

## Medical Virtual Public Services

Manole VELICANU, Academy of Economic Studies, Bucharest

Iulia SURUGIU, TotalSoft, Bucharest

*The healthcare enterprises are very disconnected. This paper intends to propose a solution that will provide citizens, businesses and medical enterprises with improved access to medical virtual public services. Referred medical services are based on existing national medical Web services and which support medically required services provided by physicians and supplementary health care practitioners, laboratory services and diagnostic procedures, clinics and hospitals' services. Requirements and specific rules of these medical services are considered, and personalization of user preferences will be supported.*

*The architecture is based on adaptable process management technologies, allowing for virtual services that are dynamically combined from existing national medical services. In this way, a comprehensive workflow process is set up, allowing for service-level agreements, an audit trail and explanation of the process to the end user. The process engine operates on top of a virtual repository, providing a high-level semantic view of information retrieved from heterogeneous information sources, such as national sources of medical services.*

*The system relies on a security framework to ensure all high-level security requirements are met. System's architecture is business oriented: it focuses on Service Oriented Architecture - SOA concepts, asynchronously combining Web services, Business Process Management - BPM rules and BPEL standards.*

**Keywords:** *Business Process Management, Service Oriented Architecture, Application Integration, Web services, information technologies, virtual repository, database.*

### 1 Introduction

The overall project objective is to research, design and develop technology innovations that will create and support a software environment that provides user-friendly, advanced interfaces to support medical services for citizens and businesses – administration interactions involving many different health care organizations within the European Union.

Business solution's specific *objectives*:

- To create adaptable process management technologies by enabling virtual services to be combined dynamically from the available set of existing functions.
- To improve effective usage of advanced medical services by information technologies by means of service-level agreements, an audit trail, semantic representations, better availability and better performance.
- To organize currently available Web services according to the specific life-event requirements, creating a comprehensive workflow process that provides clear instructions

for end users and allows them to personalize services as required.

- To support a virtual repository of data sources required by medical processes, including meta-data, declarative rules, and procedural knowledge about medical services categories.

Generally citizens and businesses will profit from more accessible public services.

The following concrete *benefits* will be achieved:

- Improved public medical services for citizens and businesses (free for service patients, medical clients or companies with benefit plans, medical employees).
- Easier access to cross-border services and therefore a closer European Union that offers unified services for its citizens, no matter the location, language or social status.
- Improved quality communication, through an integrated system for all user types: medical employees, patients, companies as medical clients.
- Increase in productivity by a reduced red tape.

## 2. Lifecycle Stages

To accomplish these challenging objectives, Health System researches advances in business process and Web service technologies. Virtual repositories provide data abstraction, and a security service framework ensures adequate levels of data protection and information security. Multi-channel interfaces allow users easy access using their preferred interface. Based on the project goals, research is being conducted in seven *main directions*:

- Design - Scenarios and Requirement Analysis
- Modeling and Architecture
- Process Execution and Web Services
- Virtual Repository Management
- Security Framework and Qualified Signature
- Process Monitoring and Process Optimization

### 2.1. Requirement Analysis

The main objective of the project is to deliver a set of tools which both enable and facilitate the construction of an application which integrates various medical IT systems built locally by public administration bodies at the European level. The major constraints for this kind of solutions have been stated in the document on European Interoperability Framework - EIF for pan-European eGovernment Services - PEGS. EIF emphasizes several principles: accessibility, multilingualism, security, privacy, etc. all of which need to be considered during development of any supranational solution.

To sum up, the *state of the art* consists of:

- interoperability constraints – heterogeneous applications behave as an integrated system;
- requirements – potential areas of interest for PEGS (with regard to requested functionality) based on various published survey reports;
- existing technology – the latest technology platforms;
- legal issues – personal data protection, handling of sensitive data.

### 2.2. BPM Architecture

As the project is situated at the European level, the main technical requirements are scalability and modularity (as the European community can grow, any new European country may be able to join the bus without changing the system's architecture), non-intrusive access to data. The use of existing or slightly modified standards is another requirement. The functional requirement is to allow any European citizen to access the public medical services no matter his localization or language. Since the system will potentially be processing private data, an implied requirement is that the whole process must be entirely secure.

### 2.3 Web Services

Business Process Management - BPM support, Service Level Agreement - SLA enforcement, asynchronous behavior of the Web services are provided by combining various Web services additional standards. The implementation of a Service Oriented Architecture - SOA ensures business orientation according to a distributed computing paradigm.

There are four *possible scenarios* for accessing services based on existing e-Medical services:

- Direct service access for services which don't need to be enhanced.
- Direct service access via enhancements for existing Web services which are compliant.
- Access to services via Web services relay that encapsulate existing Web services which are not compliant.
- Access to services via a service abstraction layer which exposes legacy application functionality as compliant Web services.

### 2.4. Virtual Repository Management

Technically, a virtual repository is a mechanism that supports transparent access to distributed, heterogeneous, fragmented and redundant resources. There are many forms of transparency, in particular location, concurrency, implementation, scaling, fragmentation, heterogeneity, replication, indexing, security, connecting/ disconnecting and failure

transparency. Due to transparency implemented on the middleware level, some complex features of a distributed and heterogeneous data/service environment do not need to be included in the code of client applications. Moreover, a virtual repository supplies relevant data in the volume and shape tailored to the particular use. Thus a virtual repository much amplifies the application programmers' productivity and greatly supports flexibility, maintainability and security of software. A central part of the architecture consists of ODRA (Object Database for Rapid Application development), an object-oriented DBMS (DataBase Management System). Existing resources are extended by wrappers and contributory views (or importers/exporters) that convert data/services proprietary to particular existing applications into the format acceptable for ODRA. The application developers can install as many ODRA servers as necessary, addressing the same distributed sources. The integration view on an ODRA server allows for the virtual integration of data and services supplied by distributed sources, supporting many of the transparencies mentioned above.

### 2.5. Security Framework

In order to develop solutions that are capable of seamlessly incorporating national, legacy identification and authentication solutions, which includes national ID cards, qualified electronic signatures or new approaches, such as Microsoft Cardspace, the system's services rely on standard Web service security mechanisms. This mechanisms are: the OASIS standard specifications Web Service Security, SOAP Message Security (WS-Security) and the Security Assertion Markup Language - SAML, modular security services, implemented as SOAP/WSDL based Web services, which provide qualified signatures, encryption, authentication, secure timestamps or secure auditing.

### 2.6. Process monitoring and optimization

Process monitoring and process optimization phases will begin as lifecycles once the system enters its production state through soft-

ware implementation, functional testing and usage by the targeted actors. Following the stages as described, the development process will become an iterative one, being analyzed, reconsidered and designed as a result of its performance and productivity. Users are active participants to these stages of the process, contributing to the future evolution of the system, once given to usage.

### 3. Conclusions

As European medical services are very heterogeneous and healthcare enterprises disconnected, the architecture proposed by this paper comes as a lien between medical system's actors: individual patients, business clients and medical employees in the context of their affiliated medical institutions. The combination of information technologies and concepts such as Web Services, Service Oriented Architecture, Business Process Architecture, in the way presented, leads to the integration of all those services in order to provide European citizens with easier and efficient access to a unified healthcare system, no matter the position from which they use system's services. The healthcare information system is meant to support the clinical and administrative information management needs of the various stockholders in today's world of contracted healthcare services – from insurer to provider organization, from patient to clinician. The solution intends to be a multinational complete suite for healthcare planning and service delivery management, situated at the European level.

### References

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