Integrated Geo-Metadata Management in the Federal State of the Saarland and its Municipalities

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Abstract: The design and implementation of a Metadata-Information System for geospatial data and services has to be done under the Inspire Directive by the public authorities. In the Federal State of the Saarland (Germany), the metadata management is done by the federal government and the municipalities within a common approach, regarding the metadata management but also regarding the information system. Metadata are essential in retrieving information located at differently distributed organisational units of governmental administration. The population of the meta-information system may be done based either on a centralised concept (e.g. with support of external interviewers) or on a non-centralised concept requiring a software tool accessible at each desktop computer where the dataholder can enter the data directly. Often the implementation of such a tool is linked with a high effort in installation and training, especially if dozends of clients have to be served. To overcome these disadvantages, a combined centralized / non-centralised metadata maintenance concept was developed within the project described.

Keywords: Inspire Directive, Metadata Information System, Municipalities, Geospatial Data and Services

1. Introduction

The implementation of the INSPIRE-Directive triggers a lot of challenges for the administration of public authorities. They should make geospatial information available which is held by or for them and disseminate them in a systematic way to the public by means of information technology. In particular, this means that public authorities at local and regional level have to ensure that geospatial information becomes available in electronic databases which are easily accessible to the public through the internet. According to the different thematic aspects underlined at the three annexes of the directive, action has to be taken on a national, federal, but also on a municipal administrative level.

In the Federal State of the Saarland (SW-Germany), the implementation of the INSPIRE Directive is planned as a joint project of the actors on the federal and on the municipal administrative level with the benefit of a wise use of financial and personal resources, but also in sharing expertise and experience. Responsible at the federal level is the land survey agency (LKVK), responsible at the municipal level is the Intermunicipal Organization for eGovernment (Zweckverband eGO-Saar). Both are supported by the Institute for Software Systems (ISS) at the University of Applied Sciences Trier.

Starting with the design of a common Metadata – Information System, the organisational and technical framework for the implementation of the INSPIRE directive is analysed, resulting in a concept for the collection and maintenance of metadata, describing the geospatial information according to the metadata implementation rules of the directive.

The following paragraphs will introduce into the motivation for the system development but also into the system architecture and the metadata collection process.

2. Implementation of the INSPIRE Directive in the Federal State of the Saarland – Key Actors

According to the Directive 2007/2/EC on establishing an Infrastructure for Spatial Information in the European Community [1], public authorities should make geospatial information available which is held by or for them and disseminate them in a systematic way to the public by means of information technology. In particular, this means that the different public authorities at local and regional level have to ensure that geospatial information becomes available in electronic databases which are easily accessible to the public through the internet. Fig. 1 outlines the administrative structure of the Federal Republic of Germany.
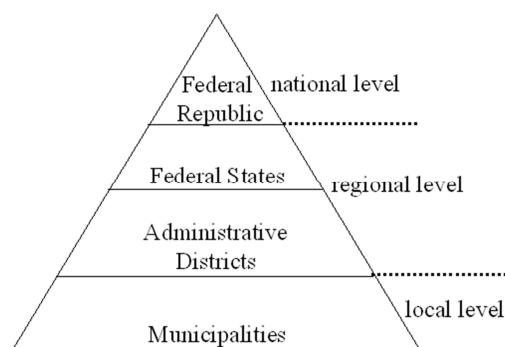

Figure 1: Administrative Structure of the Federal Republic of Germany

Figure 1 illustrates the complexity and the effort that is necessary to implement the Directive. Some of the Problems are:

- Information is held redundant (local and regional level)
- Different classification systems are used for classifying the environmental and geospatial information.
- Available information at the local Levels is very heterogeneous

To solve all this problems, the responsible actors at the different administrative units have to collaborate to come to a proper working INSPIRE environment on a national- and finally on the european level. As mentioned above, the key actors and responsible organisations for the implementation in the federal state of the Saarland are the land survey agency (LKVK) responsible at the State level, and the Intermunicipal Organization for eGovernment (eGO-Saar), responsible at the municipal level. Both geodata providing organisations started a common effort to implement the Inspire directive in the Federal State of the Saarland, sharing expertise and experience.

The Land Survey agency of the Federal State of the Saarland (LKVK) was established on 01.01.1998 as a subordinate department of the Ministry of Environment, Energy and Transport of the Saarland (MUEV). The LKVK is responsible for providing the relevant land registry and geotopographic basis for all spatial planning and documentation in the Federal State of the Saarland.

The office is divided into four devisions: geodesy, geotopography, cartography and cadastre. The staff unit `Spatial Data Centre` is responsible for the provision of the spatial thematic data of the MUEV such as soil maps, geological maps or protected areas and the implementation of the INSPIRE Directive. Currently about 315 staff are employed.

Zweckverband eGo-Saar was set up in 2004 with the objective of developing and harnessing e-government technologies and solutions for the towns, local authorities and associations of local authorities in Saarland, thereby facilitating access to and contact with administrative services for the citizens, companies and industry, regardless of whether such services are rendered by the Land government or the local authorities.

The members of the Association are all towns and local authorities in Saarland as well as associations of local government bodies.

Zweckverband eGo-Saar has set itself the task of streamlining internal administrative and decision processes and improving the quality of the services provided by the local governments for the citizens, companies and industry, in order to lend a greater degree of transparency to the administrative actions of the municipal authorities and to reduce costs at the same time.

This is currently being implemented on the basis of so-called e-government components, i.e. via virtual, digital channels. The portal "www.buergerdienste-saar.de" created in partnership with the Land government, in which information on authorities and administrative services is pooled and forms as well as electronic services are provided, enables the citizens as well as representatives of industry to contact the agency of public administration in charge of their respective concerns and requests without having to know if the Land government, the county authority or a local government body is responsible.

Moreover, as a service provider for local governments, eGo-Saar provides the basic infrastructure, network and data processing services in order to modernise administrative processes in sustained fashion. eGo-Saar also solves similar problems for its members in the form of projects; the solution developed in this way is offered to the local government bodies as a service.

3.   A Meta-Information-System for Geospatial Data

"Directive 2007/2/EC lays down general rules for the establishment of the Infrastructure for Spatial Information in the European Community. Since, for the proper functioning of that infrastructure, it is necessary for a user to be able to find spatial data sets and services and to establish whether they may be used and for what purpose, Member States should provide descriptions in the form of metadata for those spatial data sets and services.

Since such metadata should be compatible and usable in a Community and transboundary context, it is necessary to lay down rules concerning the metadata used to describe the spatial data sets and services corresponding to the themes listed in Annexes I, II and III to Directive 2007/2/EC" [2].

Within this description, one key requirement to a meta-information-system (MIS) is, to bring together the provider and the user of geospatial data. It is providing its users with information about the following data:

WHO is having WHICH information at WHAT place ?

In principle, a MIS is built around three actors: the data providers, the users of the geospatial data and the software system as the technical base for the data collection and retrieval (see figure 2). The benefits of the collection and the dissemination of metadata to geospatial data and services are discussed manifold.
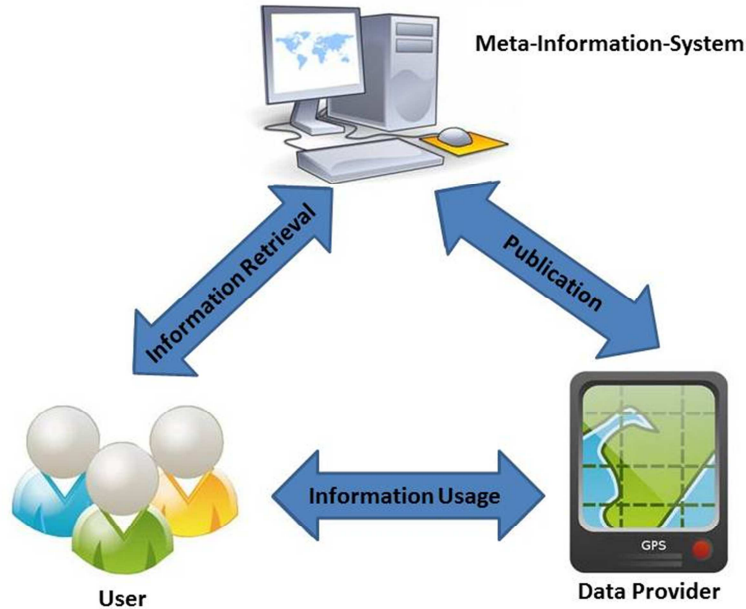

Figure 2: Meta-Information-Systems: Key Actors and Information Flow

Essential in implementing and maintaining such a meta-IS is the data entering process and the data quality control. We have to face the fact that there exists a huge number of data providers located at different distributed organisational units.

Another gap is periodical data collection and updating. Both points are outlined in the user requirements for the system: The data collection tool should be made available without any further installation effort and it should be a load-and-go solution, easy to use.

3.1 Meta Data Maintenance

In general, different strategies were discussed for collecting meta data held by different units of a public authority. If there are no tools available for generating meta data automatically, different authors [e.g. 3] propose to establish small teams for collecting meta data based on interviews and a database description in a first step. In a second step, the data holders will have access to the data catalogue with the meta data collected. They are able to maintain the meta data records.

In general, from an organisational and technical point of view we have to separate the two following situations: On the one hand, there is the initial data entering process for the very first population of the catalogue. On the other hand, we have the situation of updating and maintaining the database during its operational use [4]. The initial data capture could be done by external interviewers to speed up the collection process.

In the field of operational updating (insertion, modification and deletion of metadata objects), there are actually two different concepts implemented; namely, centralised and non-centralised maintenance:

3.1.1 Centralised Maintenance

Central entering of the data is performed by a manual transfer of the information to the central unit. The geospatial information is made available by the data generating units which have stored the data as analogue or digital text-file. The data collection process is done periodically with a defined frequency of e.g. three months. The centre with the system administrator or an other staff member is responsible for quality control and the transfer of the information into the central catalogue.

An optimisation of this procedure is reached within the project described by the use of PDF-templates instead of analogue documents. The use of a well known system (e.g. MS-Word or Adobe PDF) for data entering which requires no training and additional software installation is the big advantage of this concept. Within our project, we introduced pre-configured PDF-templates for the collection of large numbers of meta-data sets, to avoid redundant information capturing (e.g. contact information, keywords). Especially at the municipal level and it´s strong concernment regarding the themes from the INSPIRE annex III (e.g. soil, land use, utility and governmental services) we expect a significant step forward regarding the cost and time efficiency within the metadata collection process.

3.1.2 Non-Centralised Maintenance

Within the non-centralised maintenance process, the local expert enters the data, he/she or a responsible officer will do the quality check, and, with the next step, he/she will finally write the new or updated information into the central web-based catalogue.

No breaks in the media used and, in addition, the location of the data quality control at the generating units are some of the advantages of that concept. Further benefits of distributed population and updating are given through the following points:

- responsibility in quality control is with the data generating units.
- near-real time update of the information.

There is much more geospatial-related competence within the data generating units compared to the catalogue centre. Therefore, the quality control is more efficient compared to the centralised solution.

3.1.3 Solution Proposed

In order to optimize the metadata collection and maintenance process, we proposed and introduced a combined strategy: In dependence of the number of the metadata-sets to be described, we developed a PDF-based solution and a centralized integration of the data into the catalogue (e.g. land development plan, land use planning). On the other hand, the description of single data sets (means themes with only one data entry per administrative unit, e.g. sewage drain cadastre, nature protection areas), the metadata management is done on a decentralized way by an interactive use of the InGrid catalogue editor.

An evaluation of the solution proposed can be summarised as follows:

- No additional software has to be installed at desktop computers.

- No manual effort for transforming the metadata items into the central catalogue.
- Consequently, there is only a minimal additional effort for the system administrators.
- Users are familiar with the PDF template.
- The PDF-form offers a lot of explanatory messages and data checks in order to support the user.
- A simple workflow application automates and controls the data maintenance process.
- Functionality is limited to the requirements of casual users.
- Responsibility in quality control is with the data generating units.

Due to these facts we assume, that most of the users will accept the combined solution proposed.

4. System Architecture

As technical framework for the implementation of the metadata system, some components of the Software InGRID are used (e.g. catalogue, metadata editor), customized with view to the requirements analysed at the different stakeholders. InGRID is the technological base of the PortalU (http://www.portalu.de), the Internet portal for the environmental information of Germany and its Federal States.

InGrid consists of several components:

- The portal web application for research and presentation
- A meta-data editor and database
- A map viewer
- Additional various extensions, e.g. interfaces for import and export.

InGrid uses only Open Source software which makes it completely redistributable without licensing issues.

All components use a central information broker, the iBus, which works as a distributing hub between search requests and data sources: It receives a search request by an interface, e.g. the portal, processes the request and delivers it to the attached data source modules called iPlugs. The iBus finally collects the results and delivers a composite result to the client.

iPlugs are interfaces to different data sources. In our case we use the DSC-iPlug (DSC = Data Source Client) to integrate the InGrid Catalog (IGC) database into the system. The SNS iPlug (SNS=Semantic Network Service, provides a huge collection of common environmental terms including geographic names) is used to support user interaction throughout the system with geo-thesaurus data, e.g. if you search for "Lurch", similar search terms like "Amphibien" are offered to help improve the search. The CSW iPlug (CSW = Web Catalog Service, a XML-based standard for catalog data exchange) is used to integrate search results from CSW standard compliant sources all over the internet.

The Open Search Interface allows others to use the MIS server as Open Search compliant data source themselves, for example in the upcoming PortalU Saarland, increasing sustainability.
The portal provides a user administration framework, the search interface and other portal functions like RSS-feeds, personal settings and others. It embeds a MapBender installation for map display and WMS (=Web Map Service, XML-based standard for map delivery) serving, which allows easy administration of provided WMS layers.
It also provides access to the InGrid Editor (IGE). The IGE is the user interface of an InGrid Catalog (IGC) database, the most important part of the metadata information system. IGC allows fully ISO 19115

and ISO 19119 compliant description and management of geographic data and services, necessary to be compliant with the INSPIRE requirements.
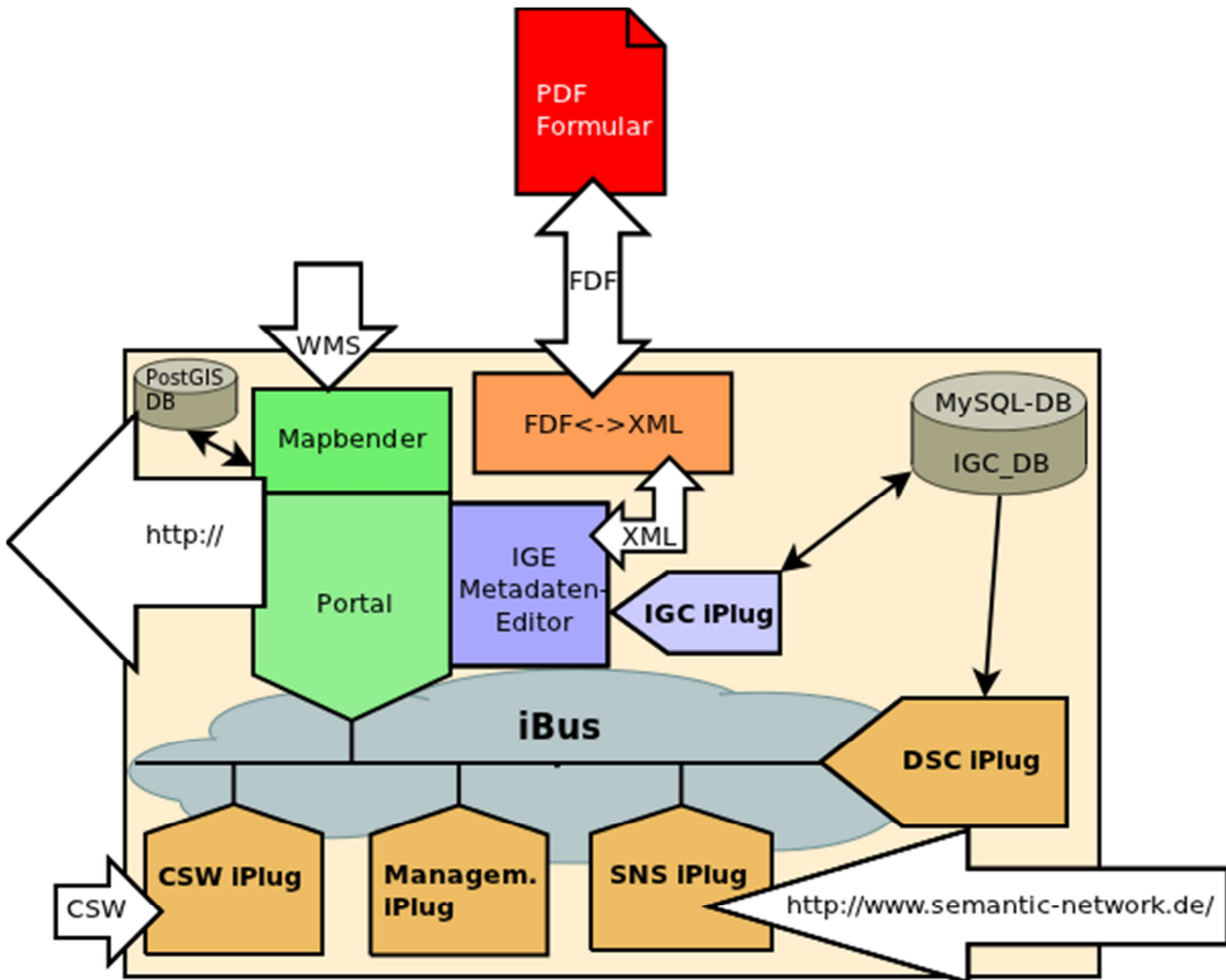

Fig. 3: Architecture of the metadata information system, based on the InGrid-Software of PortalU

To be able to import the geospatial metadata via the PDF-documents as described above, the XML interface was used directly and pre-configured for some selected themes of the Annex III of the INSPIRE directive.

5.   Data Quality Aspects

The data quality in information systems becomes more and more important [5]. The quality of data is usually described by multiple dimensions, e.g. accuracy, completeness, consistency, relevance, accessibility and timeliness.

The implementation of a system like the introduced meta information system can be divided in several phases. After the technical installation, a first data collection will be made. Already in this phase measurements to ensure data quality must be taken. The better the data quality is, the better the provided data

helps the user with their job completion (e.g. in retrieval, planning and decision processes). Besides the data itself, the representation of it is important, too.

Quality defects during initial data acquisition lead to a huge additional effort to resolve. Practical experience showed that essential quality standards can easily be fulfilled by help of guidelines for data collection. Hence, corresponding guidelines should be worked out before the beginning of the collection. Additionally it must be defined how the data will be rechecked and actualised continuously.

6.   Conclusions and Outlook

The design and implementation of the different software systems, necessary to fulfill the requirements defined by the INSPIRE directive, is a sophisticated process, not to be done en passant. Starting with the development of a meta data information system, the different stakeholders in the Federal State of the Saarland, put together their expertise and experience to solve the first step of the INSPIRE road map with a common solution.
Because of the large number of data providers located at different and distributed organizational units, and, in addition, because of the periodical collection and updating of the geospatial meta data, an easy-to-use data management solution is very important to motivate the data holders to describe their geospatial data and services. The solution proposed and developed is now implemented and fully operational. It is accessible under the following URI: *(http://www.saarland.de/geoportal.htm).*

In autumn 2011, the meta data collection of the themes listed in Annex III of the directive will start at the different administrative units. An evaluation regarding the user acceptance of the solution, but also regarding the usability of the meta data collection tools implemented, is planned.

7.   References

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