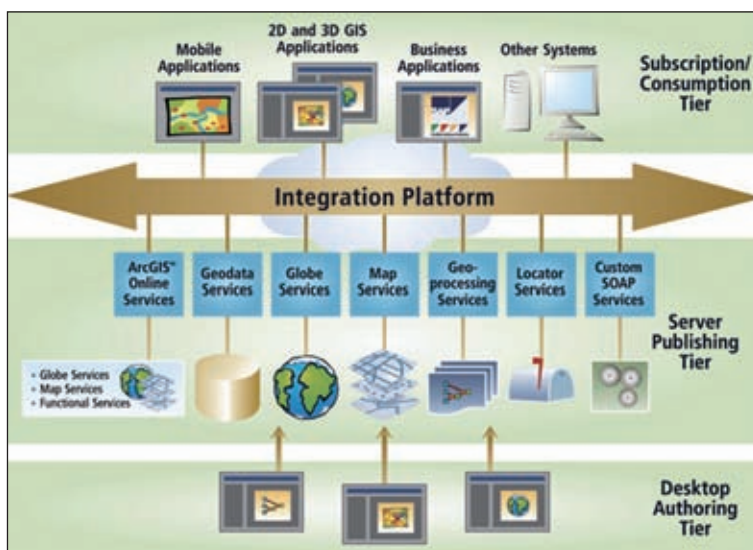


# How ArcGIS Server 9.2 Can Contribute to a Service Oriented Architecture A Silent Servant for the Spatial Enterprise

*ArcGIS Server 9.2 is announced to be the first GIS enterprise application server that implements GIS business logic in an information technology standards-based server environment. Therefore it draws upon the full spatial enablement of an enterprise. It is an answer to the integration of GIS functionality in business processes where the spatial view is critical as well as for the creation of added-value from existing information within business processes.*

By Florian Fischer



The three tier architecture of ArcGIS Server. It allows common GIS functions to be delivered as services throughout the enterprise.

## Service Oriented Architecture (SOA)

SOA enables IT departments to make the transition from an application-centric view of the world to a process centric one. IT departments then have the freedom to combine business services from multiple applications to deliver true end-to-end support for business processes. This is achieved by utilizing integration mechanisms such as Web services that are loosely coupled SOA services. ESRI has responded to this fundamental shift in the technology landscape with full Web service integration. Jack Dangermond says "This technology will produce a new group of spatial information consumers, knowledge workers who are not trained GIS professionals, who will benefit from access to the information provided by custom-tailored GIS-powered applications." ArcGIS Server enables the integration with other enterprise systems such as customer relationship management (CRM) or enterprise resource planning (ERP) systems using industry-standard software.

While often cited an overall SOA is not yet reality. It's more a vision or an objective worth to be achieved. A responsible for information management wants to define what part of an application shall be transparent. A Web services is acting as a black-box that is as transparent as necessary. One can build applications like using Lego bricks where single bricks can easily be replaced without the fear of a collapsing application. "The biggest autonomy remains on a little scope – the Web service", remarks Günter Doerffel and adds: "At a more abstract level this allows for the smarter combination, creation and advancement of applications". The concept of a SOA can also be considered as the IT translation of the continuing shift from a business organisation stamped by vertical structures to more horizontal and networked structures.

## The Business Sphere

How can ArcGIS Server 9.2 transform a SOA to a geospatial service oriented architecture? As a matter of course Web mapping services are included that support 2D dynamic as well as 3D globes. Based on the geodatabase model it includes both workgroup- and enterprise-level spatial data management. Spatial data services allow administrators to publish geographic data for extraction, checkout/check-in and replication. Furthermore it offers server-based analysis and geoprocessing. This includes vector, raster, 3D, and network analytics; models, scripts, and

Once again I visited Günter Doerffel from ESRI Germany to talk about ArcGIS Server 9.2. This article will briefly show how ArcGIS Server 9.2 helps to exploit the locational context of the corporate information assets and will give a glance to the future of enterprise GIS, where more spatial context possibly means less GIS!

## More Than Maps

So far web-mapping, that is serving digital maps via the internet, is the predominant paradigm of web-based geographical information systems. But that is only a part of GIS. Maps are the classical final product of a GIS-workflow but actually they are only one possible final product. Furthermore web-based spatial data management and web-based geo-processing are gaining more and more interest in the enterprise-sphere. There are many reasons to work server-based and there is one important fact about ArcGIS Server 9.2 I would like to men-

tion beforehand: Everything what can be done with ArcGIS Desktop, can be done server-based as well by ArcGIS Server 9.2.

While using server-based processing, a desktop client is not occupied. Therefore a shift of workload from ArcGIS clients to ArcGIS Server is possible. For enterprises with many clients a shift like this can replace high investments in clients by a low investment for server upgrade. Furthermore even an ArcView licensed desktop can use server-based functions delivered by ArcGIS Server. ArcGIS Server 9.2 introduces an out-of-the box web-based editing functionality to serve Map Services, OGC WMS, KML, Mobile ADF and many more. Moreover web-service standards like SOAP and UDDI are supported to enable every developer to connect to ArcGIS Server. ESRI definitely has its sights on the contribution of building blocks for serving the spatial context within a service oriented architecture.

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tools; desktop authoring and synchronous and asynchronous processing.

But GIS is not an end in itself. ArcGIS Server 9.2 is not only about composing GIS applications out of the parts mentioned above. Non-GIS requirements have a presumably bigger share than GIS requirements outside of a pure geospatial domain. Of course there are GIS-centric applications but in most SOAs ArcGIS Server will simply add the geospatial perspective to outline the bigger picture. Possibly here and there it will have a decisive function but mostly it will provide additional functions to make use of spatial information within an enterprise environment where many other services that parallel and shall be combined.

## Authoring Services

Generally all ESRI Desktop products are utilisable for authoring services. For the creation of

services GIS know-how is important. From the point of view of Günter Doerffel this is a part where the strengths of GIS-professionals come into play: "Concerning the matter of chaining geospatial analyses to assemble a service GIS professionals will find one's feet. Possibly even on close collaboration with experts who are capable to implement these service within an IT environment."

These services may be consumed by GIS applications or by any applications which have the ability to integrate them within their IT. For instance the Locator Service may be requested by a SAP application. Therefore SAP simply has to know what to tell the service and what and how it will deliver. Everything that is beneath is a black-box. The service provider may decide how to access the service and may decide if data, maps or simply a yes-no answer is delivered.

## Meaningful Relocation

Every geoprocessing function which is typically a local tool on your desktop GIS is available as a server tool in ArcGIS Server 9.2. The server can handle geoprocessing requests in an asynchronous mode that is the client is released after submitting a request. Other tasks can be performed while the geoprocessing service is handled in the background. By contrast is the synchronous mode which is classical for web mapping applications that can continue only if a processing step has been finished.

This ability of server-side geoprocessing is very meaningful for both desktop and mobile spatial information processing. Savings in desktop licenses, desktop computing power and therefore labour time may be reached by relocating computing power and functionality.

However James Fee asks in his GIS-Blog: "Are we beginning to see a shift away from ESRI

Server backend to Open Source solutions?” He justifies by experience with his customers who were desperately looking for fast, cheap and reliable web clients. Finally most of them went out on their own to work with open source solutions. The other issue is that the added functionality of ArcGIS Server does not give any value for most customers. “Some of the functions of ArcGIS Server are impressive, but in the real world they have almost no applicability”, James Fee argues.

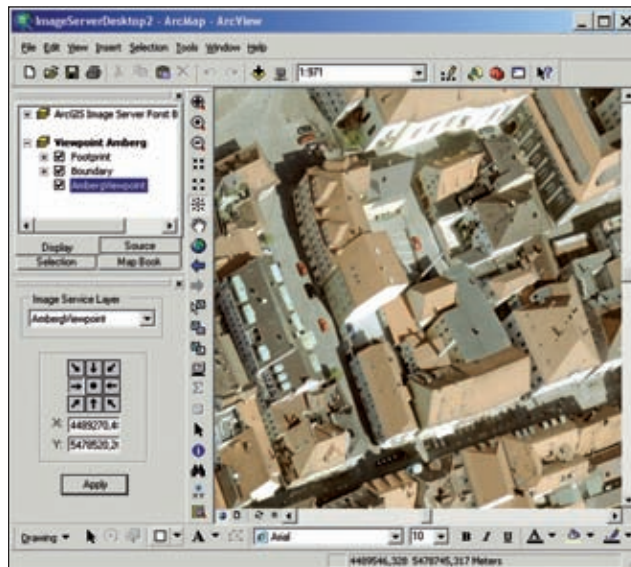
### Open-source Challenge

If that is true then it will be a hard bash for ESRI but there is more than maps and most likely James Fee's customers are pure geospatial evangelists. But ESRI's ArcGIS Server 9.2 is rather for exploiting the locational context within an IT environment than providing a GIS only environment. It is more likely that people in hardcore geo-science will continue to work with desktop software for a long time and may use open-source web mapping only for presenting and querying their results.

However the power of open-source is obvious when looking at the width of products that have been released during the last years and the focus is clearly on web based geospatial products. A reason for this development is the maturity of OGC specifications by the Open Geospatial Consortium. These specifications give a proper framework for the development of geo web services. Furthermore they form a common framework for open-source projects to orientate on and somehow pushed these projects. On the other hand OGC standards are designed to hit the needs of a pure geospatial domain and most open-source projects are originated exactly there.

Günter Doerffel remarks that the market of service infrastructures will experience an enormous development. Thereby not only viewing will be of note but server-based geoprocessing will be demanded in the future. It will be important to provide appropriate services to serve this demand. And it doesn't matter whether it is about a web-GIS application or any web application calling a spatial query.

But ESRI is not incurious about the open-source adventure. In October 2006 ESRI joined 52°North Initiative as a founding member. 52°North is an open initiative whose purpose is the development of open source software for Spatial Data Infrastructures (SDI). The current focus of development is Sensor Web Enablement, Security and Digital Rights Management. Products will be available using two licensing models: GNU General Public License (GPL) and a commercial use license. So



Bird's eye view processed on the fly by ArcGIS Image Server

far ESRI is unsure about where this adventure leads to but committed to try out.

### Mobile Services and Caching

Mostly mobile applications are deployed for recording a spatial situation and create a context. Considering server-side geoprocessing complex models and simulations may be requested by a mobile device giving local input data. These simulations then can be executed server-side and the result is sent back to the mobile device. That is a really interesting field of application but in the majority of cases data visualisation on mobile devices is the predominant service.

A mobile device is therefore not considered as a device to save spatial data and only at the worst case for intermediate data-storage. Eventually spatial data shall be stored on the server sooner or later. The mobile application in turn never accesses the server itself but the cache. ArcGIS Server 9.2 offers many strategies for the cache management while the overall aim is a never hampering application if there is no current connection to the server. Contrariwise a mobile application should at least have a connection every now and then. Otherwise an independent mobile application is the better solution. Considering temporal highly dynamic data caching is a critical procedure. Therefore ArcGIS Server offers caching of selected layers next to ex ante caching, caching on runtime, partial caching with updates and caching by degrees amongst others.

### Catch a Glimpse

My visit at ESRI-Germany would not have been complete without a short look at the ArcGIS Image Server. ESRI integrated this image server technology into its own product portfolio from MAPS geosystems, a leading producer of geospatial imaging solutions and a long-time

ESRI business partner.

The ArcGIS Image Server is a high performance server for image data like aerial photos. The image server even allows to visualise bird's-eye views like the ones from pictometry which are integrated in Microsoft's Virtual Earth platform. These images show a post-card view of a landscape and therefore have not a uniform pixel resolution. Furthermore the images are overlapping as they were made from five different directions: North, South, West, East and orthogonal.

Thus the ArcGIS Image Server must handle a varying resolution, overlapping images and a huge amount of image data – on the fly and on demand! And it does.

The image data files may be stored unsorted and the Image Server will sort them on demand according to the requested attributes. It's not an easy task to present these bird's eye views but Image Server really does a good job even if there are some small mismatches every now and then.

This is of special interest for security-relevant applications. The police force or the fire brigade may get a quick overview of the local situation like: Where are the doors of a building? Where are the windows? How does the backyard look like?

ArcGIS Image Server gives an impression of what might be possible in the future of displaying image data. The performance is solely up to the speed of the hard-disk.

### Maybe the Best Service is the One You Never Notice

Finally with ArcGIS Server 9.2 a twofold shift takes place. First of all a shift from an application-centric perspective to a process-centric perspective. This is common for the whole IT landscape nowadays. Another shift takes place from a pure GIS-centric application focus to the idea of serving the geospatial aspects for a non-GIS SOA. Depending on the level of integration, users may not even realize they are implementing GIS techniques and processes. And ArcGIS Server somehow transforms to a silent geospatial servant for many business and management processes.

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Links: ESRI – What's New in ArcGIS 9.2:

[www.esri.com/software/arcgis/about/whats-new.html](http://www.esri.com/software/arcgis/about/whats-new.html);

David Maguires weblog 'GIS Matters':

<http://gismatters.blogspot.com/>; James Fee GIS Blog:

[www.spatiallyadjusted.com/2006/10/09/](http://www.spatiallyadjusted.com/2006/10/09/).