

EXTENDED GOVERNMENT

An Interoperability Point of View

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Abstract: The widespread diffusion witnessed by e-Government services in recent years, has allowed the realization of important cases of administrative simplification, mainly due to the direct interaction between informative systems of administrations in A2A modality. In the above scenario, a great importance is assumed by the concept of interoperability, intended as the set of technical rules necessary to define a common interface between the administrations, which have the need to exchange information in A2A modality, and which allow to protect the technological choices already in existence, and the organizational autonomy. The aim of the present paper is to illustrate the state of the art of the project initiatives prompted by the Regione Lazio, relatively to interoperability, with particular reference to the concept of Extended Government. Such concept finds its foundation in the definition of Extended Enterprise. It has been massively used in project initiatives of the Region, with the aim of reusing the scientific research results in such field, mainly relatively to the design and realization of Knowledge Management Systems.

1 INTRODUCTION

In the late '90s, the concept of Virtual Enterprise (VE) for enterprise organizational models was introduced, where every business unit organization is connected to each other through a data transmission network, in order to explore market opportunities (Fabian and Plesca, 2007) (Strader et al., 1998) (Goldman et al., 1995) (Camarinha-Matos and Afsarmanesh, 1999) (Sieber and Griese, 1997) (Larsen and McInerney, 2002) (Chalmeta and Grangel, 2003) and cooperate, on a temporary basis, to better respond to business opportunities. In other words, a Virtual Enterprise can be seen as a heterogeneous network for both enterprises and individuals with integrated cooperation, using ICT technologies and protocols for a specific business process.

Over the years, a second model has been developed, substantially similar but based on more stable and long-term oriented agreements: this is the

Extended Enterprise (EE) (Schönsleben and Büchel, 1998) (Oliveira et al., 2003) model. One of the most critic and important aspects in the implementation of an EE organization model is the single participant IT assets integration, realizing inter-organization processes (B2B) with knowledge sharing. To such aim, in literature, several frameworks are diffused: from SOA and EDA model for IT infrastructures integration to XML-based outlines (like RosettaNet) for B2B processes specifications, to models implementing integrated Knowledge Management Systems (KMS). In our opinion, an organization model similar to EE has been also diffused to the Government level and can be recognized in initiatives such as IDABC¹, SPCoop², ICAR³, iLazio2010⁴. These initiatives are designed

¹<http://ec.eurpoa.eu/idabc/>

²Centro Nazionale per l'Informatica nella pubblica amministrazione - <http://www.cnipa.gov.it/>

³<http://www.progettoicar.it>

⁴<http://www.esiig2.it/esiig2/pagina.php?cat=8>

to realize the Administration to Administration (A2A) and Administration to Business (A2B) processes and are based on stable and deeply defined agreements. Unlike the EE model, however, there is no focalization on business opportunity aspects but on a strong guideline for the simplification and the effectiveness of eGovernment Services. In addition, the need to handle and query unstructured information has resulted in the gradual awareness of the need to adopt KMS based on semantic and user-modeling functions. This high degree of similarity allows us to introduce a new definition to be used for reference to the concepts described so far: we will speak about **Extended Government (EG)** as a Public Administration context-oriented organization model of EE type. Hence, the goals of this article are:

- more detailed definition of the concept of Extended Government;
- description of the initiatives started up by LAit S.p.A. and Regione Lazio in the fields of eGovernment and interoperability in terms of EG model;
- description of future developments, with particular reference to the design of a KMS, whose development is strongly based on the parallelism between EE and EG model and on deep research in the field of EE.

2 DEFINING EXTENDED GOVERNMENT

We refer to **Extended Government (EG)** as an integrated unit of organizations, agreements, protocols and ICT resources able to support Public Administration to deploy a context-oriented model to build Administration to Administration (A2A) and Administration to Business (A2B) scenarios, to simplify and to improve the effectiveness of eGovernment Services. By analogy with EE organization model, we can define main EG model features as:

- eGovernment Service-driven cooperation: A2A and A2B processes are always aimed at providing electronic government services to citizens and businesses, with the goal to simplify and make them more efficient and effective;
- Complementary: Administration exchanges with others only correct and complete data that it owns;
- Process Integration and Resource Sharing: particularly data, information and knowledge;
- Interdependence: Process Integration and Resource Sharing is carried out according to well-defined cooperation agreements.

In order to deploy the EG Organization Model, it is necessary to:

- define a common Governance Model through the Administrations of all participants;
- define Guide Lines for every single participant IT assets integration. This problem is due to different technologies used by every Administration and the need to preserve both investments and Administration autonomy. For these reasons, it is necessary to define a technological infrastructure that guarantees interoperability regardless of the organizational structures and single participant legacy systems;
- define a Maturity Model, which is a structured collection of elements that describe certain aspects of maturity in an organization, for example to provide a way to define what improvement means for an organization.

Regarding the first and second point, all regional projects (see following sections) use initiatives like IDABC, SPCOOP, Linee guida strategiche piano triennale per ICT 2009-2011 by CNIPA and ICAR as a reference. As to the third point, we introduce a heuristic Maturity Model adopted in Regione Lazio to evaluate maturity degree in EG model deploying.

2.1 Extended Government Maturity Model

Extended Government Maturity Model (ExGMM) identifies 5 broad maturity/capability levels (see Figure 1):



Figure 1: Regione Lazio Extended Government Maturity Model.

- **Level 1. Planned:** In this stage an IT and Governance strategic plan are defined. Main criteria of this level are: vision definition and need assessment;
- **Level 2. IT Integration Infrastructure Deployed:** According to the strategic plan an IT integration infrastructure is deployed;

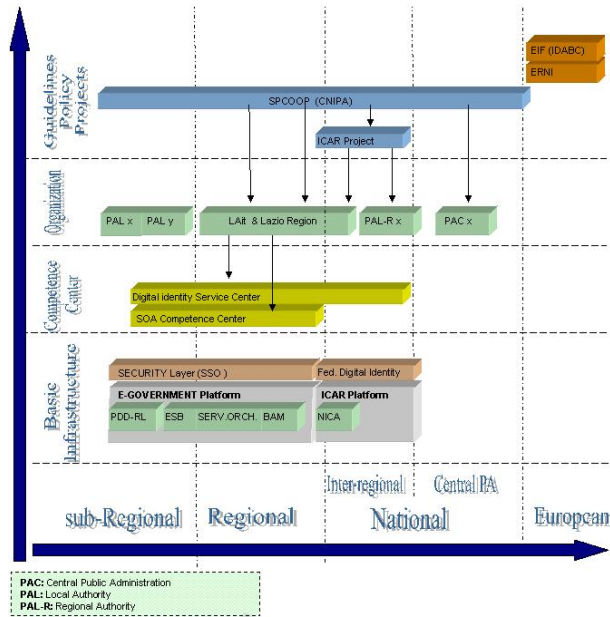


Figure 2: Regione Lazio EG Architecture and Governance vision.

- **Level 3. Institutionalized:** A competence center is established with the goal to minimize the cultural gap caused by the adoption of EG model and to define all the procedures and KPIs for management control;
- **Level 4. Managed:** at this level, using KPI, management can effectively control the AS-IS EG model;
- **Level 5. Optimized:** KPI are evaluated for model improving.

3 REGIONE LAZIO EG VISION

LAit S.p.A. (as ICT in-house agency of Regione Lazio) is implementing an interoperability architecture with progressive technical and organizational complexity levels, as shown in Figure 2. Obviously, to make the various Level Domains (Local, Regional, National and European) homogeneous, a good technical infrastructure is a necessary requirement. So, it is important to transpose the National and European Standards and Guidelines in projects and activities, through a concerted organizational and technical governance. By limiting the analysis to a mainly technical point of view, we will speak about the state of the art of architecture under development for the Regione Lazio, with a bottom-up approach, starting with the Regional Domain Level up to European Domain.

4 REGIONAL DOMAIN

In order to achieve the complete software interoperability requested by CNIPA specification, the starting point is the deployment of SOA/EDA architecture. The Regione Lazio solution can be detailed in the following figure:

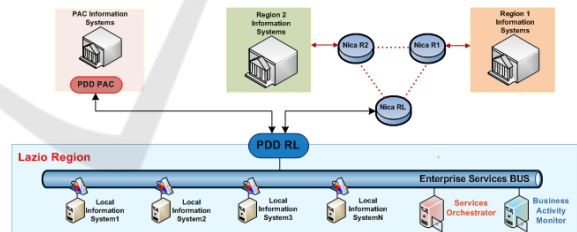


Figure 3: Regione Lazio EG IT infrastructure.

4.1 Porta di Dominio Regione Lazio

The first purpose of Regione Lazio infrastructure is to decouple external resources from heterogeneous hardware and software within Regional Domain (such as legacy systems). The module Porta di Dominio Regione Lazio (PDD-RL) represents the only point of access for external resources (obtained by the externals PDD) and internal ones (obtained by Regional Systems), using Web Services consolidated technology, and implementing shared policies for security, logging and tracing, according to SPCOOP guidelines issued by CNIPA (see footnote 2).

4.2 Enterprise Service Bus

Once the separation of external from internal resources is completed with PDD-RL, the next step is to make the internal domain uniform, with an enterprise middleware that implements standardized interfaces for communication, connectivity, transformation, portability and security between various heterogeneous systems [11]. This is the task of the Enterprise Service Bus (ESB) module, which is the integration layer between existing internal IT assets of Regione Lazio Information Systems used to publish data for G2G and G2B processes on open standards, particularly Web Services and WS-* standards. Using ESB as integration layer it is possible to implement synchronous and asynchronous integration patterns. For this reasons, we can consider ESB as the entry point for SOA/EDA deployment in Regione Lazio.

4.3 Services Orchestrator

Orchestration consists of composing multiple services in order to create a new composite service. In our architecture, this component allows Services Orchestration: it consists of a Workflow Engine that can call and execute functions provided by the single services published on the ESB. The Workflow Engine adopts WS-BPEL standard to synchronize the interactions among different services: Business Process Execution Language (WS-BPEL) provides a standard way of describing business processes that are based on Web services.

4.4 Business Activity Monitoring

The Business Activity Monitoring (BAM) module has the responsibility to monitor, in real-time mode, all business process by user-defined Key Process Indicator (KPI). The BAM module is oriented to managers and business analysts, giving them useful tools to improve decision-making and optimize processes and e-services. This module is integrated with ESB and Service Orchestrator and can be operated through an user-friendly interface.

4.5 Access & Single Sign on Security Layer

Due to the complexity of the whole system, security side is crucial. So, the ASSO Security Layer was designed to achieve single access point for Regional e-Services and to support federated authentication request in the inter-regional domain. The layer of regional security has the priority to consolidate the sys-

tem of Identity and Access Management, by making available authentication services through various authentication mechanisms (i.e. userid/password, smart card, etc.) and through the use of protocols such as WSS (security token X.509), SAML2.0 and XACML. The best solution spotted on the open source initiatives was identified on OpenSSO, which allows the use of open standards in open source, and ensures maximum interoperability, also in accordance with the specifications set by the ICAR project (see below).

4.6 SOA Competence Center

The SOA Competence Center is the focal point for aspects of infrastructure SOA and EDA, and is the benchmark for training to local and regional authorities on these issues. The competence center also has the task to organize and implement regional e-services within the infrastructure as well as maintain and upgrade the infrastructure. Using the tools described above (ESB, Service Orchestrator, BAM), the Competence Center supports local authorities to define business goals, to model business processes and to implement e-services.

4.7 Digital Identity Service Center

The Digital Identity Service Center manages flows associated with the life cycle of regional identity. Its a reference point for the insertion, update and deletion of digital identity and it is the organizational basis for federated identity management.

5 INTER-REGIONAL DOMAIN

Regione Lazio is involved in ICAR project, namely Interoperabilita' e Cooperazione Applicativa tra le Regioni (System for e-Enabled cooperation among Regional, Local and National Administrations in Italy). ICAR is present in the European database of best practices of e-government (e-practice.eu), and is setting up and testing the shared technical infrastructure for applications cooperation among Italian regional authorities, following the national standards defined for development of the so-called Sistema Pubblico di Connettivit e Cooperazione, SPCoop (Public Connectivity and Cooperation System). ICAR introduced the concept of SPCoop private network, an intranet of public regional administrations that have arranged inter-PA processes for organizational reasons, according to SPCoop guidelines.

5.1 Nica

Because of the need to interconnect the various SP-Coop Private Networks while ensuring adherence to the SPCoop specifications also in communications between parties belonging to different networks, a new infrastructural element, called Nodo di Interconnessione per la Cooperazione Applicativa (NICA, Core of Inter-regional Interoperability) was introduced. Its features are similar to PDD-RL, making it the single point of access for both the regional domain and another regional federated domain.

5.2 Federated Digital Identity

Normally, the systems for digital identity have a territorial basis. This module overcomes identity domains, whose distance can be bridged through a federated system. To achieve this result, open standard (SAML2.0) designing must be used and a reference implementation must be developed by the ICAR project community, so that interoperability can be tested in the digital representation of identity.

5.3 Architecture Deployment in Local Authorities

The resulting architecture described in the previous paragraphs raises an issue. The architecture implemented at regional level can be extended to local authorities to achieve full interoperability within the regional domain, but it is important to identify the best architecture of the right size. The answer is to make the regions the reference point of local authorities and coordination node to other Regions. To achieve this, the most advantageous solution is the hybrid architecture, which provides the use of a PDD for local authorities that can manage and use it, and PDD-RL for all other entities.

6 NATIONAL DOMAIN

At national level, the CNIPA issued a set of technical documents as a reference for infrastructural e-service development (SPCoop). These documents were written by 120 peoples from various local and central administration authorities, and represent Italian reference for all interoperability plans and projects. A significant example is the ICAR project, developed by CNIPA under the second phase of Italian e-Government, which will represent the engine of convergence of regional projects of cooperation implementing SPCoop. This way, the systems approach

adopted will allow a unified and integrated back office central and local government while preserving autonomy. Even on the basis of the experience and the results of SPCoop, on February 2008 CNIPA issued strategic lines for the period 2008-2011, providing lines of action for the development of ICT in public administrations. The document is the result of consultation with the regions and local authorities, with reference to European framework. Among the macro objectives of e-government to improve PA performance, interesting lines of action are the two below:

- Implementation of solutions for interoperability and integration between databases and services;
- Adoption of Knowledge Management Systems (KMS).

Regarding the first point, the SPCoop together with the standardization of interchange content and the cooperation domains, constitute a basic infrastructure for the integration of databases and government services. To achieve this, catalogues of databases owned by administrations should be published, including descriptions of data and services, uniform and comprehensive, based on ontology, defined rules for shared reciprocal access administrations. The integration and interoperability should not involve only information resources and information Public Central government, but also those of local authorities, with a multilevel governance. These national guidelines are covered by Regional projects. Regarding the second point, improving performance necessarily requires a new and different way of working to provide fast and effective answers to the new problems of society, increasingly complex and rapidly evolving. We must develop the capacity to involve all relevant actors in this issue, to activate the right channels of communication, to acquire the necessary information to the analysis of large quantities of unstructured documents and stimulate the contribution and creativity of communities of experts. To support this new way of working, the government should gradually adopt Knowledge Management Systems (KMS) of new generation.

7 EUROPEAN DOMAIN

As described above, the Regione Lazio Infrastructure has characteristics of flexibility, scalability and interoperability and uses open standards. This is important in the medium and long term because the whole system must progressively enter a European context that is becoming more and more relevant. In particular, the development of the Regione Lazio solution is safe

and aligned with European Interoperability Framework (EIF) recommendations. This reference document on interoperability for the IDABC programme draws primarily the concepts of technical, organizational and semantics interoperability.

8 ROAD MAP TO EG MODEL

The architecture support to Extended Government described so far is being issued in accordance with an incremental plan. PDD in particular has already been issued in production, while all other components are being deployed. To give an indication about roadmap progress in terms of Extended Maturity Model Government we can say that Lazio Region is located at Level 2 of the MM.

8.1 CO System experience

Regione Lazio is committed in a national project called Comunicazioni Obbligatorie (CO) that connects Central Administrations, Regions and Provinces by a net with the goal to replace the old modes used by public and private employers to communicate hirings, modifications and ends of job relationships to Centri per l'Impiego (CPI), Enti Previdenziali and Ministero del Lavoro (MIL). All services required for the project were developed according to SPCOOP guidelines, with particular reference to the use of PDD as WS Gateway. Regione Lazio participated in the CO System using its PDD. In the first five months, 1.570.570 service requests reached PDD-RL, as summarized in Figure 4.

8.2 Lesson Learned

Regione Lazio experience raises an issue: realization of A2A and A2B isolated processes leads to fragmented knowledge and to a loss of fundamental information used to integrate management relationship between Administration and citizens or enterprises. For this reason, LAit S.p.A. and Regione Lazio have planned a KMS design with basic concepts (see Section below) inspired both to EE model and EG model, in order to develop research ideas in the EE field.

9 FUTURE DEVELOPMENTS

Industrial and research worlds are thus sharing the same views and aims, colliding towards a new web vision, where knowledge is no more a huge amount

of (semi)structured text but is turning into a cloud of overlapping concepts, topics and domains. At the same time, a better organization of the huge amount of information erupting from the stream of available technologies is needed. To find the way through the plethora of information sources, differentiating in content, presentation and accessibility, a viable approach would be necessary to make these layers explicit, allowing users to recognize them as several possible manifestations of the same knowledge, and organize them accordingly. It makes sense to move from single (and ininteroperable) specific services (blogs, wikis, forums, discussion groups and so on) to huge collectors of information on a open and global scale. Knowledge Management Systems future (KMS, from now on) should provide the main intellectual stream of interests around which knowledge should be organized (and different services be offered). By adopting Semantic Web standards, KMS would be developed around ontological repositories of conceptual knowledge, which will be used as reference vocabularies for accessing contents of federated (or simply annexed) services and (socially) bookmarked web pages. In this scenario, traditional services will still be reusable and will coexist with their new semantic counterparts, with the former being semantically annotated with respect to the ontologies adopted, and the latter natively supporting a semantic organization of their content.

The main principles of KMS should be:

- Affordable setup: no more heavy bulked Social Networks held by major company titans. As a normal web user can now start a forum or a blog using third party (often free) software, he should also be able to use a web host or a hosting service;
- Accessible by (Semantic?) Search Engines: in our vision, this is surely something related to the open nature of KMS, but it would gain some commitment from search engines, which will be able to improve quality of searches through proper indexing of published semantic annotations;
- Scalable open architecture: a given service may explicitly be built upon a KMS, committing to its ontologies and content organization. Viceversa, in an even more open view, independent services may be linked by a given KMS. This would allow users to tag the content of these services according to the oasis reference ontologies, thus easily putting traditional (non semantic-driven) services immediately into practice. The same would be applied to standard web pages. People could write web pages directly connected to a KMS making explicit reference to its vocabulary, as embedded RDFa, or they could semantically bookmark an

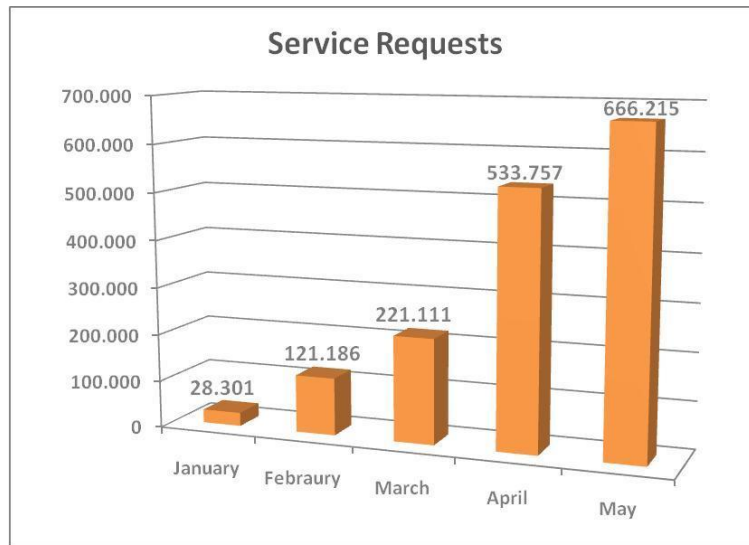


Figure 4: First five months CO System service requests.

external web page (or annotate part of its content) against that same vocabulary.

One of the biggest (and most discussed) problems in the realization of the Semantic Web was the difficulty in establishing consensus on domain representations. The major concern was about the natural resistance of companies and providers to commit to any kind of knowledge organization which could not reflect their inner nature and characteristics or simply properly address their specific information needs. Also, the different cultures which must be considered on a World Wide scale needed to be kept into account, creating another obstacle towards ontologies seen as acceptable shared reference vocabularies in the Semantic Web. These fears, appear, at least in part, as dictated by an old fashioned way of thinking about knowledge organization. Most widely adopted ontologies contain now very simple descriptions of very specific aspects of a domain (or of reality, in general). These ontologies can be easily imported in any more complex knowledge organization system, with no fear of generating unsolvable inconsistencies, while leaving the possibility of providing ad-hoc domain descriptions for addressing specific needs, by adding arbitrary concepts and relationships to the imported ones. This approach guarantees a desirable degree of shareability of the collected data (at least, on its higher-level descriptive units) while preserving the intellectual independence in modeling specific scenarios and domains. Following this approach, KMS, while allowing for ad-hoc ontologies developed for their specific needs, should foster reuse of standard ontologies, thus opening to external linkable services which have been developed independently from their

suggested vocabulary, as well as enabling peer-to-peer.

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