

# terramapserv - A Perfect Platform for Managing Geospatial Information via the Web

Oliver Schleider<sup>1</sup>

## Contents

1	Introduction .....	1
2	Business with terramapserv .....	1
3	Inside terramapserv .....	5
4	terramapserv and the geo-information market .....	7
5	How terramapserv enables a GSDI .....	9
6	Summary .....	10
7	References .....	10

## 1 Introduction

Geo-information markets are growing as supplier markets for various branches. User resp. customer groups are characterized by heterogeneous demands. Providers cover particular segments. The need to provide geodata of certain type within certain technical environments and other factors cause the generation of value chains.

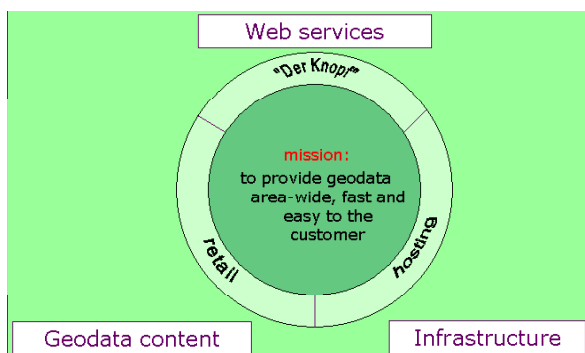
The present stage of a global spatial data infrastructure (GSDI) shows the existence of various types of geodata servers with different purposes, different functionality and different degree of networking.

Some common difficulties for the customers of geo-information hinder the opening of latent market potentials, prices and accessibility to be important ones hereunder. These difficulties have been identified by independent institutions. The challenge is now to pick up these facts by developing business models for the players of the geo-information market.

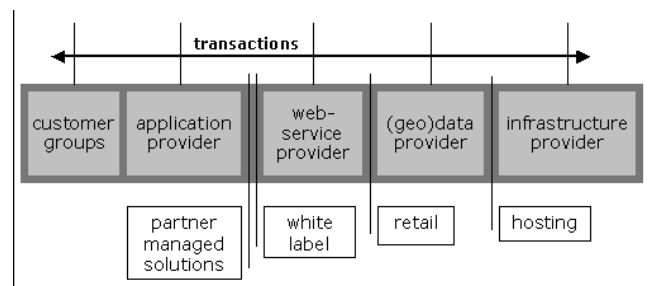
The terramapserv approach is characterized by some key features – it is an integral solution concerning content, business models and partnering, strategic approach and technical infrastructure and thus predestined for the GSDI to come up in the near future. The following chapters describe these foundations and how terramapserv interacts and helps to build a sustainable GSDI.

## 2 Business with terramapserv

Terra Map Server focuses its business on geodata retail and geodata refinement. The mission is to provide geodata to the customers in the easiest and fastest way possible.



terramapserv business focus



geo-information value chain

<sup>1</sup> Dr. Oliver Schleider, Terra Map Server GmbH, Stockholmer Allee 24, 44269 Dortmund, Germany, E-Mail: oliver.schleider@terramapserv.com

Only as a whole, geodata content, web services and a technical infrastructure enable business models that make up terramapserv a perfect platform for managing geospatial information over the web. The following chapters describe a number of items round this main focus.

## 2.1 terramapserv's content

The foundation for any economic use of terramapserv and also to establish a geo-infrastructure in general, is direct geodata availability. The following table gives an excerpt of terramapserv's content:

Provider	Area	Type of geodata
Landesvermessungsamt Nordrhein-Westfalen (LVermA NRW)	North Rhine-Westphalia	orthophotos, topographic maps, building coordinates
Landesvermessung + Geobasisinformation Niedersachsen (LGN)	Lower Saxony	orthophotos, topographic maps
Amt für Geoinformation und Vermessung der Freien und Hansestadt Hamburg	Hamburg	orthophotos, topographic maps
Landesvermessungsamt Schleswig-Holstein	Schleswig-Holstein	orthophotos, topographic maps
Kommunalverband Ruhrgebiet (KVR)	Ruhrgebiet	orthophotos, city map
GEOSPACE GmbH	Germany	Orthophotos
Navtech B.V.	Europe	navigational data
Andes B.V.	Europe	raster product out of navigational data
GfK Group	Germany	demographic data
ascos / Ruhrgas AG	Germany	satellite correction data (RINEX)

terramapserv geodata providers (excerpt)

The number of public and private providers and thus the coverage is growing rapidly. terramapserv strives for fulfilling the broad spectrum of customer requirements by offering more and more variety of geodata types. terramapserv has the first approach to concentrate geodata of many heterogeneous sources on one platform.

## 2.2 The button

The button ("Der Knopf") is an innovative transaction based access method to geodata using terramapserv's web services. It is realized as an enhanced function of standard software such as GIS, CAD or MS Office. The button follows the principle of providing geodata to the customers in the fastest and easiest way possible. The button does neither depend on hardware and operating system configuration, nor on client applications. This makes up the foundation for wide acceptance and fast distribution of the product. The button is also characterized by easy installation and handling.

## 2.3 Data providers' view on terramapserv

Terra Map Server acts as a reseller for geodata providers. Contracts with Terra Map Server regulate monetary and legal areas like forwarding terms and conditions to the customer. In terms of quality and topicality, the customer receives the original geodata as if bought directly from the provider. The benefit of terramapserv's customer orientation is that the customers can get exactly the data they want in terms of area of interest, and quality parameters deploying the adequate pricing. terramapserv's pricing models are value oriented which means that the customer pays exactly the configuration and the parameters of the geodata that they need.

At Terra Map Server, virtual geodata portals are provided as an ASP service. The respective geodata providers can market their geodata via these portals. Commercial and governmental providers have thus the opportunity to market their geodata without major start-up investments and without the specifically needed set-up know-how and can thus generate additional income. Using a geo-service provider (GSP) – infrastructure (see paragraph 3.1), geodata providers' investments can be minimized and time-to-market intervals are shorter.

This Terra Map Server service enables re-financing costly produced and maintained geodata and the amortization of the investments for the portal to develop. Governmental institutions gain an additional image effect by acting in a market oriented way.

terramapservers allows two B2C channels for marketing providers' geodata, transaction based via web services and product based via e-commerce. In the transaction based way, customers directly integrate geodata into their desktop software over the internet. terramapservers' web services offer comprehensive navigation and selection facilities. This marketing channel is designed for standard geodata configuration requirements. In the product based way, customers purchase geodata products directly from terramapservers. Classic procurement processes are mapped to the web (e-shop). Billing follows classic models, such as price per square km in reality. This marketing channel is designed for individual requirements concerning geodata configuration.

#### **2.4 Hosting / ASP customers' view on terramapservers**

Terra Map Server focuses business activities on geodata retail. In this context, Terra Map Server offers services to operate geo-applications and geodata.

Besides implementation and operations costs, purchase costs make a significant portion of a geodata / geo-service projects' TCO (total cost of ownership). Customer satisfaction requires well-engineered security concepts (firewall, backbone). In most cases, a demand oriented technical infrastructure cannot be provided and generates serious initial investments. Availability and fail-over security requirements induce technical support expenses. Software for operating system, DBMS and middleware require special licensing for intranet or internet operations. Operative geodata and applications have to be maintained and updated regularly. The overall infrastructure has an average obsolescence time of 3-5 years.

Hosted geo-applications are operated by a specialized service provider. For the owner of the software no initial investments occur. The hosting provider accomplishes data management and maintenance, which generate staff and material costs. Application hosting generally means minimization of technical workstation expenses (thin clients), so that only an internet browser or another access software is required. As an ASP (Application Service Provision) software alternative billing- and licensing models may be deployed.

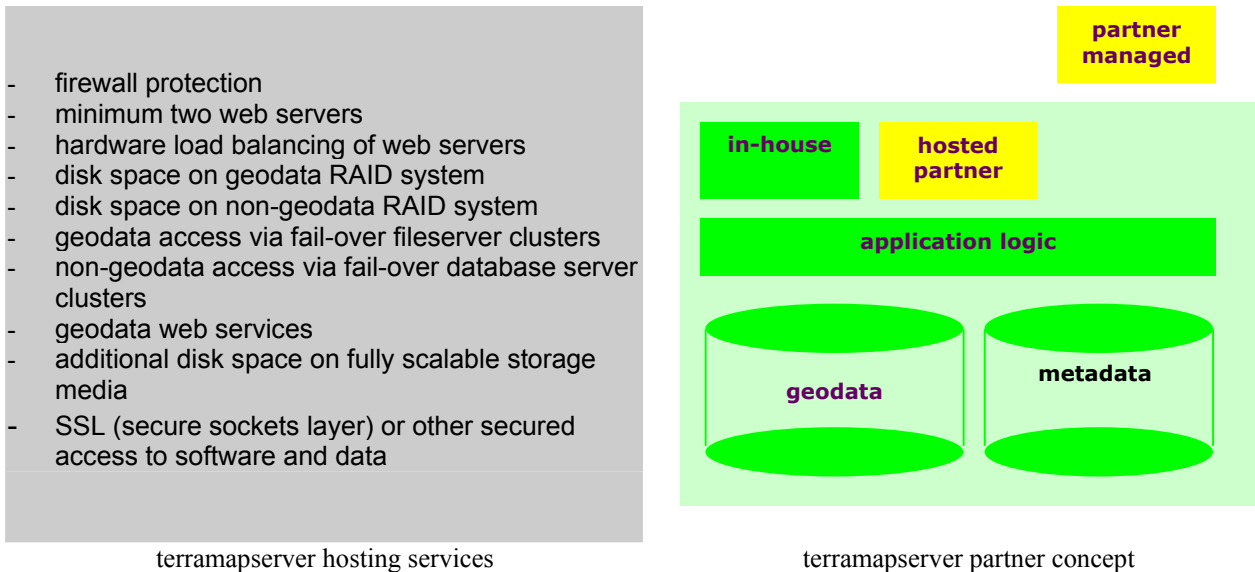
The economic value of a hosting solution follows from the low monthly fees in comparison with the high investments of in-house operations. Implementation and purchase costs for technical infrastructure do not apply. The hosting provider can share operational costs among the hosted projects and thus offer lower fees than would occur for separate infrastructures. Costs of financing for technical infrastructure do not apply.

The owner achieves shorter time-to-market intervals, better ROI (return on investment) and becomes operative with the application earlier. Infrastructure obsolescence time remains matter of the provider.

Hosting via terramapservers means direct access to additional markets and branches for project geodata. Web services enable embedding of geodata into any internet based and geo-related project. Particularly the button has a multiplier effect when marketed via the button partners. Partners are

familiar with marketing potential of products having the button embedded and they have already penetrated such markets.

As for geodata providers, using a geo-service provider (GSP) – infrastructure for the hosting service, investments for infrastructure can be reduced and time-to-market – intervals shortened. The GSP - infrastructure is the technical basis for terramapservice hosting and guarantees the availability and the scalability of a professional, modern internet site. The redundant hardware setup including software and data is maintained and updated by Terra Map Server. The internet backbone link is handled by international partners. All components were designed carefully under consideration of the requirements of mass content and high access demand.



As a central geodata and application portal, Terra Map Server provides intranet or internet access to the hosted software and geodata and guarantees maximum network availability and security. Additional server or application software can be installed according to customers' demand.

## 2.5 Partner concept

Partners use terramapservice as a basis for serving their own or any other geodata solutions to customers. By adapting the concept of strategic partnerships the server offers a three fold cooperation issue. *terramapservice data providers* update the server with geodata of optimal topicality, quality and completeness of coverage. *terramapservice technology partners* ensure the permanent update on technology of all components. *terramapservice business partners* cooperate by

- **in-house solutions** where terramapservice offers applications directly to the customers. In-house solutions are favorable for partners who like to have the desired application logic or parts of it realized by terramapservice.
- **hosted partner solutions** where partner geodata applications run on the server. Hosted partner solutions are the optimal solution for partners with an existing application which will use terramapservice's geodata.
- **partner managed solutions** where the application is run on a partner's server using terramapservice's geodata. Partner managed solutions are particularly interesting for those partners who have also their own system infrastructure ready for running the application.

All concepts are fully scalable with respect to the number of applications and the desired capacity and performance. Cooperating with terramapservice is thus interesting for any business partner in the internet / GIS environment, where mass geodata content and high performance requirements on the applications and the demand for e-business integration are part of the business model. For

transaction based solutions with web services, the complete billing and accounting mechanism can be implemented on terramapserv, using already existing components.

### 3 Inside terramapserv

#### 3.1 GSP

Terramapserv has defined a Geo-Service Provider (GSP) Infrastructure which is a collection of components so that geodata can be marketed via web services over the internet. The GSP infrastructure consists of the following parts

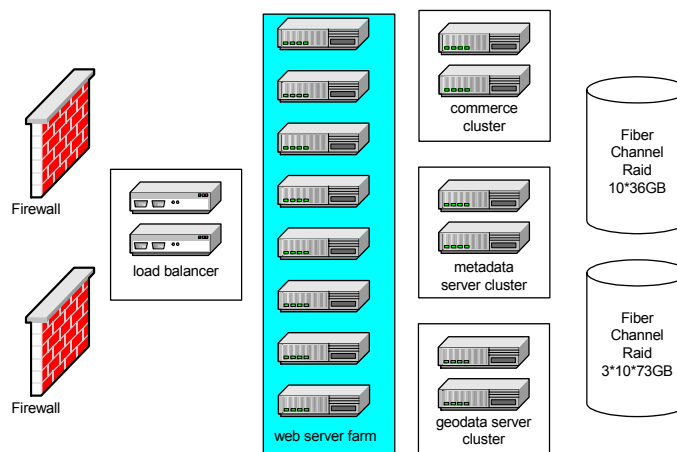
- high availability / scalability / performance – server infrastructure with 99.2 % availability p.a.
- (geo-)web service oriented system architecture
- operative billing mechanisms suitable for transaction based provision of information and partner concepts for marketing and operations thus for value-based pricing
- multi-layer, online geodata content covering large parts of Europe with a storage volume of 5 terabyte
- concept for setting up an international terramapserv network incl. technical and marketing strategy
- ISO / OGC conform metadata model
- expertise of 12 man-years of data and project management experience

The following chapters focus the hardware architecture, the web services and the e-commerce components.

#### 3.2 Hardware infrastructure

The terramapserv site is depicted in the following scheme. It is the technological core and prerequisite for all activities in the operational business. All major automated components and processes are hosted at this site.

The sketch shows protection by redundant firewall, hardware load balancers, a web server farm with 8 machines, three server clusters for commerce data, metadata and geodata, and two storage media for metadata and geodata.



principle sketch

This system is operated in a specialized hosting center of a well-known ISP (internet service provider) and maintained by a team of highly qualified experts 24 hours a day. In this context terramapserv is realized as a high-availability, high performance and scalability site. The site has a redundant components or components with special fail-over features like the storage media. terramapserv's hardware concept enables fast access to geodata. The fundamental architecture is

designed as a modern internet solution. Internal performance tests prove a mapping capacity of more than 2.4 million requests (map clips) a day.

### 3.3 Web services

terramapserver has made web services available which enable platform independent access to geodata servers and at the same time enable customer value oriented business models and value chains. terramapserver's web services are based on Microsoft's .net technology.

The current set of web services was chosen according to general market demand. Web services in particular are:

- **GeoCoder** for localization and address referencing. A comfortable location service corrects faulty inputs and allows for incomplete addresses. The user enters one address and receives a list of matching entries.
- **DataInfo** returns terramapserver metadata for coordinative requests. The user provides an area of interest and receives a descriptive list of available geodata.
- **DateInfo** returns geodata topicality information for coordinative requests. The user provides an area of interest and receives the date of production of a chosen data layer.
- **MapRequest** delivers terramapserver geodata for coordinative requests. The user provides an area of interest and metadata and receives available geodata.
- **TMSRoute** delivers routing information between two points. The user provides two locations in terms of coordinates and receives a textual description of the road navigation between these points.

This access method is different to using the e-shop in that the individual configuration options for the geodata are limited but access is much easier to handle.

### 3.4 Web service billing

terramapserver has its own, user ID based billing component. Each user ID can be individually configured concerning activated services, activated geodata, and pricing. The model provides owner entities. An owner maintains associated user IDs. Registered (by special contract) owners may configure new user IDs, activate and deactivate web services and geodata for these users. Billing statements can be generated by the owners so that billing for all users of one owner can be combined. Users can view their account balance.

### 3.5 E-commerce

The e-shop realizes an actual ordering process. The user can individually configure the geodata to order concerning spatial extent via a GIS component. The AOI (area of interest) can be rectangular or a general polygon. This allows the user to select exactly the area that is desired. Further configuration can be made for the file format, projection, coordinate system, compression and further criteria. This is implemented by a dynamic product list which contains the available geodata for the AOI selected by the user. The user can choose products from this selection and configure the order accordingly.

A standard shopping basket functionality was adapted for the e-shop. Also other features of the e-shop like user management and the direct administration of orders and delivery over the internet by the user are standard features. The order management and order processing of the e-shop is coupled to the accounting system.

For the e-shop orders, terramapserver allows CD-ROM and download fulfillment, and credit card, invoice and debit entry as payment methods. Current security mechanisms apply.

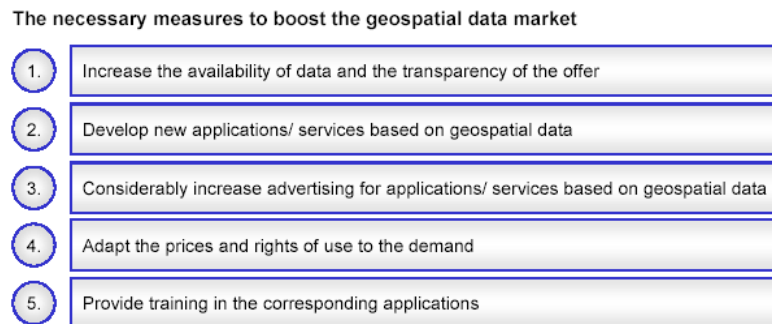
Online fulfillment by download is a special terramapserver feature. The customer has terramapserver's geodata on the workplace right after ordering and checking the order. An automated solution - terramapserver's download manager - performs necessary re-projection and

other post-processing methods. The download manager is also used internally for CD-ROM fulfillment.

## 4 terramapserver and the geo-information market

### 4.1 Needs of the German geo-information market

The German geo-information market is characterized by unused potential, high prices, poor data accessibility and other factors. However, a demand in various customer groups has clearly been identified. In their market survey „Boosting the geo-information market in North Rhine Westphalia“, MICUS [1] have extracted a number of measures to cope with the current drawbacks of the geo-information market. These measures are depicted in the following diagram.



source: MICUS [1]

### 4.2 terramapserver's answers to market needs

All measures are addressed with terramapserver concepts. The following enumeration shows that the button fulfills all mentioned prerequisites:

- **increase availability and transparency:** Availability of geodata offered by terramapserver is given in multiple ways. The server infrastructure, the web services and thus the geodata itself follow a high availability concept, transparency is given by the catalog functions implemented in the e-shop and the *DataInfo* web service and also directly by terramapserver's web site.
- **new applications and services:** The demand for innovative applications is answered by the button. It is one of the first methods to integrate geo-information directly over the internet into standard applications.
- **increase advertising and services:** Partner companies of the button multiply the advertising capabilities for terramapserver addressing existing and expanding customer groups in different branches.
- **adapt prices and rights of use:** Flat rates, traffic based (per kByte) and pixel based pricing are possible. The pixel price for the button and for other projects using terramapserver's web services enable a value based purchase for the customer. For raster data, an area independent purchase allows to choose and pay only the desired resolution.
- **provide application training:** This demand is partly overcome by realizing a strongly standardized, easy to use add-on for software already in use at the customer. Many customers of the button are not interested in extensive configuration of the purchased geodata and thus those functions could be omitted in the respective the button client.

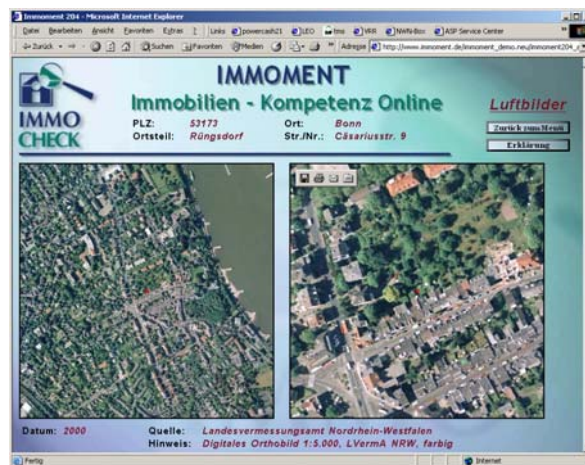
Besides further penetration of existing customer groups, where procurement processes can become more efficient, there is a direct potential for further branches and markets. Most often terramapserver business partners implement and operate applications (*partner managed solutions*), because customer groups and scenarios change rapidly. Geodata can be integrated into any spatially related projects via the web services. The button partners reach a multiplier marketing effect. Partners know products' market potentials, where the button is embedded and they have already opened respective markets.

Terra Map Server's service orientation stimulates the geo-information market in various ways. Integration into process chains enables concentration on core competencies. The mentioned marketing strategies create attractive win/win-situations for B2B business. Costs and investment risks for market participants can be reduced. Transaction based provision of information makes geodata easier and faster available. This is of fundamental significance for emerging markets like mobile and telecommunication.

### 4.3 Partner solutions

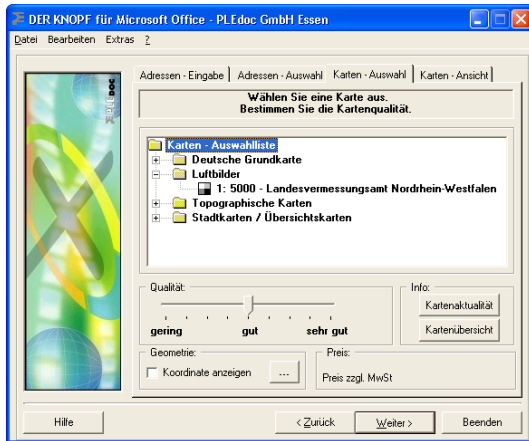
Some operative examples of the shown partner business models are listed here:

- **Where2Dig:** Where2Dig is a web based information service for pipeline networks, e.g. utilities or telecommunication companies. Where2Dig generates legally binding information about whether a geographic AOI is intersected by part of the respective pipeline network. The user is independent from hardware and operating system restrictions and the application can be embedded into a local applications infrastructure or be installed stand-alone. Usage is independent of the user's location and time of day. Where2Dig runs as a hosting solution and geodata is integrated via the terramapserver web services.
- **ascos:** terramapserver is involved in marketing satellite reference data over the internet. terramapserver's infrastructure and e-business components can be used.
- **IMMOMENT:** IMMOMENT realizes a data base for real estate objects hosted on terramapserver and using terramapserver web services *DataInfo* and *MapRequest*. The application itself and some proprietary data is provided by the IMMOMENT operator. IMMOMENT needs 5-6 maps per use: digital base map, topographic map, orthophoto (detail and overview) and city map, all of them provided by terramapserver.

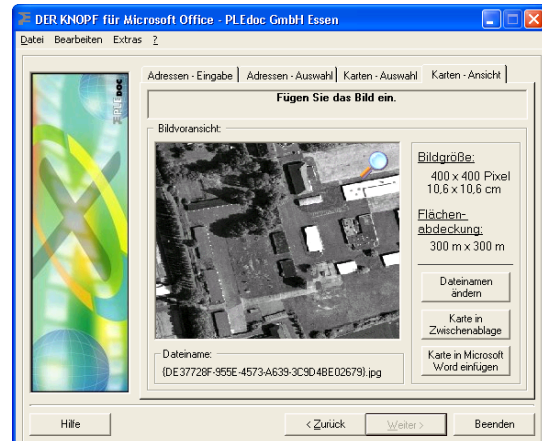


IMMOMENT

- **ASP in schools:** In the educational environment, terramapserver enables e.g. internet based geography lessons. The button for Microsoft Office™ is embedded in an office package hosted by a third party provider on their ASP platform. Special conditions apply for the business model and for the technical implementation.
- **The button for Microsoft Office™:** As an example of using the button for Microsoft Office™, an orthophoto is embedded into a Microsoft Word™ document. A real estate agent wants to create an exposé. He starts *GeoCoder* via Microsoft Word™ and receives a list of matching addresses including co-ordinates according to the objects location. Then he selects the desired list entry and directly receives an orthophoto as a result of a *MapRequest* call, so that he can embed it via Windows clipboard. No further going technical insight is necessary because of the high standardization of this workflow.



the button: DataInfo



the button: MapRequest

## 5 How terramapsserver enables a GSDI

### 5.1 Managing and marketing geodata over the web

Geo-information markets can be efficiently stimulated by innovative, straight forward programs that use modern basis technologies in the framework of a global spatial data infrastructure. However, the principal focus should be set on economic aspects since these provide the motivation and the utilization of any infrastructure activities.

Today's status shows that there are a lot of separate marketing approaches but there is no continuous, asserted SDI (spatial data infrastructure) solution. Moreover, many institutions do not want or are not able to invest in an adequate infrastructure. Further restraints exist because of security issues. Data structures are often very heterogeneous which causes integration expenses, despite standardization.

terramapsserver addresses these aspects in multiple ways. Particularly municipal or SME geodata can be made available in a fast and easy way. A geodata server network is the technological basis. This network is the platform for managing the complete technical operations of online-marketing municipal geodata. All business processes are mapped as technical processes onto a transactional service architecture. Data management as access and update of geodata content on the servers can be performed by online interaction of the municipal institutions with the geodata servers.

The service oriented approach significantly saves monetary and temporal expenses of procurement processes. Data providers, infrastructure and service providers can be integrated in value chains. The data provider generates thus income automatically with every service request by the user. The user is charged the transaction and the geodata transmitted by the service.

Web service use is embedded via the button into standard software available at the users of the municipal geodata, e.g. GIS or Office software. All geodata sources available through terramapsserver can be used automatically with the button.

Infrastructure and service providers of this SDI are not interacting directly with the customer. The customer interacts with the data provider. This enables rapid market penetration and all partners within the value chain can concentrate on their core competencies. Especially SMEs and small governmental entities get the opportunity to establish themselves in the market.

terramapsserver contributes an integral approach including infrastructure, utilization and marketing concept enabling rapid and far-reaching market penetration. Existing customer groups can be expanded by the partner concept and the creation of value chains of participating providers and

multiplier effects are obvious. Administration and fulfillment processes become more efficient so that turnover is increased.

## 5.2 GDI

Terra Map Server is embedded in the program „Geodata Infrastructure“ (GDI), supported by the government of North Rhine-Westphalia. GDI became operational in 2000 with the intention to develop and boost the geo-information market in North Rhine-Westphalia and later beyond so that the economy can use the latent potential of geodata and initiate new market segments and branches.

In co-operation with the Fraunhofer Institute for Software and Systems Engineering (ISST), terramapserv web services are connected to a web pricing and ordering system (WPOS). WPOS is fully compatible to international standards (ISO OGC). This connection enables embedding access to terramapserv into web services with standardized interface specification. Geo-related portals can thus integrate terramapserv portfolio via distributed e-business environments. The customer benefits from a transparent catalog and order facility over heterogeneous geodata servers.

## 6 Summary

The foundation for terramapserv's front position in the market concerning technology and marketing strategy was set by

- the implementation of a high-availability, scalability and high-performance geodata server
- providing comprehensive multi-layer and multi-source geodata content
- creating innovative web services according to market demands

Only the composition of all three enables that terramapserv has a top position throughout Europe. terramapserv enables a GSIDI by providing business models and technologies which

- help geodata providers to avoid project infrastructure investments, concentrate on their core competencies and market their data automatically in all accessible customer groups
- offer end users a transparent, easy and fast access to geodata and allow a value oriented pricing and customer demand oriented product portfolios and
- involve business partners with multiplying marketing activities and profit from transactional revenue sharing being part of the value chains

and by concrete activities and active participation in local state committees (GDI).

The geo-information market is stimulated efficiently and precisely by the terramapserv concept and its realization. terramapserv thus today forms market characteristics which lead to the desired effects within existing and developing target branches and customer groups and which actually generates the desired economic value. Acceptance of terramapserv is supported by today's degree of publicity. The developed processes and products technically and commercially enable usage of terramapserv itself, in the form of cooperation and also via know-how and technology transfer.

The shown business examples match a number of case studies according to desired business models as a result of a study mandated by the Government of North Rhine-Westphalia. These case studies show the present and coming-up demand for providing geodata and solutions.

## 7 References

- [1] Fornefeld, M.; Oefinger, P.: Market Survey: Boosting of the geospatial data market in North Rhine Westfalia. Micus Management Consulting GmbH, Düsseldorf / Staatskanzlei des Landes Nordrhein-Westfalen, media NRW Band 24. Düsseldorf, 03/2001. Available via the Center for Geoinformation GmbH (CeGI) web page, <http://www.cegi.de>