Ontology-enabled E-Government Service Configuration - the OntoGov Approach

Abecker Andreas, Forschungszentrum Informatik an der Universität Karlsruhe
Apostolou Dimitris, Planet Ernst & Young
Hinkelmann Knut, Fachhochschule Solothurn Nordwestschweiz
Probst Fabian, Fachhochschule Solothurn Nordwestschweiz
Stojanovic Ljiljana, Forschungszentrum Informatik an der Universität Karlsruhe
N.N. Archetypon

Extended Abstract

Overview

Electronic Government (e-Gov) is a major priority in Europe today and European governments are clearly committed to embracing related initiatives. One of the primary objectives of e-Government is to increase productivity through higher efficiency and to offer better quality services and innovation based on ICT[1].

However, in order to fully realise the potential for productivity growth, it is not sufficient to modernise the front office by offering public services over the Internet through e-Government portals. Problems such as the functional disintegration prevailing the current governmental structures affect the quality of the services provided via the e-Gov portals, which in turn are often fragmented and departmentalised, too. Problems arise also from the wide gap and inconsistencies that exist between the perspective of policy makers and public administrations' managers, on the one hand and the technical realization of e-Gov, on the other hand. For instance a change in policy or legislation that affects a particular Public Administration (PA) service does not propagate seamlessly into the e-Gov service provided via the portal. Furthermore problems arise from the loss of critical knowledge about the service configuration, for example the PA manager's knowledge of how a particular policy affects a particular service. These problems become more significant at the European Union (EU) level because of the absence of harmonisation and common semantics in the definition and configuration of e-Gov services in different countries across the EU.

OntoGov is a project of the IST programme in the EU 6th framework, planned to start in January 2004. The overall objective is to develop, test and validate a semantically-enriched (ontology-enabled) platform that will facilitate the consistent composition, re-configuration and evolution of e-Government services. More specifically, OntoGov is going to:

- Define a high-level generic **ontology for the e-Government service lifecycle** (i.e. covering all the phases from definition and design through to implementation and reconfiguration of e-Government services) that will provide the basis for designing lower-level domain ontologies specific to the service offerings of the participating public authorities. This objective will be achieved through the delivery of

[1] "e-Government and the European Union" Speech by Mr Erkki Liikanen (Member of the European Commission, responsible for Enterprise and the Information Society) at the Internet and the City Conference "Local eGovernment in the Information Society" Barcelona - 21 March 2003

    - a **Service Description Metamodel**, highly relevant to e-Government portals and end-user situation scenarios
    - **Domain Ontologies** as semantically enriched data descriptions of the participating user PAs
    - **Information Ontologies** representing all kinds of information and knowledge as well as the information flow and decision points involved for the e-Government service delivery
- Develop a **semantically-enriched platform** that will enable public administrations to model the semantics and the processes of their e-Government service offerings at different levels of abstraction; easily and consistently re-configure their e-Government services; and knowledge-enrich the provision of e-Government services to citizens and businesses. This objective will be achieved through
    - An **ontology editor** for modelling domain ontologies of public administrations
    - An **ontology management system** for managing the life cycle of domain ontologies
    - A **service configuration system** for the interconnection and communication of the ontology management system with the existing applications of public administraions
- Pilot and evaluate the OntoGov platform in three public administrations in three different European countries. The evaluation of the project results will not be limited merely to the technical evaluation; rather, it will take into account both organisational and social aspects of the project.
- Provide the public administrations with a means that enables them to have an overview of their current service configuration model and easily re-configure it whenever there is a need due to changes in national and European legislation – for example. The OntoGov platform will allow for change propagation and traceability, contributing in this way to the bridging of decision-making with technical realisation.
- Provide the end users with knowledge enhanced e-Government services that will be simplified and more user-friendly, through the active provision of context-sensitive knowledge

In the following we will give some more details on the generic ontology for e-Government lifecycle and shortly mention one of the real-world case studies.

General Description

The OntoGov project will specify, develop and deploy a holistic framework and a supporting platform to improve public service provision by enabling semantically rich representation, evolution and refinement of public processes and services to citizens and businesses.

Currently, in an increasing number of public authorities throughout Europe the public service provision model is comprised of the following parts (Figure 1):

- Data Sources in Back Office
- Processes in Back Office denoted as “Application Logic” in Figure 1

- Broker where public services are jointed up. This can be automated, semi-automated or performed manually. In the case of a central point this broker is located at a central public authority (usually a ministry)
- Communication channels handling the interface with citizens and businesses

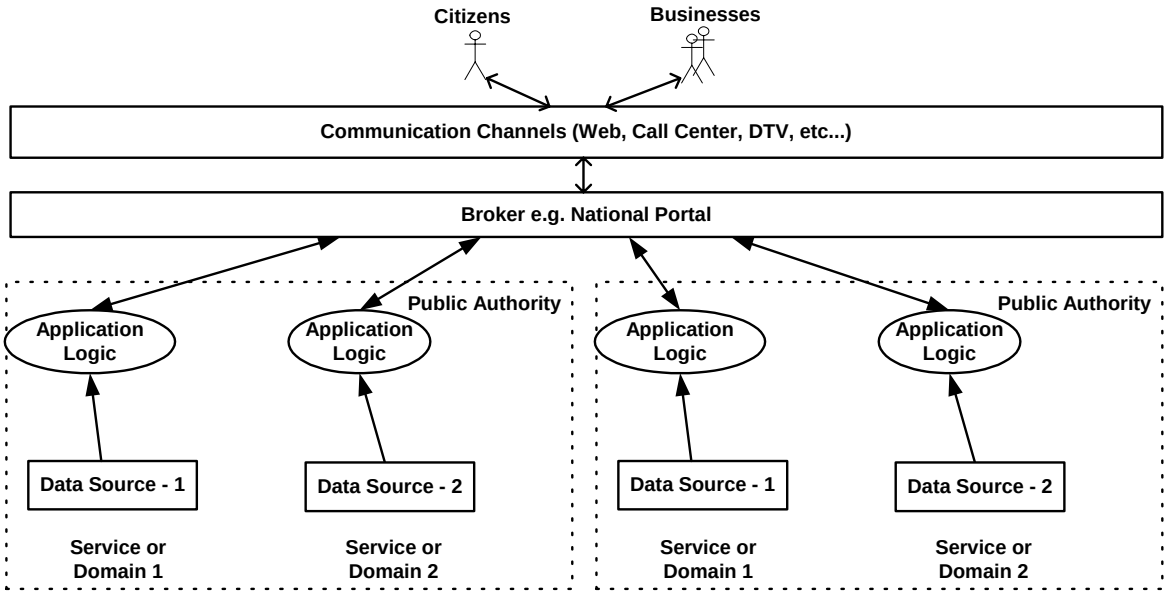

Figure 1: Current service provision model

This is an adequate model for service provision. However, the demands from the society for joined-up, high-quality, transparent public services are increasing. Public Authorities are faced with the challenges of streamlining their processes at all levels, improving their efficiency and reducing their costs.

OntoGov aims to provide an innovative framework, supported by an integrated platform, for public service provision based on Semantic Web principles and technologies.

Tim Berners-Lee, the inventor of the current WWW, coined the vision of a Semantic Web in which background knowledge is stored on the meaning of Web resources through the use of machine-processable (meta-)data (Berners-Lee et al 2001). The Semantic Web will bring structure to the content of Web pages.

Semantic Web technologies developed by participants in the OntoGov Consortium offer the promise of solving / alleviating some of limitations of current Web Service solutions.

- While existing Web Service languages provide only a low degree of flexibility and expressiveness making the meaningful discovery impossible, ontologies define a vocabulary with semantically well-defined terms and, thus, enabling precise service descriptions on which mechanisms for automated discovery, composition, negotiation and reconfiguration can be built on.
- While existing Web Service languages are based on simple message request / reply patterns ignoring application logic aspects in terms of processes completely, Semantic Web enabled Web Services (or, Intelligent Web Services) provide mechanization in service identification and discovery, configuration, comparison, and combination.

The OntoGov approach to an e-Government service ontology

The global information infrastructure and in particular the possibility to make accessible and interoperable electronic services for people and companies all across the world, opens completely new ways for globally doing business and, of course, also deliver public services to the citizen in a more comfortable, faster, and more efficient way. But, of course, such new scenarios also provide manifold new challenges with respect to discovery, composition and distributed enactment of Web Services; challenges located at all levels of

- technological (e.g., finding the appropriate service providers; secure data transmission),
- methodological (e.g., roles and organizational processes for defining and maintaining the interfaces between organization-internal and external services and process parts; or trust between unknown partners) and
- economic (e.g., negotiation models, business models, etc.) aspects.

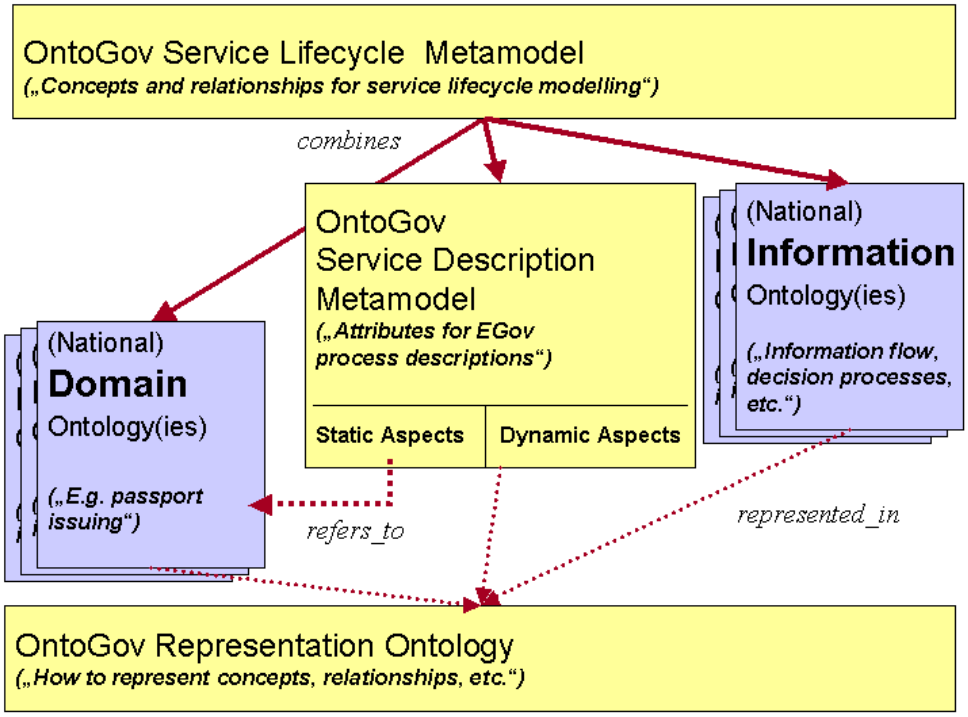

Figure 2: OntoGov indicative meta modelling approach

At the core of our semantically enriched service provision are service descriptions which shall provide explicitly all information required for finding, on-the-fly composition, and enactment of services (see Figure 2). These service descriptions instantiate classes defined in the OntoGov Service Description Metamodel in the center of our approach. An OntoGov service description contains information about static and dynamic (procedural) aspects of a service.

This service description shall be as close as possible to upcoming standards in the commercial field, but those must be examined with respect to usability in the public sector and with respect to efficient processability. For instance, a simple change to the metamodels proposed, e.g., by BPEL or DAML-S, is that instead of or in addition to the service "goal descriptions" suggested there we need here "life situation characterizations" in order to support state-of-the-art one-stop E-Government portals where the central access point is the life situation (e.g., change of residence) a specific citizen is in when searching such a portal for support (see Lenk and Traunmüller, 2002).

Though such ideas are not at all everyday practice all over Europe, there are nevertheless already some far developed sites (municipal, regional, or even state administrations) (Wimmer, 2003) which are implementing some of these concepts in their systems, or at least in prototypical systems and field experiments. Three of those far developed public authorities are members of the OntoGov Consortium.

The characterization of static aspects links into (National) Knowledge Domain Ontologies as semantically enriched descriptions of the data perspective. They will be the common denominator allowing (a) for interoperability between different services using and manipulating conceptually the same objects, and (b) for interoperability of different local authorities implementing the same services in a different manner.

So far, our ontology approach is fully aligned with similar approaches in the commercial area, it just takes into account particular requirements from the E-Gov application scenario, explores new convincing application scenarios, and further consolidates the still very immature conceptual and technological foundations of the Semantic Web Service area. Now, the remaining part of the figure extends the scenario by new aspects particularly important in E-Gov, but probably usable in industry as well. The major extension to the common view is that we embed a single Service Description into a Service Lifecycle Description, which is an instance of the concepts and relationships determined in the OntoGov Lifecycle Metamodel. A lifecycle description shall model all relevant stakeholders and parties involved in the service definition and implementation process and shall hold all relevant information required to trace back the reasons for specific implementation decisions at several levels of the service provision process. Vice versa, it should be possible to transport knowledge for specific decisions between different parties in order to make more transparent the service implementation process to all affected people. This should allow automatic notification when higher-level changes occur which might require lower level changes. In the ideal case, some changes might even be automatically propagated.

One area not yet mentioned, which comes into play in the lifecycle modelling is what we call (National) Information Ontology in the figure. This should represent all kinds of knowledge, documents, and information, as well as the information flow, and – if realizable in a computationally tractable and practically useful manner – even decision processes, involved in the service lifecycle in order to lay the technological / ontological foundations for the Knowledge Management and for allowing the lifecycle support mentioned above.

All these specific ontologies, ontology-instantiating knowledge bases, and ontology-equivalent meta models will be designed, stored, and utilized by the OntoGov Ontology Management System which will be based upon the OntoGov Representation Ontology, i.e. the specific ontology language providing the modelling primitives used for building all other models.

Real-life Case Studies

The OntoGov project examines three different case studies in different countries in order to show the whole range of possible service implementations and benefits of OntoGov methods and tools in different environment.

One partner of the OntoGov consortium is the Swiss Federal Chancellery which is running the national portal www.ch.ch, a guide to public authorities on all state level: Federation, cantons and municipality. They have implemented a URN resolver the transforms a URN into a URL to the requested services (Bundeskanzlei, 2002). The

URN encodes search criteria like namespace, language, partner, theme, and format. In OntoGov a semantically richer description will relate services to life situations.

But the Federal chancellery not only runs the national portal but also provides various Web Services that can be used by public authorities when implementing their services. These Web Services and their relation to the public services should be described using the OntoGov service lifecycle metamodel.

References:

Berners-Lee, T, Hendler, J., Lassily, O. (2001): The Semantic Web. In: Scientific American.

Bundeskanzel (2002): Funktionsweise des Resolvers. Zu finden unter (19.11.2003) http://www.admin.ch/ch/d/egov/gv/themen/privatanbieter/URN_Resolver.pdf

Lenk, K., Roland Traunmüller (Eds.) (2002): Electronic Government, First International Conference, EGOV 2002, Aix-en-Provence, France, September 2-5, 2002, Proceedings. Lecture Notes in Computer Science 2456 Springer 2002

Wimmer, M. (Ed.) (2003): 4th Working Conference on Knowledge Management in Electronic Government(KMGov2003), Rhodes Island (GR), May 26– 28, 2003. To appear as: Lecture Notes in AI 2645, Springer 2003