

The Map Supply – an Element in the National Spatial Data Infrastructure

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SUMMARY

In its five years of existence, The Map Supply has proved that offering geospatial services in a service-oriented architecture is a mature technology and with the right business model and support, it is well accepted amongst users and system integrators. Loosely coupled systems are a reality of today, but need a more unified interface to users and system integrators. With INSPIRE coming up and the general development in SOA, the next logical development is to create a more complete and coherent SDI environment addressing both technology, business and support issues.

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1. INTRODUCTION

Over the last few years the Danish National Survey and Cadastre – like many other providers of geospatial information – has added web-services as a new way of exposing their data to the users via the internet. Web services offers instant access to the latest information and reduces some of traditional barriers for including geospatial intelligence into solutions. However, this development brings forward some of the inherent issues in creating an efficient spatial data infrastructure, e.g. is the latest information available really up-to date, how do you make web-services from different sources work together seamlessly and what are the conditions for using and combining these web-services.

2. THE STARTING POINT

The Danish National Survey and Cadastre is responsible for the geodetic network, the cadastre, the topographical mapping and the nautical charting in the country. The Map Supply was launched in 2001 as the platform for making the information available on the internet in a service oriented architecture (SOA). The Map Supply is based on standards – SOA standards in general complemented with OGC standards in the geospatial area. Beside the technical standards, The Map Supply deals with the business model, and defines the conditions for using the web-services and a partner program to ensure that it is known what is available and how to include the geospatial infrastructure into mainstream IT-solutions.

The Map Supply was mainly created to decrease the barriers for using geospatial intelligence in our user environment. Traditionally geospatial intelligence was mainly used in dedicated GIS systems used by experts. With the web-service offerings we see a dramatic increase in the use of geospatial intelligence in main stream solutions, e.g. e-government solutions.

The Map Supply has been very successful. Today some 200 organizations have access to the services, more than 20 development companies are involved in the partner program and on a monthly basis more than 3 million requests are serviced, i.e. as an average 1 to 2 requests per second day and night all year round.

3. SPATIAL DATA INFRASTRUCTURE AND INSPIRE

With the anticipated approval of the INSPIRE directive, EU has put focus on spatial information and on spatial data infrastructure.

Spatial data infrastructure is defined as “the technology, policies, standards, and human resources necessary to acquire, process, store, distribute, and improve utilization of geospatial data” (GSDI, 2004).

In the proposal for the INSPIRE directive, “infrastructure for spatial information” is defined as “metadata, spatial data sets and spatial data services; network services and technologies; agreements on sharing, access and use; and coordination and monitoring mechanisms, processes and procedures, established, operated or made available in accordance with this Directive”.

The Map Supply fits in to the infrastructure for spatial information as defined by the INSPIRE directive. The INSPIRE directive and the vision of a **shared public infrastructure** for spatial data information, emphasises the need for a **seamless infrastructure** consisting of elements with **different custodianship**, offering **easy access to up-to-date information to different user communities**. As the authority responsible for the overall coordination of the Danish INSPIRE implementation, the National Survey and Cadastre see it as its role to focus on these elements, and the development direction of The Map Supply is very much determined by the resulting requirements.

4. FUNDAMENTAL SPATIAL DATA INFRASTRUCTURE IMPLEMENTATION ISSUES

The SDI must be available for integration into mainstream solutions and consists of information from different sources with different organizations being responsible for different elements in the infrastructure. In order to be successful, the implementation of the SDI must take this into account.

From a technology viewpoint, one of the most exiting developments within mainstream information and communication technology is the service oriented architecture (SOA) and its emerging standards. One of the beauties of SOA is, that an information infrastructure can be build based on collaboration between multiple loosely coupled systems. When it comes to practical implementation of the SDI, SOA is an important building block.

However, in order to use this for practical implementations, technology and technology standards alone are not solving the problem: a substantial amount of ground work needs to be done in the areas of data modelling and standardization, in developing new business models, new ways of working together, new processes and procedures, and a new set of agreements on sharing.

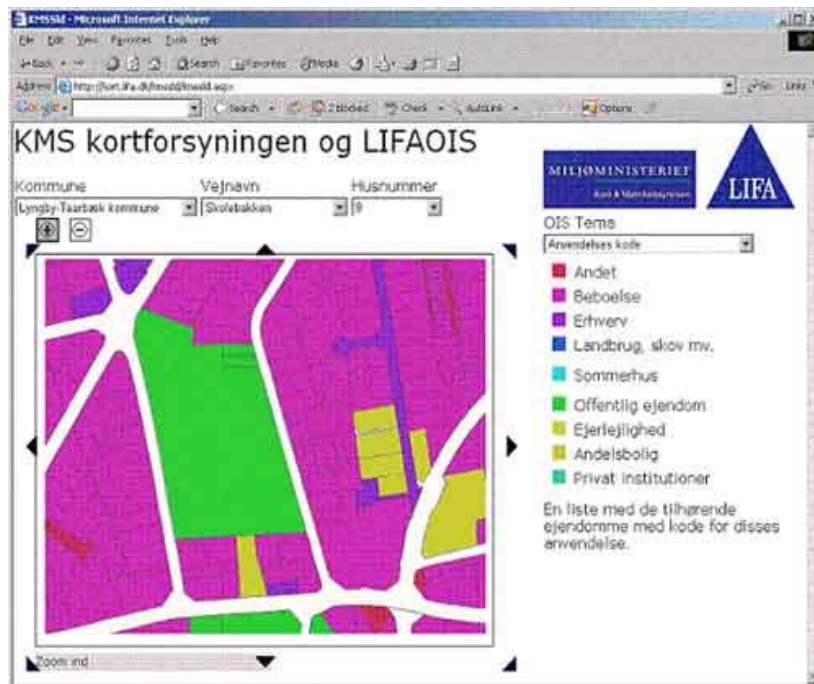
5. LOOSELY COUPLED SYSTEMS

Loosely coupled systems gives the flexibility of establishing an architecture, where information can flow more freely between the organizations that are creating and maintaining the information to the organizations that are using the information, without the traditional bindings of integrating vast amounts of data into monolithic systems, with the inherited problems of constantly copying updates around in order to try to keep all data current. A more efficient approach is to establish independent systems around different elements in the infrastructure where information is created, maintained, and serviced to the user community.

The concept of loosely coupled systems is already being used – also in the geospatial area. This is for instance the case when we see two maps overlaid, one coming from one server and the other from another. However, this is only a simple beginning; more sophisticated functionality is needed and can be implemented in the SOA architecture.

The Map Supply is offering elements of such sophisticated functionality as illustrated in the following example:

The first generation functionality of The Map Supply only offered web-services capable of showing map images with predefined cartographic set-up. With a new generation of web-services this has been taken one step further and the rendering of map images can be determined by the user application based on properties of the geospatial objects represented in the map image. The example shows a thematic parcel map from a simple browser application accessing web-services from The Map Supply and from the Public Information Server (OIS), a system offering web-services with non-spatial properties of real estates. The Map Supply knows nothing about the properties of the real estates and OIS has no geospatial intelligence. Still, the simple browser application can combine the web-services of the two systems in such a way that thematic maps are being presented to the user.



With loosely coupled systems and intelligent web-services, the user can get access to advanced GIS functionality without the need for a local copy of data and local GIS tools.

6. TYING IT ALL TOGETHER

In the example above, the system integrator still needs to know about the different systems offering different web-services, and agreements about the use need to be made with both system providers.

Making knowledge about spatial information available is already being widely addressed via metadata services, allowing users and system integrators to get the information in a standardized way.

Next step is, for each system offering web-services, to make catalogue services available, making system integration easy.

However, the ultimate goal is to offer the geospatial infrastructure in a way, where users and system integrators see the infrastructure as a uniform environment that is easy to deal with. This means that they should need to bother as little as possible about technology and business issues related to the loosely coupled architecture and different underlying responsibilities for data and functionality.

The approach that will be followed by The Map Supply to address this area is to emerge into support of portals offering federated systems based on the loosely coupled systems mentioned above. The portals must define adequate agreements on sharing, access and use. The existing development partner program and support program must adapt to the relevant portal offerings.

7. BUILDING THE SPATIAL DATA INFRASTRUCTURE

Building a spatial data infrastructure as described above is a task involving multiple organizations and a lot of work. In the following some of the major components in this task is mentioned.

SOA standards are emerging standards coming from the mainstream information and communication technology environment. Somebody once said, that the good thing about standards is, that there are so many of them. This is also true in this area, and as the standards are evolving it is important to be clear on which standards are defining the SOA platform. The Danish Ministry of Science, Technology and Innovation is following this area and is setting the standards for the entire government area on this subject.

In the pre-SOA era, data were copied and integrated in to the different monolithic systems; data modelling issues were often handled as part of the data integration process. In the SOA world, it is critical, that data modelling issues are handled prior to establishing the web-services. To deal with this, the Danish Ministry of Science, Technology and Innovation are heading the so called OIOXML effort to establish a common public standard for name giving and design of XML based messages for use in data exchange between public authorities. The

Danish National Survey and Cadastre is actively taking part in this work in order to ensure the standards for geospatial information.

In the pre-SDI era, each monolithic system used its own geospatial reference material. Information did not flow freely between systems and sectors and discrepancies caused by differences in the geospatial reference materials were dealt with manually – or ignored. With geospatial information flowing freely and between sectors in an e-government environment, it becomes critical that the information relates in a consistent way to the geospatial reference material.

In Denmark the state and regional authorities have traditionally used a topographic map produced by Danish National Survey and Cadastre, whereas the local governments have used technical maps produced in cooperation with utility companies. Some objects are shared between the two types of maps (e.g. houses and roads), and (apart from the obvious waste of having two overlapping, mainly government paid base maps) discrepancies between the two representations are problematic for e-government solutions. For that reason the municipalities and the Danish National Survey and Cadastre have entered into a mutual project with the goal of establishing one shared representation of technical and topographical objects as an element in the national SDI.

The SDI is shared between multiple sectors and is used in different application domains. The users and system integrators in the different domains will use the SDI in different contexts and in combination with different sector specific information. Although build on the same framework, the SDI will appear differently in e.g. environmental protection context and in emergency context. In order to best fulfil the requirements of the users and system integrators, we plan to offer the SDI in domain specific portals, each optimised toward specific application domains. We are initially focussing on the disaster management domain.

8. OUTLOOK

Although substantial ground work for establishing a SDI is done or in progress and some of the basic technologies and business models are in place, there is still a long way to go in establishing a full-featured SDI. It is important to realize, that moving from a mapping approach to spatial information to a spatial infrastructure approach is truly a shift in paradigm. It is an exciting development, and we have only seen the beginning of how it will change our industry. It will profoundly influence the technology we are using, the role of the players in the industry, and potentially the established organizational structures. However, the promise of the development is that it will ultimately fulfil the dream that many of us share, that geospatial information will be an integral part of mainstream solutions, making the power of “place” available to everybody.

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BIOGRAPHICAL NOTES

Thorben Hansen has more than 20 years of professional experience in land information and infrastructure management including the IT and GIS aspects from requirement studies to implementation and deployment.

Thorben Hansen has been working both on the user side and on the system provider side of IT and GIS systems. For the last five years, Thorben Hansen has been heading up the customer relations department of the Danish National Survey and Cadastre, where his main emphasis has been on changing the focus of the organization to become the provider of a national spatial data infrastructure

Jens Hollænder works at the National Survey and Cadastre with business developments, where the challenge these years is the transformation from selling products to be a infrastructure provider and at the same time to ensure the financing of the activities necessary to build and maintain the infrastructure.

Jens Hollænder is a member of the INSPIRE drafting team that works with the implementing rules for Data and Service Sharing and is a member of Eurogeographics expert group Legal and Commercial. At national level Jens Hollænder is member of the FOTdanmark working group responsible for the business and organization model for new national base map establish by the state and the municipalities.

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