SDI Initiative North Rhine-Westphalia (GDI NRW) / Germany SDI NRW Joint Project 2004: Identification of Enhanced SDI elements (GDI NRW Verbundprojekt 2004)

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Key words: Joint project, GDI NRW, GDI, SDI, geoDRM, OGC

SUMMARY

After the introduction of the OGC Web Mapping Service in April 2000 a set of interoperable technical specifications and products for Spatial Data Infrastructures was developed by OGC and ISO. In North Rhine-Westphalia (NRW), a German State, the organizational public-private-partnership frame "SDI NRW" (GDI NRW) was set-up in 1999 and evolved until today into a strong regional community, which is closely related to the international OGC/ISO community through multiple memberships and contributions.

After the more technically oriented SDI NRW Testbeds I and II in 2001 and 2002 and a pilot in 2003, the need for an operational environment as a next step was evident. This resulted in the "SDI NRW Joint Project 2004". The goal was to establish an operational SDI core. The technical and organizational cross-section tasks were managed by CeGi (Center for Geoinformation), Dortmund, NRW, Germany, and sponsored by the State of NRW.

After an open call for participation (CfP) and incoming detailed project applications, the joint project started in March 2004 with 25 self-financed projects carried out by 37 institutions from the governmental, industrial and research sectors.

The paper describes the Joint Project 2004 and some new identified SDI needs and elements, especially about required geoDRM functionalities and a follow-up with the upcoming Joint Project 2005. This will focus on SDI business networks.

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1. INTRODUCTION

After the introduction of the OGC Web Map Service in April 2000, OGC and ISO developed a set of interoperable technical specifications and products for Spatial Data Infrastructures. The organizational public-private-partnership frame "SDI NRW" (German: GDI NRW) was set up in North Rhine-Westphalia (NRW) in 1999, a German Federal State, and has evolved until today into a strong regional community, which is closely related to the international OGC/ISO community through multiple memberships and contributions. The iteration process between the regional and the global levels is illustrated in figure 1.

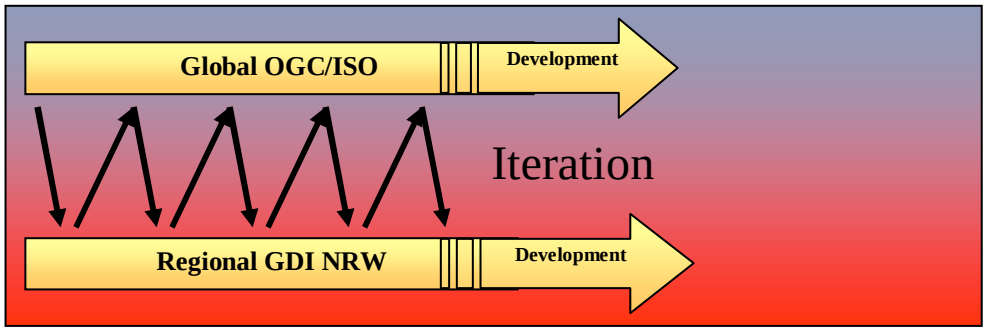

Figure 1: Iteration relationship GDI NRW and OGC/ISO

The regional "GDI NRW" initiative developed and used different instruments to stimulate the technical and organizational SDI development process.

1.1 Instrument "Testbed"

The goal in the first phase (2000 – 2002) was the definition of interoperable implementation specifications and their proof-of-concepts. Since no single company was capable of covering all SDI development fields, the need for co-operation was evident. In 2001, the SDI NRW Testbed I instrument was created and executed. After an open call for participation, more than 10 institutions contributed their various OGC interoperable service implementations. The new Web Pricing & Ordering Service was also developed, tested within this framework and later contributed to the OGC. After a period of about six months of strong collaboration, the results were demonstrated at the Intergeo fair 2001. The pubic presentations helped to educate and to persuade potential users for this emerging innovative new technology. In 2002, the SDI NRW Testbed II was started with some enhancements. The membership level "supporter" was introduced to involve early adaptors.

1.2 Instrument "Joint Project"

The need for an operational environment as a next step was evident after the more technical Testbeds I and II. This resulted in the "SDI NRW Joint Project 2004". The goal was to establish a sustainable, operational SDI core, which should last for a minimum of three years. Therefore, the target group was data and service providers. The SDI NRW Joint Project 2004 offered a platform to initiate new SDI projects. The technical and organizational cross-sectional tasks were managed by CeGi (Center for Geoinformation), Dortmund, NRW, Germany, the agency of the "GDI NRW".

After an open call for participation (CfP) and incoming detailed project applications, the SDI NRW Joint Project started in March 2004 with 25 self financed single projects carried out by more than 37 institutions from the governmental, industrial and research sectors. The relationship between data providers and software suppliers was 5 to 1, which shows the significant shift towards an operator driven and therefore more sustainable SDI. The use of interoperable interfaces enabled a new transparency among the member projects.
In October 2004, more than 130 OGC-interoperable GI sources together with 20 SDI based applications were presented at the Intergeo 2004 fair in Stuttgart. An OGC interoperable joint catalog service with data (ISO19115) and service (ISO19119) metadata for exploration is managed and powered by CeGi (http://www.geocatalog.de). The content is covering a wide thematic range from basis geo-data up to very specialized, interdisciplinary data, e.g. actual and integrated traffic, noise, real estate, tourism, environment, spatial supported marketing and more. Remke, Altmaier and Riecken described the SDI NRW Joint Project 2004 in detail

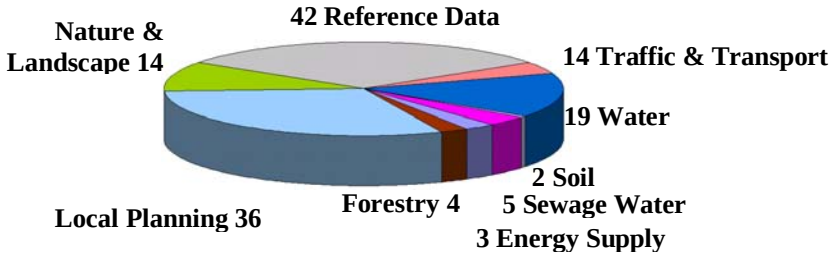

Figure 2: Operational GDI NRW Web Mapping Services (Remke, Altmaier, Riecken, 2004)

(Remke, Altmaier, Riecken, 2004) in June 2004 at halftime. Two important sets of figures and numbers are referred here. Figure 2 shows an overview distribution of data sources provided by OGC Web Map Services interface implementations (De La Beaujardière, J., 2001).

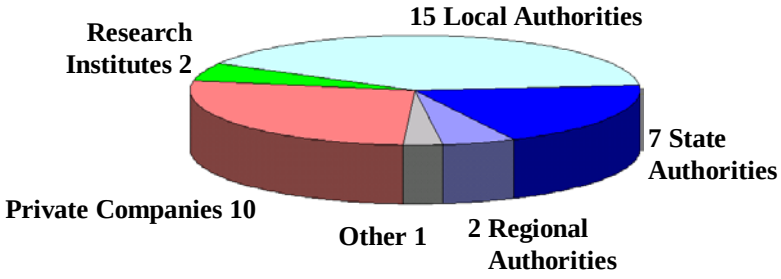

Figure 3: Participants in the Joint Project 2004 (Remke, Altmaier, Riecken, 2004)

Figure 3 shows an overview of the distribution of participating institutions. Figure 4 shows a picture of representatives of the participating institutions with their certificates. The instrument "certificates" forces the motivation especially of the local project teams within their administrative environment. Team spirit helped to solve problems.

Figure 4: Group photo at final presentation at Integeo fair, Stuttgart

2. IDENTIFICATION OF MISSING SDI ELEMENTS

New challenges appeared after the process of the Joint Project was started and detailed work began within the single projects and on the regional, more centralized level. The collaboration of so many institutions and implemented services shows the need and the value of cross-section services and descriptions like a catalog service and meta-data. Although this example could be predicted, some other elements were evident.

2.1 Monitoring Service

Due to the great number of participating institutions involved and the enormous amount of services in a distributed network, the simple question "service up and running" became crucial. Although the meta-data record helped to find a service, the "operational question" was assessed as even more relevant. Therefore, the need of a cross-section service, which monitors the states of the distributed services, is indispensable. The monitor service should support the following interfaces:

- Service Administration Notification: Many providers and service operators have a high interest to be informed if their services are not running. The OGC common service model (Whiteside, A, 2004) offers contact data. Also the meta-data ISO 19139 XML schema definition offers some contact data. The email address might be used in a Best-Practice example to send an automated notification message. In an advanced SDI, a specialized and also maybe full automated process should be established.
- Clients: Some clients offer URL favorite lists for the specified services. A monitor service might offer a status summery list for clients, which would be able to indicate the status of the target services to users. This will reduce frustration.
- Rating for Quality of Service: Statistics about the performance of services could help to rate services.
- An initial demonstrating monitor service was developed and implemented within the 2004 joint project. Further work is planed.

2.2 Quality of Service

Although the expression "Quality of Service" can be viewed and discussed from various point of views, the need for some quality mechanisms is evident. But is seems also that the assertiveness is directly depending on the operational SDI model. In an open SDI business model environment, only limited instruments are feasible. In a closed SDI business model environment other instruments allow a higher quality of service.
The topic "Quality of Service" will be addressed in the follow-up Joint Project 2005.

2.3 Feedback Mechanism

Often, SDI's processes are considered only one-way from a provider to a user. Disregarding any business models and depending on opposite money transfers, users have often a good knowledge about concrete geo-spatial situations within their own environments. This could be used for a more efficient maintaining of spatial databases.
The application "tim-online" by Landesvermessungsamt NRW (Mapping Agency NRW) together with software supplier con terra won the highest SDI NRW Joint Project 2004 award. The purpose of tim-online is to provide an SDI based and spatial supported feedback channel that enhance every person to notify spatial changes in the real world in real-time.

Although tim-online is an application, there is a potential for standardization of feedback mechanisms within SDIs, because spatial changes are permanently going on in the real world and thus cause high maintenance costs. A simple approach is the clear definition of feedback channels (e.g. email addresses) within the OGC common service model. Also the message content could be structured to allow an interoperable and highly automated processing. The tim-online implementation uses GML.

2.4 Marketable SDI or geo-(e)Business and its tools

Because of the wide range of valuable data sources within the SDI NRW Joint Project 2004, the topic of business applications appeared early. The Joint Project created a new transparency. Suddenly, almost equal products were discoverable and easy accessible. An example is the product “aerial photo”, which is offered by multiple providers and has a broad application range. The new transparency initializes a real geo-market. This desirable situation raised many commercial questions. Because of fundamental commercial relevance for a sustainable SDI, the discussion was separated from the running Joint Project and resulted in a new SDI Special Interest Group “geo-(e)Business”. This group considers the following topics as relevant:

- Basic geoDRM functions:
  - Authentication & Authorization Services
  - Pricing & Ordering Services
  - License Services
- License categories
- Definition of products

Although the question of concrete pricing and licensing is not yet solved, the listed basic geoDRM functions are required to offer valuable data and to enhance the operational SDI. Most participants in 2004 chose a pragmatic approach and offered spatial data and services without declaring any license rules. Some institutions declared free usage for non-commercial applications within a period of three years to protect their long term interests. But the need for software supported enforcement of data and service protection in future was often declared by participating organizations.

Because business services like geoDRM and solutions strongly depend on the general SDI business model, the question of this general SDI business model was evident. Although concrete business models are not subject of any standardization, the general infrastructure business model needs to be solved to deliver moored requirements for technical implementations. General infrastructure business models can be identified within many classical infrastructures, e.g. electricity and telecommunications with a regular basis fee and a usage depending fee.

An example for a general infrastructure business model is the aspect of “roaming”. The European telecommunication industries established a roaming framework in the basic GSM technology to share the risk for high investments and to gap various legal and technical obstacles cross-over Europe in the early eighties to create an initial market, which meets the critical mass for any investments. Although roaming required more complex architectures and processes, it was a key factor of the worldwide success of GSM (Jenkins, G., 2004). The SIG geo-(e)Business discussed in fall 2004 the roaming aspect and compared the GSM telecommunication infrastructure and the SDI spatial data infrastructure. The discussion about roaming in an SDI was also introduced in the OGC geoDRM working group and a topic at the OGC January Meeting (Wagner, R., 2005). The discussion continues and is open.

A roaming requirement would result in a profound architectural change for all geoDRM functionalities.

While the key question of roaming is not yet answered, other requirements especially for the security layer of the geoDRM solutions are relevant. Many nations started IT mainstream e-government initiatives, like U.K e-GIF or Germany Bund.online. A core aspect is the transport of documents, which needs to be secured and defined from a technical but also judicial point of view. In Germany, the OSCI mechanism for security was defined and implemented (OSCI). Next to these governmental initiatives, OASIS introduced SAML from a more industrial point of view. The usage of a specific security transport mechanism might be mandatory for some major data and service provider. But it might be open to support more than only one specific protocol.

The ability to support multiple geoDRM concrete solutions will help to bridge multiple SDIs. This is required, e.g. geographically from a European SDI point of view, but also between reference geo-data and specialized geo-data provider.

The mentioned aspects are requirements, which need to be solved within an OGC geoDRM framework solution.

3. OUTLOOK

The call for Participation (CfP) for the GDI Joint Project 2005 will be released February 16th and will remain open for about four weeks. A goal is to augment the existing geospatial content (data and services) geographically and for valuable and protected content by using some geoDRM functions. Therefore the upcoming Joint Project 2005 will have a testbed character in the geo-(e)Business track.

Another goal is the identification and - if possible - a categorization of typical license structures. The Joint Project will provide an interesting pool, because each participant must declare a license statement for services and data. A result of the categorization might be a "geoGNU GPL" and other named categories for data and services. These might be supported in the second half of the Joint Project by an automated license service.

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BIOGRAPHICAL NOTES

Dr. Roland M. Wagner studied aerospace engineering and computer science at University of Stuttgart/Germany, Paris/France and Vancouver, B.C./Canada. He also completed internships at Airbus Industries in Toulouse/France, at the University of Kiev/Ukraine and the German Federal Ministry of Economics.

He joined the Fraunhofer Institute for Software and System Engineering (Fraunhofer ISST) in Berlin/Dortmund in August 2000. He developed a mechanism for digital processing of complex pricing models, today known as the XML complex Configuration & Pricing Format (XCPF) and the Web Pricing & Ordering Service (WPOS). His development was contributed to the new global Spatial Data Infrastructure (SDI) initiatives GDI NRW and OGC. In June 2003 he got for this work a PhD degree from the Technical University of Berlin, Germany.

After March 2003, Dr. Roland M. Wagner moved to Beijing, China, to build up the Sino-German Joint Laboratory of Software Integration Technologies (SIGSIT), Beijing. In July 2004, he joined the SDI NRW Joint Project Team (Verbundprojekt) at CeGI, Dortmund. On OGC level he is co-founder and co-chair of the geoDRM Working Group science June 2004. Since February 2005 he is working for the Institute of Geoinformatics at the University of Münster.

Niklas Panzer studied geoinformatics and received his diploma at the University of Münster, Germany. Before finishing his studies he worked at the same institute. For his diploma thesis concerning “GIS-based Multilevel Spatial Decision Making” he worked as a research assistant in a project in the San Diego State University. Since 2004 he is working at the CeGi Center for Geoinformation GmbH, especially responsible for the organization of the SDI NRW and the SDI NRW Joint Project(s).

Dr. Falko Menge studied surveying and geoinformatics and received his diploma (Dipl.-Ing.) in Geodesy from the University of Hannover, Germany. After his studies he was research associate in satellite positioning at the Institut für Erdmessung, University of Hannover, joining several projects in Germany, the Philippines, in Iceland and Antarctica. He was in charge of different scientific projects concerning the Global Positioning System GPS (error budget, geodynamics). He received his PhD from the University of Hannover, Germany, for his work on GPS antenna calibration. Between 2001 and 2003 he had a traineeship within the surveying administration in Lower Saxony, Germany (legal clerkship for engineers in the public sector). Since 2004 he is workings at the CeGi Center for

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