

The SEEMP project

Single European Employment Market-Place

An e-government case study

1 Scenario introduction

Several **e-government** projects have been developed in the field of **employment** with the aim of emphasizing and supporting the social dimension of the problem. As examples of that, we can cite "Portale Borsa Lavoro Regione Lombardia"¹ in Italy-Lombardia, "Accés al treball of Administració Oberta de Catalunya"² in Spain-Catalunya, "FOREM Walloon Public Employment and Vocational Training Service"³ in Belgium-Wallonia and other cases in Belgium Flanders, Denmark, Netherlands, UK and Poland. The new term **PES** (Public Employment Service) has been therefore coined to indicate the provision of e-government G2C and G2G services about placement, employment, workers mobility and conjoint policy making via Internet.

PES normally offers services for the **job recruitment/placement** marketplace including all the facilities and tools for social protection. Such services aim at encouraging and assisting citizens during their insertion or re-insertion in the job market, with the final purpose to increase employment rates, to facilitate cross-border mobility and employability, to monitor and guarantee sustainable job quality, to assure equal opportunities for disadvantaged citizens categories, to plan and promote policies for competency gaps filling.

The European integration and the emergent concept of enlarged Europe have more recently emphasized the need for pan-European, cross-border initiatives which could provide citizens with more effective and efficient services related to job search and mobility. The most important of such services is **EURES**⁴ (EUROpean Employment Services), developed in 1993 under DG Employment and Social Affairs, available in 20 languages and currently hosting 90,000 CVs and 3,700 employers from 28 European Countries and 21 cross-border Regions. One severe limitation of EURES was the inability to exchange CVs and job offerings with other systems built at national level; therefore in 2002 the EC sponsored a pilot project called **EDEN**⁵ – Employment Data Exchange Network – in order to develop the new platform for EURES to display, exchange, and process job vacancies and CVs. The resulting system is highly centralised, mostly developed on proprietary technology⁶ and does not consider semantic interoperability or cross-governmental business and decision processes as recommended by **EIF**⁷ (European Interoperability Framework) for pan-European e-Government Services within the EC **IDAbc**⁸ initiative (Interchange of Data between Administrations).

¹ <http://www.borsalavorolombardia.net>

² <http://www.cat365.net>

³ <http://www.leforem.be>

⁴ <http://europa.eu.int/eures>

⁵ <http://eden.forem.be>

⁶ <http://www.microsoft.com/resources/casestudies/CaseStudy.asp?CaseStudyID=13705>

⁷ <http://europa.eu.int/idabc/servlets/Doc?id=19528>

⁸ IDAbc (<http://europa.eu.int/idabc>) defines a set of recommendations and guidelines for eGovernment services so that public administrations, enterprises and citizens can interact across borders, in a pan-European context.

2 The SEEMP project

SEEMP (Single European Employment Market-Place) is a EU-funded project kicking-off in January 2006. SEEMP mission is

to design and implement in a prototypal way an interoperability architecture for public e-Employment services which encompasses cross-governmental business and decisional processes, interoperability and reconciliation of local professional profiles and taxonomies, semantically enabled web services for distributed knowledge access and sharing.

The resulting ICT networked system should overcome most of the limitations present in current regional and national e-placement solutions, such as limited cross-government administrative processes interconnection and synchronization, limited cross-border knowledge and information circulation, scarce data and applications interoperability, semantic heterogeneity both at the administrative norms and classifications and at the technological level, not coordinated job policy strategies and principles, creating the premises for building a **Single European Employment Market**, in which PA networked bodies will play the fundamental role of arbiters and mediators between citizens, employment agencies and enterprises.

In particular, the SEEMP project will develop an EIF-compliant federated architecture and interoperability middleware as well as applicative plug-in services to allow existing National/Local job market places and data warehouses to be interoperable at pan-European level by overcoming state-of-the-art limitations:

- from an **organizational** viewpoint, by implementing cross-governmental business and decision processes and supporting them with proper ICT tools for their design and enactment (EIF **CG-BM** functions);
- from a **semantic** viewpoint, by implementing cross-governmental ontology, semantic annotation tools and ontology reconciliation mechanisms (EIF **CG-OM** functions);
- from a **technical** viewpoint, by implementing a cross-governmental service-oriented architecture following the WSMO⁹ (Web Service Modelling Ontology) approach.

On top of this ICT interoperability infrastructure, SEEMP will develop knowledge discovery-mining services for cross-governmental decision and policy making support (EIF **CG-DS**).

3 Case Study overview

PESs are information intermediaries between job seekers and employers. The existing Public Employment Services differ substantially in the way they describe positioning regarding to geographical areas, specific industries or occupation groups. As a consequence many standards are adopted and each online portal normally uses different classifications. Offering an homogeneous view upon such numerous and heterogeneous portals is almost impossible.

From the viewpoint of an organization a typical recruitment process can be divided into four main phases:

1. *describing the requirements of the job position,*
2. *publishing the job posting,*
3. *receiving of applications, and*
4. *final decision making.*

⁹ <http://www.wsmo.org>

The following figure shows in a simplified manner a typical existing PES where users (Citizens, Agencies and Employers) access to the local repositories and functionalities through dedicated GUIs.



Figure 1: a typical existing PES

Nowadays, job postings/CVs are written in free text (i.e. rarely choosing term from controlled vocabulary) and are shared among PESs using proprietary mechanisms, thus making very difficult both searching and exchanging them at a pan-European scale. In order to overcome such limitations SEEMP will employ Semantic Web Services technology by semantically annotating both the services for interacting with a PES and the job offerings/CVs. Therefore, in SEEMP, an open position/CV published on a PES will be made available to all the other PESs. This would allow job seekers to select one single portal and to access all information available in the market.

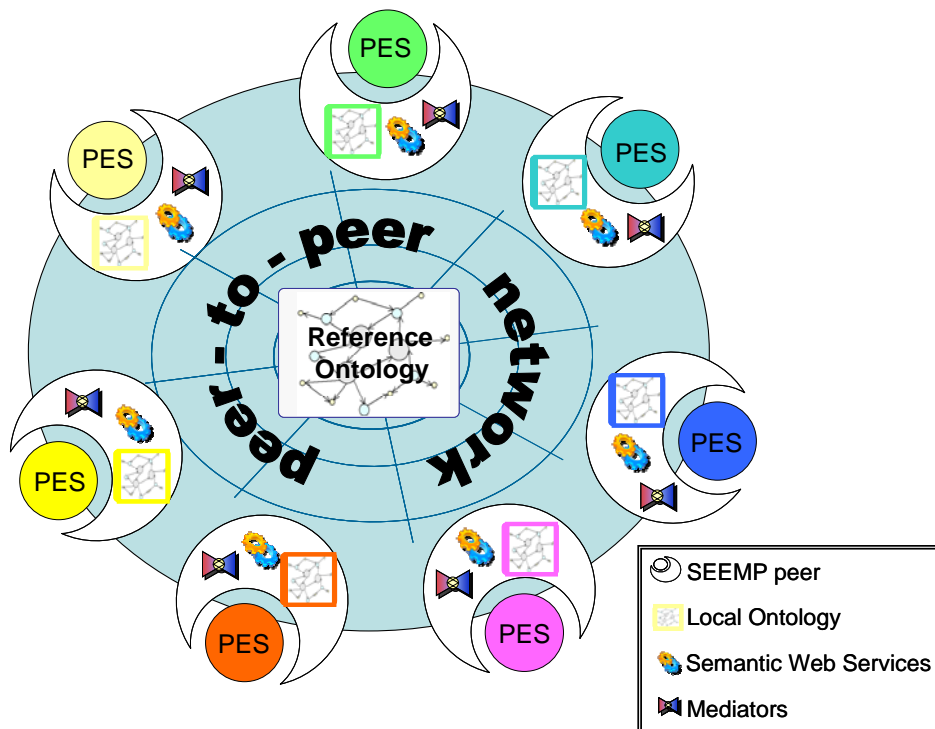


Figure 2: Semantic Web Services technology used to integrate existing PES in a pan-European networked system

Using Semantic Web Services Technologies to integrate PES (hence enabling distribute job postings) will increase market transparency and, in the meantime, will avoid the bottleneck of a central database. Organizations will publish annotated job postings directly on their websites using

terms taken from a set of controlled vocabularies (defined by a set of ontologies). They will make it possible to search and retrieve them via Web Services, so that the centralized approach will be replaced by a distributed approach. Consequently, all job portals will operate on the same information and postings would reach more applicants, resulting in a higher market transparency.

The core component of the system will be a *Reference Ontology* which will foster as much as possible the usage of a common "language" in the form of a set of controlled vocabularies to describe the details of a job posting and the related Web Services. This Reference Ontology will facilitate communication between all parties involved and will open up the potential of the automation of various tasks within the process. In order to preserve a high degree of autonomy in the organization interconnected by SEEMP solution, each organization could also independently maintain a *Local Ontology* and the necessary mediation services for maintaining the local ontologies aligned with the Reference Ontology.

4 Envisioned architecture

The SEEMP architecture will be an interoperability infrastructure for Public Employment Services based on Semantic enabled Web Services. The following picture represents an early-proposal of the internal architecture of a single node (SEEMP peer) of the SEEMP Networked System:

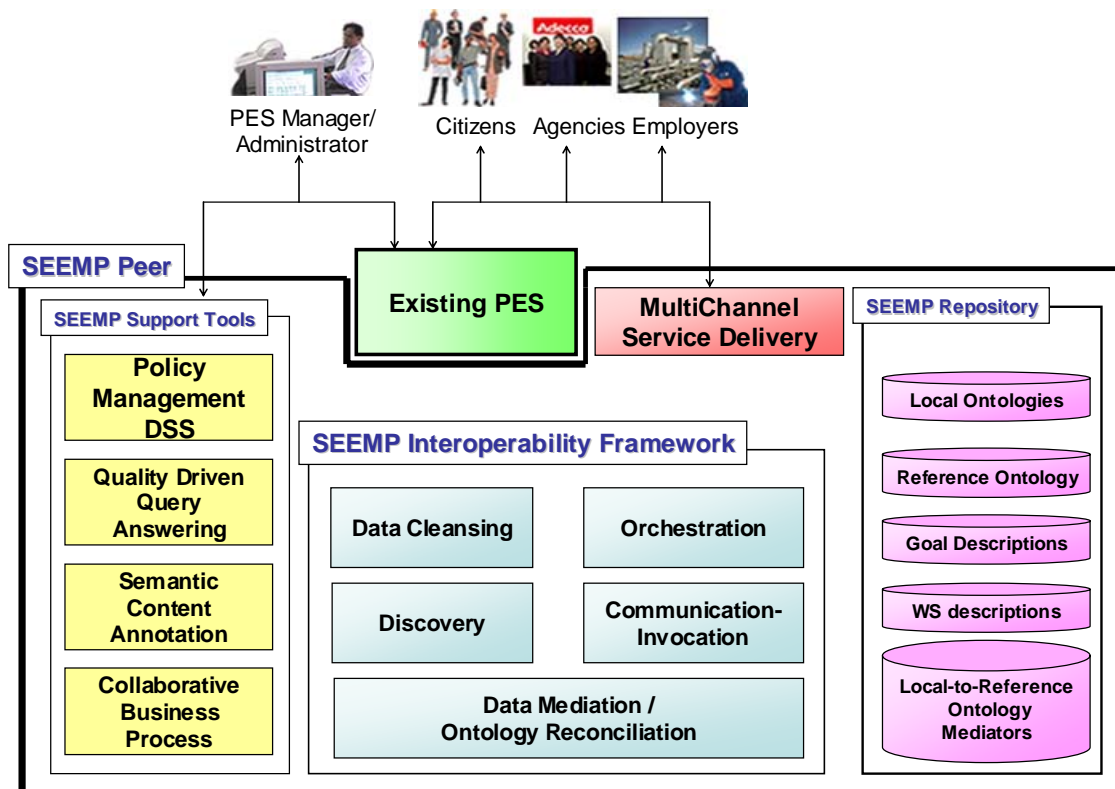


Figure 1: SEEMP peer internal architecture

A SEEMP peer acts as an extension framework for an existing PES. A SEEMP peer will be capable of providing policy-management-based DSS, Quality Driven Query answering, Semantic interoperability features and Collaborative Business Process tools.

A SEEMP peer will be made up by three main internal parts:

- *SEEMP Repository*: it's responsible for storing information needed to perform the required features. In particular it manages Local and Reference ontologies, which will contain

vocabularies and taxonomies that describe jobs, organizations, application details and skills. Human resource ontologies need to be created by integrating existing standards. The repository handles the necessary mediators for translating Job Offers and Demands from Local ontologies to the Reference ontology, and vice versa. Moreover, the SEEMP repository handles Goal and Web Service description built-up on market data in order to perform demanded discovery and composition tasks. In any case, Job-Offers and Demands owned by the existing PESs are NOT replicated inside this repository in order to avoid ownerships problems between PESs.

- *SEEMP Interoperability Framework*: it contains the main components that perform the core features of the SEEMP Networked System.
 - *Data Cleansing* manages the consolidation of data among PES databases by removing inconsistent data and re-indexing existing data in order to maintain accurate and concise databases.
 - *Discovery* performs semantic discovery and location of information providers within the SEEMP Networked System using the Goal and Web Service descriptions stored in the repository. This component uses Semantic matching algorithms to match applicant profiles and job postings based on the knowledge included in the ontology and the available descriptions.
 - *Orchestration* and *Communication-Invocation* enable the features related to collecting data from different providers and performing business processes between peers and existing public National or local job market places.
 - *Data Mediation/Ontology Reconciliation* handles the activities related to integrate data published using different vocabularies in a common Reference Ontology.
- *SEEMP Support Tools*: users will take advantage of these tools to interact with the SEEMP Networked System to obtain the enhanced features. These tools can be mainly distinguished in:
 - *Policy Management DSS*: a decision and policy making support that will integrate innovative indicators for employability, job quality management and competencies planning and improvement.
 - *Quality Driven Query Answering*: this module will support user to evaluate the correctness and rank answers by means of quality based mechanisms. Queries over databases characterized by a poor quality of data often returns a set of different (equivalent) answers that need to be compared and ranked. A technique to address this issue is to associate each answer with a profile that states qualities such as correctness, cost, trustworthiness, and other parameters. Such a technique can be improved by using the Reference Ontology and semantic annotations.
 - *Semantic Content Annotation*: the domain specific knowledge will be represented in the form of various concept hierarchies (skills, occupation classification, industry sectors, etc.) and will be used to determine the semantic similarity between concepts. The ontology will provide means for semantic annotation of job postings and job applications. Using controlled vocabularies, in contrast to free text descriptions will result in a better machine processability, data interoperability and integration. Moreover, describing job position postings and job position seekers using controlled vocabulary from ontology will allow for performing semantic matching, i.e. the calculation of the degree of semantic similarity between an applicant profile and job requirements. Consequently, for a given job position a ranked list of the best matching candidates can be delivered as a result, and vice versa.
 - *Collaborative Business Processes*: a process model will implement the typical job search, job offer and administrative tasks under strict and precise privacy constraints.