WIN:  
A New Service Oriented Architecture for Risk Management

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Abstract  [WIN: a new Service Oriented Architecture for risk management]

The Wide Information Network (WIN) Integrated Project (EU FP6 Call 2 DG IST) has started in September 2004 and will end by end of 2007. The project integrates existing reference results and initiatives to contribute to the design, the development, and the validation of a scalable solution contributing to the future Single Information Space for Environment and risk management in Europe (SISEE), Information space where environmental institutions and services providers, irrespective of size or location, can do business or simply collaborate with no technical restraints. The solution proposed by WIN is based on a Service Oriented Architecture (SOA), the strong advantage of this kind of architecture is to allow to build information systems enabling the creation of applications by combining loosely coupled and interoperable services without the knowledge of the underlying systems. A maximal interoperability is guaranteed by WIN compliance with main current and emerging standards. The solution includes a set of generic services, standard data modelling components which facilitate the deployment on various thematic cases. The project has successfully passed the second annual review, focused on the service oriented architecture. The last year of WIN project will be focused on validation, experimentation, evaluation and preparation of the deployment of the solution, in several thematic.

1. Objectives of the project

The general requirements put in priority in the design of WIN architecture are fully in line with DG INFSO main guidelines on future architecture of systems:

- Maximal interoperability to inter-operate data, services, and environment or risk management actors;
- Easy access to various sources of data, connection with existing data sources to reuse existing information spaces;
- No constraint on the localization of the data themselves, data being hosted at the favorite location in line with the applicable practices and rules;
- Generic solution and potential deployment for environmental or risk management applications;
- Reuse of standards ensuring the compatibility with other developments and enabling an easy integration with existing systems;
- Modularity of the solution which can be deployed on one or several computing nodes;
- Low cost solution and very light Client configuration offering an easy-to-use access for both SMEs and institutions;
- Support of business processes to model and execute real world business processes and enable service chaining.

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2. Main issues covered by WIN project

WIN project covers in particular the following issues:

- The definition of a data/information model valid for risk management issues relevant to Europe and in line with European geo-information standards (INSPIRE);
- The design of the Info-structure optimised in terms of use of state-of-the-art information technologies and high capability to inter-operate data, services, and risk management actors;
- The development of a basic set of generic core services that can be deployed to cover major needs of various actors, whatever the specific thematic field;
- The investigation of multiple stakeholder business and organisational models;
- The evaluation of WIN added value through real life experimentation scenarios;
- The definition of the info-structure deployment roadmap.

3. Interoperability as the main driver if WIN solution

WIN high interoperability directly results from the compliance of WIN architecture with existing and emerging standards and the collaboration established with several other European projects. This high interoperability allows building a variety of powerful solutions based on cooperative systems for environment or risks management, using WIN as a core of the solution.

Using user requirements specifications, the data modelling work has produced a data model specification and developed consistent and generic risk data models. Special attention has been put on the interoperability with data models produced by complementary projects - such as ESA HMA (Heterogeneous Missions Accessibility); EC ORCHESTRA and EC MOTIVE/RISE – via the use of standards from standard bodies such as W3C, ISO, OGC and OASIS.

Main objectives of WIN data modelling have been:

- To assure interoperability of the created data models;
- To use standards wherever possible and to limit developments to strict specific features;
- To deal with complexity of data models;
- To combine generic and specific elements of the data model;
- To produce data models that allows easy exchange of datasets.

The WIN Data Models cover management of important objects that play a role in Crisis / Risk management – like identification of all types of Actors, Ordering of data and services, performing Cross Checks, managing crisis alerts, follow-up particular crisis events (like oil spill or fire) and description of particularities of a type of disaster (like oil spill or fire).

The WIN Metadata Model is based by large on existing standards (such as Dublin Core, GML and ISO19115) - and includes some additional specifications for WIN. All this metadata is managed in the same way by using the ebRIM standard, which can express any type of metadata and – on top of that – make valuable associations between metadata. This allows very powerful querying and managing of metadata.

The WIN Data models are implemented via the Data Web Service component, the metadata via an ebXML Registry tool. Both components/tools are using SOAP/WSDL type of Web Services, which is the standard. This allows standard-based connections to other tools like for Workflow management –based on BPEL standard.

The top layer is an Adaptation layer. Via adaptation it is possible to convert, on a case by case basis, the Data Web Services and ebRIM interfaces to another interface.
Basically, the user requirements underlines the need of an information system providing:
- Easy access to reference data managed by the different actors at European, National and Local level;
- Easy access to historical data collected during past disasters to benefit of lessons learned;
- Supports to establish the relationships between users and providers;
- Interfaces with service providers acting in domains of interest such as oil spill monitoring, detection, drift forecast services, rapid mapping services, etc … ;
- Tools to facilitate information exchange between actors including dissemination means, collaborative applications, multi-linguality to overcome the language barrier etc…;
- Tools for efficient decision process;
- Communication means with scaleable QoS according to the risk phase;
- Support and training.

According to these needs, WIN has been designed as a backbone data infrastructure offering a set of generic services and interfacing Services & Products providers, Data providers, End users and other stakeholders for risk management purpose.

In short, WIN generic services can be classified into 4 functional groups:
- User management (registration, profile information, authentication & authorisation);
- Data/Products/Service access (registration, catalogue, ordering, exploration of external standardized catalogues);
- Support tools (Object viewers & GIS, Multi-lingual glossary, Alert Services, Crisis Event follow-up, Reflex cards, Directory of contact, Collaborative working tool);
- Administration (data handling & dissemination, workflow management, system monitoring, data storage, backup, traceability, help desk).

All these generic services are accessible to the users through a Web Portal.

4. A Service Oriented Architecture

Since the WIN infrastructure is to interoperate in a context of cooperative systems, the Service oriented architecture (SOA) is most appropriate type of design methodology to be followed. SOA represents a style of architecture, primarily for application development, that is typically multi-tier and based on the principle of dividing business processes into a series of subunits or services. The services can then be assembled and linked together to perform a desired application. The services are defined at a level above that of the traditional view of components.

As a consequence, this approach allows the definition of system architectures having the following characteristics:
- Stateless services, ensuring re-usability, since they are designed to be used in any context,
- Interoperable services, ensuring, of course, interoperability, since they are defined and realized according to market standards (XML, XSDL, WSDL, SOAP…) in order to interact in a ‘plug and play’ mode, both internally and externally,
- Loosely coupled services, enabling an optimum flexibility.

To sum up, WIN solution includes in particular:
- An open architecture and info-structure based on ISO, OGC, OASIS, W3C standards;
- A set of generic services like catalogue of data and services and GIS allowing an easy access and powerful combination of various sources of information;
A generic registration capability which provides a very efficient way to extend the information system by “plug and play” of various external services in relation with the thematic domains;
A work flow management, allowing to support domain practices by design and execution of most frequently activities work flows;
A set of data/information models corresponding to generic and specific requirements for WIN experimentations (generic, oil spill, fires and floods models), this set being easily extendable in relation with new target application.

Apart from its high interoperability, other advantages of this solution are:
- a cost-effective deployment consequence of the maximal use of open source components in the infrastructure implementation and, basically, no specific needs on client side;
- the architecture can be deployed at several levels (geographical levels or thematic domains), and a level can be considered as a data/service provider for another level.

5. **WIN experimentation and deployment**

Two domains of experimentations are defined:
- Marine and Coastal domain with experimentations related to oil-spill monitoring and response process, in relation with Maricoast GSE project and several users and service providers in France, Spain, Italy, and Greece
- Land risk management domain, with experimentations on fire and floods disaster management in relation with French and other countries Civil protections.

WIN deployment roadmap includes several opportunities at European and regional level, on several thematic like shoreline monitoring, various land-based risks management and environment management domains. According to the needs, various deployment of WIN can be performed.

Two typical models are presented hereafter:
- WIN can be deployed using a “Internet-based” model where all actors involved on a given thematic field can find easily the relevant data and information they need, the WIN infrastructure acting like a “broker” between the providers and the users (data and services consumers), helping the users to perform their activity in various phases of risk management cycle, and providing data/service providers with a wider “audience”.
- WIN can also be deployed on a “case-by case” model, after a customisation phase helping to adjust the model to specific practices; in particular the customisation allows to design the different work flows to support specific processes, to extend the data/information models needed in a given thematic domain, or to integrate complementary tools or services like decision-support or response management services.

WIN project has defined an open architecture to support risk management process and more generally environment management processes. A first implementation has been performed through a core set of generic services.
The compliance with current and emerging standards is the guarantee of the sustainability of the solution, and of its interoperability with other standard-compliant systems.
The added value of the solution is being demonstrated in relation with several kind of actors on two thematic (oil spill, fires).
WIN results constitute a major contribution to the future Single Information Space for Environment in Europe.