

Towards one stop citizen interfaces as entry points to Spatial Information Infrastructures

Hartmut MÜLLER, Falk WÜRRIEHAUSEN
Germany

Key words: Citizen interface, Geoportal, INSPIRE, SDI

SUMMARY

A geoportal is an internet entry point to access spatial data infrastructures. By providing web based network services a geoportal is an essential part of a spatial information infrastructure.

In the year 2010, the European Commission started to operate a community geoportal to assist the integration of the national infrastructures of the member states within the INSPIRE initiative. At the national level of Germany the implementation takes place under the name GDI-DE. At the local level the 16 German Federal States implement their own SDI's by using corresponding acronyms like GDI-RP, which represents the local SDI of the Federal State Rhineland-Palatinate, for instance.

The geoportal of Rhineland-Palatinate GeoPortal.rlp provides for access to spatial information on the complete territory of the federal state. GeoPortal offers the opportunity for federal state agencies, municipal authorities and private companies to make their data and services accessible for the whole community of internet users. In June 2008, GeoPortal.rlp was elected Website of the Month of the Open Geospatial Consortium OGC. The paper covers technical issues by describing data provision problems and solutions as well as the currently reached status of portal content provision.

ZUSAMMENFASSUNG

Ein Geoportal ist eine Anwendung im Internet, die den Anbietern und Nutzern von Geodaten als zentraler Einstiegspunkt in eine Geodateninfrastruktur dient. Ein Geoportal ist damit zunehmend ein wichtiger Bestandteil in jeder Geodateninfrastruktur.

Die Europäische Kommission hat im Rahmen der Umsetzung von INSPIRE im Jahr 2010 ein Geoportal in Betrieb genommen, um so den Mitgliedstaaten einen Zugang zu nationalen Infrastrukturen ermöglichen zu können. In Deutschland ist der Prozess des Aufbaus der GDI-DE auf nationaler Ebene im vollen Gange. Auch die GDI's in den 16 Bundesländern, wie beispielsweise die GDI Rheinland-Pfalz auf lokaler Ebene, sind im Aufbau befindlich.

Das GeoPortal.rlp als zentrale Plattform der Geodateninfrastruktur Rheinland-Pfalz ermöglicht einen zentralen Zugang zu allen raumbezogenen Informationen in Rheinland-Pfalz. Das GeoPortal eröffnet die Möglichkeit, dass sowohl Behörden des Landes, die kommunalen Gebietskörperschaften als auch private Firmen die Geodaten und Dienste der Gemeinschaft über eine zentrale Plattform im Internet zugänglich machen. Im Juni 2008 wurde das GeoPortal.rlp vom Open Geospatial Consortium (OGC) zur Webseite des Monats gewählt.

Der Beitrag beschreibt technische Probleme und Lösungen sowie den derzeitigen Stand der Bereitstellung von Informationen im Portal.

Towards one stop citizen interfaces as entry points to Spatial Information Infrastructures

Hartmut MÜLLER, Falk WÜRRIEHAUSEN
Germany

1. INTRODUCTION

Geoportals as a general-purpose tool to access service oriented architectures gain more and more attention in the geo-community. Emerging Web Services are end-point in many service architectures. In a Spatial Data Infrastructure there may be soon available several hundred services, which can be used for composing user applications on request. To reach this goal, the availability of web services and datasets must first be discovered. Catalogue services containing metadata information enable search for spatial data sets and services. Service oriented architectures comprising discovery, download and viewing services provided by different partners must be maintained both by regional spatial data infrastructure providing institutions and by other administrations.

Answering spatially related questions to datasets and services is a much more complex task than just providing static information by an Internet website. The proprietary interests of SDI members, related to licensed data and information must be protected. Spatial Portal implementations like the German states' Rhineland-Palatinate GeoPortal.rlp are a well suited way to involve a large community of users and data providers in a common geo-community management Internet entry point of spatial information.

2. GEOPORTALS - ENTRY POINTS TO THE EUROPEAN, NATIONAL AND REGIONAL SDI'S

2.1 The Role of Geoportals in an SDI framework

A Geoportal in an SDI framework is a gateway to spatial data, metadata, users and tools which are interactively connected in order to use spatial data in an efficient and flexible way. Map based websites describe and grant access to spatial information available for a specified administration territory. Geoportal user front-ends should be able to manage different geo related services like [INSPIRE NSA, 2008]:

- View services
- Discovery services
- Download services
- Transformation services
- Invoke spatial data services

The content and interaction of these components are subject to restriction by the geo-community and the data owner's access rights. The portal provides the information about geospatial data and the data owners, not the data itself. The data and meta services of different authorities and organizations are a

part of the spatial data infrastructure being realized as a public data network. Figure 1 shows the role of a Geoportal within an SDI with user and software interaction.

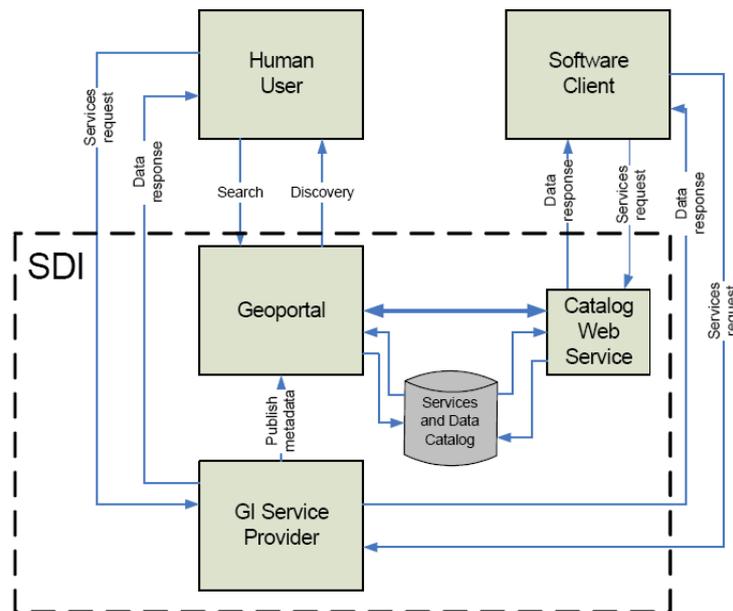


Figure 1. Geoportals and SDI [Geoinfo, 2005]

Geoportal-networks of data and services originating from different public and private administration organizations should also include rules and standards. An interoperability SDI framework can be defined as a set of standards and guidelines which describe the way in which one or more autonomous organizations agree to interact with each other. Moreover, the SDI activities at the higher European and German levels have to include the structure and the activities of a coordinating agency.

The German SDI initiative GDI-DE comprising the sixteen federal states of Germany in conjunction with INSPIRE is an activity of one of the member states of the European Union. The German federal units responsible for their own administration territory work together within joint SDI management groups for the purpose of common SDI development, for example by regulation activities or by the development of data management concepts for the data exchange

Issues of internal organization at the administration territory level will play a major role in the whole SDI implementation process. Even though, this contribution will concentrate on technical issues which currently turn out to be a driving force in the whole process, as well. The core part of technology which will be described here is a web based portal solution provided by the upper state administration body to support data and service providers and users.

Geoportal providers are in the function of a broker between the users and the more than one data and service providers. Therefore, an agency which provides for the portal site is not necessarily a data provider. The European Union's INSPIRE-Geoportal is a broker in that sense.

In the following chapters some important Geoportal Entry Points at different SDI levels will be described.

2.2 Geoportal-INSPIRE

Since several years the proposed 'INSPIRE - Infrastructure for Spatial Information in the European Community' directive has been on its way to pass all stages of a long decision process as a precondition to put it into force. The directive finally was adopted and published in the official Journal on the 25th April 2007 entering into force on the 15th May 2007. At the European Level, the INSPIRE-Geoportal enables SDI access. Currently, a first prototype implementation is in operation. In the year 2010, the European Commission started to operate a community geoportal to assist the integration of the national infrastructures of the member states within the INSPIRE initiative. [INSPIRE Directive, 2007]

The implementation of the INSPIRE directive will affect mainly the work of public authorities at many levels, even at the European Level. By providing data based network services a geoportal is an essential part of a spatial data infrastructure. The Geoportal-INSPIRE which is being defined in the INSPIRE directive is, and will be, the gateway to the European SDI.

As specified in the INSPIRE directive Article 3 an 'INSPIRE geo-portal means an Internet site, or equivalent, providing access to the services referred to in Article 11(1)' [INSPIRE Directive, 2007]. The geo related services named at the article 11(1) are

- View services
- Discovery services
- Download services
- Transformation services
- Invoke spatial data services

In the nomenclature of the OGC web service specification, Web Map Service (WMS), Web Feature Service (WFS), Catalog Service Web (CSW) and Web Processing Service (WPS) will have to be operated. Other Standards like HTTP file download or the W3C Standards WSLD and SOAP can be used in this service context. [Smits, 2008]

The web services must be managed by the INSPIRE-Geoportal front-end implementation. At the moment, the prototype implementation of the Geoportal consists of four user components:

- Map Client Viewing component
- Metadata Searching component
- Metadata Editing component
- Information component

The Viewing component is a Map Client to present map-service information of different service providers across whole Europe. By using map standards like the WMS all information provided by the services can be viewed in the map client.

The search function provided by INSPIRE geoportal, makes it possible to search for geographic resources in the INSPIRE geoportal metadata database, as well as for the metadata available in linked

catalogues by performing a federated metadata search. In the present prototype version of the INSPIRE geoportal one can search through the metadata catalogues for the following partners: Geoportal.Bund (DE), BRGM (FR), Catalunya region (SP), Regione Lombardia (IT), European Environment Agency (EEA) and European Space Agency (ESA). Registered users are entitled to use a number of extra functions such as editing and importing metadata, once they have logged into the system. [INSPIRE Geoportal, 2011]

Containing additional information about the Geoportal and INSPIRE, the website is designed as a user-friendly common interface to the world of INSPIRE Spatial Data Infrastructure.

The Member States may also provide access to the EU level services through their own NSDI level access points. This feature is regulated at the Article 15(2) of the INSPIRE directive [INSPIRE Directive, 2007], therefore the GeoPortal.Bund at national SDI-level is provided.

2.3 GeoPortal.Bund

GeoPortal.Bund is the Spatial Data Infrastructure Germany (GDI-DE) specific federal geoportal which offers direct access to geo data, to metadata as well as to additional functionalities and interfaces to related projects. In addition to its responsibility of observing and monitoring national developments, GDI-DE is mandated to integrate the developments at the German national level into the European (INSPIRE) and into the emerging global scale (GSDI). The Head of the Federal Chancellery together with the Heads of Federal State and Senate Chancelleries set up a steering committee to act as a strategic decision making platform representing federal authorities, federal state agencies as well as local bodies. An Administration and Coordination Office GDI-DE (GKSt.) was established to serve as an executive organ with the aim to guarantee for the close cooperation between authorities at all levels of government. [GeoPortal.rlp, 2011]

Beyond the access to geo-spatial data the Geoportal enables for the procurement of services, like Data pre-processing, Data visualization, Co-ordinates transformation. The portal allows for access to scattered data from one or multiple suppliers by using OGC standards and connects data and service suppliers. Through online access to the scattered data of the respective suppliers, a high level of up-to-dateness can be assured. GeoPortal.Bund makes information about geo-spatial data, their owners, and integrated functions available (Meta data, Forums, etc) Standardised WWW and GIS technologies will be used for the implementation of the planned specific functions. Conformance to the ISO/OGC standards will also play an important role in the realisation of the portal. [GeoPortal.Bund, 2011]

In the international context, GeoPortal.Bund on the one hand presents the EU Initiative INSPIRE and on the other hand interfaces to the initiative. The first realisation of GeoPortal.Bund will take place parallel to the creation of the research tool, GeoMIS.Bund. Starting from 2004, direct access was made available to geo-spatial data in Germany. To improve co-ordination of geo information processing within the Federal administration the Inter-ministerial Committee for Geo Information IMAGI was set up on September 8, 1998 under the overall control of the BMI (Federal Ministry of the Interior). The members of the German IMAGI are [GeoPortal.Bund, 2011]:

- the Federal Chancellery,
- the Federal Ministry of Education and Research,
- the Federal Ministry of Finance,
- the Federal Ministry of the Interior,
- the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety,

- the Federal Ministry of Consumer Protection, Food and Agriculture,
- the Federal Ministry of Transport, Building and Housing,
- the Federal Ministry of Economics and Labour,
- the Federal Ministry for Economic Cooperation and Development.

The co-ordination office is located in the Federal Agency for Cartography and Geodesy (BKG) in Frankfurt am Main. The IMAGI contract is the result of the German Federal Government Cabinet decision as by June 17, 1998. [GeoPortal.Bund, 2011]

Human Interface - GDI-DE GeoPortal.Bund was designed to act as a broker between the users and the suppliers of geo-spatial data, geo-spatial information and services. All OGC WebMapServices of national agencies can be integrated into the GeoPortal.Bund map-client, like the WMS of National Water-level Measurement on German rivers and seas, for instance (Figures 2 and 3).

The WebMapService comprises the current information available from water-level measurements within the gauge network of German rivers and seas. Because of using the WebMapService Standard of the OGC, the service provided by the portal likewise can be fully integrated into all map-based applications or into any private or public GIS.

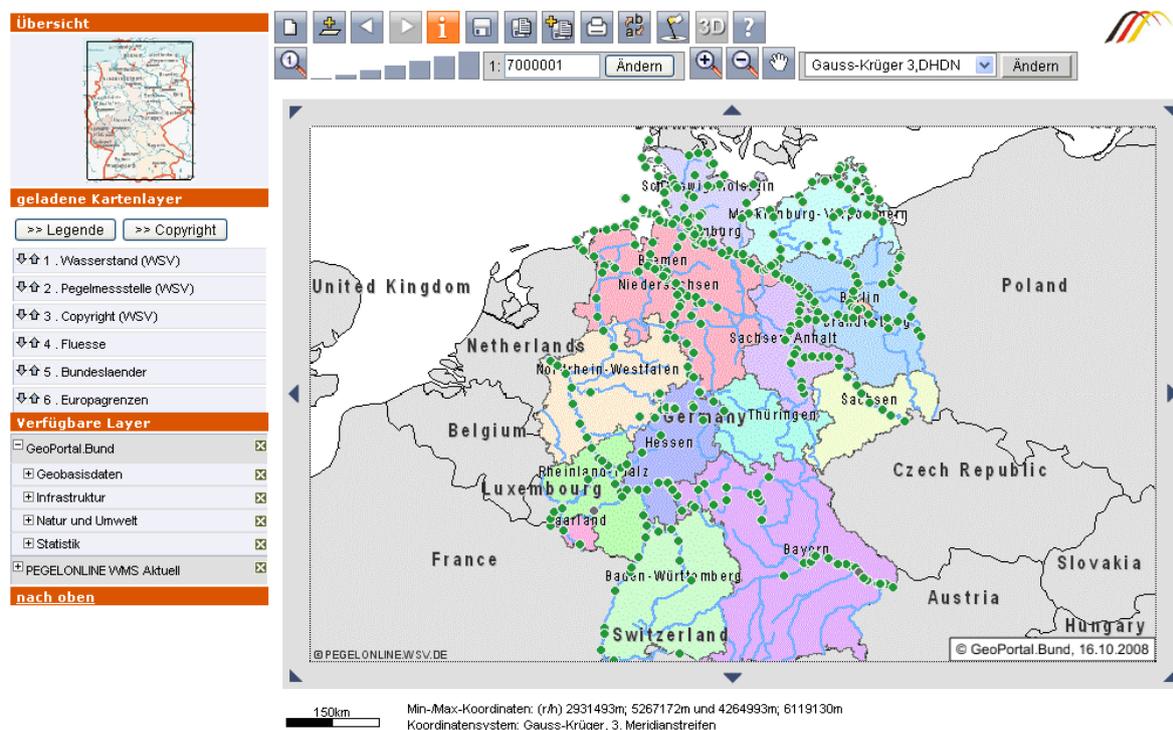


Figure 2. Geoportals.Bund with WebMapService of National Water-level Measurement [GeoPortal.Bund, PegelOnline, 2011]



Figure 3. WebMapService for water-level information in the Geoportal.Bund, Gauge Mainz [GeoPortal.Bund, PegelOnline, 2008]

2.4 GeoPortal.rlp

Spatial Data Infrastructure Rhineland-Palatinate (GDI-RP) forms part of GDI-DE, a project jointly initiated by the federal government, federal state governments and municipal authorities with the aim to set up and make available a network of geo information. The purpose of GDI-RP is to enhance the field of geo information within Rhineland-Palatinate. By 24 May, 2005, the Council of Ministers decided to entrust IMAGI-RP with the political mandate of establishing a Geo Data Infrastructure in Rhineland-Palatinate. [GeoPortal.rlp, 2011]

Within Spatial Data Infrastructure Rhineland-Palatinate, it is up to GeoPortal.rlp to take the role of the service-oriented agent brokering geo data between geo users and geo service providers. The portal (<http://www.geoportal.rlp.de/>) is designed to provide only information about geospatial data and the data owners, not the data itself. The data as well as related metadata information remains with the data providers thus leaving full control on all provided information to the information provider. In June 2008, GeoPortal.rlp was elected Website of the Month of the Open Geospatial Consortium OGC. 'With more than 2000 layers from 70 OGC WMS services it is a perfect example of interoperable service architecture and a living example of the emerging INSPIRE directive', as OGC states. [OGC Newsletter, June 2008]

GeoPortal offers the opportunity for federal state agencies, municipal authorities and private companies to present their data and services. Online-access to the distributed data sources of each geospatial service- and product-provider ensures that information made available by these institutions on a joint platform is as up-to-date as possible. Instead of users having to copy the data, links to the original data sources enable them to have direct access. This metadata is managed by the providers themselves using the multi-client-capable administrative framework implemented by Mapbender. GeoPortal.rlp provides information about geospatial data and the data owners, as well as offering integrated functionality for use in standard GIS viewers and in specific applications. [OGC Newsletter, June 2008]



Figure 4. GeoPortal of the federal state of Rhineland-Palatinate [GeoPortal.rlp, 2011]

The states' geoportal is embedded in the federal GDI-DE, and at the European level connects seamlessly into the emerging INSPIRE platform. Therefore all SDI Implementation should follow the common strategies, to have access to spatial data and information about a specified administration territory like the state of Rhineland-Palatinate.

3. IMPLEMENTATION STRATEGIE OF SDI

3.1 Necessary Tools

Over the last years, geospatial data collection and management tools have become common in many organizations both in public or private sector. These management tools include geographic information systems (GIS), surveying equipment with GPS, map digitizing and scanning equipment, and so on. Using such tools gives public sector organizations at all levels the ability to produce and manage their own geospatial information. To implement the tools, feasible data management needs two main strategies, an implementation strategy of GIS as a data management tool and a strategy to implement the necessary content, namely spatial information of different themes. GIS and Spatial Information Management are the backbone of all organizations concerned with spatial questions of local planning, of monitoring or of simple data viewing. Geospatial data are available at the involved institutions in a wide range of formats, partly in analogue form, or, if digitally available, filed in a considerable number of different file formats. Based on that, data of many different organizations exist, but it is relatively unknown where and how those data are available. Metadata which describe the data and the data owners are urgently needed to implement a data management within an SDI framework of different partners.

A Geoportal as an internet entry point to access spatial data and information about the SDI is a necessary and an essential part of a spatial information infrastructure. If municipal authorities, local governments and private companies make their services accessible for the whole community, the Geoportal is the easiest way to get information about geo datasets. The portal is designed to integrate

only information about geospatial data and the data owners. The data as well as related metadata information remains with the data providers which leaving full control on all provided information to the information provider.

3.2 Necessary Framework

The framework is one of the key building blocks and forms the data backbone of the Spatial Data Infrastructure. Common official practices will have to be developed to create and to update metadata, to provide for data services which will have to be fully compatible, to state the principles on access to data and on the related charges and to establish a co-ordination among all involved partners. Depending on the way in which Spatial Information Management is currently organised in the different countries of the European geo-community the work on these tasks will result in a various number of more or less complex and time-consuming processes to be conducted in all member countries.

For this reason a cooperation across different administration units is necessary, to initiate a common geodata management between districts, departments and other partners. Following the best-practice implementation strategies of the Geoportal.rlp as a part of the Spatial Data Infrastructure Rhineland-Palatinate an organisational framework of the states' counties was formed. The umbrella organisation of the 24 local authorities at federal state of Rhineland-Palatinate, the County Association of Rhineland-Palatinate (Landkreistag Rheinland-Pfalz), started a broad state-wide project initiative, to concept a GIS implementation at the county level, on the one side. Another goal of the initiative was to prepare a strategy how to build up a spatial data infrastructure for the cooperation and the data exchange within the local authorities themselves and between all of the different administration bodies at the federal state of Rhineland-Palatinate.

A well-developed Geoportal provides for an excellent opportunity to support the development of the Spatial Data Infrastructure and the integration of the local authorities into the spatial data management of the federal state. Being responsible for the development and maintenance of the Geoportal, the cadastre and land surveying administration of the federal state of Rhineland-Palatinate plays a central role within this framework. On the one hand the authority provides for the hardware and software components of Geoportal.rlp. Beyond that, the public administration geospatial basic data are available by this organisation, for example the Digital Orthophotos or the Automated Real Estate Map which comprises the cadastral boundaries for the whole state. Those public data as well as a growing number of GIS based county-related data are available at Geoportal.rlp even for all citizens by the internet (see Figure 5).

In the upcoming time, all organisations will spend more time by digitizing maps to create spatial datasets of their own public information. A data framework between the authorities and also within the authorities themselves will have to be managed. Data exchange within the departments of the counties is initiated with a WebGIS Infrastructure and a spatial data management system for all data themes. In the same way as by using the geo-spatial basic data across different districts, added value can be generated by using district-owned data across the departments of the district within a common data framework (see Figure 5).

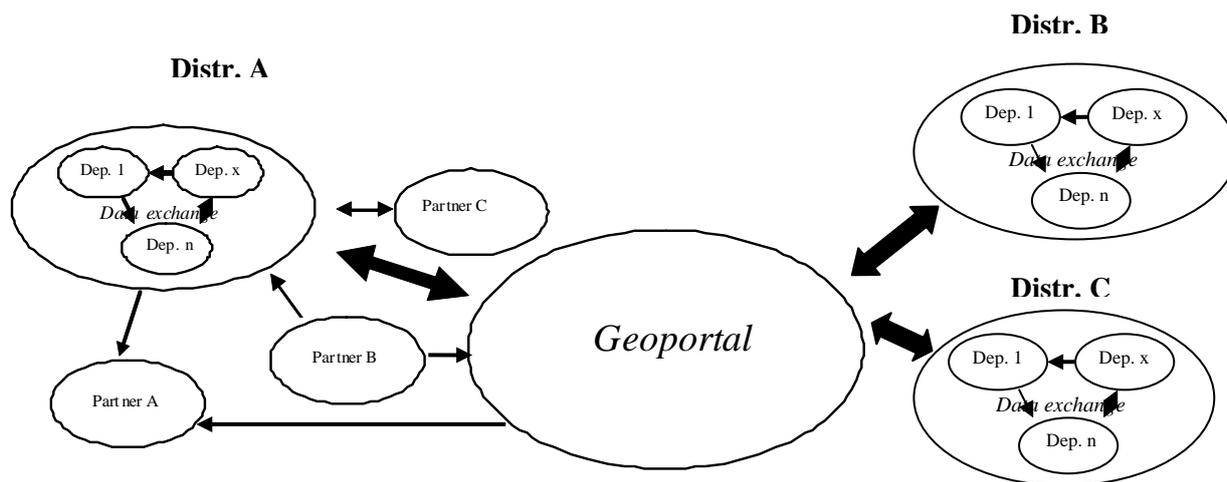


Figure 5. GeoPortal as a general purpose tool to support the development of a Spatial Data Infrastructure

Geoportals as common interface are even a part of the spatial data infrastructure as a public data network by using standards for data exchange and data access. It should be mentioned, that the Geoportal as a part of the data framework only provides for the information about the geospatial data and the data owners, not the data itself. The Geoportal supports publication and mining of data services provided by different administrations through meta information. Spatial data accesses of different partners, which enjoy an either formal or informal independency from each other, are managed with a common Geoportal-oriented SDI framework.

3.3 SDI Project Initiative

Over the past five years many organisations of Rhineland-Palatinate started with SDI projects. To initiate joint SDI member activities a state or regional wide project initiative is necessary to develop a real added value of common management practices. Questions of common interest, like those overall GIS implementation strategies, can be discussed within joint SDI project initiatives. Such SDI projects of the counties are initiated by the umbrella organisation, the Landkreistag Rheinland-Pfalz. At the beginning of project group work at the federal state of Rhineland-Palatine it was necessary to know, how to build up a GIS infrastructure at the 24 local authorities. To analyse such problems of the GIS-Implementation it is necessary to support the common activities of co-workers of the local authorities by scientific background work. Therefore the Institute for Spatial Information and Surveying Technology at the Mainz University of Applied Sciences (i3mainz) is a part of many project group activities (see figure 6).

Following such best-practise SDI projects already completed at the federal state of Rhineland-Palatinate more duties will have to be mastered by joint SDI project management group comprising members from all involved parties. The “geo-community” Rhineland Palatinate is ready to cope with future items of SDI to find appropriate solutions.

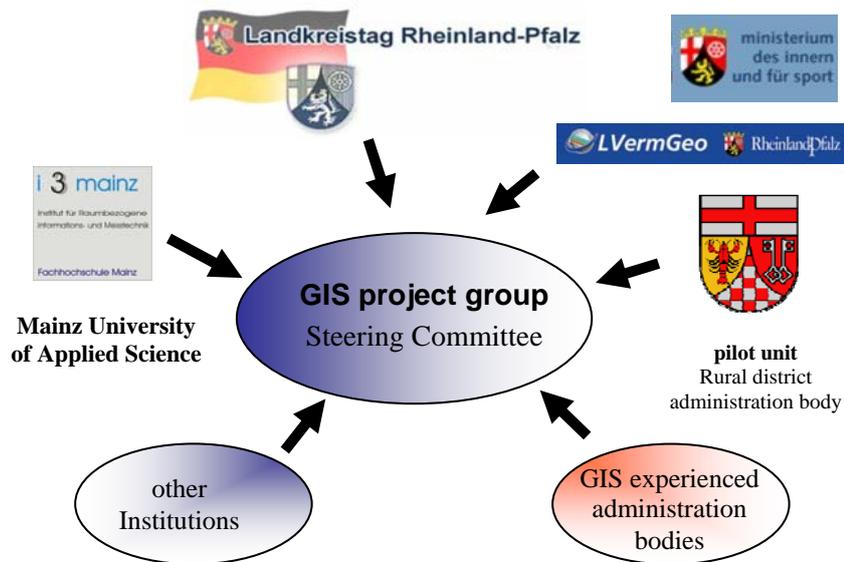


Figure 6. The GIS Implementation Project Group of Rural District

4. CONCLUSIONS

Geoportals are more than simple Internet websites. In fact, a geoportal has capabilities to integrate a bunch of different spatial frameworks at one geo-community platform. By strictly maintaining standards of interoperability the operation of geo information systems of many partners enables for the concentration of resources. A geoportal is a valuable tool to meet many SDI requirements like using distributed datasets, services and metadata of the different providers. The operation of a common Geoportal can help to boost the collaboration of different partners by generating awareness for the benefits of having access to geospatial data of different origins by one single user interface.

REFERENCES

- GEOINFO, 2005: VII. Brazilian Symposium on GeoInformatics, 20-23 November 2005, Campos do Jordão, São Paulo, Brazil, ISBN 85-17-00022-6
Local Spatial Data Infrastructures Based on a Service-Oriented Architecture (#71)
Clodoveu Davis, Leonardo Lacerda Alves
- GeoPortal.Bund, 2011: Geoportal GDI-DE
<http://geoportal.bkg.bund.de/EN/>
- GeoPortal.rlp, 2011: GeoPortal Rheinland-Pfalz
<http://www.geoportal.rlp.de/portal/en/>
- INSPIRE Directive, 2007: Directive 2007/2/EC of the European Parliament and of the Council, March 14, 2007
http://inspire.jrc.ec.europa.eu/directive/1_10820070425en00010014.pdf
- INSPIRE Geoportal, 2011: The EU Portal for Geographic Information
<http://www.inspire-geoportal.eu/>
- INSPIRE NSA, 2008: Network Service Architecture Version 3.0, Network Drafting Team, July 19, 2008
http://inspire.jrc.ec.europa.eu/reports/ImplementingRules/network/D3_5_INSPIRE_NS_Architecture_v3-0.pdf
- OGC Newsletter, June 2008 – WEB SITE OF THE MONTH
<http://www.opengeospatial.org/pressroom/newsletters/200806/#C4>
- PEGELONLINE, 2008: Gewässerkundliches Informationssystem, Wasser- und Schifffahrtsverwaltung Bund
<http://www.pegelonline.wsv.de/gast/start>
- Smits, 2008: ISO/TC 211 Standards in Action Workshop, May 28, 2008, 1400 – 1700, Scandic Copenhagen, Denmark
INSPIRE – current status of technical implementing rule development - Paul Smits, JRC EC, Ispra
http://www.isotc211.org/WorkshopCopenhagen/Presentations/Paul_Smits_INSPIRE.pdf

BIOGRAPHICAL NOTES

Hartmut Müller got his diploma and doctoral degree at Karlsruhe University, Germany. After 8 years of research he turned into the marketing and software development departments of international enterprises for 6 years. Since 1991 he is a professor at Mainz University of Applied sciences. Since 1998 he is a member of the board of i3mainz, Institute for Spatial Information and Surveying Technology. In the DVW – German Association of Geodesy, Geoinformation and Land Management he was the chair of working group 2 –Spatial

Information and Spatial Data Management until 2010. **Falk Würriehausen** holds a diploma in Geodesy. Since 2008 he is a research co-worker at the i3mainz Institute for Spatial Information and Surveying Technology of Mainz University of Applied Sciences.

CONTACTS

Prof. Dr.-Ing. Hartmut Müller, Mainz University of Applied Sciences
Lucy-Hillebrand-Str. 2, D-55128 Mainz, GERMANY
phone +49 6131 628 1438
mueller@geoinform.fh-mainz.de, www.i3mainz.fh-mainz.de

Dipl.Ing. Falk Würriehausen, Mainz University of Applied Sciences
Lucy-Hillebrand-Str. 2, D-55128 Mainz, GERMANY
phone +49 6131 628 1472
wuerriehausen@geoinform.fh-mainz.de, www.i3mainz.fh-mainz.de