Integrating Spanish Autonomous Parliaments: A Model of E-Government, Issues and Technologies Support

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Abstract. The paradigm of *E-Government* is a way to advance towards a better administration in Spanish autonomous parliaments using information and communication technologies (ICT) in order to carry out one of the major initiatives of COPREPA (conference of presidents of autonomous parliaments from Spain). The goals of this initiative involve the sharing of information among legislative institutions, the increasing of productivity through higher operational efficiency, the offering of better quality services and innovation. In this paper, the main issues and technologies support related to the integration and cooperation among Spanish autonomous parliaments based on an e-government approach are presented. Firstly, the characteristic of Spanish legislative interaction problems are addressed and secondly, the conceptual architecture model for integrating Spanish parliaments and other institutions are presented. Different requirements are considered: interoperability problems arising from heterogeneous legacy parliament systems, components model, system access and security model. Finally, this paper acknowledges the potential of egovernment model to transform how parliaments can provide services online and how more sophisticated forms of consultations and cooperation between parliaments and other institutions can be encouraged.

1 Introduction

The idea of sharing information among parliamentary institutions was a result of the conference of autonomous presidents from Spain (COPREPA), where the projects and common interests among all the parliaments from Spain are established. In a meeting taken place by COPREPA arises the initiative of looking for some procedures that allows sharing information among the parliaments, with the purpose of having valuable information for the deployment of the legislation in each parliament.

The main functions of COPREPA are based on the exchange of experiences and information on the performance of the different autonomous parliaments and on the

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other hand, the study, and in their case approval of combined initiatives that improve the performance of the parliamentary cameras or of their intercommunication.

Furthermore, the conference of European regional parliament's presidents, (CALRE) which is integrated by the presidents of the legislative assemblies of the regions of Europe, promote at the same time the relationships between the regional legislative assemblies and the European institutions by means of the fomentation of the exchange of information through the use of information and communication technologies (ICT). CALRE consists of more than sixty assemblies that represent more than two hundred million Europeans. Concretely, CALRE is formed by the seventeen Spanish autonomous parliaments, all the Italian regional councils, the cameras of the regions and communities of Belgium, all the parliaments of the German Länder, the autonomous Parliament of the islands Åland of Finland and the regional assemblies of Azores and Madeira, belonging to Portugal.

However, public administration is the most complex organization in a society. For example, Spanish public administration consists of large and complex networks of institutions, administrations and agencies, which are conformed in seventeen autonomous communities. In each autonomous community, the legislative function is carried out by the autonomous parliament. It is the representative organ of the citizens of that autonomous community. Additionally, the legislative function is carried out by the senate and congress of deputies in the general courts, where the general courts are the representative organ in national Spanish state. Figure 1 illustrates the Spanish legislative environment, where a complex set of interactions between autonomous parliaments, senate, congress of deputies and other institutions may take place.

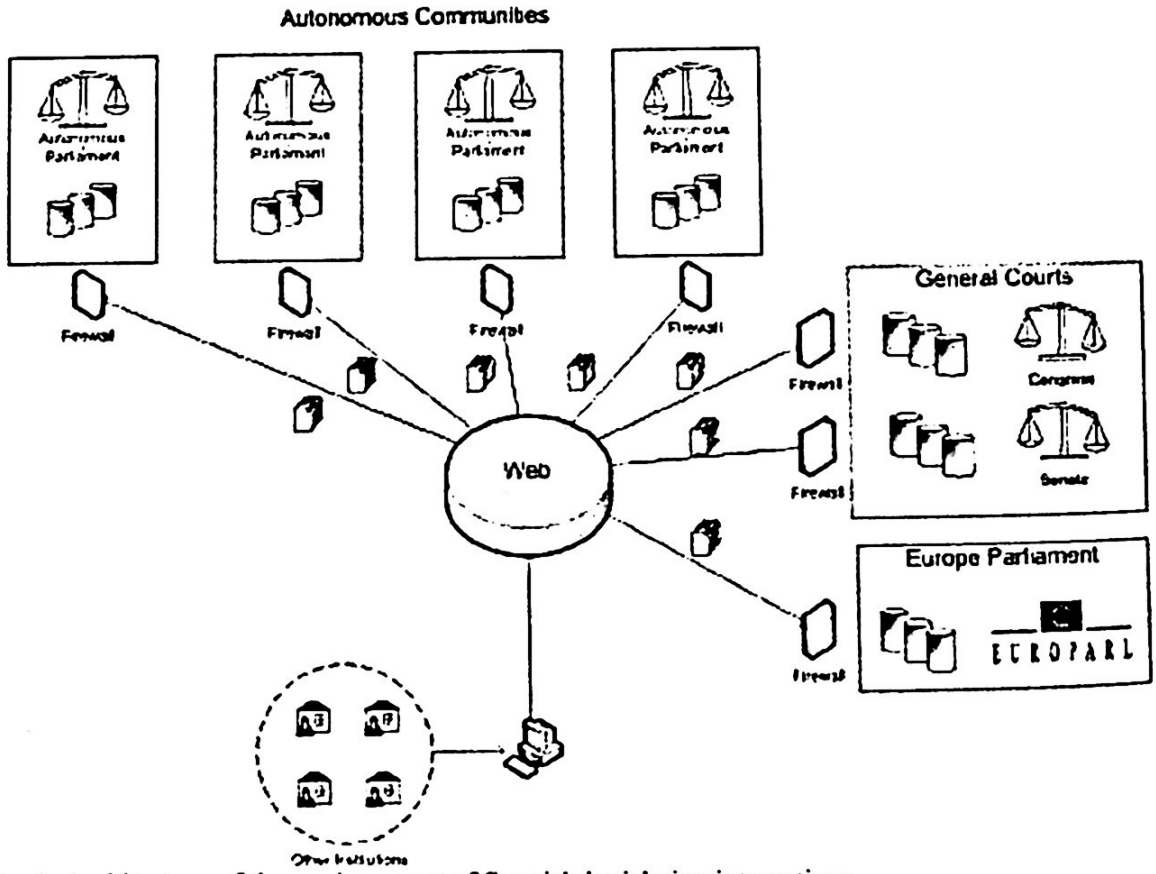

Fig. 1. Architecture of the environment of Spanish legislative interactions

At the same time, the use of *Web technologies* should also be considered changing the traditional mechanisms in which the institutions and administrations operate and interoperate. More importantly, the Web has introduced new paradigms in the way data and services are accessed.

To be precise, the paradigm of *E-Government* or *Digital Government* (DG) [1] is a way to advance towards a better administration in Spanish autonomous parliaments using information and communication technologies (ICT) in order to increase productivity through higher operational efficiency, offering better quality services and innovation.

In this paper, our launching pilot project, *WebSpanishParliament* project (*WebSP*), is presented, where the e-government paradigm is used in our approach of integrating Spanish parliaments in order to improve the interactions between parliaments and other institutions through the deployment of a digital infrastructure which allows sharing legislative data information among a number of distributed hosts. Information about documentation and procedure on the laws, information about legislative initiatives, statistics data on the legislative activity as well as the consultation of the librarians funds are illustrative examples of the need for cooperation between the different parliaments and other institutions. This cooperation and collaboration will contribute to improve each parliament's internal function through a more efficient administration and management of the information, as well as a significant reduction in the use of paper, mail and phone activities, and consequently, improving the services supplied to the legislative authority. This way, the efficiency and productivity are considerably increased by on-line DG services.

One of the critical issues in our *WebSpanishParliament* project is the interoperability problem arising from heterogeneous legacy parliament systems. To solve the problem, effective tools, methodologies and technologies are required to provide easy and seamless connections between systems that were developed by different people, running in different environments under different software/hardware platforms.

WebSP consists of an experimental digital infrastructure built around Web services technology solutions for the integration, cooperation and interoperability among the heterogeneous systems of information that integrate the distributed hosts in each autonomous parliament, general courts and other institutions in order to improve the internal legislative function of each one of these institutions.

The remainder of this paper is organized as follows. In Section 2, we address the different dimensions for evaluating the integration and cooperation between Spanish parliaments and other institutions related to content exchange, autonomy, heterogeneity and security. Section 3 provides an overview of Web services technology solutions. In Section 4, we present and discuss the conceptual architecture model for integrating Spanish parliaments and other institutions, where different requirements are considered: components model, system access model and security model. Finally, we provide some concluding remarks in Section 5.

2 Characteristics of Problems of Spanish Legislative Interactions

The development of an e-government infrastructure for the integration and cooperation between Spanish parliaments and other institutions entail a number of policy and technical challenges. It is interesting to note that many problems that appear in legislative environments share similarities with the judicial and executive environments. In this section, the major issues that must be addressed for a successful deployment are presented.

2.1 Integration of Heterogeneous Data

Spanish autonomous parliaments collect, produce and manage massive amounts of data. This information is typically distributed over a large number of autonomous, heterogeneous and large databases. An efficient administration and management of all this information is quite complex, due to the different situations that are presented:

- Some parliaments have specific applications that enable the sharing of relevant information based on HTML documents that can be accessed through a World Wide Web browser to a Web server.
- Other parliaments provide explicit resources to access to the legislative information systems, where the access to this information is restricted to authorized people of the parliament the information belongs to.
- There are also some parliaments that have no access mechanism to the information that other parliaments propose to share.
- Heterogeneous software architectures, platforms, applications and databases can be found among the parliaments that decide to share the legislative information. This way, the interoperability problem arises from heterogeneous legacy parliament systems.
- Spanish state is made up of seventeen autonomous communities, where several of them provide its legislative information in its proper language such as catalán, gallego and vasco language, which differ to the language used in the rest of the communities. On the other hand, each one of the European institutions stores their information in their own language. This context limits the formal treatment of the systems information using only one language. Therefore, resources of translation are required in order to take into account the different languages.

All the above mentioned issues involves developing solutions based on an interoperability architecture that perform the storage, sharing and management of the information among parliaments without imposing the substitution of the basic infrastructure of the systems of information, because no parliament can impose his approach on another parliament. Therefore, several challenges must be addressed to enable an efficient integrated access to the legislative information. These include: solution to the problem of the interoperability among computers, ontological integration, middleware support and query processing. This way, the solution of this

problem involves the coordination of the effort of different people with different skills and functions.

2.2 Scalability

An e-government infrastructure must be able to scale to support growing numbers of underlying systems and users. It also must easily accommodate new information systems and heterogeneous high volumes of information. Two important dimensions of the scalability problem must be addressed in Spanish legislative interactions: the number of transactions that can be supported in a given unit of time and the volume of accessible data.

2.3 Autonomy

The different computer systems that integrate the legislative environment are characterized by its autonomy in their design, communication and execution. This means that each individual department of computer science of each autonomous parliament select the process and content of description models, programming models, interaction models with the outside world, security model, etc. In a fully autonomous collaboration, each parliament is viewed as a black box, which is able to exchange information. As a result, the parliaments must interact via well-defined interfaces. However, a completely autonomous collaboration was very difficult to achieve some years ago because it requires effective support technologies that can resolve connections between systems that were developed on different environments under different software/hardware platforms.

2.4 Security

Autonomous parliaments collect and store huge amounts of sensitive information about laws and legislative information. Security is therefore one of the major concerns in the digital applications. Recent advances in cryptography and protocols for secure Internet communication significantly contributed in securing information transfers within digital parliamentary infrastructures.

Securing digital parliamentary infrastructures involves many aspects. Such as prevention, this is related to network security and enablement, which is related to identity and access management. For example, a service provider (e.g, any parliamentary institution or another institution) must be able to specify *who* may access the service, *how* and, *when* accesses are made [3].

Currently, the issue of securing the interoperability of Web services is one that has been the focus of many standardization bodies. Many standards for securing Web services have been proposed or are under development. Examples include: WS Security [2], XML Encryption [7], XML Digital Signature [8], SOAP Digital Signature [9], XACML [10], and SAML [11].

2.5 User Interface and User Accessibility

E-government applications are typically developed to be used by average users who in general have no special computer skills. Therefore, the user interfaces needed to access these applications must be easy to use and accessible to users with different aptitudes. Recent effort issues at developing "smart user interfaces" are arising. These issues are based on learning user's abilities and dynamically adapt to those. Technical solutions to the smart user interfaces problem can be covered by an agent system or multi-agent systems [4].

3 Web Services

The problems experienced in achieving collaboration between parliaments have been largely due to a lack of support technology that provides exposing and sharing heterogeneous and distributed databases and applications between parliaments and other institutions using standard technologies. Centralizing the relevant information that Spanish parliaments decide to share, without exposing the entire application and using standard initiatives is one of the major aims of each one of the Spanish autonomous parliaments. One of the critical issues is the interoperability problem arising from heterogeneous legacy of parliament systems. In order to solve the problem, in the early days of the Web, core technologies were used to provide an interface to distributed services (e.g., HTML forms calling CGI scripts). However, XML has accelerated this development, and has sparked the emergence of numerous XML-based environments that enable Web services technology solutions. In this respect, Web services [25, 26] are a useful component in e-government infrastructure due to the support of the broad interoperability problem between distributed applications using standard XML-based technology and Internet communication protocols (e.g., TCP/IP, HTTP). Web services technology, therefore have the potential to facilitate deeper and more sophisticated integration and consultation, that is, how to better share data information between applications and underlying architectures and reuse components between parliaments and other institutions.

The precise definition of Web services is still evolving; therefore several definitions for Web services can be found in the literature. For example, a Web service is said to be:

- A piece of business logic, located somewhere on the Internet, that is accessible through standard-based Internet protocols such as HTTP or SMTP. Using a web service could be as simple as logging on a site or as complex as facilitating a multi-organization business negotiation [5].
- Loosely coupled software components that interact with one another dynamically via standard Internet technologies (Gartner Group, a leading research and advisory firm).

- A software application identified by a URI (*Uniform Resource Identifier*), whose interfaces and binding are capable of being defined, described, and discovered by XML artefacts and supports direct interactions with other software applications using XML-based messages via Internet-based protocols (W3C, *World Wide Web Consortium*)
- A functionality that can be engaged over the Web [6].

3.1The Web service reference model

Interactions among Web services involve three types of participants: *service provider*, *service broker*, and *service requestor*. Service broker is also referred as *service registry*. The Web services functionalities are illustrated in Figure 2.

The architecture of Web Services is founded on issues and standards based on connection, communication, description, and discovery. This way, *service providers*, are the owners that offer services. They define descriptions of their services and *publish* them in the *service registry*, a searchable repository of service descriptions. Each description contains details about the corresponding service such as its data types, operations, and network location such as name, description and contact information of business data. *Service requestors* use a *find* operation to locate services of interest. The registry returns the description of each relevant service. The requestor uses this description to invoke the corresponding Web service.

Three major standardization initiatives XML-based technologies have been submitted to the W3C consortium to support interactions among Web services:

- WSDL (Web Services Description Language) [12]: WSDL is an XML-based language for describing operational features of Web services. WSDL descriptions are composed of *interface* and *implementation* definitions. The *interface* is an abstract and reusable service definition that can be referenced by multiple implementations. The *implementation* describes how the interface is implemented by a given provider. Most Web services development tools generate WSDL documents automatically. Therefore, it is not necessary for developers to fully understand the syntax of WSDL when they are building and deploying Web services.
- UDDI (Universal Description, Discovery, and Integration) [13]: UDDI enables developers and businesses to publish and locate Web services on a network through the *business registry*, an XML repository. As its name implies, the specification allows companies to describe their own services and electronic processes, discover those of other companies and integrate others services into their system. Conceptually, the information provided in a UDDI business registration consists of *white pages* (contact information), yellow pages (industrial categorization), and green pages (technical information about services).
- SOAP (Simple Object Access Protocol) [14]: SOAP is a messaging framework for exchanging XML formatted data among Web Services. SOAP can be used with a variety of transport protocols such as HTTP, SMTP, and FTP. A SOAP message consists of three main parts: an *envelope*, a *header* and a *body*. The *envelope* wraps the entire message and contains the *header* and *body* elements; the *header* is an

optional element that provides information regarding such topics as security and routing. The *body* of the SOAP message includes the actual exchanged data.

Besides standards for XML, SOAP, WSDL, and UDDI, there is a need for broad agreement on the semantics of specific domains. This is provided by the Resource Description Framework (RDF) [15, 16], the DARPA Agent Modelling Language (DAML) [17], DAML+OIL [18], DAML-S [19] and, more generally, ontologies [20].

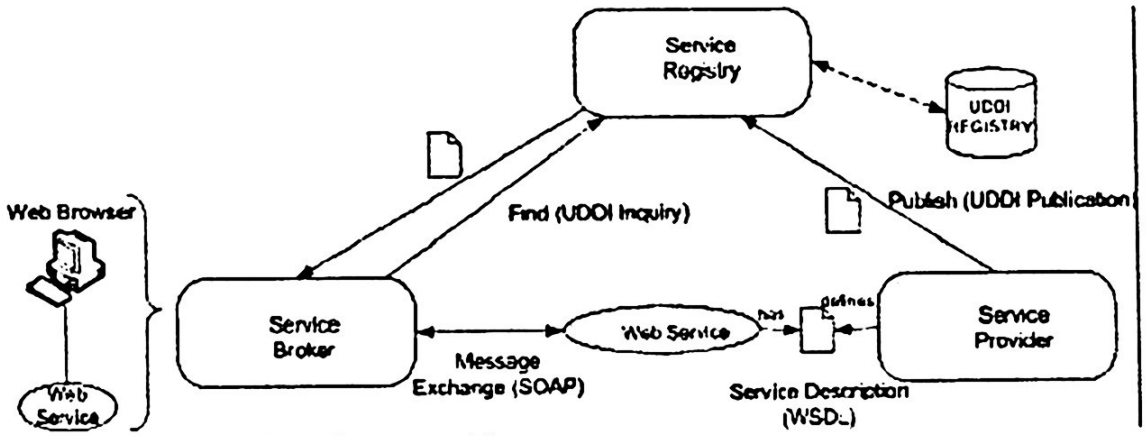

Fig. 2. The Web service reference model

3.2 Web Services Advantages

Among the most important advantages of the Web services technologies, the following ones can be stood out:

- Web services are built around open standards, which makes them truly independent platform and language neutral.
- Web services provide a suite of XML based interoperability standards for software deployed on Internet, so multiple organizations can communicate with the same Web service.
- Web services are comparatively easy and inexpensive to implement, because they employ an existent infrastructure (a network, such as the Web) to exchange data information. Moreover, most applications can be repackaged as Web services, so companies do not have to adopt entirely new software.
- Each vendor can have a unique Web services architecture, which is the most appropriate implementation to its proprietary platform, while adhering to the same XML standards to facilitate successful interoperation with users sticking to the same standards. This enables vendors to incorporate Web services support seamlessly into their platform products. This way, most major software vendors have recognized that Web services technology represents a significant step forward for computing paradigm. Ariba, Apache, IBM, Microsoft, Sun, Oracle, Hewlett-Packard and others have contributed to the development of Web services standards and toolkits that enable programmers to create and deploy Web services.

4 WebSpanishParliament Project (WebSP)

In this section, our research in designing and evaluating a comprehensive infrastructure for online legislative services is described, which is called *WebSP*. The major aim of *WebSP* is to develop techniques to efficiently facilitate the access to legislative databases and services using standard initiatives, resources that enable the management of different European languages and Web services technology solutions in order to facilitate the access, interaction and interoperability among distributed heterogeneous information systems where the information is provided in different European languages. The next sections discuss *WebSP's* major concepts and describe the essential components of its architecture.

A fundamental challenge in the development of our project is not to attempt to modify the resulting information systems which each parliament currently uses. Thus, we propose the use of standard initiatives such as XML-based technology and Internet HTTP protocol, which will allow completing the current systems of each parliament with the least incidence in them.

One of the essential requirements of this project is based on the solution of building modular Web services [21] in each autonomous parliament, as well as the development in each one of them of one or several modules that allows them to carry out consultations to their databases.

The development of three modular Web services in order to provide consultations to: bibliographical funds (B), legislative information data (L) and legislative activities (LA) are initially proposed in *WebSP*.

4.1 General Overview

In Figure 3, the global architecture of our system *WebSP* is presented. The overall system includes three components or layers of functionality: (1) *Process Manager Layer*, which enables the request of information using the deployed Web services in each autonomous parliament. (2) *Parliamentary Web Services* layer, which describes the implementation of Web service in each autonomous parliament and allow the consultation of each database within each parliament. And (3): *Security Processors Layer*, that addresses the aspect of security and management related to the sharing of data in each parliament.

In the design of the proposed architecture model, several issues should be taken into account:

- No additional training for the users is required, because the new system *WebSP* can be integrated inside the existent application of the local databases information search.
- At the present time, all the parliaments have all the information that they decide to share in some internal databases. However, the parliaments provide a myriad of heterogeneous databases such as Oracle, SQL Server, Informix, MySQL, Access, etc. Although the variety of databases is wide, the development of applications that allow the consultation of these databases is feasible. Therefore, the development of a Web service that allows the consulting of the required information of some

database is feasible at the same time. For example, if all the relative data about the books that a certain parliament possesses are stored in a database, then it is feasible to develop a Web service that allows consulting that parliament's bibliographical fund.

- Nowadays, any software company of database offers some ODBC/JDBC gateway that allows accessing the corresponding database.
- It is each parliament's task, to impose restrictions on the access to certain information. For example, in the previously described case of the bibliographical funds of a parliament, the parliament who owns the funds can establish to allow the consulting of all the information of each book, but to restrict the access to relative information related to the cost of the book, or their physical location.
- So that each parliament can publish new services or to modify the current services in an autonomous way, it is advisable for each parliament to have available a Web Service Registry (UDDI), where all the modifications carried out in each parliament's UDDI would be replied autonomously to the rest of the parliaments. This condition is not essential, due to a single Web Service Registry could be implemented in a single parliament, however it would imply that any modification in a Web service of a parliament would need the permission from the parliament that manages the Web Service Registry.

The following sections describe each layer of functionality of the proposed architecture model.

4.2 Process Manager Layer

The *process manager layer* is used to process all the incoming requests from the users of the system. Two types of requests are supported by *WebSP*: *request information* and *request subscriptions.*

The *process manager* will allow each parliament's users, especially the documental users, to be able to carry out consultations about certain information in a simultaneous way in all the parliaments that have enabled the appropriate Web service.

The use of Web services technology allows the access to the *process manager* to be developed as a HTML page via a *Graphical User Interface* (GUI), a specific software application or as an integrated application inside another existent application.

The *process manager* will be located in each parliamentary institution. Each institution will be able to carry out different implementations about the process manager layer in function of the available resources.

4.2.1 Request Handler

All requests are received and processed by the *request handler module*. To cover all aspects of location, discovery and invocation of available Web services, a *service locator* module is used by the *request handler module*.

The *service locator* module discovers the available Web services through the examination of the Web service registry (UDDI). The Web service registry will be

able to be locally located in a centralized way in a certain parliament or in a distributed way.

The *request handler module* can improve the consultation of the system's information using the *translator* module. This module is based on the use of the database *Eurovoc* and *Eurodicautom.*

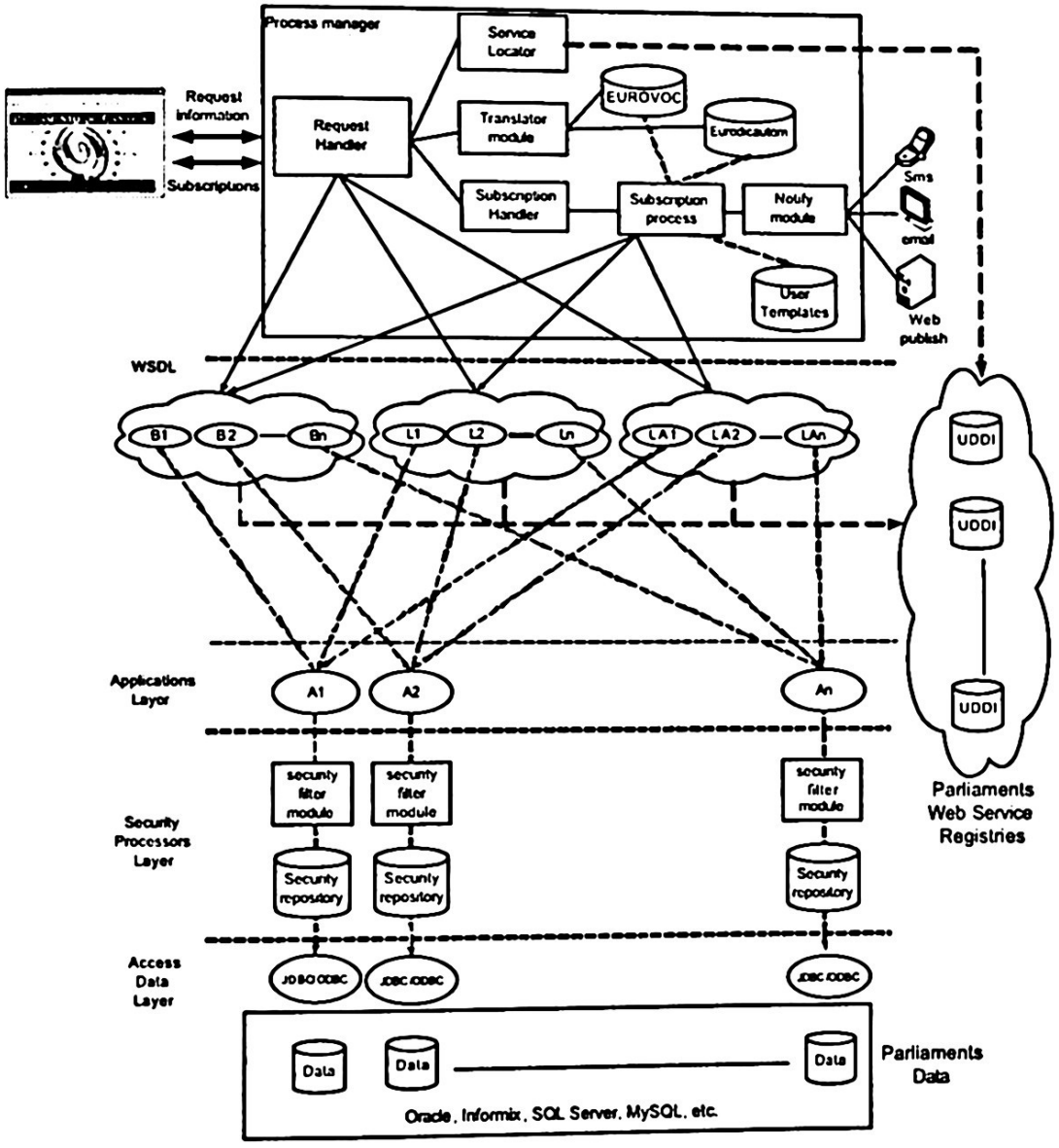

Fig. 3. Global WebSP architecture

Eurovoc [22] is a multilingual thesaurus covering the fields in which the European Communities are active; it provides a means of indexing the documents in the documentation systems of the European institutions and of their users. This documentation product is currently used by the European Parliament, the Office for Official Publications of the European Communities, national and regional parliaments in Europe, national government departments and certain European organisations. Eurovoc exists in the 11 official languages of the European Union (Spanish, Danish,

German, Greek, English, French, Italian, Dutch, Portuguese, Finnish and Swedish). In addition to these versions, it has been translated by the parliaments of a number of countries.

A thesaurus is a structured list of expressions intended to represent in unambiguous fashion the conceptual content of the documents in a documentary system and of the queries addressed to that system.

The European institutions, the national parliaments and the various users of Eurovoc have cooperated to produce the thesaurus. A team of Commission translator-terminologists was entrusted with the preparation of each language version.

If a correspondence is established between identical concepts expressed in different languages, the user of a multilingual thesaurus can in addition interrogate the documentary system in his own language and retrieve documents irrespective of the language in which they have been indexed.

On the other hand, Eurodicautom [23] is the European Commissions multilingual term bank. When it was first set up in 1973 the development team drew upon the know-how and lexicographic material of two other tools available to Commission translators: Dicautom, a phrasal automatic dictionary launched in 1964, and Euroterm, a translation dictionary developed in 1962-68. The four original languages of Eurodicautom were Dutch, French, German and Italian, to which Danish and English were added in 1973, Greek in 1981, Portuguese and Spanish in 1986, and Finnish and Swedish in 1995. Latin is also present.

Today it is an invaluable tool for translators, interpreters, terminologists and other linguists worldwide over the Internet, where it records a daily average of 120.000 enquiries.

This way, starting from the text that is required to search for in *WebSP* system, the key words of the search can be extracted and replaced by the equivalent term in another language using Eurovoc and Eurodicautom. As a result, we will be able to enlarge the consultation to institutions that present their information in another language, as well as to enlarge the search with synonymous terms.

4.2.2 Subscriptions

Besides requests of information, the *WebSP* system allows the user to be informed when something of his interest it is published in some parliament.

Each user will be able to select the subscription to a collection of established terms from the thesaurus Eurovoc and he will be able to denote the way that the system will notify him. The *user templates module* stores all the relative information about the subscriptions of the registered users. This way, the *notify module* will carry out the notification to the user in the way that has specified via for example sms, e-mail, web publishing, etc.

4.3 Parliamentary Web Services Layer

For each service that is required to be implemented in each parliament, an application will be deployed to implement the Web service in that parliament and this application will allow the consulting to the relative information of that service in a remote way for other parliaments.

Since this architecture model is completely decentralized it allows each parliament to decide to implement his Web services or not to do so. In the same way, each autonomous parliament can only deploy a Web service of all those outlined, or to carry out it in a progressive way.

When a *provider* parliament proposes to publish his new Web service so that the other parliaments can make use of it, he will only have to publish it in a Web Service Registry (UDDI) with the idea that the *consumer* parliaments can know its existence and consultation form. This way, *provider* parliaments define descriptions of their services and publish them in the *registry* and *consumer* parliaments access the *registry* to locate services of interest using the returned description of each relevant service from the *registry* to "understand" how to use the corresponding Web service.

Essential information about that must be contained in a certain Web service will be required to be established among all the parliaments. For example, the basic information required for the implementation of the Web service related to legislative consultations (L) illustrated in Figure 3 could include the following information: title, dates of beginning, current state and proposer.

All the relative information of the necessary data to invoke the Web service as well as the list of return data will come specified in the file WSDL implemented by each parliament that has previously been published in the Web Service Registry (UDDI).

In Figure 3, three different Web services have been represented in the model of proposed architecture of our project *WebSP*: consultations to the bibliographical funds (B), consultations to the legislative procedures (L) and information about legislative activities in general (LA); where the index in each one of them indicates the Web service implemented in each parliament.

Additionally, the application layer represents the gateway to the invocation of the Web services implemented in each parliament

4.4 Security Processors Layer

Preserving privacy is one of the most challenging tasks in deploying e-government infrastructures. The privacy problem is particularly complex due to the different perceptions that different staff of e-government services may have with regard to their privacy. Furthermore, a same user may have different privacy preferences associated to different types of information.

In order to solve the privacy problem, three issues are required: *privacy profiles*, *privacy credentials* and *privacy scopes*.

The set of privacy preferences applicable to a user's information is called *privacy profile*. The *privacy credentials* determine the *privacy scope* for the corresponding

user, where *the privacy scope* defines the information that a parliament service can disclose to a certain user.

When a request is received by a service, it checks that the request has the necessary credentials to access the requested operation according to its privacy policy. If the request can be answered, the service translates it into an equivalent data query that is submitted to the appropriate parliamentary database.

The system of security will be able to be integrated in a LDAP server [24] of each institution with the purpose of recovering all the relative information to each user. They will be able to establish security profiles to apply in different ways to each user as well as different profiles for each Institution. All the relative information to the security profiles will be stored in the security repository.

Each institution will be able to implement a *security processor layer* with the purpose of carrying out a control of who is using the corresponding Web service.

5 Conclusions

In this paper the potential of e-government paradigm is acknowledged and presented to transform how legislative institutions can provide services online and more sophisticated forms of consultation and cooperation between them. Information about documentation and procedure on the laws, information about legislative initiatives, statistics data on the legislative activity as well as the consultation of the librarians funds are illustrative examples of it. A discussion of key issues in Spanish legislative interactions in developing a digital infrastructure is introduced. This is followed by our launching pilot project, *WebSpanishParliament*. Our project is developed around three major concepts: use of standard initiatives, resources that enable management of different languages in the distributed information systems and Web services technology solutions. The standard initiative approaches were used in order to facilitate the access among heterogeneous systems. Management of different European languages was provided for interacting among different European institutions and Web services technology were used as wrappers that enable access to and interoperability amongst legislative services. The paper also provides an establishment about Web services solutions.

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Part II

e-Participation and e-Democracy