SIDEV: towards a service based architecture

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Riassunto

Il progetto del Sistema Informativo dell'Edilizia Veneziana (SIDEV) è il risultato dell'individuazione dei requisiti funzionali, l'analisi dei materiali e delle interazioni tra utenti e sistema. Nei precedenti rapporti si era confermata la convenienza di concepire il SIDEV come un'architettura basata su servizi. Ovvero, un'architettura che permetta di gestire un'attività di ricerca costruita nel tempo da diversi gruppi di lavoro distribuiti territorialmente. Il SIDEV, pur facendo uso di dati geografici, prevede che i gruppi di lavoro inseriscano i dati testuale e descrittivi sugli edifici raccolti nell'ambito della ricerca attraverso un sistema basato sul web. Per le cartografie si è progettato di non replicare alcuna informazione e basarsi su concetti collaudati di erogazione di servizi mappali, usando gli standard del OpenGisConsortium (OGC) WMT e OWS. I vantaggi per CORILA dell'approccio basato su servizi riguardano l'economicità della manutenzione delle basi cartografiche, che invece di essere duplicate, corrette, modificate in ogni luogo, vengono semplicemente usate dalle varie applicazioni a fronte di arricchimenti tematici derivanti dalle attività di ricerca. Quindi le applicazioni non vanno più pensate come sistemi monolitici sviluppati e consegnati in pacchetti onnicomprensivi di dati geografici, allegati e cartografie. SIDEV si appoggia pesantemente su questo modello di architettura in modo da consentire un'elevata scalabilità delle applicazioni e garantire gli esiti migliori alle attività di ricerca.

Abstract

The project of Sistema Informativo dell'Edilizia Veneziana (SIDEV) is the result of the functional analysis of the system, analysis of the materials and interactions between users and the system itself. In our previous reports we confirmed the convenience of planning SIDEV as a service based architecture. That is, an architecture that would allow managing a research activity built over a wide time span and by working groups spread over the territory. Even if SIDEV makes use of geographical data, working groups are asked to insert the descriptive textual data about buildings found during the research activities through a web based interface. SIDEV will not replicate any information that is already available for CORILA, instead it will be based on proven concepts of mapping services, using OpenGisConsortium blessed standards like WMT and OWS. The service based approach for CORILA will guarantee convenient and effective management of cartographic base: instead of duplicating, correcting, modifying maps in each application, these will be simply used by the applications and will be enriched with thematic improvements by all research

activities. The applications will not be designed as monolithic systems, developed and delivered as packages that contain all data, including descriptive textual data, other attachments and cartography. SIDEV is deeply based on this model of architecture that allows a high scalability of applications and best results for the research.

1 Introduction

One of the most important aspect of an effective information system is its capability to allow mutual collaboration of groups of users from different disciplines and their easy sharing of knowledge. An effective information system allows modeling and representing the complexity of real life problems, issues, aspects in a complete multidisciplinary approach. Architectures reside in a natural environment where disciplines like biology, geology, structural engineering and other aspects insist simultaneously therefore information systems must allow scientists not only to gather all information of their own field of interest, but to analyze the more complex relations happening in real life. In practice, it should be possible to ask to the information systems questions like "Is there a connection between tides, average temperatures of the air and degradation of plaster in historical buildings?"

Very often it is possible to gather raw data about many physical aspects of nature because many agencies and companies, public and private, collect them. Possibly this data is also available easily and cheaply, although more often this is not the case. But it is still rare to have access to information in a timely and interoperable form. Interoperability allows to create an open system, from which a variety of data sources can be added on-the-fly from different data providers, displaying new relations between observed phenomena, independently from observation scale.

2 Levels of information: territory, city, insula, building

The design of the SIDEV (Information System for Diagnostic of Venetian Buildings) keeps as a requisite allowing multiple sources of data to be consulted and added. The system allows analisys and representation of data at two scales: from the wider territory to the single building, meanwhile scaling the quantity of information allowed. These levels of detail are complimentary since they allow managing the knowledge in two different directions: from the synthesis (or aggregation) to the analytic datum and viceversa, depending on the level of competence and of intervention. This aspect is the foundation layer for the definition of research criteria of the information system. Aggregation and disaggregation of data depending on the competence level and of intervention is coherently applied to both spatial/geographic data and alphanumeric attributes.

2.1 Level of Territory and Lagoon

For SIDEV the territorial level is basically the one that includes the Lagoon of Venice: all information levels are pertaining to the environmental characteristics of the wider scale. The sources of data for this level are mainly identified in the

Environmental database of Venice Lagoon and Environmental data of CORILA consortium. From these data providers SIDEV can gather information about atmosphere, idrosphere, litosphere and biosphere. Another significant source of information come from the results of other work packages of the CORILA research.

2.2 *Level of city, insula, building*

The local level should be distinguished into three distinct sub-levels that will determine the visual aggregation of different data sets: urban, insula and building. The distinction is only used for visualization purposes, because the database doesn't separate the information in any way: all the built environment is treated as a continuum. So, for the database a building is a kind of atom of the city and atoms can be mixed to form molecules (like the insulae) and bigger parts. The database of the built environment is modeled to allow also describe other architectures, like bridges or gardens, and empty spaces like squares.

Urban level: this is the reference level and shows the data necessary for the definition of the environmental contest and urban morfology of Venice, that is the elements that concur to the assessment of the 'artifact' Venice.

Insula level: this level participates to the pre-projectual investigation phase and can give significant contributes to deepen the knowledge on the single artifact. This knowledge helps representing the context and it is very useful to interpret phenomena of degradation and damage that are significant also on urban level. For example, the proximity of other buildings or of waters are elements that request a wider view of the surroundings and they represent rulers for more profound analysis of the building level.

Building level: the conservation's project refers to this level for the specific knowledge of the building. The building can be described in two ways, either the synthesis or the details. The building can be represented as synthesis of its qualitative and quantitative characters, coherently with the level of detail represented. In details, the same data regarding the building are useful for the conservation's project, particularly for the diagnostics. The building is dissected into all its components and the results of the analysis are displayed in all details, together with the precise localization with respect to the elements of the building.

The identification and localization of the building must be semantically coherent with the rest of CORILA databases, so that the different data sources can be effectively mixed. This is one of the levels of interoperability that will also be discussed later.

3 User requirements and use cases

The Unified Modeling Language (UML) has been used to describe the user requirements of the information system, the use case scenario and the structure of the database for the actual work packages. UML has proved an extremely powerful and useful mean to describe with graphical formalisms the complex behaviors of system and of the users. Through the use cases, based on a

description of actions both in text and standardized graphics, it is possible to describe the interactions between the components of the system. To describe the conceptual structure of the database a diagram of classes has been used. The main requirements are organized in three areas:

A. Data entry

Data entry to be done via a web-based user interface

Description of the characteristics of the user interface

B. Data consultation or query

Basic research criteria

Characteristics of user interface and levels of consultation of the system

Scalability of information

Management of documents for analysis as attachments

Consultation of project guidelines, proceedings, norms, specifications

Consultation of metadata

Connection to the expert system VMDS

C. Data visualization

Bilingual user interface (Italian and English)

Different levels of consultation of the system

Visualization of buildings

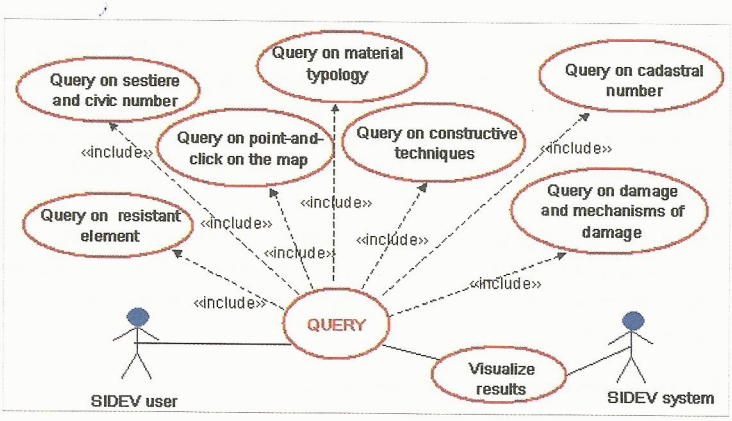

Fig. 1 – Use case about data entry on web.

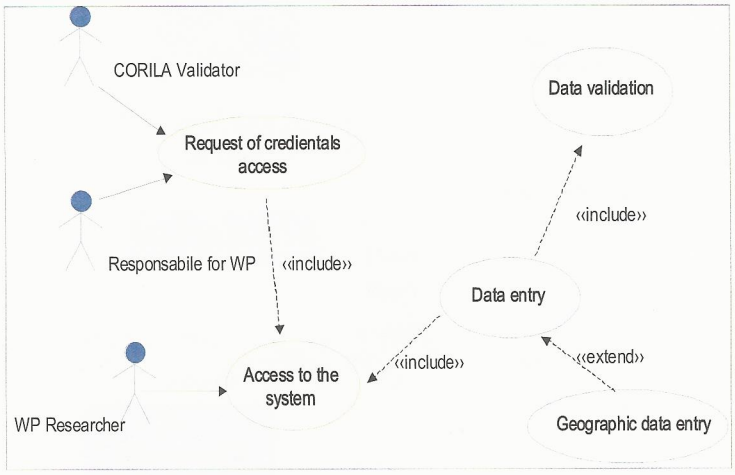

Fig. 2 – Use case about query criterias

4 Interoperability and 'service based architecture'

The term 'standard' has many different meanings but in the technology field a standard is "a set of specifications, that is a set of constraints and requirements that identify globally the external behavior of a product or of a service. External behavior implies that the implementation of the standard is irrelevant so far it adheres to the specifications". For example, the GSM standard for mobile phones is implemented by all manufacturers of telephones and all network operators and as a result all phones can communicate with all the networks, interoperably.

Interoperability means the ability of Information and Communication Technology systems and of business processes to exchange data and allow sharing of information and knowledge.

Open standards are of extreme importance for SIDEV and in general for all information systems since they allow that information is transported safely and integrally across applications. The standards set by the Open Geospatial Consortium (OGC) and other international bodies (ISO, W3C ecc) allow for transportation of information but in multidisciplinary environments there is more to it than that to keep into consideration.

The semantics of the data is paramount to share descriptions of buildings in a meaningful way between different working groups. The definition of a set of common words and their meaning, thesaurus is the only way to achieve real interoperability between systems and start developing a 'service based system'. The concepts behind SIDEV allow to enter the data only once and use that information often, without having to make copies of it in different applications: using open standards it is possible to take the cartographic layer of the territory from one source, take the city layer from another, then import from different sources also atmospheric data and combine them into one application, together with the data coming from other CORILA researches.

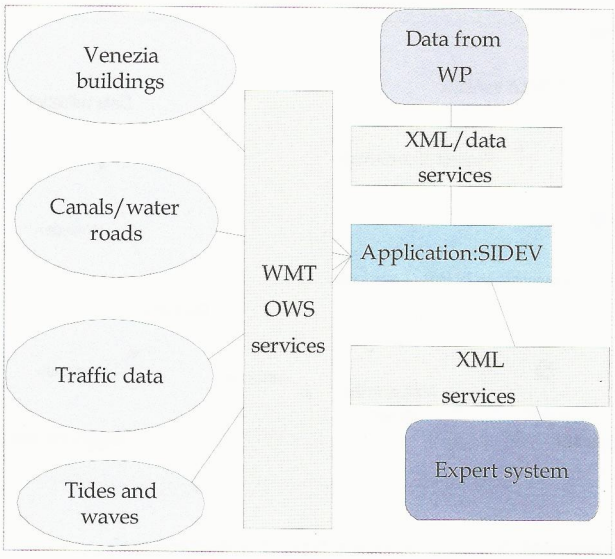

Fig. 3 – Schema for distribution of information and applications between services in SIDEV

Conclusions

An approach to designing information systems that allows flexibility and expandability, with data thought as building blocks glued together by international standards will lead to an architecture that would allow managing a research activity built over a wide time span and by working groups geographically spread. SIDEV is designed not to replicate any information that is already available for CORILA, instead it is based based on proven mapping services, using standards set by Open Geospatial Consortium, like WMS and WFS. The service based approach guarantees convenient and effective management of cartographic base: instead of duplicating, correcting, modifying maps in each application, these will be simply used as served centrally and will be enriched locally with thematisms by all research groups, as needed. The applications are not designed as monolithic systems, developed and delivered as closed packages that contain all data, including descriptive textual data, other attachments and cartography. SIDEV is deeply based on this model of architecture that allows a high scalability of applications and best results for the researches.