Spatial Information Management in the Context of SDI and e-Government – The German Approach

Dr. Jens RIECKEN, Germany

Key words: SDI, E-Government, SDI-initiatives.

SUMMARY

Realizing spatial information as a basic economic good, in Germany several initiatives from local to national started early to set up spatial data infrastructures based upon the relevant international norms and industrial standards.

In 2003, the federal and of regional governments (Länder), backed by national associations of local authorities, adopted a joint strategy called Deutschland-Online to intensify the co-operation in E-Government. One area of cooperation is the unit of "geoinformation, spatial data and spatial data infrastructure (SDI)". To push the development in different individual public agencies and administration levels, the Surveying and Mapping Agency of North-Rhine Westphalia has accepted the lead this unit.

Already in 1999, the German State North-Rhine Westphalia has established it's spatial data infrastructure ("GDI.NRW") as a joint initiative of State Agencies, municipalities, private companies and scientific institutes. About 140 participating institutions were involved in standardization, specification, implementation, testing, and marketing activities in a bottom-up approach. The benefits of a SDI was demonstrated by several test-beds and joint projects of a lot of partners which created an operational SDI kernel with more than 120 different services. Recently, these activities have led to local SDI clusters with own organizational structures. The next step will be to make use of these cluster experiences helping other local initiatives in developing their solutions.

The author wants to present several initiatives from local to federal in the context of spatial information management.

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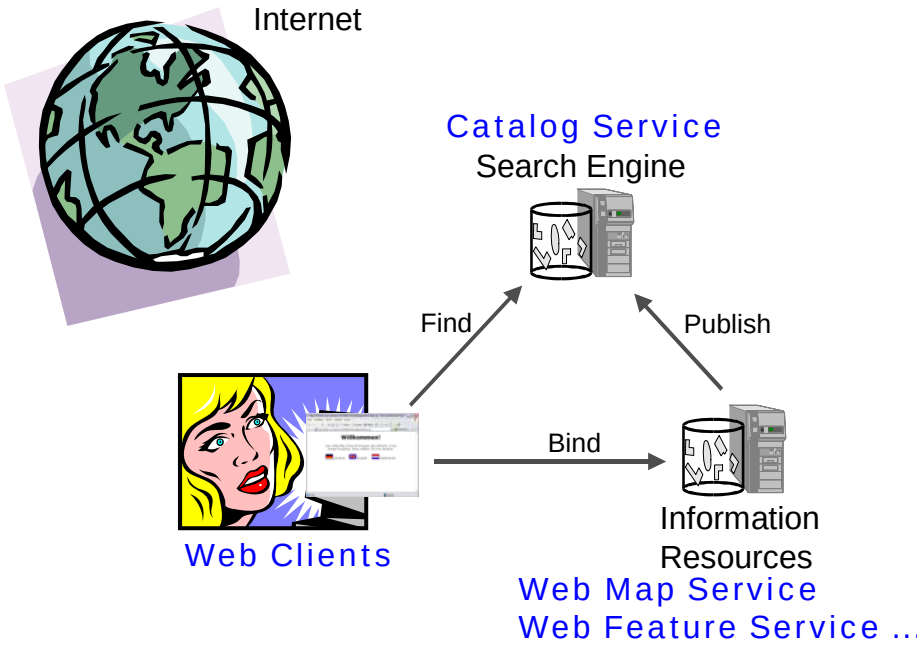
1. INTRODUCTION

Spatial Data Infrastructures (SDIs) are currently being set up from local, regional, nationwide, up to the European scale (INSPIRE) or even world wide (GSDI). From the point of information management these SDIs should brake existing barriers and enable the user to access reference data as well as thematic data. It is expected that establishing this access will enable domain-crossing, integrated views on a wealth of available content for the aim of better governance, improved business processes, and newly created added value by processing services chains yet unknown. On the other hand side SDIs provide the basic technical framework for E-Government.

SDIs typically build on Internet technology, which provides the ideal distributed environment for wide-spread integration and dissemination of spatial data. Data in an SDI has to be provided in a standardized interoperable manner. This means that an SDI has to provide spatially enabled web services, which can answer questions issued against the data and meta-information explaining the structure of data and service and which on the whole generate an infrastructure complying with the well-known publish-find-bind pattern.



Standards for the components of SDIs are widely available from the ISO 19100 series of International Standards, covering particularly the conceptual modeling side, as well as very

concrete implementation specifications from the Open Geospatial Consortium (OGC), which typically form the basis of SDI architectures.

1. SPATIAL DATA INFRASTRUCTURE ON THE REGIONAL LEVEL - GDI.NRW

Realizing geo-information as a basic economic good, North-Rhine Westphalia has begun to set up it's Geo-Data Infrastructure – the GDI.NRW. Oriented to international examples, this project is based upon the relevant international norms and industrial standards. It is intended to activate and stimulate the market for spatial data in NRW with the help of this initiative.
To guarantee an organized development of GDI.NRW, a permanent decision body has been appointed by the Minister President's office - the "GI-Committee NRW" (Committee for Geo-Information in North-Rhine Westphalia).
The goal of the GDI.NRW is to stimulate the geo-information market which is only at 15 percent of it's potential [3]. GDI.NRW will provide the users, including private industry, access to available public and private spatial datasets with the help of a homogenous infrastructure easily available through the internet [4]. In 2005, with the "Surveying and Mapping Law" (VermKAtG NRW 2005) legal regulations were revised in NRW in order to give the legal reference frame for GDI.NRW. In the setting up of this law the following goals were formulated:

- Reference data of cadastre and national mapping are the official public reference sources to be used by all state authorities.
- These reference data should be easily accessible to the general public and all possible user groups.
- The access to public data sets is only limited if defined privacy information (for example information about the names of the owners of property) is concerned.

In the beginning of the GDI.NRW developments several software projects have been co-financed by public money providing the basic components of an interoperable solution for the GDI.NRW, strictly following the available OGC standards and the agreed profiles for NRW. From the technical point of view in NRW interoperability is insured by the NRW reference model [5]. All participating institutions (state agencies, private GIS-companies, universities, GIS-users) have agreed on a common manifesto to apply uniform standards fixed in this reference model and based on international standards. First results were demonstrated from 2001 to 2003. The GDI.NRW development was supported by market studies giving recommendations for further activities to activate the geographic information market in NRW and Germany. Special attention was given to the development of fruitful public-private partnership solutions in this field.

Since the joint project ("Verbundprojekte") 2004 and 2005 the GDI.NRW development was self financed by the participating partners from industry, administration and science. It was the goal of these projects to develop the operational kernel of GDI.NRW, in terms of access to spatial data and related meta data via standardized web services [6]. The joint projects have been initialized with a call for participation (CFP). This call was open for all potential public and private contributors willing to fulfill technical and organizational requirements, especially:

- Services and applications have to be compliant with adopted GDI.NRW standards (profiles os OGC)
- Services and applications have to be accessible by a broad user community through the internet
- Nodes within the SDI-network have to collaborate to enable value chains (interoperability)
- Services and applications must be described by metadata

Today Spatial Data Infrastructure is accepted as the essential technique for Geo-E-Government, where Geo-E-Government defines the task of E-Government in the field of spatial information [7].

For the further development of GDI.NRW the so called "cluster approach" is used. This means that the strength of local initiatives will be supported ("strengthen the strength") to transform the results for the whole state. An already existing example is the local area of Bonn, where the city of Bonn and the counties of Siegburg and Ahrweiler work together on a local SDI. Due to the fact that the county of Ahrweiler belongs to the state of "Rheinland-Pfalz" south of NRW, these initiative is even an example for cross-border-cooperation inside of Germany. A first result is a local internet portal for the so called "Neighbourhood Bonn".

2. NATIONWIDE ACTIVITIES – GDI-DE AND DEUTSCHLAND-ONLINE

The NRW.GDI activities are integrated in nation-wide initiatives with the aim to generate a German Geographic Information Infrastructure (GDI-DE) as a common initiative of the German States, the municipalities and the federal government ("from local to nationwide").

With its decision 14/5323 of February 15, 2001, the German Bundestag requested the Federal Government to take political measures to expedite the building of a national spatial data infrastructure in Germany (GDI-DE) as a step towards a public infrastructure. Federal Government, states, and private initiatives are called upon, in trusting and close cooperation, to use and improve further for long-term effect those opportunities that are found in geo sciences and spatial information. A core component of the GDI-DE is the National Geo Database (NDGB), which consists of reference data (GBD), thematic data (GFD = Geo-Fachdaten), and their metadata (MD). With the help of the geo database, a geo information network together with services and standards, the GDI-DE can create the conditions required for the acquisition, analysis and application of geo information. This information is utilised by users and providers in public administration, in the commercial and non-commercial sector, in science and by citizens [8]. The structure of the GDI-DE is to follow a three stage process, co-ordinated by IMAGI, the inter-ministerial committee on geo-information of the federal government.

The development of the GDI-DE is a mirror image of the already described development of the GDI.NRW. In 2007 an architecture model will be published and in a consensus process several OGC based profiles have been accepted and will be accepted as GDI-DE standards by the participants as the technical framework of the GDI-DE [9].

In 2003, the federal and of regional governments (Länder), backed by national associations of local authorities, adopted a joint strategy called Deutschland-Online to intensify the co-operation in E-Government. One area of cooperation is the unit of "geoinformation, spatial data and spatial data infrastructure (SDI)". With respect to spatial information Deutschland-Online is focusing on E-Government aspects. Currently several projects are under development to fulfill this goal. To mention three examples:

- X-Planung realizes a national standard for urban planning and will support a standardized access through the internet.
- The gazetteer service "Hauskoordinaten Deutschland" will provide the access to all 18 million addresses in Germany via a web-service.
- VBORIS will provide real estate information in a portal conform to the GDI-DE standards.

3. CROSS-BORDER-COOPERATION

In the last years a significant number of SDI's were under development worldwide – on all levels from local to global. While this is very encouraging, there are a number of risks associated with these parallel developments. To name just a few [10]:

- Different SDI's (or even different players within an SDI) have a conflicting understanding of what an SDI is;
- incompatible and conflicting technical solutions or content;
- incompatible organizational structures and rules.

As this was realized very early during the development of GDI.NRW, more and more activities deal with linking GDI.NRW components to offerings from its neighboring regions (both inside and outside of Germany).

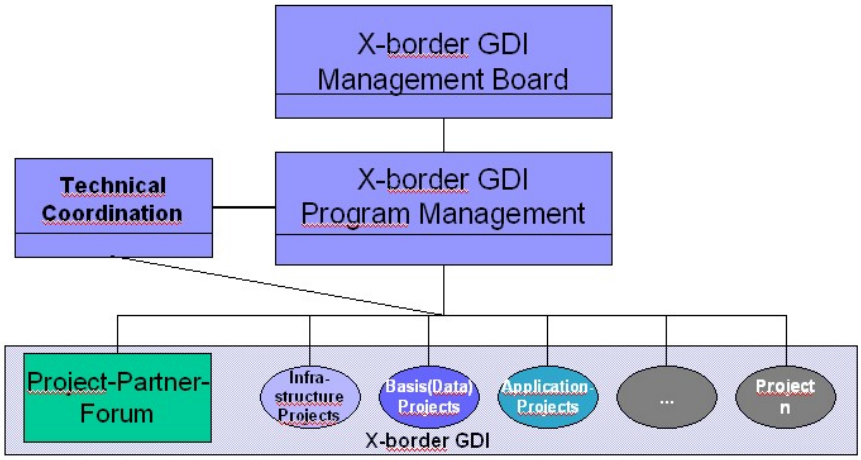
Since 2001, cooperation between The Netherlands (NL) and NRW relating to spatial information has been intensified, starting with several cross-border workshops on spatial information and SDI. In addition a regional SDI (RSDI) workshop, held at the Joint Research Centre (JRC) at the beginning of 2003 made clear that concrete demand for cross-border SDI cooperation exists. The region of NRW, The Netherlands and Belgium has proved to be an ideal test area for a cross-border SDI, with its more than 20 million inhabitants sharing cross-border problems. From the user's point of view, the main application areas of disaster management, spatial planning, nature & recreation and traffic & transport need to be considered.

3.1. SDI Developments under Interreg IIIC – Cross Border Cooperation NRW-NL

In spring 2003, a preliminary cross-border study was started, to explore the feasibility and the potentials of NL-NRW SDI, a regional spatial data infrastructure (RSDI). This study focuses on three subtopics.

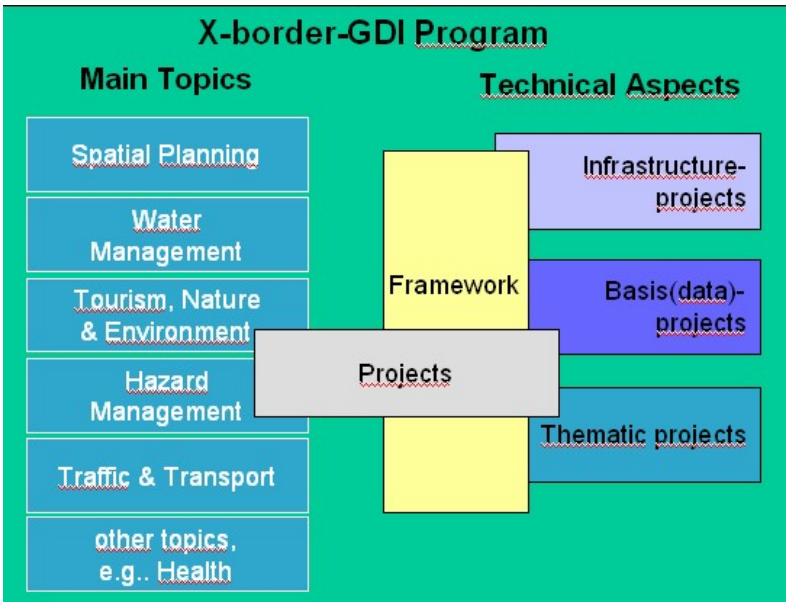
The investigation of the benefits of cross-border co-operation was documented in a market study for the NL-NRW border region. The main aim of this was to gather prospective users of a common cross-border RSDI and to disclose their individual requirements with respect to spatial data.

The second investigation focused on organizational issues of a cross-border SDI. The main aim was to deliver an organizational structure that is capable of achieving a sustainable development of the cross-border SDI. Here it was of great importance to incorporate the prospective users in order to develop an RSDI that really matches the needs of the users. At the end the following organizational structure was established:



The third investigation focused on technological issues of the cross-border SDI. The main goal was to deliver a test prototype that provides a seamless and frictionless search and visualization of spatial information for the border region. In fact this prototype was developed to prove the results of the JRC-workshop mentioned before.

Today, the basic framework of the cross-border SDI between North-Rhine Westphalia and The Netherlands is established and several SDI-project are under realization (http://www.x-border-gdi.org/).



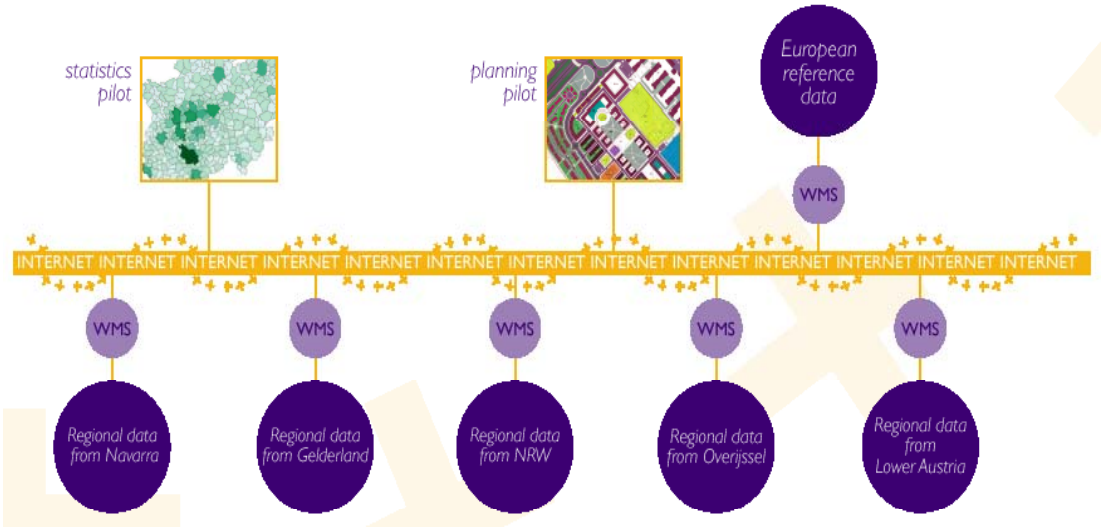
3.2 SDI Developments under Interreg IIIA – Cross Regional Cooperation

"Change on Borders" is a Regional Framework Operation (RFO), which has been approved within the EU-program INTERREG IIIC. The EU-program INTERREG IIIC aims at promoting interregional cooperation between regional and other public authorities across the entire EU territory and neighboring countries. It allows regions to work together in common projects and develop networks of cooperation. The overall objectives are to improve the effectiveness of regional development policies and instruments through large-scale information exchange and sharing of experience (networks) in a structured way. In this context "Change on Borders" is an approach that promotes interregional cooperation among 25 different border regions in the European Union and beyond (http://www.change-on-borders.net/).

The CROSS-SIS-project (http://www.cross-sis.com/) is partly financed by the European Union within the Change on Borders program with the aim to enhance the use of spatial data for spatial decision making in cross-border settings, promoting the modernization of the regional administrations, the use of INSPIRE and the development of the information society (www.cross-sis.com). Some further objectives are to achieve greater efficiency in the acquisition, maintenance, management and distribution of spatial data both at regional and cross-national level. The ambitions of the project are closely related to the directives of INSPIRE (http://inspire.jrc.it/) – so a decentralized approach is favored, also to go further in modernizing the regional administrations and finally arrive at e-government.

As a starting point all participants Lower Austria (Austria), Gelderland and Overijsel (The Netherlands), Navarra (Spain) and North-Rhine Westphalia (Germany) analyzed the available SDIs in their regions in 2005. Based on this exchange of knowledge and experiences two pilot-projects were implemented since 2006. They should serve as an "opener" for a European spatial data infrastructure as envisioned by INSPIRE.

The general objective of CROSS-SIS is to demonstrate how Spatial Information Systems can be a strategic tool and contribute to the strategic objectives and decision-making process in cross-border regions. Therefore CROSS-SIS is focusing on solutions/services for the use of cross-border spatial information by the customers in the participating region as a test bed for all interested European Regions. In CROSS-SIS pilot projects will set up cross-border SIS services in two specific areas:



Statistics (see: www.cross-sis.com)
In the area of statistic the difficulties in harmonizing European data are obvious, showing living conditions in Europe. However, with CROSS-SIS it will be demonstrated that with distributed interoperable web service technologies, which constitute the base for any modern SDI, it is possible to discover, retrieve, visualize, and analyze spatial data regardless of the factual physical location of spatial data repositories and geo-processing facilities. This is a precondition for a seamlessly integrative application of spatial data by statistics professionals in cross-borer settings. But the demonstration will not avoid addressing current semantic data problems.

Planning (www.tim-online.nrw.de/gdi-europe or see www.cross-sis.com)
The purpose of the planning pilot is similar to the statistic one focusing on the service-oriented presentation of planning data in a cross-border context free of charge via the internet. There realization of a the decentralized architecture – conform to INSPIRE – was chosen to guarantee cost efficiency and actuality. The goal of the planning pilot is to develop a WEB-GIS-client that presents comparable regional planning data as interactive maps at a European level. The added value of this pilot is not only to present planning data in a cross-border context free of charge via the internet, but also to follow a service-oriented architecture by utilizing OGC (Open Geospatial Consortium)-compliant technologies. Using these, the planning data is integrated into the WEB-GIS-application via standardized Web-Map-Services (WMS) that each partner did set up. One advantage of this process is the fact that the preparation and the up-dating process for the data are both done decentralized by each partner region. Another advantage of the WEB-GIS-client is the easy-to-use approach for both beginners and experts. The technical architecture is structured to conveniently enable users to interact with the application (choose regions, level of plans, show the related documents).

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BIOGRAPHICAL NOTES

1983 - 1990	Study at the University of Bonn, Germany and Washington State University, WA, USA
1990 - 1994	Ph.D. - assistant at the Institute for Theoretical Geodesy of the University of Bonn
1994 - 1996	trainee program in several state agencies, second state degree
Since 1997	Surveying and Mapping Agency of North-Rhine Westphalia
	01/97-12/01 Chair of the section “Integration of spatial information of the surveying and mapping administration”
	01/02-06/02 Chair of the department “Development and Data Processing Services”
	since 07/02 Chair of the business area “Cadastral Information Systems” Responsible for the standardization of spatial information in the administration of surveying and mapping, project coordinator of GEOBASIS.NRW (the introduction of the cadastral system “ALKIS” in North-Rhine Westphalia), Member of several state and federal working groups, member of the EU expert group of the INSPIRE initiative

CONTACTS

Dr. Jens Riecken
Surveying and Mapping Agency of North-Rhine Westphalia
Muffendorfer Str. 19-21
D - 53177 Bonn
GERMANY
Tel.: + 49 228 8464000
Fax: + 49 228 8464002
email: riecken@lverma.nrw.de
Internet: http://www.lverma.nrw.de