

# **The Map Supply – A New Way of Providing a National Geodata Infrastructure**

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## **SUMMARY**

In 2001 The National Survey and Cadastre, Denmark (KMS) introduced “The Map Supply” as a WEB-service. The general idea of The Map Supply is to provide developers and users access to KMS’ national geodata, and it is one of the key elements in KMS’ data distribution strategy. As the national geodata infrastructure company undertaking this task, it is important to support the Danish society with authentic and updated geodata.

The current services in The Map Supply are geodata presentations based on the OpenGIS standard, Web Map Service (WMS), where cadastral and topographical data is provided to the end users as raster maps and feature information. The service also allows geocoding of addresses, cadastral parcel IDs, and place names as well as transformation of co-ordinates between different projections; all geocoding functionality is based on XML. New services are under construction e.g. feature services based on GML and large format map printing (print-on-demand).

The distribution of geodata as WEB-services presents the distributor with technical as well as business challenges. KMS has developed new business models and access control systems to ensure that users can only access data and services according to their privileges. The article includes a statement of KMS’ technical and business improvements.

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## **1. THE CHALLENGE IN USING THE SPATIAL DIMENSION**

“80% of all the information we deal with can be geographically related”. We have all heard it hundreds of times and GIS professionals have agreed that spatial information would soon be in the heart of all kinds of solutions.

But little has happened. Look at most of today’s solutions dealing with this kind of information and you will be disappointed about how the spatial dimension is dealt with (or rather: not dealt with). Although the use of digital maps and GIS has had respectable growth over the last years, it can still only be considered a niche in the field of information management and information presentation.

The reason for utilizing the spatial dimension is as compelling as ever. Think for instance of e-government and the requirement for communicating complex information between government bodies and between government and the public. We all know that a picture is worth a thousand words, but truth is, that the cost of spatially enabling solutions has prevented this from happening on a wide scale.

For years the need for highly specialized skills, for off-standard IT platforms and for up-front investments in data and technology were among the key barriers preventing spatial technologies from becoming an integral part of the IT mainstream and hence of main stream solutions.

With the advent of the Internet and the possibility of offering Internet based services, a vehicle has emerged, that potentially can break down these barriers. However, the technology in itself will not cause a change. Only when it is combined with new service interface standards and new business models, a new paradigm can be introduced for how spatial intelligence can become part of mainstream IT and mainstream solutions. Defining this new paradigm is what Kortforsyningen ® - The Map Supply – is all about.

Kort & Matrikelstyrelsen (KMS) is the Danish national mapping agency responsible for the geodetic network, the land parcel cadastre, topographical mapping and nautical charting. KMS is providing the national spatial infrastructure within its areas of responsibility, and as part of this infrastructure, The Map Supply was introduced in 2001. This paper discusses the starting point for the initiative, the general trends in the market, the actual components of The Map Supply concept and some practical experience from the deployment.

## **2. THE STARTING POINT**

As most other organizations responsible for creating and maintaining a diverse set of spatial data, KMS has a legacy of specialized systems and applications, built on a variety of IT platforms.

This environment has emerged out of the application needs for the different areas of responsibility with no particular focus on the overall availability of the information to the outside world. Each platform has been chosen based on its ability to fulfill the requirement of a specific production line. Due to the nature of mapping and GIS tools, this resulted in a host of proprietary islands of automation, making it a laborious task to create an extract of data from more platforms.

A few years ago KMS started the work on a common geodata warehouse, storing all data relevant for external use and optimized for data analysis and distribution. The geodata warehouse is based on object relational database technology, including a native spatial extension to the database.

The geodata warehouse is synchronized with the data production systems on a daily basis, hence ensuring an up-to-date platform optimized for data analysis and distribution and freed from the boundaries of the underlying data creation and maintenance platforms.

A major advantage of untying the data analysis and distribution platform from the data creation and maintenance platforms is, that the production tools can be optimized as such and can have their own life cycles independent of each other and independent of the analysis and distribution system. This reduces the interdependencies in the IT platform and is obviously crucial when real-life resource constraints must be obeyed in the ever-ongoing modernization of the entire system.

The Map Supply initiative took the geodata warehouse as a conceptual and practical starting point. The goal for The Map Supply is to provide an efficient way of making KMS' spatial information available to the users via the Internet.

## **3. THE SIGNIFICANCE OF INTERNET**

Over the last few years the significance of the Internet as the distribution vehicle for maps and geodata has become evident.

We all know the hassle of copying huge datasets, sending them to users that on their side have to go through laborious and tedious translation and integration processes before they can use the data in their GIS system. All of these activities add absolutely no value. And on top of that: the data are outdated even before the users are able to start using them.

Obviously, the Internet can help us do the process more efficient: files can be requested on-line and delivered almost instantaneously via the Internet, speeding up the time from start to

end of the process. However, the basic problems are inherited in the approach and not done away with just by using more efficient tools.

One of the exciting things about the Internet is, that it is possible not only to push data around, but also to establish more intelligent services, that in some cases can provide the desired functionality directly to the user via the Internet instead of sending data to be integrated into the users own application.

We all know how maps are available in Map24 or in Expedia. Here data are exposed as an integral part of an end-user application and are of good use for the user – if he needs that specific application.

If the user needs maps in his own application on the Internet, all GIS vendors today offer tools to let him set up a map server that can be accessed from his own Internet application. However, the process of collecting external data and translating and integrating them into his own system is still the same.

The real advantage of the Internet comes, when it is no longer necessary to collect the data in advance to the same repository. Instead data are exposed as services on the Internet directly from their various sources, in a way that allows the user to call the functionality he needs directly into his own application.

Technology wise this takes basically the same as the two previous scenarios. However, in order to make this latter scenario work, a few additional things need to be in place. First of all, agreed-upon standards need to be in place that allows interfacing the client application with the Internet service. Secondly, unless the Internet service is free, a business model needs to be defined and implemented that allow the user to get access to the Internet service. And finally a partnership model must be in place between the service and the application provider in order to make sure that the new paradigm will work in real life.

So there are some fundamental differences between the service paradigm and the traditional data exchange paradigm, not only technology wise, but also business model wise and partnership wise. In order to take advantage of the new technology, we have to work on the business and on the partnership side. Below these aspects are covered in some more details.

#### **4. INTERNET STANDARDS FOR SPATIAL INFORMATION**

XML is a well-established protocol for exchanging information in heterogeneous networks such as the Internet. However, XML is very generic and needs to be refined in order to be useful as a standard in specific areas such as spatial information exchange.

The Open GIS Consortium (OGC) early saw the need for establishing open standards that can serve as interface standards for spatial Internet services. Their Web Map Service (WMS) and Geographic Markup Language (GML) are probably the most well known, but more exist and even more is coming (see <http://www.opengis.org/> for more information).

The Map Supply is fundamentally based on OGC standards with some extended functionality based directly on XML. When it comes to defining the individual data fields exchanged via

XML, this is being done in the context of a national XML standardization effort called the OIOXML.

## **5. BUSINESS MODEL**

Within our existing customer base (mainly government agencies) we have seen that the use of spatial data has had a hard time spreading from traditional hard-core GIS application areas, where spatial data is an absolute must, to areas where spatial data are not imperative, but definitely can add value. To facilitate that our existing customers take more advantage of their investment in spatial data, we offer The Map Supply as an additional tool, that they can use as a service that slots into their main stream IT solutions. With the use of open interface standards The Map Supply is easy to integrate both into standard solutions offered in the market and into custom developments.

Like most European National Mapping Agencies (NMA's), KMS must obtain substantial parts of its funding from selling its data and services to its customers. Consequently, we are not in a position where we can provide our Internet services free of charge – paying for the services is part of the concept.

As a government body, our focus is on providing a national spatial infrastructure that can be widely used. It is not within the scope of the business as an NMA to offer a host of spatial end-user solutions to the market; private partners are encouraged to take this role. So the challenge is to offer a service-based spatial infrastructure to the market on a commercial basis.

For our traditional market, The Map Supply is available on a subscription basis, where the subscription fee consists of two elements: payment for The Map Supply service in itself and payment for the general rights to use our geodata. The customers can subscribe to all or just a few of the datasets and functionalities available in the service, and subscription can be made nationwide or within a geographically restricted area.

However, with the flexibility of the internet based service approach and the richness of data we have available to expose via such services, it is obvious for us to take the role as content provider offering the spatial data infrastructure as services to partners offering solutions to the market with a spatial content, also outside our traditional government market.

To do so, it is necessary to develop new product packaging models and new pricing schemes that fit the targeted market. Our traditional approach to our traditional markets was to sell site licenses to data, and the pricing scheme was mainly based on data production cost considerations. As a content provider, the challenge is to define the value-adding functionality that the solution provider can embed into his solution and to set a price that matches the value added. This is a very different way of thinking and a challenge to traditional pricing policies.

## **6. PARTNERSHIP MODEL**

As mentioned earlier, the role of KMS, as a government body is to provide a spatial data infrastructure, KMS has neither the organization nor the aspiration to venture into development of all kinds of spatially enabled end-user services.

The role as spatial data infrastructure provider fits well with the technological development, where a convergence between spatial data, GIS and mainstream IT is developing around Internet services. As a natural consequence of this, the traditional monolithic approach to spatial solutions dissolves and new horizontal market layers develop as components that can be combined into solutions.

We see the spatial infrastructure as one of the horizontal layers in this new world. To make this work, there must be a clear understanding of how this layer plays together with other layers. Technical interface standards and business models are two important factors. The third – and equally important factor – is the partnership model. The new paradigm with horizontal layers will only work if the players interfacing the layers are working closely together and have a mutual understanding of how the horizontals complement each other in solutions.

To address this, a partnership program has been developed that sets up the ground rules for cooperation, serves as the vehicle for knowledge exchange and a forum for exchanging requirements and developing business ideas. There has been substantial interest in participating in this program from end-user solution providers, both companies doing custom development and companies offering standard off-the-shelf end-user solutions.

## **7. STATUS AND EXPERIENCE**

The KMS Map Supply service was announced back in November 2001 and was released in April 2002.

On the technical side The Map Supply today consists of 3 main components: a geodata warehouse, an access control system and the actual services exposing the content of the geodata warehouse.

Data in the geodata warehouse consists of a land parcel cadastre and a topographical dataset. It includes a comprehensive set of integrated spatial keys that links the spatial information in the data warehouse with non-spatial information in the outside world. The most important spatial keys are parcel identifications, road identifications and addresses.

The basic functionality of The Map Supply is centered on a set of XML-based geocoding tools and a set of WMS-based map services.

More sophisticated functionality is emerging on top of this foundation. The functionality is developed based on requirements for value adding services. Examples of actual developments are feature services and location services.

The main challenge of getting a concept like The Map Supply off the ground has been two-fold. Firstly, everybody talks about service based architecture and solutions, but truth is that

it's still a market for early adopters. Secondly the chicken-and-egg problem: The Map Supply provides a spatial infrastructure, but doesn't provide a solution in itself; the success of the service is dependent on the availability of applications utilizing the service - so getting partners on board to develop solutions and customers signed up to request these solution must be addressed in parallel.

Today a total of 16 development partners are signed up in the (paid) partner program. Amongst the partners are both companies offering standard end-user solutions and companies doing custom development exclusively.

So far more than one hundred subscription agreements have been made with individual customer organizations in KMS' traditional market area. Furthermore agreements have been made with partners offering solutions to their own customers outside the traditional KMS market.

We have received very positive feedback on the whole concept from both partners and customers. Customers are happy about the up-to-date information available in the services and the developers see the offering of a spatial infrastructure as a truly complementary service to their business. We definitely expect the Internet based spatial services to be a growth area for the coming years.

## **REFERENCES**

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