

Governmental Interoperability Service Utilities: The Way Forward for Zero-stop Electronic Service Composition and Provision

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Abstract: The implementation of various decentralized e-Government initiatives throughout the world has highlighted the importance of governmental interoperability service utilities, which will facilitate the seamless exchange of information and resolve interoperability issues during electronic service provision. However, there is nowadays the need for centralised e-Government strategies and policies that can be built on second-generation national e-Government Interoperability Frameworks (eGIFs). The Greek eGIF presents a transition from a paper-based system specifications to an integrated infrastructure devoted in assisting administrations, businesses and citizens to create, manage, transform and use electronic services in an organized way, combining centralised management of standards and decentralised operation of systems. This paper presents the objectives, the overall methodology, structure and the architecture of the Governmental Interoperability Service Utility (G-ISU) developed in the context of the Greek eGIF initiative, that meet today's demands for storing, modelling and managing a vast number of service descriptions, XML structures, common standardised data components – also providing for certification and management mechanisms.

Keywords: eGovernment, Interoperability Service Utility, Services Registry.

1. Introduction

As European Union Member States Governments are progressing to meet the goals of the i2010 pan-European strategy [1] on electronic services provision for businesses and citizens, new challenges appear that need novel approaches in solving long-standing interoperability issues and assisting Government Transformation. The new European Services Directive [2] is stressing the need for Interoperability Management Infrastructures at national and international levels of operation, opening the way for federated management of service definitions and semantics. The long-standing goal of “one-stop” service provision is now being replaced by truly transformative ideas for drastically changing the definition – and even existence – of manual or electronic services. Furthermore, researchers, industry practitioners and governmental officials now realize the immense complexity of information and knowledge to be constantly managed, in order to allow for new services composition and operation.

In the above context, there exists a true need for federated systems allowing for semantically-rich definition of electronic services, together with the needed process and data models, driving standardization and functionality beyond the existing paper-based

specifications of National eGovernment Interoperability Frameworks, or the user-oriented descriptions of Governmental Service Portals.

Respecting the subsidiary principle the pan-European Public Service Framework [3], [4] leads to a design that leverages the Generic Public Services Framework. The National (and Regional) Public Services Frameworks should be re-used as independent components of the pan-European Public Services Framework.

Member States are invited by the European Commission to open up a set of basic public services [4]. These services can be accessed by administrations, citizens and businesses through pan-European aggregate services provided by certified intermediary portals set-up by administrations or industries.

In practice, federation on a European level is preceded by federation on the national levels. Federation hence applies at multiple levels. This leads to the following nested European Public Services Framework, adopted by Gartner Report Preparation for European Interoperability Framework (EIF) 2.0 [4].

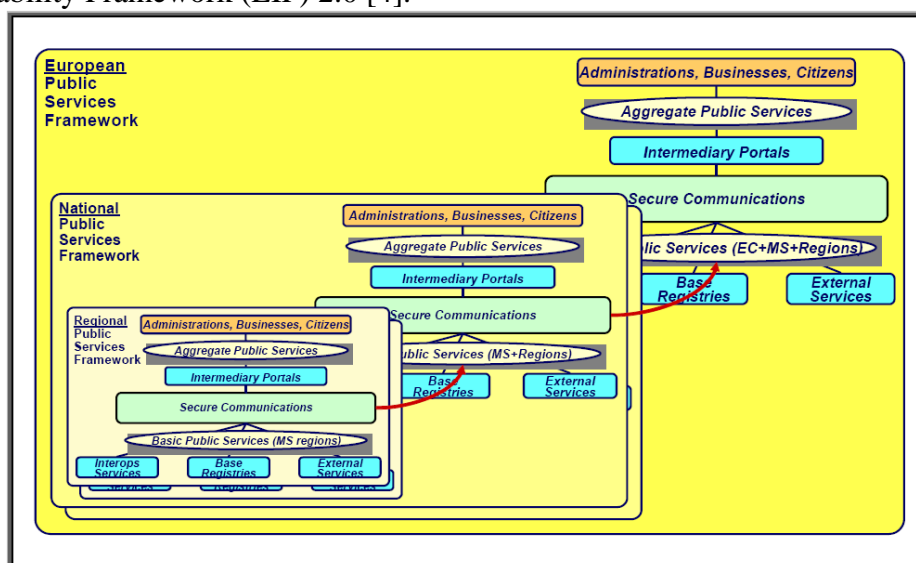


Figure 1: Pan-European Public Services Framework (a recursive model)

Regional frameworks operate in a federation as a national framework. National frameworks operate in federation in the European Public Services Framework. In this framework, national (or even regional) basic public services are re-used in national and European aggregate public services. Of course, this can only be accomplished if standards are created on a European level. So, ensuring standardized interfaces to national base registries across all Member States is one of the principal conditions for pan-European Public Services.

Such a system-for-systems is being developed within the Greek eGovernment Programme, gaining knowledge and best practices from the following similar but partial past attempts:

- In the United Kingdom, the e-Government Interoperability Framework [5] issued by the e-Government Unit is accompanied by the GovTalk XML Schema Library [6] containing approximately 78 XML Schemas. However, the majority of those Schemas are peripheral, do not refer to “core” governmental documents, like the Automated Registration of Title to Land (ARTL) Case Management Interface Schema and Schema for CON29 Land Searches, or map to simple components like address and person.
- In Denmark, the latest version of the Interoperability Framework [7] has been released by KIU since 2006. InfoStructureBase [8], the Danish collaboration tool promoting interoperability, includes an international standards repository containing business process descriptions, datamodel descriptions, interface descriptions, complex XML

schemas and schema fragments (information object) from public and private organizations and an UDDI repository containing information on web services. Such schemas are in line with the Core Components Technical Specification (CCTS) but incline more towards being characterized as codelists and core components and do not present any actual governmental documents.

- In Hong Kong, the Information Technology Services Department (ITSD) (The Government of the Hong Kong Special Administrative Region (HKSAR)) has established the HKSARG Interoperability Framework (Version 5.1) [9] and publishes Common Schemas on the XML registry [10].
- In Italy, a project named Arianna [11] has defined an ontology for e-Government public services and has deployed a repository containing service descriptions at local level.
- In the United States of America, the National Information Exchange Model (NIEM) [12] designed to develop, disseminate and support enterprise-wide information exchange standards and processes is the outcome of the partnership between the U.S. Department of Justice and the Department of Homeland Security. NIEM has adopted an approach quite similar to the UN/CEFACT CCTS and has published today the broadest set of XML Schemas.

2. Objectives

The Governmental Interoperability Service Utility (G-ISU) is an infrastructure that is devoted in assisting administrations, businesses and citizens to create, manage, transform and use electronic services in an organized way. Gaining momentum from relevant eBusiness examples (ISU is set a Grand Challenge in the European Commission Enterprise Interoperability Research Roadmap – EIRR/DGINFSO) [13], such an infrastructure supports the interoperable operation of governmental systems through providing for service composition, discovery and use in a utility-like way. The G-ISU purpose is to engage the public sector in order to formally describe information that is usually dispersed in the public authorities, like:

- Service description, using extended metadata sets and formal means for process modeling, covering the Service Directive requirements
- Unified data modeling for governmental forms, using XML/CCTS methodologies [14] and standard national or international codelists (utilizing methods from US/NIEM [12] specifications)
- Specification of manual and electronic (web) services execution, in a machine-retrievable way

In this context, G-ISU will also provide patterns and guidelines for systematically transforming service and document definitions and will coordinate the business process re-engineering efforts in the public sector.

In a more long term horizon, a G-ISU shall prove to be not only a central repository but a mechanism allowing for federated management of descriptions from the owner of each service (e.g. a Ministry or a Municipality) towards all the systems that may reproduce descriptions or invoke electronic services. The promised advantages from such infrastructures are ground-breaking, as they can be used for on-the-spot electronic service composition from existing web services, for managing and modifying the service flows with immediate propagation towards all involved administrations or even for controlling content federation among multiple Governmental Portals.

3. Methodology

The methodology that the Greek G-ISU is based on following an “increasing spiral approach” has been organized along the above steps:

- i. 'Core services' provided for citizens and businesses, by processing more than 2000 public services and more than three million service requests that have occurred during 2005 and 2006 in the Citizen Service Centres (or KEPs in Greek transliteration) have been defined, as well the 'core organisations' that provide the 'core services'.
- ii. Well-structured design and modelling of the processes involved in the provision of these services has been performed and the results have been notated using BPMN (Business Process Modelling Notation) [15], extending the Dublin Core metadata standard [16].
- iii. Data schemas have been designed to describe the execution of the processes under consideration, with the use of the UN/CEFACT Core Components Technical Specification (CCTS) methodology [14] and common components among the various governmental documents have been recorded.
- iv. Relevant technical specifications for interoperability, digital authentication and certification for systems and practitioners have been identified.
- v. The process map, BPMN models, the document definitions, the XML schemas, and the related technical standards have been then inserted in the new eGIF platform under a common data schema.

As far as the semantic interoperability aspect of the G-ISU is concerned, the methodology followed during the XML Schema design, adopts the UN/CEFACT Core Components Technical Specification (CCTS) [22], ensuring the creation of standardised, extendible electronic schemas for governmental documents and data forms.

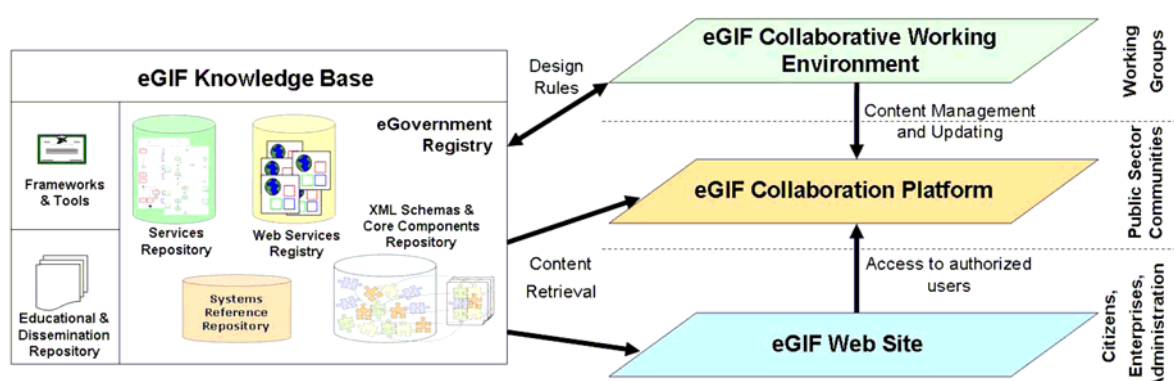


Figure 2: A second generation eGIF architecture

In order to fulfil the demands derived from the methodological approach described above, the architecture required by a second-generation eGIF consists of four key components, as depicted in Figure 2:

- i. The eGIF Website: A web platform where the various documents, deliverables and relative material of the eGovernment Framework are published.
- ii. The eGIF Collaboration Platform: A web platform which is accessible through the eGIF Website mainly by the Public Sectors Community for navigating through the process models, searching through the catalogues for Core Components, XML Schemas, proposals for Schemas and Process Models that satisfy the given criteria and for posting change requests.
- iii. The Collaborative Working Environment: A platform that integrates tools for Data Modelling and Management, Process Modelling and Ontology Management to which the Working Groups have access in accordance with the access rights designated to them.
- iv. The eGIF Knowledge Base: An integrated knowledge space that unifies different perspectives and interpretations of knowledge resources. The Knowledge Base consists of:

- The Frameworks Repository, which contains the Certification Framework for Public Sites and Portals (CFPSP), the Interoperability and Services Framework (ISP), the Digital Authentication Framework (DAF) and the Interoperability Standards Documentation (ISD) in various versions.
- The eGIF Interoperability Registry Platform, which contains the (a) UDDI (Universal Description, Discovery and Integration) Registry with files describing the fundamental web services, the (b) tools layer, containing the Process Repository, with the workflow models and a populated taxonomy of the services and the (c) Information Repository with interconnected Data Elements, Process Models, XML Schemas and Web Service descriptions, at the core of the Registry.
- The Educational and Dissemination Material Repository, which contains presentations, SCORM-based e-Learning material and dissemination material.

4. Development of the Service Utility

The prototype G-ISU is a multi-tier, multi-site, multi-platform information system implemented in the Greek Ministry of the Interior, Public Administration and Decentralization and the National Technical University of Athens and can be decomposed as following presented in Figure 3.

i. The Front-End components are:

- The Registry Website, found in the eGIF Website [17], where various documents of the eGovernment Framework and gives access to citizens and businesses for publicly available data.
- The Registry Intranet, which is accessible to specific public administrations and portal developers and provides access to the Registry Tools (processes, Ontologies and XML Schemas).
- The Registry UDDI Interface, where selected access is given to administrations in order to publish their Web Services or find existing, available Web Services to use in conjunction with their Information Systems, in order to provide completely interoperable, one-stop services.

The Tools Layer consists of:

- The Process Modelling facilities, based on the ADONIS modelling engine (from BoC International GmbH) [18].
- The XML Management facilities based on ALTOVA XML platform (from ALTOVA Inc) [19].
- The custom-developed Ontology Management, Data Entry and Reporting facilities that integrate all representations and models and is the software implementation of the Services Registry.
- Additional ontology formalisations are supported by PROTEGE tool [20] and the Description Logic Reasoner RacerPro [21].

Finally, the Information Repository Layer comprises interconnected information elements (of services, documents, administrations, systems, etc), process models, XML schemas and Web Services descriptions. This layer, implemented on relational DBMS, supports advanced syndication mechanisms for managing information channelling from multiple sources. The scope of the Services Registry developed is to provide a methodological process modelling framework for e-government services via an ontology-based intelligent web information system. For it, the portal offers simple data entry and management, and allows different user groups to access the public sector administration and services provision data through a wide range of simple, more sophisticated and other statistical reports. The target audience for this Registry are the Greek Ministry of the Interior, Public Administration and Decentralization (as the Registry Monitor), every Public

Body provides services interacting with the external environment (citizen, enterprises, other public bodies), and ultimately citizens and enterprises as beneficiaries of the registered services.

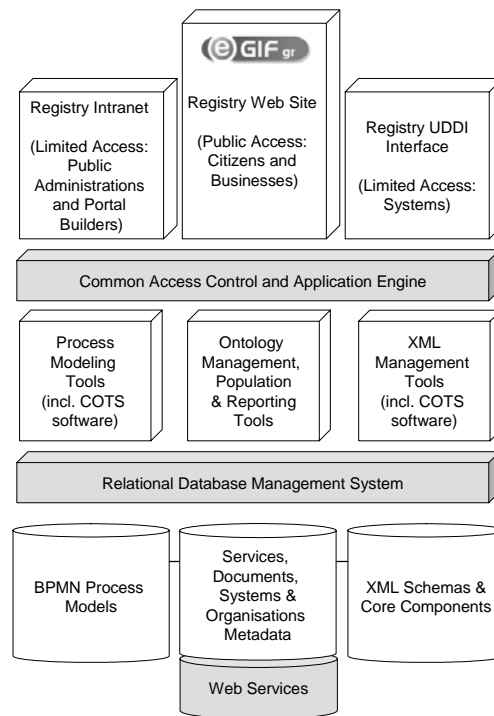


Figure 3: The Greek eGIF Interoperability Registry Platform architecture

The Registry provides standard management functionality (create, edit, delete) for all the main and secondary eGovernment elements, each of which corresponds to menu item. Thus, the items of the elements' management menu are Services, Public Bodies, Documents, Document Fields, IT Systems, Websites and Other Elements such as Projects, Addressees etc. A web form of Service Editing is depicted in Figure 4, representing all the meta-data, relations with other elements and attached files, which characterize a governmental service and can be accessed by the authorized users.

The whole platform has been built using an ASP.NET 2/AJAX Web Application Framework, in integrated mode on Internet System 7.0. The DBMS used in the development of the system is SQL Server 2005. A parallel installation has also been performed using Java/J2EE/MySQL components.

5. Application and Benefits

Initial population of the Governmental Interoperability Service Utility was greatly assisted by the existence of data in electronic form, through the Greek Ministry of the Interior, Public Administration and Decentralization. Population of the repository was achieved through the following automated and semi-automated activities:

- Automated import of more than 1,500 administrations including ministries, prefectures, districts, municipalities and public sector organisations.
- Automated import of 1,009 public services definitions, with core metadata descriptions and frequency indications, stemming out of more than 10,000,000 actual service requests by citizens and businesses during the last 3 years. Such services fall in various fields and disciplines, for example internal affairs (municipalities' and prefectures' registries), justice, finance and social insurance.
- Modelling of the core-100 governmental services (including all i2010 core services and the services amounting to 85% of the yearly service requests), in BPMN format.

- Modelling of the core-100 XML schemas and WSDL for Web Services to be developed by various administrations.

The resulting system is now being deployed towards an initial group of approximately 100 governmental officials from ministries, prefectures and governmental organisations, engaged in the re-design and electronic transformation of services towards citizens and businesses.

6. Conclusions

The new Greek Governmental Interoperability Service Utility presented in this paper introduces a new system (not a paper-based specification) that will interact with e-Government portals and back-office applications, administration stakeholders, businesses and citizens, guiding eGovernment transformation and ensuring interoperability by design, rework or change. The implementation of this Interoperability Service Utility addresses a number of key issues, such as:

- Definition of an eGovernment Ontology and Metadata Definitions for all core elements in the eGovernment domain, following Dublin Core and UK-eGMS definitions.
- Formal description of manual and electronic governmental services, with the use of BPMN models and tools or UML-Sequencing Diagrams where applicable, that guides and co-ordinates the business process re-engineering efforts.
- Development of unified governmental data models (one of the first utilisations of UN/CEFACT CCTS methodology in Governmental data, worldwide), with the use of XML authoring platforms.
- Integration of models, tools and repositories in a comprehensive platform, made available to public administrations, businesses and citizens.

In this context, new perspectives should be taken into consideration in eGovernment Frameworks from now on, analysed as following:

- Importance and adequate effort should be put in defining standard, formally described electronic services for businesses and citizens, thus providing clear examples to administrations and service portal developers.
- The paper-based specification should give way to system-based presentation of the framework, incorporating service descriptions, data definitions, unified domain representation ontologies and metadata in a common repository.
- Organisational interoperability issues should be supported by a more concrete methodology of how to transform traditional services to electronic flows, with the use of decision-making tools. In this direction, the infrastructure presented can be of great assistance as it contains all the necessary information in a comprehensive, well-defined and connected semantic network.

The initial application of the system is indicating that formalizing the description of governmental knowledge that has not been recorded before is not an easy task and that the problems faced during implementation and application are not trivial and have to be taken in mind during relevant attempts by government officials and practitioners. For example, such a system that is supposed to embrace the whole public sector of a country needs to be legally established and well supervised, otherwise the knowledge it manages will not be effectively sustained, while adequate effort should be placed on persuading and training public servants to use the G-ISU.

Future work along the Greek eGIF and the Interoperability Service Utility includes both organisational and technical tasks, such as:

- Binding with the Central Governmental Portal for citizens and businesses, so that the registry can be used for locating and enrolling to electronic services.
- Development of mechanisms for federated management of the G-ISU descriptions.

- Completion and publication of additional XML Schemas and Standard Codelists.
- Training of key staff within administrations for using and extending the G-ISU.

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