interoperability levels’”.

![Alignment of the NIF of Spain with the European Interoperability Framework (EIF). NIFO, Factsheet Spain.](image)

**Fig. 3.** Alignment of the NIF of Spain with the European Interoperability Framework (EIF). NIFO, Factsheet Spain.

VII. CONCLUSION

The National Interoperability Framework (NIF) of Spain is based on three main aspects: the support of a sound legal basis; the role of common infrastructures and services; and a strong cooperation effort between public bodies.

The NIF embeds interoperability requirements in the legal framework of eGovernment, thus configuring a coherent and comprehensive approach in the context of European Union policies and actions in this field.

The NIF addresses the interoperability principles, dimensions, agreements and governance, plus other issues related to interoperability, such as standards, common infrastructures and services, reuse of applications, electronic signature, and electronic documents.

The challenges ahead have to do with issues such like the following:

- to achieve an implementation of the NIF as full as possible in public administrations; regular monitoring of the situation is taking place to identify the degree of advance and weaknesses;
- how to provide a stronger legal support to the maintenance, extension and use of code lists and inventories of administrative objects;
- to extend and improve the common infrastructures and services that support interoperability with an eye kept on what is happening in the European Union in terms of the development of building blocks for cross border eGovernment services;
- how to reinforce the use of common infrastructures and services and provide them with sustainability;
- how to reinforce the reuse of software applications, either as products or as services through the network;
- to update and improve the NIF, since it includes the notion of permanent updating;
- to identify which new interoperability agreements which might be needed.

**REFERENCES**


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